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ABSTRACT

Stigma and Misconceptions in the Time of the COVID-19 Pandemic: A Field Experiment in India*

A hidden cost of the COVID-19 pandemic is the stigma associated with the disease for those infected and groups that are considered as more likely to be infected. This paper examines whether the provision of accurate and focused information about COVID-19 from a reliable source can reduce stigmatization. We carry out a randomized field experiment in the state of Uttar Pradesh, India, in which we provide an information brief about COVID-19 by phone to a random subsample of participants to address stigma and misconceptions. We find that the information brief decreases stigmatization of COVID-19 patients and certain groups such as religious minorities, lower-caste groups, and frontline workers (healthcare, police), and reduces the belief that infection cases are more prevalent among certain marginalized social and economic groups (Muslims, low caste, rural-poor population). We provide suggestive evidence that improved knowledge about the prevention and transmission of COVID-19 and reduced stress about the disease are important channels for these effects.

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1. Introduction

The COVID-19 pandemic is taking a tremendous toll on humanity. This is evident not only in terms of the significant loss of life but also the negative impact on the world economy caused by the uncertainty and disruptions to economic activities related to the lockdown and other containment measures (Altig et al., 2020; Barro et al., 2020). One consequence of the COVID-19 crisis that has received less attention is the hidden social costs associated with the stigma of the disease (Bagcchi, 2020; Chandrashekhar, 2020). Pandemics have a long history of leading to stigmatization of patients and of certain groups and communities that are believed to have high infection rates - leprosy, cholera and more recently HIV-AIDS being leading examples (Cohn, 2018; Jedwab et al., 2020). Moreover, by engendering scapegoating against outgroups - in particular religious, ethnic and other minorities - pandemic conditions may lead to discriminatory practices and violence against these marginalized groups (Bartos et al., 2020; Van Bavel et al., 2020).

Stigmatimization of COVID-19 can have negative public health implications, as it may lead people to avoid testing and respecting prevention measures, not to mention that it can have a direct heavy impact on the mental health of those stigmatized (Quinn et al., 2014). As COVID-19 is a new disease and the facts surrounding how it is transmitted and can be treated require specialized knowledge, people are finding it challenging to discern truth from false information. Therefore, a leading cause of stigma could be the widespread misinformation and false beliefs about COVID-19 that are fueled by rumors circulating in the news (Bursztyn et al., 2020; Simonov et al., 2020) and spreading through the social media (Pennycook et al., 2020). Indeed, large international organizations are recognizing the harmful role of misinformation in the fight against the pandemic: the WHO has issued a resolution in April 2020 to encourage its member states to redress the problem, while the UN has launched an initiative to encourage social media users to "pause, take care before you share" when it comes to sharing information online. Addressing stigma early on can be key in combatting a pandemic, as historic lessons from previous pandemics such as HIV-AIDS suggest (Chandrashekhar, 2020).

This paper examines whether the provision of accurate and focused information about COVID-19 from a reliable source can reduce stigmatization and discrimination. To address this question, we carried out a field experiment in the state of Uttar Pradesh, India, in the summer of 2020 (June/July) with 2,138 participants in collaboration with the Indian Insitute of Technology (IIT), Kanpur. India is a very suitable country to examine our question as there is

an abundance of COVID-19 stigma and discrimination reports in the media (Bhattacharya et al., 2020; Lancet, 2020), and a history of intense intergroup tension and exclusionary practices between religious groups and castes (Munshi, 2019). Examples include reports that Muslim individuals were blamed, threatened, and attacked for spreading the virus, non-Hindu doctors and patients being denied dignified burials, incidents of health care workers being attacked and asked to vacate their rented apartments due to the fear of contraction, members of the lower caste being blamed and discriminated for spreading the virus, and individuals fleeing quarantine facilities or hiding their symptoms or travel history out of fear of stigmatization (Bhattacharya et al., 2020, Ganguly, 2020). Although we focus on India, incidents of stigma and discrimination are not unique to India but have been widely reported in countries such as France, Italy, and the U.S. during the early days of the COVID-19 outbreak (Villa et al., 2020).

In our intervention, we randomly assigned participants to a treatment group that received by phone an information brief about COVID-19 and a control group that did not.[6] The brief contained information about (i) the infection transmission and prevention mechanisms; (ii) Ministry of Health & Family Welfare's (MoHFW) guidelines to address social stigma associated with COVID-19; and (iii) the geographic distribution of infection rates relative to the geographic distribution of stigmatized groups. We collected detailed survey information about a range of outcomes before and after the intervention, namely: (i) knowledge about COVID-19 prevention and transmission; (ii) an incentivized measure of knowledge about the geographic distribution of cases across Indian states;[7] (iii) the extent to which people believe that particular groups (religious, castes, or frontline occupations) are to blame for the spread of COVID-19; (iv) whether people respect social distancing measures; and (v) measures of physical and mental health.

We find that the information intervention has a significant impact on all of the main five aforementioned outcomes. Relative to the control group, we find that participants who receive the information brief to: (i) have improved knowledge about the prevention and transmission of COVID-19; (ii) be less likely to believe that infection cases are more prevalent among certain outgroups that are in opposition to themselves (Hindus vs Muslims, low vs high caste, rich vs poor population); (iii) reduce stigmatization of COVID-19 patients, certain occupation groups (healthcare workers, sanitary workers, and the police) and marginalized groups such as

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[6] Mobile phone penetration in India is very high but smart phone ownership is low (see Siddique et al. 2020), which is why we relied on direct communication via phone. This also allowed us to make the information provision interactive as callers were able to respond to any additional queries related to the information we delivered.
[7] Participants were paid for correct knowledge about the geographic distribution of infection cases across a selective group of Indian states.

religious minorities and lower-caste groups; (iv) increase compliance with social distancing measures; and (v) report improved physical and mental health.

We then provide suggestive evidence that improved knowledge about the prevention and transmission of COVID-19 and reduced stress are possible channels for the reduction in attaching stigma to COVID-19 patients and their families. Thus, our results are consistent with the notion that misinformation or lack of information and fear and stress associated with COVID-19 are fuelling stigma and discrimination against COVID-19 patients and marginalized socio-economic groups. These findings suggest that designing interventions to combat misinformation and to relieve stress are key for preventing the deeply undesirable consequences of stigma and discrimination.

This paper relates to the growing literature on the COVID-19 pandemic that aims to understand the role of information on people's beliefs and behavior related to the pandemic (Abel et al., 2020; Akesson et al., 2020; Banerjee et al., 2020; Bursztyn et al., 2020; Siddique et al., 2020). Much of this literature, like our study, uses information experiments (Haaland et al., 2020) that allow clean identification of causal effects. To the best of our knowledge, none of this previous work has studied the issue of stigma and discrimination related to COVID-19, which is our focus.[8] In particular, this paper contributes to this literature by documenting causally how information can not only lead to better knowledge and higher adherence to protective measures, but also can correct misconceptions about the spread of the virus among different subgroups of the population, alleviate stress and anxiety about the disease, and reduce stigma. More broadly, the study relates to a wider literature on the role of information in overcoming stereotypes and discrimination in various contexts.[9]

The rest of the paper is organized as follows. The next section provides background about the context in which the study takes place. Section 3 presents the information intervention and research design of our study. Section 4 presents the results, while Section 5 explores the plausible mechanisms. Finally, Section 6 offers some concluding remarks.

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[8] Dupas (2011) provides an overview of the evidence of the role of information on health behavior in the context of developing countries.

[9] For instance, Bohren et al. (2019) and Ewens et al. (2014) examine the role of information on gender and racial discrimination, respectively. Bordalo et al. (2016) provides a theoretical framework of stereotypes formation in which individuals tend to exaggerate differences in characteristics between groups. Bertrand and Duflo (2017) provides a survey of the large literature on discrimination using field experiments.

2. Background: COVID-19, Stigma, and Discrimination in India

With over 10 million confirmed cases of COVID-19 and more than 146,000 deaths as of December 2020 (Ministry of Health & Family Welfare, 2020), India has one of the largest number of confirmed cases in the world after the United States and Brazil. There have also been numerous reported cases of misinformation, stigmatization, and discrimination since the start of the COVID-19 outbreak in India (Bhattacharya et al., 2020; Lancet, 2020).

India also has a history of tension and conflict between religious groups, especially between Hindus and Muslims (Mitra and Ray, 2014) and of enduring discriminatory practices against members of the lower castes (Munshi, 2019). Uttar Pradesh (UP), the most populous state (with about 225 million) and the state with the largest Scheduled Caste (SC) in India, is of particular interest as it has the highest share of atrocities against SC population in India and has witnessed a near 50% increase in crimes against SC population between 2014 and 2018. The situation in UP became particularly precarious with the advent of the COVID-19 crisis as more than half of the total confirmed cases in UP by late April in 2020 were linked to the Tablighi Jamaat Muslim event in the previous month in New Delhi. Several COVID-19 hotspots emerged in the district of Kanpur in UP. These patterns have heightened fear and stigma against religious minority and lower-caste groups across UP. Given that these traditionally disadvantaged and vulnerable groups have already suffered disproportionately due to the adverse health and economic effects of the pandemic, the increased stigmatization and discrimination against them would likely further worsen their wellbeing.

3. Information Intervention and Research Design

The study was carried out in three stages. In the first stage, which started in the first week of June 2020, we surveyed individuals (by phone) to collect information about their social and economic backgrounds, their attitudes towards individuals from different religious, caste, and other social backgrounds, their knowledge about COVID-19, their concerns regarding the pandemic, information about their physical and mental health, their sources of information, and their modes of communication with friends and relatives.

In the second stage, which started in the third week of June 2020, we implemented a pre-registered randomized controlled trial (RCT) wherein we randomly assigned half of the sample to the control group and the other half to the treatment group. The treatment group received information about COVID-19, such as transmission and preventive mechanisms, Ministry of Health & Family Welfare's (MoHFW) guidelines that aim to reduce social stigma, and the

geographic distribution of case infection rates relative to the geographic distribution of demographic and social groups for selective states (see Appendix C). In our understanding, these MoHFW guidelines were unlikely to have systematically reached our participants at the time of the experiment.

There are ten items related to the transmission and preventive mechanisms and the MoHFW guidelines. In particular, items 1-3 of the information brief provided information about how COVID-19 is transmitted. Item 4 is an adaptation of MoHFW guidelines that aims to dispel misinformation about the spread of the disease across different religious, caste and income groups. In the adaptation, we specifically include the actual distribution of case infection rates across a selected number of states to highlight that states with a high concentration of lower-caste groups, Muslim individuals, and rural poor population are not states with larger shares of case infection rates. Item 5 provides information about what to do if one develops symptoms, while item 7 about what to do if someone they know gets infected; item 6 provides information about the prevalence of COVID-19 in India relative to other countries; items 8 and 9, provide information about the role and appropriate treatment of health professionals, the police, sanitary workers, and foreigners; finally, item 10 urges to trust only information coming from experts.

In the third stage, which took place at the end of July and early August (more than a month after the information intervention), we followed up with the sampled individuals to collect information similar to that collected in the baseline as well as an incentivized measure of beliefs about the geographic distribution of case infection rates relative to the geographic distribution of demographic and social groups for selective states (Appendix B and C). The data collected in the follow up survey allow us to assess if the intervention is effective in improving knowledge about transmission and prevention of COVID-19, reducing stigmatization and discrimination against minorities and vulnerable groups, and improving adherence to the physical distancing directives and measures of wellbeing.

Note that the study was carried out in collaboration with the Indian Institute of Technology (IIT) Kanpur, which is a well known and trusted institution. The university has a good reputation in India, and in this region particularly, and this helped us to reach out to the study participants. This also ensures that the content of the information brief was delivered to participants from a reliable source they are familiar with and trust. In order to reduce social desirability bias and experimental demand effects, we had a different enumerator survey (phone) a person in the endline than the one in the baseline, and a third researcher delivering the information brief

for the treatment group.[10] In the endline, the enumerators did not mention or remind anything about the information provided during the intervention to the treatment group to minimize any bias.

3.1 Data

Our study took place in 40 localities across the Kanpur Nagar district of Uttar Pradesh in India (see the map of the region in the Appendix A). The 40 localities were selected as the average demographic, economic, and social characteristics of households in these localities are similar to the average characteristics of households in Uttar Pradesh. The randomization was carried out at the individual level such that individuals within a locality could be either in the treatment or the control group.[11] Our sample consists of 2,138 individuals and their average demographic and socioeconomic characteristics are similar to the averages of individuals in Uttar Pradesh (see the last column of Table A1 in the Appendix).[12]

Both the baseline and follow-up surveys collect questions related to household composition, demographic and socio-economic characteristics of the household, income and employment status, general attitudes and trust towards different castes and religions, stress and anxiety, self-reported health, life satisfaction, concerns and anxiety related to the COVID-19 outbreak, opinions and perceptions about COVID-19, knowledge about COVID-19, sources of information, and modes of communication with friends and relatives. In the follow-up survey, we also asked additional incentivized questions about the distribution of infection rates in selective Indian states.

Outcomes

We collected a number of primary and secondary outcomes. The five sets of primary outcomes are directly related to the intervention:

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[10] The enumerators were trained by one of the authors (D. Pakrashi) who is locally based in Kanpur and ensured that the information was contextualized and communicated well using local dialect/language.

[11] Given that India was in lockdown during the time of the intervention and Kanpur in particular was a hotspot under extended lockdown in most places until the end of July 2020, we expect that the information spillover within locality from treatment to control participants was minimal. Only about 50 participants in each locality were part of our study when, on average, each of these localities has more than 2000 inhabitants.

[12] The individuals in our sample had previously participated in a correspondence study on caste discrimination in 2017, in which they were invited to receive a free health check delivered by a mobile clinic (Islam et al., 2020). We used the available contact list of 2300 individuals from that earlier study to approach participants for the current study. We could reach out to 2138 participants at the baseline. About 20 households refused to participate, while the remaining individuals did not participate because of disconnected phone numbers, unanswered phone calls or migration out of the areas. The phone calls were made on behalf of IIT Kanpur.

1. Stigmatization of COVID-19
   - Stigma index: based on five, 5-point Likert scale questions about stigmatization of COVID-19 patients and their family members.
   - Scores/indices based on ten, 5-point Likert scale questions about whether certain groups (nationality/caste/religion/poverty/occupation) are responsible for the spread of COVID-19.
2. Knowledge about COVID-19 prevention and transmission.
3. Knowledge about the distribution of infection cases in six states to measure (incentivized) biased belief or prejudice against religious/vulnerable groups.
4. Compliance with social/physical distancing.
5. Health outcomes
   - Self-reported physical health.
   - Symptoms of COVID-19.

The five sets of secondary outcomes include variables that could potentially be impacted by our intervention:

1. Self-reported mental health
2. Stress
   - Perceived Stress Scale (PSS) (Cohen et al., 1997) – ten, 5-point Likert scale questions.
3. Concerns about the COVID-19 outbreak
   - Nine, 5-point Likert scale questions about various concerns/anxiety related to the COVID-19 outbreak.
4. Life satisfaction.
5. Demand for information (frequency of news).

Table A2 in Appendix A provides a summary of how the various outcome variables are defined and measured, while Appendix B enlists the underlying questions that comprise the various indices that we construct.

3.2 Hypotheses

As a large part of the information treatment educates participants about how the virus may spread, how to protect themselves against infection, what symptoms COVID-19 patients may exhibit, what risks are associated with COVID-19, and where to seek medical help, we expect treated participants' knowledge about the prevention and transmission of COVID-19 to

improve. The improvement in knowledge should then translate into behaviors that improve physical health.

The effects of the information treatment on mental health, life satisfaction, and information need are a priori ambiguous. For example, it is possible that after learning more about the transmission mechanisms and prevention methods of the disease, participants became more stressed and anxious about their health and wellbeing due to the heightened saliency of the disease (Selinger et al., 2013). On the other hand, past experimental evidence of telephone-based informational and counselling intervention among newly diagnosed glaucoma patients suggests that our information treatment may reduce stress and anxiety and improve life satisfaction (Skalicky et al., 2018). It is possible that treated participants became less anxious after learning more about the nature of COVID-19 and how to minimize the risks of infection and disease. Similarly, the effect of heightened awareness about COVID-19 may have an ambiguous effect on the demand for news, as it depends on whether the information treatment and the demand for news are complements or substitutes.

The lack of proper knowledge and the fear and stress about the disease may fuel stigmatization and discrimination toward outgroups (Schaller and Neuberg, 2012; Demirtaş-Madran, 2020). As the information treatment is expected to improve knowledge about COVID-19 and to potentially reduce stress and anxiety, the tendency for treated participants to stigmatize and discriminate against various stigmatized and marginalized social, religious, economic and occupational groups as well as COVID-19 patients and their family members may decrease.

To summarize, we hypothesize that the intervention will have the following effects:

H1 (Stigma). Treated participants: (a) reduce stigmatization against COVID-19 patients and their family members; and (b) reduce stigmatization against specific social, religious, economic, and occupational groups, especially against social, religious and economic outgroup members.

H2 (Knowledge). Treated participants: (a) improve knowledge about the prevention and transmission of COVID-19, and increase adherence to social/physical distancing; and (b) reduce the likelihood of believing that infection cases are more prevalent among the Muslim population, lower-caste population, and/or rural poor population.

H3 (Health). Treated participants experience improved physical health.

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Beyond these effects, the intervention is expected to have ambiguous effects on mental health, stress, anxiety, life satisfaction, and information need.

3.3 Balancing and Summary Statistics

Balance tests using data collected in the baseline are reported in Tables A3-A5 in Appendix A. As can be seen, our treatment and control groups are balanced in terms of individual and household characteristics (Table A3), and the various baseline measures of outcomes (Tables A4-A5).

Table A1 in Appendix A presents summary statistics of the main individual characteristics. Our sample is balanced in terms of gender. Participants are on average 39 years old, mostly married, and in majority are Hindus (78%), from a low-caste background (63%), and reside in a rural area (64%). About 10% of the sample have college education and are employed. Slightly more than half are below the poverty line. Summary statistics of the follow-up outcomes by treatment group are provided in Table A6.

Next, we summarize participants' beliefs regarding whether particular groups are responsible for spreading COVID-19, drawing on their survey responses in the baseline. In particular, Figure A1 displays these average beliefs for the various groups (measured on a 1-5 scale, where 1 is for strongly disagree and 5 strongly agree). In panel (A), we see that among foreigners, healthcare workers, sanitary workers, and the police, foreigners are perceived to be the most responsible for the spread of COVID-19. For the three other groups the average responses are very close to three indicating that respondents do not perceive these groups as particularly responsible. Panel (B) shows average beliefs vis-à-vis outgroups; we see that Muslim individuals are perceived by Hindu participants as responsible for the spread of COVID-19. In contrast, general-caste individuals, backward-caste individuals, and Hindu individuals are not perceived by their out-group members as responsible for the spread of COVID-19, as the average response is near two, indicating that on average outgroup members tend to disagree with the statement.

4. Results

4.1 Empirical Framework

To assess the impact of the intervention on the various outcomes, we estimate regressions of the following form:

$$y_{iv1} = \alpha + \beta T_i + \gamma X_{iv} + \delta y_{iv0} + \theta_v + \epsilon_{iv1}$$

where y_{iv1} is an outcome of individual i living in locality v measured in the endline. This outcome variable can be a primary or secondary outcome of interest, as detailed in section 3. The dummy variable T takes the value of one if the individual is assigned randomly to the treatment group, and zero if otherwise. The coefficient of interest is β, which captures the causal effect of the treatment on an outcome. We also include in the specification a vector of individual and household characteristics X_i: age, religion (Hindu or Muslim) and caste (General or backward caste such as SC/ST/OBC) of the respondent, gender, disability status, marital status, college educated dummy, employed dummy, household size, below poverty level dummy. When available, we also control for the baseline measure of a particular outcome, y_{i0}.[13] θ_v denote locality fixed effects. Finally, the term ϵ indicates the error term. We cluster standard errors at the locality level. To account for the large set of outcomes that we consider, we also report the Family Wise Error Rate (FWER) adjusted p-values corrected for multiple hypotheses testing using the free step-down resampling approach of Westfall and Young (1993).

4.2 Stigma related to COVID-19

We begin by presenting results on whether the information provision affected stigma associated with COVID-19. In particular, in column 1 of Table 1, Panel A, we estimate the impact of the information treatment on the stigma index (the index ranges from 5 to 25), which measures the strength of the stigma that respondents' attach to people who have had COVID-19 and their families. We find that the treatment leads to a substantial and statistically significant reduction in the value of the stigma index. The effect is quite sizeable, amounting to a reduction of 36% relative to the baseline value of the index in the control group.

This provides evidence in support of **Hypothesis 1a**.

In the remaining columns of Table 1, Panel A, we present results on the extent to which respondents believe that foreigners and frontline workers (i.e., healthcare workers, sanitary workers, and the police) are primarily responsible for spreading COVID-19. In all cases, beliefs are measured on a scale from 1-5, where five indicates a stronger agreement. We find that across the board, the treatment leads to a strong and statistically significant reduction in these beliefs.

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[13] Excluding y_{iv0} and other individual and household controls does not affect our results.

The effects are substantial, as the reductions are in the order of more than 50% over the strength of beliefs observed in the control group.

In Table 1, Panel B, we perform further analysis to examine how the treatment has impacted perceptions toward particular outgroups that are in opposition, with regards to their responsibility for the spread of COVID-19. Specifically, we look at the beliefs of the general caste vis-à-vis the backward caste, Muslims versus Hindus, and poor versus rich, and vice-versa for each case. The results indicate that even for these groups with oppositional identities that might be more prejudiced toward each other, the intervention leads to a substantial reduction in the attribution to the outgroup of spreading COVID-19. Here again the treatment effects are sizeable, in all cases we estimate an at least 50% reduction in the strength of beliefs compared to the control group.

These results provide evidence in support of **Hypothesis 1b**.

4.3 Knowledge and prevention of COVID-19

We next present results related to knowledge about COVID-19 prevention and transmission and on whether participants adhere to social distancing measures, which are shown in Table 2, columns 1 and 2, respectively. The intervention has a statistically significant impact on both these outcomes. In the case of knowledge, which is measured on a scale from 0 to 12, there is a 1.3 points improvement from a baseline of 9.9 in the control group, i.e., a 13% improvement. We also find that individuals in the treatment group are 27.3 pp less likely to report having had any direct contact with friends and relatives in the last week, which implies almost perfect compliance with social distancing rules.

This evidence provides support for **Hypothesis 2a**.

We next examine whether the intervention affects participants' knowledge about the geographic distribution of infection cases in Indian states. In particular, we focus on the prevalence of COVID-19 cases in Indian states that have either high or low presence of Muslims, people belonging to the backward caste, and poor people. Recall that information about the share of COVID-19 cases in each of these states and the share of one of these groups was provided to participants in the treatment group during the intervention. Participants are asked to indicate what share of the total COVID-19 cases a certain state with a particular share of caste, religious or economic group has, choosing among the following four options: [1] less than 5%; [2]

between 5% and 10%; [3] between 10% and 15%; [4]; more than 15%. Note that we incentivized this part of the experiment; participants earned 25 Indian Rupees for correctly answering a question.

We estimate the effect of the intervention on participants' answers to these questions using as dependent variable the number of correct answers provided out of 6. Because we are interested in knowing whether the intervention corrects prejudiced or biased beliefs, we focus on the direction of the answer and define a "correct" answer when the participant has chosen one of the two options on the left when the correct answer is in one of them, or the one of the two options on the right when the correct answer is in one of them. We are able thus to assess whether the information provision leads participants to choose the right or close to the right answer. Results are presented in Table 3.[14] In column 1, we find that overall, the intervention led to a substantial improvement in the number of answers in the correct direction. As compared to the control group, respondents in the treatment group gave 1.1 additional answers in the correct direction, a significant improvement of 42.3% in the number of correct answers.

This evidence provides support for **Hypothesis 2b**.

4.4 Physical Health

In columns 3 and 4 of Table 2, we show results on self-reported physical health and on the development of COVID-19 related symptoms. We find that the treatment has led to a significant improvement in physical health, measured on a 1-5 scale. The size of the improvement is about 10%. We also find a significant reduction in reporting of COVID-19 symptoms of 1.5 pp, which over a baseline incidence of about 3% in the control group implies a halving in the incidence of symptoms.

This evidence provides support for **Hypothesis 3**.

4.5 Secondary outcomes

We next examine the impact of the information treatment on selected secondary outcomes we collected: mental health, perceived stress, anxiety, life satisfaction, and demand for news. Table 4 presents these results. Several interesting findings emerge.

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[14] In Appendix Table A7, we present results using as dependent variable a dummy variable that takes the value 1 if the participant has chosen exactly the correct answer and zero otherwise.

First, we find that the intervention improves mental health and reduces stress and anxiety substantially. To get a sense of the magnitude of the effect, we find that treated group's mental health, measured on a 1-5 scale, improves by as much as 23.4% (column 1) relative to the control group, while the likelihood of being stressed for the treated group decreases by 75 percentage points (column 3), which over a baseline where essentially everyone in the control is stressed suggests a very sizeable impact. Similarly, we find a substantial reduction in anxiety stemming from COVID-19, with the treated group reporting a decrease in anxiety that exceeds 30% of the baseline anxiety experienced by the control group (column 4). In the next section, we examine whether this substantial reduction in stress acts as a mediator for the effect that the intervention has on our measures of stigmatization.

Second, we find a substantial improvement in life satisfaction (column 5) for the treated group, which amounts to a roughly 20% improvement over the baseline life satisfaction in the control group. We also find a slight increase in the frequency of checking the news (column 6), but the effect is small and statistically significant only at 10% level. This result suggests that the information treatment heightened information awareness and information consumption.

All in all, the information brief seems to have significantly alleviated people's stress and anxiety stemming from the COVID-19 crisis.

5. Understanding the Role of Knowledge and Stress for COVID-19 Stigma

Next, we aim to understand the channels through which the information treatment leads to reduction in stigma. To this end, we begin by exploring why stigma attached to COVID-19 patients might develop in the first place. Two possible leading factors that fuel stigmatization and discrimination toward outgroups are the lack of proper knowledge of COVID-19 facts and the fear and stress about the disease (Schaller and Neuberg, 2012; Demirtaş-Madran, 2020). To assess whether these factors are at play in our sample, we first investigate whether knowledge of COVID-19 facts and stress are associated with stigma in the baseline. When running an OLS regression of the stigma index on one's knowledge about COVID-19 (measured on a scale from 0 to 12) and our index of stress (measured on a scale from 0 to 40) -- all measured at the baseline before the intervention took place -- and the other controls we obtain a negative association between both knowledge and stress, and stigma, suggesting that these are indeed factors that might underpin the formation of stigma.[15]

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[15] The coefficient on knowledge is -0.47 with a standard error of 0.10, while the one on stress is 0.09 with a standard error of 0.02.

To further probe the role of knowledge and stress as channels for the impact of the information treatment on stigma that we document above, we next re-estimate the regression models presented in Table 1, but adding post-intervention knowledge index and post-intervention PSS index as additional controls. While post-intervention knowledge and post-intervention stress are outcomes of our intervention on their own right and therefore introducing them as right-hand-side variables suffers from a "bad" control problem (Angrist and Pischke, 2009), the aim of this accounting exercise is to assess to what extent addition of knowledge and stress absorbs any of the treatment effects that we estimated in Table 1.[16]

These results are displayed in Table 5. Starting from panel A, what we find in the first column is that addition of knowledge and stress reduces (in absolute value) substantially the treatment effect on the stigma index, while knowledge itself has a negative and statistically significant coefficient and stress has a positive and statistically significant effect on the stigma index. These findings provide suggestive support for the proposition that improved knowledge (see Table 2, column 1) and reduced stress (see Table 4, column 2) are indeed contributing channels for the impact that the information treatment has on stigma. In the other columns of Table 5, panel A, we observe that the treatment effect is slightly reduced, if at all, relative to the one we estimate in Table 3, and knowledge does not have a statistically significant effect on the various outcomes, whereas stress does have an effect. Similarly, in panel B of Table 5, we find some reduction in the treatment effect, relative to that estimated in Table 1, panel B, and we also observe that stress but not knowledge is significantly associated with the various outcomes in most of the cases. This suggests that reduction in stress is a channel for the treatment effects we find on the perceptions that participants have about the role of these groups in spreading COVID-19 and on the beliefs about outgroups, whereas improved knowledge, at least as measured by our index, does not seem to play a significant role.

Overall, this analysis provides suggestive evidence that both knowledge and stress are mediators of the treatment effect of the information intervention on stigma toward COVID-19 patients, and that stress is also a driver of negative attitudes toward various occupational groups and main oppositional outgroups.

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[16] We reach the same conclusion when we investigate these channels using an alternative approach similar to Angrist et al. (2013) and Hahn et al. (2018) where we regress an outcome on these two potential factors and other controls for the sample of treated participants only. The results are available upon request.

6 Conclusion

This study reports the findings of an information provision randomized intervention aimed at curbing COVID19-related stigma in India. We find that the provision of information from a reliable source has the potential to improve knowledge, reduce stigma, and to improve health and wellbeing. One potential limitation of our study is that participants might report less stigma and better health and wellbeing due to social desirability and experimental demand effects. We partly address this issue by having the different stages of the study delivered by different individuals. Although we still cannot rule out the possibility of bias, we believe that the treatment effects on stigma, health and wellbeing are truly present because we also find treatment effects on outcomes that are not subject to such biases: improved knowledge about COVID-19 and incentivized beliefs about the geographic distribution of infection cases relative to the geographic distribution of demographic and social groups for selective states.

The findings of this study shed light on the possible policy responses that are useful for countering stigma and misinformation that aggravate the spread of disease and negative health outcomes as well as reducing discrimination and the associated adverse effects that vulnerable individuals suffer. The Health Ministry in India has stressed that there is an urgent need to counter stigma and prejudice through health literacy and intensive campaigns.[17] The WHO has also issued advice and guidelines to prevent and address social stigma associated with COVID-19. The current study provides experimental evidence that information campaigns would constitute a first step in this direction. Moreover, we provide suggestive evidence that lack of knowledge and presence of stress are important underlying root causes of stigma toward COVID-19 patients and marginalized groups. This suggests that policies that aim to curb COVID-19 stigma should target these two factors to improve the wellbeing of stigmatized individuals. This is a matter that we believe deserves further academic and policy attention.

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[17] https://timesofindia.indiatimes.com/india/stigma-around-covid-19-should-be-addressed-through-intensive-campaign-health-ministry/articleshow/75411220.cms

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Table 1: Impact on COVID-19 Stigma

Panel A		Perception that COVID-19 is spread in India by			
	Stigma Index	Foreigners	Health care workers	Sanitary workers	Police
Treatment	-7.008***	-2.449***	-2.305***	-2.172***	-1.705***
	(0.372)	(0.054)	(0.058)	(0.055)	(0.053)
FWER p-values	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
R-squared	0.733	0.730	0.652	0.673	0.501
Control Mean	19.598	4.510	4.089	3.938	3.815
No. of observations	2,117	2,117	2,117	2,117	2,117

Panel B		Perception that COVID-19 is spread in India by				
Outgroup:	Backward	General	Muslim	Hindu	BPL	APL
Sub-sample (respondent)	General	Backward	Hindu	Muslim	APL	BPL
Treatment	-2.092***	-2.055***	-2.534***	-2.918***	-2.180***	-2.150***
	(0.110)	(0.060)	(0.049)	(0.061)	(0.086)	(0.081)
R-squared	0.654	0.574	0.847	0.884	0.688	0.639
Control Mean	3.921	3.979	4.470	4.211	3.797	4.094
No. of observations	776	1,341	1,667	450	967	1,150

Note: All regressions also include controls for age, religion (Hindu or Muslim) and caste (General or backward such as SC/ST/OBC) of the respondent, gender, disability status, marital status, college educated dummy, employed dummy, household size, below poverty level dummy and locality fixed effects. In Panel A: The stigma index, which ranges from 5 to 25, was created from a series of questions (response to each question was on a scale of 1 to 5, where 1 is strongly disagree and 5 strongly agree) by summing them (see Appendix B for details). In Panel B: we report results related to the relevant subgroup that is considered the main oppositional outgroup i.e., for General caste individuals we report the results related to perception that COVID-19 is spread by backward castes, for backward caste individuals we report the perception towards general caste and so on. All responses are on a scale of 1 to 5 where 1 is strongly disagree and 5 strongly agree. Standard errors are clustered at the locality level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The Family Wise Error Rate (FWER) adjusted p-value was estimated using the free step-down resampling approach of Westfall and Young (1993).

Table 2: Impact on COVID-19 Knowledge & Prevention, and Health

	Knowledge (1)	Physical contact (2)	Physical health (3)	COVID-19 symptoms (4)
Treatment	1.288***	-0.273***	0.381***	-0.015*
	(0.145)	(0.019)	(0.042)	(0.008)
FWER p-values	[0.000]	[0.000]	[0.000]	[0.046]
R-squared	0.456	0.215	0.158	0.040
Control Mean	9.865	0.286	3.911	0.029
No. of observations	2,117	2,117	2,117	2,117

Note: All regressions also include controls for age, religion (Hindu or Muslim) and caste (General or backward such as SC/ST/OBC) of the respondent, gender, disability status, marital status, college educated dummy, employed dummy, household size, below poverty level dummy and locality fixed effects. Knowledge is measured on a scale of 0 to 12 and captures the number of correct responses to 12 questions (see Appendix B for details). Physical contact is an indicator for whether there was a direct meeting with friends/relatives in the last week. The physical health variable capture responses to the following question: "On an average, how do you feel your physical health has been in general in the past 7 days?" where 1 is very bad and 5 very good. The symptoms variable takes a value 1 if any of the primary COVID-19 symptoms (dry cough, fever, fatigue, new loss of sense of smell/taste, and shortness of breath) are reported. Standard errors are clustered at the locality level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The Family Wise Error Rate (FWER) adjusted p-value was estimated using the free step-down resampling approach of Westfall and Young (1993).

Table 3: Impact on Knowledge about geographic distribution of COVID-19 cases (correct direction)

	Total correct directions (out of 6)						
	Overall	General	Backward	Hindu	Muslim	APL	BPL
Treatment	1.102***	1.379***	0.946***	1.287***	0.483***	1.147***	1.077***
	(0.251)	(0.353)	(0.268)	(0.313)	(0.138)	(0.286)	(0.274)
R-squared	0.170	0.250	0.160	0.217	0.105	0.212	0.163
Control Mean	2.594	2.528	2.632	2.475	3.022	2.559	2.622
No. of observations	2,117	776	1,341	1,667	450	967	1,150

Note: All regressions also include controls for age, religion (Hindu or Muslim) and caste (General or backward such as SC/ST/OBC) of the respondent, gender, disability status, marital status, college educated dummy, employed dummy, household size, below poverty level dummy and locality fixed effects. Correct direction captures whether a response is towards the right direction (top two or bottom two choices) regarding the share of case infection rates in a particular state with a particular share of demographic or economic group in India. Standard errors are clustered at the locality level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. APL denotes above poverty level and BPL denotes below poverty level.

Table 4: Impact on Secondary outcomes

	Mental health	PSS	PSS dummy	Anxiety index	Life satisfaction	Frequency of news
Treatment	0.821***	-19.723***	-0.751***	-12.403***	1.248***	0.164*
	(0.045)	(0.880)	(0.034)	(0.779)	(0.103)	(0.094)
FWER p-values	[0.000]	[0.000]	[0.000]	[0.009]	[0.009	[0.085]
R-squared	0.274	0.798	0.645	0.754	0.411	0.427
Control Mean	3.510	30.608	0.987	34.977	6.027	4.161
No. of observations	2,117	2,117	2,117	2,117	2,117	2,117

Note: All regressions also include controls for age, religion (Hindu or Muslim) and caste (General or backward such as SC/ST/OBC) of the respondent, gender, disability status, marital status, college educated dummy, employed dummy, household size, below poverty level dummy and locality fixed effects. The mental health variable capture responses to the following question: "On an average, how do you feel your mental health has been in general in the past 7 days?" where 1 is very bad and 5 very good. Perceived Stress Scale (PSS) was created by adding ten 5-point Likert scale questions ranging from 0 (never) to 4 (very often) (see Appendix B). A dummy is created from PSS, which takes a value if PSS is greater than equal to 14 and 0 otherwise. Anxiety index is created by summing responses to nine questions (see Appendix B) where a higher value means more worried or anxious (responses to each question range from strongly disagree (1) to strongly agree (5), thus, the anxiety index ranges from 9 to 45). The life satisfaction variable captures the response to the following question "All things considered, how satisfied are you with your life? *(as a whole nowadays)*. Pick a number between 0 and 10 to indicate how satisfied you are. The more satisfied you are, the higher the number you should pick. The less satisfied you are, the lower the number". "Frequency of news" captures responses to the following question "How often do you read/listen/watch news from any source?" on a scale of 1 (rarely not at all) to 5 (almost every day). Standard errors are clustered at the locality level. *** p<0.01, ** p<0.05, * p<0.1. The Family Wise Error Rate (FWER) adjusted p-value was estimated using the free step-down resampling approach of Westfall and Young (1993).

Table 5: Knowledge & COVID-19 Stigma

Panel A		Perception that COVID-19 is spread in India by			
	Stigma Index	Foreigners	Health care workers	Sanitary workers	Police
Treatment	-4.283***	-2.154***	-2.027***	-1.857***	-1.258***
	(0.965)	(0.112)	(0.132)	(0.173)	(0.159)
FWER p-values	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Endline knowledge Score	-0.438***	-0.008	0.033*	-0.013	0.001
	(0.077)	(0.017)	(0.019)	(0.019)	(0.018)
FWER p-values	[0.000]	[0.884]	[0.280]	[0.831]	[0.962]
Endline PSS	0.111***	0.014***	0.016***	0.015**	0.023***
	(0.037)	(0.005)	(0.005)	(0.007)	(0.007)
FWER p-values	[0.001]	[0.022]	[0.022]	[0.022]	[0.002]
R-squared	0.766	0.733	0.655	0.676	0.510
Control Mean	19.598	4.510	4.089	3.938	3.815
No. of observations	2,117	2,117	2,117	2,117	2,117

Panel B	Perception that COVID-19 is spread in India by					
Outgroup:	Backward	General	Muslim	Hindu	BPL	APL
Sub-sample (respondent)	General	Backward	Hindu	Muslim	APL	BPL
Treatment	-1.172***	-1.622***	-2.282***	-3.011***	-1.575***	-1.846***
	(0.281)	(0.188)	(0.109)	(0.194)	(0.253)	(0.214)
Endline knowledge Score	-0.025	-0.040	-0.031*	0.004	-0.047*	-0.018
	(0.034)	(0.028)	(0.018)	(0.039)	(0.026)	(0.028)
Endline PSS	0.044***	0.020**	0.012**	-0.004	0.026**	0.015*
	(0.011)	(0.008)	(0.004)	(0.006)	(0.010)	(0.009)
R-squared	0.683	0.581	0.849	0.884	0.698	0.643
Control Mean	3.921	3.979	4.470	4.211	3.797	4.094
No. of observations	776	1,341	1,667	450	967	1,150

Note: All regressions also include controls for age, religion (Hindu or Muslim) and caste (General or backward such as SC/ST/OBC) of the respondent, gender, disability status, marital status, college educated dummy, employed dummy, household size, below poverty level dummy and locality fixed effects. In Panel A: The stigma index, which ranges from 5 to 25, was created from a series of questions (response to each question was on a scale of 1 to 5, where 1 is strongly disagree and 5 strongly agree) by summing them (see Appendix B for details). Perceived Stress Scale (PSS) was created by adding ten 5-point Likert scale questions ranging from 0 (never) to 4 (very often) (see Appendix B). In Panel B: we only report results related to the outgroup i.e., for General caste individuals we report the results related to perception that COVID-19 is spread by backward castes, for backward caste individuals we report the perception towards general castes and so on. All responses are on a scale of 1 to 5 where 1 is strongly disagree and 5 strongly agree. Standard errors are clustered at the locality level. *** p<0.01, ** p<0.05, * p<0.1. The Family Wise Error Rate (FWER) adjusted p-value was estimated using the free step-down resampling approach of Westfall and Young (1993).

Stigma and Misconceptions in the Time of the COVID-19 Pandemic: A Field Experiment in India

Appendices

Additional Tables, Figures, and Maps

Asad Islam, Debayan Pakrashi, Michael Vlassopoulos, and Liang Choon Wang

Appendix A

Table A1: Sample Summary Statistics

Variables	All Sample Mean	SD	Treatment Mean	SD	Control Mean	SD	Uttar Pradesh Mean
Age (in years)	38.66	12.22	38.68	12.29	38.64	12.14	38.0
Male	0.53	0.50	0.55	0.50	0.52	0.50	0.51
Hindu	0.79	0.41	0.79	0.41	0.78	0.41	0.80
Urban resident	0.34	0.48	0.33	0.47	0.36	0.48	0.34
At least college educated	0.11	0.31	0.12	0.32	0.10	0.30	0.08
Below poverty level	0.54	0.50	0.54	0.50	0.55	0.50	0.29
General category (GC)	0.37	0.48	0.37	0.48	0.37	0.48	0.37
Scheduled caste (SC)	0.22	0.41	0.22	0.41	0.22	0.41	0.21
Scheduled tribe (ST)	0.01	0.12	0.01	0.11	0.02	0.13	0.01
Other Backward Classes (OBC)	0.40	0.49	0.40	0.49	0.39	0.49	0.41
No. of Observations	2,138		1,081		1,057		-

Notes: Uttar Pradesh composition data is from the Census 2011 and Thomson Reuters 2017 based on Voter Composition in Uttar Pradesh.

Table A2: Variable description

Variables	Description
Stigma Index	Index aggregated from five questions.
	On a scale of 5 to 25 where higher value indicates stigma.
Perception about COVID-19	Perception that COVID is spread in India by the following
	On a scale of 1 (strongly disagree) to 5 (strongly agree)
General caste	
Backward caste	
Hindu	
Muslim	
Rich	
Poor	
Foreigners	
Healthcare workers	
Sanitary workers	
Police	
Knowledge score	Correct responses from 12 questions. On a scale from 0 to 12.
Physical contact	=1 if met friends/relatives directly during past week.
Physical health (past 7 days)	On a scale of 1 (very bad) to 5 (very good).
COVID-19 symptoms	=1 if experienced COVID symptoms in past week
Incentivized biased belief	
Total correct responses	Total correct guesses in the correct direction on a scale of 0 to 6.
Mental health (past 7 days)	On a scale of 1 (very bad) to 5 (very good).
	Sum of responses to the ten 5-point Likert scale questions where re-sponses range from 0 (never) to 4 (very often). On a scale of 0 to 40
Perceived Stress scale (past 7 days)	where higher value indicates stress.
PSS dummy	=1 if PSS is greater than or equal to 14 (i.e. more stressed).
Anxiety Index	Index aggregated from nine questions.
	On a scale of 9 to 45 where higher value means more worried.
Life satisfaction	On a scale of 0 to 10 where higher values means more satisfied.
Frequency of news	Frequency of reading/listening/watching news from any source.
	On a scale of 1 (rarely not at all) to 5 (almost every day)

Note: See Appendix B for detailed questions and further details.

Table A3: Balance check – Individual and Household Characteristics

Panel A: Individual characteristics	Age (in years)	Male dummy	Married dummy	College educated dummy	Employed dummy
Treatment	0.037	0.025	0.020	0.015	0.016
	(0.581)	(0.019)	(0.019)	(0.015)	(0.017)
R-squared	0.000	0.001	0.001	0.001	0.001
Control Mean	38.640	0.521	0.804	0.103	0.096
No. of observations	2,138	2,138	2,138	2,138	2,138

Panel B: Household characteristics	Rural dummy	Hindu dummy	General caste dummy	Household size	Below poverty level dummy
Treat	0.027	0.007	-0.001	-0.096	-0.009
	(0.020)	(0.019)	(0.029)	(0.140)	(0.019)
R-squared	0.001	0.000	0.000	0.001	0.000
Control Mean	0.643	0.784	0.368	5.535	0.549
No. of observations	2,138	2,138	2,138	2,138	2,138

Note: Each column reports a balancing test, which we conduct by estimating an OLS regression of each characteristic on a treatment dummy. Total number of observations is 2,138. Standard errors are clustered at the locality level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A4: Balance checks in terms of COVID-19 Stigma

Panel A	Stigma Index	Perception that COVID-19 is spread in India by			
		Foreigners	Health care workers	Sanitary workers	Police
Treatment	-0.253	-0.027	0.021	0.046	0.041
	(0.373)	(0.100)	(0.082)	(0.120)	(0.092)
R-squared	0.002	0.000	0.000	0.000	0.000
Control Mean	12.618	4.485	2.915	2.510	2.712
No. of observations	2,138	2,138	2,138	2,138	2,138

Panel B	Perception that COVID-19 is spread in India by					
Outgroup:	Backward	General	Muslim	Hindu	BPL	APL
Sub-sample (respondent)	General	Backward	Hindu	Muslim	APL	BPL
Treatment	-0.133	0.068	-0.032	-0.127	0.048	0.053
	(0.150)	(0.088)	(0.104)	(0.095)	(0.082)	(0.102)
R-squared	0.003	0.001	0.000	0.004	0.000	0.001
Control Mean	2.578	2.361	3.871	2.167	2.618	2.774
No. of observations	786	1,352	1,684	454	975	1,163

Note: Total number of observations is 2,138. In Panel A: The Stigma index was created from a series of questions (response to each question was on a scale of 1 to 5, where 1 is strongly disagree and 5 strongly agree) by summing (see Appendix B for details). Thus, the stigma index ranges from 5 to 25. In Panel B: we report results related to the relevant subgroup that is considered the main oppositional outgroup i.e., for General caste individuals we report the results related to perception that COVID-19 is spread by backward castes, for backward caste individuals we report the perception towards general caste and so on. All responses are on a scale of 1 to 5 where 1 is strongly disagree and 5 strongly agree. Standard errors are clustered at the locality level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A5: Balance checks in terms of COVID-19 Knowledge & Prevention, and Health & Secondary outcomes

Panel A	Knowledge (1)	Physical contact (2)	Physical health (3)	COVID-19 symptoms (4)	
Treatment	-0.229	-0.007	-0.050	-0.002	
	(0.140)	(0.005)	(0.037)	(0.015)	
R-squared	0.007	0.001	0.001	0.000	
Control Mean	9.843	0.013	3.675	0.082	
No. of observations	2,138	2,138	2,138	2,138	

Panel B	Mental health (1)	PSS (2)	Anxiety Index (3)	Life satisfaction (4)	Frequency of news (5)
Treatment	-0.069	-0.189	0.604	0.183	0.061
	(0.052)	(0.415)	(0.444)	(0.226)	(0.139)
R-squared	0.002	0.000	0.004	0.004	0.001
Control Mean	3.686	18.552	30.455	5.062	4.167
No. of observations	2,138	2,138	2,138	2,138	2,138

Note: Total number of observations is 2,138. In Panel A: Knowledge is measured on a scale of 0 to 12 and captures the number of right responses to 12 questions (see Appendix B for details). Physical contact captures if there was a direct meeting with friends/relatives in the last week, where 1 is yes and 0 otherwise. The physical health variable captures responses to the following question: "On an average, how do you feel your physical health has been in general in the past 7 days?" where 1 is very bad and 5 very good. The symptoms variable takes a value 1 if any of the primary COVID-19 symptoms (dry cough, fever, fatigue, new loss of sense of smell/taste, and shortness of breath) are reported. In Panel B: The mental health variable captures responses to the following question "On an average, how do you feel your mental health has been in general in the past 7 days?" where 1 is very bad and 5 very good. Perceived Stress Scale (PSS) was created by adding ten 5-point Likert scale questions ranging from 0 (never) to 4 (very often) (see Appendix B). Anxiety index is created from by summing responses to nine questions (see Appendix B) where a higher value means more worried or anxious (responses to each question range from strongly disagree (1) to strongly agree (5), thus, the anxiety index ranges from 9 to 45). The life satisfaction variable captures the response to the following question "All things considered, how satisfied are you with your life? *(as a whole nowadays).* Pick a number between 0 and 10 to indicate how satisfied you are. The more satisfied you are, the higher the number you should pick. The less satisfied you are, the lower the number". "Frequency of news" captures responses to the following question "How often do you read/listen/watch news from any source?" on a scale of 1 (rarely not at all) to 5 (almost every day). Standard errors are clustered at the locality level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A6: Summary statistics: Endline outcomes by treatment status

Variables of Interest	Control Mean	Std. Dev	Treatment Mean	Std. Dev	Diff	p-value	Min	Max
Stigma Index	19.60	2.47	12.63	2.20	-6.97	0.00	5.00	25.00
Perception about COVID-19								
General caste	3.98	0.73	1.94	1.06	-2.04	0.00	1.00	5.00
Backward caste	3.92	0.77	1.82	0.85	-2.10	0.00	1.00	5.00
Hindu	4.47	0.72	1.96	0.80	-2.51	0.00	1.00	5.00
Muslim	4.21	0.64	1.31	0.47	-2.90	0.00	1.00	5.00
Rich	4.09	0.67	1.97	0.98	-2.12	0.00	1.00	5.00
Poor	3.80	0.83	1.63	0.72	-2.17	0.00	1.00	5.00
Foreigners	4.51	0.66	2.07	1.00	-2.44	0.00	1.00	5.00
Healthcare workers	4.09	0.72	1.79	1.00	-2.30	0.00	1.00	5.00
Sanitary workers	3.94	0.73	1.77	0.82	-2.17	0.00	1.00	5.00
Police	3.81	0.76	2.12	1.02	-1.69	0.00	1.00	5.00
Knowledge score	9.87	1.51	11.13	0.86	1.27	0.00	0.00	12.00
Physical contact dummy	0.29	0.45	0.01	0.11	-0.27	0.00	0.00	1.00
Physical health	3.91	0.81	4.30	0.77	0.38	0.00	1.00	5.00
COVID-19 symptoms	0.03	0.17	0.01	0.11	-0.02	0.01	0.00	1.00
Incentivized biased belief								
Total correct responses	2.59	1.28	3.71	1.55	1.12	0.00	0.00	6.00
Mental health	3.51	0.79	4.33	0.73	0.82	0.00	1.00	5.00
Perceived Stress scale (PSS)	30.61	6.72	10.85	4.60	-19.75	0.00	0.00	40.00
PSS dummy	0.99	0.11	0.23	0.42	-0.76	0.00	0.00	1.00
Anxiety Index	34.98	4.29	22.56	3.48	-12.41	0.00	9.00	45.00
Life satisfaction	6.03	0.98	7.29	1.05	1.26	0.00	0.00	10.00
Frequency of news	4.16	1.13	4.38	1.03	0.22	0.00	1.00	5.00
No of Observations	1,046		1,071					

Notes: The reported p-values are from the two-tailed test with the null hypothesis that the treatment and control means are equal. Diff denotes the difference in outcomes between treatment and control. Min and Max denote the minimum and the maximum value for each variable.

Table A7: Impact on Knowledge about geographic distribution of COVID-19 cases (correct response)

	Total correct response (out of 6)						
	Overall	General	Backward	Hindu	Muslim	APL	BPL
Treatment	0.782***	1.047***	0.638**	0.970***	0.120	0.802***	0.782***
	(0.245)	(0.356)	(0.257)	(0.308)	(0.086)	(0.289)	(0.273)
R-squared	0.147	0.225	0.137	0.189	0.058	0.183	0.153
Control Mean	0.979	0.934	1.005	0.886	1.313	0.966	0.990
No. of observations	2,117	776	1,341	1,667	450	967	1,150

Note: See footnote of Table 1. The outcome variable is the total number of correct responses. Standard errors are clustered at the locality level. *** p<0.01, ** p<0.05, * p<0.1. APL denotes above poverty level and BPL denotes below poverty level.

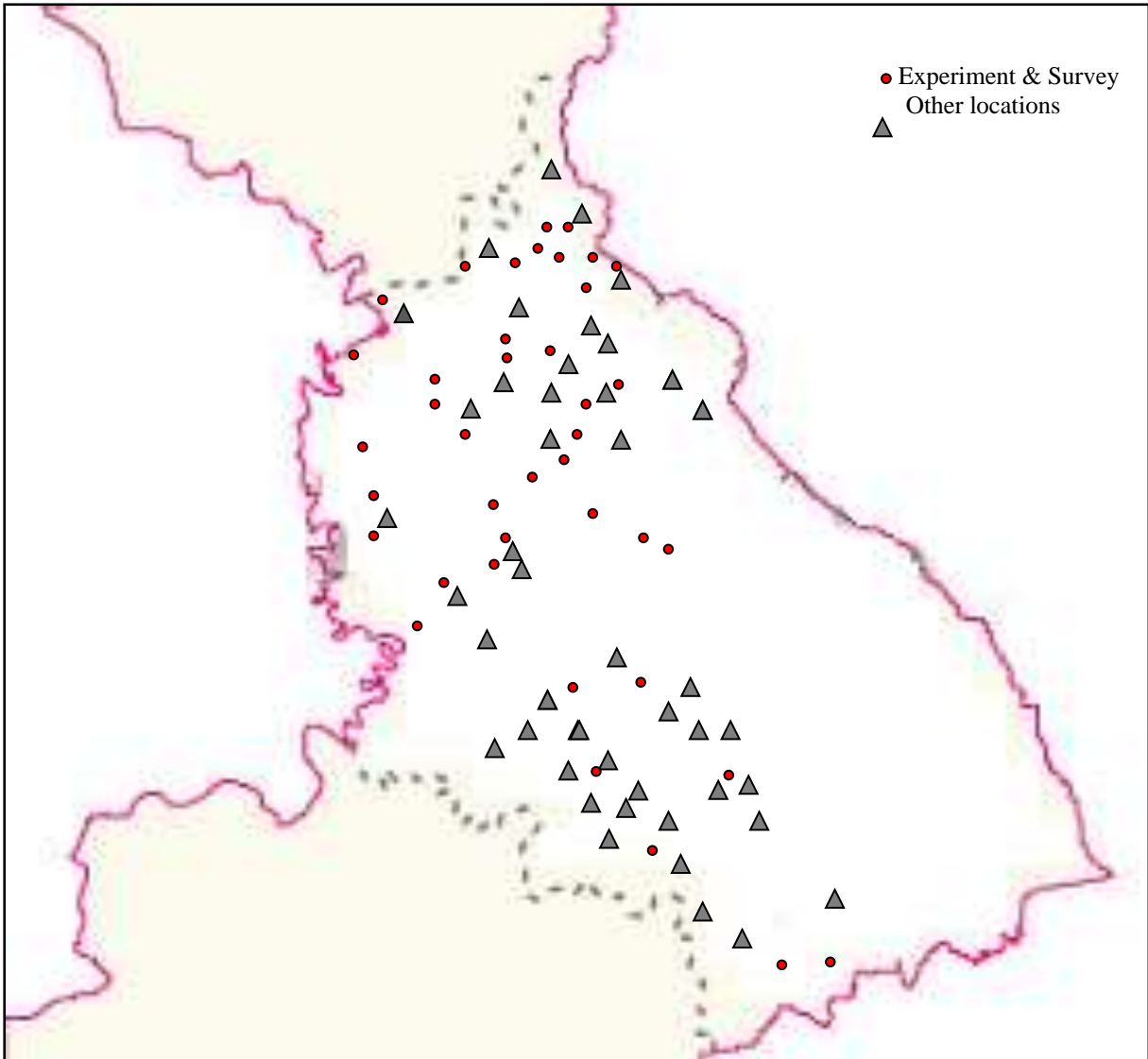**Figure A1: Beliefs that COVID-19 is spread by different groups in Baseline**
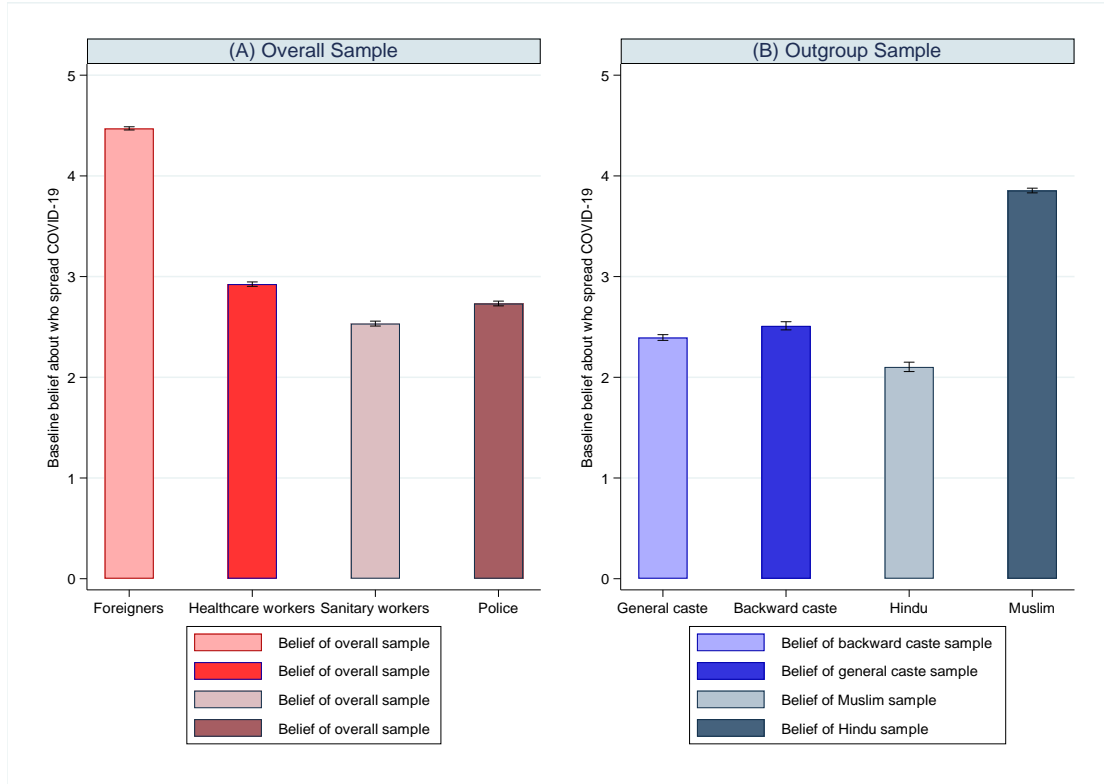
Note: The figure displays average belief at baseline that COVID-19 is spread by ……. on a scale of 1=Strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree.

Map A: Location of Kanpur Nagar, Uttar Pradesh on the Map of India

Map B: Locations where survey was conducted

Appendix B
Description of the variables

The variable *Stigma index* was created from five questions on stigma related to the spread of COVID-19 by summing them, where a higher value means strong attitudes towards COVID-19. The five questions used in the stigma index are as follows: (i) "If a person in my community dies from COVID-19, he/she should not be allowed to be cremated/buried in my village/neighborhood"; (ii) "If a person has COVID-19, the person is guilty and should be boycotted"; (iii) "If a person has COVID-19, the person is a sinner"; (iv) "I will never build a marriage relationship of my family members with another family which has a history of Coronavirus" and (v) "No one will want to build a marriage relationship of their family members with my family if any of my family members has had COVID-19", where response to each question was on a scale of 1 to 5 where 1 is strongly disagree and 5 strongly agree. So, the stigma index ranges from 5 to 25.

The variables *Perception that COVID-19 is spread in India by*: each of the following social and economic groups (religion, castes, income, foreigners, health care workers, sanitary workers and police) capture responses of individuals on a scale of 1 to 5 where 1 is strongly disagree and 5 strongly agree.

The *Knowledge* variable is constructed from a series of 12 questions related to knowledge about Coronavirus on a scale of 0 to 12 and capture the number of right responses to the 12 questions in the series. There are a total of 11 True and False questions and one open ended question. The 11 questions are as follows: (i) "Anyone of any age could be infected with Coronavirus"; (ii) "Once infected, the person will surely die"; (iii) "Coronavirus can transmit from one person to another"; (iv) "If there is a person infected with Coronavirus in a village/neighborhood, other people in the same village/neighborhood will surely be infected"; (v) "There is no proven Coronavirus vaccine available in the market"; (vi) "It is possible to protect yourself from Coronavirus by staying at home"; (vii) "This Coronavirus/COVID-19 is a curse"; (viii) "Coronavirus can be spread through coughing and sneezing"; (ix) "Coronavirus can be spread by being too close to animals"; (x) "A person can be infected with Coronavirus by touching face, eyes, nose, and/or mouth after touching surfaces contaminated with Coronavirus" and (xi) "Keeping physical distance from other people can reduce the chances of being infected with Corona virus". Finally, the open-ended question is as follows: "According to you what are the modes of transmission of Coronavirus?" (multiple choices possible) with the following choices: (a) From a healthy person (b)From a Coronavirus infected person (c) From domestic cattle (d) From domestic poultry (e) From birds.

The *Physical contact* variable captures responses to "In the past 7 days, how did you keep in touch with your friends/relatives who do not stay at your house?" with the following responses: (a) Meeting them directly; (b) Over mobile phone (call/message); (c) Through internet (chat/video call) and (d) Others (Please specify …………………………). The variable takes the value 1 if the response is yes and 0 otherwise. Similarly, the *physical health* variable capture responses to the following question: "On an average, how do you feel your physical health has been in general in the past 7 days?" where 1 is very bad and 5 very good, while *mental health* captures "On an average, how do you feel your mental health has been in general in the past 7 days?". Finally, the *COVID-19 symptoms* variable takes a value 1 if the response to "Have you experienced any of the following symptoms in the past 7 days" were the primary COVID symptoms (dry cough, fever, fatigue, new loss of sense of smell/taste, and shortness of breath).

The *Knowledge about geographic distribution of COVID-19 cases* results reported in Table 3 in the main text capture whether responses to the six incentivized measure of knowledge about

the geographic distribution of cases across a few Indian states were towards right direction (top two or bottom two choices) or not (*on the date of the interview*). Respondents were incentivized to take a guess about the share of all Coronavirus cases in India for each of the six Indian states with the following responses: [1] less than 5%; [2] between 5% and 10%; [3] between 10% and 15%; [4]; more than 15%. The questions asked were as follows:

(1) Uttar Pradesh has as much as 22% of all Muslim population in India. It is one of Indian states with the largest Muslim population. What do you think is Uttar Pradesh's share of all Coronavirus cases in India at the moment?

(2) Tamil Nadu has only 2% of all Muslim population in India. It is one of Indian states with the smallest Muslim population. What do you think is Tamil Nadu's share of all Coronavirus cases in India at the moment?

(3) West Bengal has as much as 11% of all SC population in India. It is one of Indian states with the largest SC population. What do you think is West Bengal's share of all Coronavirus cases in India at the moment?

(4) Gujarat has only 2% of all SC population in India. It is one of Indian states with the smallest SC population. What do you think is Gujarat's share of all Coronavirus cases in India at the moment?

(5) Bihar has as much as 15% of all rural BPL population in India. It is one of Indian states with the largest rural BPL population. What do you think is Bihar's share of all Coronavirus cases in India at the moment?

(6) Delhi has almost 0% of all rural BPL population in India. It is one of Indian states with the smallest rural BPL population. What do you think is Delhi's share of all Coronavirus cases in India at the moment?

The *Perceived Stress Scale (PSS)* was created by adding the responses to the ten 5-point Likert scale questions where responses range from 0 (never) to 4 (very often) following Cohen et al. (1997).[18] The ten questions used in the construction of the PSS are as follows: (i) "how often have you been upset because of something that happened unexpectedly?"; (ii) "how often have you felt that you were unable to control the important things in your life?", (iii) "how often have you felt nervous and stressed?"; (iv) "how often have you felt confident about your ability to handle your personal and family problems?" (reverse coded); (v) "how often have you felt that things were going your way?" (reverse coded); (vi) "how often have you found that you could not cope with all the things that you need to do in this corona virus situation?"; (vii) "how often have you been able to control irritations in your life?" (reverse coded); (viii) "how often have you felt that you were on top of things?" (reverse coded); (ix) "how often have you been angered because of things that happened that were outside of your control?" and (x) "how often have you felt difficulties were piling up so high that you could not overcome them?". So, the variable PSS ranges from 0 to 40. In addition, a dummy variable, *PSS dummy* is created from the Perceived Stress Scale (PSS), which takes a value 1 if PSS is greater than equal to 14 and 0 otherwise.

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[18] Cohen, S., Kessler, R. C., & Gordon, L. U. (1997). Measuring stress: A guide for health and social scientists. Oxford University Press.

The *Anxiety index* is created by summing responses from nine questions where a higher value means more worried or anxious. The nine questions are as follows: (i) "I am worried that I may be infected with Coronavirus"; (ii) "I am worried that my family members may be infected with Coronavirus"; (iii) "I am worried that my family members and I may be infected with Coronavirus if any of my neighbors has COVID-19"; (iv) "I am worried that my family members and I may be infected with Coronavirus if we go to COVID-19 test facilities"; (v) "I am worried that my family members and I may not be able to access COVID-19 test if needed"; (vi) "I am worried that my family members and I may not be able to access any other health care facilities in the current situation if needed?"; (vii) "I am worried about going to market to buy things or workplace or any other places that are likely to be crowded"; (viii) "I am worried that the community where I live have been severely affected by the "lockdown" or "COVID-19 outbreak?" and (ix) "I am worried about being able to have three meals a day for my family and myself in the next few days" with responses ranging strongly disagree (1) to strongly agree (5). So, the variable Anxiety index ranges from 9 to 45.

The *life satisfaction* variable captures the response to the following question "All things considered, how satisfied are you with your life? (as a whole nowadays). Pick a number between 0 and 10 to indicate how satisfied you are. The more satisfied you are, the higher the number you should pick. The less satisfied you are, the lower the number".

Finally, the variable *Frequency of news* captures responses to the following question "How often do you read/listen/watch news from any source?" on a scale of 1 (rarely not at all) to 5 (almost every day).

Appendix C
Information Brief

Hello!!! We are here to provide you with some important knowledge about how Coronavirus transmits and also some precaution and prevention methods to help keep you safe:

1. The Coronavirus typically transmits from an infected person to a healthy person when the infected person's droplet, such as through coughing and sneezing, contacts the healthy person's eyes, nose, or mouth.

2. Although the Coronavirus is highly contagious, you can minimise your chances of getting the disease by taking precautionary and prevention measures, such as washing hands with soap after touching contaminated surfaces like public areas and door knob, avoiding touching your face/nose/eyes/mouth, keeping physical distancing of 1.5 meters (or 2 hands) from other people when you go out, and staying at home as much as you can.

3. Because an infected person may not show any symptom, it is important that when you cough or sneeze, you cough or sneeze into the crack of your arm or shoulder and not in the open air or in your hands. Wearing face mask can also stop your droplets from spewing onto someone else.

4. The disease caused by the Coronavirus is called COVID-19. This disease does not discriminate. Anyone of any age, religion, caste, class, occupation, foreign status, and backgrounds could get it. If someone unfortunately gets it, it is not really the person's fault. It is not the wrath of God, not a curse. How would you like to be treated if you or your family had it? Show empathy to COVID-19 patients regardless of their backgrounds.

Summarizing the numbers: Please note that as of the week of *15th of June 2020 (the date and these numbers were updated regularly)*:

State	% Case	% Muslim	% SC	% Rural BPL
Uttar Pradesh	4%	22%		
Tamil Nadu	13%	2%		
West Bengal	3%		11%	
Gujarat	7%		2%	
Bihar	2%			15%
Delhi	12%			0%
Maharashtra	32%	8%	7%	7%

UP has as many as 22% (one-quarter) of all Muslims in India but it only accounts for 4% of all the Coronavirus cases in India. Tamil Nadu has only 2% of all Muslims in India but it accounts for as many as 13% of all the Coronavirus cases in India. West Bengal has as many as 11% of the lower-caste population in India but it only accounts for 3% of the Coronavirus cases in India. Gujarat has only 2% of the lower-caste population in India but it accounts for as many as 7% of the Coronavirus cases in India. Bihar has as many as 15% of the rural poor population in India, but it only has 2% of the Coronavirus cases in India. Delhi has less than 1% of the rural poor population in

India, but it accounts for as many as 12% of the Coronavirus cases in India. The state with 32% of Coronavirus cases in India is Maharashtra. This worst affected state has only 8% of the Muslims, 7% of the lower-caste population, and 7% of the rural poor population in India. So, you see religion, caste, and economic status are not indicative of disease status.

5. Although there is no vaccine for Coronavirus available on the market yet, most COVID-19 patients recover by taking care of themselves and seeking medical help. There are more people who recovered from the disease than died from it because the disease can be managed and is curable. For example, the recovery rate is as high as 90% in Kanpur. If you have symptoms such as fever, sore throat, coughing, new loss of smell or taste, chills, muscle pain, and shortness of breath or difficulty breathing, make sure you self-isolate, stay at home to rest, and call telemedicine.

6. The Coronavirus situation in India is not as bad as some other countries, such as the USA. Indian population is 4 times the US population, but the cases in USA are 10 times more than India. The COVID-19 death rate in India is one of the lowest in the world. As long as you practice precaution and prevention measures, your chances of getting the Coronavirus are low and your chances of death from Coronavirus are extremely low.

7. When a person in your village/neighborhood is infected with the Coronavirus, other people in your village/neighborhood will still be safe if the infected person self-isolate at home and everyone else practices precaution and prevention measures mentioned earlier.

8. Frontliners deserve our support and respect. Doctors, nurses, cleaners, and police are putting themselves at risks to make sure that we are safe. They are trained to practice good hygiene and take precaution and prevention measures seriously. There is no reason to be scared of them and to attack them. Targeting essential services providers and their families will weaken our fight against COVID-19 and can prove grievously detrimental for the entire nation. The important things for you to do are to practice precaution and prevention measures and let frontliners focus on their jobs so that they can keep everyone safe.

9. Foreigners are just as likely as you are to have COVID-19. Anyone who newly arrived in India must self-isolate for two weeks according to government regulation. As long as you practice precaution and prevention measures, there is no reason for you to be scared when you are out.

10. Only believe in information coming from doctors and experts because there are people out there spreading false information.