Social Messages, Costs of Sending, Resending and Norm Expectations

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Abstract

We study the influence of social messages encouraging the use of a Corona Tracing App, varying whether there is a message and if so, at what cost it came. Does this affect messaging behavior and norm expectations in receivers? The data show that willingness to invest in sending social messages increases in receivers. In contrast, norms remain largely robust. App-use and vaccine decisions of Corona patients are considered normatively relevant. This is reflected in norms regarding triage and sharing costs of Corona treatment. Yet social messages do not affect these norm expectations.

1   Introduction

„The virus is contagious, and so is our behavior"

(Rutger Bregman)

Humans are social animals. Hence, social information exerts pervasive influence on behavior (Cialdini 1984, and observing others' altruistic actions, in turn, motivates pro-social deeds (Capraro & Marcelleti 2014). As Covid reemphasizes the significance of behavioral insights to spur collective action (Bavel et al. 2020), we leverage social messages as moral nudge (Capraro et al. 2019, Dal Bo & Dal Bo 2014) to foster conditional cooperation (Fischbacher et al. 2001) and garner public health support by promoting Contract Tracing App uptake. The propensity of negative content to go viral on twitter and other social media platforms is a widely discussed phenomenom (Sacerdote et al. 2020) and played a part in shaping recent political events (Allcott & Gentzkow 2017). But what if we could harness similar mechanisms to promote prosociality, even when messaging is costly?

In this study, we elicit subjects' willingness to incur personal costs for sending a message to a third person encouraging Contact Tracing App (CTA) use. As treatment, we vary the reception of an analogous moral message between subjects – such that they do or do not receive a moral messsage themselves before making their decision. Subjects further receive information on the cost that another subject had previously been willing to bear for sending that message. This observed cost varies between treatment groups.

We find that receiving a moral message increases willingness-to-pay for sending a social message yourself significantly by around 50% – illustrating a leverage point for cascading moral appeals on behavior in social networks. While subjects pay more for sending a message after they previously received one, the willingness-to-pay observed in others has no significant impact on their own willingness-to-pay. Our study shows the efficacy of moral nudges in fighting a global pandemic. It further contributes to the discussion on social media's welfare effects (Allcott et al. 2020a) and underlines the power of (social) media to propagate certain behavior by making it particularly observable and salient. This also provides further evidence as to the importance of avoiding false balance in media coverage.

For refusing to treat patients in person who chose to remain unvaccinated against Covid, a Miami physician stirred up controversy (Bella 2021). The second part of our study examines the circumstances – if there are any – where such a stance (Wikler 2021) is deemed morally legitimate. In an incentivized manner, we elicit normative expectations with respect to Covid-related moral dilemmas, such as triage decisions that incorporate vaccination status or CTA use. We measure the impact of receiving a moral messages on those normative expectations. While we find irresponsible

behavior to be viewed morally relevant in such context, moral messages exert no significant effect on moral judgment.

Recently, a fundamental development affecting communication and information sharing is digitization and, in particular, smartphone use. Digital and social media play a profound role in shaping actions and beliefs (Bond et al. 2012, Sunstein 2017, Allcott et al. 2019). Within and beyond the scope of the Covid pandemic, the effects of information sharing via social media have been widely discussed (Cinelli et al. 2020, Cuello-Garcia 2020). To improve our understanding of the mechanisms by which cascading social information affects real behavior through online networks remains an exciting field of research (Salganik et al. 2006). Often, the discussions revolved around detrimental effects – such as growing polarization – and media's negativity bias (Rathje et al. 2021). At the same time, health-related behavior in the pandemic is intertwined with political polarization (Allcott et al. 2020b). Our findings, however, add to a line of research that suggests a potential to turn these effects around and to create a pro-social virality of behavior (Berger & Milkman 2012). Our inquiry further helps explain how a small piece of salient information can have cascading – and hence outsized – effects on the behavior of a large population when shared via a social (media) network (Onnela & Reed-Tsochas 2010, Fowler & Christakis 2010). It reemphasizes the need to remain attentive and deliberate in sharing information, to consider framing, and to be mindful of false balance which – according to our results – must be viewed as a real challenge.

The remainder of this text is structured as follows: Section 2 lays out the experimental design. Section 3 presents underlying considerations that motivate three distinct hypotheses while section 4 provides the corresponding results. Section 5 concludes.

2   Design

We conduct an online study with subjects from the KD2Lab subject pool at the Karlsruhe Institute of Technology (KIT) who previously signed up for participation in experiments. In total, we analyze the decisions of 709 individuals, after excluding inconsistent (multi-switching) subjects. We implemented the study using the SoSci Survey tool and sent out invitations to participate via KD2Lab's recruiting software hroot (Bock et al. 2014) and email. The invitation letter informed subjects that they would be required to use a smartphone to take part. Data collection took place in two rounds, with the first round being conducted in December 2020, and the second round in February 2021.

At the top of the instructions, we informed subjects that – after the experiment – a computer program would choose randomly those subjects who receive a payoff and whose decisions would be implemented exactly as stated in the instructions. Since the study contains three incentivized parts, the computer would also randomly pick the one of them to be implemented. First, using the multiple price list format (Anderson et al. 2007), we elicited subjects' willingness to pay for sending a message to their peers to recommend the use of the COVID-19 tracing app. Specifically, subjects decided for each individual price whether they would prefer to send a message to another person or to receive a pay-off for themselves with the monetary amounts ranging from 0.01 EUR up to 20 EUR. Crucially, before making their individual decisions, subjects would also receive a message – or no message at all in the control group. The content of that message varied based on subjects randomized treatment assignment. This message conveyed the information of another individual's willingness to pay for sending a recommendation.

In the second part of the study, we elicited subjects' normative expectations for specific scenarios using the methodology proposed by Krupka & Weber (2013). The first vignette in this part introduced a triage situation: Person A und Person B both are in dire need of a ventilator as a consequence of falling ill with COVID-19. However, there is only one ventilator available. We asked participants whether they would deem it morally appropriate or inappropriate that Person A would be chosen for treatment, given two different sets of circumstances. In the first case, Person A – contrary to Person B – had evidentially and publicly advocated against using the COVID-19 tracing app. In the second case, Person A – again contrary to Person B – had decided against getting a widely available and strongly recommended vaccine. Both contexts were identically applied to the second vignette which addressed the costs to the public health sector caused by COVID-19 treatment. Here, we asked if it would be morally appropriate for the public health insurance to recall part of the treatment cost from Person A. In this stage of the study, subjects were incentivized to judge correctly the modal response between themselves and all other participants. Moral appropriateness would be expressed in the form of a 4-point-Likert scale with the corresponding ratings "morally very inappropriate", "morally somewhat inappropriate", "morally somewhat appropriate" "morally very appropriate". For the purpose of analyzing results, we categorized responses as -1, $-1/3$, $1/3$, and 1 accordingly. The third and last stage of the study makes use of Holt & Laury's (2002) approach to elicit individual risk preferences.

3   Predictions

Digital Contact Tracing (Howell O'Neill et al. 2020, Colizza et al. 2021) provides a powerful tool to alleviate pandemic spread, as vast research regarding Covid attests (Wymant et al. 2021, Abueg et al. 2021). CTAs can be effective even at low uptake levels (Lopez et al. 2021). However, benefits increase substantially with growing user numbers and when combined with other interventions (Aleta et al. 2020, Almagor & Picascia 2020, Kucharski et al. 2020). The public goods character is intuitive: CTA use contributes to public benefits by mitigating the virus's proliferation. Yet, the app sends out alerts to users only after contact with a positive tested person has occured – after potential transmission, that is. By contrast, individual users face privacy costs (Grekousis & Liu 2021). Among other factors (Kaptchuk et al. 2020, Montagni et al. 2020), CTA uptake thus depends on the willingness of people to disclose personal information (Schudy & Utikal 2017, Preibusch et al. 2013, Benndorf et al. 2015, Beresford et al. 2012). Informational nudges and monetary incentives to increase CTA use have been tried and tested with varying success (Munzert et al. 2021).

While the emergence of cooperation for the common good remains an intriguing puzzle (Nowak et al. 2004, Nowak 2006), studies have demonstrated the existence of mechanisms based on conditionality that promote cooperation (Reischmann & Oechssler 2018) – e.g., in dynamic and repeated public goods games (Oechssler et al. 2020). Behavioral insights can be leveraged in this context (van Lange et al. 2018) to make the contributions of others towards fighting Covid more salient (Jordan et al. 2021). With increased public attention towards nudging interventions in recent years (Benartzi et al. 2017) to promote collective welfare, this approach proved a promising tool to encourage pro-social behavior. According to Thaler & Sustein (2008), a nudges are defined as „any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives." Researchers have employed nudge interventions successfully in a variety of settings and policy areas (Halpern 2015; Allcott 2011) including medicine (Johnson & Goldstein 2003) and Covid specifically (Serra-Garcia & Szech 2021). Other examples in the domain of public health include nudges that help to increase attendance of healthcare appointments (Hallsworth et al. 2015), encourage physical activity (Milkman et al. 2014), establish healthier dieting habits (Wisdom et al. 2010), or to motivate people to get their flu vaccine shot (Milkman et al. 2021).

An effective way to nudge public good provision and other-regarding behavior is the communication of social norms in an attempt to motivate people to conform with the salient norm (Kraft-Todd et al. 2015, Krupka & Weber 2013, Hallsworth et al. 2017, Bicchieri & Dimant 2019, Pruckner & Sausgruber 2013). Such social norm interventions are often implementable at low cost and might be added to existing communication channels. There are several ways to categorize social norm nudges with a particularly prominent distinction (Cialdini 1984) being the one between injunctive and descriptive norms. While injunctive norms state what others regard as appropriate behavior, the pervasive effect of descriptive norms lies in stating how, on average, other people – who are in the same situation – *actually* behave. Depending on the setting, descriptive norms

might be more effective category since they do not only reflect on hypotheticals but on real behavior. Yet, they also carry an inherent risk of unintended consequences as people who are already behaving in a desirable way might receive this social norm information as a signal that their own behavior is „above average" which provides them with moral leeway to slacken their efforts.

A closely related strand of the nudging literature highlights social influence and employs the provision of social information to study effects on individual behavior, where the observed behavior need not necessarily be the overall prevalent course of action – i.e. the social norm – but rather an individual observation. Receiving social information about the choice taken by another person who was confronted with the same decision choice might yield value to the observer in two different ways: First, in a situation where the expected values of choice options remains obscure, social proof can provide an informational cue as to what might be the individually optimal or most acceptable option. In a normatively relevant situation, social proof can additionally serve as an indication of the morally appropriate and socially acceptable course of action, or even as a quick reminder of the moral obligation, one should adhere to. In any case, there exists plenty of empirical evidence suggesting that behavior – and, in particular pro-social behavior – can be contagious (Sisco & Weber 2019, Centola 2010, Bond et al. 2012). Previous studies have build on that insight and employed moral message to nudge behavioral cascades (Fowler & Christakis 2010).

Emphasis on the informational value of observing others' behvaior, on the other hand, is very much in line with a more game-theoretically informed perspective on behavior (Milgrom & Roberts 1986). Paying to send a recommendation message constitutes a costly signal about the unknown expected value of opting to send. When receiving the message, a Bayesian agent adjusts her prior belief about the value towards this new piece of information and decides accordingly.

Both perspectives on the informational value of social information arrive at common predictions regarding the effect of costly messages which we formulate as our first set of hypotheses:

H1   *Social messages influence others' moral behavior.*

H2   *Moral behavior of receivers increasing with higher costs of messages.*

The course of the pandemic has brought up a range of moral questions and dilemmas. Due to the omnipresence of COVID-19 related topics, such moral questions were frequently discussed in public and private conversations. One specific problem that rose to sinister prominence early on in the aftermath of the events in Northern Italy and New York City was the question of triaging patients. E.g. in hospitals in Italy and the US, not enough ventilators were available for patients in need. Doctors were confronted with the grueling task of selecting some patients while rejecting others (Glenza 2020)– fully aware of the potential consequences this decision would entail. We asked subjects via an incentive-compatible approach (Krupka & Weber 2013) to judge the moral appropriateness of a triage decision between two patients, coupled with the possibility to take into account or not take into account prior patient behavior. In particular, we studied two different cases: In the first case, one of the patients had previously discouraged others from using the

COVID-19 tracing app before falling ill. In the second case, one of the patients had rejected to get a widely available and safe vaccine before falling ill. In both cases, the other patients had not engaged in that trangressive behavior.

Besides the problem of triage, we also examine a question regarding COVID-19 treatment costs and the tension between individual responsibility and common solidarity in the health care system. We asked subjects to evaluate the moral appropriateness of requiring patients to (partly) bear costs from their COVID-19 treatment themselves after those patients previously transgressed against measures of safety and caution before falling ill. As with the triage question, those transgressions are represented (a) by opposing the use of the app and (b) by refusing to get vaccinated.

Studies show that people are willing to punish – even at individual cost – the behavior of others when they act in an anti-social or non-cooperative way (Fehr & Gächter 2002). We study if subjects also take into account patient behavior when it comes to judging the outcome of moral dilemmas and if subjects would also tend to punish questionable behavior in these circumstances. One might assume e.g., that subjects find it morally problematic in terms of an equitable distribution to favor a trangressing patient over another patient about whom such transgressions are not known.

Are these concerns aggravated when subjects received a costly social message prior to passing a judgment? Learning about another person's willingness to bear individual costs to send a message may put a focus on the fact that some people act very pro-social and cautions while others – such as the trangressing patients we present – lack this ambition. This focus could in turn increase subjects' willingness to consider the individual responsibility of patients for falling ill in a triage dilemma. Respectively, the focus on large costs voluntarily borne by some to promote the common good – contrasted with the failure of others to comply with basic safety standards – might increase the appropriateness rating of holding transgressors financially liable for the costs caused by their COVID-19 treatment. In light of these considerations, we formulate our third hypothesis:

H3   *Social messages influence norm perceptions of receivers.*

4   Results

Subjects are willing to pay substantial amounts to send a recommendation. When they do not receive a costly message before making their decision, the willingness to pay for a recommendation averages at 3.95 EUR which we observe in our control group. With most subjects being students (average age = 24.6 years), this amount already is noteworthy. Looking at the decisions of subjects in our treatments groups where they received either the *1cent, 2EUR, 10EUR,* or *20EUR* message, we find that subjects are on average willing to pay 5.95 EUR to send a recommendation message for the app (Figure 1). Compared to the control group which we use as baseline, this amounts to a relative increase of more than 50% as a result of this simple nudge.
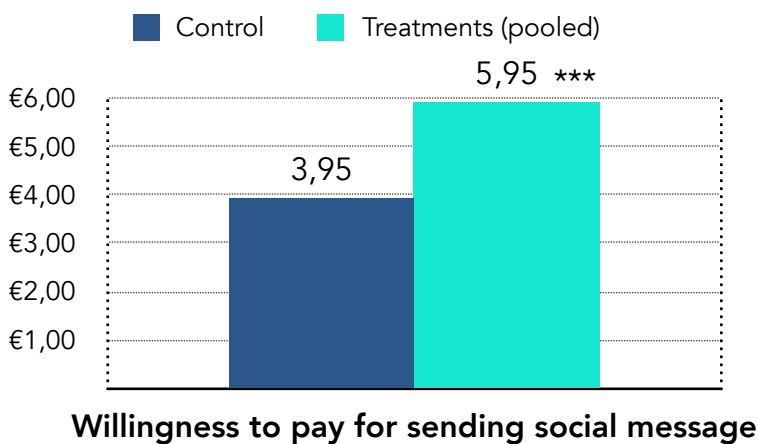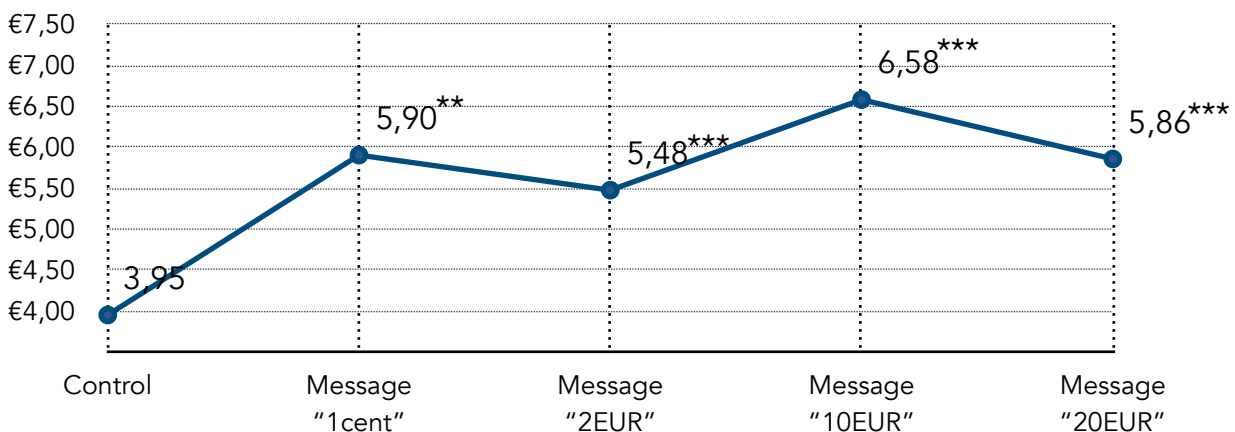

Willingness to pay for sending social message

Figure 1. Receiving a costly social message substantially increases willingness to pay for the receiver. Pairwise Wilcoxon rank-sum test: *p* = 0.0001.

**Result 1**   *We can confirm hypothesis H1 based on the observed treatment effects.*

Willingness to pay for sending a message, different treatments

Figure 2. Receiving a costly social message affects own messaging behavior. *Note:* This figure presents the average willingness to pay for sending a social message in the different treatment condition group – elicited using the multiple price list format. Stars indicate the p-values resulting from pairwise Wilcoxon rank-sum tests against the control group (where no message was received prior to the decision). * *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01.

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Examining the different treatments individually, we find that subjects receiving the *10EUR message* display the highest average willingness to pay at 6.58 EUR (Figure 2). Compared to the baseline wtp of 3.95 EUR, this constitutes a relative increase of more than 66%. All four treatments, however, yield a large, postive and statistically significant effect (p=0.0179 *1 cent message*, and p<0.01 respectively for the three other treatments) on wtp compared to the baseline level. The smallest relative increase still amounts to roughly 38% and is associated with the *2EUR message* where subjects were willing to pay 5.48 EUR on average. Even in the case where the observed cost is as low as 1 cent, messages prove to be highly effective. However, we do not find clear evidence to support the idea that higher costs for sending systematically translate into higher wtp on the receiving side. While we find modest variation in wtp between the four treatments ranging from 5.48 EUR to 6.58 EUR, those differences are not statistically significant. Interestingly, the data suggest that there could be a level of observed cost above which additional cost for the sender do not yield an additional effect on the receiver's behavior.

Result 2   *We reject hypothesis H2 based the treatment effects we find. Variation in wtp between the different message treatments is statistically not significant.*

Overall, as one might expect based on charitable giving literature, females () display substantially higher wtp than males (N=289, mean wtp= 6,03 EUR versus N=415, mean wtp=5,19 EUR; p=0.036 Wilcoxon rank-sum test). Not surprinsingly, the roughly 25% of subjects in our sample stating they had not previously installed and used the tracing app on their phone, also exhibit a significantly lower wtp compared to those who do use the app (N=168, mean wtp=4.03 EUR versus N=539, mean wtp=6.02 EUR; p=0.0 Wilcoxon rank-sum test).
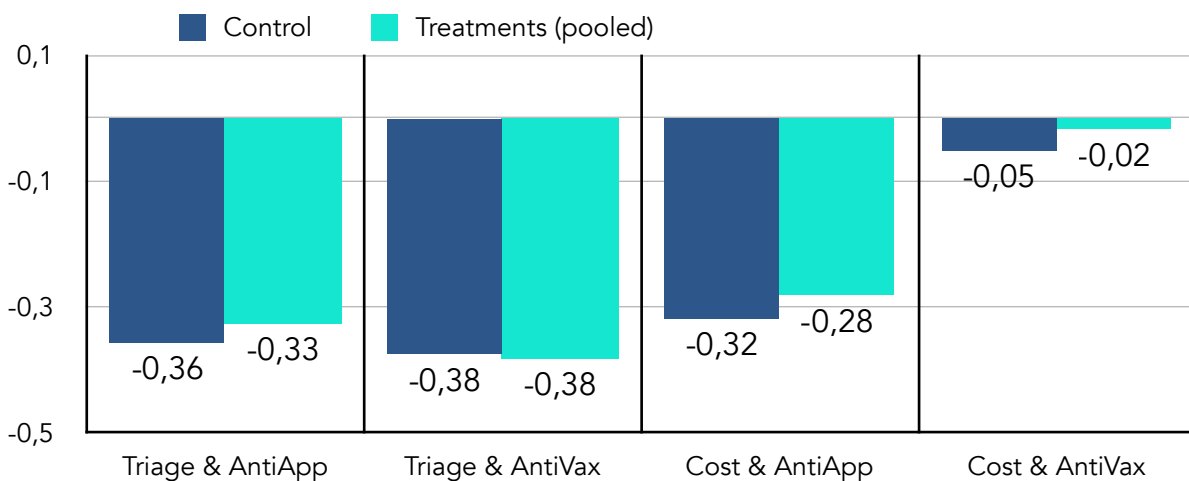
Normative expectations

Figure 3. Subjects consider individual behavior relevant in judging COVID-19 related moral dilemmas. The columns indicate subjects' moral appropriateness rating (1="very appropriate" to –1 "very inappropriate"). In the first two cases, subjects rate a situation where a transgressing patient is favored in a triage decision. The third and fourth concern a transgressing patient that has to bear part of her treatment costs.

Normative expectations appear remarkably constant across treatment variation. We find that receiving a costly social message does not affect normative judgment for the triage scenario and the cost scenario (Figure 3, 4, 6). Looking a treatment groups individually and using the Wilcoxon rank-sum test again, we find that none of the treatments has any significant effect on any of the normative expectation we elicited – not even at the p=0.1 level.

Result 3   *We reject hypothesis H3. In our data, receiving a social message does not affect normative expectations.*

Examining the same two types of patient behavior (AntiApp & AntiVax) against the backdrop of two distinct moral dilemmas allows us to draw relative comparisons of the normative judgments. In light of the very high stakes and existential triage decision, AntiVax behavior is consistently seen as more morally relevant across all treatments ($p < 0.05$, matched ttest). However, the ratings of the case involving AntiApp behavior is quite close across treatments (Figure 4).

For the cost scenario where stakes are still high but also not as existential as in the triage scenario, we again find that AntiVax behavior is regarded as morally more problematic. Here though, the difference between ratings based on AntiApp versus AntiVax behavior ($p < 0.01$, matched ttest) is substantially larger (Figure 5).

Result 4   *Opting against getting vaccinated bears greater moral relevance as compared to advocating against using the COVID-19 tracing app.*
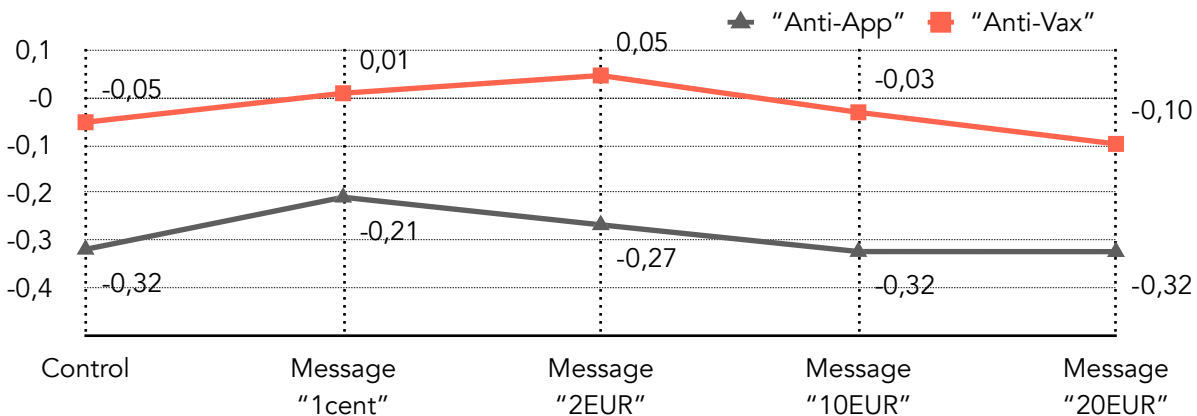
Is it morally appropriate to reclaim medical costs for a COVID-19 treatment from someone who is "AntiApp" or "AntiVax"?

Figure 4. "Anti-Vax" behavior entails larger moral relevance than "Anti-App", and normative expectations are robust regardless of which social message – if any – had been received. *Note:* This figure shows subjects' average assessment of the moral appropriateness for the cost sharing case – elicited in an incentive-compatible guessing game. The response scale ranges from -1 = "morally very inappropriate" to 1 = "morally very appropriate".
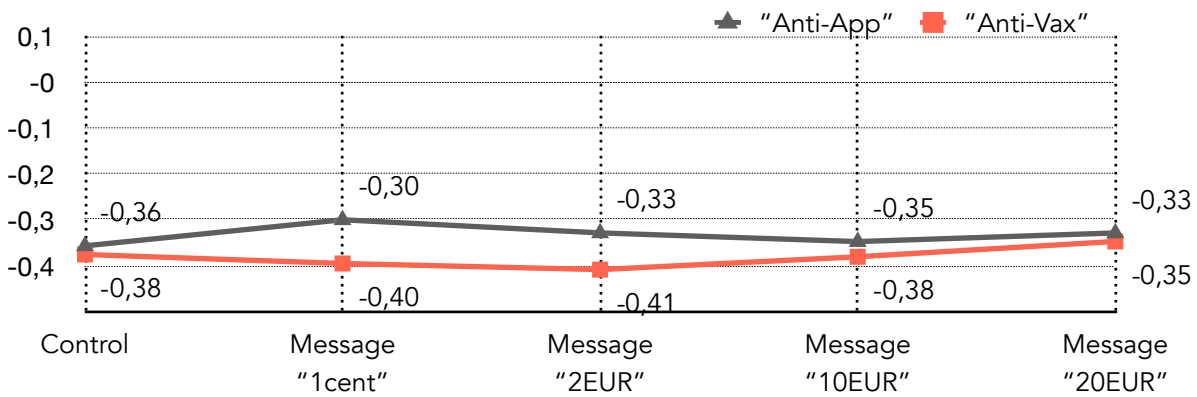
Triage for COVID-19 treatment: Is it morally appropriate to favor a person who is "AntiApp" or "AntiVax"?

Figure 5. When weighing an existential triage decision, the type of risky behavior a patient engaged in ("Anti-Vax" v. "Anti-App") carries less relevance for normative judgment than in the cost sharing case. Normative expectations are, again, robust between treatment conditions. *Note:* This figure shows subjects' average assessment of moral appropriateness for the triage case – elicited in an incentive-compatible guessing game. The response scale ranges from -1 = "morally very inappropriate" to 1 = "morally very appropriate".

Result 5   *The difference in normative relevance betwenn Anti-App and Anti-Vax*
        behavior (Result 4) is greater in the cost scenario with relatively lower
stakes as compared to the triage scenario that invoves very high stakes.

Further observation: Subjects stating not to use the app differ in another dimension as well –their normative judgment of people refusing to get vaccinated is much more favorable. This applies to both scenarios studied, the triage decision and the case of passing on costs of medical treatment.

Regarding risk attitudes, there is no meaningful relation neither to messaging behavior, nor to normative expectations. As one would expect, females in our sample tend to be slightly more risk-averse. They average 5.42 safe choices in the selection task, while males opt for the safe choice in 4.96 cases out of 10.

5 Conclusion

Social messages can be leveraged as a powerful and effective nudge to promote pro-social behavior. We strongly encourage policy-makers to appreciate in future considerations the enormous potential of making good examples and role models more visible. Increased observability of pro-social behavior promises behavioral contagion that in the end contributes to the common good. The findings can and should inform communication strategies and information campaign in connection tackling public health issues.

The media holds the power to play an important part as well and could learn from these findings. While a lot of coverage during the pandemic has focussed on the deviant behavior of a small subsgroup of the population, the considerate and diligent behavior of the overwhelming majority for most of the time, day in and day out, received comparatively little attention.

Re-adjusting that focus and making admirable acts of pro-sociality more visibile will increase their salience. This in turn can help to spark motivation in observers to set higher standards of behavior for themselves. This ambition is enormously important in taking on any challenge of enormous scale like a global pandemic. It might even initiate a virtuous cycle at times where observing pro-social behavior turns out to be self-reinforcing.

References

Abueg, Matthew, Robert Hinch, Neo Wu, Luyang Liu, William Probert, Austin Wu, Paul Eastham, et al. 2021. "Modeling the Effect of Exposure Notification and Non-Pharmaceutical Interventions on COVID-19 Transmission in Washington State." Npj Digital Medicine 4 (1): 49. https://doi.org/10.1038/s41746-021-00422-7.

Aleta, Alberto, David Martín-Corral, Ana Pastore y Piontti, Marco Ajelli, Maria Litvinova, Matteo Chinazzi, Natalie E. Dean, et al. 2020. "Modelling the Impact of Testing, Contact Tracing and Household Quarantine on Second Waves of COVID-19." Nature Human Behaviour 4 (9): 964–71. https://doi.org/10.1038/s41562-020-0931-9.

Allcott, Hunt. 2011. "Social Norms and Energy Conservation." Journal of Public Economics 95 (9–10): 1082–95. https://doi.org/10.1016/j.jpubeco.2011.03.003.

Allcott, Hunt, Luca Braghieri, Sarah Eichmeyer, and Matthew Gentzkow. 2020. "The Welfare Effects of Social Media." American Economic Review 110 (3): 629–76. https://doi.org/10.1257/aer.20190658.

Allcott, Hunt, Levi Boxell, Jacob Conway, Matthew Gentzkow, Michael Thaler, and David Yang. 2020. "Polarization and Public Health: Partisan Differences in Social Distancing during the Coronavirus Pandemic." Journal of Public Economics 191 (November): 104254. https://doi.org/10.1016/j.jpubeco.2020.104254.

Allcott, Hunt, and Matthew Gentzkow. 2017. "Social Media and Fake News in the 2016 Election." Journal of Economic Perspectives 31 (2): 211–36. https://doi.org/10.1257/jep.31.2.211.

Allcott, Hunt, Matthew Gentzkow, and Chuan Yu. 2019. "Trends in the Diffusion of Misinformation on Social Media." Research & Politics 6 (2): 205316801984855. https://doi.org/10.1177/2053168019848554.

Almagor, Jonatan, and Stefano Picascia. 2020. "Exploring the Effectiveness of a COVID-19 Contact Tracing App Using an Agent-Based Model." Scientific Reports 10 (1): 22235. https://doi.org/10.1038/s41598-020-79000-y.

Anderson, Steffen, Glenn W. Harrison, Morten I. Lau, and Rutstrom E. Elisabet. 2007. "Valuation Using Multiple Price List Formats⋅." Applied Economics 39 (6): 675–82. https://doi.org/10.1080/00036840500462046.

Bavel, Jay J. Van, Katherine Baicker, Paulo S. Boggio, Valerio Capraro, Aleksandra Cichocka, Mina Cikara, Molly J. Crockett, et al. 2020. "Using Social and Behavioural Science to Support COVID-19 Pandemic Response." Nature Human Behaviour 4 (5): 460–71. https://doi.org/10.1038/s41562-020-0884-z.

Bella, Timothy. 2021. "Florida Doctor Says She Won't Treat Unvaccinated Patients in Person." The Washington Post, 2021. https://www.washingtonpost.com/health/2021/09/07/florida-doctor-unvaccinated-patients-marraccini/.

Benartzi, Shlomo, John Beshears, Katherine L. Milkman, Cass R. Sunstein, Richard H. Thaler, Maya Shankar, Will Tucker-Ray, William J. Congdon, and Steven Galing. 2017. "Should Governments Invest More in Nudging?" Psychological Science 28 (8): 1041–55. https://doi.org/10.1177/0956797617702501.

Benndorf, Volker, Dorothea Kübler, and Hans-Theo Normann. 2015. "Privacy Concerns, Voluntary Disclosure of Information, and Unraveling: An Experiment." European Economic Review 75 (April): 43–59. https://doi.org/10.1016/j.euroecorev.2015.01.005.

Beresford, Alastair R., Dorothea Kübler, and Sören Preibusch. 2012. "Unwillingness to Pay for Privacy: A Field Experiment." Economics Letters 117 (1): 25–27. https://doi.org/10.1016/j.econlet.2012.04.077.

Berger, Jonah, and Katherine L. Milkman. 2012. "What Makes Online Content Viral?" Journal of Marketing Research 49 (2): 192–205. https://doi.org/10.1509/jmr.10.0353.

Bicchieri, Cristina, and Eugen Dimant. 2019. "Nudging with Care: The Risks and Benefits of Social Information." Public Choice, July. https://doi.org/10.1007/s11127-019-00684-6.

Bock, Olaf, Ingmar Baetge, and Andreas Nicklisch. 2014. "Hroot: Hamburg Registration and Organization Online Tool." European Economic Review 71 (October): 117–20. https://doi.org/10.1016/j.euroecorev.2014.07.003.

Bond, Robert M., Christopher J. Fariss, Jason J. Jones, Adam D. I. Kramer, Cameron Marlow, Jaime E. Settle, and James H. Fowler. 2012. "A 61-Million-Person Experiment in Social Influence and Political Mobilization." Nature 489 (7415): 295–98. https://doi.org/10.1038/nature11421.

Capraro, Valerio, Glorianna Jagfeld, Rana Klein, Mathijs Mul, and Iris van de Pol. 2019. "Increasing Altruistic and Cooperative Behaviour with Simple Moral Nudges." Scientific Reports 9 (1): 11880. https://doi.org/10.1038/s41598-019-48094-4.

Capraro, Valerio, and Alessandra Marcelletti. 2015. "Do Good Actions Inspire Good Actions in Others?" Scientific Reports 4 (1): 7470. https://doi.org/10.1038/srep07470.

Centola, Damon. 2010. "The Spread of Behavior in an Online Social Network Experiment." Science 329 (5996): 1194–97. https://doi.org/10.1126/science.1185231.

Cialdini, Robert B. 1984. Influence: The Psychology of Persuasion. Melbourne: Business Library.

Cinelli, Matteo, Walter Quattrociocchi, Alessandro Galeazzi, Carlo Michele Valensise, Emanuele Brugnoli, Ana Lucia Schmidt, Paola Zola, Fabiana Zollo, and Antonio Scala. 2020. "The COVID-19 Social Media Infodemic." Scientific Reports 10 (1): 16598. https://doi.org/10.1038/s41598-020-73510-5.

Colizza, Vittoria, Eva Grill, Rafael Mikolajczyk, Ciro Cattuto, Adam Kucharski, Steven Riley, Michelle Kendall, et al. 2021. "Time to Evaluate COVID-19 Contact-Tracing Apps." Nature Medicine 27 (3): 361–62. https://doi.org/10.1038/s41591-021-01236-6.

Cuello-Garcia, C., Pérez-Gaxiola, G., & van Amelsvoort, L. (2020). Social media can have an impact on how we manage and investigate the COVID-19 pandemic. Journal of clinical epidemiology, 127, 198-201.

Dal Bó, Ernesto, and Pedro Dal Bó. 2014. "'Do the Right Thing:' The Effects of Moral Suasion on Cooperation." Journal of Public Economics 117 (September): 28–38. https://doi.org/10.1016/j.jpubeco.2014.05.002.

Fehr, Ernst, and Simon Gächter. 2002. "Altruistic Punishment in Humans." Nature 415 (6868): 137–40. https://doi.org/10.1038/415137a.

Fischbacher, Urs, Simon Gächter, and Ernst Fehr. 2001. "Are People Conditionally Cooperative? Evidence from a Public Goods Experiment." Economics Letters 71 (3): 397–404. https://doi.org/10.1016/S0165-1765(01)00394-9.

Fowler, J. H., and N. A. Christakis. 2010. "Cooperative Behavior Cascades in Human Social Networks." Proceedings of the National Academy of Sciences 107 (12): 5334–38. https://doi.org/10.1073/pnas.0913149107.

Glenza, Jessica. 2020. "Who gets a ventilator? The 'gut-wrenching' choices facing US health workers." The Guardian. Published online at theguardian.com on April 9, 2020. Retrieved from: https://www.theguardian.com/world/2020/apr/09/us-healthcare-workers-make-gut-wrenching-decisions-coronavirus' [Online Resource]

Grekousis, George, and Ye Liu. 2021. "Digital Contact Tracing, Community Uptake, and Proximity Awareness Technology to Fight COVID-19: A Systematic Review." Sustainable Cities and Society 71 (August): 102995. https://doi.org/10.1016/j.scs.2021.102995.

Hallsworth, Michael, Dan Berry, Michael Sanders, Anna Sallis, Dominic King, Ivo Vlaev, and Ara Darzi. 2015. Stating appointment costs in SMS reminders reduces missed hospital appointments: findings from two randomised controlled trials. PloS one, 10(9), e0137306.

Hallsworth, Michael, John A. List, Robert D. Metcalfe, and Ivo Vlaev. 2017. "The Behavioralist as Tax Collector: Using Natural Field Experiments to Enhance Tax Compliance." Journal of Public Economics 148 (April): 14–31. https://doi.org/10.1016/j.jpubeco.2017.02.003.

Halpern, David. 2015. Inside the Nudge Unit: How Small Changes Can Make a Big Difference. London: Allen.

Holt, Charles A, and Susan K Laury. 2002. "Risk Aversion and Incentive Effects." American Economic Review 92 (5): 1644–55. https://doi.org/10.1257/000282802762024700.

Howell O'Neill, Patrick, Tate Ryan-Mosley, and Bobbie Johnson. 2020. "MIT Technology Review Covid Tracing Tracker." MIT Technology Review (blog). 2020. https://www.technologyreview.com/2020/05/07/1000961/launching-mittr-covid-tracing-tracker.

Johnson, Eric J., and Daniel Goldstein. 2003. "Do Defaults Save Lives?" Science 302 (5649): 1338–39. https://doi.org/10.1126/science.1091721.

Jordan, Jillian J., Erez Yoeli, and David G. Rand. 2021. "Don't get it or don't spread it: comparing self-interested versus prosocial motivations for COVID-19 prevention behaviors." Sci Rep 11, 20222. https://doi.org/10.1038/s41598-021-97617-5

Kaptchuk, Gabriel, Daniel G. Goldstein, Eszter Hargittai, Jake Hofman, & Elissa M. Redmiles. 2020. "How good is good enough for COVID19 apps? The influence of benefits, accuracy, and privacy on willingness to adopt". arXiv preprint arXiv:2005.04343.

Kraft-Todd, Gordon, Erez Yoeli, Syon Bhanot, and David Rand. 2015. "Promoting Cooperation in the Field." Current Opinion in Behavioral Sciences 3 (June): 96–101. https://doi.org/10.1016/j.cobeha.2015.02.006.

Krupka, Erin L., and Roberto A. Weber. 2013. "IDENTIFYING SOCIAL NORMS USING COORDINATION GAMES: WHY DOES DICTATOR GAME SHARING VARY?: Identifying Social Norms Using Coordination Games." Journal of the European Economic Association 11 (3): 495–524. https://doi.org/10.1111/jeea.12006.

López, Jesus A., Beatriz Arregui García, Piotr Bentkowski, Livio Bioglio, Francesco Pinotti, Pierre-Yves Boëlle, et al. 2021. "Anatomy of digital contact tracing: Role of age, transmission setting, adoption, and case detection." Science advances, 7(15).

Kucharski, Adam J, Petra Klepac, Andrew J K Conlan, Stephen M Kissler, Maria L Tang, Hannah Fry, Julia R Gog, et al. 2020. "Effectiveness of Isolation, Testing, Contact Tracing, and Physical Distancing on Reducing Transmission of SARS-CoV-2 in Different Settings: A Mathematical Modelling Study." The Lancet Infectious Diseases 20 (10): 1151–60. https://doi.org/10.1016/S1473-3099(20)30457-6.

Milgrom, Paul, and John Roberts. 1986. "Price and Advertising Signals of Product Quality." Journal of Political Economy 94 (4): 796–821. https://doi.org/10.1086/261408.

Milkman, Katherine L., Julia A. Minson, and Kevin G. M. Volpp. 2014. "Holding the Hunger Games Hostage at the Gym: An Evaluation of Temptation Bundling." Management Science 60 (2): 283–99. https://doi.org/10.1287/mnsc.2013.1784.

Milkman, Katherine L., Mitesh S. Patel, Linnea Gandhi, Heather N. Graci, Dena M. Gromet, Hung Ho, Joseph S. Kay, et al. 2021. "A Megastudy of Text-Based Nudges Encouraging Patients to Get Vaccinated at an Upcoming Doctor's Appointment." Proceedings of the National Academy of Sciences 118 (20): e2101165118. https://doi.org/10.1073/pnas.2101165118.

Montagni, Ilaria, Nicolas Roussel, Rodolphe Thiébaut, and Christophe Tzourio. 2020. "The French Covid-19 Contact Tracing App: Knowledge, Attitudes, Beliefs and Practices of Students in the Health Domain." Preprint. Medical Education. https://doi.org/10.1101/2020.10.23.20218214.

Munzert, Simon, Peter Selb, Anita Gohdes, Lukas F. Stoetzer, and Will Lowe. 2021. "Tracking and Promoting the Usage of a COVID-19 Contact Tracing App." Nature Human Behaviour 5 (2): 247–55. https://doi.org/10.1038/s41562-020-01044-x.

Nowak, Martin A. 2006. "Five Rules for the Evolution of Cooperation." Science 314 (5805): 1560–63. https://doi.org/10.1126/science.1133755.

Nowak, Martin A., Akira Sasaki, Christine Taylor, and Drew Fudenberg. 2004. "Emergence of Cooperation and Evolutionary Stability in Finite Populations." Nature 428 (6983): 646–50. https://doi.org/10.1038/nature02414.

Oechssler, Joerg, Andreas Reischmann, and Andis Sofianos. 2020. "The Conditional Contribution Mechanism for Repeated Public Goods: The General Case." https://www.econstor.eu/bitstream/10419/204568/1/1678198366.pdf.

Onnela, J.-P., and F. Reed-Tsochas. 2010. "Spontaneous Emergence of Social Influence in Online Systems." Proceedings of the National Academy of Sciences 107 (43): 18375–80. https://doi.org/10.1073/pnas.0914572107.

Preibusch, Sören, Dorothea Kübler, and Alastair R. Beresford. 2013. "Price versus Privacy: An Experiment into the Competitive Advantage of Collecting Less Personal Information." Electronic Commerce Research 13 (4): 423–55. https://doi.org/10.1007/s10660-013-9130-3.

Pruckner, Gerald J., and Rupert Sausgruber. 2013. "HONESTY ON THE STREETS: A FIELD STUDY ON NEWSPAPER PURCHASING: Honesty on the Streets." Journal of the European Economic Association 11 (3): 661–79. https://doi.org/10.1111/jeea.12016.

Rathje, Steve, Jay J. Van Bavel, and Sander van der Linden. 2021. "Out-Group Animosity Drives Engagement on Social Media." Proceedings of the National Academy of Sciences 118 (26): e2024292118. https://doi.org/10.1073/pnas.2024292118.

Reischmann, Andreas, and Joerg Oechssler. 2018. "The Binary Conditional Contribution Mechanism for Public Good Provision in Dynamic Settings — Theory and Experimental Evidence." Journal of Public Economics 159 (March): 104–15. https://doi.org/10.1016/j.jpubeco.2018.02.009.

Sacerdote, Bruce, Ranjan Sehgal, and Molly Cook. 2020. "Why Is All COVID-19 News Bad News?" w28110. Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.3386/w28110.

Salganik, Matthew J., Peter Sheridan Dodds, and Duncan J. Watts. 2006. "Experimental Study of Inequality and Unpredictability in an Artificial Cultural Market." Science 311 (5762): 854–56. https://doi.org/10.1126/science.1121066.

Schudy, Simeon, and Verena Utikal. 2017. "'You Must Not Know about Me'—On the Willingness to Share Personal Data." Journal of Economic Behavior & Organization 141 (September): 1–13. https://doi.org/10.1016/j.jebo.2017.05.023.

Serra-Garcia, Marta, and Nora Szech. 2021. "Choice Architecture and Incentives Increase COVID-19 Vaccine Intentions and Test Demand." SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3818182.

Sisco, Matthew R., and Elke U. Weber. 2019. "Examining Charitable Giving in Real-World Online Donations." Nature Communications 10 (1): 3968. https://doi.org/10.1038/s41467-019-11852-z.

Sunstein, Cass R. 2017. #Republic: Divided Democracy in the Age of Social Media. Princeton; Oxford: Princeton University Press.

Thaler, Richard H., and Cass R. Sunstein. 2008. Nudge: Improving Decisions about Health, Wealth, and Happiness. Rev. and Expanded ed. New York: Penguin Books.

Van Lange, Paul A. M., Jeff Joireman, and Manfred Milinski. 2018. "Climate Change: What Psychology Can Offer in Terms of Insights and Solutions." Current Directions in Psychological Science 27 (4): 269–74. https://doi.org/10.1177/0963721417753945.

Wikler, Daniel. 2021. "When Medical Care Must Be Rationed, Should Vaccination Status Count?" The Washington Post, 2021. https://www.washingtonpost.com/outlook/2021/08/23/refuse-covid-treatment-unvaccinated-triage/.

Wisdom, Jessica, Julie S Downs, and George Loewenstein. 2010. "Promoting Healthy Choices: Information versus Convenience." American Economic Journal: Applied Economics 2 (2): 164–78. https://doi.org/10.1257/app.2.2.164.

Wymant, Chris, Luca Ferretti, Daphne Tsallis, Marcos Charalambides, Lucie Abeler-Dörner, David Bonsall, Robert Hinch, et al. 2021. "The Epidemiological Impact of the NHS COVID-19 App." Nature 594 (7863): 408–12. https://doi.org/10.1038/s41586-021-03606-z.