Behavioral nudges in social media ads show limited ability to encourage COVID-19 vaccination across countries

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Summary: Behavioral nudges in 6 countries broadly failed to move people toward vaccine signup; any effects were heterogeneous.

Abstract: Behavioral nudges in Facebook ads encouraged Covid-19 vaccine signup across six diverse countries. The ads reached nearly 14 million people and, consequently, many thousands took the step of navigating to governments' vaccine signup sites. However, none of the treatment ads caused significantly more vaccine signup intent than placebo across all countries. Critically, reporting the descriptive norm that 87 percent of people worldwide had either been vaccinated or planned vaccination—social proof—did not meaningfully increase vaccine signup intent in any country and significantly backfired in South Africa and Taiwan. This result contradicts prominent prior findings. A charge

to "protect lives in your family" significantly outperformed placebo in Brazil and Taiwan but saw mixed effects elsewhere. A message noting that vaccination significantly reduces hospitalization risk significantly increased signup intent in Brazil, Taiwan, and Turkey, had no significant effects in South Africa or Russia, and significantly backfired in the United States. Such heterogeneity was the the hallmark of the study: some messages saw significant treatment effects in some countries but failed in others. No nudge outperformed any other condition in Russia, a location of high vaccine skepticism. In all, widely touted behavioral nudges often fail to promote vaccine signup intent and appear to be highly moderated by cultural context.

Introduction

Minimizing death from communicable disease requires low-cost methods of promoting vaccination at scale. Rarely has this need been more acute than during the Covid-19 pandemic. Widespread resistance to vaccines generates enclaves of unvaccinated people in which new disease variants can mutate, spread, and kill. And hesitancy appears to be common, with roughly one in five people surveyed in low- and middle-income countries expressing reluctance to be vaccinated (1). Given that Covid-19 vaccines have yet to penetrate majorities of populations in many lower-income countries, the need for scalable online solutions to reduce hesitancy remains urgent for Covid-19 and the next pandemic, whenever it comes.

Researchers are pursuing two broad approaches to the challenge. First, they seek to encourage those already inclined to vaccination. Interventions sending a variety of text reminders have effectively increased vaccine uptake for influenza and Covid-19 (2–4). Early in the vaccination campaign, SMS reminders appear especially helpful if they induce

a sense of ownership over the vaccine by noting that "a shot is waiting for you" (2) or urging the subject to "claim your dose" (4), but they appear to have no significant effects in later stages of the vaccine drive (5). Such studies have the added advantage of causal identification "in the wild": as field experiments they boast high external validity in terms of naturalism of settings, interventions, and outcomes.

Second, researchers aim to change the intentions of those who do not plan to be vaccinated. Plans may be malleable, a possibility reinforced by the facts that vaccine hesitancy has declined over time in almost every surveyed country and that vaccination rates continued to rise slowly many months after full vaccine availability. Some evidence has recently emerged that behavioral "nudges" in survey experiments describing broadly followed norms of conforming behavior, priming prosocial motives to protect others, and providing information on efficacy all prove effective in decreasing vaccine hesitancy measured as attitudes and self-reported intentions (6–9).

While the studies seeking to change vaccine intentions point to promising approaches, they are all survey experiments in which participants knew they were being studied. Possible Hawthorne effects, social desirability, or researcher demand may bias results (10–12). Moreover, researchers have long known that self-reported attitudes do not always correspond with observed behavior (13–15). Field experiments with greater ecological validity or naturalism are required to learn if effects uncovered through surveyed attitudes and self reports translate to observable action.

To this end, the research team designed a pre-registered experiment using A/B testing of ads on the Meta platform to encourage viewers to take the concrete step of navigating to their government's vaccine signup website. In describing its A/B testing platform, Meta reports that it randomly assigns users to view different experimental versions of ads (16). However, researchers have worried that Meta platform A/B tests are subject

to algorithmic bias due to their use of internal auctions (17). The research team sought to minimize algorithmic bias by setting the campaign to maximize reach, or the number of users' feeds in which the ads appeared regardless of anticipated user actions. Post-experiment, the team sought to diagnose algorithmic bias, and little evidence suggests a threat to causal inference (see Supplemental Information [SI] Section 7). However, in the absence of a complete description of the Meta randomization procedure, which the company withholds for proprietary reasons, questions remain about the internal validity of online A/B tests.[1] This study might thus be viewed as a natural experiment in which the researchers do not control the randomization procedure but in which assignment of experimental conditions is effectively as-if random. In seeking to learn the effects of different ad messages on social media users' online behavior, the present study has high naturalism or ecological validity at the possible expense of internal validity—a necessary tradeoff given the parameters of social media A/B testing.

The team crafted an array of advertisements with identical images but varying messages to learn if behavioral nudges drawn from social psychology and behavioral economics would promote greater vaccine uptake generally across different countries. All of the nudges were compared to a placebo ad that contained the image and the signup link but not the encouragement text. Importantly, the experiments test substantively identical messages across multiple country contexts, which present variable background conditions and therefore may produce heterogeneous effects cross-nationally (18).

Interventions reporting descriptive norms of what most people actually do have robustly increased desired actions across a wide array of behaviors (6, 7, 19–21). In the

[1]Non-random assignment across conditions seems likely to be the case for A/B tests set to maximize users' interactions with the ads, clickthroughs to listed websites, or ultimate sales. However, it seems much less likely that non-random assignment also holds for ad campaigns set to maximize reach, which seek to place ads in many user feeds regardless of anticipated actions. Examination of randomization imbalances across subgroups and their correspondence to treatment effects by subgroup suggest minimal evidence of algorithmic bias in this study. See SI Section 7.

context of the Covid-19 pandemic, Van Bavel et al. predict that "[p]roviding accurate information about what most people are doing is likely to be helpful if what most people are doing is desirable (health-promoting)" (22, 463). While promising survey experimental evidence suggests that such a "social proof" intervention could increase vaccination in multiple countries (7, 9), to our knowledge it has not been tested in an experiment with high ecological validity. Accordingly, the research team deployed an ad stating that "87 percent of people have been vaccinated or plan to get vaccinated (according to polls by Morning Consult)." The ad suggested an overwhelming norm and therefore should have provided strong social proof enjoining vaccination.

Additionally, reminding people that their actions can have positive effects on others—priming prosocial motivation—appears to increase vaccination intentions across studies in multiple countries (7, 8). The present study primed subjects' interest in helping others with two distinct messages: "Protect lives in your family" and "Protect lives in your community." The research team pre-registered the expectation that the "protect family" message would have the strongest treatment effects cross-nationally. Both prosocial messages can be directly compared to an additional treatment condition deployed to prime self-interest: "Protect your life."

Further, interventions providing information about vaccine efficacy have increased inoculation intentions reported in surveys across different countries (8). The present study attempted to signal the effectiveness of the vaccines in multiple ways. The first efficacy intervention stated, "Vaccination is 96% effective against hospitalization (including from the Delta variant, according to a study by Public Health England)." A second efficacy intervention associated the vaccines with science: "Follow medical scientists." Additional efficacy signals were sent by identifying the vaccines as produced in different countries known for strong scientific expertise: Germany and the United States. However, it is

worth emphasizing that these country treatments also associate the vaccines with other factors—some probably negative—that might be connected to these countries in the minds of subjects.

Results

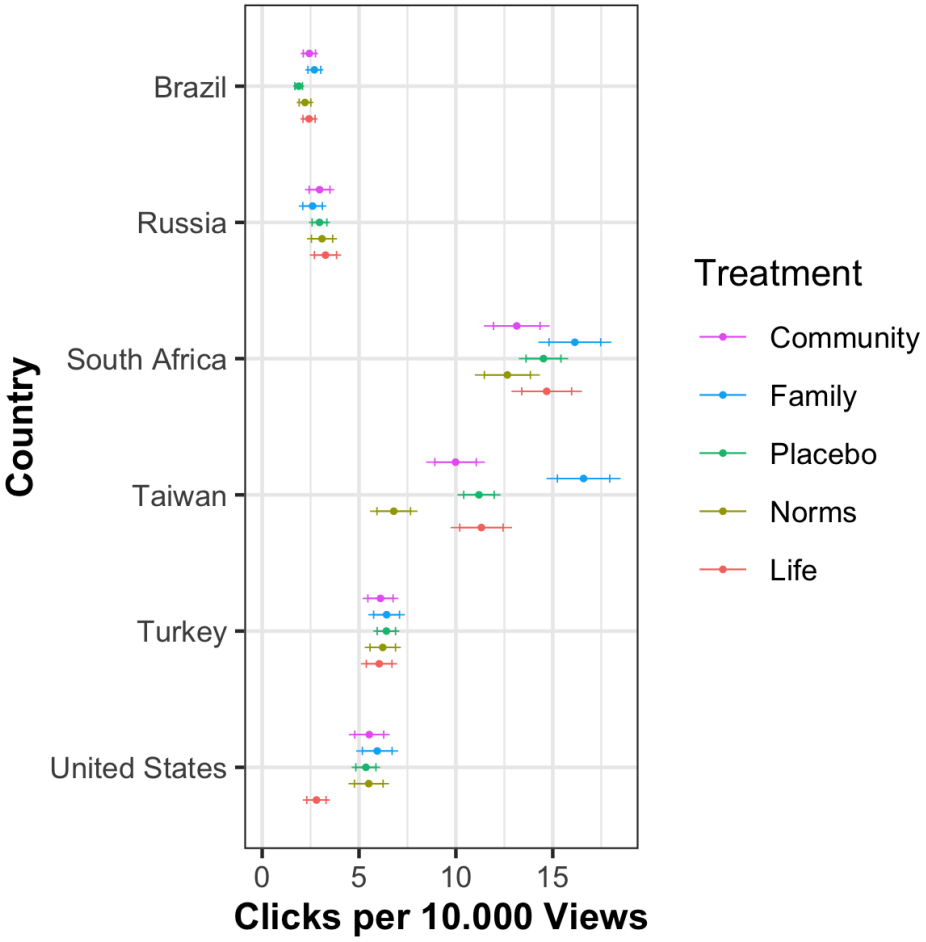
Over the months of October 2021 through January of 2022 the ads appeared in the feeds of 13,930,000 Facebook Users in six countries: Brazil, Russia, South Africa, Taiwan, Turkey, and the United States. The vaccination rates in the countries varied cross-nationally and over time during the experiments as seen in SI Table S14. The number of clicks per view varied between 18 and 192 per 100,000 user views or reach, which is Facebook's term for the ads' appearance in users' feeds. Figures 1–2 show the effect of each treatment across all country contexts.[2] [3] Confidence intervals indicated by the horizontal lines are set at .95 while the vertical hashmarks denote the .83 confidence intervals. The hashmarks correspond to differences in means between conditions at the .05 level and enable readers to more easily discern significant differences across treatments where the hashmarks do not overlap.

For the nudge priming descriptive norms by providing social proof ("Norm" in Figure 1), the ad stating that 87 percent of people are already or plan to be vaccinated caused a significant decrease in vaccination signup clicks in Taiwan compared to placebo ($p = 0.000$). The social proof treatment also appeared to decrease vaccine uptake in South Africa ($p = 0.099$), though at a lower level of statistical significance. In all other countries the social proof treatment was indistinguishable statistically from placebo.

[2]Details of the difference in means for each treatment and country are in SI Tables S1-S2.

[3]Results for randomization inference and adjustments for multiple comparisons are presented in SI Section 2 and 6. We included the Bonferroni, Holm, and Benjamini-Hochberg (BH) adjustments. The Bonferroni adjustment, which is one of the most commonly used adjustment, controls for familywise error rate (FWER) in a rigid way, the Holm adjustments are less conservative, and BH adjustments controls for false discovery rate (FDR) (23).

Figure 1: Motivation Treatments



The prosocial motivation treatments ("Family" and "Community" in Figure 2) produce varying results depending on the country context. The admonition to "protect lives in your family" significantly increased signup clicks compared to placebo in Brazil ($p = 0.003$) and Taiwan ($p = 0.000$). In South Africa, the message to protect family significantly outperformed the charge to "protect lives in your community" but was statistically indistinguishable from placebo. In the United States, the protect-family and protect-community ad results were null compared to placebo but they both significantly and somewhat surprisingly outpaced the encouragement to "protect your life" ("Self" in

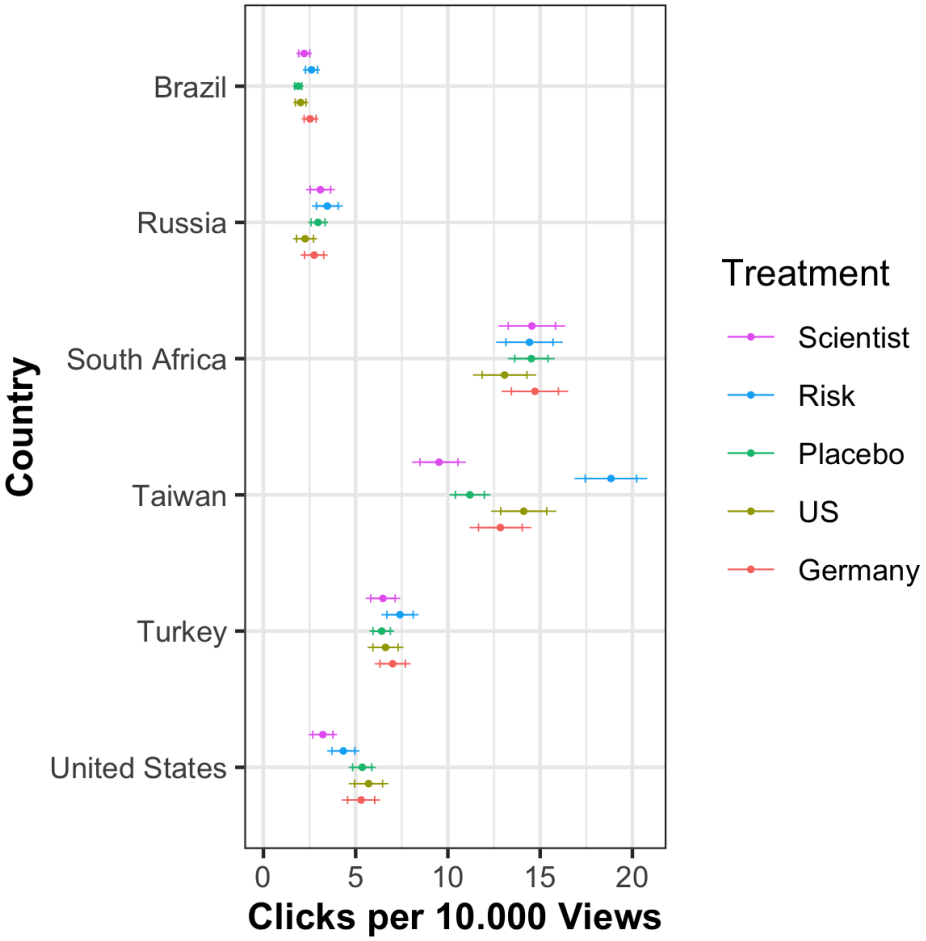
Figure 2), which in turn performed significantly worse than placebo. Yet in Brazil the self-interest encouragement caused a significant increase in vaccine site clicks compared to placebo ($p = 0.040$). None of these nudges produced statistical differences from placebo in either Turkey or Russia.

The efficacy treatment signaling reduced hospitalization risk ("Risk" in Figure 1) performed better than placebo in Brazil ($p = 0.008$), Taiwan ($p = 0.000$), and possibly Turkey ($p = 0.111$). However, the effects of this reduced-risk message were negative and significant in the United States ($p = 0.066$), though only at the least exacting significance threshold. The effects of this efficacy message were indistinguishable statistically from placebo in Russia and South Africa. This is more evidence of treatment heterogeneity across country contexts, and it provides additional data suggesting that psychological responses to behavioral stimuli are culturally contingent (24).

The efficacy treatment associating vaccines with science, "Follow Medical Scientists," did not significantly increase signup clicks in any country, but it did significantly decrease click rates in both Taiwan and the United States compared to placebo. It is important to note that roughly 60 percent the U.S. population had already been fully vaccinated at the time of the study in October of 2021 through January 2022, though less than half of the Taiwanese population was fully vaccinated in November of 2021 when the study took place there. Many Facebook users who had already been vaccinated likely disregarded the ad, leaving only the unvaccinated as the potentially active subject population. This sub-population is likely more antagonistic to messages priming science.

The remaining efficacy treatments noted two of the principal countries where the vaccines were produced and which have established reputations for scientific expertise, the United States and Germany. Figure 2 indicates that while Germany caused more clicks for sign up in Brazil than placebo, for Taiwan it was the United States. The U.S.

Figure 2: Efficacy Treatments



treatment appeared to marginally decrease signup clicks in Russia ($p = 0.106$). The country treatments produced null results in other contexts at conventional significance levels.

We also used reactions to ads as an alternative dependent variable. Reactions consist of "like, love, wow, angry, haha, sad," from which we grouped the first three as positive reactions and the rest as negative. Since there were very few reactions compared to clicks, we chose to pool the samples rather than analyze them at the country level. Family and community treatments increase positive reactions at $p<.1$ and the protect yourself

treatment increases at p<.01. The U.S.-manufacture and family treatments decreased negative reactions at p<.05. All treatments with their effects, standard errors, and p-values of the t-tests compared to placebo are presented in the SI Tables S3 and S4. We note that the experiment used the Meta platform generally, which led to different proportions of participants on Meta platforms by country. With this, particularly, the Brazil results seem to be driven by the Facebook sample (See SI Table S5. Refer to Section 8 for ad placements by country.).

Discussion

In this article, we investigated whether various encouragement messages, focusing on interventions related to social proof, pro-social nudges, and vaccine efficacy/credibility, bolstered individual vaccination signup clicks. In the study, few individuals chose to click the signup links, and most of the persuasive messages had limited effects. Yet, in certain countries, some messages did significantly motivate users compared to placebo—and in a few countries, some messages backfired and significantly de-motivated subjects.

The most surprising finding involved the evocation of social proof, or information reporting descriptive norms about how overwhelming majorities of other people behave. As noted, social proof interventions have produced strong effects in the lab and field across many prominent studies (6, 7, 19–21, 25, 26). However, on the topic of Covid vaccination, some evidence already suggested the probable ineffectiveness of the social-proof nudge (8). The findings here strongly reinforce that earlier result. In no case did social proof positively and significantly motivate navigation to vaccine signup sites. The findings here suggest that descriptive social norms do not cause conforming behavior in any of the tested country contexts and, in the case of Covid-19 vaccination, may even backfire in some locations.

Indeed, in Taiwan, reporting that 87 percent of people had been or planned to be vaccinated backfired significantly. The negative treatment effect is large in substantive terms and highly significant statistically ($p = .000001$), a level that easily survives multiple-comparisons adjustments (see SI Table S15). Indeed, in robustness analysis employing non-parametric randomization inference, the permuted assignments in 10,000 draws did not produce a single value more extreme than that found in the actual results. There is some hint in the data that the social proof treatment also backfired in South Africa ($p = .099$), though with limited statistical confidence.

The failure of social proof to move Facebook users toward signup for vaccination in any country—and to even backfire—clearly questions the generalizability of nudges relying on descriptive social norms for causing conformity in the critical domain of health behaviors. More research will be needed to demarcate the limits of nudges using social proof. But the findings here suggest ample reason for skepticism that they function to motivate vaccination generally.

We also investigated the persuasive potential of prosocial messages. We focused on the benefits vaccination could bring to an individual's family and community, respectively. We compared the performance of these messages to a message that focuses on the benefits vaccination has for individual well-being. In other words, we sought to determine whether self-interest can also motivate vaccination, and whether it is more effective at doing so than pro-social messages. We find substantial heterogeneity across the various countries.

Pro-social messages focusing on the family seem to be an effective encouragement in some countries. In Taiwan, for example, the family treatment promoted more engagement than any other condition. And, in South Africa, family fared better than community (though not placebo). Both family and community outperformed messages focused on protecting oneself (but, again not placebo) in the U.S. Finally, in Brazil, community and

family outperformed the placebo condition. Generally, messages with calls to protect oneself were ineffective at spurring engagement except in Brazil where it increased sign-up clicks. As noted above, the protect-self message actually backfired significantly among subjects in the United States. These findings suggest that pro-social messages, especially those that focus on family, may be effective at bolstering vaccine uptake in multiple locales. Moreover, focusing on individual self-interest seems to be generally ineffective.

Finally, we investigated the impact of vaccination efficacy through three different message types. First, we employed messages that directly suggested vaccination reduces hospitalization risk by 96%. This message saw significantly positive effects relative to placebo in Taiwan and Brazil, and there is a suggestion of a positive effect in Turkey as well ($p = 0.111$). However, the treatment also appeared to backfire in the United States ($p = 0.066$). This result seemed to underscore that even messages that included a scientific citation can activate skepticism in especially mistrustful sub-populations.

Second, we considered whether associating vaccines with medical scientists could bolster persuasive impact. Here, we assumed that adding expert credibility would prove effective; yet, this message did little to shift individual engagement, and it actually depressed engagement relative to placebo in Taiwan and the U.S. That a charge to conform behavior to scientific advice produced a backlash in two advanced industrialized democracies is worrisome and provides evidence of reflexive anti-science sentiment in some population segments.

Finally, we manipulated messages to include information about a vaccine's country of origin. Here, we found that Brazilian respondents were slightly more responsive to information that vaccines are produced in Germany; Taiwanese respondents were instead persuaded by American vaccines. In the other countries, these treatments had limited effects. Generally, these findings suggest that vaccine country of origin—a factor that we

pre-registered as a signal of credibility or scientific repute—does not appear to make a major difference for individuals. However, the countries we selected (Germany and USA) are relatively similar in levels of development and scientific credibility and also likely connote factors other than science to individuals. Future research could focus on whether Chinese- or Russian-made vaccines evoke different reactions.

Taken together, these results suggest that widely touted informational nudges have limited effects when it comes to motivating vaccination. Moreover, in some cases, these nudges appear to backfire.

The other striking result of this field experiment is the substantial heterogeneity across the country contexts. Often, researchers tout the external validity of field experiments, especially as it relates to their naturalism. Our design, which used Meta to achieve a high degree of realism, led to results that underscore an additional, critical element of external validity: context. The effects of pro-vaccination nudges varied notably across the six countries under study. This variation suggests that the respective cultural contexts may moderate—if not mediate—the effects of these nudges on vaccine uptake. Thus, when crafting pro-vaccine persuasive messages, the best strategy may be to incorporate norms, data, and calls-to-action that take country-specific factors into account. Ultimately, decreasing vaccine hesitancy remains an essential challenge in the post-Covid era, and our results provide a first glance at which strategies may or may not be effective across diverse countries.

Methods

Research Design and Data

The experiment uses A/B testing with multiple conditions. Based on a binary outcome, A/B testing assesses the difference between the proportions of two options A and B (27).

A/B testing compares two or more ads to determine which version performs best. The experiment employs Facebook's A/B testing platform to probe the effects of messages embedded with behavioral nudges. The subjects' intention to receive Covid-19 vaccination is measured using their clickthroughs to vaccine signup sites. Meta reports that its A/B testing platform divides the budget equally, randomly exposes users to each version of the ads, and provides statistically comparable results. For this experiment, we use the A/B testing feature by changing the primary text in the ad creative to encourage Covid-19 vaccination.[4]

The ads include the following: page name, treatment statement, image, click statement, and a website URL. In all six countries, the page name was "Information Sharing Project,"[5] which was kept consistent to ensure that the page name did not affect the outcomes. A total of eight treatments were randomly assigned to individuals: advertisements with action charges—"Protect Lives in Your Family," "Protect Lives in Your Community," "Protect Your Life," "Follow Medical Scientists"; efficacy treatment—"Vaccination is 96% effective against hospitalization (including from the Delta variant, according to a study by Public Health England)"; social proof treatment—"87% of people have been vaccinated or plan to get vaccinated (according to polls by Morning Consult)"; and vaccine country origin—"One widely used vaccine has been developed in the [US / Germany]". The experiment consisted of two combinations, each with one placebo and four treatments. One combination had the four action charges with a placebo and the other included the country origin, efficacy, and social proof treatments with a placebo. As each combination only varies one condition—the treatment messages—this enables the results to indicate which treatments are effective with all other confounding factors held constant in expectation.

[4]https://www.facebook.com/business/help/1738164643098669?id=445653312788501

[5]The page name in the US was "[proper noun redacted for review] Information Sharing Project" and for the other countries we named them either as "Information Sharing Project" or a name equivalent of that in the countries' language.

In the ads,[6] we show a statement "Click here to sign up for the vaccine" with a button stating "Learn More" and an image that is constant within each country. The research team selected images that depicted a happy, vibrant, and "normal" life, which had been difficult during Covid-19. We measure the number of interactions with a given ad, in particular clicks on the link leading to an actual government-sponsored vaccination signup page. For the website URL, we included the government web address where users could sign up to receive vaccinations in each country.[7]

We conducted the experiment across six countries: Brazil (São Paulo),[8] Russia, South Africa, Taiwan, Turkey, and the U.S. The diverse set of countries should help to alleviate external validity concerns and enable assessment of cross-country heterogeneity in treatment effects. Using the "custom audience" feature in Meta ads, each experiment targeted the country in question. For instance, a message in Turkish would be set to target the population of Facebook users in Turkey. Recruiting samples from these six countries ensures meaningful geographical, cultural, and socio-economic variation. In addition, the countries were selected for three main reasons. First, citizens in the selected countries can freely use Facebook/Instagram. Second, in a study in which biases and prejudices play a role, nuances matter, and these are countries where the research team had a strong command of the native languages. Thus, all of the ads used in the study were vetted by native speakers. Third, at least one of the vaccines in our study was widely available for each country.

When implementing A/B testing using Meta ads, we built upon Orazi and Johnston (28). Predating the Facebook A/B testing feature, Matz et al. (29) conducted experiments

[6]Examples of the Facebook ads are shown in SI Section 5 Figures S49 - S54.

[7]URL links can be found in SI Section 9.

[8]In the case of Brazil, we targeted São Paulo, the largest city in Brazil, because the vaccination signup websites were different for each Brazilian region. This geographic specificity helped to avoid confusion among users.

on Facebook comparing different types of advertisements, which were criticized for the lack of random assignment (30). Previously, Facebook experiments had drawn fire because the platform did not have tools to ensure random assignment prior to November 2017 and thus had the potential to introduce endogenous variation (28, 30–32). The post-2017 procedure addresses that inference challenge (28), though concerns about algorithmic bias persist (17). It seems likely that A/B tests set to maximize interactions, link clicks, or sales will engage the internal auction in ways that may induce algorithmic bias because the algorithm is predicting user actions in these cases.

However, A/B tests set to maximize "reach" as the objective—in which the ads appear in the maximum number of user feeds without regard to anticipated user behavior, as in this study—have not been directly considered by critics (17). Maximizing reach should minimize algorithmic bias because the assignment procedure ought to be orthogonal to predicted user actions (28). In post-experiment diagnostic tests, we find little evidence that the Meta algorithm maximizing reach induced threats to causal inference. The diagnostics suggest that Facebook/Instagram is not deploying either simple or complete randomization; indeed, treatment and control assignments are unbalanced in number and a larger-than-expected proportion of randomization imbalances are seen in demographic and geographic subgroups. However, the subgroup imbalances are statistically unrelated to the subgroup treatment effects, suggesting that the imbalances are not driving effects. This significantly increases confidence in the as-if randomness of the A/B tests. See SI Section 7 and related discussion.

During the initial rounds of experiments, in the interest of statistical power to detect small differences in treatment effects, we targeted 100 link selections for each condition for each country.[9] However, because we encountered greater heterogeneity across countries in

[9]We achieved or exceeded the targets in all countries except Russia, where the excessive monetary

click rates per ad spend than anticipated, we adjusted the amounts spent for each ad buy for each country and added advertising rounds for each country as needed to approximate the target number of link clicks. We conducted the experiment in two or three rounds for each country: two rounds in Turkey, Russia, and Taiwan, and three rounds in the US, Brazil, and South Africa.[10] As seen in SI Tables S8 - S13, there was general—though far from complete—consistency for experimental conditions across rounds in each country, most of which might reasonably be accounted for by random variation. Because Meta, for proprietary reasons, does not reveal the technical details applied in its A/B testing platform, it is difficult to discern the source of the remaining anomalies within conditions across rounds.[11] We have elected to report the results as received and anticipate that future studies might answer key remaining questions.

Outcomes and Statistical Analysis Method

Meta does not provide any individual-level data, thus we use the behavioral outcomes, clicks on the provided signup link, to measure the effectiveness of treatments. Building on Orazi and Johnston (28), we conduct a two-sided t-test comparison to compare the users who clicked the ad and those that did not across the conditions. Our primary outcome measure of interest is clicks—the number of people who select the "Learn More" link in the advertisement divided by the number of people who see the advertisement (reach). We compare differences in clicks by using two-sided t-tests with unequal variance and Cohen's D's. We checked robustness of these tests using the non-parametric technique of randomization inference (33), equivalent to Fisher's permutation, and results can be seen

cost of link clicks coupled with scant evidence of treatment effects caused us to conclude the Russia experiment at two rounds.

[10]Details of the link clicks and reach by treatment and country is in SI Section 3 and data for each round is provided in SI Tables S8 - S13.

[11]The most glaring is the "Follow Medical Scientists" result in the U.S., which showed an order of magnitude difference in Round 2 from placebo but was comparable to placebo in Rounds 1 and 3.

in SI Figures S1 - S48. Randomization inference produced substantively similar findings to those presented from t-tests.

$$t = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{s^2(\frac{1}{n_1} + \frac{1}{n_2})}} \tag{1}$$

The formula for calculating the t-statistic divides the standard deviation by the square root of the number of observations, the number of units in the sample: $s \div \sqrt{n}$. We take the value obtained from subtracting μ from $\overline{x}$ and divide it by the value obtained from dividing s by the square root of n: $\frac{(\overline{x}-\mu)}{(s \div \sqrt{n})}$.

In this formula, t is the t-value, $\overline{x}_1$ and $\overline{x}_2$ are the means of the two groups being compared, s^2 is the pooled standard error of the two groups, and n^1 and n^2 are the number of observations in each of the groups. Meta gives us raw aggregate data for the number of people our ads reached and the number of people who click on the ads. To calculate the t-test parameters, we convert each placebo and treatment group into vectors to obtain their variances and apply the formula above.

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Supplemental Information

1 Difference in Means

Table S1: Difference in Means: Action Treatments Compared to Placebo

Country	Treatment Group	Test	Difference per 10k	p-value	Cohen's D
Brazil	Action	US	0.1	0.5978	0.0010
Brazil	Action	Germany	1	0.0175	0.0045
Brazil	Action	Risk	1	0.0089	0.0049
Brazil	Action	Scientist	0	0.2073	-0.0023
Russia	Action	US	-1	0.1032	-0.0043
Russia	Action	Germany	0	0.6543	-0.0012
Russia	Action	Risk	1	0.3214	0.0028
Russia	Action	Scientist	0	0.7884	-0.0007
South Africa	Action	US	-1	0.1828	-0.0039
South Africa	Action	Germany	0	0.8634	0.0005
South Africa	Action	Risk	0	0.9276	-0.0003
South Africa	Action	Scientist	0	0.9800	-0.0001
Taiwan	Action	US	3	0.0061	0.0084
Taiwan	Action	Germany	2	0.1071	0.0048
Taiwan	Action	Risk	8	0.0000	0.0206
Taiwan	Action	Scientist	-2	0.0733	0.0051
Turkey	Action	US	0	0.7313	0.0008
Turkey	Action	Germany	1	0.3249	0.0023
Turkey	Action	Risk	1	0.1080	0.0038
Turkey	Action	Scientist	0	0.9102	-0.0003
United States	Action	US	0	0.6043	0.0015
United States	Action	Germany	0	0.9310	-0.0002
United States	Action	Risk	-1	0.0808	-0.0046
United States	Action	Scientist	-2	0.0001	0.0099

Table S2: Difference in Means: Motivation Treatments Compared to Placebo

Country	Treatment Group	Test	Difference per 10k	p-value	Cohen's D
Brazil	Motivation	Norms	0	0.2102	0.0023
Brazil	Motivation	Family	1	0.0036	0.0055
Brazil	Motivation	Life	1	0.0458	0.0037
Brazil	Motivation	Community	1	0.0398	0.0038
Russia	Motivation	Norms	0	0.7862	0.0008
Russia	Motivation	Family	0	0.4351	-0.0021
Russia	Motivation	Life	0	0.5309	0.0018
Russia	Motivation	Community	0	0.9905	-0.0000
South Africa	Motivation	Norms	-2	0.0828	-0.0050
South Africa	Motivation	Family	2	0.1632	0.0042
South Africa	Motivation	Life	0	0.8844	0.0004
South Africa	Motivation	Community	-1	0.2031	-0.0037
Taiwan	Motivation	Norms	-4	0.0000	-0.0141
Taiwan	Motivation	Family	5	0.0000	0.0150
Taiwan	Motivation	Life	0	0.8976	0.0004
Taiwan	Motivation	Community	-1	0.2068	-0.0037
Turkey	Motivation	Norms	0	0.7489	-0.0007
Turkey	Motivation	Family	0	0.9842	-0.0000
Turkey	Motivation	Life	0	0.5249	-0.0015
Turkey	Motivation	Community	0	0.5998	-0.0012
United States	Motivation	Norms	0	0.8202	0.0006
United States	Motivation	Family	1	0.3804	0.0025
United States	Motivation	Life	-3	0.0000	-0.0121
United States	Motivation	Community	0	0.7905	0.0007

Table S3: Difference in Means: Positive Reactions

Treatment	Effect/10k	SE/10k	p-value	Reactions (N)
Germany	0.03	0.05	0.6124	68
Risk	0.00	0.05	0.9919	80
US	0.08	0.06	0.5592	72
Scientist	(0.02)	0.05	0.7982	63
Community	0.13	0.06	0.07563	80
Family	0.12	0.06	0.0838	80
Norm	0.11	0.06	0.1321	64
Self	0.22	0.06	0.003197	95

Table S4: Difference in Means: Negative Reactions

Treatment	Effect/10k	SE/10k	p-value	Reactions (N)
Germany	0.02	0.02	0.3175	5
Risk	0.00	0.01	0.8231	3
US	(0.02)	-	0.02535	0
Scientist	0.00	0.01	0.832	3
Community	(0.01)	0.01	0.3147	1
Family	(0.02)	-	0.02535	0
Norm	0.02	0.02	0.1904	6
Self	(0.01)	0.01	0.3099	1

Table S5: Difference in Means: Instagram Only

Country	Treatment Group	Test	Difference per 10k	p-value	Cohens's D
Brazil	Action	Placebo-US	0	0.8862	-0.0003
Brazil	Action	Placebo-Germany	0	0.1748	0.0026
Brazil	Action	Placebo-Risk	0	0.3726	0.0017
Brazil	Action	Placebo-Scientist	0	0.6228	0.0009
Brazil	Motivation	Placebo-Norms	0	0.2360	0.0023
Brazil	Motivation	Placebo-Family	0	0.0980	0.0032
Brazil	Motivation	Placebo-Life	0	0.2951	0.0020
Brazil	Motivation	Placebo-Community	0	0.2135	0.0024
Russia	Action	Placebo-US	0	0.4423	0.0022
Russia	Action	Placebo-Germany	0	0.3126	0.0030
Russia	Action	Placebo-Risk	0	0.2832	0.0033
Russia	Action	Placebo-Scientist	0	0.7239	0.0010
Russia	Motivation	Placebo-Norms	0	0.5433	0.0018
Russia	Motivation	Placebo-Family	0	0.7444	0.0009
Russia	Motivation	Placebo-Life	1	0.0976	0.0051
Russia	Motivation	Placebo-Community	1	0.1170	0.0047
South Africa	Action	Placebo-US	3	0.0591	0.0203
South Africa	Action	Placebo-Germany	1	0.2679	0.0099
South Africa	Action	Placebo-Risk	4	0.0318	0.0291
South Africa	Action	Placebo-Scientist	2	0.2433	0.0123
South Africa	Motivation	Placebo-Norms	1	0.2706	0.0111
South Africa	Motivation	Placebo-Family	0	0.8615	0.0015
South Africa	Motivation	Placebo-Life	0	0.6204	-0.0038
South Africa	Motivation	Placebo-Community	0	0.9186	-0.0008
Taiwan	Action	Placebo-US	0	0.9174	-0.0005
Taiwan	Action	Placebo-Germany	2	0.0312	0.0115
Taiwan	Action	Placebo-Risk	2	0.0381	0.0156
Taiwan	Action	Placebo-Scientist	1	0.4973	0.0037
Taiwan	Motivation	Placebo-Norms	-1	0.3697	-0.0042
Taiwan	Motivation	Placebo-Family	0	0.8737	0.0010
Taiwan	Motivation	Placebo-Life	2	0.0462	0.0125
Taiwan	Motivation	Placebo-Community	1	0.1522	0.0087
Turkey	Action	Placebo-US	0	0.5401	0.0029
Turkey	Action	Placebo-Germany	0	0.9608	-0.0002
Turkey	Action	Placebo-Risk	-1	0.0000	-0.0140
Turkey	Action	Placebo-Scientist	0	0.8879	-0.0006
Turkey	Motivation	Placebo-Norms	0	0.4573	-0.0032
Turkey	Motivation	Placebo-Family	0	0.8423	-0.0009
Turkey	Motivation	Placebo-Life	-1	0.2647	-0.0047
Turkey	Motivation	Placebo-Community	1	0.0556	0.0090
United States	Action	Placebo-US	-2	0.0455	-0.0155
United States	Action	Placebo-Germany	0	0.9813	0.0003
United States	Action	Placebo-Risk	-1	0.3153	-0.0090
United States	Action	Placebo-Scientist	-1	0.2516	-0.0106
United States	Motivation	Placebo-Norms	1	0.6131	0.0060
United States	Motivation	Placebo-Family	-2	0.0455	-0.0154
United States	Motivation	Placebo-Life	-1	0.3487	-0.0082
United States	Motivation	Placebo-Community	1	0.6549	0.0052

2 Randomization Inference

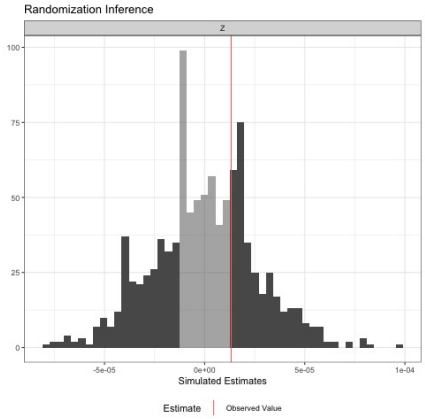

Figure S1: US Treatment (Brazil)

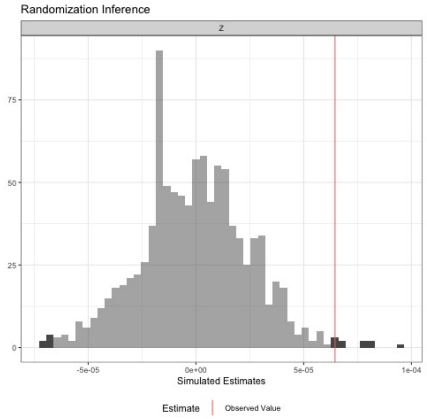

Figure S2: Germany Treatment (Brazil)

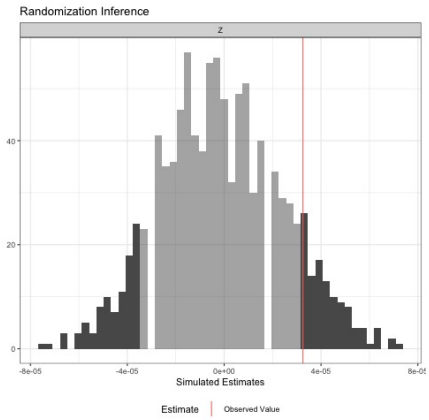

Figure S3: Norms Treatment (Brazil)

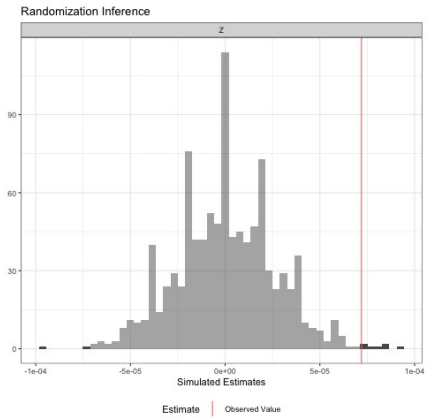

Figure S4: Risk Treatment (Brazil)

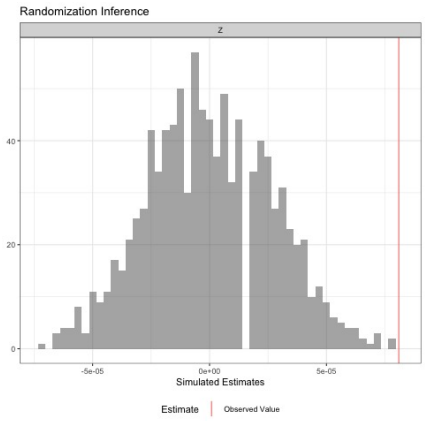

Figure S5: Family Treatment (Brazil)

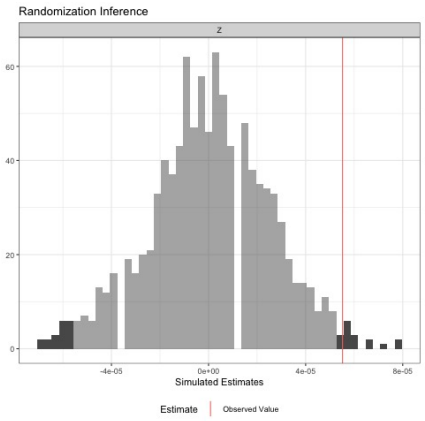

Figure S6: Community Treatment (Brazil)

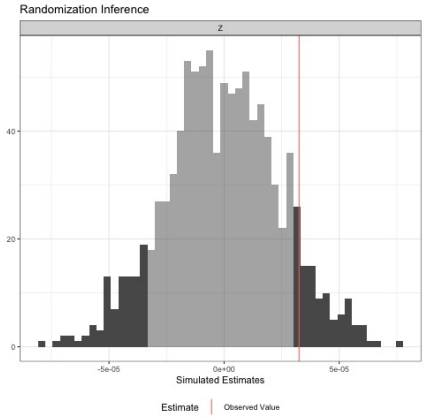

Figure S7: Scientist Treatment (Brazil)

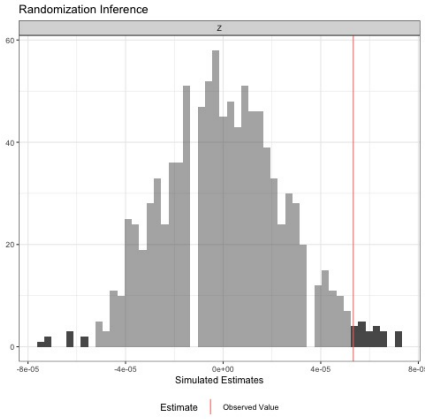

Figure S8: Self Treatment (Brazil)

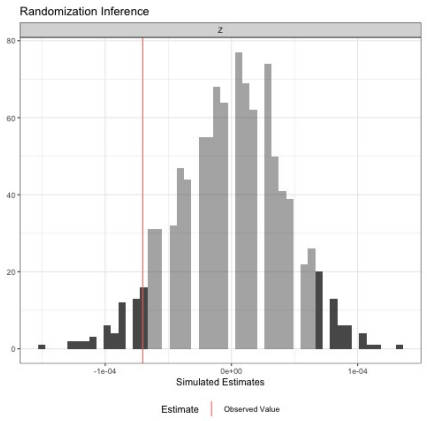

Figure S9: US Treatment (Russia)

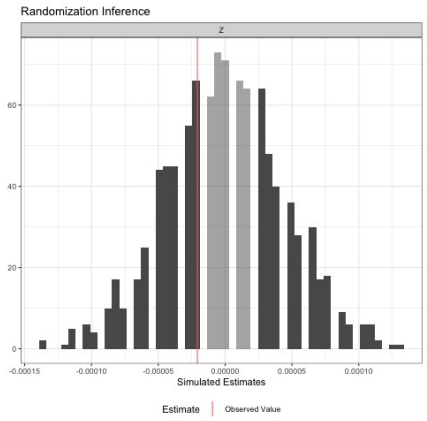

Figure S10: Germany Treatment (Russia)

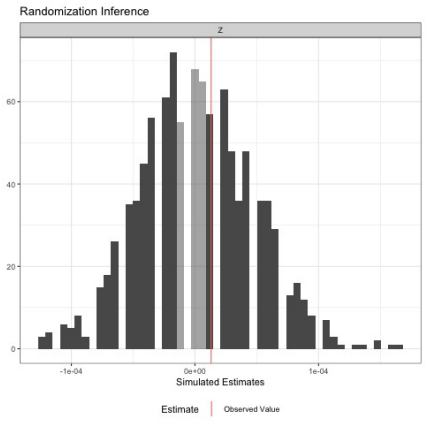

Figure S11: Norms Treatment (Russia)

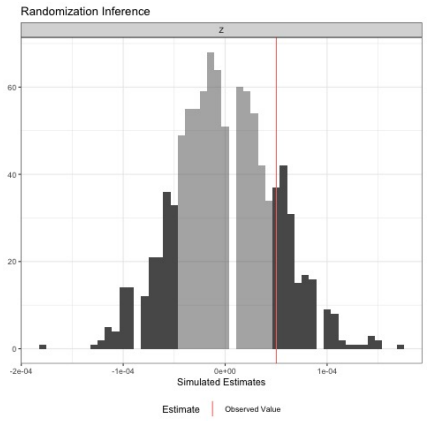

Figure S12: Risk Treatment (Russia)

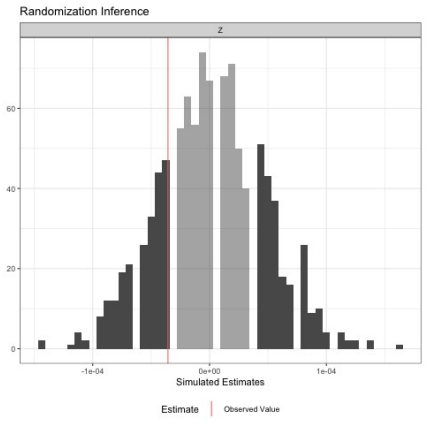

Figure S13: Family Treatment (Russia)

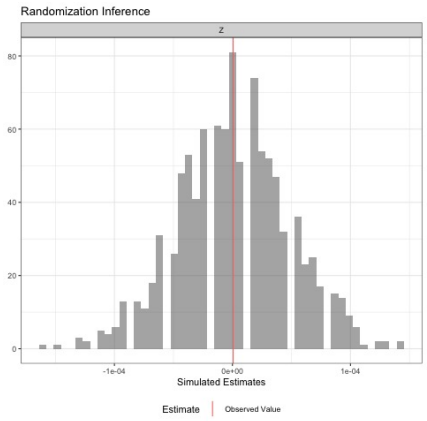

Figure S14: Community Treatment (Russia)

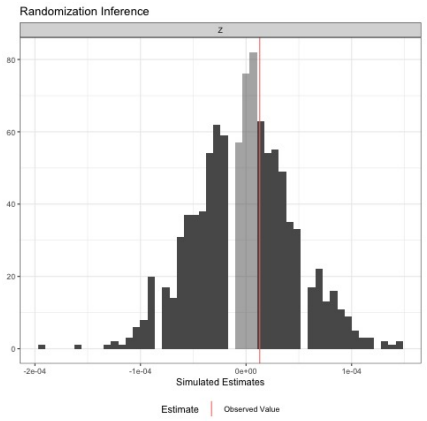

Figure S15: Scientist Treatment (Russia)

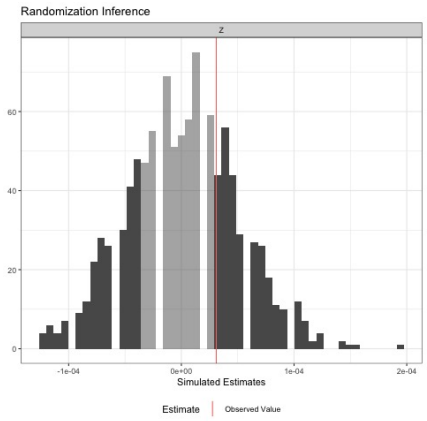

Figure S16: Self Treatment (Russia)

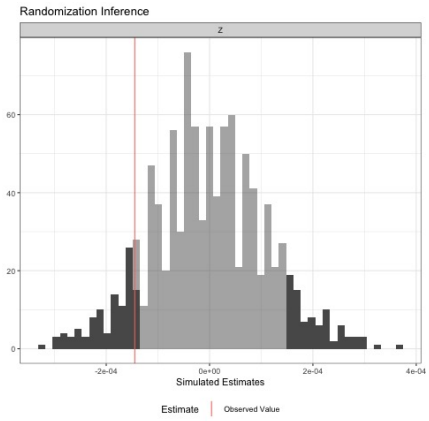

Figure S17: US Treatment (South Africa)

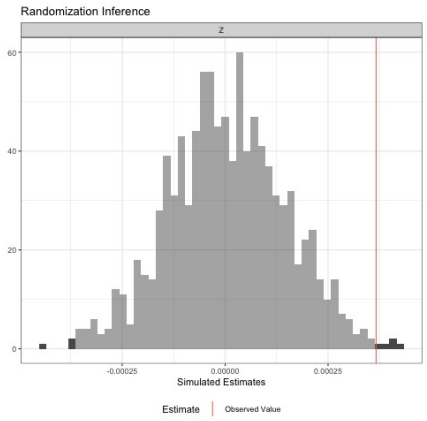

Figure S18: Germany Treatment (South Africa)

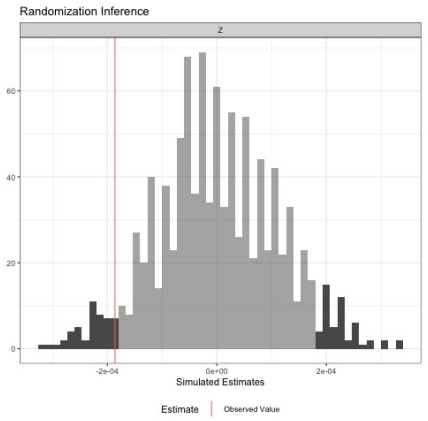

Figure S19: Norms Treatment (South Africa)

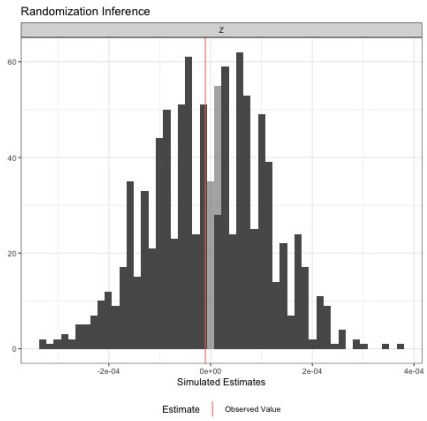

Figure S20: Risk Treatment (South Africa)

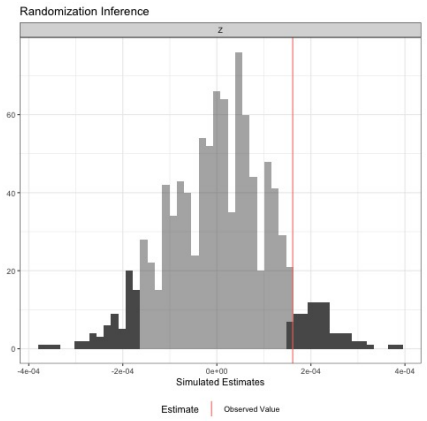

Figure S21: Family Treatment (South Africa)

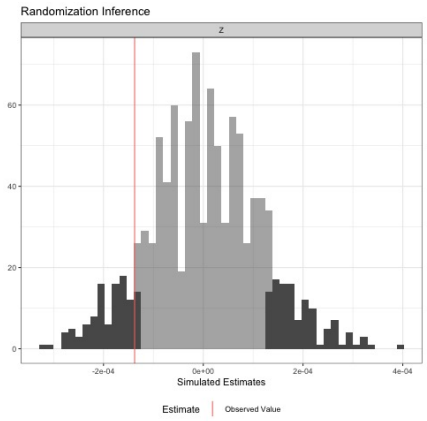

Figure S22: Community Treatment (South Africa)

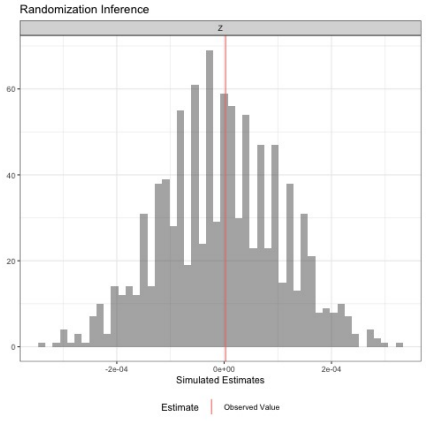

Figure S23: Scientist Treatment (South Africa)

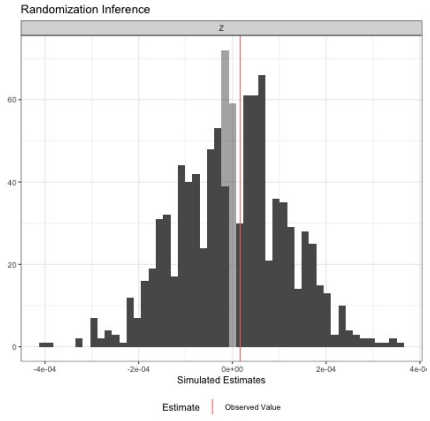

Figure S24: Self Treatment (South Africa)

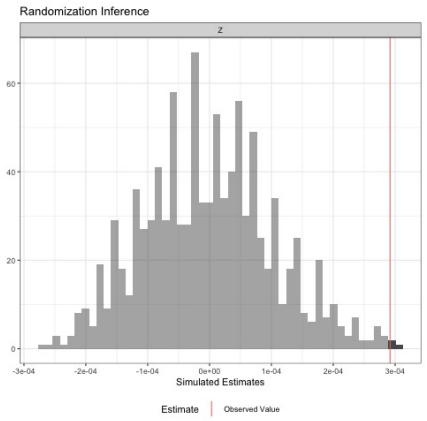

Figure S25: US Treatment (Taiwan)

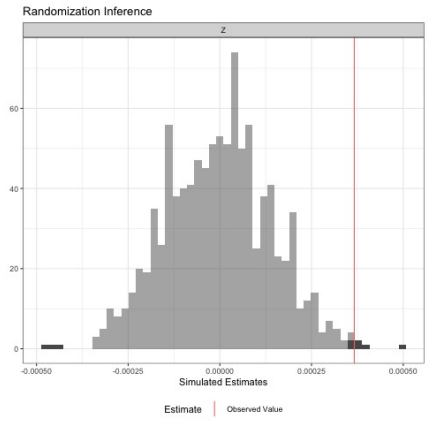

Figure S26: Germany Treatment (Taiwan)

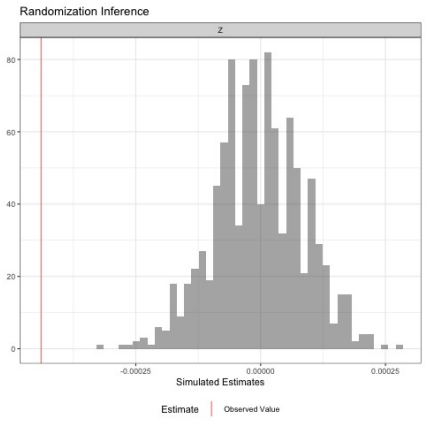

Figure S27: Norms Treatment (Taiwan)

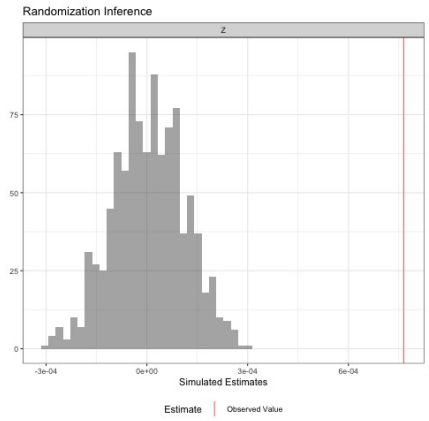

Figure S28: Risk Treatment (Taiwan)

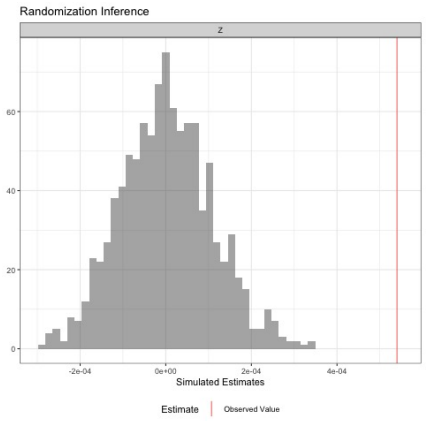

Figure S29: Family Treatment (Taiwan)

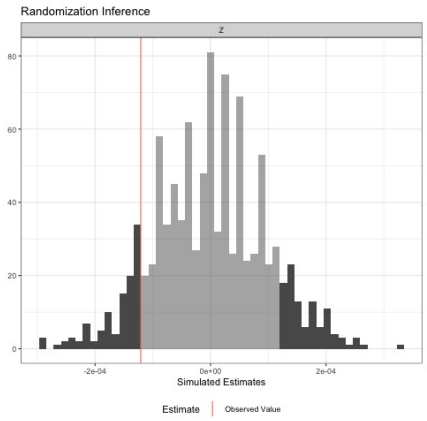

Figure S30: Community Treatment (Taiwan)

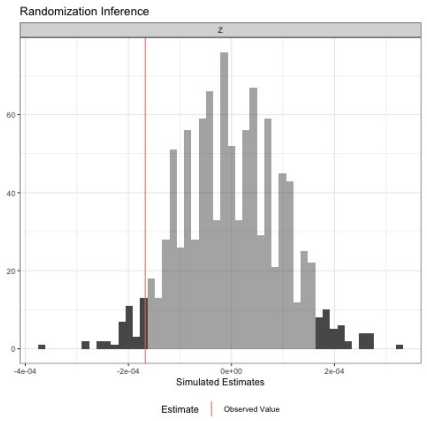

Figure S31: Scientist Treatment (Taiwan)

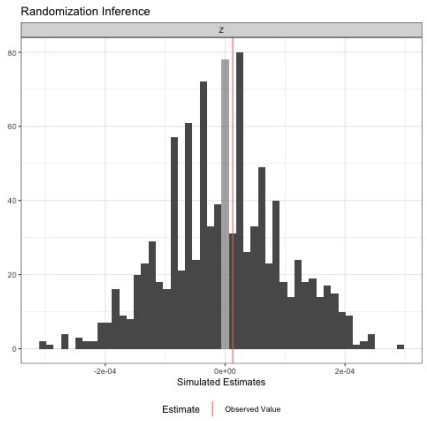

Figure S32: Self Treatment (Taiwan)

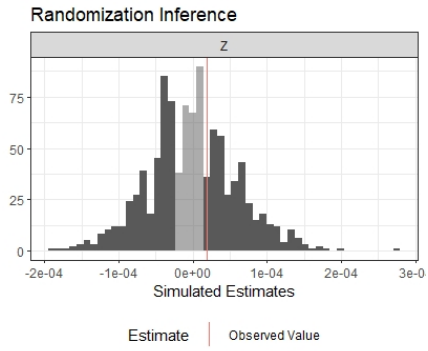

Figure S33: US Treatment (Turkey)

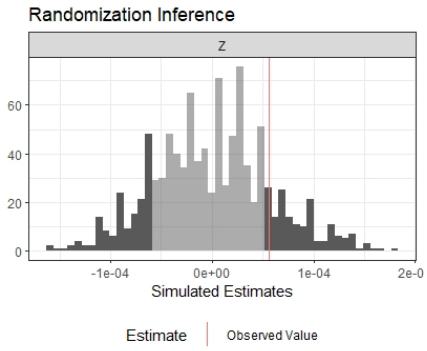

Figure S34: Germany Treatment (Turkey)

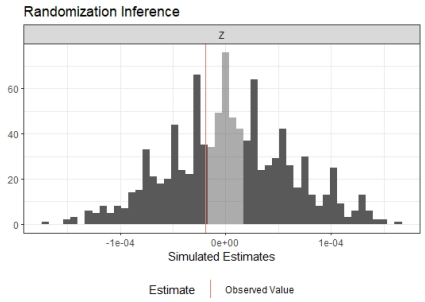

Figure S35: Norms Treatment (Turkey)

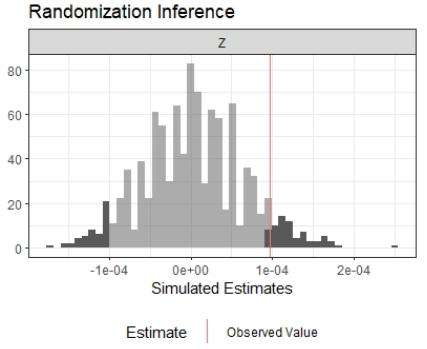

Figure S36: Risk Treatment (Turkey)

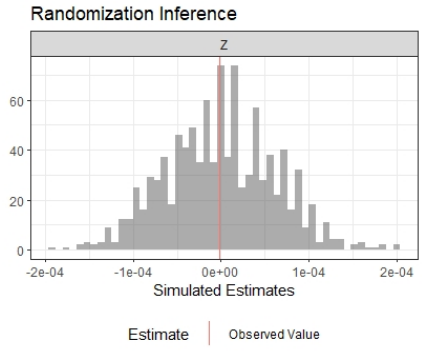

Figure S37: Family Treatment (Turkey)

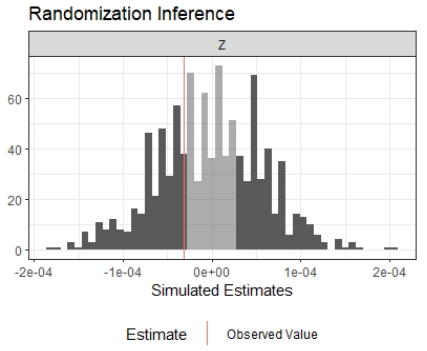

Figure S38: Community Treatment (Turkey)

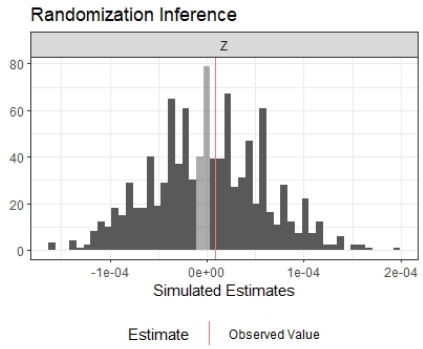

Figure S39: Scientist Treatment (Turkey)

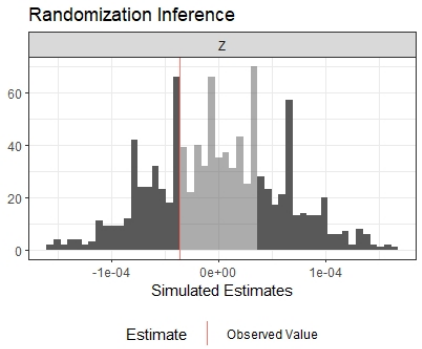

Figure S40: Self Treatment (Turkey)

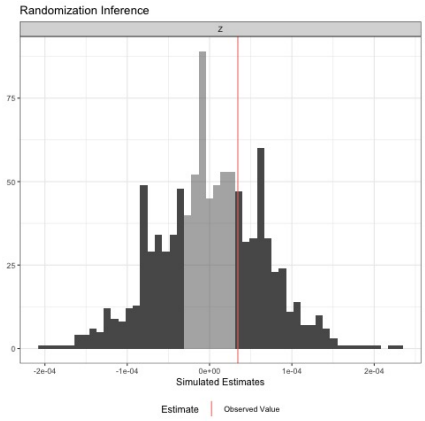

Figure S41: US Treatment (US)

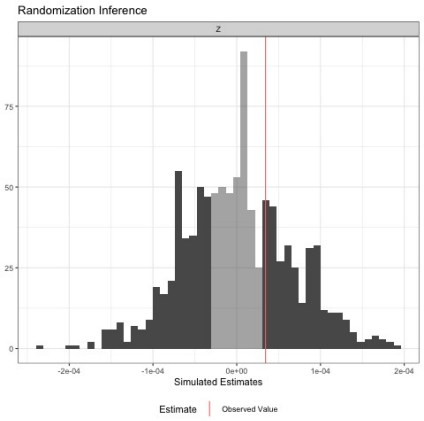

Figure S42: Germany Treatment (US)

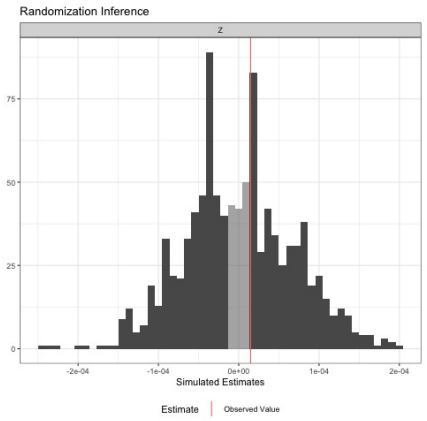

Figure S43: Norms Treatment (US)

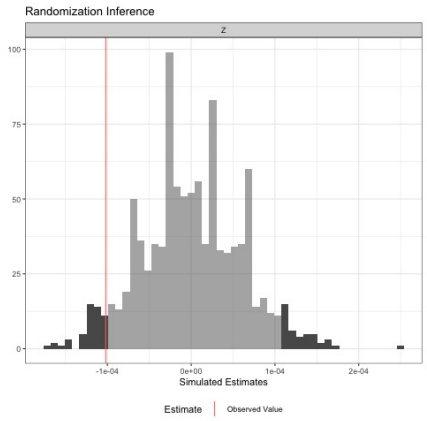

Figure S44: Risk Treatment (US)

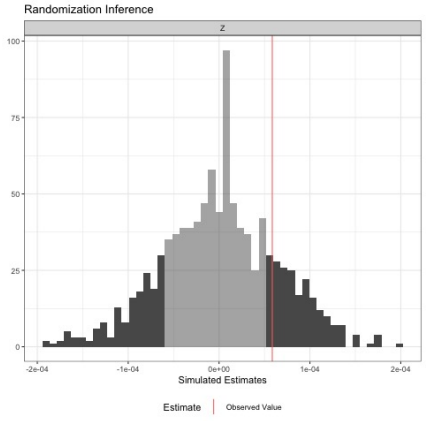

Figure S45: Family Treatment (US)

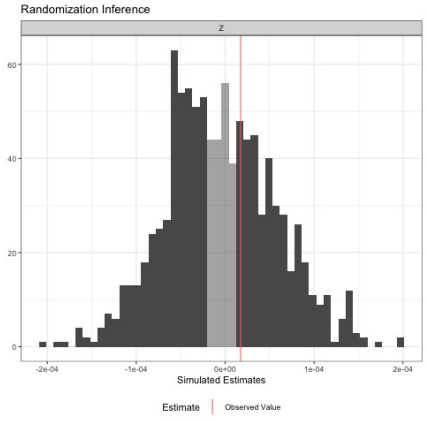

Figure S46: Community Treatment (US)

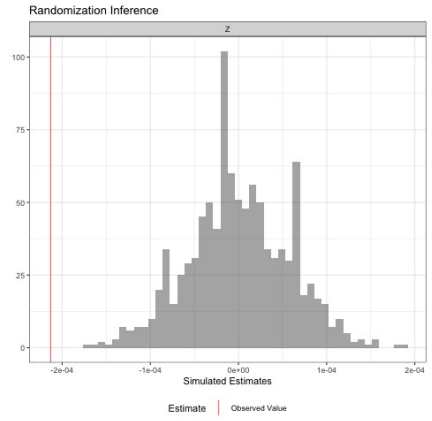

Figure S47: Scientist Treatment (US)

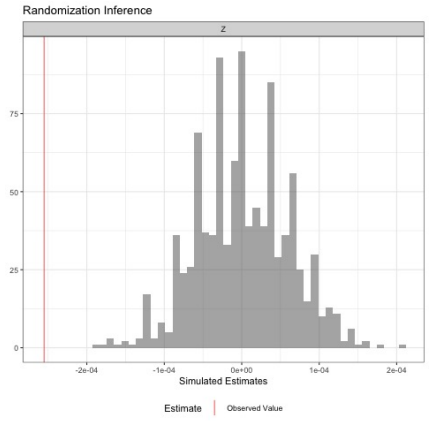

Figure S48: Self Treatment (US)

3 Experiment Details

Table S6: Link Clicks and Reach by Treatment/Country: Brazil (São Paulo), Russia, and South Africa

	Brazil (São Paulo)		Russia		South Africa	
	Link Clicks	Reach	Link Clicks	Reach	Link Clicks	Reach
Placebo1	94	471618	54	197801	266	172859
Placebo2	81	478510	62	199357	239	175744
Family	127	477214	51	199887	283	175758
Self	114	476465	63	194247	252	172668
Community	114	473283	59	201325	229	176721
Scientists	105	479976	60	198434	252	171595
US	94	468360	46	206069	227	171769
Germany	119	476879	54	198896	260	175262
Norms	102	469922	62	199634	221	173685
Efficacy	122	475176	66	193204	245	171153
Total	1074	4748823	577	1989209	2474	1737216

Table S7: Link Clicks and Reach by Treatment/Country: Taiwan, Turkey, and the United States

	Taiwan		Turkey		United States	
	Link Clicks	Reach	Link Clicks	Reach	Link Clicks	Reach
Placebo1	201	176521	165	275942	113	192186
Placebo2	179	156991	189	279538	92	193018
Family	291	175922	178	279970	115	194906
Self	197	176756	160	266544	61	219237
Community	169	169327	169	279013	105	192588
Scientists	166	174524	184	285034	68	210846
US	218	156704	179	272493	111	191637
Germany	210	157922	198	285355	101	191244
Norms	109	156545	172	278060	106	194974
Efficacy	322	167461	207	281710	93	218163
Total	2062	1668673	1801	2879043	965	1999008

Table S8: Brazil (São Paulo): A/B Test Results by Round and Treatment

Round	Start	End	Treatment	Reach	Link Clicks	Click per 10,000 Reach
1	Dec. 4, 2021	Dec. 7, 2021	Placebo	208858	29	1.389
1	Dec. 4, 2021	Dec. 7, 2021	Family	106522	23	2.159
1	Dec. 4, 2021	Dec. 7, 2021	Self	105944	29	2.737
1	Dec. 4, 2021	Dec. 7, 2021	Community	107455	15	1.396
1	Dec. 4, 2021	Dec. 7, 2021	Scientists	107204	22	2.052
1	Dec. 4, 2021	Dec. 7, 2021	US	105192	18	1.711
1	Dec. 4, 2021	Dec. 7, 2021	Germany	104649	29	2.771
1	Dec. 4, 2021	Dec. 7, 2021	Norm	105067	23	2.189
1	Dec. 4, 2021	Dec. 7, 2021	Efficacy	105220	31	2.946
Round 1				1056111	219	2.074
2	Dec. 10, 2021	Dec. 14, 2021	Placebo	381265	77	2.020
2	Dec. 10, 2021	Dec. 14, 2021	Family	193635	55	2.840
2	Dec. 10, 2021	Dec. 14, 2021	Self	190695	47	2.465
2	Dec. 10, 2021	Dec. 14, 2021	Community	188560	56	2.970
2	Dec. 10, 2021	Dec. 14, 2021	Scientists	192388	53	2.755
2	Dec. 10, 2021	Dec. 14, 2021	US	188235	40	2.125
2	Dec. 10, 2021	Dec. 14, 2021	Germany	191581	54	2.819
2	Dec. 10, 2021	Dec. 14, 2021	Norm	189561	39	2.057
2	Dec. 10, 2021	Dec. 14, 2021	Efficacy	190166	44	2.314
Round 2				1906086	465	2.440
3	Dec. 18, 2021	Dec. 21, 2021	Placebo	360005	69	1.917
3	Dec. 18, 2021	Dec. 21, 2021	Family	177057	49	2.767
3	Dec. 18, 2021	Dec. 21, 2021	Self	179826	38	2.113
3	Dec. 18, 2021	Dec. 21, 2021	Community	177268	43	2.426
3	Dec. 18, 2021	Dec. 21, 2021	Scientists	180384	30	1.663
3	Dec. 18, 2021	Dec. 21, 2021	US	174933	36	2.058
3	Dec. 18, 2021	Dec. 21, 2021	Germany	180649	36	1.993
3	Dec. 18, 2021	Dec. 21, 2021	Norm	175294	40	2.282
3	Dec. 18, 2021	Dec. 21, 2021	Efficacy	179790	47	2.614
Round 3				1785206	388	2.173
Total				4747403	1072	2.260

Table S9: Russia: A/B Test Results by Round and Treatment

Round	Start	End	Treatment	Reach	Link Clicks	Click per 10,000 Reach
1	Dec. 3, 2021	Dec. 6, 2021	Placebo	85637	28	3.270
1	Dec. 3, 2021	Dec. 6, 2021	Family	42919	5	1.165
1	Dec. 3, 2021	Dec. 6, 2021	Self	42342	13	3.070
1	Dec. 3, 2021	Dec. 6, 2021	Community	41141	11	2.674
1	Dec. 3, 2021	Dec. 6, 2021	Specialists	41796	13	3.110
1	Dec. 3, 2021	Dec. 6, 2021	US	43832	9	2.053
1	Dec. 3, 2021	Dec. 6, 2021	Germany	41919	7	1.670
1	Dec. 3, 2021	Dec. 6, 2021	Norm	42749	11	2.573
1	Dec. 3, 2021	Dec. 6, 2021	Efficacy	40340	13	3.223
Round 1				422675	110	2.602
2	Dec. 10, 2021	Dec. 14, 2021	Placebo	311521	88	2.825
2	Dec. 10, 2021	Dec. 14, 2021	Family	156968	46	2.931
2	Dec. 10, 2021	Dec. 14, 2021	Self	151905	50	3.292
2	Dec. 10, 2021	Dec. 14, 2021	Community	160184	48	2.997
2	Dec. 10, 2021	Dec. 14, 2021	Specialists	156638	47	3.001
2	Dec. 10, 2021	Dec. 14, 2021	US	162237	37	2.281
2	Dec. 10, 2021	Dec. 14, 2021	Germany	156977	47	2.994
2	Dec. 10, 2021	Dec. 14, 2021	Norm	156885	51	3.251
2	Dec. 10, 2021	Dec. 14, 2021	Efficacy	152864	53	3.467
Round 2				1566179	467	2.982
Total				1988854	577	2.901

Table S10: South Africa: A/B Test Results by Round and Treatment

Round	Start	End	Treatment	Reach	Link Clicks	Click per 10,000 Reach
1	Nov. 4, 2021	Nov. 6, 2021	Placebo	53356	79	14.806
1	Nov. 4, 2021	Nov. 6, 2021	Family	26168	41	15.668
1	Nov. 4, 2021	Nov. 6, 2021	Self	26223	27	10.296
1	Nov. 4, 2021	Nov. 6, 2021	Community	26700	26	9.738
1	Nov. 4, 2021	Nov. 6, 2021	Scientists	26440	28	10.590
1	Nov. 4, 2021	Nov. 6, 2021	US	26744	37	13.835
1	Nov. 4, 2021	Nov. 6, 2021	Germany	26488	48	18.121
1	Nov. 4, 2021	Nov. 6, 2021	Norm	26548	27	10.170
1	Nov. 4, 2021	Nov. 6, 2021	Efficacy	26120	33	12.634
Round 1				264787	346	13.067
2	Nov. 18, 2021	Nov. 21, 2021	Placebo	102021	142	13.919
2	Nov. 18, 2021	Nov. 21, 2021	Family	52137	80	15.344
2	Nov. 18, 2021	Nov. 21, 2021	Self	52041	70	13.451
2	Nov. 18, 2021	Nov. 21, 2021	Community	52313	72	13.763
2	Nov. 18, 2021	Nov. 21, 2021	Scientists	50130	84	16.756
2	Nov. 18, 2021	Nov. 21, 2021	US	51728	68	13.146
2	Nov. 18, 2021	Nov. 21, 2021	Germany	51145	74	14.469
2	Nov. 18, 2021	Nov. 21, 2021	Norm	51008	84	16.468
2	Nov. 18, 2021	Nov. 21, 2021	Efficacy	51170	70	13.680
Round 2				513693	744	14.483
3	Dec. 6, 2021	Dec. 10, 2021	Placebo	193226	284	14.698
3	Dec. 6, 2021	Dec. 10, 2021	Family	97453	162	16.623
3	Dec. 6, 2021	Dec. 10, 2021	Self	94404	155	16.419
3	Dec. 6, 2021	Dec. 10, 2021	Community	97708	131	13.407
3	Dec. 6, 2021	Dec. 10, 2021	Scientists	95025	140	14.733
3	Dec. 6, 2021	Dec. 10, 2021	US	93297	122	13.077
3	Dec. 6, 2021	Dec. 10, 2021	Germany	97629	138	14.135
3	Dec. 6, 2021	Dec. 10, 2021	Norm	96129	110	11.443
3	Dec. 6, 2021	Dec. 10, 2021	Efficacy	93863	142	15.128
Round 3				958734	1384	14.436
Total				1737214	2474	14.241

Table S11: Taiwan: A/B Test Results by Round and Treatment

Round	Start	End	Treatment	Reach	Link Clicks	Click per 10,000 Reach
1	Nov. 1, 2021	Nov. 3, 2021	Placebo	111979	138	12.324
1	Nov. 1, 2021	Nov. 4, 2021	Family	63283	79	12.484
1	Nov. 1, 2021	Nov. 4, 2021	Self	66136	85	12.852
1	Nov. 1, 2021	Nov. 4, 2021	Community	62783	71	11.309
1	Nov. 1, 2021	Nov. 4, 2021	Scientists	64199	55	8.567
1	Nov. 1, 2021	Nov. 3, 2021	US	47509	74	15.576
1	Nov. 1, 2021	Nov. 3, 2021	Germany	47196	79	16.739
1	Nov. 1, 2021	Nov. 3, 2021	Norm	46558	29	6.229
1	Nov. 1, 2021	Nov. 3, 2021	Efficacy	47646	73	15.321
Round 1				557289	683	12.256
2	Nov. 18, 2021	Nov. 24, 2021	Placebo	221533	242	10.924
2	Nov. 18, 2021	Nov. 24, 2021	Family	112639	212	18.821
2	Nov. 18, 2021	Nov. 24, 2021	Self	110620	112	10.125
2	Nov. 18, 2021	Nov. 24, 2021	Community	106544	98	9.198
2	Nov. 18, 2021	Nov. 24, 2021	Scientists	110325	111	10.061
2	Nov. 18, 2021	Nov. 24, 2021	US	109195	144	13.187
2	Nov. 18, 2021	Nov. 24, 2021	Germany	110726	131	11.831
2	Nov. 18, 2021	Nov. 24, 2021	Norm	109987	80	7.274
2	Nov. 18, 2021	Nov. 24, 2021	Efficacy	119815	249	20.782
Round 2				1111384	1379	12.408
Total				1668673	2062	12.357

Table S12: Turkey: A/B Test Results by Round and Treatment

Round	Start	End	Treatment	Reach	Link Clicks	Click per 10,000 Reach
1	Oct. 26, 2021	Nov. 4, 2021	Placebo	319448	215	6.730
1	Oct. 26, 2021	Nov. 4, 2021	Family	157094	98	6.238
1	Oct. 26, 2021	Nov. 4, 2021	Self	156271	84	5.375
1	Oct. 26, 2021	Nov. 4, 2021	Community	159589	96	6.015
1	Oct. 26, 2021	Nov. 4, 2021	Scientists	158602	89	5.612
1	Oct. 26, 2021	Nov. 4, 2021	US	153358	106	6.912
1	Oct. 26, 2021	Nov. 4, 2021	Germany	163244	111	6.800
1	Oct. 26, 2021	Nov. 4, 2021	Norm	157514	107	6.793
1	Oct. 26, 2021	Nov. 4, 2021	Efficacy	157935	114	7.218
Round 1				1583055	1020	6.443
2	Nov. 6, 2021	Nov. 9, 2021	Placebo	254398	139	5.464
2	Nov. 6, 2021	Nov. 9, 2021	Family	127740	80	6.263
2	Nov. 6, 2021	Nov. 9, 2021	Self	125536	76	6.054
2	Nov. 6, 2021	Nov. 9, 2021	Community	131678	73	5.544
2	Nov. 6, 2021	Nov. 9, 2021	Scientists	132127	95	7.190
2	Nov. 6, 2021	Nov. 9, 2021	US	130719	73	5.584
2	Nov. 6, 2021	Nov. 9, 2021	Germany	131390	87	6.622
2	Nov. 6, 2021	Nov. 9, 2021	Norm	131138	65	4.957
2	Nov. 6, 2021	Nov. 9, 2021	Efficacy	131262	93	7.085
Round 2				1295988	781	6.026
Total				2879043	1801	6.256

Table S13: United States: A/B Test Results by Round and Treatment

Round	Start	End	Treatment	Reach	Link Clicks	Click per 10,000 Reach
1	Oct. 14, 2021	Oct. 17, 2021	Placebo	113514	58	5.110
1	Oct. 14, 2021	Oct. 17, 2021	Family	57337	23	4.011
1	Oct. 14, 2021	Oct. 17, 2021	Self	58991	26	4.407
1	Oct. 14, 2021	Oct. 17, 2021	Community	57310	40	6.980
1	Oct. 14, 2021	Oct. 17, 2021	Scientists	56015	29	5.177
1	Oct. 14, 2021	Oct. 17, 2021	US	57325	29	5.059
1	Oct. 14, 2021	Oct. 17, 2021	Germany	55679	23	4.131
1	Oct. 14, 2021	Oct. 17, 2021	Norm	56315	26	4.617
1	Oct. 14, 2021	Oct. 17, 2021	Efficacy	55809	39	6.988
Round 1				568295	293	5.156
2	Dec. 7, 2021	Dec. 15, 2021	Placebo	79469	67	8.431
2	Dec. 7, 2021	Dec. 15, 2021	Family	39212	32	8.161
2	Dec. 7, 2021	Dec. 15, 2021	Self	40169	15	3.734
2	Dec. 7, 2021	Dec. 15, 2021	Community	39775	25	6.285
2	Dec. 7, 2021	Dec. 15, 2021	Scientists	57587	4	0.695
2	Dec. 7, 2021	Dec. 15, 2021	US	40026	26	6.496
2	Dec. 7, 2021	Dec. 15, 2021	Germany	39182	34	8.677
2	Dec. 7, 2021	Dec. 15, 2021	Norm	40787	37	9.072
2	Dec. 7, 2021	Dec. 15, 2021	Efficacy	40072	31	7.736
Round 2				416279	271	6.510
3	Jan. 13, 2022	Jan. 18, 2022	Placebo	192221	80	4.162
3	Jan. 13, 2022	Jan. 18, 2022	Family	98366	60	6.100
3	Jan. 13, 2022	Jan. 18, 2022	Self	120077	20	1.666
3	Jan. 13, 2022	Jan. 18, 2022	Community	95503	40	4.188
3	Jan. 13, 2022	Jan. 18, 2022	Scientists	97244	35	3.599
3	Jan. 13, 2022	Jan. 18, 2022	US	94286	56	5.939
3	Jan. 13, 2022	Jan. 18, 2022	Germany	96383	44	4.565
3	Jan. 13, 2022	Jan. 18, 2022	Norm	97872	43	4.393
3	Jan. 13, 2022	Jan. 18, 2022	Efficacy	122282	23	1.881
Round 3				1014234	401	3.953
Total				1998808	965	4.828

4 Vaccination Rate by Country

Table S14: Vaccination Rate by Country

Country	Date	Vaccinated (%)	Fully Vaccinated (%)
Brazil	Dec. 4, 2021	76.89%	63.94%
Brazil	Dec. 7, 2021	76.97%	64.44%
Brazil	Dec. 10, 2021	77.07%	65.11%
Brazil	Dec. 14, 2021	77.07%	65.49%
Brazil	Dec. 18, 2021	77.30%	66.11%
Brazil	Dec. 21, 2021	77.36%	66.32%
Russia	Dec. 3, 2021	46.24%	39.66%
Russia	Dec. 6, 2021	46.68%	40.30%
Russia	Dec. 10, 2021	47.37%	41.23%
Russia	Dec. 14, 2021	48.33%	42.38%
South Africa	Nov. 4, 2021	26.07%	21.21%
South Africa	Nov. 6, 2021	26.27%	21.32%
South Africa	Nov. 18, 2021	27.56%	22.92%
South Africa	Nov. 21, 2021	27.73%	23.11%
South Africa	Dec. 6, 2021	29.89%	25.02%
South Africa	Dec. 10, 2021	30.55%	25.53%
Taiwan	Nov. 1, 2021	72.46%	33.10%
Taiwan	Nov. 4, 2021	72.94%	35.43%
Taiwan	Nov. 18, 2021	75.38%	44.84%
Taiwan	Nov. 24, 2021	75.91%	49.56%
Turkey	Oct. 26, 2021	64.98%	56.82%
Turkey	Nov. 4, 2021	65.32%	57.63%
Turkey	Nov. 6, 2021	65.39%	57.80%
Turkey	Nov. 9, 2021	65.49%	58.02%
United States	Oct. 14, 2021	65.52%	58.20%
United States	Oct. 17, 2021	65.66%	58.36%
United States	Dec. 7, 2021	70.97%	61.40%
United States	Dec. 15, 2021	71.79%	62.12%
United States	Jan. 13, 2022	74.45%	63.60%
United States	Jan. 18, 2022	74.80%	63.79%

[1]People vaccinated was calculated using "people vaccinated/population" and Fully vaccinated (%) was calculated using "people fully vaccinated/population".

[2]As Brazil for Dec. 10, 2021 is missing “Vaccinated (%)", we interpolate it at 77.07 percent from the other two adjacent numbers.

5 Facebook Ads Example

Figure S49: Facebook Ad: Brazil

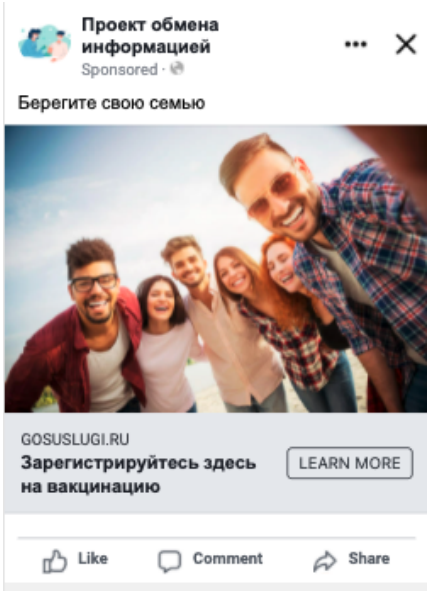

Figure S50: Facebook Ad: Russia

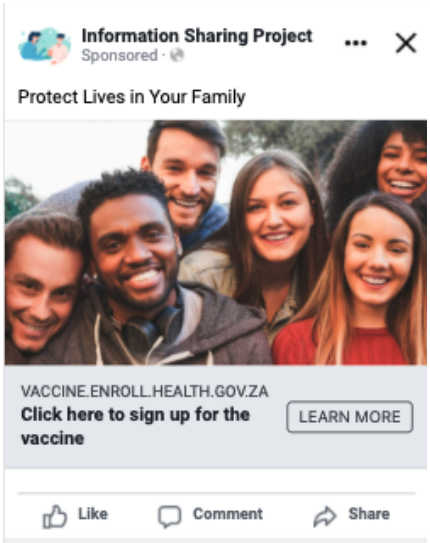

Figure S51: Facebook Ad: South Africa

Figure S52: Facebook Ad: Taiwan

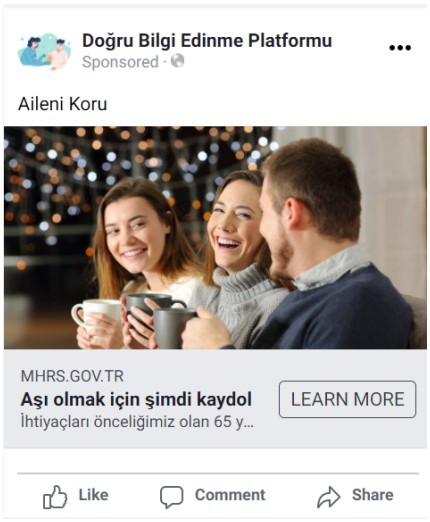

Figure S53: Facebook Ad: Turkey

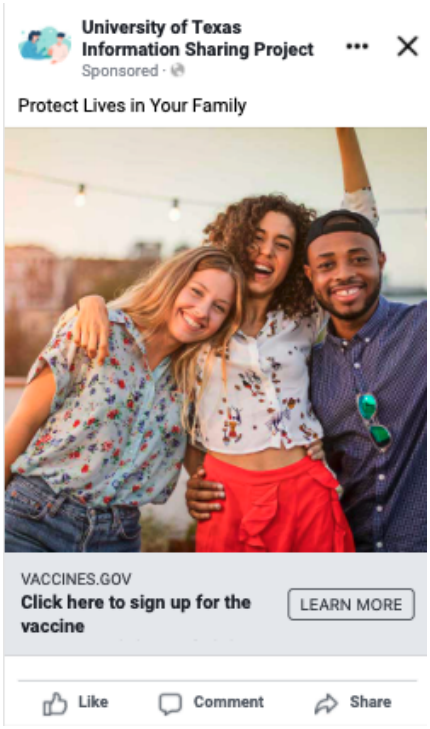

Figure S54: Facebook Ad: US

6 Adjustments for Multiple Comparisons

Table S15: Adjustments at Country and Facebook-Ad Group Level

Country	Group	Treatment	Raw pvalue	Bon-ferroni	BH	Holm	Hoch-berg	Hommel	BY
Brazil	Action	US	0.598	1	0.598	0.598	0.598	0.598	1
Brazil	Action	Germany	0.018	0.070	0.035	0.053	0.053	0.053	0.073
Brazil	Action	Risk	0.009	0.036	0.035	0.036	0.036	0.035	0.073
Brazil	Action	Scientist	0.207	0.829	0.276	0.415	0.415	0.415	0.576
Brazil	Motivation	Norms	0.210	0.841	0.210	0.210	0.210	0.210	0.438
Brazil	Motivation	Family	0.004	0.014	0.014	0.014	0.014	0.014	0.030
Brazil	Motivation	Life	0.046	0.183	0.061	0.120	0.092	0.092	0.127
Brazil	Motivation	Community	0.040	0.159	0.061	0.120	0.092	0.080	0.127
Russia	Action	US	0.103	0.413	0.413	0.413	0.413	0.413	0.860
Russia	Action	Germany	0.654	1	0.788	1	0.788	0.788	1
Russia	Action	Risk	0.321	1	0.643	0.964	0.788	0.788	1
Russia	Action	Scientist	0.788	1	0.788	1	0.788	0.788	1
Russia	Motivation	Norms	0.786	1	0.991	1	0.990	0.990	1
Russia	Motivation	Family	0.435	1	0.991	1	0.990	0.990	1
Russia	Motivation	Life	0.531	1	0.991	1	0.990	0.990	1
Russia	Motivation	Community	0.990	1	0.991	1	0.990	0.990	1
SouthAfrica	Action	US	0.183	0.731	0.731	0.731	0.731	0.731	1
SouthAfrica	Action	Germany	0.863	1	0.980	1	0.980	0.980	1
SouthAfrica	Action	Risk	0.928	1	0.980	1	0.980	0.980	1
SouthAfrica	Action	Scientist	0.980	1	0.980	1	0.980	0.980	1
SouthAfrica	Motivation	Norms	0.083	0.331	0.271	0.331	0.331	0.271	0.564
SouthAfrica	Motivation	Family	0.163	0.652	0.271	0.490	0.406	0.326	0.564
SouthAfrica	Motivation	Life	0.884	1	0.884	0.884	0.884	0.884	1
SouthAfrica	Motivation	Community	0.203	0.812	0.271	0.490	0.406	0.406	0.564
Taiwan	Action	US	0.006	0.024	0.012	0.018	0.018	0.018	0.025
Taiwan	Action	Germany	0.107	0.428	0.107	0.147	0.107	0.107	0.223
Taiwan	Action	Risk	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taiwan	Action	Scientist	0.073	0.293	0.098	0.147	0.107	0.107	0.204
Taiwan	Motivation	Norms	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taiwan	Motivation	Family	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taiwan	Motivation	Life	0.898	1.000	0.898	0.898	0.898	0.898	1.000
Taiwan	Motivation	Community	0.207	0.827	0.276	0.414	0.414	0.414	0.574
Turkey	Action	US	0.731	1	0.910	1	0.910	0.910	1
Turkey	Action	Germany	0.325	1	0.650	0.975	0.910	0.910	1
Turkey	Action	Risk	0.108	0.432	0.432	0.432	0.432	0.432	0.900
Turkey	Action	Scientist	0.910	1	0.910	1	0.910	0.910	1
Turkey	Motivation	Norms	0.749	1	0.984	1	0.984	0.984	1
Turkey	Motivation	Family	0.984	1	0.984	1	0.984	0.984	1
Turkey	Motivation	Life	0.525	1	0.984	1	0.984	0.984	1
Turkey	Motivation	Community	0.600	1	0.984	1	0.984	0.984	1
USA	Action	US	0.604	1	0.931	1	0.931	0.931	1
USA	Action	Germany	0.931	1	0.931	1	0.931	0.931	1
USA	Action	Risk	0.081	0.323	0.162	0.243	0.243	0.243	0.337
USA	Action	Scientist	0.000	0.000	0.000	0.000	0.000	0.000	0.001
USA	Motivation	Norms	0.820	1	0.820	1	0.820	0.820	1
USA	Motivation	Family	0.380	1	0.761	1	0.820	0.820	1
USA	Motivation	Life	0.000	0.000	0.000	0.000	0.000	0.000	0.000
USA	Motivation	Community	0.791	1	0.820	1	0.820	0.820	1

Table S16: Adjustments at Country Level

Country	Group	Treatment	Raw pvalue	Bon-ferroni	BH	Holm	Hoch-berg	Hommel	BY
Brazil	Action	US	0.598	1	0.598	0.622	0.598	0.598	1
Brazil	Action	Germany	0.018	0.140	0.047	0.105	0.105	0.092	0.127
Brazil	Action	Risk	0.009	0.071	0.036	0.062	0.062	0.061	0.097
Brazil	Action	Scientist	0.207	1	0.240	0.622	0.420	0.415	0.653
Brazil	Motivation	Norms	0.210	1	0.240	0.622	0.420	0.420	0.653
Brazil	Motivation	Family	0.004	0.029	0.029	0.029	0.029	0.029	0.078
Brazil	Motivation	Life	0.046	0.366	0.073	0.199	0.183	0.183	0.199
Brazil	Motivation	Community	0.040	0.319	0.073	0.199	0.183	0.159	0.199
Russia	Action	US	0.103	0.826	0.826	0.826	0.826	0.826	1
Russia	Action	Germany	0.654	1	0.901	1	0.990	0.990	1
Russia	Action	Risk	0.321	1	0.901	1	0.990	0.990	1
Russia	Action	Scientist	0.788	1	0.901	1	0.990	0.990	1
Russia	Motivation	Norms	0.786	1	0.901	1	0.990	0.990	1
Russia	Motivation	Family	0.435	1	0.901	1	0.990	0.990	1
Russia	Motivation	Life	0.531	1	0.901	1	0.990	0.990	1
Russia	Motivation	Community	0.990	1	0.990	1	0.990	0.990	1
SouthAfrica	Action	US	0.183	1	0.406	1	0.980	0.914	1
SouthAfrica	Action	Germany	0.863	1	0.980	1	0.980	0.980	1
SouthAfrica	Action	Risk	0.928	1	0.980	1	0.980	0.980	1
SouthAfrica	Action	Scientist	0.980	1	0.980	1	0.980	0.980	1
SouthAfrica	Motivation	Norms	0.083	0.663	0.406	0.663	0.663	0.497	1
SouthAfrica	Motivation	Family	0.163	1	0.406	1	0.98	0.816	1
SouthAfrica	Motivation	Life	0.884	1	0.98	1	0.98	0.98	1
SouthAfrica	Motivation	Community	0.203	1	0.406	1	0.98	0.98	1
Taiwan	Action	US	0.006	0.049	0.012	0.03	0.03	0.03	0.033
Taiwan	Action	Germany	0.107	0.857	0.143	0.321	0.321	0.31	0.388
Taiwan	Action	Risk	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Taiwan	Action	Scientist	0.073	0.587	0.117	0.293	0.293	0.220	0.319
Taiwan	Motivation	Norms	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taiwan	Motivation	Family	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taiwan	Motivation	Life	0.898	1	0.898	0.898	0.898	0.898	1
Taiwan	Motivation	Community	0.207	1	0.236	0.414	0.414	0.414	0.642
Turkey	Action	US	0.731	1	0.984	1	0.984	0.984	1
Turkey	Action	Germany	0.325	1	0.984	1	0.984	0.984	1
Turkey	Action	Risk	0.108	0.864	0.864	0.864	0.864	0.864	1
Turkey	Action	Scientist	0.910	1	0.984	1	0.984	0.984	1
Turkey	Motivation	Norms	0.749	1	0.984	1	0.984	0.984	1
Turkey	Motivation	Family	0.984	1	0.984	1	0.984	0.984	1
Turkey	Motivation	Life	0.525	1	0.984	1	0.984	0.984	1
Turkey	Motivation	Community	0.600	1	0.984	1	0.984	0.984	1
USA	Action	US	0.604	1	0.931	1	0.931	0.931	1
USA	Action	Germany	0.931	1	0.931	1	0.931	0.931	1
USA	Action	Risk	0.081	0.647	0.216	0.485	0.485	0.485	0.586
USA	Action	Scientist	0.001	0.001	0.000	0.001	0.001	0.001	0.001
USA	Motivation	Norms	0.820	1	0.931	1	0.931	0.931	1
USA	Motivation	Family	0.380	1	0.761	1	0.931	0.931	1
USA	Motivation	Life	0.001	0.000	0.000	0.000	0.000	0.000	0.000
USA	Motivation	Community	0.791	1	0.931	1	0.931	0.931	1

7 Balance Checks and Subgroup Analyses

In this section, we perform diagnostics to learn if statistical imbalances that occurred in Facebook's assignment of experimental conditions across demographic and geographic subgroups correspond to the treatment effects reported. Facebook, as noted, does not provide individual-level data but reports only aggregate statistics across experimental conditions and a few additional categories including various age cohorts, gender identities, and geographic units. So, in the first step we check whether treatment assignment is balanced across subgroups for the three different categories: age, gender, and geography. We divided subgroups into female or male, those living in the countries' capitals or elsewhere, and above or below the median age. In Brazil we only conducted the experiment in São Paulo, the largest city, so we omit consideration of geographic subgroups in the Brazilian case.

As noted in the main text, it seems unlikely that Facebook is performing complete—or even simple—randomization given the numeric imbalances among experimental conditions. As can be seen in Tables 16 - 20, there are many statistical imbalances in the number of subjects assigned to the different treatment and placebo conditions. The study's high statistical power enables detection of small imbalances, but even so the number of imbalances is higher than would be expected under complete or simple randomization. Among the 680 pairs of experimental conditions, we detected 111 subgroup imbalances—a rate of 16.3 percent. While 83.7 percent balanced might not seem too low, it is much lower than typical in experiments in which researchers control randomization procedures. Still, a high rate of statistical imbalance becomes a concern mainly when it seems to be biasing results.

Thus, as a second step, we examine subgroup treatment effects and cross-reference

them to the subgroup assignment imbalances. Tables S17 - S22 summarize the two tests, balance (bal) and subgroup effect (sub), and we use yes (Y) and No (N) to indicate whether the effects are statistically significant (p-value less than or equal to 0.05). We observed treatment effects in roughly 20 percent of the 680 subgroups (135 total). However, in general the subgroup assignment imbalances did not correlate statistically with the treatment effects, suggesting that the observed imbalances were not causing the subgroup treatment effects (or visa versa). In a bivariate regression testing the correlation between subgroup imbalances and subgroup treatment effects, the relationship between the two is negative, with imbalanced subgroups having a lower proportion of treatment effects than balanced subgroups; the R-squared is 0.002 and the p-value is 0.117. The negative correlation suggests that, if anything, imbalanced subgroups were less likely to correspond to subgroup treatment effects, though it is important to emphasize that the relationship is not significant statistically at conventional levels.

The upshot: the observed statistical imbalances do not appear to be resulting in treatment effects. Only in 16 of 680 cases (2.4 percent of the total) did a treatment effect occur in the same subgroup as an assignment imbalance. Most of those cases did not correspond to the treatment effects reported in Figures 1 and 2 of the main text. In the few that did, subgroup treatment effects were also observed in other subgroups that did not evince statistical imbalances in assignment. The sole exception—the Family vs. Community comparison in South Africa—was not a test of a pre-registered primary hypothesis. However, for that comparison the lack of subgroup treatment effects in other, balanced subgroups raises our skepticism about that singular result. On the whole, however, the imbalances in treatment and placebo assignments were not statistically related to the treatment effects. This provides scant evidence of threats to causal inference from the assignment procedure and thus increases our confidence in the findings.

Table S17: Brazil

Test	Young		Old		Female		Male	
	bal	sub	bal	sub	bal	sub	bal	sub
Action								
Placebo-US	Y	N	Y	Y	Y	N	Y	N
Placebo-Germany	Y	N	Y	Y	Y	Y	Y	N
Germany-US	Y	N	Y	N	Y	N	Y	N
Placebo-Norms	Y	N	Y	N	Y	N	N	N
Placebo-Risk	Y	N	Y	Y	N	N	N	Y
Norms-Risk	N	N	Y	N	Y	N	N	Y
US-Risk	Y	N	Y	N	Y	N	Y	Y
Germany-Risk	Y	N	Y	N	Y	Y	Y	Y
Norms-US	Y	N	Y	N	Y	N	Y	N
Norms-Germany	Y	N	Y	N	Y	N	Y	N
Motivation								
Placebo-Family	Y	N	Y	Y	N	Y	Y	Y
Placebo-Life	N	N	Y	Y	Y	N	Y	Y
Placebo-Community	Y	N	Y	N	Y	N	Y	Y
Placebo-Scientist	Y	N	Y	Y	Y	N	Y	N
Family-Life	Y	N	Y	N	Y	N	Y	N
Family-Community	Y	N	N	N	Y	N	Y	N
Family-Scientist	Y	N	Y	N	Y	N	N	N
Life-Community	Y	N	Y	N	Y	N	N	N
Life-Scientist	Y	N	Y	N	Y	N	Y	N
Community-Scientist	Y	N	Y	N	Y	N	Y	N

Table S18: Russia

Test	Young		Old		Female		Male		Capital		Noncapital	
	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub
Action												
Placebo-US	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Placebo-Germany	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Germany-US	Y	N	Y	N	N	N	Y	N	Y	N	Y	N
Placebo-Norms	Y	N	Y	N	Y	N	Y	N	N	N	N	N
Placebo-Risk	Y	N	Y	N	Y	N	Y	N	N	N	Y	N
Norms-Risk	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
US-Risk	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	N
Germany-Risk	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Norms-US	N	N	Y	N	N	N	Y	N	Y	N	Y	N
Norms-Germany	Y	N	Y	N	Y	N	N	N	Y	N	N	N
Motivation												
Placebo-Family	Y	N	Y	N	Y	N	Y	N	N	N	Y	N
Placebo-Life	Y	N	Y	N	Y	N	N	N	Y	N	Y	N
Placebo-Community	Y	N	Y	N	Y	N	Y	N	N	N	Y	N
Placebo-Scientist	N	N	Y	N	Y	N	Y	N	Y	N	N	N
Family-Life	Y	N	Y	N	N	N	Y	N	Y	N	Y	N
Family-Community	Y	N	Y	N	Y	N	Y	N	N	N	Y	N
Family-Scientist	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Life-Community	Y	N	N	N	Y	N	Y	N	Y	N	Y	N
Life-Scientist	N	N	Y	N	Y	N	Y	N	Y	N	Y	N
Community-Scientist	Y	N	Y	N	N	N	Y	N	Y	N	Y	N

Table S19: South Africa

Test	Young		Old		Female		Male		Capital		Noncapital	
	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub
Action												
Placebo-US	N	N	Y	N	Y	N	N	N	Y	N	Y	N
Placebo-Germany	Y	N	N	N	Y	N	Y	N	Y	N	Y	N
Germany-US	Y	N	N	N	N	N	Y	N	N	N	Y	N
Placebo-Norms	Y	N	Y	N	Y	N	N	N	N	N	N	N
Placebo-Risk	Y	N	Y	N	Y	N	N	N	N	Y	N	N
Norms-Risk	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
US-Risk	Y	N	Y	N	N	N	Y	Y	N	Y	N	N
Germany-Risk	Y	N	Y	N	N	N	Y	N	Y	Y	N	N
Norms-US	Y	N	N	N	Y	N	N	Y	N	Y	N	N
Norms-Germany	Y	N	N	N	Y	N	Y	N	N	N	N	N
Motivation												
Placebo-Family	Y	N	N	N	Y	N	Y	Y	Y	N	N	Y
Placebo-Life	N	N	Y	N	Y	N	N	N	Y	N	Y	N
Placebo-Community	Y	N	N	N	Y	Y	Y	N	Y	N	N	N
Placebo-Scientist	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Family-Life	Y	N	Y	Y	N	N	Y	N	Y	N	Y	Y
Family-Community	N	Y	Y	N	N	N	N	N	Y	N	N	Y
Family-Scientist	Y	N	Y	N	Y	N	Y	N	Y	N	Y	Y
Life-Community	Y	Y	Y	N	N	N	Y	N	Y	N	Y	N
Life-Scientist	Y	N	Y	N	Y	N	Y	N	N	N	N	N
Community-Scientist	Y	N	Y	N	Y	N	N	N	Y	N	Y	N

Table S20: Taiwan

Test	Young		Old		Female		Male		Capital		Noncapital	
	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub
Action												
Placebo-US	Y	N	Y	Y	Y	N	Y	Y	Y	N	Y	Y
Placebo-Germany	Y	N	Y	Y	Y	N	Y	Y	Y	N	Y	N
Germany-US	Y	N	Y	N	Y	N	Y	N	N	N	Y	N
Placebo-Norms	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Placebo-Risk	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Norms-Risk	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
US-Risk	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y
Germany-Risk	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y
Norms-US	Y	Y	Y	Y	N	Y	N	Y	N	N	N	Y
Norms-Germany	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y	Y
Motivation												
Placebo-Family	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Placebo-Life	Y	N	Y	N	N	N	N	N	N	N	N	N
Placebo-Community	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Placebo-Scientist	N	N	Y	N	Y	N	Y	N	Y	N	Y	N
Family-Life	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Family-Community	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Family-Scientist	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Life-Community	Y	N	Y	N	N	N	Y	N	Y	N	Y	N
Life-Scientist	Y	Y	Y	N	N	N	N	N	Y	N	Y	N
Community-Scientist	Y	N	N	N	N	N	Y	N	Y	N	Y	N

Table S21: Turkey

Test	Young		Old		Female		Male		Capital		Noncapital	
	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub
Action												
Placebo-US	Y	N	Y	N	Y	N	Y	N	N	N	Y	N
Placebo-Germany	Y	N	Y	N	Y	N	Y	N	N	Y	Y	N
Germany-US	Y	N	Y	N	Y	N	Y	N	N	N	Y	N
Placebo-Norms	Y	N	Y	N	Y	Y	Y	N	Y	N	Y	N
Placebo-Risk	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Norms-Risk	Y	N	Y	N	Y	Y	Y	N	Y	N	N	N
US-Risk	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Germany-Risk	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Norms-US	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Norms-Germany	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Motivation												
Placebo-Family	Y	N	Y	N	Y	N	Y	N	Y	N	N	N
Placebo-Life	Y	N	Y	N	N	N	Y	N	Y	N	Y	N
Placebo-Community	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Placebo-Scientist	Y	N	N	N	Y	N	Y	N	Y	N	Y	N
Family-Life	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Family-Community	Y	N	Y	N	Y	N	N	N	Y	N	Y	N
Family-Scientist	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Life-Community	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Life-Scientist	Y	N	Y	N	Y	N	Y	N	N	N	Y	N
Community-Scientist	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N

Table S22: United States

Test	Young		Old		Female		Male		Capital		Noncapital	
	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub	bal	sub
Action												
Placebo-US	Y	N	N	N	Y	N	N	N	N	N	N	N
Placebo-Germany	Y	N	Y	N	N	N	Y	N	Y	N	Y	N
Germany-US	Y	N	Y	N	Y	N	Y	N	N	N	N	N
Placebo-Norms	N	N	Y	N	Y	N	Y	N	Y	N	Y	N
Placebo-Risk	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	N
Norms-Risk	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	N
US-Risk	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	N
Germany-Risk	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	N
Norms-US	N	N	Y	N	Y	N	N	N	Y	N	Y	N
Norms-Germany	Y	N	N	N	Y	N	N	N	Y	N	Y	N
Motivation												
Placebo-Family	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Placebo-Life	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y
Placebo-Community	Y	N	N	N	Y	N	N	N	N	N	N	N
Placebo-Scientist	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y
Family-Life	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Family-Community	Y	Y	Y	N	Y	N	Y	N	Y	N	Y	N
Family-Scientist	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y	Y
Life-Community	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Life-Scientist	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Community-Scientist	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

8 Ad Placements

Table S23: Ad Placements by Country

	Facebook Reach	Instagram Reach	Facebook %	Instagram %
Brazil	380893	4363624	8.03	91.97
Russia	142303	1844146	7.16	92.84
SA	1528052	207254	88.06	11.94
Taiwan	1240019	526261	70.21	29.79
Turkey	2066468	717930	74.22	25.78
US	1642669	354521	82.25	17.75

9 Language Translation of Treatment Message

9.1 Portuguese

Country Treatment Ad Content:

- Germany: Uma vacina amplamente usada foi desenvolvida na Alemanha
- US: Uma vacina amplamente utilizada foi desenvolvida nos Estados Unidos

Motivation Treatment Ad Content:

- Norm: 87% das pessoas foram vacinadas ou planejam ser vacinadas (de acordo com pesquisas da Morning Consult)
- Efficacy: A vacinação é 96% eficaz contra a hospitalização (incluindo da variante delta, de acordo com um estudo da Public Health England)

Action Treatment Ad Content:

- Family: Proteja vidas em sua família
- Community: Proteja vidas em sua comunidadeec
- Scientist: Siga os cientistas médicos
- Self: Proteja sua vida

Ad Elements:

- Headline: Clique aqui para se inscrever para a vacina
- Facebook Page Name: Projeto de compartilhamento de informações
- Vaccine signup link: https://vacinaja.sp.gov.br/?utm_source=portalutm_medium=banner-topoutm_campaign=Cadastro-Vacinaja

9.2 Russian

Country Treatment Ad Content:

- Germany: Одна из широко используемых вакцин была разработана в Германии.
- US: Одна из широко используемых вакцин была разработана в США.

Motivation Treatment Ad Content:

- Norm: 87% людей были вакцинированы или планируют вакцинацию (согласно опросам, проведенным Morning Consultom).
- Efficacy: Вакцинация эффективна на 96%, как профилактика против госпитализации (также включая дельта-вариант, что подтверждается в исследовании Public Health England)

Action Treatment Ad Content:

- Family: берегите свою семью
- Community: берегите жизни в своем общес
- Scientist: послушайте ученых-медиков
- Self: берегите свою жизнь

Ad Elements:

- Headline: Нажмите здесь, чтобы зарегистрироваться на вакцинацию
- Facebook Page Name: проект обмена информацией цией
- Vaccine signup link:
  https://www.gosuslugi.ru/landing/vaccination

9.3 Traditional Chinese

Country Treatment Ad Content:

- Germany: 德國已研製出一種廣泛使用的疫苗
- US: 美國已研製出一種廣泛使用的疫苗

Motivation Treatment Ad Content:

- Norm: 87% 的民衆已接種或計劃接種疫苗（根據Morning Consult 的民意調查）
- Efficacy: COVID-19疫苗住院的保護力為96%（包括Delta變異株，根據英國公共衛生部的一項研究）

Action Treatment Ad Content:

- Family: 保護家人的生命
- Community: 保護社區中的生命
- Scientist: 信任醫學專家
- Self: 保護你的生命

Ad Elements:

- Headline: COVID-19疫苗接種院所
- Facebook Page Name: 信息共享平台
- Vaccine signup link: https://www.cdc.gov.tw/Category/List/hlrN4cZsF2Pe4C6DFhggqQ

9.4 Turkish

Country Treatment Ad Content:

- Germany: Oldukça yaygın kullanılan aşılardan biri Almanya'da üretiliyor.
- US: Oldukça yaygın kullanılan aşılardan biri Amerika Birleşik Devletleri'nde üretiliyor.

Motivation Treatment Ad Content:

- Norm: İnsanların 87%'si aşı oldu veya olmayı düşünüyor.
- Efficacy: Aşılar hastaneye yatma riskini 96% oranında azaltıyor (delta varyantı dahil).

Action Treatment Ad Content:

- Family: Aileni koru
- Community: Toplumu koru
- Scientist: Bilim insanlarına kulak ver
- Self: Virüsten korun

Ad Elements:

- Headline: Aşı olmak için şimdi kaydol
- Facebook Page Name: Doğru Bilgi Edinme Platformu
- Vaccine signup link: https://www.mhrs.gov.tr/