Learning about COVID-19: Improving Knowledge via Incentives and Feedback [*]

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Abstract:

We seek to support the Mozambican COVID-19 response, in collaboration with the government's health research center for the central region, by following up on a study sample of a randomized controlled trial in Mozambique. Sample households will be contacted by phone and administered several rounds of surveys regarding COVID-19 knowledge, beliefs, and behavior. We will randomize novel over-the-phone interventions to test if we can improve knowledge about COVID-19 via incentives and tailored feedback. Our findings will support the Mozambican response by informing policymakers of the public's COVID-19 knowledge and behaviors and on which public health messaging strategies are best to pursue given limited resources.

Keywords: COVID-19, social distancing, health behavior, Mozambique

JEL codes: I12 (health, general), I12 (health behavior), D90 (micro-based behavioral economics, general)

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TRIAL INFORMATION:

1. Context:

Households are drawn from an ongoing impact evaluation of a community health program in Mozambique. Please refer to the registered trial "Direct and Spillover Impacts of a Community-Level HIV/AIDS Program: Evidence from a Randomized Controlled Trial in Mozambique**"**: https://www.socialscienceregistry.org/trials/3990

2. Trial Dates:

Expected Trial Start Date: **2020-07-10**
Expected Intervention Start Date: **2020-08-26**
Expected Intervention End Date: **2020-09-16**
Expected Trial End Date: **2020-12-31**

3. Institutional Review Board (IRB) Approvals:

University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board
IRB Approval Date: 2020-04-15
IRB Approval Number: HUM00113011

Mozambique Ministry of Health National Committee on Bioethics for Health (CNBS)
IRB Approval Date: 2020-07-01
IRB Reference Number: 302/CNBS/20

4. Sponsors:

Innovations for Poverty Action (IPA)
New Haven, CT, USA
https://www.poverty-action.org/

Abdul Latif Jameel Poverty Action Lab (J-PAL)
Cambridge, MA, USA
https://www.povertyactionlab.org/

Michigan Institute for Teaching and Research in Economics (MITRE)
Ann Arbor, MI, USA
https://lsa.umich.edu/econ/mitre.html

5. Partners:

Beira Operations Research Center (CIOB)
Beira, Mozambique

EXPERIMENTAL DETAILS:

1. Study Sample:

The study population are households included in the ongoing impact evaluation of the FCC program in Mozambique. The households are distributed across 76 communities in three provinces of Mozambique (Manica: Manica, Chimoio, Gondola; Sofala: Dondo, Nhamatanda; Zambézia: Namacurra, Nicoadala). Compared to other communities in Mozambique, the study areas are relatively accessible to main transport corridors (highways and ports). They are thus important geographic conduits for infectious disease, and this makes them important areas in which to conduct research on combating COVID-19.

The sample will be a subset of households with phone numbers who are participating in the ongoing FCC randomized controlled trial. Given budget and past experience with phone contact rates in our sample, we are targeting a sample size of 2,000 households.

2. Experimental Design:

The interventions will be tested using a randomized controlled trial study design. The interventions will be randomly assigned to participants as different treatment arms (including a control group). We randomize over-the-phone interventions to test if we can improve knowledge about COVID-19 via incentives and tailored feedback. We consider the intent-to-treat (ITT) effect of the randomized interventions on a standardized version of our outcomes: indices of COVID-19 knowledge. All interventions will be implemented in the Round 2 Survey to allow for comparison across treatments and to incorporate required input for other treatments from the Round 1 Survey. Outcome data will be collected in the Round 3 Survey.

3. Randomization:

Randomization will occur at the household level and be applied to all households recruited into the Round 1 Survey – hence, it will occur after the Round 1 Survey but before the Round 2 Survey. Randomization will be stratified by the 76 community designations. Randomization is done using Stata/SE 15 (Stata Corporation, College Station, TX, USA). Based on our power analysis, we limit to three treatment arms to detect effects of reasonable size.

The targeted breakdown of the sample into Knowledge treatment arms is as follows:
Target Sample: 2000
Control (40%): 800
K1 (20%): 400
K2 (20%): 400
K1 + K2 (20%): 400

4. Interventions:

Knowledge Treatments:

- **K1: Knowledge Incentives.** We will randomly offer a subset of respondents 5 Mozambican meticais (MT) for every correct knowledge response on a subsequent phone survey. We will examine the effect of the treatment on future knowledge and behavior. If they answer all 40 questions correctly, respondents can earn a maximum of 200MT (approx. US$2.86).

- **K2: Tailored Feedback.** We will randomly give tailored feedback to a subset of respondents based on their response to COVID-19 knowledge questions, by informing them of a subset of their correct responses and correcting a subset of their incorrect responses. We will examine if tailored feedback improves relevant knowledge and behavior in a subsequent telephone survey.

We also cross-randomize a family of social distancing treatments as a part of this study. They are described here but their analysis is pre-specified in another pre-analysis plan found here: https://doi.org/10.1257/rct.5862-1.0

Social Distancing Treatments:

- **SD1: Community Support for Social Distancing.** We will ask individuals whether they themselves support social distancing, and use this information to calculate the fraction of households in the community who support social distancing. Then, in a later phone call, we will ask individuals to guess the share of households in the community who support social distancing. Individuals who underestimate the true share of households in the community that support social distancing will be given information on the true (higher) share of support for social distancing, and individuals correctly guessing the true share will be told that their guess is correct.
- **SD2: Community leader support for social distancing.** We will survey community leaders and ask them to endorse social distancing in their communities. In this treatment, we will inform households by phone call that their leaders support social distancing in their communities.

5. Primary Analysis of Knowledge Treatments:

Question:

- Do people recall important public health information more when learning outcomes are incentivized?
- Do people recall important public health information more when provided specific feedback on learning outcomes measured in a prior survey?

Primary Outcomes:

- **Knowledge Index:** Number of correct answers to 40 knowledge questions in Round 3: 12 on general knowledge, 16 on preventive actions, and 12 on government actions. Responses are indicated as correct if they match the research team's pre-specified "correct" answer (listed below in the Round 2 question pool) and are indicated as incorrect otherwise.
- **Feedback-Eligible Knowledge Index:** Number of correct answers to the 20 knowledge questions in Round 3 that were eligible for the K2 feedback treatment (i.e., also asked in Round 2): 6 on general knowledge, 8 on preventive actions, and 6 on government actions. Responses are indicated as correct if they match the research team's pre-specified "correct" answer (listed below in the Round 2 question pool) and are indicated as incorrect otherwise.

Survey Design Details:

Round 1:

We have drafted a pool of 71 knowledge question in the full survey instrument: 21 on general knowledge (i.e., risk factors, transmission, symptoms), 30 on preventive action, and 20 on government actions. Due to time limitations, we will ask each respondent 20 knowledge questions randomly selected from within each question type: 6 on general knowledge (2 on risk factors, 2 on transmission and 2 on main symptoms), 8 on preventative actions (4 on social distancing actions and 4 on household prevention actions), and 6 on government actions. The Round 1 Knowledge Index is the number of correct answers to these 20 knowledge questions. For preventive action questions, we also elicit the subject's confidence in their answers on 0-4 Likert scale.

Round 2:

The Round 2 question pool has 40 knowledge questions: 12 on general knowledge, 16 on preventive action, and 12 on government actions. Questions were selected using summary statistics (i.e., mean of correct responses, standard deviation) from the Round 1 survey to identify questions with larger shares of incorrect answers and wide variance in responses. We also considered each question's medical significance and relevance to COVID-19 prevention as well as the diversity of the question pool (e.g., a mix of "yes" and "no" correct responses). Moreover, one new question was included, and six questions were slightly modified to clarify or update the wording to reflect current information. The final question pool for Round 2 is specified below (correct answers in parentheses):

General Knowledge: Ask random 2 questions from each sub-category in Round 2. Ask all in Round 3.	
Risk Factors: Who do you think is more likely to die from a coronavirus infection?	
1	An adult who does not smoke or an adult who does smoke (Second)
2	A 60-year-old man with diabetes and hypertension and 60-year-old man with blindness and hearing loss (First)
3	A grandparent or their grandchild (First)
4	A healthy 30-year-old adult or a healthy 60-year-old adult (Second)
Transmission: How is coronavirus spread?	
5	droplets from the cough of an infected person (Yes)
6	drinking unclean water (No)
7	sexually transmitted (No)
8	mosquito bites (No)
Symptoms: What are the main symptoms of coronavirus?	
9	Fever (Yes)
10	Cough and breathing difficulties (Yes)
11	Pain with urination (No)
12	New loss of taste or smell (Yes)

Preventive Actions: Ask random 4 questions from each sub-category in Round 2. Ask all in Round 3.	
Social Distancing Actions: Will this action prevent spreading coronavirus to yourself and others?	
1	Shop in crowded areas like informal markets (No)
2	Gather with several friends (No)
3	Help the elderly avoid close contact with other people, including children (Yes)
4	If show symptoms of coronavirus, immediately inform my household and avoid people (Yes)
5	Drinking alcohol in bars (No)
6	Wear a face mask if showing symptoms of coronavirus (Yes)
7	Instead of meeting in person, call on the phone or send text message (Yes)
8	Allow children to build immunity by playing with children from other households (No)
Household Prevention Actions: Will this action prevent spreading coronavirus to yourself and others?	
9	Drinking hot tea (No)
10	Open the windows to increase air circulation (Yes)
11	Wear a face mask in public when you are healthy (Yes)
12	Eat foods with lemons or garlic or pepper (No)

13	Drink only treated water (No)
14	Spray alcohol and chlorine all over your body (No)
15	Avoid close contact with anyone who has a fever and cough (Yes)
16	Avoid taking taxi-bicycle or taxi-mota to go out (Yes)

Government Actions: Ask random 6 questions in Round 2. Ask all in Round 3.	
24. To the best of your knowledge, is the government of Mozambique currently taking this action to address coronavirus?	
1	Order a 14 day home quarantine for all persons who have had direct contact with confirmed cases of COVID-19 (Yes)
2	Close all airports (No)
3	Suspend religious services and celebrations (Yes)
4	Allow a maximum of 50 participants in funeral ceremonies where COVID-19 is NOT the cause of death (Yes)
5	Banning personal travel between provinces (No)
6	Prohibit use of minibuses for public transportation (No)
7	Ask household to not visit patients infected by COVID-19 at hospitals (Yes)
8	Close government offices not related to health (No)
9	Order all citizens to wear masks when going out of their homes (No)
10	Prohibit funerals for those with coronavirus or COVID-19 (No)
11	Declare a State of Emergency (Yes)
12	Plan to resume Grade 12 classes this year before other primary and secondary grades (Yes)

In Round 2, we will ask each respondent 20 knowledge questions from the Round 2 question pool, randomly selected from within each question type: 6 on general knowledge (2 on risk factors, 2 on transmission and 2 on main symptoms), 8 on preventative actions (4 on social distancing actions and 4 on household prevention actions), and 6 on government actions. The Round 2 Knowledge Index is the number of correct answers to these 20 (generally more difficult) knowledge questions. For preventive action questions, we also elicit the subject's confidence in their answers on 0-4 Likert scale.

Exposure to treatment occurs in Round 2 after all knowledge questions are asked. First, respondents randomly selected into the **K1: Knowledge Incentive** treatment will be told of the additional financial reward they will receive for every correct answer on the Round 3 survey.

Then, respondents randomly selected into the **K2: Tailored Feedback** treatment will be given feedback on their responses to the knowledge questions given in Round 2. Feedback will remind respondents of their answer, name the correct answer, and then state the correct answer as a complete sentence. For questions on general knowledge and government actions, feedback will be provided for incorrect responses only; for example, if a respondent incorrectly identifies mosquito bites as a transmitter of COVID-19, feedback will state "For 'mosquito bites', you chose YES but the correct answer is NO. Coronavirus is NOT SPREAD by 'mosquito bites'." For questions on preventive actions, feedback will be determined through additional randomization (described in Section 7 below) in order to analyze potential mechanisms driving the effect of feedback in this context, and may be provided for both correct and incorrect responses; for example, if selected to receive feedback on "drinking hot tea" as a preventive action, feedback will state: "For 'Drinking hot tea', you chose YES / NO / DON'T KNOW / REFUSE TO ANSWER. Your answer is INCORRECT / CORRECT /

INCORRECT / INCORRECT. The correct answer is NO. This action will NOT prevent spreading coronavirus to yourself and others." Note that the **K2: Tailored Feedback** treatment will only apply to questions answered in Round 2 – that is, those 20 questions included in the Round 2 Knowledge Index.

Round 3:

Respondents will be asked all 40 knowledge questions in the Round 2 question pool: 12 on general knowledge, 16 on preventive action, and 12 on government actions. The Round 3 Knowledge Index is the number of correct answers to these 40 knowledge questions. For preventive action questions, we also elicit the subject's confidence in their answers on 0-4 Likert scale.

Of these 40 knowledge questions, survey respondents will have been asked 20 of these knowledge questions in Round 2. Additionally, for those respondents in a feedback treatment, survey respondents may have received feedback on these 20 knowledge questions in Round 2. Therefore, the Round 3 Feedback-Eligible Knowledge Index is the number of correct answers to the 20 knowledge questions also asked in Round 2. The other 20 knowledge questions asked in Round 3 will not have been asked in Round 2.

Regression:

(1) $$Y_{i,j,t=3}^{all} = \alpha_0 + \alpha_1 K1_{ij} + \alpha_2 K2_{ij} + \alpha_3 (K1 + K2)_{ij} + \eta \boldsymbol{B}_{ijt} + \gamma_i + \epsilon_{ij}$$

where $Y_{i,j,t=3}^{all}$ is the Round 3 Knowledge Index for household *i* in community *j*; *K* are indicator variables representing treatment groups; B_{ij} is a vector representing the Round 1 Knowledge Index and the Round 2 Knowledge Index; γ_i are community fixed effects; and ε_{ij} is a mean-zero error term. We will use robust standard errors.

(2) $$Y_{i,j,t=3}^{feedback} = \beta_0 + \beta_1 K1_{ij} + \beta_2 K2_{ij} + \beta_3 (K1 + K2)_{ij} + \eta \boldsymbol{B}_{ijt} + \gamma_i + e_{ij}$$

where $Y_{i,j,t=3}^{feedback}$ is the Round 3 Feedback-Eligible Knowledge Index for household *i* in community *j*; *K* are indicator variables representing treatment groups; B_{ij} is a vector representing the Round 1 Knowledge Index and the Round 2 Knowledge Index; γ_i are community fixed effects; and e_{ij} is a mean-zero error term. We will use robust standard errors.

Hypothesis:

Human capital theory posits that individuals will attain the level of human capital at which the marginal benefits of attainment are equal to the marginal costs. The knowledge incentive aims to increase knowledge attainment by effectively increasing its marginal benefit. Tailored feedback aims to increase knowledge attainment by effectively decreasing the marginal cost of learning the correct information. Thus, we hypothesize that treated households will have higher Round 3 knowledge indices: K1 respondents will have a higher overall Round 3 Knowledge Index; K2 respondents will have a higher Round 3 Feedback-Eligible Knowledge Index; K1 + K2 respondents will have a higher Round 3 Feedback-Eligible Knowledge Index as well. In the regressions above, this means we hypothesize that the coefficients α_1, β_2 and β_3 will be positive. We make no prediction regarding the relative magnitudes of the coefficients.

Multiple Hypothesis Testing:
In all cases where we adjust key values to control the false discovery rate, we will use the method of List, Shaikh and Xu (2019) using the user-written program mhtreg (Barsbai et al 2020) in Stata 15.

Three hypotheses are of primary interest: K1 respondents will have a higher overall Round 3 Knowledge Index; K2 respondents will have a higher Round 3 Feedback-Eligible Knowledge Index; K1 + K2 respondents will have a higher Round 3 Feedback-Eligible Knowledge Index as well. Therefore, when we assess the primary hypothesis, we will apply multiple hypothesis test corrections to the coefficients α_1, β_2 and β_3.

Secondary Analyses:
We may pool K1, K2 and (K1 + K2) together, to examine the effect of any knowledge treatment on the Knowledge Index.

We may analyze impacts of the knowledge treatments on the separate components of the Round 3 Knowledge Index: general knowledge, preventive actions, and government actions. Regressions will be specified as (1) and (2) above but replacing the knowledge indices with knowledge sub-indices for general knowledge, preventive actions, and government actions.

We may analyze impacts of the knowledge treatments on self-reported preventive behaviors for both social distancing and household prevention. Outcomes may include respondents' stated support for social distancing in general and the number of preventive actions taken by the household to prevent the spread of COVID-19.

We will also run a regression with indicators for knowledge treatments, the cross-randomized social distancing treatments and their interaction terms. We will also verify that our primary results hold when excluding social distancing questions, which are most susceptible to being affected by other treatments.

6. Further Analysis for Knowledge Incentive (K1) Treatment:

Question: How does the knowledge incentive improve learning or knowledge retention in order to improve learning outcomes?

Previously-Asked vs. Newly-Asked Questions:

a. *Question:* Does the knowledge incentive affect knowledge attainment only to specific pieces of information (i.e., previously-asked questions) or also to broader categories of information (i.e., newly-asked questions that are similar in content to previously-asked questions)? This question has implications for how the knowledge incentive may best be implemented to produce knowledge improvements.
b. *Outcomes*:
    i. **Previously-Asked Knowledge Index:** number of correct answers to the 20 or more knowledge questions in Round 3 that were also randomly asked of the respondent in Round 1 or Round 2: at least 6 on general knowledge, 8 on preventive actions, and 6 on government actions.
    ii. **Newly-Asked Knowledge Index**: number of correct answers to the 20 or fewer knowledge questions in Round 3 that were randomly not asked of the respondent in Round 1 or Round 2: at most 6 on general knowledge, 8 on preventive actions, and 6 on government actions.

c. *Hypothesis*: The marginal cost of learning the correct answers to previously-asked questions is likely lower than to newly-asked questions since the respondent knows exactly which piece of information is required in order to attain the incentive. Thus, we hypothesize that:
   i. Treated households will have higher Round 3 knowledge indices for both previously-asked and newly-asked questions, but…
   ii. The effect size will be larger for previously-asked questions vs newly-asked questions.

d. *Regression:* Same as regression (1) above but where the outcome knowledge index is replaced by each sub-index outcome described here, and also controlling for the number of total questions in each sub-index (as it may vary from respondent to respondent).

e. *Implications:*
   i. If the effect size on the **Previously-Asked Knowledge Index** and the **Newly-Asked Knowledge Index** are significantly positive, then this suggests the knowledge incentive can improve knowledge attainment of both specific pieces of information and categories of information. However, it is also possible that the effect size is insignificant on one or both of the indices, suggesting the knowledge incentive may not improve knowledge attainment for that knowledge type.
   ii. If the effect size on the **Previously-Asked Knowledge Index** is greater than the effect size on the **Newly-Asked Knowledge Index**, then this suggests that the knowledge incentive is more effective at improving knowledge attainment to specific pieces of information relative to broader categories of information, and vice versa. However, if the effect size on both indices are not statistically different, then a definite conclusion will not be drawn on the relative effectiveness of the knowledge incentive on these knowledge types. For example, if the effect size on both indices is greater than zero, the analysis will not likely have enough power to detect significant differences between these effect sizes, in which case comparing the point estimates on the effect sizes will be considered more suggestive evidence warranting further research.

Reception to Feedback Analysis:

a. *Question:* Does the knowledge incentive make households more receptive to receiving feedback on their currently held beliefs, as measured by their self-reported attentiveness during the K2 feedback treatment and, conditional on attentiveness, their decision to have the K2 feedback treatment repeated back to them?

b. *Outcomes*:
   i. **Attentiveness:** Response to the following question, asked after receiving the K2 feedback treatment: "We know it can be hard to listen to new information on the phone. How confident are you that you were able to pay attention to the feedback I just provided? (1=Not Confident At All, 2=A Little Confident, 3=Mostly Confident, 4=Completely Confident, .= refuse to answer)"
   ii. **Repeat Request**: Indicator if households responded "Yes" to the question "Do you want me to repeat this feedback? This will naturally add time to your survey."

c. *Hypothesis:* The marginal cost of receiving feedback and then repeating feedback should be equal across the sample, on average, but the marginal benefit of receiving and then repeating feedback is higher for treated households. Thus,
   i. Of households receiving feedback, households also receiving the incentive treatment will be more likely to report being attentive during the K2 feedback treatment.
   ii. Of households receiving feedback and controlling for reported attentiveness, households also receiving the incentive treatment will be more likely to ask for the feedback to be repeated.

d. *Regression*:

(3) $$\{attentiveness\}_{ij} = a_0 + a_1 K1_{ij} + \gamma_i + u_{ij}$$

(4) $$1\{repeat\ request\}_{ij} = b_0 + b_1 K1_{ij} + \mathbf{1}\{attentiveness\}_{ij} + \gamma_i + v_{ij}$$

where the sample are all respondents selected into the K2 feedback treatment, the dependent variable are the outcomes described above for household *i* in community *j*; *K1* is an indicator variable representing the knowledge incentive treatment; $\mathbf{1}\{attentiveness\}$ is a vector of dummies variables representing each level of attentiveness (as opposed to the continuous variable of attentiveness used in regression *(3)*) γ_i are community fixed effects; and u_{ij} and v_{ij} are mean-zero error terms. We will use robust standard errors.

Note that it is important to control for some measure of attentiveness in regression *(4)* since it is possible that households treated with the knowledge incentive may be more attentive to the initial round of feedback and therefore gain less from repeating the feedback, leading to an ambiguous prediction on the effect size of the K1 treatment on the repeat request. Thus, regression *(3)* tests the effect of the knowledge incentive on attentiveness, while controlling for attentiveness in regression *(4)* allows us to test the effect of the knowledge incentive on seeking out information closely tied to improving performance on the knowledge incentive holding fixed the respondents' attentiveness during the initial round of feedback.

e. *Implications:*
   i. If a_1 is significantly positive, then this suggests one mechanism through which the knowledge incentive works is by increasing respondent attentiveness when receiving information closely tied to improving performance on the knowledge incentive.
   ii. If b_1 is significantly positive, then this suggests one mechanism through which the knowledge incentive works is by encouraging the respondent to request or seek out information closely tied to improving performance on the knowledge incentive (at least when provided freely at only the cost of time).

Source of Information Analysis:

a. *Question*: How does the incentive affect households' sources of their information on COVID-19, including the number of sources, consumption of unofficial and official sources, and their stated most trusted source?
b. *Outcomes*:
   i. Number of total sources (1-13) from which they heard about coronavirus, both official sources and unofficial sources.

   From the question: Where did you hear about the new coronavirus from?

   1 Radio
   2 TV
   3 ATM screen messages
   4 Vodacom, TMCEL or Movitel SMS messages
   5 WhatsApp
   6 Facebook or Facebook Messenger
   7 family members
   8 friends
   9 health workers
   10 community nonprofit/NGO

11 community leaders
12 religious leaders
13 traditional healers or midwives

ii. Number of official sources (3.1-3.4) from which they heard about coronavirus: radio, TV, ATM screen messages, SMS messages from telecom companies.
iii. Number of unofficial sources (3.5-3.13) from which they heard about coronavirus: WhatsApp, Facebook, family members, friends, health workers, community nonprofit/NGO, community leaders, religious leaders, traditional healers or midwives.
iv. Most trusted source of information. From the question: Of those sources you selected, which do you trust the most to receive information related to coronavirus?

c. *Hypotheses*:
i. Treated households will increase the number of sources (3.1-3.4) from which they heard about coronavirus.
ii. Holding fixed the number of new sources, treated households will increase the number of official sources (3.1-3.4) from which they heard about coronavirus. Similarly, holding fixed the number of new sources, treated households will decrease the number of unofficial sources (3.5-3.13) from which they heard about coronavirus.
iii. Treated households will be more likely to change their most trusted source of information to an official source (3.1-3.4) from an unofficial source (3.5-3.13).

d. *Implications:*
i. If hypothesis (i) holds, this suggests that the incentive induces knowledge attainment via seeking out additional sources of information.
ii. If hypothesis (ii) holds, this suggests that the incentive induces knowledge attainment via seeking out more official sources of information relative to unofficial sources of information.
iii. If hypothesis (iii) holds, this suggests that the incentive induces knowledge attainment via by encouraging respondents to putting more trust in official sources of information—a mechanism and a useful outcome in and of itself.

7. Further Analysis for Tailored Feedback (K2) Treatment:

Question: Can tailored feedback improve learning outcomes, reduce subjects' incentives to spread incorrect information and increase their propensity to spread correct information?

Design Details:

For the eight questions on preventive actions in Round 2, we also elicit the subject's confidence in their answers on 0-4 Likert scale. We use the Likert scale to rank the subjects' confidence in their correct beliefs and in their incorrect beliefs. We then define strong(weak) correct beliefs as correct responses where confidence ranks in the upper(lower) half of the ranking. For example, if you have 6 correct responses, correct responses ranked 1, 2, and 3 will be considered strong correct beliefs and responses ranked 4, 5, and 6 will be considered weak correct beliefs. If the number of correct responses is odd, then the cutoff for strong vs. weak beliefs is N/2 +/- .5 where the +/- is randomly determined with equal probability. If there is a tie in the rank of the subjects' confidence in their correct beliefs, rank is determined arbitrarily so that rank is always unique. An identical procedure is used to define strong(weak) incorrect beliefs.

We will then provide feedback for a subset of the responses, depending on the respondent's random assignment to one of four sub-treatments:

i. (correct-weak, incorrect-weak)
ii. (correct-strong, incorrect-weak)
iii. (correct-weak, incorrect-strong)
iv. (correct-strong, incorrect-strong)

Thus, feedback may be provided for both correct and incorrect responses; for example, if selected to receive feedback on "drinking hot tea" as a preventive action, feedback will state: "For 'Drinking hot tea', you chose YES/NO/DON'T KNOW/REFUSE TO ANSWER. Your answer is CORRECT/INCORRECT. This action will NOT prevent spreading coronavirus to yourself and others." Additionally, directly after answering the eight preventive action questions in Round 2 and before the feedback, we ask subjects to nominate 2 of their answers as "clues" to other people in the community who are also study participants (among questions they answered with yes or no). Respondents are told that "clues" may be chosen to be shared anonymously with other study participants in their community on a future survey. Respondents are then reminded of their answers to the preventive action questions and asked to select two or choose from the following other options: I do not wish to share any actions, Don't know, Refuse to answer.

In Round 3 we ask again the answers to the same binary knowledge questions and confidence in their answers on the 0-4 Likert scale.

Hypotheses:

a) Feedback strengthens correct beliefs and weakens incorrect beliefs as measured by Likert-level confidence.
b) Feedback weakens the propensity to suggest incorrect clues in Round 3 and increases the propensity to suggest correct clues.
c) The most effective treatment to increase the share of positive clues is the (N-weak, M-strong) sub-treatment which strengthens weakly held correct beliefs (and hence increases propensity to suggest these clues) and weakens strongly held incorrect beliefs (and hence decreases propensity to suggest these clues).

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