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Using Social and Behavioral Science to Support COVID-19 Pandemic Response

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ABSTRACT

The COVID-19 pandemic represents a massive, global health crisis. Because the crisis requires large-scale behavior change and poses significant psychological burdens on individuals, insights from the social and behavioral sciences are critical for optimizing pandemic response. Here, the authors review relevant research from a diversity of research areas relevant to different dimensions of pandemic response. They review foundational work on navigating threats, social and cultural factors, science communication, moral decision-making, leadership, and stress and coping that is relevant to pandemics. In each section, they outline implications for solving public health issues related to COVID-19. This interdisciplinary review points to several ways in which research can be immediately applied to optimize response to this pandemic, but also points to several important gaps that researchers should move quickly to fill in the coming weeks and months.

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Introduction

On December 12, 2019 a new coronavirus (COVID-19) emerged, sparking an epidemic of acute respiratory syndrome in humans in Wuhan, China (see [1]). Within three months, the virus had spread to more than 118,000 cases and 4,291 deaths in 114 countries, leading the World Health Organization to declare a global pandemic. The virus is highly contagious and there is no known vaccine or specific antiviral treatment for COVID-19. The pandemic has led to a massive and immediate global public health campaign to reduce the spread of the virus by increasing hand washing, avoidance of contact with the face, and physical distancing.

An effective response to COVID-19 or another pandemic requires contributions from across the sciences. The central scientific contributions to a pandemic are medical and biological: the need to understand the virus' properties, identify effective treatments, and to develop and test a vaccine. Epidemiologists, policy analysts, public health scholars, engineers, computer scientists, and network researchers all can help, for example in effectively modelling the virus' spread, coordinating responders, and designing and producing materials needed for effective treatment. Optimizing public health during this pandemic also requires knowledge from the social and behavioral sciences.

Social and behavioral sciences can support efforts to identify effective public health messages, encourage compliance with government directives, design institutional responses that are well-calibrated to human behavior, sustain prosocial motivations in large, disconnected societies, manage anxiety and loneliness, identify cultural factors that can minimize the spread of the virus and motivate compassion for, and costly actions that benefit, vulnerable groups. The current paper reviews insights derived from several particularly relevant areas of research in the social and behavioral sciences. For each of these areas, we highlight relevant findings, derive insights of potential use to policy makers, leaders, and the general public, and highlight areas where future research is needed.

Navigating Threats

Historically, infectious diseases have been responsible for the greatest human death tolls. The bubonic plague killed approximately 25% of the European population [2]. From a psychological perspective, it is critical to understand how people think and behave when they appraise a pandemic to be such a threat. In this section, we discuss how people perceive and respond to threats during a pandemic and the downstream consequences for decision-making and intergroup relations.

Threat

One of the central emotional responses during a pandemic is a feeling of fear. Humans, like other animals, possess a set of defensive systems that have evolved to combat such ecological threats [3,4]. However, some of the survival strategies we employ can leave us psychologically vulnerable and these may be amplified by social media sites, which bombard us with threatening information about the growth of a pandemic.

To survive, it is better to observe a conspecific being attacked by a predator than to be attacked ourselves. Humans have the enhanced capacity to vicariously learn about threats [5]. However, we not only learn by observation, but also via books, the internet, movies, newspapers, music, and tales. While these rich forms of vicarious learning are adaptive, particularly to our ancestors who were mainly concerned with threats in their ecology, in the modern world our brains have not evolved to process information on a global level. Negative emotions are also contagious [6] and fear makes us perceive threats as more imminent [7]. With over three billion people on social media, this will likely serve as a significant source of threat for modern pandemics.

Humans also have an outstanding ability to envisage future threats to protect our future selves via prevention strategies. In other words, if we can imagine encounters with future threats we can avoid them [4]. However, people often suffer from optimism bias, which can lead them to believe they are less likely to acquire a disease [8]. If so, they may fail to engage in public health behaviors, like distancing, which could spread the infectious disease. Finding strategies for overcoming these errors in threat prediction will likely be critical for mobilizing effective public health campaigns during pandemics.

Moral Emotions

Concerns about contracting a highly contagious disease are likely to elicit the emotion of disgust [9]. This reaction is part of an evolutionarily adaptive mechanism, which ensures that we stay away from rotten food, dirty objects and surfaces, as well as people who may carry a communicable disease [10,11]. Feelings of disgust, however, can also bleed into how we form impressions of other people [12,13]. With worries about physical health more salient, people may become more judgmental of others' behavior, and make less charitable interpretations [14,15]. Thus, policy makers need to be aware that even their most sincere attempts at improving the situation may be met with distrust, and therefore frequent and transparent communication about the crisis, and resulting recommendations and interventions, is of utmost importance.

On the positive side, emotions can also be powerful when we look up to those whose moral compass we admire. So-called *moral elevation* is the feeling of being uplifted and inspired by others' prosocial, selfless acts, and this experience prompts observers to also act with kindness and generosity themselves [16]. Thus, exceptional role models can motivate people to put their own values into action [17,18]. Highlighting the exceptionally selfless behavior of ordinary citizens or having respected politicians and celebrities lead the way with exemplary behavior and sacrifice could produce a contagion of a different kind, namely one of prosocial behavior and cooperation which we discuss in more detail in a later section.

Existential threat

Unfortunately, thinking about one's possible demise can create existential angst[19]. Likewise, thinking about the possible demise of one's cherished social group (e.g., one's nation), or humanity as a whole, can create collective angst [20]. People who perceive threats like a pandemic to be existential feel collective angst as a result [21] and take action to eliminate the threat. During a pandemic, this may result in some constructive action.

However, existential threat-induced angst can also have negative consequences. People may hoard products (e.g., toilet paper, medicine), potentially making them inaccessible to those in real need. For instance, Americans who were led to believe that COVID-19 posed an existential threat to the US reported more severe symptoms of clinical anxiety than a control [22]. Experiencing more severe clinical anxiety symptoms, in turn, predicted greater prejudice toward a perceived source of COVID-19. Thus, the experience of threat can promote both prosocial and antisocial behavior and leaders should be cautious about engaging this response.

Group threat

Although some people's reactions to fear and threat are focused on the self, other reactions are focused more on how people think about and respond to others. For instance, greater perceived vulnerability to disease is associated with higher levels of ethnocentrism [23], and greater fear and perceived threat are associated with higher levels of political intolerance and punitiveness toward outgroups [24–26]. Highlighting group boundaries can undermine empathy with those who are socially distant [27,28] and increase dehumanization [29] or punishment [28].

Europe's most deadly disease, the bubonic plague of the 14th century, for example, unleashed massive violence, including the murder of Catalans in Sicily, clerics and beggars in some locations, and pogroms against Jews, with over a thousand communities eradicated [30]. Although not every pandemic leads to violence, pandemics are nonetheless often associated with rampant cases of discrimination and cases of individual assault. There have been instances of physical attacks on ethnic Asian people in predominantly White countries, and some government officials' mis-characterizations of COVID-19 as the 'Wuhan/Chinese virus'[31].

Fortunately, pandemics may also offer opportunities to reduce religious and ethnic prejudice. People prioritize cooperative behavior over category-membership cues (e.g., race, nationality) when identifying those who are counted as 'us' (even in the absence of a common human enemy [32]). Coordinated efforts across individuals, communities, and governments to fight the spread of disease send strong signals of cooperation and shared values, which allow people to re-cast others who were previously considered out-group members as in-group members. This 'superordinate categorization' is most effective in cases when everyone is of equal status[33] -- that is, every one of us could get sick. These cooperative acts are already unfolding in the current pandemic. For example, 21 countries donated medical supplies to China in February, and China has reciprocated. Government officials can highlight events like these to improve out-group attitudes[34]. Likewise, making people feel safer can reduce prejudice[35].

Risk perception

People use their emotions to assess risk, motivate action, and focus their thinking. These emotional influences are generally helpful, but can also be harmful. First, emotional reactions to risky situations often diverge from cognitive evaluations and end up driving risk perceptions[36,37]. People rely on their feelings as a substitute for other information, such as the actual numeric risk. In this case, someone experiencing more negative emotion during a pandemic will perceive greater risk than if they experienced less negative emotion [38].

Emotions felt in response to a risky situation also influence judgment in two-stages[39]. First, the quality of emotion (e.g., positive vs negative) focuses the decision-maker on congruent information. That information, rather than the feeling itself, is then used to guide judgment. For example, smokers exposed to more emotional health warnings experienced more negative emotion to the warnings and smoking, spent more time examining the warnings, and recalled more risks, with subsequent effects on risk perception and quit intentions[40,41]. In the case of COVID-19, as negative emotions increase, people may seek out and/or weigh negative information about COVID-19 more than others.

Emotion also acts as a powerful motivator of behaviors[42], such as socially isolating, and washing hands, but also hoarding supplies, and supporting harsh policies. The emotion's function as direct motivator also means that, with strong emotional reactions, people often ignore important numeric information such as probabilities[43] a problem's scope[44], and the effects of time [45].

These emotional effects interact with the media who also tend to present information more negatively. The media seem to focus disproportionately, for example, on the percentage of people who die, and less so on those who survive or experience only mild symptoms. People, and especially those who are less good at math, are more susceptible to this negative framing[39]. Providing the opposite frame may help to educate the public and relieve some people's feelings of panic. Policy-makers and other communicators need to package those facts using evidence-based techniques so that complex content can be understood and used by decision makers [46].

Disaster and 'panic'

Both in popular culture and in the media, there is a widespread belief that, when in peril, people panic. That is, they act blindly and excessively in the pursuit of self-preservation, and thereby endanger the survival of all. This idea has been widely used in response to the current coronavirus outbreak – most commonly in relation to the notion of 'panic buying'[47]. However, close inspection of what happens in disasters reveals a different picture. Certainly, some people do act selfishly. But there are many instances when they display remarkable altruism and where they act in an orderly and norm-governed way. Moreover, when people die it is less from *over*-reaction than from *under*-reaction: not responding to signs of danger until it is too late.

In fact, the concept of 'panic' has largely been abandoned by researchers in the field since it neither describes nor explains what people usually do in disaster[48]. Instead, the focus has shifted to the factors which optimise how people respond: what allows people to work with each-other rather than against each-other in response to a crisis. The key factor is the emergence of a sense of shared identity which leads people to be concerned and care for others[49,50]. To some extent, this sense emerges naturally from the shared experience of being in a disaster[51]. But it is fragile and far from inevitable. It can be encouraged by addressing the public in collective terms and by urging us to act for the common good[52].

Conversely, the sense of shared identity can be undermined by representing others as one's competitors. This is precisely what happens with stories of 'panic buying' and images of empty shelves which suggest that other people are only looking out for themselves. So, the only option one has is to do likewise. In a context where people are being asked to prepare for potential self-isolation, the buying patterns are

not irrational ‘panic’ but a meaningful individual response to the available information. The more general point is that use of the notion of ‘panic’ is actively harmful. Stories that employ the language of ‘panic’ help create the very phenomena that they purport to condemn. They help create the very selfishness and competitiveness that turns sensible preparations into dysfunctional stockpiling. They serve to undermine the sense of collectivity which facilitates people coming together and supporting each-other in a crisis or disaster.

Social and Cultural Factors

Slowing viral transmission during pandemics requires significant shifts in behavior. How much people change will be influenced by aspects of the social and cultural context. The fact that people tend to follow social norms and cultural mores can sometimes have undesirable consequences. For example, continuous exposure to news examples of people going out might explain why it was difficult to convince Italians to stay at home after the COVID-19 lockdown of March 11th. However, understanding these features of the social environment, such as social norms, culture, and polarization, can help identify risk factors and successful messages and interventions.

Social Norms

People’s decisions are influenced by social norms: what they perceive others are doing or approve/disapprove of[53]. Informational influence occurs when people use others’ behavior as input for reasonable interpretations and responses[54] and is stronger when people are uncertain and outcomes are important[55]. Normative influence occurs when people conform for social approval and is associated with more conformity in public than private[56].

Although people are influenced by perceptions of norms, their estimates of behavior are frequently inaccurate[57]. For example, they underestimate health-promoting behaviors (e.g., hand washing[58]) and overestimate unhealthy behaviors[59]. Changing behaviors by correcting misperceptions is likely better achieved by public messages reinforcing health-promoting norms (e.g., common engagement in social distancing and hand-washing) rather than highlighting extreme/uncommon behaviors (e.g., panic buying, young adults gathering).

Perceived norms and corrective information are most influential when specific to others with whom we share identities[60]. This form of social influence can be problematic if it reduces learning from innovations in outgroups or if oppositional groups adopt different norms for partisan reasons (as we describe below in our section on polarization). Likewise, young adults’ behaviors may be unaffected by information about how older adults are responding. If group divides produce different rates of conformity to health-protecting behaviors, we expect to see different rates of infection/mortality and greater difficulty containing the virus. Messages that provide ingroup models for norms (e.g., members of your community) may therefore be most effective.

Another way to leverage the impact of norms falls under the general category of "nudges"[61,62], which steer people in particular directions without imposing coercion. Because people are highly reactive to the choices made by others and especially trusted others, an understanding of social norms that are seen as new or emerging can have a large impact[63]. For instance, a message with compelling social norms might say: "The overwhelming majority of people in your community believe that, in light of the risks associated with COVID-19, everyone should stay home, to the extent possible," or "Doctors believe that in light of the risks associated with COVID-9, everyone should stay home, to the extent possible." Another option is creating default decisions that guide people toward healthier behaviors. Creating messages and choice architecture that employs these principles is more likely to be effective. Nudges that employ these principles can be used, for example, to encourage people to wash their hands frequently; to maintain social distance; to stay at home to the extent possible; to avoid shaking hands with others; to avoid international travel; to stay away from large groups; and to self-quarantine if they are sick.

Culture

Cultural psychology identifies an important likely effect of pandemics on societal dynamics: the tightening of groups and associated trade-offs in order and openness. Research has shown that tight cultures, such as Singapore, Japan, and China, have strict rules and punishments for deviance, while loose cultures, such as the U.S., Italy, and Brazil, have weaker norms and are more permissive[64]. Tight nations often have extensive historical and ecological threats, including greater historical prevalence of natural disasters, invasions, population density, and pathogen outbreaks[64,65]. From an evolutionary perspective, strict rules help groups to coordinate, providing the glue that helps keep people together during a crisis[64,66].

Tight groups have more order, synchrony, and self-regulation. Yet tightness is also linked to less openness—less tolerance of stigmatized groups[25,64], lower creativity[65,67], and support for authoritarian leadership[25] and punishing gods[68]. Likewise, excessive tightening can result in higher suicide, depression, and lower happiness[69].

We would expect that the spread of COVID-19 will tighten communities. A critical question, however, is whether loose societies will adapt as quickly to the virus. Countries accustomed to prioritizing freedom over security may have more difficulty coordinating in the face of a pandemic. Accordingly, it is critical that communities negotiate social norms so that there is a healthy balance between freedom and constraint, or *tight-loose ambidexterity*[70]. Tight rules regarding social distancing are critical, yet looseness within these constraints also helps by creating novel mechanisms that help people feel connected. We describe some of these opportunities for support in the section on social support and coping below.

Political Polarization

One cultural barrier for coordinated action within countries is political polarization. Polarization among citizens comes in two varieties. *Attitudinal polarization* concerns partisans taking extreme opposing issue positions (e.g., Republicans in the U.S. oppose climate change mitigation policies while Democrats support them). Attitudinal polarization tends to occur more among more politically knowledgeable and sophisticated people (e.g, [71,72]. *Affective polarization* refers to partisans, of all types, disliking and distrusting those from opposing party(ies)[73,74]. Affective polarization has political consequences – such as a lowering of political trust[75], privileging partisan labels over policy information[76], and believing false information[77], which often undermine social and economic relationships[74] and can impair public health.

One issue with polarization during a pandemic is that it might lead different segments of the population to arrive at different conclusions about the threat in the situation and appropriate actions. Many point to news and social media as drivers of polarization because individuals self-select into partisan "echo chambers"[78,79] or communicate in ways that create echo chambers[80]. By contrast, in-person political interactions can provide more opportunity for cross-partisan communication[81] that can de-polarize[82] and produce a shared understanding. The decrease in in-person contact due to COVID-19 thus may exacerbate the role of on-line sources of political information and its polarizing effects. The consequence could be that the social distancing behaviors dictated by COVID-19 could reduce willingness to engage with people from another party. It also could increase attitudinal polarization if people opt for partisan outlets in obtaining information on COVID-19.

The spread of COVID-19 could also have a de-polarizing effect. Polarized politics stems from strong partisan identities but when superordinate identities, such as national identities, become salient, partisan out-group animus declines[83], and people become less likely to turn to parties for issue guidance. A pandemic highlights not only a common identity with individuals all facing the same risk (see Group Threat-, but also accentuates a sense of linked fate. Alternatively, COVID-19 could become politicized around attributions of responsibility, nationalism, and immigration. This quickly happened in Italy, where the far right politicized COVID-19 around these issues[84]. The United States seems to be following suit with the 2020 election under way and COVID-19 response quickly becoming a campaign issue on which partisans are taking distinct sides[85] and indicated that whereas 68% of US Democrats were concerned about COVID-19, only 35% of Republicans were. If elite politicization and partisan information environments exacerbate polarization, social solidarity is undermined, as could be the generalized trust needed to sustain social distancing and other public health policies.

Science communication

The information environment around pandemics underscores the importance of effective science communication. The COVID-19 pandemic has been accompanied by a rise in conspiracy theories, fake news and misinformation. In this context, it is hard for the public to understand the risks and act in ways that promote their individual safety as well as the health of the community. This section will discuss the challenges associated with different types of misinformation during a pandemic as well as strategies for engaging in effective science communication and persuasion around public health.

Conspiracy theories

Conspiracy theories emerged almost immediately after the first news of COVID-19. Some concerned the origins of the virus, for example, that it was a bioweapon designed by China to wage war on the US (or vice versa). Others focused on prevention and cure, for instance, that conventional medical treatment should not be trusted and that people should take alternative measures, such as drinking bleach, to ward off the virus. It is not surprising that conspiracy theories have flourished at this time. Research suggests that people feel the need to explain large events with proportionally large causes[86], and are more likely to believe in conspiracy theories about events with serious consequences[87] and in times of crisis[88]. This is likely because people are more drawn to conspiracy theories when important psychological needs are frustrated[89]. Thus, we can expect conspiracy theories to gain more traction as COVID-19 spreads and more people isolate themselves[90].

These conspiracy theories can have harmful consequences. For example, belief in conspiracy theories has been linked to vaccine hesitancy[91], climate denial[92], extremist political views[93] and prejudice[94,95]. COVID-19 conspiracy theories are likely to be similarly problematic. For instance, people who believe that alternative remedies can help them fight off the virus may be less likely to follow health officials' advice and instead opt for less effective (at best) or lethal (at worst) alternatives. Conspiracy beliefs may also fuel hostility toward groups seen as responsible for the virus[96]. Some evidence suggests that inoculating people with factual information prior to exposure can reduce the impact of conspiracy theories[97]. However, because people tend to consume information within like-minded "echo chambers," doing so remains a challenge[98].

Fake News & Misinformation

Fake news about COVID-19 has proliferated widely on social media[99]. Emerging research has explored social-science based solutions to counter the spread of fake news. One approach is to debunk using fact-checking and correction[100–102]. Source expertise, trustworthiness, co-partisanship, messages from "unlikely sources" (e.g., those likely to benefit from the misinformation), and corrections that provide causal explanations all increase the effectiveness of countering misinformation[103,104]. However, fact-checking and corrections may not keep up with the vast amount of false information produced in moments of crisis like a pandemic. Thus, other approaches beyond debunking are needed.

One *prebunking* approach involves psychological inoculation[105,106]. For example, preemptively exposing people to small doses of misinformation techniques (including scenarios about COVID-19) can reduce susceptibility to fake news[107–109]. Another preventative approach involves subtle prompts that emphasize accuracy (e.g., asking users to judge the accuracy of a single neutral headline). Such prompts improve the quality of the content users share (including posts about COVID-19[110,111], and could be easily implemented by social media platforms.

To effectively counter fake news about COVID-19 around the world, governments and social media companies must rigorously develop and test interventions in collaboration with independent behavioral scientists. This includes identifying treatments that effectively reduce belief in misinformation, while not undermining belief in accurate information (e.g., [112]) – a particularly salient concern given evidence that most exposure to and sharing of fake news in the US has been concentrated among relatively small sub-sections of the population[113,114].

Persuasion

In the domain of science communication, scholars have explored a host of messaging approaches including providing scientific information in evidence-based ways that increase the likelihood of the information being understood[115]. Decades of research have shown that whether recipients are motivated to think carefully or not [116] determines whether credible sources are more persuasive[117]. The credibility of sources stems from how knowledgeable, honest, and objective they are perceived to be. Once a credible source is identified, what message should be delivered?

When feasible, focusing a message on the benefits to the recipient is effective[118]. However, there is some evidence that a focus on protecting *others* can be more effective for health issues (e.g., "wash your hands to protect your parents and grandparents"; [119]. Additionally, aligning a message with the recipient's moral values facilitates persuasion[120]. Finally, in addition to adopting attitudes, people must feel confident in them to act on these new attitudes[121]. Methods to increase certainty include making people feel knowledgeable about their new attitude (e.g., having them score well on a quiz[122]) and making them feel that their new attitude is the "moral" one to have[123].

Effort or elaboration determines the factors to which people attend when receiving messages. When effort is low, people rely on heuristics such as source cues or argument length whereas high effort leads them to focus on message quality (e.g., [124]). Given the personal salience and relevance of COVID-19, people will likely put forth significant cognitive effort to attend to messages. That does not mean, however, that they are motivated to process information accurately. When people assess a message, they sometimes do so with the goal of arriving at the best possible outcome, but other times they aim to confirm a standing belief, value, or identity – a process which is called directional motivated reasoning[77,125].

Therefore, one crucial question is the extent to which political leaders and the media will politicize COVID-19. As mentioned, there already is an emerging partisan divide on elements of the COVID-19 pandemic[85]. Data suggests that most people will rely on social consensus or scientific norms when forming opinions and taking action on scientific issues[126–128]. However, other people, especially when knowledgeable, may be motivated to instead seek partisan in-group approval[71,72]. That may lead to in-group partisan identity messaging proving more impactful. Science communicators should therefore be mindful of appealing to moral values, accentuating in-group norms, and highlighting consensus including those around scientific norms.

Moral Decision-Making

The behavior of individuals living in communities is regulated by moral norms and values[129,130]. These capture shared conceptions of socially (in-)appropriate forms of behavior[131–133]. People who do what is "right" are respected and publicly admired; those who do what is "wrong" are devalued and socially excluded[134]. These mechanisms of social enforcement encourage people to embrace and internalize shared guidelines, making them motivated to do what is considered 'right' while avoiding behaviors that seem 'wrong'[135]. This is a unique form of behavioral control in social communities - that does not rely on legal agreements and formal sanctions[136]. It is indispensable to make the quick behavioral changes that are required to adequately respond to a pandemic. In this section, we consider how research on morality and cooperation can encourage prosocial behaviors by individuals and groups.

Zero-sum thinking

People often default to thinking that someone else's gain—especially someone from a competing coalition—necessitates a loss to ourselves and vice versa[137,138]. This zero-sum thinking sits uneasily with the decidedly non-zero-sum nature of pandemic infection, where someone else's infection is a threat to oneself and everyone else[139]. The zero-sum bias makes the hoarding of protective measures (sanitizer, masks, etc.) psychologically compelling but ultimately self-defeating. Given the importance of mitigating or prolonging the pace of infection, communicating this misperception should be a priority.

However, whereas reducing infections across the entire population is non-zero-sum, the provision of scarce health care resources to those already infected does have zero-sum elements. For example, when the number of patients needing ventilators exceeds capacity, health care providers are forced to make life-for-life tradeoffs. Some countries have explicit guidelines to prioritize care in a pandemic (e.g., in Italy care for those over 65 is deprioritized). How well the policies enacted match the local norms will determine how much social support they receive. People *are* willing to sacrifice the elderly to save the young[140], but there are cultural differences on this preference[141]. Of the countries tested, Italy is actually the second highest in terms of the degree of willingness on this dimension, whereas Eastern cultures show a smaller preference for sacrificing the elderly to spare the young.

Moral decision-making

W*ho* is perceived as making the life-for-life decisions may also impact the public's and patients' trust. People who make utilitarian judgments about matters of life and death are not trusted[142]. Whereas Americans show low levels of trust in most institutions, their trust in medical doctors remains high[143], and compared to public health officials, doctors are less utilitarian in their ethical decision-making, opting instead for deontic "do no harm" rules[144]. Though triaging decisions need to be responsive to changing conditions, to maintain doctors' sacred trust and spare them further decision fatigue, it may be best to have the decisions behind life-for-life tradeoffs perceived as systematic and coming from governmental agencies rather than from the physicians themselves.

Moral decision-making during a pandemic involves uncertainty. It's not certain whether going to work or social gatherings will infect others, and it's not certain whether others, if they do get infected, will suffer severe disease. In general, people are more risk-averse when their decisions affect others compared to themselves[145,146], suggesting that focusing on *risks* to others (rather than oneself) may be more effective in convincing individuals to practice public health behaviors. However, people are unwilling to make sacrifices for others when the *benefits* are uncertain[147]. For instance, in deciding whether to go to work while sick, American and British participants were less willing to stay home when it was uncertain they would infect a coworker. However, when going to work risked infecting an elderly coworker who would suffer a serious illness, participants were more willing to stay home[148]. Thus, focusing on worst-case scenarios, even if they are uncertain, can encourage people to make sacrifices for others.

When people make moral decisions, they consider how others would judge them for behaving selfishly at the expense of others, regardless of whether they are observed or not[149,150]. Harmful actions are judged more harshly than harmful inactions[151,152], and causing harm by deviating from the status quo is blamed more than harming by default[153,154]. Reframing "business as usual" during a pandemic as an active choice rather than a passive or default decision may therefore make such behaviors less acceptable. Because morality is a core aspect of the self[155], we might also promote prosocial behaviors and discourage selfish behaviors by linking them to people's self-concept. Effective public health messages during a pandemic might include "Be a good citizen" or "Don't be a disease spreader" as well as focusing on duties and responsibilities towards family and friends[156].

Cooperation within groups

Fighting a global pandemic requires large-scale cooperation. The problem is that cooperation requires people to bear an individual cost to benefit other people[157]. In particular, there is a conflict between short-term self-interest versus longer-term collective interest[158]. Moreover, in this crisis, there are several collectives distributed at the family, community, national and international levels making decisions to cooperate particularly challenging. From an evolutionary perspective, extending self-interest to protect and promote the welfare of family members should be a small step, as it increases genetic fitness. What about the level of the community often characterized by some interaction – such as one's unit at the organization or country?

Some research has revealed that people strongly prioritize local interests over global (or international) interests[159,160]. Indeed, at the onset of the COVID-19 pandemic countries did not cooperate very well. They failed to benefit from experiences and lessons from countries who faced it earlier. Even in Europe, policies differ vastly between countries facing the crisis in tandem. Did this crisis increase awareness of global interdependence, or the feeling we are all in this together (see [161])? A working hypothesis may be that although a stronger realization of global interdependence is not sufficient, it is a necessary ingredient for increasing cooperation between nations. One major question is how to promote cooperation between individuals or groups?

Several techniques are known to increase cooperative behavior, such as sanctioning defectors[162,163] or rewarding cooperators[164]. Unfortunately, these require governments or policy makers to closely monitor people to find out who should be rewarded or punished. To avoid these additional costs, scholars have recently started exploring alternative ways to increase cooperative behavior, such providing cues that make the morality of an action salient, has been shown to increase cooperative behavior[165,166]. People are also more likely to cooperate when they believe that others are cooperating[167]. Accordingly, interventions based on observability and descriptive norms are highly effective at increasing cooperative behavior[168]. This suggests that leaders and the media should make it salient as much as possible that cooperating is the right thing to do and that other people are already cooperating.

Leadership

Crises like COVID-19 create a huge amount of uncertainty that individuals are unable to resolve on their own. Accordingly, they look to others to help them understand what they should be doing. Crises create a strong demand for *leadership* and this demand is present in all the groups to which we belong: our family, our local community, our workplace, and our nation. In this section we discuss effective and ineffective leadership during a pandemic.

Identity Leadership

In a pandemic, there is a particular demand for leaders who represent and advance the shared interests of group members and create a sense of *shared social identity* among them[169]. We seek leaders who cultivate a sense that "we are all in this together". In part, such leadership gives people a sense of collective self-efficacy and hope[170]. More importantly, though, it provides a psychological platform for group members to coordinate efforts to tackle the stressors they confront[171]. Without this platform, there is a risk that people will avoid acts of citizenship and instead embrace a harm-enhancing philosophy of "everyone for themselves".

By building social identity, leaders unlock a key source of collective strength and resilience[172,173], which can increase the chances of a group emerging stronger from a crisis than it might otherwise. For this reason, the first responsibility of leaders in times of crisis is to set aside personal or partisan interests and cultivate an inclusive sense of "us"[174]. As we look at responses to COVID-19 around the world, there are some very salient examples of *bad* identity leadership where national leaders have effectively put their personal or electoral interests above their followers. This leaves groups vulnerable and weak, and exposes them to the full force of threats — biological or otherwise.

When familiar guidelines are suddenly disrupted, leaders need to clarify when actions are right or wrong. Such leadership provides a powerful platform to coordinate individual behaviors. Effective moral leadership requires the adaptation of moral standards – to achieve behavioral change, simultaneously with the management of moral emotions – to avoid the shame and guilt that tempts people to defend and persist in behaviors that are no longer considered socially responsible. This can allow people to understand that certain behaviors, like avoiding contact with a beloved grandparent, have changed from a moral vice to a virtue. Communicating about positive examples, while forgiving inevitable lapses, offer a way to achieve this[175].

National identity

Solidarity within and between nations is critical during a global pandemic. Yet, in many countries, political leaders seem focused on prioritizing national interests. In some cases, that these leaders may create a sense that they are especially well prepared to handle the situation, even if this is not the case. Although building a strong sense of shared social identity can help coordinate efforts to manage threats (Haslam & Reicher, 2006), foster in-group commitment and adherence to norms[176], nationalistic tendencies focused on promoting the image of the nation as handling the situation *better* than others may backfire.

The belief in national greatness can be maladaptive in a number of ways[177]. For instance, it is likely to promote greater focus on protecting the image of the country, rather than on caring for its citizens[178]. It also tends to predict seeing out-groups as a threat and blaming them for in-group misfortunes[179]. For instance, collective narcissism among Americans predicts a belief in conspiracy theories about COVID-19 being spread deliberately by the Chinese government[180]. To increase a willingness to take a pandemic seriously and engage with other nations to defeat it, citizens and leaders need to accept that their country is at risk and take immediate steps to protect the public. There is some evidence that boosting people's sense of personal control decreases collective narcissism[181]. It might then be useful to pay special attention to whether they help people maintain or restore a sense of control over their lives.

Stress and coping

When people face a threat of pathogen contamination, they may be motivated to defray and soothe the fear of the viral risks. One potent means for so doing is available for those engaged in their communities and thus immersed in their relationships. Since cohesive, affectionate, and cordial social relations typically serve as a significant source of warmth and protection[182], they may have a powerful analgesic effect on the threat network of the brain[183]. In this section, we discuss the impact of social isolation and strategies for promoting social connection, relationship satisfaction, and emotional regulation during the pandemic.

Social isolation and connection

One of the most vital strategies for slowing the spread of COVID-19 is "social distancing". Alas, distancing clashes with the deep-seated human instinct to connect with others[184], especially during emotional times[185]. Social connection helps people regulate affect, cope with stress, and remain resilient during difficult times[186–188]. By contrast, loneliness and social isolation worsen the burden of stress, and produce deleterious effects on mental, cardiovascular, and immune health[173,189]. Older adults, who are at the greatest risk of severe symptoms from COVID-19, are also highly susceptible to isolation, which can worsen their aging trajectory[190]. Distancing threatens to produce an epidemic of loneliness that could exacerbate the long-term health consequences of the COVID-19 epidemic.

There are strategies to mitigate these outcomes. First, we suggest the term "social distancing" be replaced when possible with "physical distancing", to highlight the fact that deep social connection with a broader community is possible even when people are physically apart through the use of technology. Online forums have long served as hubs for mutual support—for instance among individuals with rare illnesses[191] and both receiving and giving support online can bolster psychological well-being[192]. Technologies such as FaceTime and Zoom that are (i) informationally rich, (ii) dyadic, and (iii) temporally synchronous are best suited to generating empathy and connection[193,194]. However, some forms of technology, like Facebook, can *decrease* one's sense of social connection[195]. Special attention should be placed on helping older adults—who might be less familiar with these technologies—to learn and acclimate to the potential richness of digital connections. COVID-19 will leave many of us confused, anxious, and lonely. But ironically, this collective struggle might also bring us together.

Intimate Relationships

The social effects of COVID-19 will influence our relationships with the people who live with us, including our romantic partners and children. Although firm data are not yet available, reports from state-run media in China point to a link between virus-related isolation and surging divorce rates[196]. Other research suggests that being forced to spend time with people without a means to escape can enhance aggression[197,198] and domestic violence[199]. Even for households free from the virus, COVID-19 can function as a major stressor, especially in terms of emotional effects like chronic anxiety and economic effects like job loss.

Stress is an established risk factor for relationship difficulties and dissolution, both because it changes the content of couple interactions (more focus on homeschooling or financial concerns, less focus on long-term goals) and undermines the psychological resources, like empathy and patience, that make challenging interactions go smoothly[200]. Indeed, consistent with the early COVID-19 reports from China, research on the effects of Hurricane Hugo in 1989 revealed that disaster areas experienced a spike in the divorce rate[201]. Containment policies like quarantining and self-isolation tend to elicit elevated levels of stress, confusion, and anger[202], effects that can be explosive when multiple family members simultaneously undergo them, in close quarters, for weeks or months on end.

The news for families is not all bad, however. The same study that documented surging divorce rates following Hurricane Hugo also documented surging marriage and birth rates[201]. Major stressors, it seems, alter the trajectories of our intimate relationships, but researchers are still unpacking when, why, and for whom these effects are harmful vs. beneficial. What we do know is that people will benefit from calibrating expectations for the relationship to the circumstances[203]. Continuing to expect the same level of excitement and adventure from the relationship is a recipe for disappointment. To further reduce the psychological impact of quarantine it should be kept as short as possible, people should receive clear information and necessary supplies, they should have tools to reduce boredom, and an emphasis on altruism should be reinforced[202].

Healthy Mindsets

In response to uncertainty and complexity people adopt mindsets that influence wellbeing, behavior, and physiology[204,205]. For example, mindsets about the nature of aging (e.g., “an inevitable decline”) are related to decreased preventative behaviors, increased coronary events, and shortened lifespans (e.g., [206]), and mindsets about the nature of stress (e.g., “stress is debilitating”) lead to compromised physiological responses and maladaptive behaviors (e.g., [207]). While many mindsets are likely to play a role in responses to COVID-19, mindsets about our body’s ability to cope are likely to be especially important[208]. Is COVID-19 a catastrophe, is it manageable, or can it be an opportunity? Is my body capable of coping with COVID-19?

Inconsistent and unclear messaging further increases uncertainty and confusion, leaving people to rely on pre-existing mindsets that may be less adaptive (i.e., “the flu is manageable and this is like the flu, so I do not need to take precautions”). On the other hand, exaggerating risks may instill maladaptive mindsets that “this is a catastrophe”, increasing avoidance behaviors and negative affect[204] and possibly the risk for infection[209]. A better approach may be to communicate what we do know clearly to instill adaptive mindsets. This means guiding individuals towards the mindsets that this illness is manageable, their bodies are capable, and that this can be an opportunity to make positive changes in the world. There is a way out of this pandemic and there are even silver linings (e.g., a chance to connect with one’s values or improve healthcare). But these opportunities will be overlooked if we are in a mindset that precludes such possibilities.

Conclusion

Urgent action is needed to mitigate the potential devastation of COVID-19. However, the lessons from behavioral and social science outlined in the current paper should be relevant to future pandemics and other public health crises. Whether policy makers are trying to increase vaccination rates or reduce the harm of climate change, they will be fundamentally facing many of the same issues. A recent report from the World Health Organization declared “health communication is seen to have relevance for virtually every aspect of health and well-being, including disease prevention, health promotion and quality of life”[210]. By applying the insights described in the current paper, we hope that public health experts will be better equipped to communicate effectively and drive behavior change in a manner that benefits society.

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