TITLE
Using social and behavioural 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 behaviour change and places significant psychological burdens on individuals, insights from the social and behavioural sciences can be used to help align human behavior with the recommendations of epidemiologists and public health experts. Here we discuss evidence from a selection of research topics relevant to pandemics, including work on navigating threats, social and cultural influences on behaviour, science communication, moral decision-making, leadership, and stress and coping. In each section, we note the nature and quality of prior research, including uncertainty and unsettled issues. We identify several insights for effective response to the COVID-19 pandemic, and also highlight important gaps researchers should move quickly to fill in the coming weeks and months.

Introduction (6642 words)

In December 2019, a new coronavirus (SARS-CoV-2) emerged, sparking an epidemic of acute respiratory syndrome (COVID-19) in humans, centered in Wuhan, China (see [1]). Within three months, the virus had spread to more than 118,000 cases and caused 4,291 deaths in 114 countries, leading the World Health Organization to declare a global pandemic. The pandemic has led to a massive global public health campaign to slow the spread of the virus by increasing hand washing, reducing face touching, wearing masks in public, and physical distancing.

While efforts to develop pharmaceutical interventions for COVID-19 are under way, the social and behavioural sciences can provide valuable insights for managing the pandemic and its impacts. Existing research can be leveraged to formulate effective public health messages, identify cultural and structural factors related to disease spread, sustain prosocial motivations in large societies, manage anxiety and loneliness, and motivate compassion for at-risk populations. We discuss topics that are broadly relevant to numerous stages of the current pandemic to help policy-makers, leaders, and the public better understand how to manage risk, reduce social conflict, improve communication, enhance cooperation, model effective leadership, and provide social and emotional support. For each area, we highlight relevant insights, discuss implications for policy makers, leaders, and the public (see Box 1), and highlight areas for future research.

Due to space constraints, this paper provides a brief summary of each topic. Research topics discussed here were identified by the corresponding authors as potentially relevant to pandemic response, and thus are not exhaustive (for a review of research on specific actions, such as handwashing, face-touching, and self-isolation, see [2]). Furthermore, research on these topics is ongoing and, in many cases, far from settled. We have highlighted relevant findings in each area as well as critical gaps in the literature. Insights and implications for policy should be interpreted with caution because there is very little published social science research on the current pandemic. Thus, our discussion often draws from different circumstances than the current pandemic (e.g., laboratory experiments examining hypothetical scenarios), and quality of evidence cited varies substantially (e.g., correlational studies versus field experiments, single studies versus systematic reviews of substantial evidence). In the sections that follow, we try to describe the quality of evidence to facilitate careful, critical engagement by readers. We call for the scientific community to mobilize rapidly to produce research to directly inform policy and individual/collective behaviour in response to the pandemic.

Threat Perception

Historically, infectious diseases have been responsible for the greatest human death tolls. For example, the bubonic plague killed approximately 25% of the European population[3]. In this section, we discuss how people are likely to perceive and respond to threats and risk during a pandemic, and downstream consequences for decision-making and intergroup relations.

Threat

One of the central emotional responses during a pandemic is fear. Humans, like other animals, possess a set of defensive systems for combating ecological threats[4,5]. Negative emotions resulting from threat can be contagious[6], and fear can make threats appear more imminent[7]. A meta-analysis found that targeting fears can be useful in some situations, but not others: Appealing to fear leads people to change their behavior if they feel capable of dealing with the threat, but leads to defensive reactions when they feel helpless to act[8]. The results suggest that strong fear appeals produce the greatest behavior change only when people feel a sense of efficacy, whereas strong fear appeals with low-efficacy messages produce the greatest levels of defensive responses.

Another challenge is that people often exhibit an "optimism bias": the belief that bad things are less likely to befall oneself than others. While optimism bias may be useful for avoiding negative emotions[9], it can lead people to underestimate their likelihood of contracting a disease[10], and therefore ignore public health warnings[11]. Communication strategies must strike a balance between breaking through optimism bias without inducing excessive feelings of anxiety and dread.

Emotion and Risk Perception

Sound health decisions depend on accurate perceptions of the costs and benefits of certain choices for oneself, and for society[12,13]. Emotions often drive risk perceptions, sometimes more so than factual information[14,15]. An emotional response to a risky situation can influence thinking in two-stages[16]. First, the emotion's quality (e.g., positive vs. negative) focuses people on congruent information (e.g., negative information when feeling negative). That information, rather than the feeling itself, is then used to guide judgment at the second stage. For example, smokers exposed to more negative emotional health warnings experienced more negative emotion to warnings and smoking, spent more time examining warnings, and recalled more risks, with subsequent effects on risk perception and quitting intentions[17,18]. As negative emotions increase, people may rely on negative information about COVID-19 more than other information to make decisions.

In the case of strong emotional reactions, people may also ignore important numeric information such as probabilities[19] and a problem's scope[20]. Negative framing captures attention, especially for people who are less mathematically skilled[21]. The media usually report on COVID-19 negatively – for example, by reporting the number of people infected and those who die – as opposed to those who recover or experience only mild symptoms. This may increase negative emotion and sensitize people to otherwise neglected risks for themselves or others. Research is needed to determine whether a more positive frame could educate the public and relieve negative emotions while increasing public health behaviors.

Prejudice and discrimination

The experience of fear and threat has ramifications not only for how people think about themselves, but also how they feel about and react to others--in particular, out-groups. For instance, being threatened with disease is often associated with higher levels of ethnocentrism[22]; greater fear and perceived threat are associated with greater intolerance and punitiveness toward out-groups[23–25]. Highlighting group boundaries can undermine empathy with those who are socially distant[26,27] and increase dehumanization[28] or punishment[29].

The bubonic plague, for example, unleashed massive violence in Europe, 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, disease threat can nonetheless give rise to discrimination and violence against stigmatized or scapegoated groups. Already, there have been reports of physical attacks on ethnic Asian people in predominantly White countries, and some government officials' mis-characterizations of SARS-CoV-2 as the "Wuhan" or "Chinese virus"[31].

Conversely, a global pandemic may also create opportunities to reduce religious and ethnic prejudice. Coordinated efforts across individuals, communities, and governments to fight the spread of disease can send strong signals of cooperation and shared values, which could facilitate reorganization of previously considered out-groups and in-groups into a single community with a common destiny. This "superordinate categorization" is most effective when everyone is of equal status[32]. 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 widely. Highlighting events like these could improve out-group attitudes[33] and foster further international cooperation.

Disaster and "panic"

There is a common belief in popular culture that, when in peril, people panic - especially when in crowds. That is, they act blindly and excessively out of self-preservation, potentially endangering the survival of all[34]. This idea has been used to explain responses to the current COVID-19 outbreak – most commonly in relation to the notion of "panic buying." However, close inspection of what happens in disasters reveals a different picture. Certainly, some people do act selfishly and some, especially those who are particularly vulnerable, may experience more distress. But cooperation and orderly, norm-governed behaviour are common across a range of emergencies and disasters; and there are many instances when people display remarkable altruism[35]. There is already evidence that mutual aid groups among the public have become widespread in response to Covid-19[36]. Indeed, in fires[37] and other natural hazards[38] people are less likely to die from over-reaction than from *under*-reaction, that is, not responding to signs of danger until it is too late.

In fact, the concept of "panic" has largely been abandoned by researchers because it neither describes nor explains what people usually do in disaster[39]. Instead, the focus has shifted to the factors that explain why people cooperate rather than compete in response to a crisis[35]. One of these factors is an emerging sense of shared identity, and concern for others, which arises from the shared experience of being in a disaster[40]. This feeling can be harnessed by addressing the public in collective terms and by urging "us" to act for the common good[41].

Conversely, the sense of shared identity can be undermined by representing others as competitors. This can happen with images of empty shelves and stories of "panic buying," which suggest that others are only looking out for themselves, thus prompting a desire for doing the same. Stocking up on supplies is adaptive in preparation for potential self-isolation[42]. However, use of the notion of "panic" can be actively harmful. News stories that employ the language of "panic" often create the very phenomena that they purport to condemn. They can foster the very individualism and

competitiveness that turns sensible preparations into dysfunctional stockpiling and undermine the sense of collective purpose which facilitates people supporting one another during an emergency.

Social Context

Slowing viral transmission during pandemics requires significant shifts in behavior. Various aspects of social and cultural contexts influence the extent and speed of behaviour change. In this section, we describe how aspects of the social context, such as social norms, social inequality, culture, and polarization, may help decision-makers identify risk factors and effectively intervene.

Social Norms

People's behavior is influenced by social norms: what they perceive that others are doing or what they think that others approve or disapprove of[43]. A large literature has distinguished different motives for conformity to norms, including the desire to learn from other people and to gain affiliation or social approval[43,44]. Although people are influenced by norms, their perceptions are often inaccurate[45]. For example, people can underestimate health-promoting behaviors (e.g., hand washing[46]) and overestimate unhealthy behaviors[47].

Changing behaviors by correcting such misperceptions can be achieved by public messages reinforcing positive (e.g., health promoting) norms. Providing accurate information about what most people are doing is likely to be helpful if what most people are doing is desirable (health promoting). But if what most people are doing is not desirable, providing purely descriptive normative information can backfire by reducing positive behaviors among people who already engage in them, unless it is accompanied by information signalling that most people approve of these actions ("prescriptive" as opposed to "descriptive" norms)[48,49]. Perceived norms are also most influential when specific to others with whom common identities are shared[50], including for the spread of health behaviors[51]. Therefore, messages that provide ingroup models for norms (e.g., members of your community) may therefore be most effective.

Social networks can amplify the spread of behaviors that are both harmful and beneficial during an epidemic, and these effects may spread through the network to friends, friends' friends, and even friends' friends' friends[52]. The virus itself spreads from person to person, and since people centrally located in networks come into contact with more people, they are often among the first to be infected[53]. But these very same central people may be instrumental in slowing the disease because they can spread positive interventions like hand washing and physical distancing by demonstrating them to a wide range of people[54]. Some research suggests that a larger proportion of interventions can come not from direct effects on people who receive the intervention, but from indirect effects on their social contacts who copied the behavior[55]. We may therefore leverage the impact of any behavior change effort by targeting well-connected individuals and making their behavior change visible and salient to others.

Another way to leverage the impact of norms falls under the general category of "nudges"[56,57], which influence behaviour through modification of choice architecture (i.e., the contexts in which people make decisions). Because people are highly reactive to the choices made by others, especially trusted others, an understanding of social norms that are seen as new or emerging can have a positive impact on behavior[58]. For instance, a message with compelling social norms might say: "The overwhelming majority of people in your community believe that everyone should stay home". Nudges and normative information can be an alternative to more coercive means of behavior change or used to complement regulatory, legal, and other imposed policies when widespread changes must occur rapidly.

Social Inequality

Inequalities in access to resources affect not only who is at greatest risk of infection, developing symptoms, or succumbing to the disease, but also who is able to adopt recommendations to slow the spread of the disease. The homeless cannot shelter in place[59], families in housing without running water cannot wash their hands frequently[60], people who are detained by a state (e.g., in jails, prisons, immigrant detention centers, or refugee camps) may lack space to implement "physical distancing," people without health insurance may delay or avoid seeking testing or treatment, people who rely on public transportation cannot always avoid large crowds, and low-wage workers are often in occupations (e.g., service, retail, cleaning, agricultural labor) where remote work is impossible and paid sick leave unavailable[61]. Economic disadvantage is also associated with the pre-existing conditions associated with higher morbidity rates once infected, such as compromised immune systems, diabetes, heart disease, and chronic lung diseases like asthma and chronic obstructive pulmonary disease[62]. We expect that, as in natural hazards, the economically disadvantaged will be most likely to be exposed to the hazard, susceptible to harm from it, and experience negative outcomes from it[63,64].

Issues of economic disadvantage intersect with issues of race and ethnicity. Members of minority communities (such as blacks, Latinos, and American Indians/Alaska Natives in the U.S.) are disproportionately found among the homeless[59], the detained, the workers in high public contact but low-benefit occupations[65], and those with prior health conditions that make them more vulnerable[66,67]. Because social networks tend to be racially differentiated[68], members of minority communities who contract the disease may become vectors of transmission to others in their racial and ethnic communities[69].

Economic position and racial inequality are also associated with levels of trust in social institutions, including the healthcare system. Racial and ethnic minority communities, in particular, have both historical and contemporary experiences of discrimination, leading to distrust[70–74]. Members of these communities may be more likely to be wary about the public health information they receive, less willing to adopt recommended safety measures, and potentially more susceptible to "fake news." This suggests the need for more targeted public health information, and for partnerships between public health authorities and trusted organizations that are internal to these communities.

Culture

A sense of the self as independent versus interdependent with others is a dimension of cultural variation[75]. Western European and North American cultures that endorse individualism[76] are considered independent, whereas most other cultures share a stronger commitment to collectives such as country, tribe, and family, and are considered interdependent[77,78]. While medical policies are different across societies, some differences in the response to the pandemic may be better described as cultural, and many of those have a linkage to the dimension of independence versus interdependence. First, the priority given to obligations and duties in Asian societies may motivate individuals to remain committed to social norms while suppressing personal desires[79]. Second, Asians may more readily recognize unobservable situational influences on viral infection, like herd immunity[80]. Third, social norms and conventions in North America and much of Western Europe tend to positively value the expressivity of the self (e.g., kissing, hugging, direct argumentation), relative to Asia[81]. This is another reason why interpersonal transmission of the virus could be more likely in independent cultures than in interdependent cultures.

Another, related dimension of cultural variance is a society's "tightness" versus "looseness." Research has found that "tight" cultures, such as Singapore, Japan, and China, have strict social norms and punishments for deviance, while "loose" cultures, such as the U.S., Italy, and Brazil, have weaker social norms and are more permissive[82,83]. Tight nations often have extensive historical and ecological threats, including greater historical prevalence of natural hazards, invasions, population density, and pathogen outbreaks[82,84]. From an evolutionary perspective, when groups experience collective threats, strict rules may help them to coordinate to survive[82,85]. Therefore, the spread of COVID-19 infections may tighten communities. Cultures accustomed to prioritizing freedom over security may also have more difficulty coordinating in the face of a pandemic. It may also be relevant that communities negotiate social norms so that there is a balance between freedom and constraint, or *tight-loose ambidexterity*[86]. Tight rules regarding social distancing are critical, yet looseness within these constraints may also help to spawn the development of creative technical solutions that are needed to contain the pandemic as well as creating novel tools to help people feel connected. The cumulative evidence here suggests that very different strategies might be called for in varying cultural contexts in the fight against COVID-19.

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, whereas "affective polarization" refers to partisans disliking and distrusting those from the opposing party(ies)[87,88]. Affective polarization has political consequences – such as a lowering trust[89], privileging partisan labels over policy information[90], and believing false information[91], that can undermine social and economic relationships[88] and 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. Partisans may receive different news because individuals can self-select polarized news sources or partisan "echo chambers"[92,93] or communicate in ways that are associated with less cross-partisan information sharing[94]. But in-person political interactions can provide more opportunity for cross-partisan communication[95] (that produce a shared understanding[96]). The decrease in in-person contact due to COVID-19 may reduce cross-partisan interactions and information sharing.

Yet, there are actionable steps that could reduce polarization. First, the pandemic highlights not only a common identity with individuals all facing the same risk, but also could foster a sense of shared fate. By highlighting an overarching identity, politicians, the media, and opinion leaders could help reduce political division around the issue. Second, a growing body of work shows that misperceptions of the other side underlie polarization[97,98]. Therefore, it is likely important to combat misinformation that could generate partisan motivated reasoning and inaccurate beliefs (see Fake News & Misinformation). Finally, leaders can highlight bipartisan support for COVID-related measures, when they exist, as such endorsements in other contexts have reduced polarization and led to less biased reasoning[99].

Science communication

The information environment around a pandemic underscores the importance of effective science communication. The COVID-19 pandemic has already seen a rise in conspiracy theories, fake news, and misinformation[100]. In this context, it is hard for the public to distinguish scientific evidence and facts from less reliable sources of information. In this section, we discuss the challenges associated with different forms 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 shortly after the first news of COVID-19 and have continued to persist[100]. Some concerned the origins of the SARS-CoV-2 virus, for example, that it was a bioweapon created by the Chinese to wage war on the US, or vice versa[101]. Others focused on prevention and cure, for instance, that conventional medical treatment should not be trusted and that people should use alternative remedies to ward off the virus[102]. 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[103], are more likely to believe in conspiracy theories about events with serious consequences[104], and in times of crisis[105]. This is likely because people are more drawn to conspiracy theories when important psychological needs are frustrated[106]. Thus, conspiracy theories may gain more traction as COVID-19 spreads and more people isolate themselves[107].

These conspiracy theories can have harmful consequences. For example, belief in conspiracy theories has been linked to vaccine hesitancy[108], climate denial[109], extremist political views[110] and prejudice[111,112]. COVID-19 conspiracy theories may 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[113]. Some evidence suggests that giving people factual information prior to exposure to conspiracy theories can reduce conspiracy theory beliefs[114], and this strategy might work in efforts to combat conspiracy theories relevant to the current pandemic (see following section for similar findings). However, because some people tend to consume information within like-minded "echo chambers," combating conspiracy theories remains a challenge[115].

Fake News & Misinformation

Fake news and misinformation about COVID-19 has proliferated widely on social media with potentially dangerous consequences[116]. Emerging research is using social-science to understand and counter the spread of fake news[117–119]. One approach is to debunk using fact-checking and correction[120–122]. Source expertise, co-partisanship, exposing denial, and corrections that provide causal explanations all tend to increase the effectiveness of countering misinformation[123–125]. However, fact-checking may not keep up with the vast amount of false information produced in times of crisis like a pandemic. Moreover, there is mixed research regarding whether corrections may actually increase belief in the original misinformation[122,125–127] or in other misleading claims that fail to get corrected[128]. Thus, other approaches beyond debunking are needed.

One "prebunking" approach involves psychological inoculation[129,130]. Inoculation follows the biomedical analogy: people are exposed to a severely weakened dose of a persuasive argument, strong enough to trigger the immune system but not so strong as to overwhelm it. A meta-analysis has found inoculation effective in protecting attitudes from persuasion[131]. The fake news game, *Bad News*, is a real-world inoculation intervention (www.getbadnews.com) used by schools and governments which finds that preemptively exposing people to small doses of misinformation techniques (including scenarios about COVID-19) can reduce susceptibility to fake news[132,133] and could be embedded directly on social media platforms[134].

Another preventative approach involves subtle prompts that nudge people to consider accuracy. Evidence suggests that deliberation is associated with[135–137] and causes[138] reduced belief in false news headlines that circulated on social media. Platforms could nudge users to think about accuracy, for example, periodically asking users to rate the accuracy of randomly selected posts. The crowdsourced accuracy ratings generated by this process may also be useful for identifying misinformation, as has been found for crowd ratings of source trustworthiness[139–141].

To effectively counter fake news about COVID-19 around the world, governments and social media companies must rigorously develop and test interventions. This includes identifying treatments that effectively reduce belief in misinformation, while not undermining belief in accurate information[142].

Persuasion

In the domain of science communication, scholars have explored a host of messaging approaches including providing information in evidence-based ways that increase understanding and action[143]. Decades of research has found that whether recipients are motivated to think carefully or not[144], sources perceived as credible are more persuasive[145]. The credibility of sources stems from how trustworthy and expert they are perceived to be[146]. Enlisting trusted voices has been shown to make public health messages more effective in changing behaviour during epidemics. During the West African Ebola crisis, for example, religious leaders across faiths in Sierra Leone advocated for practices such as handwashing and safe burials. The engagement of the faith-based sector was considered a turning point in the epidemic response[147]. Therefore, finding credible sources for different audiences who are able to share public health messages might prove effective.

Once a credible source is identified, what message should be delivered? Several messaging approaches may be effective, including emphasizing the benefits to the recipient[148], focusing on protecting others (e.g., "wash your hands to protect your parents and grandparents"[149]), aligning with the recipient's moral values[150], appealing to social consensus or scientific norms[151–153], and/or highlighting social group approval[154,155]. Which of these messages work best depends on the audience's motivations[156]. Beyond finding effective messages for attitude change is the issue of inducing behavioral change. This occurs when people feel confident about their attitudes[157]. Methods to increase certainty include helping people feel knowledgeable about their new attitude[158] and making them feel that their new attitude is the "moral" one to have[159]. It may therefore be useful to identify which messages work best on which populations not only to generate policy support but also to ensure individuals actions needed to combat the spread of the virus.

Aligning Individual and Collective Interests

The behavior of individuals living in communities is regulated by moral norms and values[160–164]. People who do what is "right" are respected and publicly admired, while those who do what is "wrong" are devalued and socially excluded[165]. 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'[166] and does not rely on legal agreements and formal sanctions[167]. 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 group—necessitates a loss to themselves, and vice-versa[168,169]. Zero-sum thinking sits uneasily with the non-zero-sum nature of pandemic infection, where someone else's infection is a threat to oneself and everyone else[170]. Zero-sum thinking means that while it might be psychologically compelling to hoard protective materials (sanitizer, masks, even vaccines) beyond what is necessary, doing so could be self-defeating. Given the importance of slowing infections, it may be helpful to make people aware that others' access to preventative measures is a benefit to oneself.

Whereas reducing infections across the population is non-zero-sum, the provision of scarce health care resources to the infected does have zero-sum elements. For example, when the number of patients needing ventilators exceeds capacity, health care providers are often forced to make life-for-life tradeoffs. How well the policies enacted match the local norms can help determine how much support they receive. While some people are willing to sacrifice the elderly to save the young[171], there are cultural differences on this preference[172]. Who is perceived to be making those decisions may also impact the public's and patients' trust. In experiments, people who make utilitarian judgments about matters of life and death are less trusted[173]. American's trust in medical doctors remains high[174], and compared to public health officials, doctors are less utilitarian in their ethical decision-making, opting instead for deontic "do no harm" rules[175]. As such, it may be best to have decisions behind life-for-life tradeoffs perceived as systematic and coming from governmental agencies rather than from physicians themselves.

Moral decision-making

Moral decision-making during a pandemic involves uncertainty. It's not certain whether social interactions will infect others. People may be less willing to make sacrifices for others when the benefits are uncertain[176,177]. For instance, in hypothetical scenarios about deciding whether to go to work while sick, American and British participants reported they would be 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 reported they would be more willing to stay home[178]. Thus, focusing on worst-case scenarios, even if they are uncertain, may encourage people to make sacrifices for others.

When people make moral decisions, they often consider how others would judge them for behaving selfishly[179,180]. Harmful actions are judged more harshly than harmful inactions[181,182], and causing harm by deviating from the status quo is blamed more than harming by default[183,184]. Therefore, reframing decisions to carry on with "business as usual" during a pandemic as active decisions, rather than passive or default decisions, may make such behaviors less acceptable.

Cooperation within groups

Fighting a global pandemic requires large-scale cooperation. The problem is that, by definition, cooperation requires people to bear an individual cost to benefit other people[185]. In particular, there is a conflict between short-term self-interest versus longer-term collective interest[186]. Moreover, in this pandemic, there are several collectives (e.g., family, community, national and international) which can make decisions to cooperate 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. Indeed, laboratory research has found that people prioritize local over global (or international) interests[187,188]. One major question, then, is how to promote cooperation?

Several techniques, such as sanctioning defectors[189] or rewarding cooperators[190], tend to increase cooperative behavior in laboratory experiments using economic games. Providing cues that make the morality of an action salient (such as having people read the Golden Rule before making a decision, or asking them to report what they think is the morally right thing to do) have also been shown to increase cooperation[191,192]. People are also more likely to cooperate when they believe that others are cooperating[193]. Accordingly, interventions based on observability and descriptive norms are highly effective at increasing cooperative behavior in economic games as well as in the field[194]. This suggests that leaders and the media can promote cooperation by making these behaviors more observable.

Leadership

Crises like the COVID-19 pandemic create an opportunity for leadership across groups of varying levels: families, workplaces, local communities, and nations. Leadership can coordinate individuals and help them avoid behaviors that are no longer considered socially responsible. In this section, we discuss the role of trust and compliance with leaders, effective identity leadership, and supporting group members

Trust and compliance

During a pandemic, health officials often need to persuade the population to make a number of behaviour changes and follow health policies aimed at containment—e.g., honoring a quarantine or reporting voluntarily for medical testing. By their nature and the scope of the population, such measures can be difficult to enforce. Research from the West Africa Ebola crisis of 2014-2015 suggests that enlisting local voices to help build engagement and trust in health officials can increase the success of such public health measures. For instance, specialized Ebola treatment facilities which employed community liaisons and social mobilizers to raise awareness and resolve misconceptions, were associated with increases in reporting Ebola cases[195]. Correlational evidence from Liberia also suggests that explicit government efforts to reach out to the population, like door-to-door canvassing, are associated with compliance with crisis management policies like bans on gatherings[196].

Trust in institutions and governments also may play an important role. For example, trust in the Liberian government was correlated with decisions to abide by mandated social distancing policies[197] and utilizing clinics for care during the Ebola outbreak[198]. Trust was also related to decisions to adopt preventive measures such as Ebola vaccinations in the DRC[199]. Conversely, a lack of trust in public health officials may lead to negative effects on utilization of health services[200,201]. Reliable information and public health messages are needed from national leaders and central health officials. But local voices can amplify these messages and help build the trust that is needed to spur behavioral change.

Identity Leadership

Experimental studies clarify what leaders can do to promote trust leading to cooperation. A priority for leaders is to create a sense of *shared social identity* amongst their followers[202]. A large body of research suggests that people tend to prefer leaders who cultivate a sense that "we are all in this together"[203]. In part, such leadership gives people a sense of collective self-efficacy and hope[204]. More importantly, though, it provides a psychological platform for group members to coordinate efforts to tackle stressors[205]. Without leadership, there is a risk that people will avoid acts of citizenship and instead embrace a philosophy of "everyone for themselves."

Leaders who are seen as prototypical of the group ("one of us") and as acting for the interest of the group as a whole ("working for us"), rather than for themselves or for another group, tend to gain greater influence[206,207]. Actions which divide the leader from followers, or which suggests that the leader is not prepared to share the burdens of followers, can be corrosive to their ability to shape followers' behaviour[208]. For instance, leaders who threaten people with sanctions as a way to deter undesired behavior may make people feel distrusted and paradoxically reduce their willingness to do as they are told[209]. Leaders and authorities who treat people with respect, and communicate that they trust people to do as they are told, tend to be more successful in eliciting cooperation[210].

Elevating the ingroup without demeaning others

Building a strong sense of shared social identity can help coordinate efforts to manage threats[205] and foster in-group commitment and adherence to norms[211]. Leaders can do this, for instance, by being a source of "moral elevation." Visibly displaying prosocial and selfless acts can prompt observers to also act with kindness and generosity themselves[212]. In this way, leaders can function as role models and motivate people to put their own values into action[213,214]. Having respected politicians, celebrities, and community leaders model exemplary behavior and sacrifice could help promote prosocial behavior and cooperation.

Excessive efforts to foster a sense of national unity by promoting the image of the nation as handling the situation exceptionally well can backfire—especially if there is no objective basis for this. An inflated belief in national greatness (i.e., "collective narcissism"[215]) can be maladaptive in a number of ways. For instance, it is associated with a greater focus on defending the image of the country, rather than on caring for its citizens[216,217]. It is also correlated with seeing out-groups as a threat and blaming them for in-group misfortunes[218]. To increase a willingness to take a pandemic seriously and engage with other nations to defeat it, citizens and leaders may need to accept that their country is at risk, just like others, and find ways to share resources and expertise across national boundaries.

Stress and coping

Even for households free from the virus, the pandemic is likely to function as a major stressor, especially in terms of chronic anxiety and economic difficulties. Such effects may be exacerbated by self-isolation policies that can increase social isolation and relationship difficulties. In this section, we consider some strategies to mitigate the virus-linked threats to social connection, intimate relationships, and stress.

Social isolation and connection

In the absence of a vaccine, one of the most vital strategies for slowing the pandemic is "social distancing". However, distancing clashes with the deep-seated human instinct to connect with others[219]. Social connection helps people regulate emotions, cope with stress, and remain resilient during difficult times[220–223]. By contrast, loneliness and social isolation worsen the burden of stress, and often produce deleterious effects on mental, cardiovascular, and immune health[224,225]. Older adults, who are at the greatest risk of severe symptoms from COVID-19, are also highly susceptible to isolation[226]. Distancing threatens to aggravate feelings of loneliness and could produce negative long-term health consequences.

Scholars have identified strategies that could mitigate these outcomes. First, in psychological terms, loneliness is construed as the subjective state that one is not experiencing enough social connection, whereas isolation is an objective lack of social interactions[227]. This means one can be isolated but not lonely, or lonely in a crowd. Thus, the term "social distancing" might imply that one needs to cut off meaningful interactions. A useful alternative term might be "physical distancing," to help highlight the fact that social connection is possible even when people are physically separated.

Online interactions can also foster a sense of connection. Both receiving and giving support online can bolster psychological well-being[228]. However, we caution against enhanced use of passive use of social media as research suggests that it may not contribute to one's sense of social connection[229,230]. Instead, technologies that are informationally rich, dyadic, and temporally synchronous appear better suited to generating empathy and connection[231,232]. Special attention should be placed on helping people who are less familiar with these technologies to learn how to take advantage of digital connections.

Intimate Relationships

The social effects of the pandemic also extend to the inside of our homes, where many people find themselves in sudden forced proximity with their immediate family. People subject to quarantine or self-isolation are at risk for confusion and anger (Brooks et al., 2020), emotional tendencies that can be explosive when multiple household members simultaneously endure them for weeks or months on end. Indeed, some studies suggest that forced proximity is a risk factor for aggression[233,234] and domestic violence[235].

Even without forced proximity, stress, including economic stress[236], is linked to relationship difficulties. It often changes the content of social interactions (e.g., more focus on unpleasant logistics, less focus on emotional connection), and undermines the psychological resources, like empathy and patience, that make challenging interactions go smoothly[237]. A study of the effects of Hurricane Hugo in 1989, for example, revealed that harder hit areas experienced a spike in the divorce rate[238]. The news is not all bad, however. The hurricane study also documented surging marriage and birth rates[238].

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. But one factor underlying success is for individuals to calibrate their expectations to the circumstances, a process that will vary from couple to couple and from partner to partner[239]. The recalibration process involves both (a) lowering broad expectations that the course of true love in the time of COVID-19 will run smoothly while also (b) sustaining high expectations in those domains where the relationship can deliver in these conditions.

Healthy Mindsets

In the face of a global pandemic, avoiding stress altogether is simply not an option. Fortuitously, the past twenty years of research on coping and stress suggest that it's not the type or amount of stress that determines its impact. Rather, mindsets and situation appraisals about stress can alter its impact[240,241]. For instance, some research finds these mindsets can increase the possibility of "stress related growth": a phenomenon in which stressful experiences serve to increase physiological toughening[242–244] help reorganize our priorities, and can help lead to deeper relationships and a greater appreciation for life[245].

Preliminary research suggests that mindsets about stress can be changed with short and targeted interventions. These interventions do not focus on viewing the stressor (such as the virus) as less of a threat[246]. Instead, they invite people to recognize that we tend to stress about things we care deeply about and that we can harness the stress response for positive gain. A number of studies found that inducing more adaptive mindsets about stress could increase positive emotion, reduce negative health symptoms and boost physiological functioning under acute stress[246,247]. Research is needed to see if adopting these mindsets can help some people harness the stress during a pandemic for positive growth.

Conclusion

Over 100 years ago, *Science* magazine published a paper on lessons from the Spanish Flu pandemic[248]. The paper argued that three main factors stand in the way of prevention: (1) people do not appreciate the risks they run, (2) it goes against human nature for people to shut themselves up in rigid isolation as a means of protecting others, and (3) people often unconsciously act as a continuing danger to themselves and others. Our paper provides some insights from the past century of work on related issues in the social and behavioural sciences that may help public health officials mitigate the impact of the current pandemic. Specifically, we discussed research on threat perception, social context, science communication, aligning individual and collective interests, leadership, and stress and coping. These are a selection of relevant topics, but readers may also be interested in other relevant work we were unable to cover, including on psychological reactance[249,250], collective emotions and social media[251,252], and the impact of economic deprivation and unemployment[253,254].

Urgent action is needed to mitigate the potentially devastating effects of COVID-19, action that can be supported by the behavioural and social sciences. However, many of the implications outlined here may also be relevant to future pandemics and public health crises. 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".

BOX 1: Social scientific insights for COVID-19 pandemic response

We highlight some insights for public health experts, policy makers, and community leaders.

- A shared sense of identity or purpose can be encouraged by addressing the public in collective terms and by urging "us" to act for the common good.
- Identifying sources (e.g., religious or community leaders) that are credible to different audiences to share public health messages can be effective.
- Leaders and the media might try to promote cooperative behavior by emphasizing that cooperating is the right thing to do and that other people are already cooperating.
- Norms of prosocial behaviour are more effective when coupled with the expectation of social approval and modeled by ingroup members who are central in social networks.
- Leaders and members of the media should highlight bipartisan support for COVID-related measures, when they exist, as such endorsements in other contexts have reduced polarization and led to less biased reasoning.
- There is a need for more targeted public health information within marginalized communities, and for partnerships between public health authorities and trusted organizations that are internal to these communities.
- Messages that (1) emphasize benefits to the recipient, (2) focus on protecting others, (3) align with the recipient's moral values, (4) appeal to social consensus or scientific norms, and/or (5) highlight the prospect of social group approval tend to be persuasive.
- Given the importance of slowing infections, it may be helpful to make people aware that they benefit from others' access to preventative measures.
- Preparing people for misinformation and ensuring they have accurate information and counterarguments against false information before they encounter conspiracy theories, fake news, or other forms of misinformation, can help 'inoculate' them against false information.
- Use of the term "social distancing" might imply that one needs to cut off meaningful interactions. A preferable term is "physical distancing," because it allows for the fact that social connection is possible even when people are physically separated.
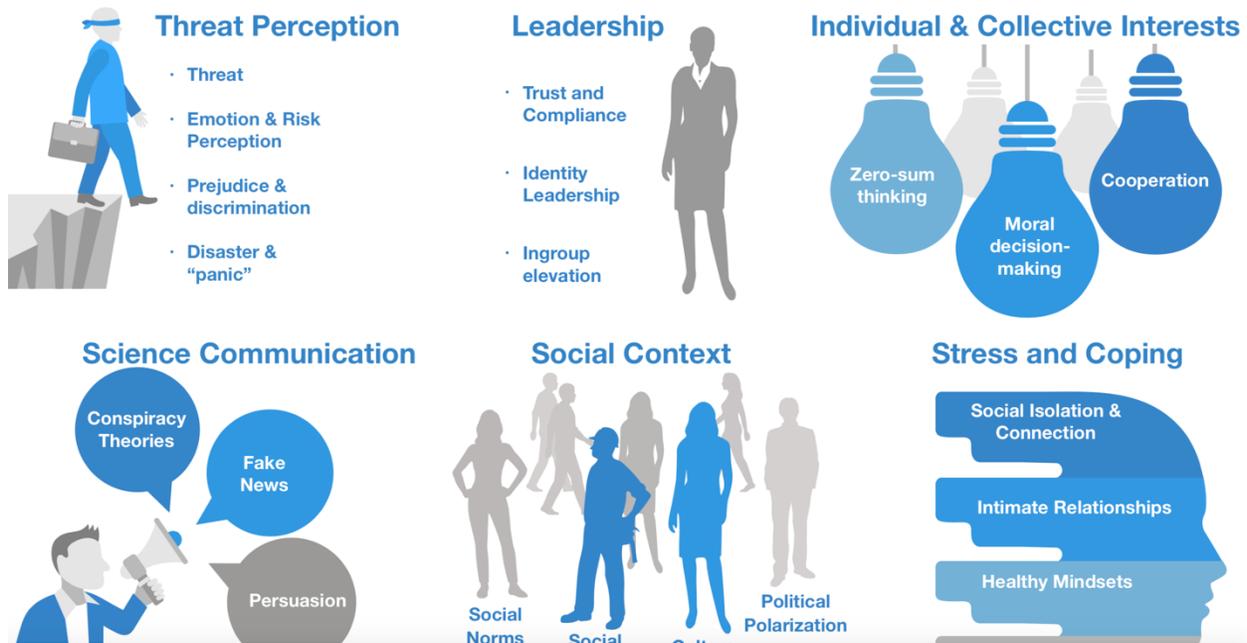
Figure 1. Infographic depicting a selection of topics from the social and behavioral sciences relevant during a pandemic. It includes threat perception, social context, science communication, individual and collective interests, leadership, and stress and coping. (The figure was built using the fonts, forms, and icons using Infographics Lab templates, Version 3.4.8 (502678)).

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COMPETING INTERESTS

The authors declare no competing interests.