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Countering misinformation with targeted messages: Experimental evidence using mobile phones

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Abstract

Widespread misconceptions can be critical, especially in times of crisis. Through a field experiment, we study how to address such wrong or inaccurate beliefs using messages delivered to individual citizens using mobile phones. We focus on misinformation related to the COVID-19 pandemic in a hard-to-reach population – India's slum residents. We randomly allocate participants to receive voice and video messages introduced by a local citizen, the messenger, and in which medical practitioners debunk misconceptions. To understand the role of targeting, we randomly vary the signaled religious identity of the messenger into either Muslim or Hindu, guaranteeing exogenous variation in religion concordance between messenger and recipient. Doctor messages are effective at increasing knowledge of, and compliance with, COVID-19 policy guidelines. Changes in misconceptions are observed only when there is religion concordance and mainly for religious-salient misconceptions. Correcting misconceptions with information requires targeting messages to specific populations and tailoring them to individual characteristics. (*JEL* D04, D80, D83, I10, I15, Z12)

Keywords: Misinformation, Misconception, Fake news, Religion, India, Social media, COVID-19.

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Misinformation play an important role in distorting people's beliefs (Gerber et al., 2009; Barrera et al., 2020). Media, and in particular social media and instant messaging platforms, are often used as channels to propagate fake news, spreading misconceptions (Allcott and Gentzkow, 2017; Barrera et al., 2020).[1] This can have deep consequences in the way people make decisions in a wide variety of domains.[2] In the context of the COVID-19 pandemic, misinformation has become so widespread to have been deemed a major concern for public health, labeling its diffusion as *infodemic* (Vicario et al., 2016; World Health Organisation, 2020; Bursztyn et al., 2020). While the literature highlights the importance of misinformation in spreading misconceptions among citizens, their persistence is 'incompletely understood' (Chan et al., 2017), and evidence about the instruments that can counteract them remains limited.

We study how targeted messages, i.e. messages delivered and tailored to an individual citizen, can correct misconceptions. To this purpose, we implement a field experiment among slum residents of the two largest cities of Uttar Pradesh (UP), India, amid the COVID-19 pandemic. Misinformation is a particularly pressing issue in India, which has seen dramatic increases in access to platforms that are widely used to spread misleading information. Internet penetration rate increased from about 4% in 2007 to 50% in 2020, giving access to 622 million users, while social media platforms are becoming the primary source of news (Statista, 2021). With the onset of the COVID-19 pandemic, a wave of misinformation flooded India to the extent that PM Narendra Modi addressed the nation urging everyone to rely only on credible medical advice and demanding social media companies to curb misinformation on their platforms (Purohit, 2020; Akbar et al., 2020). Misconceptions about COVID-19 were widespread in our target population from early in the pandemic.

Being the most marginalized and less-educated share of the urban population in India, focusing on slum residents allows studying the roots of misconception among the citizens that are most-at-risk for the consequences of misinformation (Lazer et al., 2018; Bavel et al., 2020). Worldwide one billion people live in such settlements -– more than half of these in Asia and almost a fifth in India (World Bank, 2020). From June 2020, amid the early months of the pandemic, we followed more than 4,000 slum residents via phone surveys for up to 6 months. Using standard measures of agreement with self-reported misconception together with a novel survey instrument to capture agreement with other citizen's misconceptions, we gathered rich information about people's beliefs related to the COVID-19 pandemic.

By varying the content of a message sent to citizens using mobile phone technology, the experiment tests two hypotheses about the persistence of misconception among citizens. First, we test whether receiving credible and informative messages can correct misconceptions. We randomly allocate participants to receive messages on their mobile phones in which doctors working in locally-renowned hospitals debunk misconceptions related to COVID-19 (versus receiving an unrelated message about a Bollywood gossip). In the study setting, 95% of the target population report doctors and health experts as the most trusted

[1] A *misconception* is defined as a wrong or inaccurate idea/belief. See, e.g., Scheufele and Krause (2019) for an application to science.

[2] These include women's agency and fertility choices (Jensen and Oster, 2009; La Ferrara et al., 2012; Kearney and Levine, 2015), political accountability (Besley et al., 2002; Strömberg, 2004), crime (Müller and Schwarz, 2021; Bursztyn et al., 2019; Card and Dahl, 2011; Dahl and Dellavigna, 2009), social capital and attitudes (Olken, 2009; Paluck and Green, 2009).

source of COVID-19 information. In addition, given concerns that class differences between the recipient and the doctors can induce skepticism (Gauchat, 2012; Eichengreen et al., 2021), the messages were introduced by a local citizen (labeled the *messenger*). While trusted voices have shown to increase the credibility of the source and improve knowledge and health outcomes (O'Keefe, 2016; Greyling et al., 2016; Khan et al., 2021; Sadish et al., 2021), there is limited knowledge on how targeted messages can affect persistent misconceptions.

Second, we test whether tailoring the message by introducing shared characteristics between the messenger and the recipient improves its effectiveness. Building on the literature on identity (Akerlof and Kranton, 2000), we focus on religion concordance and we further randomize the signaled religious identity of the messenger to be either Muslim or Hindu, by altering its name, clothing, and greeting. Religious identity is highly salient in India, and was particularly so during the onset of the COVID-19 pandemic, which fueled pre-existent tensions that spurred violence against the Muslim population (Banaji and Bhat, 2020; Menon, 2020).[3] At baseline, misleading claims about the role of Muslim citizens in the spread of the virus were identified as the primary driver of the increase in fake news on social media (Appendix A; Purohit, 2020); other widely-spread misconceptions had similarly a clear religious connotation. While misconceptions are often tied with tensions across different identities (Greenwood et al., 2018; Bazzi et al., 2019; Alsan et al., 2019, 2020; Greenwood et al., 2020; Hill et al., 2020; Alsan and Eichmeyer, 2021; Lowe, 2021), it remains unclear whether identity can play a role in debunking them.

Our results show that targeted messages containing informative content from trusted sources is an effective way to inform citizens: Doctor messages increase knowledge about ways to prevent infection with COVID-19, and reported compliance with the related policy guidelines. Similar findings are reported by Alsan et al. (2020) and Torres et al. (2021) in the context of the US.

While citizens become more acknowledged about the recommendations received, misconceptions arising from fake news are hard to change and a large proportion of the targeted population holds on to their wrong beliefs. The effectiveness of messages in debunking them relies on whether there is religion concordance with the messenger. Misconceptions are corrected only when the religious identity is related to the misconception, and when the misconception is religion-salient, i.e. wrong beliefs are stably different across religions. Results are robust to alternative specifications and to multiple hypothesis testing. This result reinforces the importance of identity in they way views and decisions are formed (Bazzi et al., 2019; Lowe, 2021), and especially in the way health outcomes are improved (Alsan et al., 2019; Greenwood et al., 2018, 2020; Hill et al., 2020; Alsan and Eichmeyer, 2021). It also contributes to the understanding of the role of religion among interacting citizens, a growing field of research (Iyer, 2016), highlighting an important role of diversity in the persistence of misinformation (see, e.g., Habyarimana

[3]The Hindu-Muslim conflict in India goes back to the pre-partition era and flared up at regular frequency since (see, e.g., Mitra and Ray, 2014). During the pandemic, UP was repeatedly in the news for religious incidents (Arya, 2020; Al Jazeera, 2020). In addition, in early 2020, the Citizenship Amendment Act, a new law that offers Indian citizenship to people from three neighboring countries, but restricted to non-Muslim only, led to protests across the country (see, e.g., Bhatia, 2021). Discrimination and violence against stigmatized groups has been documented in other pandemic settings (Desai and Amarasingam, 2020).

et al., 2007).

Overall, findings provide important insights into how governments and agencies across the world can rely on targeted messages to counter misconceptions. They underline that careful consideration of the type of misconception and the population targeted need to be taken into account for their design, highlighting the importance of tailoring messages to specific individuals. These results contribute to the literature identifying ways to counteract agreement with misconceptions (Bolsen and Druckman, 2015; Ecker et al., 2010; van der Linden et al., 2017), without undermining agreement with accurate information, a concern highlighted in other contexts (Clayton et al., 2019).

1 Intervention and experimental design

The intervention targets the population of slum residents in the two largest urban agglomerations in UP, Lucknow and Kanpur. Appendix B provides a description of the study area. Similar to other states of India, UP was hit hard by the COVID-19 pandemic during the period of the study (Appendix Figure A1 shows he number of COVID-19 cases and deaths in UP during this period). Guidelines of social distancing and wearing face masks remained constant throughout these periods. Appendix Figure A2 shows details of which restrictions applied when over the study period.

The intervention consists of sending messages targeted at individual citizens using mobile phone technology. We sent the messages to targeted recipients in two forms: as an audio via voice messages, and as a short video through a WhatsApp chatbot.[4] Each message is structured in two components: the *introduction of a messenger*, i.e. a local citizen closer in socio-economic status to the targeted population, and the *informative content* of the message. In the main treatment, the informative content is represented by doctors from locally renowned medical institutions updating priors about misinformed ways to prevent COVID-19. Qualified medical practitioners were chosen as the main messengers since 95% of respondents named doctors and health experts as their most trusted source of COVID-19 information in the baseline survey. We sent two rounds of messages debunking two misconceptions prevalent in India: first that eating a vegetarian diet protects against COVID-19 (sent in October–November 2020), and second that the immune system of Indians is resilient to COVID-19 (sent in December 2020–January 2021). Pre-intervention, these two beliefs about protection against COVID-19 were the two most prevalent in the targeted population (Appendix Figure D5): about two-thirds of our study population believed that a vegetarian diet can protect from infection with COVID-19, and only 16% disagree with the idea that the Indian immune system ensures protection against the virus.

To build the informative content, we first asked several doctors from renowned local institutions to reply, unscripted, to the questions "Is it true that eating a vegetarian diet protects against COVID-19?" and "Is it true that the immune system of Indians is resilient to COVID-19?". Responses were then collated

[4]WhatsApp chatbot is a software program that runs on the encrypted WhatsApp platform, purposely programmed for the intervention. Users can communicate with the chatbot through the chat interface.

ensuring that every message was composed by a first part debunking the misconception and a second part providing a reminder about the proven ways to protect against COVID-19. We refer to this as the *doctor message* treatment arm. The full script is provided in Appendix E.

A *control message* was designed with a similar structure to hold all features not varied experimentally constant, but replacing the informative content with an unsubstantiated gossip concerning Bollywood stars. Sending a control message, rather than no message, allows us to disentangle the effects of the intervention from receiving a message through mobile phone technologies. The final message duration was 112 seconds for the doctor message and 40 seconds for the control message.

For each message, we introduced two additional variations by changing the signaled religious identity of the messenger. In one version, keeping all else constant (including the informative content), the messenger signaled a Hindu identity by dressing with traditional Hindu head wear and colors (see Appendix E), using "namaste" as salutation, and introducing himself as "Rajesh". In the other version, again keeping all else constant, the messenger signaled a Muslim identity by dressing with traditional Muslim head wear and colors, using "salam alaikum" as salutation, and introducing himself as "Abdul".[5] In our analysis, we refer to religion concordance of the message when the signaled religious identity of the messenger is the same as the religion stated by the receiver of the message. We therefore refer to this cross-randomization as the *religion concordance* variation.

All messages were incentivized to increase attention to the message by giving participants the chance to enter a lottery if they replied correctly to a follow-up question about the message. During the introduction of the message, the messenger announced the financial incentive to be paid out through mobile top-up.[6] Lottery incentives have been widely used in experimental economics to increase response rates, particularly relevant when faced with potentially extremely low uptake. For instance, Banerjee et al. (2020), sending video messages to Indian citizens urging them to comply with COVID-19 policies and report symptoms, achieved a viewing rate of information videos of only 1.14%, consistent with low rates of 'click-through' studies (Richardson et al., 2007; Kanich et al., 2008).

We perform household-level randomization by randomly allocate targeted households, independent of the number of mobile phones in each household, to receive one of the message variation, stratifying by religion of the household head and by city. Randomization into the experimental arms was conducted at the household level because the intervention is directed one-to-one through mobile phones. Using households as the unit of randomization allows us to take advantage of greater variation in response to the intervention within slums. Concerns over spillover effects are mitigated because the voice message

[5]The names are the two most common male name by religion in the census of the targeted population. Refer to Armand et al. (2021) for further details about the census.

[6]We introduced two types of incentives: a low-incentive lottery with a value of Rs. 2,500 (US$35) and a high-incentive lottery with a value of Rs. 5,000. The two modalities were randomly allocated to participants in the process of randomization. Results on the effectiveness of different incentives are shown in Appendix Tables G7–G9. Potentially driven by the lottery amounts being both sizable for our study context (approximately 14 days of pay under the Government's National Rural Employment Generation Scheme), and in line with Porter and Whitcomb (2003), we do not find any differential impacts along this margin.

is in the form of an automatic call which cannot be forwarded or shared, and the share of participants accessing short videos through WhatsApp is small (see Section 2). There remains the possibility of word-of-mouth information sharing, which we cannot test for. To the extent that it did occur, our estimates would provide lower bounds to the true treatment effect.

2 Data

We draw on two data sources: administrative data on message delivery and time listened, and a panel survey of slum residents.

Administrative data. We gather information about the delivery of both the WhatsApp chatbot and the voice message, and about the share of the voice message that is listened by the user. Concerning the WhatsApp chatbot, 50% of the sample had WhatsApp installed on their phone, 39% received the message, 7% interacted with the chatbot, but only 3% replied accurately with 'Hi', a precondition to play the video. The voice messages were instead sent to the whole sample, in which 37% picked-up the phone when receiving the call, and once picked-up, the average listen time was 42 seconds (55% of the message). Listening times vary between the experimental arms, given that the control message was significantly shorter. For those who listened to the message, the average listening time was 51 seconds (43% of the message) of the doctor message, and 33 seconds (67% of the message) of the control message.

Primary panel data. A baseline survey was collected in June–July 2020, followed by two panel data waves in October–November 2020, and December 2020–January 2021 (3.5 and 5.5 months after the baseline survey). Interviews were conducted via phone conversation. Multiple follow-up measurements allows the averaging out of noise in the outcome variables, and increases power (McKenzie, 2012). The sampling frame for targeted recipients was a census conducted in the second half of 2018 of more than 30,000 households living in the slums of the study area (see Armand et al., 2021 for further details). We selected 5,261 residents to be part of the study, all of of which were sent the messages. Of these, we were able to interview 3,991 at baseline, 3,816 during the first follow-up and 3,906 during the second follow-up survey. Combining both follow-up surveys, we re-interviewed 87% of residents at least once, with a low implied attrition rate (13%) compared to phone surveys conducted in similar settings.[7] A likely important driver of attrition rate is represented by people using multiple SIM cards to avail discounts offered by different providers (Silver and Huang, 2019). Importantly, attrition is orthogonal to treatment allocation (Panel B, Table C2).[8]

Appendix Table C1 presents descriptive statistics of the sample. Twenty-one percent are Muslim, similar to the religion composition at the state level. Almost 80% of respondents are male, mostly represented

[7] Response rates are typically around 50% in non-crisis contexts, while during crisis contexts this is expected to be lower. For instance, a study during the Ebola crisis was able to re-interview only 38% (Himelein et al., 2020).

[8] Appendix Table C3 correlates observable characteristics with attrition. Being female and dwelling owners reduces attrition.

by the household head, with an average age of 40 years. More than 80% live in a strong dwelling with four other members and 38% have a ration card (i.e., an official document by state governments for subsidized purchase of essential commodities). At the time of the baseline survey, when lockdown restrictions started to ease in both cities, 12% of respondents report that at least one member was having COVID-19 symptoms, and respondents knew on average 1.6 COVID-19 symptoms.

The surveys elicited information on households' experiences during the COVID-19 pandemic, such as their knowledge on how to prevent the virus, compliance with policies, risk perceptions, symptoms and testing, as well as information on sources of information and trust.[9]

A key part of the surveys was the elicitation of the level of agreement or disagreement with misconceptions about prevention of COVID-19. In the follow-up surveys, we ask whether respondents agree or disagree with the following ways of preventing COVID-19: (1) eating a vegetarian diet, (2) just being Indian because of stronger immune systems, (3) living in warm weather because the virus does not survive, and (4) being a disease of rich people, poor people are safe.[10] The idea that Indians have stronger immunity to prevent COVID-19 is the one most widely held, with two thirds of respondents voicing agreement. But even the least perceived misconception – that COVID-19 is a disease that only rich people can get – is still believed by one third of respondents. Figure 1 shows the average (normalized) agreement with these misconceptions over time (Appendix Figure D6 breaks down the level of agreement using categorical responses). Responses to the misconception that eating a vegetarian diet is a mean to prevent COVID-19 differ in two ways from responses to other statements: the percentage of respondents agreeing does not reduce over time, and the misconception is religion-salient, i.e. Hindus are significantly more likely to hold this belief than Muslims, likely because they are also significantly more likely to follow a vegetarian diet.

Because misconceptions are often spread by groups or individuals with a particular identity where the legitimacy is drawn from, we introduce a novel survey instrument to capture misconceptions originating from these specific sources. We first inform respondent that 'we have surveyed people from UP and would like to hear whether you agree with their opinion'. We then reveal identity information of the person making a statement by providing a name which signals his or her religion. Similar to the messenger, we choose names common to the local context. For a randomly selected one third of the sample the name is associated with Hindu religion, for one third with Islam and for the remaining respondents, the statement is introduced by 'people say'. We elicit level of agreement with four statements that have a religious connotation: [NAME] says/People say that (1) 'if you are vegetarian, you do not need to worry about the coronavirus', (2) 'if you are a good person you do not need to worry about the coronavirus', (3) 'unity and brotherhood will help us fight the coronavirus', and (4) 'religious gatherings should be allowed'. The first statement carries religious salience since, in the context of India, vegetarianism is widely asso-

[9] In order to collect detailed high-quality data, while at the same time balancing the need for concise phone survey, some modules were administered to a random subset of households only. This was for example the case for compliance with COVID-19 rules and regulations: some households were asked about social distancing and other households about hand washing.

[10] At baseline, we asked respondents about prevention of COVID-19 using open-ended questions. Answers included misconceptions, which helped shaping the interventions and are summarized in Appendix D.

ciated with the dominant ideology of Hinduism. The second statement alludes to the idea that religion helps a person to become a 'good person', and in the third statement, 'unity and brotherhood' is typically connected with Islam, but in the context of India, it is also associated with the Hindu nationalist ruling party Bharatiya Janata Party (BJP).[11] The fourth statement talks explicitly about religious gatherings. We highlight that this statement can be interpreted as an opinion rather than a misconception. It bears weight in the study context in view of an early outbreak in India linked to a congregation by the *Tablighi Jamaat*, an Islamic missionary movement, which led to strong Islamophobic reactions across media (Menon, 2020).

Panel A of Figure 2 shows levels of agreement for the random subset of households where statements were said by 'people', split by whether the respondent is Hindu or Muslim. As with the generic statement, Hindus are significantly more likely than Muslims to agree that vegetarianism implies not needing to worry about being infected. Remaining statements, although carrying religious connotation, do not show similarly stark differences by religion. Except for the statement about vegetarianism, we observe an increase in agreement over time for both Hindus and Muslims. This trend is particularly stark for the statement about religious gatherings, possibly linked to the fact that the first wave of cases was receding when the follow-up data was collected, making it safer for gatherings to take place.

Panel B of Figure 2 displays levels of agreement with the statements said by someone of the same religion as the respondent ('own'), of a different religion ('other'), or whether it was said by 'people'. We find relatively small differences in levels of agreement by religious concordance. This suggests low levels of taste-based discrimination (driven by an aversion towards other religious identities) in our sample.[12] The largest (statistically significant) difference is found in the statement 'if you are a good person you do not need to worry about the coronavirus', where respondents tend to agree more, on average, when said by somebody from another religion. Our study will shed light on whether one could leverage on these (small) identity biases to correct misconceptions.

3 Results

To assess intervention impacts we rely on post-baseline data, in line with the trial registry (Armand et al., 2020) and justified by having successfully created observationally-equivalent groups (we report mean differences at baseline between control and treatment groups for various characteristics in Appendix Table C1 and for outcomes at baseline in Appendix Table C2). We estimate treatment effects using the following specification:

[11] Slogans such as *Vasudhaiva Kutumbakam* (brotherhood of mankind) and *unity among religions* were evoked multiple times by key party leadership before and during the pandemic as one of the ideological foundations of Hinduism (Kulkarni, 2017; Choudhury, 2020; Hindustan Times, 2020; The Economic Times, 2020).

[12] Low levels of taste-based discrimination could be driven by the close proximity households of different religions live in, thereby having more information about each other (Farber and Gibbons, 1996; Altonji and Pierret, 2001; Arnold et al., 2018). While one might be concerned that the name itself does not carry sufficient information for the respondent to react, we record religious concordance of the citizen to have significant treatment effects that survive multiple hypothesis testing (Section 3).

$$Y_{ijt} = \beta T_i + \alpha \mathbf{X}_{ij} + \delta_t + \epsilon_{it} \quad (1)$$

where Y_{ijt} are outcomes of interest of recipient i in slum j at time t. T_i is an indicator variable equal to 1 if the recipient i is in the treatment group, and 0 otherwise. $\mathbf{X}_{ij}$ is a set of indicator variables for randomization strata, and δ_t are period-of-survey indicator variables. The error term ϵ_{it} is assumed to be clustered at the slum level.[13] Because 63% of recipients did not receive or listen to any message (Section 1), the parameter β identifies the intention to treat (ITT) impact of the treatment.

Results are presented in Tables 1–3. In each table, Panel A provides estimates of treatment effects using equation 1, where T_i indicates allocation to the doctor treatment, while Panel B restricts the sample to those that were allocated to the doctor message and T_i becomes an indicator of religion concordance between the messenger of the doctor message and the intended recipient. Appendix Tables C1–C2 show that, conditional on having received the doctor messages, baseline characteristics are also balanced between those that were allocated to different introductions of to the informative content of the message. Appendix G.4 reports heterogeneous impacts by pre-specified variables, as well as by a social desirability index, and no noteworthy differences are found.

In terms of exposure to the intervention, participants who received the doctor message have a 2.0 percentage point higher probability of recalling at least one of the keywords about COVID-19 from the message sent to their mobile phones (last Panel of Appendix Table C2). While small in magnitude, this is a 40% increase over the control mean. Appendix Tables G1–G3 show treatment on the treated estimates, obtained through an instrumental variable strategy where the endogenous treatment variable a proxy of treatment intensity, i.e., a variable that multiplies the amount of time the message is listened with the number of key words mentioned during this time) is instrumented with the random treatment indicators T_i.[14] The first stages are strong both when comparing the exposure to the doctor message versus the control message, and when comparing the exposure to a religious-concordant introduction to the doctor message versus non-religious concordant introduction. The doctor message increases listening intensity by 14 percentage points (p-value < 0.001) and the F-stat is 74.4. The religious concordance introduction treatment has a similar coefficient and F-stat of 45.9. In line with expectations, IV estimates are larger in magnitude, and their statistical significance remain comparable to ITT estimates.

Level of agreement with misconceptions

Table 1 presents estimates of treatment effects on agreement with COVID-19 misconceptions. Column (1) concerns the misconception that eating vegetarian is a mean to prevent COVID-19, column (2) that Indians have a stronger immunity to prevent COVID-19, column (3) is about agreement with the mis-

[13] Results are robust to heteroskedasticity and to clustering standard errors at the individual level. In addition, using weights to increase representativeness of the population does not affect results.

[14] We estimate 'listening time' for those 2.5% that were able to view the video as 50% of the video length. Varying these imputations does not alter results.

conception that living in warm weather protects from COVID-19 because the virus does not survive, and column (4) that coronavirus is a disease of rich people, so poor people are safe.

We do not find any evidence that the doctor messages are successful in shifting agreement with these general statements (Panel A). However, when the doctor message is introduced by religion-concordant messenger, the respondent's likelihood of agreeing with the statement that eating vegetarian protects from getting COVID-19 reduces by 1.6 percentage points. This effect results from combining religion concordance with the doctor message, rather than from the religion concordant introduction by itself (Appendix Table G4 shows estimates of the effect of receiving the religion-concordant introduction with the Bollywood control message). When accounting for multiple hypothesis testing, the p-value increases from 0.04 to 0.16.

Table 2 assesses whether the interventions are effective when misconceptions are linked to identity and local context. Columns (1)-(4) estimate impacts on agreement with statements, when the person making the statement is of the same religion as the recipient, whereas in columns (5)-(8) the statement is made by a person of a different religion.[15] Columns (1) and (5) indicates level of agreement with [NAME] saying that 'if you are vegetarian, you do not need to worry about the coronavirus', Columns (2) and (6) that 'if you are a good person you do not need to worry about the coronavirus', Columns (3) and (7) that 'unity and brotherhood will help us fight the coronavirus', and Columns (4) and (8) that 'religious gatherings should be allowed'.

Focusing first on the left Panel of the table, which shows outcomes where the statements are made by someone of the same religion, we find that for statements 1 to 3 the estimated effects are in line with those for the religious generic statement (Column (1) of Table 2), both in terms of size and sign. This suggests that respondents might interpret generic statements as said by someone closer to their identity. The effect of the religious-concordant introduction on the statement about vegetarianism is, however, no longer statistically significant, possibly driven by the reduction in sample size due to only two-thirds of the sample having been presented with a statement introduced by a named person.

Being allocated to the doctor message with a religion-concordant introduction reduces by 3 percentage points the agreement with the misconception that 'being a good person protects from getting the virus'. This effect is statistically significant at the 5% level and is robust to multiple hypothesis testing. People seem to be only persuaded to disagree with a statement said by their own religion when the message delivered leverages on religion concordance.

The right Panel of Table 2 shows impact estimates when statements were made by someone of a different religion as compared to the respondent. The doctor message reduces agreement with misconceptions stated by someone else, statistically significant only for the statement of 'being a good person'. The doctor message successfully decreases agreement with this statement by 3.9 percentage points, statistically significant and robust to multiple hypothesis testing. We find no effects driven by religion concordance.

[15] Appendix Table G10 shows impacts when statements are said by 'people'. We find no significant effects.

This effect brings the level of agreement with someone of another religion down to that of someone of the own religion (Figure 2. For other statements, the baseline difference between 'own' and 'other' religion is less pronounced, leaving less room to be aligned. Correcting misconceptions said by someone from another religion is achieved through messages from doctors (a trusted source in our context), without the need to leverage on religion concordance.

Knowledge and reported behavior

Column (1) in Table 3 shows impact estimates on the extent to which respondent check truthfulness of news, proxied with an indicator variable equal to 1 if news shared or discussed with family and friends is always or frequently checked for truthfulness. We find a significant reduction in reported fact checking of news. We interpret this result as respondents having now received information they trust more, decreasing their felt need for additional checks.

Columns (2)–(5) show impacts on knowledge of and compliance with COVID-19 WHO guidelines, which are included at the end of the doctor message (i.e, using a mask in crowded places, social distancing, and washing hands). Knowledge of guidelines is calculated as the normalized mean of responses on different policies, measured using a likert scale. Compliance with policy guidelines is captured as an indicator variable, equal to 1 if the respondent does not visit any other slum nor receive any visitors from other slums within the previous week, and 0 otherwise.

The increased exposure to the doctor message translates into changes in knowledge and reported behavior. We find a significant increase in knowledge of guidelines about using a mask and on hand washing, as well as a significant increase in reported compliance with these guidelines. Respondents are 4 percentage points more likely to report compliant behavior. The effects on knowledge are smaller, partly attributable to the fact that knowledge on guidelines is high also without the intervention taking place. When accounting for multiple hypothesis testing, only the effect on checking truthfulness loses significance at conventional levels, with the p-value changing to 0.107. The effect on reported behavior is particularly encouraging considering that previous literature has found that slum residents would find it challenging to adhere to COVID-19 guidelines, given the lack of access to water (Patel, 2020) and the limitations on social distancing imposed by crowded spaces (Wasdani and Prasad, 2020).

4 Conclusions

The internet and social media have become popular resources for news. At the same time, they have become spreaders of inaccurate and misleading information. Ensuring that misconceptions resulting from misinformation and fake news do not drown out scientific evidence and affect behavior in consequential ways is of global importance.

In this study, we demonstrate that a low-cost intervention, relying on mobile technology, can be effec-

tively deployed to reduce agreement with misconceptions about how to prevent COVID-19 infection. We provide such evidence for a hugely important, while significantly understudied population: the urban poor, living in overcrowded conditions at great risk of infectious diseases. Design choices are, however, important. We show that messages from a trusted source can shift beliefs when the messenger and recipient share identity. In our setting, the trusted source of information is a public health specialist (a doctor from a local and renown institution) and the messenger is a local citizen (closer in socio-economic status) of the same religion as the respondent. Even under these circumstances, we find that only misconceptions that have a religious association are shifted, and only when Muslims and Hindus, the two main religions in our setting, have on average different beliefs.

This study provides important insights into how governments and agencies across the world can rely on mobile phone messages to counter COVID-19 misconceptions, and improve adherence to policy guidelines. While results highlight the importance of shaping messages to the characteristics of individual citizens, further research is needed to understand how to target communication against misconception in a more effective way.

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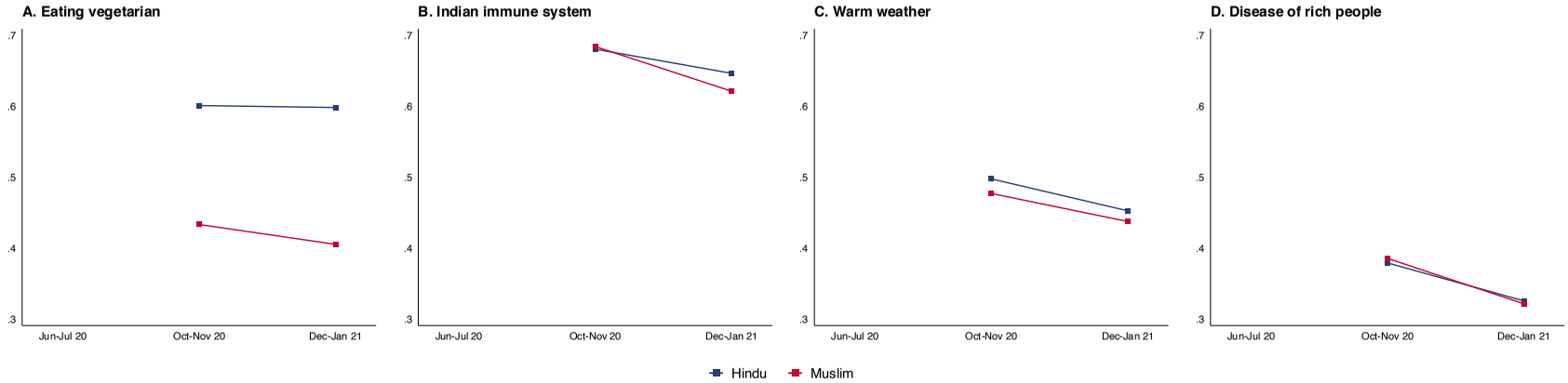
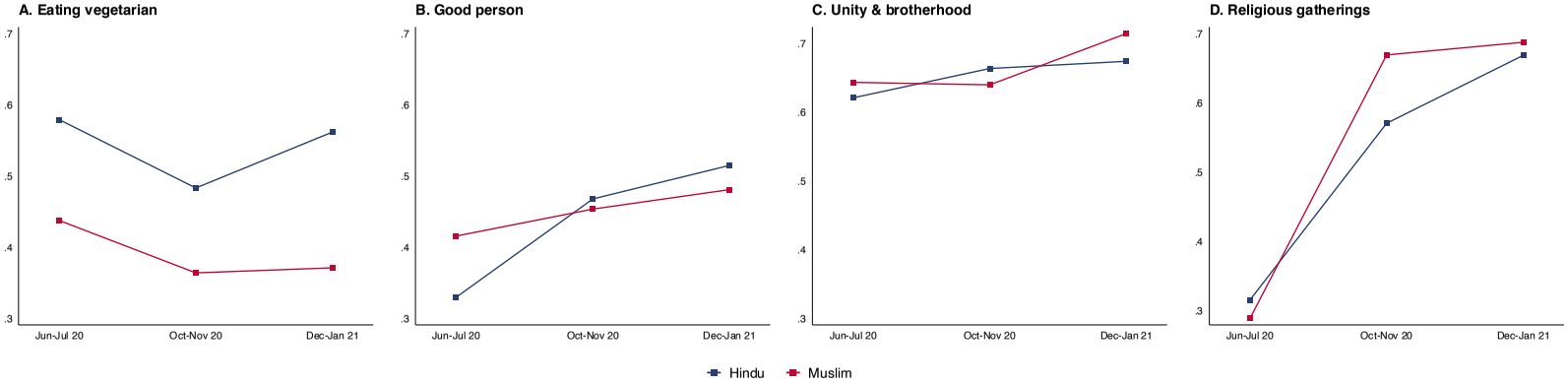
Figure 1: Agreement with misconceptions, by religion and over time



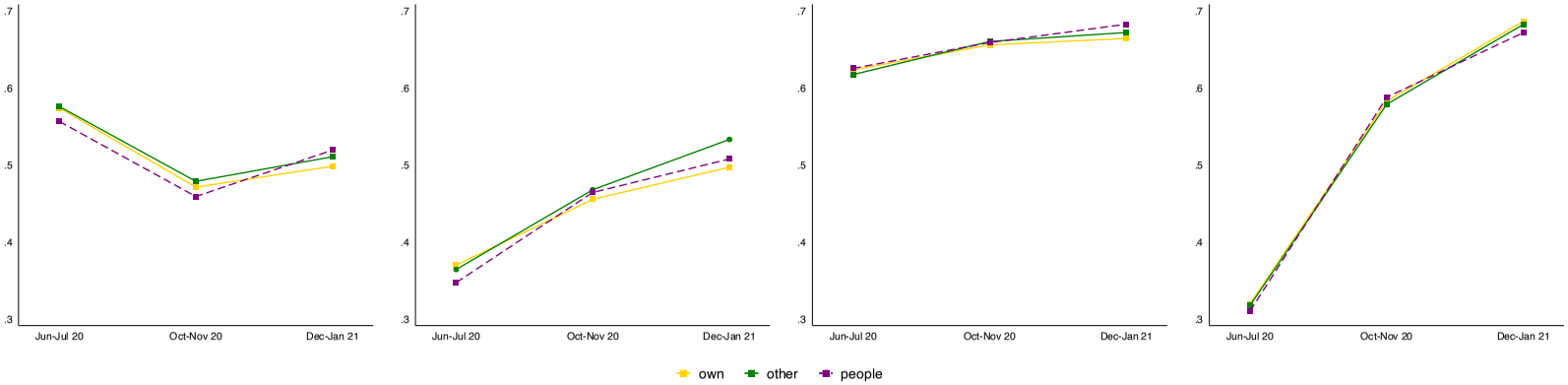
Notes. This figure shows the trends in outcome variables over time by respondents religion for those in the control group. Each outcome variable indicates the respondent's level of agreement with the following misconceptions (from left to right): A. *Eating vegetarian*: 'Eating vegetarian is a way to prevent COVID-19'; B. *Indian immune system*: 'Indians having stronger immunity to prevent COVID-19'; C. *Warm weather*: 'Living in warm weather protects from COVID-19 because the virus does not survive'; D. *Disease of rich people*: 'Coronavirus is a disease of rich people, so poor people are safe'. Each outcome is measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses plotted are the mean of normalized values. The sample is restricted to the control group. Lines in blue and red refer to Hindu and Muslim respectively.

Figure 2: Agreement with religion-related misconceptions, over time

Panel A - Statement said by 'people', Hindu versus Muslim



Panel B - Statement said by someone of own versus other religion, versus 'people'



Notes. This figure shows the trends in outcome variables over time by respondents religion for those in control group. Each outcome variable indicates respondent's level of agreement with the following misconceptions (from left to right) among citizens, as said by someone of the same religion (Panel A) and of a different religion (Panel B): A. *Eating vegetarian*: 'If you are vegetarian, you do not need to worry about the coronavirus'; B. *Good person*: 'If you are a good person you do not need to worry about the coronavirus'; C. *Unity & brotherhood*: 'Unity and brotherhood will help us fight the coronavirus'; D. *Religious gatherings*: 'Religious gatherings should be allowed'. Each outcome is measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses plotted are the mean of normalized values. The sample is restricted to the control group. Lines in blue and red refer to Hindu and Muslim respectively.

Table 1: Effect on agreement with misconception about ways to prevent COVID-19

	Eating vegetarian (1)	**Indian immune system** (2)	**Warm weather** (3)	**Disease of rich people** (4)
Panel A				
Doctor message	0.002	-0.007	-0.004	-0.003
	(0.006)	(0.005)	(0.006)	(0.006)
	[0.798; 0.797]	[0.126; 0.423]	[0.486; 0.867]	[0.646; 0.873]
Mean (Control message)	0.563	0.661	0.471	0.352
Observations	7692	7697	7681	7676
Slums	142	142	142	142
Observation rounds	2	2	2	2
Panel B				
Religion concordance	-0.016	-0.001	-0.006	-0.013
	(0.008)	(0.007)	(0.009)	(0.009)
	[0.044; 0.156]	[0.850; 0.863]	[0.526; 0.758]	[0.172; 0.758]
Mean (Other religion)	0.571	0.654	0.470	0.355
Observations	3846	3849	3842	3839
Slums	142	142	142	142
Observation rounds	2	2	2	2

Notes. Estimates based on OLS regressions using Equation (1). Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. P-values are presented in brackets, the first from individual testing, the second adjusting for testing that each treatment is jointly different from zero for all outcomes presented in the table, separate for Panels A and B. Dependent variables by column indicate respondent's level of agreement with the following misconceptions: (1) *Eating vegetarian*: 'Eating vegetarian is a way to prevent COVID-19'; (2) *Indian immune system*: 'Indians have stronger immunity to prevent COVID-19'; (3) *Warm weather*: 'Living in warm weather protects from COVID-19 because the virus does not survive'; (4) *Disease of rich people*: 'Coronavirus is a disease of rich people, so poor people are safe'. Measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses are normalized in the analysis. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

Table 2: Effect on agreement with misconceptions said by someone of own or other religion

	...from own religion				...from other religion			
	Eating vegetarian	**Good person**	**Unity & brotherhood**	**Religious gatherings**	**Eating vegetarian**	**Good person**	**Unity & brotherhood**	**Religious gatherings**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A								
Doctor message	0.003	0.011	0.010	-0.002	-0.014	-0.039	-0.001	-0.011
	(0.009)	(0.010)	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
	[0.716; 0.920]	[0.247; 0.674]	[0.287; 0.654]	[0.757; 0.755]	[0.141; 0.402]	[0.000; 0.000]	[0.883; 0.877]	[0.236; 0.425]
Mean (Control message)	0.485	0.476	0.660	0.635	0.495	0.501	0.666	0.631
Observations	3040	3138	3049	3118	3111	3067	3125	3101
Slums	142	142	142	142	142	142	142	142
Observation rounds	2	2	2	2	2	2	2	2
Panel B								
Religion concordance	-0.015	-0.030	-0.015	0.014	-0.002	0.015	0.006	-0.007
	(0.012)	(0.012)	(0.013)	(0.011)	(0.013)	(0.015)	(0.015)	(0.013)
	[0.222; 0.404]	[0.014; 0.067]	[0.246; 0.250]	[0.191; 0.473]	[0.888; 0.883]	[0.316; 0.791]	[0.694; 0.906]	[0.576; 0.927]
Mean (Other religion)	0.492	0.500	0.679	0.626	0.481	0.456	0.663	0.626
Observations	1514	1584	1530	1568	1606	1519	1505	1536
Slums	142	142	140	141	142	141	142	137
Observation rounds	2	2	2	2	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1). Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. P-values are presented in brackets, the first from individual testing, the second adjusting for testing that each treatment is jointly different from zero, testing jointly columns (1)-(4) and (5)-(8), separate for Panels A and B. Dependent variables by column indicate respondent's level of agreement with the following misconceptions (from left to right) among citizens, as said by someone of the same religion (Panel A) and of a different religion (Panel B): (1) *Eating vegetarian*: 'If you are vegetarian, you do not need to worry about the coronavirus'; (2) *Good person*: 'If you are a good person you do not need to worry about the coronavirus'; (3) *Unity & brotherhood*: 'Unity and brotherhood will help us fight the coronavirus'; (4) *Religious gatherings*: 'Religious gatherings should be allowed'. Each outcome is measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses plotted are the mean of normalized values. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

Table 3: Effect on behavioral outcomes

	Check truthfulness	Knowledge of policy guidelines			Compliance with guidelines
		Using mask	Social distancing	Wash hands	
	(1)	(2)	(3)	(4)	(5)
Panel A					
Doctor message	-0.023	0.006	0.005	0.006	0.041
	(0.010)	(0.003)	(0.004)	(0.003)	(0.015)
	[0.029; 0.107]	[0.030; 0.088]	[0.195; 0.200]	[0.042; 0.077]	[0.006; 0.032]
Mean (Control message)	0.352	0.813	0.799	0.786	0.578
Observations	7700	7696	7698	7696	5079
Slums	142	142	142	142	142
Observation rounds	2	2	2	2	2
Panel B					
Religion concordance	0.006	-0.002	-0.006	-0.004	0.026
	(0.015)	(0.005)	(0.004)	(0.005)	(0.022)
	[0.687; 0.693]	[0.628; 0.857]	[0.202; 0.645]	[0.338; 0.706]	[0.241; 0.686]
Mean (Other religion)	0.326	0.820	0.806	0.795	0.604
Observations	3851	3849	3849	3849	2519
Slums	142	142	142	142	142
Observation rounds	2	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1). Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. P-values are presented in brackets, the first from individual testing, the second adjusting for testing that each treatment is jointly different from zero for all outcomes presented in the table, separate for Panels A and B. Dependent variables in Column (1) *Check truthfulness* is indicator variable equal to 1 if the respondent 'always or very frequently' checks the truthfulness of news s/he shares or discusses with family and friends, and 0 otherwise. Columns (2)–(4) indicate respondent's level of agreement with (normalized mean of) COVID-19 guidelines, measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree. In particular, column (2) *Using mask* concerns mask-wearing in crowded places; column (3) *Social distancing* concerns keeping physical distance with other people; column (4) *Wash hands* concerns washing hands more frequently and for longer with soap. Column (5) *Compliance with guidelines* is an indicator variable equal to 1 if respondent complied with a randomly asked COVID-19 guideline (either leaving the slum and receiving visitors or washing hands after all events indicated by the World Health Organization), and 0 otherwise. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response, as well as some outcomes collected only for a random sub-set of study participants.

ONLINE APPENDIX

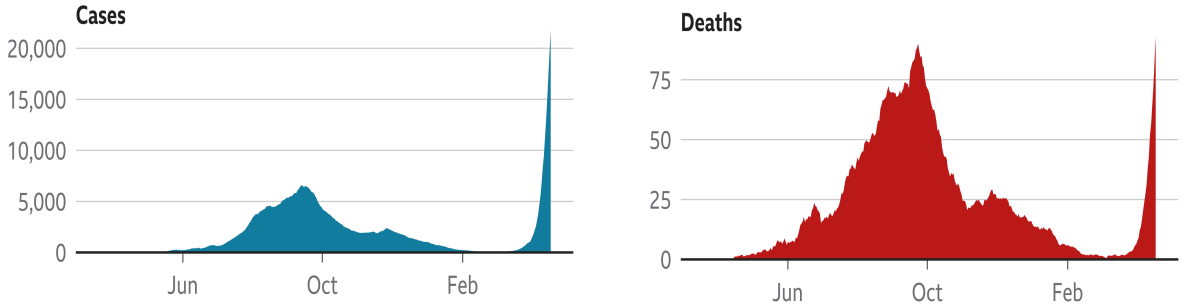
Countering misinformation with targeted messages: Experimental evidence using mobile phones

Alex Armand, Britta Augsburg, Antonella Bancalari and Kalyan Kumar Kameshwara

A The COVID-19 pandemic and infodemic in UP

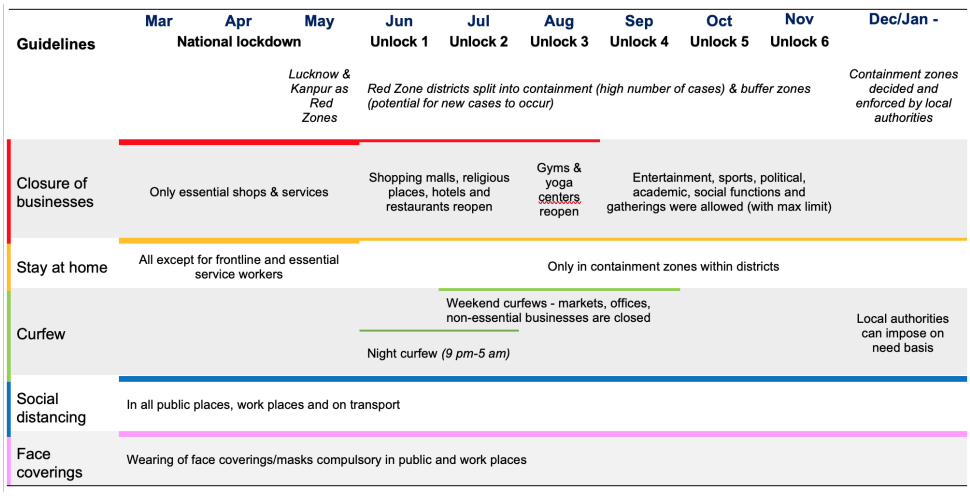
Figure A1 reports the time series of the number of COVID-19 cases and deaths in UP from the beginning of 2020 until April 2021. Data collection was performed in June–July 2020 (baseline), October–November 2020 (follow-up 1), and in December 2020–January 2021 (follow-up 2). Figure A2 provides information on types of restrictions that were in place in our study locations Lucknow and Kanpur starting with the initial March 2020 lockdown and until the end of our study period.

Figure A1: Daily COVID-19 cases and deaths in Uttar Pradesh



Notes. Reported number of cases and deaths from the beginning of 2020 until April 2021. The source of data is the Indian Ministry of Health and Family Welfare. Graphic elaboration produced by BBC (https://www.bbc.com/news/world-asia-india-56799303).

Figure A2: Policy guidelines amid the COVID-19 pandemic in India

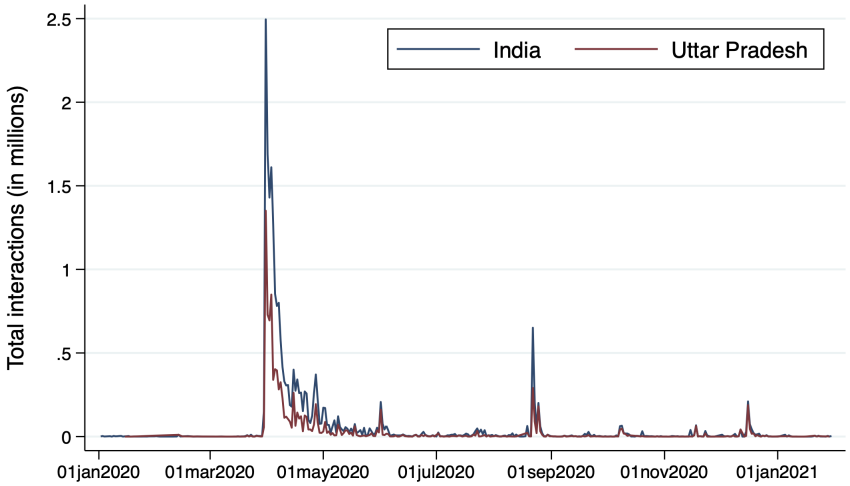


Notes. Author's own compilation from Ministry of Home Affairs India (2020c,g,d,e,a,f,b); Awasthi (2020). Red zones are the areas with high coronavirus cases and high doubling rate compared to orange and green with fewer and no positive cases (in past 21 days) respectively.

Figure A3 displays trends in social media interactions (Facebook and Facebook-related media) targeting

and blaming the Muslim population for the spread of the virus. It highlights the sharp increase early on in the pandemic in India and UP in particular.

Figure A3: Targeting of Muslims in social media trends about COVID-19 spread



Notes. The data shows the trends between the time period of 01 January, 2020 and 31st January 2021, on the horizontal axis. The vertical axis depicts the total interactions which captures the total number of times a Facebook post (e.g. photos, links, statuses, Facebook videos, Facebook live videos, Youtube videos, other videos, memes with message text) created on a given date is liked, shared or commented upon. The blue and red lines show the trends across India and the state of UP respectively. Trends are constructed using data from Facebook's Crowd Tangle Team (2020) using the keywords: 'Corona_Jihad', 'CoronaJihad', 'Corona Jihad', 'Tablighi', 'Tablighi jamat', 'Tablighijamat', 'Tablighi_jamat', 'jihadivirus', 'Muslim virus, 'Nizamuddin Markaz'. In the search, we included the keywords both in Latin and in Hindi. 'CoronaJihad', 'Jihadivirus' and 'Muslim virus' were popular phrases used on social media accusing the Muslim population of using coronavirus for purposes of jihad. *Tablighi jamat* is an international Islamic missionary movement which organized a mass religious congregation in Delhi in the month of March, 2020. It quickly became a target word when a group of attendees tested positive for COVID-19. 'Nizamuddin Markaz' refers to the mosque where the religious congregation took place and was popular on social media.

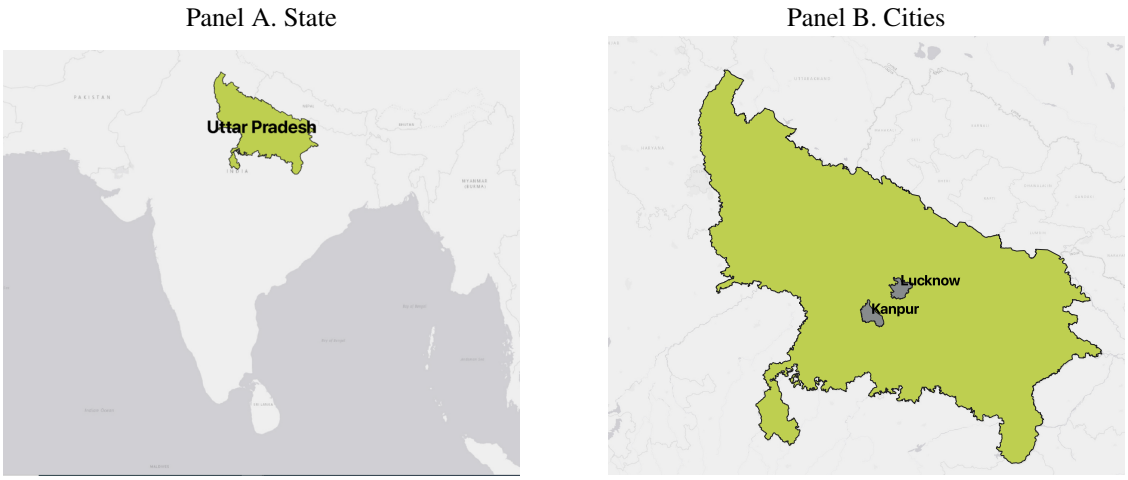
B Study setting

The Indian state of Uttar Pradesh (UP) provides an ideal setting to study these issues. Out of 32 states, it is the largest (home to 200 million people), the 4th most-densely populated, and the 6th in terms of share of population living in slums (corresponding to more than 6 million people) (Government of India, 2011). While UP presents a higher poverty rate as compared to the average for India (29.43% versus 21.92%, Reserve Bank of India, 2019), its slum population is highly comparable to the average slum population in the country. The share of adult males (0.53 in UP versus 0.52 in India), of adult females (0.47 versus 0.48), and of children (0.14 versus 0.12), as well as the sex ratio (1.12 versus 1.08) and the share belonging to Scheduled Castes (0.22 versus 0.20) are indicative of close similarities between these two populations. In terms of literacy rates, the average slum in UP outperforms the one of the whole India (0.69 versus 0.78).

This study focuses on the two largest urban agglomerations of UP, Lucknow and Kanpur. Figure B4 shows the geographic location of the study. Similar to many expanding cities in South Asia and Sub-Saharan Africa, Lucknow and Kanpur are characterized by a relatively large prevalence of informal settlements, and a prospect of rapid population growth. In 2015, among all urban agglomerations with

more than 300,000 inhabitants, Lucknow and Kanpur were respectively the 129th and 141st worldwide (United Nations, 2019). In the period 2015–2035, Lucknow is expected to grow from 3.2 to 5.2 million (+59%), and Kanpur from 3 to 4.1 million inhabitants (+37%). Across agglomerations of similar size (1.5–4 million inhabitants), this growth prospect is similar to cities such as Accra (Ghana), Amman (Jordan), Jaipur (India), or Hyderabad (Pakistan). Among largest cities, this is similar to Karachi (Pakistan), Cairo (Egypt) or Manila (The Philippines). In terms of proportion of slum households, the share of households living in slums is 12.95% in Lucknow and 14.5% in Kanpur. This is comparable to other major cities in India, such as Delhi, where 14.66% of households live in slums (Government of India, 2011).

Figure B4: Study location



Notes. Panel A shows the location of the state of Uttar Pradesh, while Panel B show the location of Lucknow and Kanpur in the state. Basemap source: Esri.

C Study population, balance and attrition

Tables C1 and C2 reports descriptive statistics for observable characteristics of the respondent and the household and of outcome variables. In these tables, Column (1) reports the mean and standard deviation of the each variable for the control group in the doctor message treatment, while column (2) shows the difference to this mean of those who were sent the doctor messages. Column (3) reports the joint sample size. Columns (4)–(6) report the same information comparing those that were sent the message with a Muslim messenger to those that were sent a message with a Hindu messenger, hence focusing on the Doctor sample only. Table C3 reports correlates of attrition.

Table C1: Descriptive statistics – Respondent and household characteristics

	Full sample			**Sample restricted to doctor message**		
	Control mean	Diff. with doctor message treatment	N	Messenger signals Muslim identity (mean)	Messenger signals Hindu identity (diff.)	N
	(1)	(2)	(3)	(4)	(5)	(6)
Respondent is male	0.79	-0.00	3983	0.78	0.02	1996
	[0.41]	(0.01)		[0.41]	(0.02)	
Head is male	0.82	-0.00	3983	0.81	-0.00	1996
	[0.39]	(0.01)		[0.39]	(0.02)	
Respondent is Muslim	0.21	-0.00	3983	0.23	0.01	1996
	[0.41]	(0.00)		[0.42]	(0.01)	
Caste: General	0.16	0.01	3983	0.16	0.02	1996
	[0.36]	(0.01)		[0.36]	(0.02)	
Age	39.77	-0.50	3983	39.34	-0.15	1996
	[11.41]	(0.38)		[11.59]	(0.47)	
Household members	5.17	0.05	3983	5.32	-0.18*	1996
	[2.20]	(0.07)		[2.37]	(0.10)	
Share females	0.35	-0.01	3983	0.34	0.01	1996
	[0.16]	(0.01)		[0.16]	(0.01)	
No children	0.72	-0.02	3983	0.71	-0.02	1996
	[0.45]	(0.01)		[0.45]	(0.02)	
Own dwelling	0.73	-0.00	3983	0.73	0.00	1996
	[0.44]	(0.01)		[0.44]	(0.02)	
Own latrine	0.61	0.00	3977	0.61	0.02	1995
	[0.49]	(0.02)		[0.49]	(0.02)	
BPL ration card	0.38	-0.01	3983	0.38	-0.01	1996
	[0.49]	(0.02)		[0.49]	(0.02)	
Member with COVID-19	0.12	0.01	3983	0.14	-0.01	1996
	[0.32]	(0.01)		[0.34]	(0.01)	
COVID-19 symptoms known	1.60	-0.03	3975	1.58	-0.02	1991
	[0.66]	(0.02)		[0.66]	(0.02)	
Trust: Doctors and health experts	0.95	0.01	1586	0.96	-0.01	753
	[0.23]	(0.01)		[0.20]	(0.01)	
Trust: Government official	0.84	-0.01	1586	0.83	-0.01	753
	[0.37]	(0.02)		[0.38]	(0.03)	

Notes. Column (1) reports the mean and standard deviation of the each variable for the control group in the doctor message treatment, while column (2) shows the difference to this mean of those who were sent the doctor messages. Column (3) reports the joint sample size. Columns (4)–(6) report the same information comparing those that were sent the message with a Muslim messenger to those that were sent a message with a Hindu messenger, hence focusing on the Doctor sample only. Observations for some variables (Trust: Doctors and health experts; Trust: Government official) are lower as they are collected from sub-sample of participants.

Table C2: Descriptive statistics – Outcomes, attrition and exposure to intervention

	Full sample			Sample restricted to doctor message		
	Control mean	Diff. with doctor message treatment	N	Messenger signals Muslim identity (mean)	Messenger signals Hindu identity (diff.)	N
	(1)	(2)	(3)	(4)	(5)	(6)
A. Outcomes at Baseline						
Eating vegetarian: own rel	0.57	-0.01	1564	0.58	-0.02	772
	[0.28]	(0.01)		[0.29]	(0.02)	
Good person: own rel	0.37	-0.01	1612	0.36	0.01	808
	[0.31]	(0.01)		[0.31]	(0.02)	
Unity & brotherhood: own rel	0.62	0.00	1571	0.64	-0.02	769
	[0.29]	(0.02)		[0.31]	(0.02)	
Religious gatherings: own rel	0.32	0.00	1641	0.32	0.00	833
	[0.26]	(0.01)		[0.28]	(0.02)	
Eating vegetarian: oth rel	0.58	-0.01	1619	0.57	-0.01	826
	[0.28]	(0.01)		[0.31]	(0.02)	
Good person: oth rel	0.36	0.02	1583	0.37	0.01	803
	[0.31]	(0.01)		[0.32]	(0.02)	
Unity & brotherhood: oth rel	0.62	0.02	1626	0.64	-0.01	814
	[0.29]	(0.01)		[0.29]	(0.02)	
Religious gatherings: oth rel	0.32	0.01	1535	0.32	0.01	745
	[0.27]	(0.01)		[0.28]	(0.02)	
Check truthfulness	0.45	-0.01	1586	0.44	0.01	753
	[0.50]	(0.02)		[0.50]	(0.04)	
Comply with (WHO) guidelines	0.80	0.00	1595	0.79	0.01	811
	[0.40]	(0.02)		[0.41]	(0.03)	
B. Attrition						
Attrition BL-any FU	0.13	-0.01	3983	0.14	-0.01	1996
	[0.34]	(0.01)		[0.34]	(0.01)	
Attrition BL-FU1	0.28	0.00	3983	0.29	-0.00	1996
	[0.45]	(0.01)		[0.45]	(0.02)	
Attrition BL-FU2	0.24	-0.00	3983	0.23	-0.00	1996
	[0.42]	(0.01)		[0.42]	(0.02)	
C. Exposure to intervention						
Recall message	0.05	0.02***	7700	0.06	0.01	3851
	[0.21]	(0.01)		[0.24]	(0.01)	

Notes. Column (1) reports the mean and standard deviation of the each variable for the control group in the doctor message treatment, while column (2) shows the difference to this mean of those who were sent the doctor messages. Column (3) reports the joint sample size. Columns (4)–(6) report the same information comparing those that were sent the message with a Muslim messenger to those that were sent a message with a Hindu messenger, hence focusing on the Doctor sample only. Observations for some variables (Check truthfulness; Comply w/ guidelines) are lower as they are collected from sub-sample of participants. Panel A shows outcome variables (when available at baseline), Panel B information on attrition, and Panel C information on exposure to message, e.g. whether respondents report to recall the message, where the sample includes both follow-up survey rounds.

Table C3: What predicts HH attrition?

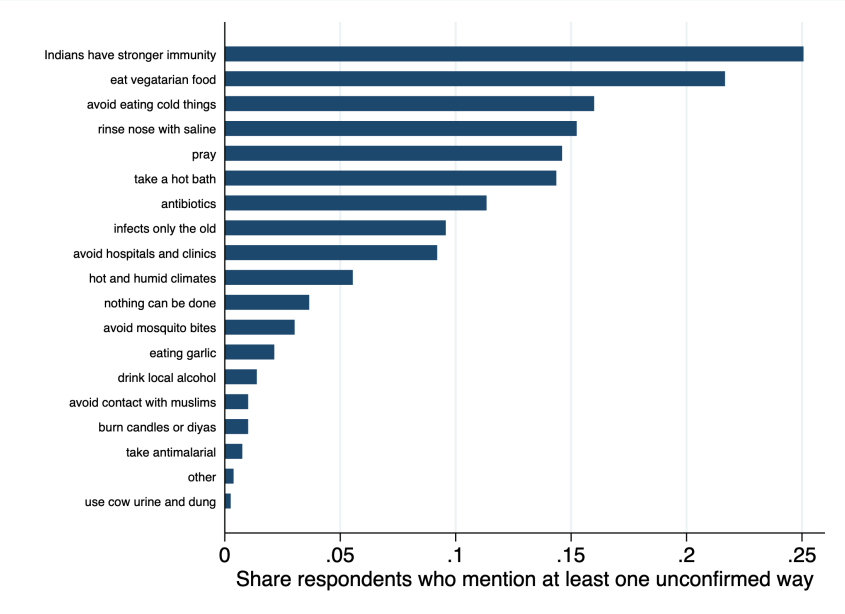
	Attrition			
	Full sample		Sample restricted to doctor message	
	(1)	(2)	(3)	(4)
Doctor message	-0.01	-0.01		
	(0.01)	(0.01)		
Doctor message x Muslim		0.01		
		(0.02)		
Religion concordance intro			-0.01	-0.02
			(0.01)	(0.02)
Religion concordance intro x Muslim				0.04
				(0.04)
Respondent is male	0.03**	0.03**	0.04*	0.04*
	(0.01)	(0.01)	(0.02)	(0.02)
Head is male	-0.04**	-0.04**	-0.04*	-0.04*
	(0.02)	(0.02)	(0.02)	(0.02)
Respondent is Muslim	0.04**	0.03	0.04*	0.02
	(0.02)	(0.02)	(0.03)	(0.03)
Caste: General	-0.02*	-0.02*	-0.03	-0.03
	(0.01)	(0.01)	(0.02)	(0.02)
Age	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Household members	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Share females	0.00	0.00	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
No children	-0.01	-0.01	0.00	0.00
	(0.01)	(0.01)	(0.02)	(0.02)
Own dwelling	-0.04**	-0.03**	-0.04*	-0.04*
	(0.02)	(0.02)	(0.02)	(0.02)
BPL ration card	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.02)	(0.02)
Member with COVID-19	-0.02	-0.02	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
COVID-19 symptoms known	0.02**	0.02**	0.02	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
Attrition Rate	0.13	0.13	0.13	0.13
Slums	142	142	142	142
Households	3,975	3,975	1,991	1,991

Notes. The dependent variable attrition equal to 1 if a households was neither re-interviewed in follow-up 1 or follow-up 2, and 0 otherwise. Standard errors, clustered at the slum level, are presented in parenthesis. Columns (1) and (2) are for the full sample, columns (3) and (4) restrict the analysis to the doctor sample.

D Misconceptions at baseline

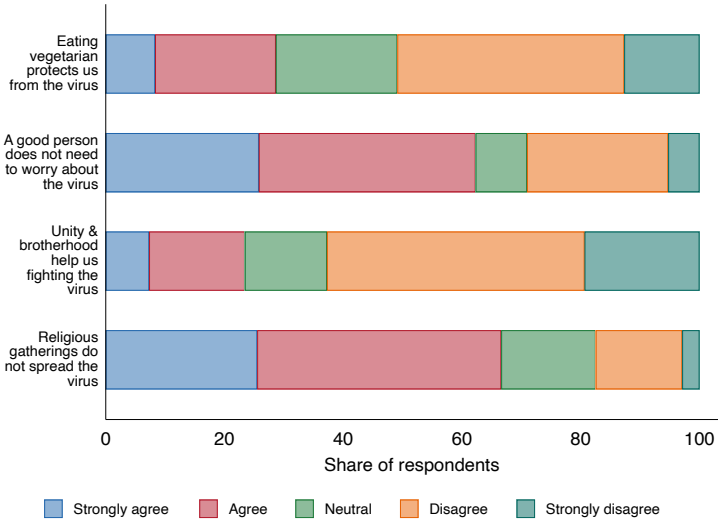
Figure D5 reports the main reported misconceptions on the way to protect against COVID-19. The misconceptions were obtained from sample respondents using an open-ended question at baseline. Figure D6 reports instead the level of dis/agreement for different misconceptions reported by a citizen of Hindu or Muslim religion. Refer to Section 2 for details about measurement.

Figure D5: Misconceptions at baseline



Notes. Responses (n = 3,991) recorded at baseline. Respondents were asked what in their opinion would help in protecting them, or their family, from getting coronavirus. The responses were categorized into confirmed and unconfirmed ways of preventing coronavirus. The share of respondents who mention at least one of the unconfirmed ways are presented.

Figure D6: Alignment with misconceptions among citizens at baseline



Notes. Responses (n = 3,991) recorded at baseline. Respondents were asked about their levels of dis/agreement for statements made by citizens of Hindu or Muslim religion, as indicated by their name. The share of respondents and their responses are presented.

E Intervention content

The **doctor message** treatment included two messages. The first message was 1 minute and 52 seconds long and the script reads as follows:

> Greetings (Namaste/Salam Walekum)! I am a resident of U.P. and like me, you might also be confused about various sorts of information shared on social media. If this is the case, then these messages from renowned doctors regarding coronavirus might be helpful for you. After watching this video, if you answer any of the questions correctly, then you can get a chance to win the lottery in the form of mobile recharge. So, lets listen to what the doctors have to say about the question: Is it correct that we Indians need not worry about the coronavirus because our immune system is quite strong?
>
> *Doctor 1*: This is a myth. This myth can lead to false beliefs among people that they we will not get the disease. Please do not live with this false belief. In fact, being Indian, we have contacted many diseases in the past. Please look at how many people are contacting the virus and even with our immune systems the number of people who are getting this disease is increasing in the country and the world. *Doctor 2*: Coronavirus is a threat to the entire human civilization today. Do not stay under the misconception that we are immune to the virus. We need to be careful and protect ourselves from the virus. We should follow the guidelines set by the government.
>
> We thank the doctors. Now, things are clear for me and hopefully for you too. Now, you have understood the truth, please spread this message to others. If each of us makes this contribution at our own level and we can together save a lot of lives. Now, to enter the lottery, you would have to answer the following questions correctly, even if the doctor has answered them correctly or not: Can we Indians be carefree and not worry about coronavirus because our immune system is very strong?

The second message is similar in content of first message except for the question posed to the doctors. The doctors debunked the myth by emphasizing on how being a vegetarian or eating only a vegetarian diet does not fully protect from contacting coronavirus. The **control message** was 30 seconds long and the informative content included a gossip about popular actresses of Bollywood. For the **religion concordance** treatment, Figure E7 shows an example of the variation induced by the different signaled religious identity of the messenger.

Figure E7: Citizen religious identity in chatbot video

Note. The left panel shows the messenger in the version signaling a religious identity closer to Hindu religion, while the right panel shows the version signaling a religious identity closer to Muslim religion.

F Variable definition and additional details about measurements

Variable	Description
Demographics	
Gender	Indicator variable equal to 1 for male respondents, and 0 for female respondents.
Head is male	Indicator variable equal to 1 if household head is male, and 0 otherwise.
Muslim	Indicator variable equal to 1 if respondent is Muslim, and 0 otherwise.
Household head did not complete primary education	Indicator variable equal to 1 if household head did not complete primary education, and 0 otherwise.
Slum with low % of Muslims	Indicator variable equal to 1 if household is in a slum where the percentage of Muslims in the slum is lower than the slum median percentage, and 0 otherwise.
Caste: General	Indicator variable equal to 1 if respondent belongs to General caste, and 0 otherwise.
Share females	Number of women in the household.
No children	Indicator variable equal to 1 if household has no children (less than five years old), and 0 if household has children.
BPL ration card	Indicator variable equal to 1 if household possess a below poverty line ration card, and 0 if it does not.
Own dwelling	Indicator variable equal to 1 if respondent owns the dwelling, and 0 otherwise.
Own latrine	Indicator variable equal to 1 if household has its own latrine, and 0 otherwise.
Member with COVID-19	Indicator variable equal to 1 if any household member has tested positive with COVID-19, and 0 otherwise.
COVID-19 symptoms known	Indicator variable equal to 1 if any household member has COVID-19 symptoms, and 0 otherwise.
Trust: Government official	Indicator variable equal to 1 if respondent 'trusts or strongly trusts' the government officials (measured at the baseline), and 0 otherwise.
Trust: Doctors and health experts	Indicator variable equal to 1 if respondent 'trusts or strongly trusts' the doctors and health experts (measured at the baseline), and 0 otherwise.
Traditional sources of information	Indicator variable equal to 1 if respondent uses traditional sources to gain information about coronavirus pandemic (tv/radio, printed media, government letters), and 0 otherwise. Measured at baseline only.
Technology as sources of information	Indicator variable equal to 1 if respondent uses technology as source of information on coronavirus pandemic (online news sites, social media, whatsapp, messenger, emails, voice/text messages), and 0 otherwise. Measured at baseline only.
Intervention	
Message status	Indicator variable equal to 1 if whatsapp message was successfully delivered, and 0 if it failed.
Response	Indicator variable equal to 1 if respondent replied 'Hi' to whatsapp chatbot, and 0 otherwise.
Call status	Indicator variable equal to 1 if the audio message (IVR) was successfully delivered, and 0 if it failed.
Call duration	Duration of the audio message listened (in seconds).
Call percentage	Percentage of the audio message listened.
Call proportion	Proportion of the audio message listened.
Message listened (share)	Proportion of the audio message listened accounting for the intensity of the message (normalised score of call proportion x number of times the keywords appear in the audio message which are different for both the treatment messages). It is coded as 0 for those who received the control group message and 0.5 for those who have also received the WhatsApp message in the treatment group
Outcomes	
Recall message	Indicator variable equal to 1 if respondent was able to recall atleast one keyword from the treatment message about COVID-19, and 0 otherwise.

(continued on next page)

Variable	Description
Agreement with misconceptions	Indicate respondent's level of agreement (mean) with the following misconceptions: (1) *Eating vegetarian*: 'Eating vegetarian as way to prevent COVID-19'; (2) *Indian immune system*: 'Indians have stronger immunity to prevent COVID-19'; (3) *Warm weather*: 'Living in warm weather protects from COVID-19 because the virus does not survive'; (4) *Disease of rich people*: 'Coronavirus is a disease of rich people, so poor people are safe'; measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses are normalized.
Agreement with misconceptions of citizens of own or other religion	Indicate respondent's level of agreement with the following misconceptions among citizens, as said by someone of the respondent's religion (own) or of a different religion (other): (1) *Eating vegetarian*: 'If you are vegetarian, you do not need to worry about the coronavirus'; (2) *Good person*: 'If you are a good person you do not need to worry about the coronavirus'; (3) *Unity & brotherhood*: 'Unity and brotherhood will help us fight the coronavirus'; (4) *Religious gatherings*: 'Religious gatherings should be allowed'. Each outcome is measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses plotted are the mean of normalized values.
Check truthfulness	Indicator variable equal to 1 if respondent 'always or very frequently' checks the truthfulness of news s/he shares or discusses with family and friends, and 0 otherwise.
Compliance with guidelines	Indicator variable equal to 1 if respondent complied with a randomly asked COVID-19 guideline (either leaving the slum and receiving visitors or washing hands after all events indicated by the World Health Organization), and 0 otherwise.
Know guidelines	Indicates respondent's level of awareness on (normalized mean of) these three COVID-19 guidelines included in the survey: a) Agree with using mask in crowded places b) Agree with Keeping physical distance with other people c) Agree with Washing hands more frequently and for longer with soap. Measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree.

G Additional analysis

G.1 Estimates of treatment effects using 2SLS

Appendix Tables G1–G3 show treatment on the treated estimates, obtained through an instrumental variable strategy where the endogenous treatment variable a proxy of treatment intensity, i.e., a variable that multiplies the amount of time the message is listened with the number of key words mentioned during this time) is instrumented with the random treatment indicators T_i.

Table G1: Effect on agreement with misconception about ways to prevent COVID-19, 2SLS

	Eating vegetarian (1)	**Indian immune system** (2)	**Warm weather** (3)	**Disease of rich people** (4)
Panel A: Doctor message				
Message listened (share)	0.010	-0.051	-0.028	-0.019
	(0.041)	(0.033)	(0.040)	(0.040)
	[0.796]	[0.125]	[0.482]	[0.644]
Mean (Not listened)	0.566	0.658	0.468	0.350
Observations	7692	7697	7681	7676
Slums	142	142	142	142
Observation rounds	2	2	2	2
Panel B: Religion-concordance				
Message listened (share)	-0.111	-0.009	-0.037	-0.087
	(0.055)	(0.046)	(0.058)	(0.063)
	[0.045]	[0.849]	[0.523]	[0.169]
Mean (Other religion)	0.571	0.654	0.470	0.355
Observations	3846	3849	3842	3839
Slums	142	142	142	142
Observation rounds	2	2	2	2

Notes. Estimates based on 2SLS regressions. Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. Naive p-values are presented in brackets. Dependent variables by column indicate respondent's level of agreement with the following misconceptions: (1) *Eating vegetarian*: 'Eating vegetarian as way to prevent COVID-19'; (2) *Indian immune system*: 'Indians have stronger immunity to prevent COVID-19'; (3) *Warm weather*: 'Living in warm weather protects from COVID-19 because the virus does not survive'; (4) *Disease of rich people*: 'Coronavirus is a disease of rich people, so poor people are safe'. Measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses are normalized in the analysis. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

Table G2: Effect of treatment message on agreement with misconceptions said by someone of own or other religion, 2SLS

	...from own religion				...from other religion			
	Eating vegetarian	**Good person**	**Unity & brotherhood**	**Religious gatherings**	**Eating vegetarian**	**Good person**	**Unity & brotherhood**	**Religious gatherings**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Doctor message								
Message listened (share)	0.022	0.080	0.072	-0.017	-0.095	-0.252	-0.009	-0.078
	(0.061)	(0.068)	(0.067)	(0.053)	(0.064)	(0.062)	(0.058)	(0.065)
	[0.714]	[0.242]	[0.278]	[0.755]	[0.137]	[0.000]	[0.882]	[0.229]
Mean (Not listened)	0.492	0.482	0.662	0.634	0.492	0.487	0.664	0.629
Observations	3040	3138	3049	3118	3111	3067	3125	3101
Slums	142	142	142	142	142	142	142	142
Observation rounds	2	2	2	2	2	2	2	2
Panel B: Religion-concordance								
Message listened (share)	-0.103	-0.218	-0.110	0.103	-0.013	0.090	0.039	-0.050
	(0.083)	(0.088)	(0.094)	(0.078)	(0.092)	(0.089)	(0.097)	(0.089)
	[0.216]	[0.014]	[0.243]	[0.191]	[0.887]	[0.312]	[0.691]	[0.570]
Mean (Other religion)	0.492	0.500	0.679	0.626	0.481	0.456	0.663	0.626
Observations	1514	1584	1530	1568	1606	1519	1505	1536
Slums	142	142	140	141	142	141	142	137
Observation rounds	2	2	2	2	2	2	2	2

Notes. Estimates based on 2SLS regressions. anel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. Naive p-values are presented in brackets. Dependent variables by column indicate respondent's level of agreement with the following misconceptions (from left to right) among citizens, as said by someone of the same religion (Panel A) and of a different religion (Panel B): (1) *Eating vegetarian*: 'If you are vegetarian, you do not need to worry about the coronavirus'; (2) *Good person*: 'If you are a good person you do not need to worry about the coronavirus'; (3) *Unity & brotherhood*: 'Unity and brotherhood will help us fight the coronavirus'; (4) *Religious gatherings*: 'Religious gatherings should be allowed'. Each outcome is measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses plotted are the mean of normalized values. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

Table G3: Effect of treatment message on behavioral outcomes, 2SLS

	Check truthfulness	**Knowledge of policy guidelines**			**Compliance with guidelines**
		using mask	**social distancing**	**wash hands**	
	(1)	(2)	(3)	(4)	(5)
Panel A: Doctor message					
Message listened (share)	-0.159	0.044	0.033	0.045	0.282
	(0.072)	(0.020)	(0.025)	(0.022)	(0.101)
	[0.026]	[0.028]	[0.193]	[0.040]	[0.005]
Mean (Not listened)	0.344	0.814	0.800	0.789	0.594
Observations	7700	7696	7698	7696	5079
Slums	142	142	142	142	142
Observation rounds	2	2	2	2	2
Panel B: Religion-concordance					
Message listened (share)	0.040	-0.016	-0.038	-0.030	0.175
	(0.099)	(0.032)	(0.030)	(0.031)	(0.148)
	[0.685]	[0.626]	[0.201]	[0.337]	[0.239]
Mean (Other religion)	0.326	0.820	0.806	0.795	0.604
Observations	3851	3849	3849	3849	2519
Slums	142	142	142	142	142
Observation rounds	2	2	2	2	2

Notes. Estimates based on 2SLS regressions. Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. P-values are presented in brackets, the first from individual testing, the second adjusting for testing that each treatment is jointly different from zero for all outcomes presented in the table, separate for Panels A and B. Dependent variables by column: (1) *Check truthfulness*: indicator variable equal to 1 if the respondent 'always or very frequently' checks the truthfulness of news s/he shares or discusses with family and friends, and 0 otherwise; Columns (2) to (4) indicate respondent's level of agreement with (normalized mean of) COVID-19 guidelines, measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree. In particular: (2) *Using mask* concerns mask-wearing in crowded places; (3) *Social distancing* concerns keeping physical distance with other people; (4) *Wash hands* is about washing hands more frequently and for longer with soap. Column Column (5) *Compliance with guidelines* is an indicator variable equal to 1 if respondent complied with a randomly asked COVID-19 guideline (either leaving the slum and receiving visitors or washing hands after all events indicated by the World Health Organization), and 0 otherwise. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response, as well as some outcomes collected only for a random sub-set of study participants.

G.2 Effect of religion concordance

Tables G4–tab:TABControl3 show estimates of the effect of the religion concordance of the message, independently from whether the message is a doctor message or a control message. In the main text, we show estimates f the effect of the religion concordance of the message when the message delivered is the doctor message.

Table G4: Effect of religion-concordant introduction to message on agreement with misconception about ways to prevent COVID-19

	Eating vegetarian	**Indian immune system**	**Warm weather**	**Disease of rich people**
	(1)	(2)	(3)	(4)
Panel A: Control message sample (ITT)				
Religion concordance intro	-0.008	-0.004	-0.007	0.001
	(0.008)	(0.007)	(0.008)	(0.009)
	[0.306]	[0.519]	[0.348]	[0.928]
Mean (Other religion)	0.567	0.663	0.475	0.353
Observations	3846	3848	3839	3837
Slums	142	142	142	142
Observation rounds	2	2	2	2
Panel B: Control message sample (LATE)				
Message listened (share)	-0.606	-0.323	-0.561	0.065
	(0.598)	(0.496)	(0.606)	(0.720)
	[0.311]	[0.514]	[0.354]	[0.928]
Mean (Other religion)	0.563	0.661	0.471	0.352
Observations	3846	3848	3839	3837
Slums	142	142	142	142
Observation rounds	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1) in Panel A and on 2SLS regressions in Panel B. Panels A and B restricts the sample to participants allocated to the control group message. Standard errors clustered at the slum level are reported in parentheses. Naive p-values are presented in brackets. Dependent variables by column indicate respondent's level of agreement with the following misconceptions: (1) *Eating vegetarian*: 'Eating vegetarian as way to prevent COVID-19'; (2) *Indian immune system*: 'Indians have stronger immunity to prevent COVID-19'; (3) *Warm weather*: 'Living in warm weather protects from COVID-19 because the virus does not survive'; (4) *Disease of rich people*: 'Coronavirus is a disease of rich people, so poor people are safe'. Measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses are normalized in the analysis. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

Table G5: Effect of religion-concordant introduction to message on agreement with misconceptions said by someone of own or other religion

	...from own religion				...from other religion			
	Eating vegetarian	**Good person**	**Unity & brotherhood**	**Religious gatherings**	**Eating vegetarian**	**Good person**	**Unity & brotherhood**	**Religious gatherings**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Control message sample (ITT)								
Religion concordance intro	0.002	-0.003	-0.014	-0.005	0.004	0.019	-0.030	-0.007
	(0.013)	(0.016)	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)	(0.012)
	[0.881]	[0.834]	[0.279]	[0.668]	[0.787]	[0.138]	[0.019]	[0.530]
Mean (Other religion)	0.484	0.478	0.669	0.638	0.493	0.491	0.681	0.636
Observations	1526	1554	1519	1550	1505	1548	1620	1565
Slums	139	140	139	139	138	139	142	141
Observation rounds	2	2	2	2	2	2	2	2
Panel B: Control message sample (LATE)								
Message listened (share)	0.150	-0.300	-1.025	-0.464	0.251	1.400	-2.305	-0.601
	(0.998)	(1.409)	(0.994)	(1.059)	(0.920)	(0.969)	(1.134)	(0.951)
	[0.880]	[0.831]	[0.303]	[0.661]	[0.785]	[0.148]	[0.042]	[0.528]
Mean (Other religion)	0.486	0.477	0.660	0.636	0.494	0.501	0.667	0.631
Observations	1526	1554	1519	1550	1505	1548	1620	1565
Slums	139	140	139	139	138	139	142	141
Observation rounds	2	2	2	2	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1) in Panel A and on 2SLS regressions in Panel B. The sample is restricted to participants allocated to the control group message. Standard errors clustered at the slum level are reported in parentheses. Naive p-values are presented in brackets. Dependent variables by column indicate respondent's level of agreement with the following misconceptions (from left to right) among citizens, as said by someone of the same religion (Panel A) and of a different religion (Panel B): (1) *Eating vegetarian*: 'If you are vegetarian, you do not need to worry about the coronavirus'; (2) *Good person*: 'If you are a good person you do not need to worry about the coronavirus'; (3) *Unity & brotherhood*: 'Unity and brotherhood will help us fight the coronavirus'; (4) *Religious gatherings*: 'Religious gatherings should be allowed'. Each outcome is measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses plotted are the mean of normalized values. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

Table G6: Effect of religion-concordant introduction to message on behavioral outcomes

	Check truthfulness	**Knowledge of policy guidelines**			**Compliance with guidelines**
		using mask	**social distancing**	**wash hands**	
	(1)	(2)	(3)	(4)	(5)
Panel A: Control message sample (ITT)					
Religion concordance intro	0.017	0.002	-0.007	-0.006	-0.017
	(0.017)	(0.005)	(0.004)	(0.005)	(0.021)
	[0.321]	[0.616]	[0.126]	[0.217]	[0.437]
Mean (Other religion)	0.345	0.812	0.802	0.789	0.586
Observations	3849	3847	3849	3847	2560
Slums	142	142	142	142	141
Observation rounds	2	2	2	2	2
Panel B: Control message sample (LATE)					
Message listened (share)	1.296	0.179	-0.513	-0.497	-1.309
	(1.324)	(0.352)	(0.336)	(0.410)	(1.676)
	[0.327]	[0.611]	[0.127]	[0.225]	[0.435]
Mean (Other religion)	0.352	0.813	0.799	0.786	0.578
Observations	3849	3847	3849	3847	2560
Slums	142	142	142	142	141
Observation rounds	2	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1). Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. P-values are presented in brackets, the first from individual testing, the second adjusting for testing that each treatment is jointly different from zero for all outcomes presented in the table, separate for Panels A and B. Dependent variables by column: (1) *Check truthfulness* is an indicator variable equal to 1 if respondent 'always or very frequently' checks the truthfulness of news s/he shares or discusses with family and friends, and 0 otherwise; Columns (2) to (4) indicate respondent's level of agreement with (normalized mean of) COVID-19 guidelines, measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree. In particular: (2) *Using mask* concerns mask-wearing in crowded places; (3) *Social distancing* concerns keeping physical distance with other people; (4) *Wash hands* is about washing hands more frequently and for longer with soap. Column (5) *Compliance with guidelines* is an indicator variable equal to 1 if respondent complied with a randomly asked COVID-19 guideline (either leaving the slum and receiving visitors or washing hands after all events indicated by the World Health Organization), and 0 otherwise. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response, as well as some outcomes collected only for a random sub-set of study participants.

G.3 Effect of high versus low lottery incentives

Table G7: Effect of high incentives on agreement with misconception about ways to prevent COVID-19

	Eating vegetarian (1)	**Indian immune system** (2)	**Warm weather** (3)	**Disease of rich people** (4)
Panel A: Doctor message sample				
High incentive	-0.006	-0.005	-0.001	-0.017
	(0.008)	(0.007)	(0.009)	(0.009)
	[0.472]	[0.498]	[0.905]	[0.064]
Mean (Low incentive)	0.567	0.656	0.468	0.358
Observations	3846	3849	3842	3839
Slums	142	142	142	142
Observation rounds	2	2	2	2
Panel B: Control message sample				
High incentive	-0.009	0.009	-0.006	-0.000
	(0.008)	(0.007)	(0.009)	(0.010)
	[0.273]	[0.171]	[0.512]	[0.966]
Mean (Low incentive)	0.567	0.657	0.474	0.352
Observations	3846	3848	3839	3837
Slums	142	142	142	142
Observation rounds	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1). Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. Naive p-values are presented in brackets. Dependent variables by column indicate respondent's level of agreement with the following misconceptions: (1) *Eating vegetarian*: 'Eating vegetarian as way to prevent COVID-19'; (2) *Indian immune system*: 'Indians have stronger immunity to prevent COVID-19'; (3) *Warm weather*: 'Living in warm weather protects from COVID-19 because the virus does not survive'; (4) *Disease of rich people*: 'Coronavirus is a disease of rich people, so poor people are safe'. Measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses are normalized in the analysis. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

Table G8: Effect of high incentives on agreement with misconceptions said by someone of own or other religion

	...from own religion				...from other religion			
	Eating vegetarian	**Good person**	**Unity & brotherhood**	**Religious gatherings**	**Eating vegetarian**	**Good person**	**Unity & brotherhood**	**Religious gatherings**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Doctor message sample								
High incentive	-0.007	0.007	-0.004	-0.002	-0.006	-0.009	0.015	-0.019
	(0.015)	(0.012)	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)
	[0.637]	[0.565]	[0.766]	[0.880]	[0.632]	[0.479]	[0.239]	[0.115]
Mean (Low incentive)	0.489	0.482	0.674	0.632	0.484	0.468	0.658	0.630
Observations	1514	1584	1530	1568	1606	1519	1505	1536
Slums	142	142	140	141	142	141	142	137
Observation rounds	2	2	2	2	2	2	2	2
Panel B: Control message sample								
High incentive	0.008	0.016	0.017	0.000	0.016	-0.023	-0.007	0.007
	(0.014)	(0.015)	(0.014)	(0.012)	(0.014)	(0.012)	(0.011)	(0.012)
	[0.592]	[0.288]	[0.221]	[0.980]	[0.236]	[0.055]	[0.547]	[0.529]
Mean (Low incentive)	0.479	0.468	0.651	0.635	0.488	0.512	0.670	0.628
Observations	1526	1554	1519	1550	1505	1548	1620	1565
Slums	139	140	139	139	138	139	142	141
Observation rounds	2	2	2	2	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1). Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. Naive p-values are presented in brackets. Dependent variables by column indicate respondent's level of agreement with the following misconceptions (from left to right) among citizens, as said by someone of the same religion (Panel A) and of a different religion (Panel B): (1) *Eating vegetarian*: 'If you are vegetarian, you do not need to worry about the coronavirus'; (2) *Good person*: 'If you are a good person you do not need to worry about the coronavirus'; (3) *Unity & brotherhood*: 'Unity and brotherhood will help us fight the coronavirus'; (4) *Religious gatherings*: 'Religious gatherings should be allowed'. Each outcome is measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses plotted are the mean of normalized values. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

Table G9: Effect of high incentives on behavioral outcomes

	Check truthfulness	**Knowledge of policy guidelines**			**Compliance with guidelines**
		using mask	**social distancing**	**wash hands**	
	(1)	(2)	(3)	(4)	(5)
Panel A: Doctor message sample					
High incentive	-0.030	0.002	-0.002	-0.001	-0.010
	(0.016)	(0.004)	(0.004)	(0.005)	(0.024)
	[0.057]	[0.686]	[0.606]	[0.754]	[0.678]
Mean (Low incentive)	0.344	0.818	0.805	0.793	0.624
Observations	3851	3849	3849	3849	2519
Slums	142	142	142	142	142
Observation rounds	2	2	2	2	2
Panel B: Control message sample					
High incentive	-0.019	0.003	-0.000	0.003	-0.001
	(0.016)	(0.004)	(0.004)	(0.005)	(0.023)
	[0.228]	[0.451]	[0.963]	[0.553]	[0.968]
Mean (Low incentive)	0.361	0.811	0.798	0.784	0.580
Observations	3849	3847	3849	3847	2560
Slums	142	142	142	142	141
Observation rounds	2	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1). Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. P-values are presented in brackets, the first from individual testing, the second adjusting for testing that each treatment is jointly different from zero for all outcomes presented in the table, separate for Panels A and B. Dependent variables by column: (1) *Check truthfulness* is an indicator variable equal to 1 if respondent 'always or very frequently' checks the truthfulness of news s/he shares or discusses with family and friends, and 0 otherwise; Columns (2) to (4) indicate respondent's level of agreement with (normalized mean of) COVID-19 guidelines, measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree. In particular: (2) *Using mask* concerns mask-wearing in crowded places; (3) *Social distancing* concerns keeping physical distance with other people; (4) *Wash hands* is about washing hands more frequently and for longer with soap. Column (5) *Compliance with guidelines* is an indicator variable equal to 1 if respondent complied with a randomly asked COVID-19 guideline (either leaving the slum and receiving visitors or washing hands after all events indicated by the World Health Organization), and 0 otherwise. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response, as well as some outcomes collected only for a random sub-set of study participants.

Table G10: Effect of treatment message on agreement with misconceptions reported by "people say"

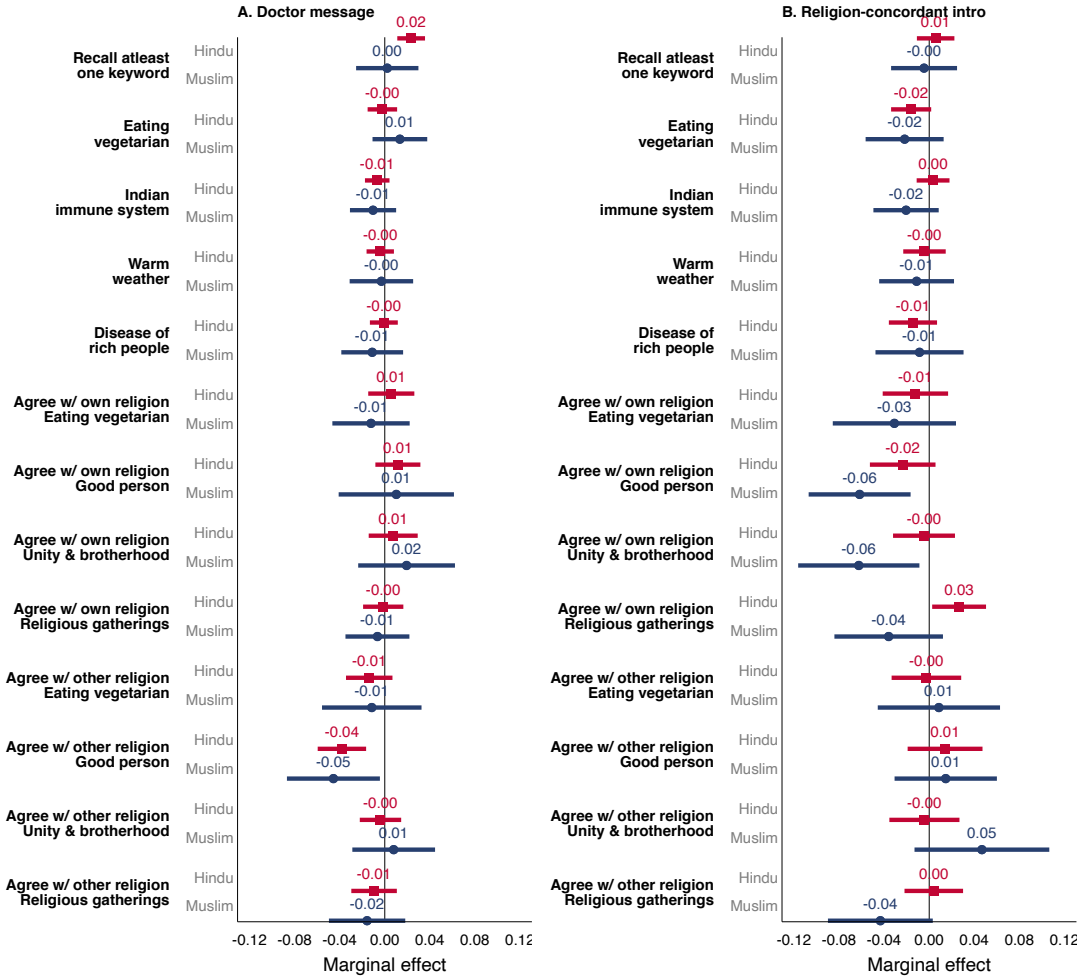
	Eating vegetarian (1)	**Good person** (2)	**Unity & brotherhood** (3)	**Religious gatherings** (4)
Panel A: Doctor				
Message sent	-0.014	0.005	-0.007	-0.004
	(0.012)	(0.012)	(0.014)	(0.013)
	[0.263]	[0.664]	[0.587]	[0.732]
Mean (Control message)	0.491	0.487	0.671	0.629
Observations	1549	1495	1526	1481
Slums	140	142	141	141
Observation rounds	2	2	2	2
Panel B: Religion-concordance				
Religion concordance intro	0.010	0.004	-0.005	-0.000
	(0.021)	(0.017)	(0.021)	(0.017)
	[0.648]	[0.801]	[0.825]	[0.991]
Mean (Other religion)	0.476	0.492	0.663	0.630
Observations	731	748	816	747
Slums	134	135	139	134
Observation rounds	2	2	2	2

Notes. Estimates based on OLS regressions using equation (1). Panel B restricts the sample to participants allocated to the doctor message. Standard errors clustered at the slum level are reported in parentheses. Naive p-values are presented in brackets. Dependent variables by column indicate respondent's level of agreement with the following misconceptions (from left to right) as said by 'people': (1) *Eating vegetarian*: 'If you are vegetarian, you do not need to worry about the coronavirus'; (2) *Good person*: 'If you are a good person you do not need to worry about the coronavirus'; (3) *Unity & brotherhood*: 'Unity and brotherhood will help us fight the coronavirus'; (4) *Religious gatherings*: 'Religious gatherings should be allowed'. Each outcome is measured using likert scale where 1 refers to strongly disagree and 5 refers to strongly agree, and the responses plotted are the mean of normalized values. All specifications include indicator variables for data collection rounds, and strata indicators (city and religion of respondent). Differences in observations across columns are due to unit non-response.

G.4 Heterogeneous analysis

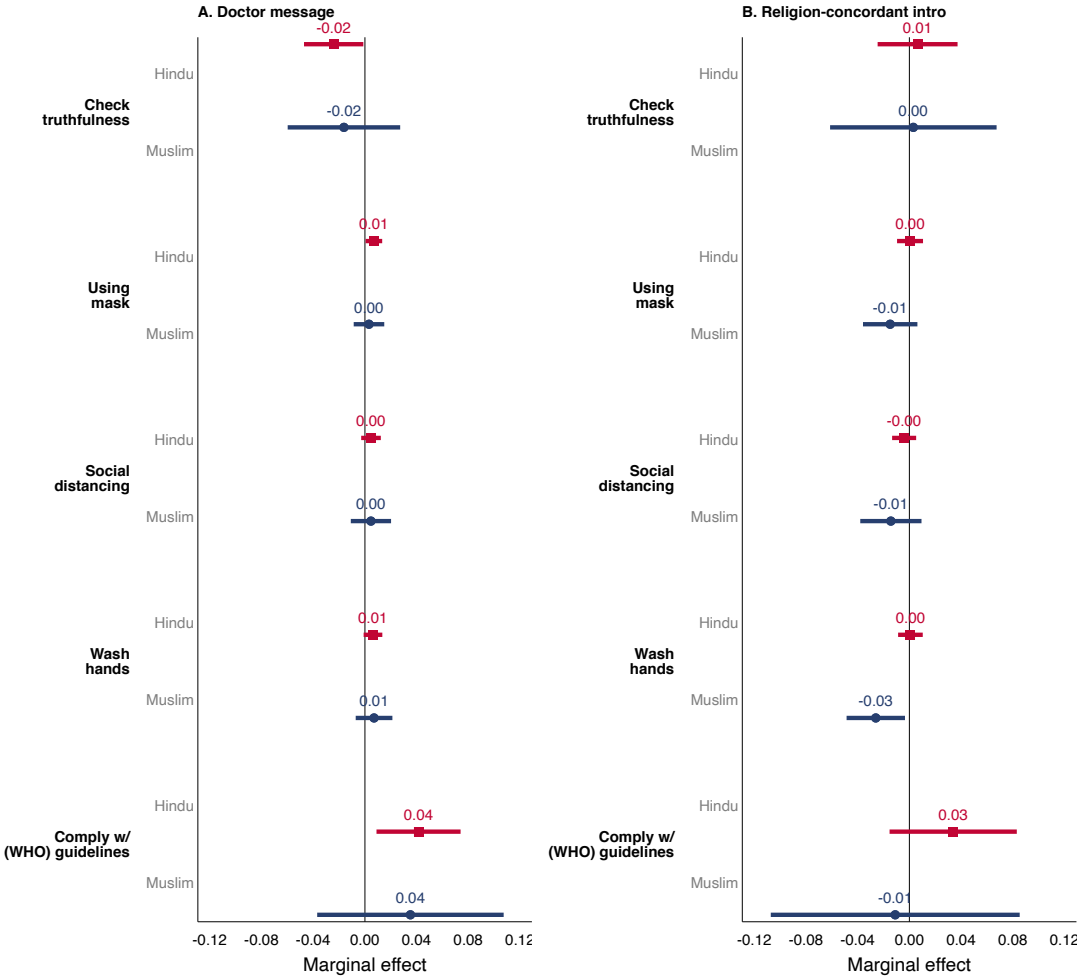
Figures G1–G6 reports estimates of heterogeneous treatment effects for the effect of the doctor message (Panel A), and for the effect of the doctor message being delivered by a religion-concordant messenger (Panel B). Estimates of the effects are obtained by estimating equation (1) separately by restricting the sample to the categories reported in column in light gray.

Figure G1: Heterogeneous effects by religion



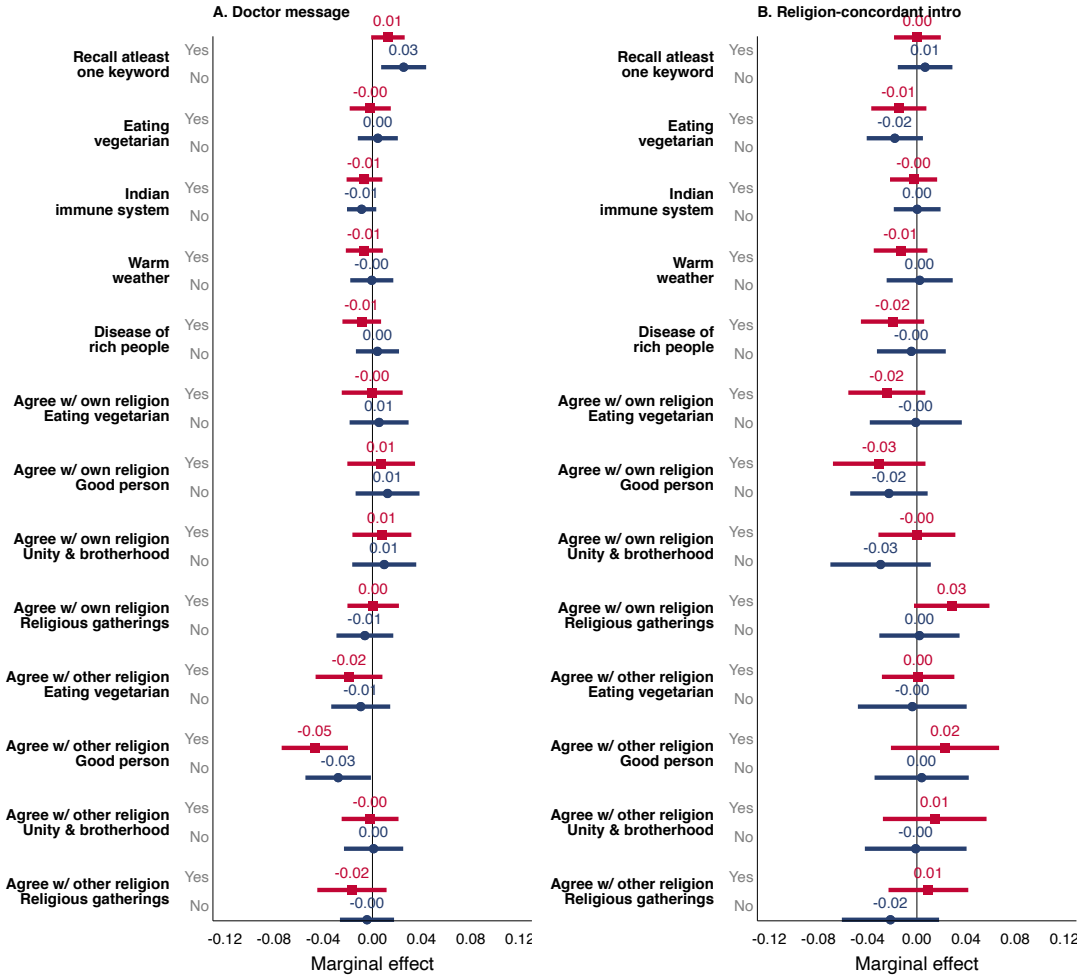
Notes. Panel A includes all participants in the sample. Panel B restricts the sample to participants allocated to the doctor message.

Figure G2: Heterogenous effects by religion



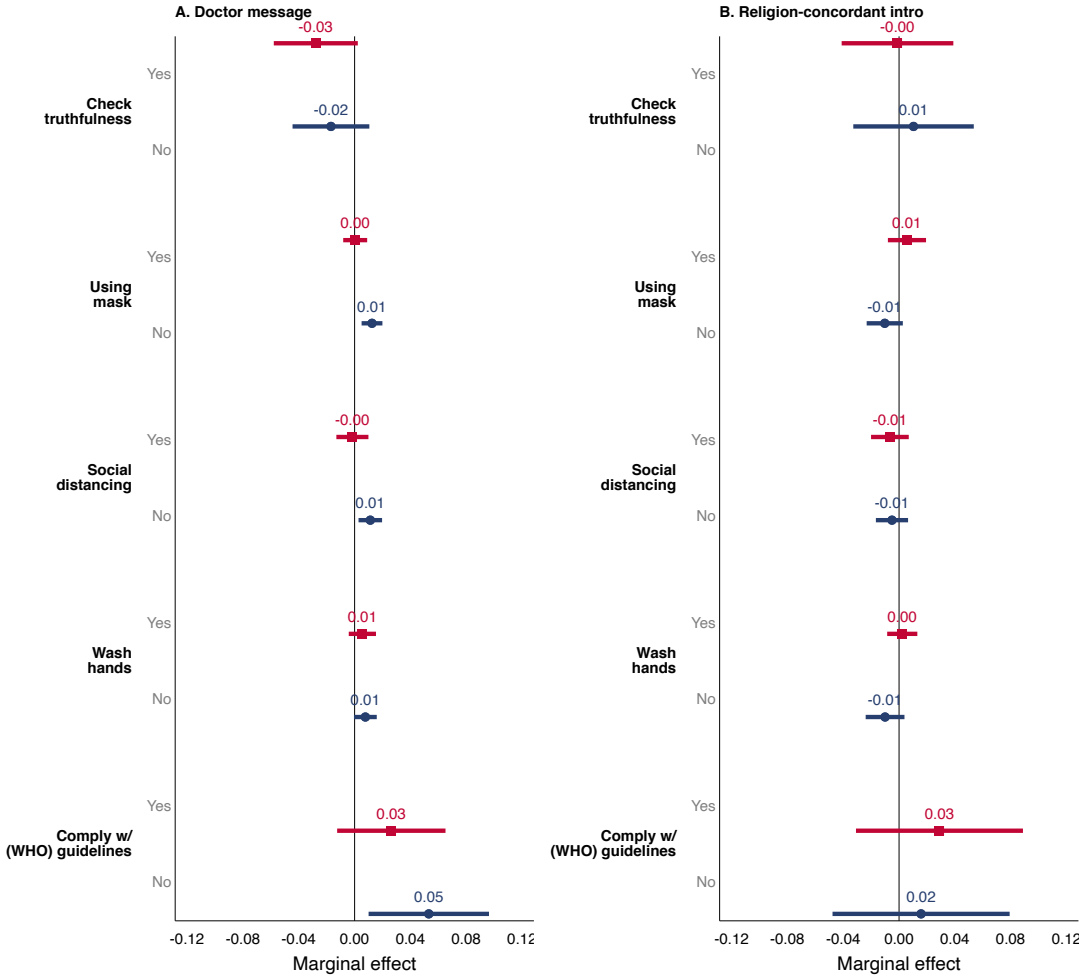
Notes. Panel A includes all participants in the sample. Panel B restricts the sample to participants allocated to the doctor message.

Figure G3: Heterogeneous effects by religious diversity



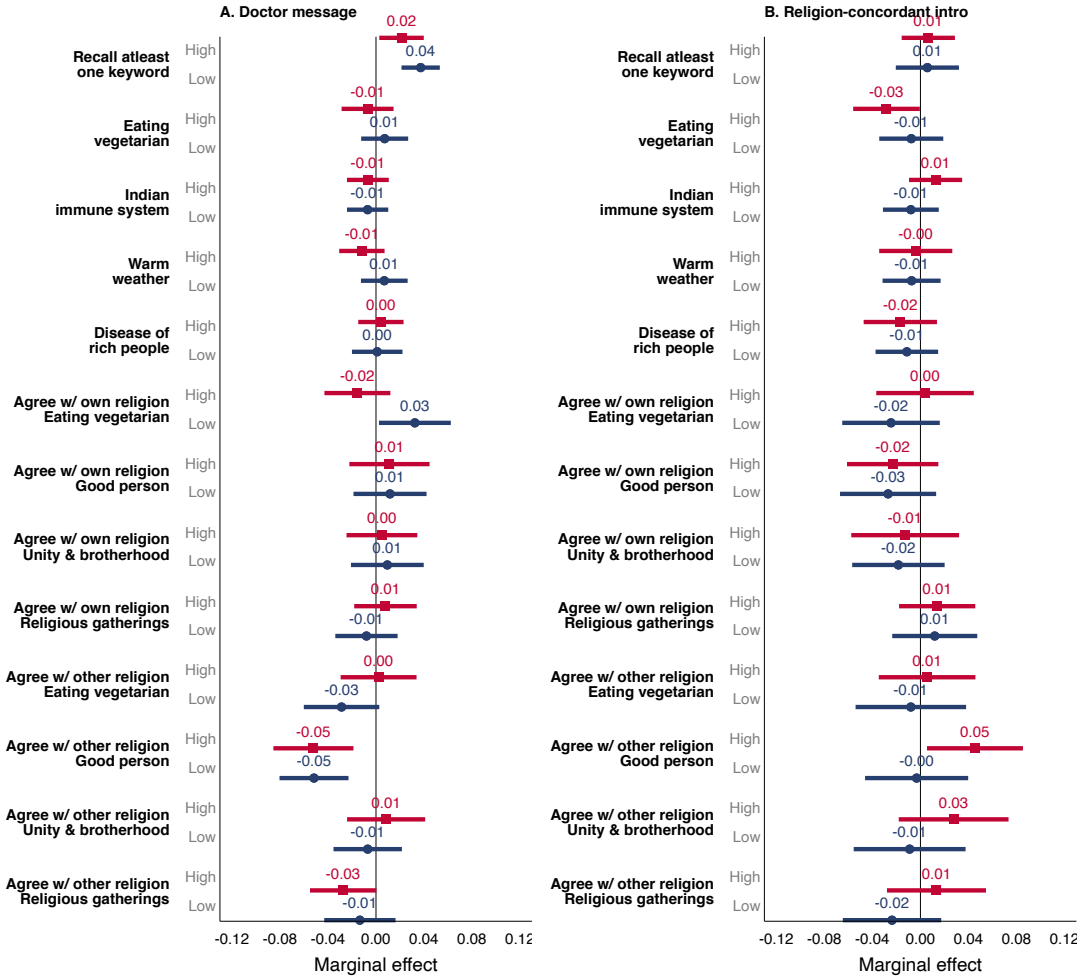
Notes. Panel A includes all participants in the sample, while Panel B restricts the sample to participants allocated to the doctor message. Religion diversity is an indicator variable equal to 1 when the share of Muslim residents in the slum is between the 25_{th} percentile and 75_{th} of the distribution of the share of muslims in the household census, 0 otherwise.

Figure G4: Heterogeneous effects by religious diversity



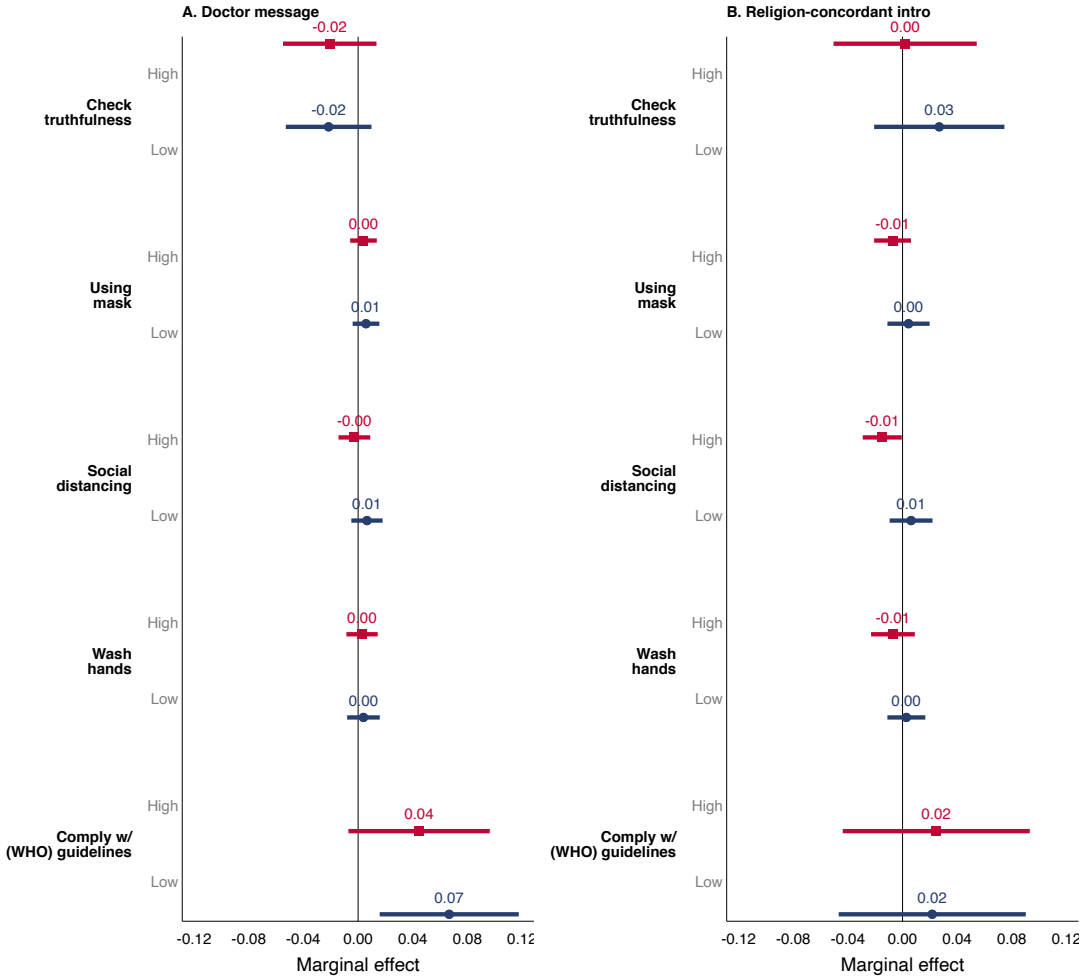
Notes. Panel A includes all participants in the sample, while Panel B restricts the sample to participants allocated to the doctor message. Religion diversity is an indicator variable equal to 1 when the share of Muslim residents in the slum is between the 25_{th} percentile and 75_{th} of the distribution of the share of muslims in the household census, 0 otherwise.

Figure G5: Heterogeneous effects by social desirability



Notes. Panel A. includes all participants in the sample, while Panel B. restricts the sample to participants allocated to the doctor message. 'Social desirability' is measured using the short version of the Marlowe–Crowne Social Desirability Scale (MC–SDS).

Figure G6: Heterogeneous effects by social desirability



Notes. Panel A includes all participants in the sample, while Panel B restricts the sample to participants allocated to the doctor message. 'Social desirability' is measured using the short version of the Marlowe–Crowne Social Desirability Scale (MC–SDS).

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