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In a Pandemic, People Must Remember: Friends *Are* Contagious

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Friends *Are* Contagious

Abstract

This article reveals a behavioral tendency that may contribute to the spread of the novel coronavirus (SARS-CoV-2). Across seven studies—including two representative samples of Americans and Canadians (N = 3,408)—we show that people consistently underestimate the risk of contracting the coronavirus from close others (i.e., friends) compared to other groups (e.g., colleagues or strangers). We reveal that informing people of their (unconscious) preference to believe that friends are less risky than strangers can effectively attenuate this behavioral tendency. Together, these results shed light on a critical area of intervention for promoting social distancing: people's beliefs about the risk of contracting the coronavirus from their friends.

The coronavirus pandemic has dramatically changed people's lives: Since January 2020 the coronavirus has spread globally (*22*). In a few short months, the virus has caused a substantial death toll, primarily through a lung disease called COVID-19. The coronavirus spreads through droplets and aerosols produced in people's respiratory system (*31*) and often goes undetected when people's lungs are not affected. These clinical markers show the primary way of spreading COVID-19—through close contact with infected persons (*3; 4; 11*) and highlight that virtually anybody can be infected without being aware of it.

In the absence of pharmaceutical interventions (*15*), public health officials have advocated for physical distancing, which includes two primary strategies. The first strategy comprises keeping a distance between themselves and others of six feet (~two meters; *6; 12; 33*). The second mandates that people should avoid unnecessary contact with individuals who live outside their households.

In this article, we examine a process that affects people's adoption of physical distancing, that is, how people make assessments about the risks associated with various people in their social network. Based on previous research examining the connection between familiarity and trust in the context of risk assessment in general (*8*) and for diseases in particular (*9*), we propose that people will (a) systematically underestimate the risk of close others regarding the spread of the coronavirus and, as a result, (b) fail to obey physical distancing rules. Seven studies support these hypotheses and in doing so, identify a key issue related to confining the spread of the coronavirus.

Physical distancing—staying at least six feet away from other people and obeying 'stay-at-home' practices—is an effective method for attenuating the consequences of the coronavirus pandemic (*6; 10; 12*). Nearly all countries globally have advised their citizens to engage in physical distancing (*1; 24*). Insight into what predicts physical distancing is nascent. Emerging

research has found that person-level variables such as political orientation (*21*) and values (*19*) play a role in compliance with distancing recommendations.

Another underexplored factor that may lead people to defer practicing physical distancing is their perception of risk, or, how vulnerable they think they are in contracting the virus (e.g., *28; 31*). Prior research has examined the antecedents of risk perception including individual differences, such as health conditions (*17*), and general beliefs about susceptibility to infectious diseases (*8*). In research on the 'behavioral immune system,' Schaller and Park (*23*) describe multiple factors that increase people's perceived vulnerability to diseases. People who feel vulnerable to infections favor contact with more familiar rather than less familiar people (*9*). Moreover, high levels of repetition decrease perceived risk (*16*), unfamiliar objects are assessed as riskier (*7; 25; 26*), and people underestimate risk-related factors associated with their own group (*5*). Accordingly, we propose that people will judge close others to be less likely to spread the coronavirus and will be less inclined to engage in physical distancing with these individuals. Specifically, we propose following hypotheses:

H1: The perceived risk of catching the coronavirus from socially close others will be lower than from more socially distant others.

H2: Physical distancing will be less pronounced for socially close (vs. distant) others.

H3: The perceived risk of spreading coronavirus will mediate the effect of socially close (vs. distant) others on physical distancing.

We test these hypotheses in seven studies (N = 3,408) with participants recruited through representative panels or Amazon's Mechanical Turk, which is typically more representative of the general population than college samples (*20*). In all studies we obtained informed consent agreement by all subjects. See Table 1 for demographics across studies.

Table 1: Demographics across all studies.

Study	*N*	M_{age}	SD_{age}	Percent female	Percent political orientation left / democrat[1]
S1A	754	44.3	16.7	51.3	23.7
S1B	840	42.6	17.4	62.1	30.6
S2	296	34.3	10.3	32.1	32.8
S3	120	37.3	12.2	38.3	47.5
S4	196	38.3	12.3	45.9	52.6
S5	400	37.2	11.9	45.0	41.8
S6	802	38.5	12.8	46.8	31.5

[1]In the representative samples (S1A, S1B), the question was "Overall, what would be the best description of your political views", 0 = "very left leaning" to 10 = "very right leaning". Values 0-4 were counted left leaning. In all other studies, participants could identify as Democrats.

Studies 1A (*N* = 754) and 1B (*N* = 840) examine whether and how people perceive the risk of various social ties (Study A: US; Study B: Canada). Study 2 replicates these results in a scenario-based study (*N* = 296) and provides a more controlled test of our core hypothesis (H1). Study 3 (*N* = 120) examines whether people differently assess the risk of contracting the coronavirus from friends compared to strangers using a within-subjects design (H1). Study 4 (*N* = 196) further tests differences in the risk perceptions between close friends and colleagues (H1) and examines the consequences of risk perceptions on behavioral intentions to participate in a common social event (H2, H3). Study 5 is a pre-registered experiment (*N* = 400) that tests underlying mechanisms and rules out alternative explanations (i.e., different expectations of physical distancing among friends vs. strangers). Study 6 (*N* = 802) tests potential intervention strategies and uses a behavioral task to assess people's inclinations for physical distancing.

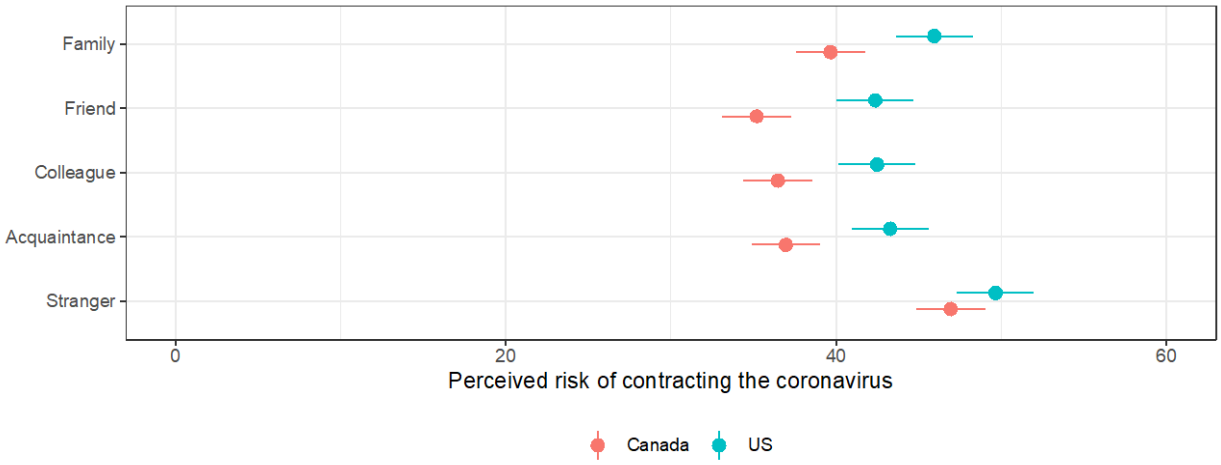
Together, these studies show that people underestimate the risks associated with interacting with close others, even while holding constant knowledge about physical distancing and previous interaction history (i.e., using scenarios that involve meeting the person by chance).

Results

Study 1: Representative surveys. Respondents were nationally representative in terms of gender, age, income, and ethnicity for the US (Sample A) and Canada (Sample B). Across Samples A and B, we used a linear mixed model and included several, conceptually relevant control variables (i.e., threat scales, staying at home practices, age, gender, region, knowledge of somebody tested positive, working hours) to examine people's perceptions of contracting COVID from friends, family, acquaintances, colleagues, and strangers.

In Sample A, people rated the probability of contracting coronavirus from a friend to be lowest, and from a stranger to be highest (M_{Friend} = 42.37%, M_{Family} = 45.95%, $M_{\text{Colleague}}$ = 42.48%, $M_{\text{Acquaintance}}$ = 43.27%, M_{Stranger} = 49.65%). In Sample B, once again, people rated the probability of contracting coronavirus from a friend to be lowest, and from a stranger to be highest (M_{Friend} = 37.27%, M_{Family} = 41.77%, $M_{\text{Colleague}}$ = 38.58%, $M_{\text{Acquaintance}}$ = 39.06%, M_{Stranger} = 49.07%). See Figure 1 for point estimates. These effects hold even when including all covariates. See appendix for between-group contrasts, as well as moderation analyses that further explore the low risk perceptions people had about their colleagues.

Figure 1: The perceived risk of contracting the coronavirus from various social ties.

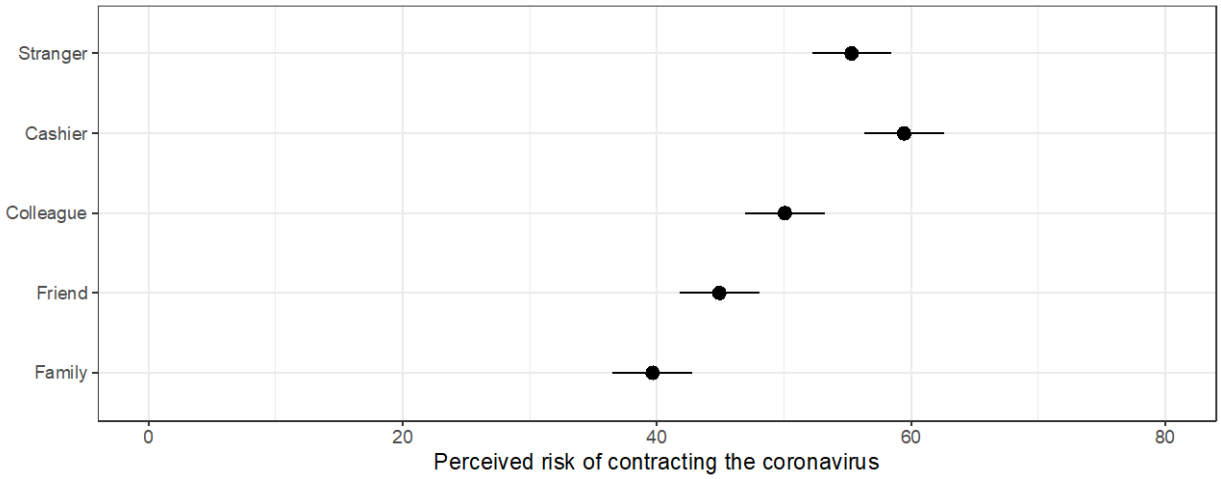


Study 2: Supermarket Study. In Study 2, respondents imagined taking a trip to a local supermarket and talking to a friend, family member, stranger, work colleague, and cashier (in random order). This allowed us to hold constant exposure to members of each group (we suspected the high perceived risk of family members in S1 to be caused by frequent exposure). Respondents then indicated who they would be most likely to contract the coronavirus from.

Consistent with Study 1, people rated the probability of contracting coronavirus from close others (i.e., the friend or family member) to be lowest, while the risk of the cashier was evaluated to be the highest (M_{Friend} = 44.91%, M_{Family} = 39.66%, $M_{\text{Colleague}}$ = 50.06%, M_{Stranger} = 55.33, M_{Cashier} = 59.45%; H1). See Figure 2 for point estimates and appendix for contrasts.

Overall, people evaluated the risk lowest for close others (i.e., family and friends), and highest for others who they were not close to (i.e., strangers and cashier). These effects were robust when controlling for the time that people expected interacting with members from each group (see appendix).

Figure 2: The effect of conditions on perceived risk of contracting the coronavirus.

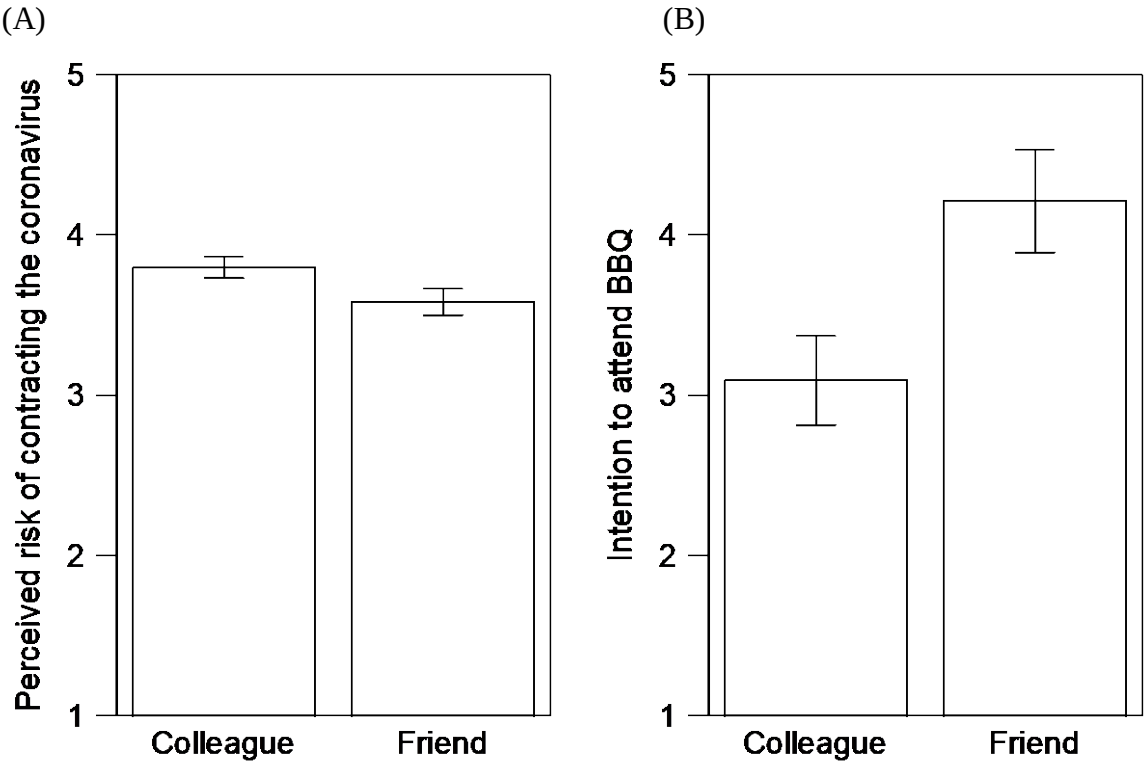


Study 3: Supermarket Replication. Respondents imagined meeting and talking to a friend (close other person) and a stranger for ten minutes each during a trip to a local supermarket. Then, they imagined that they started to exhibit symptoms of COVID-19 (three days after the trip to the supermarket) and indicated who they believed they had contracted the disease from (binary response: "friend" vs. "stranger"). Respondents were more likely to identify the stranger as the person infecting them with COVID-19 (exact binomial test: $M_{\text{Friend}} = 44\%$, $M_{\text{Stranger}} = 56\%$; $p < 0.001$). People also rated the risk of contracting COVID-19 as greater for the stranger compared to the friend (linear mixed model: $M_{\text{Friend}} = 5.98$, $SD = 1.88$, $M_{\text{Stranger}} = 6.47$, $SD = 1.86$; $B = 0.49$, $SE = 0.24$, $t(238) = 2.04$, $p = 0.043$, $d = 0.26$; H1).

Study 4: BBQ Invitation. To replicate Studies 2 & 3 using a new context and a between-subjects design, and to show the behavioral consequences of the effects, participants imagined that a good friend or a distant work colleague had invited them to a BBQ in the upcoming weeks. Participants estimated the risk of contracting the coronavirus from the friend or the distant work colleague and reported on their intention to attend the BBQ.

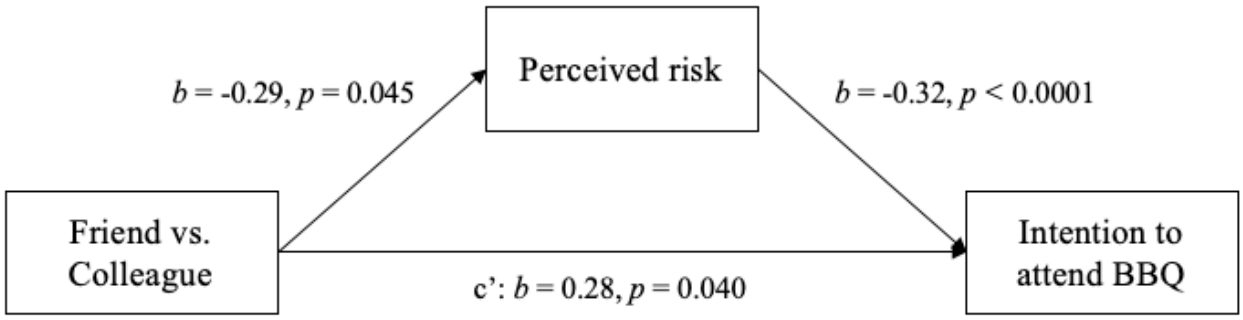
Again, people perceived their friend as less risky than their colleague (M_{Friend} = 3.58, *SD* = 0.82, $M_{\text{Colleague}}$ = 3.80, *SD* = 0.67; *t*(194) = 2.01, *p* = 0.045, *d* = 0.29; see Figure 3A; H1). People stated they were more likely to attend their friend's BBQ than their colleague's (M_{Friend} = 4.21, *SD* = 3.19, $M_{\text{Colleague}}$ = 3.09, *SD* = 2.74; *t*(194) = -2.63, *p* = 0.009, *d* = 0.38; see Figure 3B; H2).

Figures 3: The effect of conditions on (A) perceived risk of contracting the coronavirus and (B) intention to attend BBQ.



We then examined whether differences in perceived risk explained why people were more inclined to attend the BBQ of their friend (vs. colleague). The indirect effect via perceived risk (b = 0.09, $CI_{95\%}$ = [0.03; 0.20], SE = 0.05) was significant. The direct effect of condition (friend vs. colleague) on intention to attend the BBQ remained significant (b = 0.28, $CI_{95\%}$ = [0.01; 0.55], SE = 0.14, t = 2.07, p = 0.040). Thus, perceived risk explained the effect of close (vs. distant) others on intentions to attend the BBQ (H3). See Figure 4 for individual paths of the mediation model.

Figure 4: The mediational paths of condition on intention to attend BBQ.

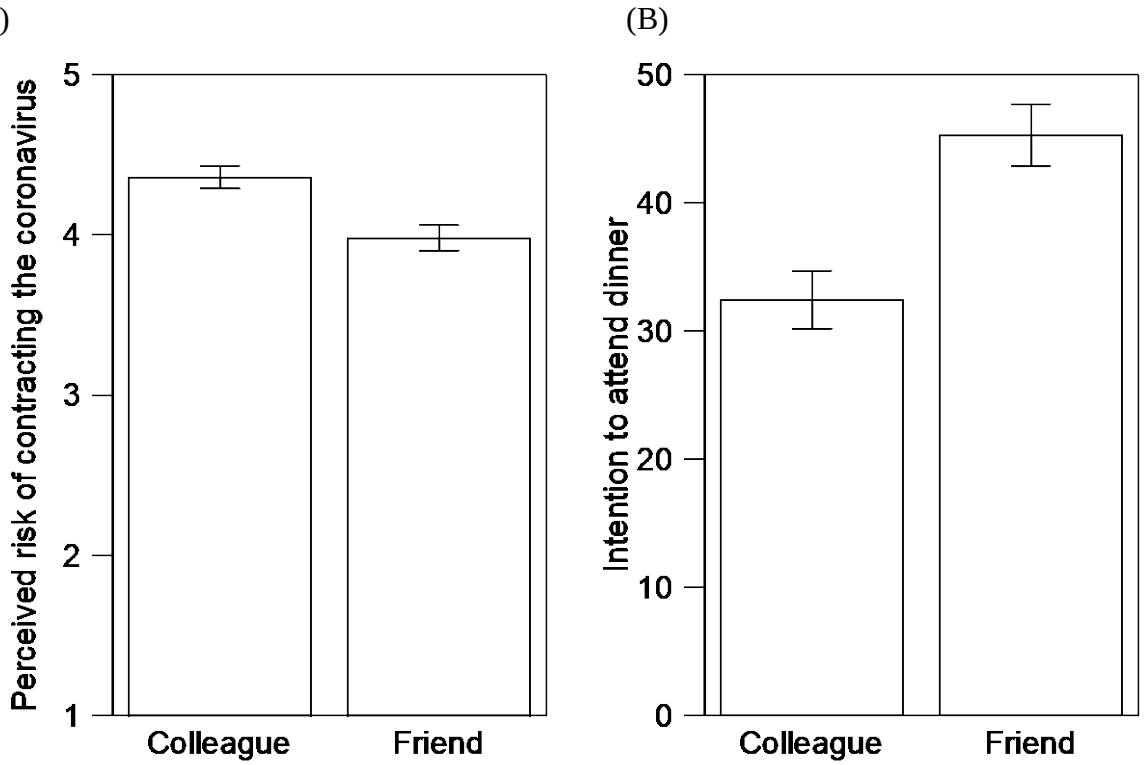


Study 5: Dinner Invitation. In Study 5, we wanted to replicate the results of Study 4, while including a potential mechanism, perceived trust, and ruling out an alternative explanation—the belief that friends were more likely to follow social distancing guidelines. Participants imagined that themselves and their partner were invited for a dinner and were randomly assigned to imagine that a good friend or a distant work colleague had invited them.

People perceived their friend as less risky than their colleague (M_{Friend} = 3.99, *SD* = 1.13, $M_{Colleague}$ = 4.33, *SD* = 1.01; *t*(396) = -3.14, *p* = 0.002, *d* = -0.32; see Figure 5A; H1) and they were more willing to attend the dinner hosted by their friend vs. colleague (M_{Friend} = 45.42, *SD* = 34.09, $M_{Colleague}$ = 32.31, *SD* = 32.14; *t*(397) = 3.95, *p* < 0.001, *d* = 0.40; see Figure 5B; H2).

People also trusted their friend more than their colleague (M_{Friend} = 5.73, *SD* = 1.17, $M_{Colleague}$ = 4.35, *SD* = 1.43; *t*(398) = 10.60, *p* < 0.001, *d* = 1.06) and believed that their friend were more likely to engage in physical distancing than their colleague (M_{Friend} = 4.99, *SD* = 1.46, $M_{Colleague}$ = 4.38, *SD* = 1.43; *t*(398) = 4.19, *p* < 0.001, *d* = 0.42).

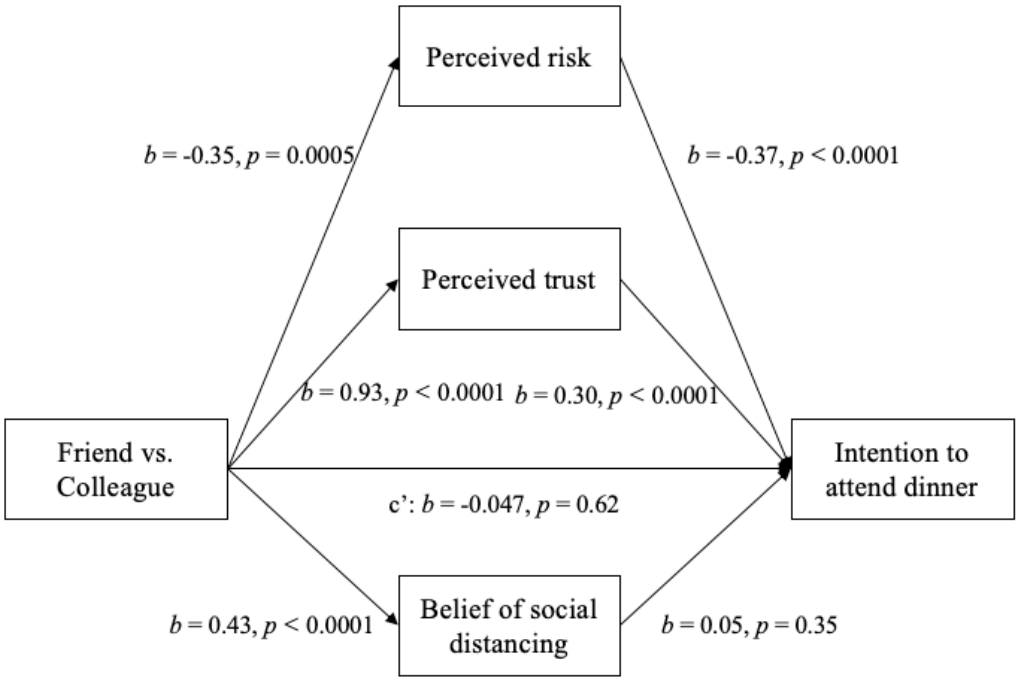
Figures 5: The effect of conditions on (A) perceived risk of contracting the coronavirus and (B) intention of attending dinner.



Next, we explored whether perceived risk, expected physical distancing and trust explained *why* people were more likely to attend the dinner of the friend vs. colleague. The indirect effect via perceived risk was significant (b = 0.11, $CI_{95\%}$ = [0.04; 0.19], SE = 0.04; H3). Moreover, the effect of trust (b = 0.30, $CI_{95\%}$ = [0.19; 0.43], SE = 0.06) was significant whereas the indirect effect via social distancing was non-significant (b = 0.02, $CI_{95\%}$ = [-0.02; 0.07], SE = 0.02). With the indirect effect included in the model, the direct effect of condition on intention to attend the dinner became non-significant (b = -0.05, $CI_{95\%}$ = [-0.23; 0.14], SE = 0.09, t = -0.49, p = 0.63). See Figure 6 for individual paths of the mediation model. Thus, perceived risk explained the effect of close (vs. distant) others on intentions to attend the dinner (H3). Although

participants believed friends were more likely to be physically distancing, this did not predict whether people wanted to attend the event.

Figure 6: The mediational paths of condition on intention to attend dinner.

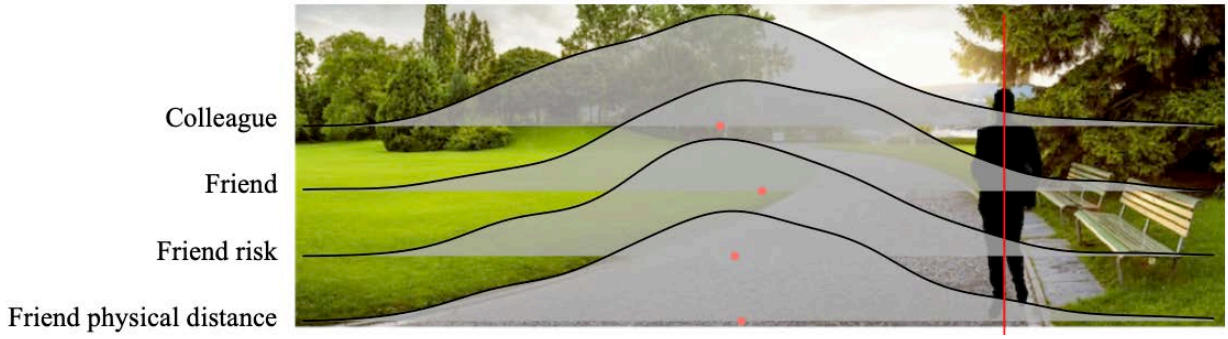


Study 6: Park Interaction. Participants imagined visiting a local park and interacting with a good friend or a work colleague. Some participants who were assigned to the 'friend' condition were randomly assigned to one of two intervention conditions. The first intervention reminded people that their friends posed a significant health-risk. The second intervention reminded people that social distancing was important to reduce transmission. All participants rated their perceived risk of the park interaction and completed a physical distancing task indicating how close they would stand to the friend or colleague while meeting (see appendix).

Consistent with our previous studies, in the no-intervention condition, people perceived interacting with their friend as less risky (M_{Friend} = 3.25, *SD* = 0.85, $M_{\text{Colleague}}$ = 3.49, *SD* = 0.91,

$M_{FriendRisk}$ = 3.52, *SD* = 1.04, $M_{FriendDistance}$ = 3.35, *SD* = 0.92) than interacting with their colleague (*B* = -0.24, *t*(798) = -2.58, *p* = 0.017, *d* = 0.26; H1) and they kept less physical distance (M_{Friend} = 676.98, *SD* = 209.25, $M_{Colleague}$ = 746.08, *SD* = 199.67, $M_{FriendRisk}$ = 713.49, *SD* = 209.04, $M_{FriendDistance}$ = 717.78, *SD* = 194.88; *B* = -69.09, *t*(798) = -3.37, *p* = 0.001, *d* = 0.34; H2; see appendix for all contrasts). Most critically, the interventions successfully increased physical distancing in the behavioral task (Figure 7). Participants who were randomly assigned to the interventions engaged in more physical distancing in the behavioral task than participants who were randomly assigned to the no-intervention condition. The mediation analyses supported the role of perceived risk (H3) and showed that the interventions reduced this link (see appendix).

Figure 7: The effect of condition on physical distancing.



Note: Red dots show median values.

General discussion

The coronavirus pandemic has significantly changed the way we live. To date, no vaccine exists that can cure the effects of the virus and will allow us to go back to normal life. In this paper, we document an effect that potentially contributes to the spread of the pandemic: People assign consistently less risk to their friends and engage in less physical distancing compared to other more socially distant groups—including strangers and colleagues.

Seven studies support this hypothesis: Study 1, which included two representative surveys conducted in the US and in Canada, provided initial evidence that people who were previously known to individuals—especially friends—were systematically thought to pose less risk than strangers. Study 2 used a more controlled design to corroborate these findings. Study 3 used another scenario-based study to replicate these effects in a different social setting. Studies 4 & 5 corroborated these findings and found that this biased assessment for believing friends are less risky translated into behavioral intentions to meet up with friends at a BBQ and at a dinner. Study 6 provided initial evidence that highlighting the fact that friends can be *more* likely to spread the coronavirus—as we interact with them more often and for a longer period of time—attenuated this tendency to assess friends as less risky and restored physical distancing.

The key contribution of this paper is revealing one of the mechanisms that potentially contributes to the spread of the novel coronavirus: People underestimate the risk that friends—and other close contacts—pose, even though close others are most likely one of the facilitators of the spread (*13*). Indeed, recent studies not only find that mainly close contacts such as family members, or community contacts spread the disease (*3; 4; 11*), but also that social contacts play a critical role in spreading the disease (*13; 32*). Moreover, we provide interventions which can attenuate the perceptions of friends. This paper therefore contributes to research on behavioral science called for by international organizations (*30*), as well as scientists (*2*) by highlighting a critical area for future intervention: reducing the perception that friends are less risky and more trustworthy than strangers, colleagues, and more socially distant others.

Methods

Verbal informed consent was obtained from all participants. All data and variables are accessible under https://osf.io/7g3ds/?view_only=27c23a42455949e091f82ffd1532b198. Study 5 was preregistered on aspredicted.org (preregistration number "39609", http://aspredicted.org/blind.php?x=h87u65). Study 6 was preregistered on aspredicted.org (preregistration number "41200", http://aspredicted.org/blind.php?x=5cx7qx). Where possible, we excluded people who had already contracted the coronavirus given that would likely not fear contracting the virus and their assessments would be heavily biased by personal experience.

Study 1: Representative Samples. Sample A was recruited using the professional survey company 'Qualtrics'. Sample B was recruited using an online survey recruitment provider 'Lucid'. Samples A and B were collected in nearly an identical way. First, respondents completed a manipulation check that asked them to type a specific number into a field. Moreover, respondents reported whether they had tested positive for COVID-19. We excluded participants who had tested positive for COVID, as they would be unlikely to contract the COVID-19 in future.

The two studies were conducted in a nearly identical way. All respondents were asked to assess the risk of contracting coronavirus from a friend, a family member, a stranger, a work colleague and an acquaintance as compared to any other person: "Compared to any other person, how high would you estimate the likelihood to be infected with the coronavirus from ____?" The scale ranged from 0 = "Far below average" over 50 = "Average" to 100 = "Far above average".

Respondents then completed several questions that we used as control variables including "Currently, how many hours per week (Monday to Sunday) do you spend on paid work?", the two-factor COVID-19 threat scale (*14*; "On March 11th, 2020, the World Health Organization (WHO) officially declared the COVID-19, a viral disease that has swept the globe, a

pandemic. “How much of a threat, if any, is the coronavirus outbreak for each of the following,” sample item factor 1: “Your personal health”; sample item factor 2: “American values and traditions”), whether they stayed at home (“During the days of the coronavirus (COVID-19) pandemic, I have been...” “...staying at home as much as practically possible,” “...visiting friends, family, or colleagues outside my home”, ranging from 0 = “Strongly disagree” to 10 = “Strongly agree”), and whether participants knew anybody who tested positive (1 = “no”, 2 = “no”).

At the end of the survey, respondents were asked several demographic questions (age, gender, region [Midwest, Northeast, South, West]). The demographic variables slightly differed across Sample A and Sample B (see Open Science Framework for full items; https://osf.io/7g3ds/?view_only=27c23a42455949e091f82ffd1532b198). Our questions were part of a larger multi-topic study administered during the beginning of May 2020.

Study 2: Supermarket Study. Respondents were recruited from the online pool Amazon Mechanical Turk (MTurk). Respondents first indicated a name of a friend. Then, they imagined that they went shopping at the supermarket and talked to several groups of people. Specifically, we asked respondents to imagine encountering a friend, a family member, a stranger, a work colleague and the cashier of the supermarket: “*Imagine you went shopping this week and you met several persons, a friend, the cashier in the supermarket, a stranger, and a work colleague*.”

Next, respondents rated the probability of contracting the coronavirus from each of the people mentioned against any other person: “*Compared to any other person, how high would you estimate the likelihood to be infected with the coronavirus from each of these persons?*” The scale ranged from 0 = “Far below average” over 50 = “Average” to 100 = “Far above average.”

Moreover, respondents indicated the amount of time they would expect talking with each of those groups of people “*How much time would you spend talking with each of these persons? (please indicate in minutes)*” on a scale ranging from 0 minutes to 60 minutes.

Respondents then answered several demographic questions.

Study 3: Supermarket Replication. Participants were recruited from MTurk. Participants imagined that they were shopping and that they had talked to a stranger as well as a friend. Participants imagined that they were starting to cough and suspected that they had contracted the coronavirus. We asked participants to imagine a friend that they had not seen in the past weeks and therefore could not know whether s/he followed the recommendations of the center for disease control (CDC) ("*Imagine you went shopping four days ago and met a stranger and a friend that you had not seen for 2-3 weeks. You talked with both for about 15 minutes. You are not aware whether the friend has followed best practices from the Center for Disease Control in the US (https://www.cdc.gov/coronavirus/2019-ncov/index.html). Imagine, you now start coughing and worry that you have been infected with coronavirus*").

Next, we asked a series of questions about who was most likely to have spread the coronavirus ("*Assume you would have been infected with the coronavirus. Who would you think had infected you with the coronavirus?*", 1 = "friend", 2 = "stranger") and the probability they would have assigned to the stranger and the friend ("*How high would you estimate the likelihood to have been infected with the coronavirus by the [friend / stranger]?*", 1 = 0% to 11 = 100%). Then participants answered several demographic questions including their age and gender.

Study 4: BBQ Study. Participants were recruited from MTurk. Participants imagined that they were invited for a BBQ. To increase realism, we asked participants to indicate three persons who had invited them: A good friend, a family member, and a distant work colleague. Importantly, they were given the advice to only choose a person that they had not heard or seen during the past two weeks ("*Please name the first names and the first letter of the last name for each of the following groups below (Example: Peter F.). Important: Please choose persons that*

you have not talked to about the coronavirus in the past two weeks.") This was done to guarantee that people did not know whether the person engaged in social distancing.

In the friend condition, participants imagined that they were invited by the friend that they had named. In the colleague condition, participants were asked to imagine being invited by the colleague they had named: "*Imagine [friend's / colleague's name] is planning a BBQ at her/his place with about 8 people in about three weeks from now. [friend's / colleague's name] asks if you want to join. Importantly, you do not know whether [friend's / colleague's name] engaged in social distancing as suggested by the health authorities in the course of the coronavirus pandemic*." Also, given that there were limitations that made it impossible to meet somebody in parts of the US when we ran the study, we highlighted the fact that the BBQ would take place in three weeks (at a time in which the social distancing restrictions could have been lifted).

Next, participants estimated the risk of contracting the coronavirus (using seven items of the 10-item scale from *18*, $\alpha = 0.83$). Moreover, we asked for the probability to meet the person. Then participants answered demographic questions.

The manipulation check of closeness showed that the manipulation worked as intended. The t-test of condition on perceived closeness was significant ($M_{\text{Friend}} = 4.53$, $SD = 1.62$, $M_{\text{Colleague}} = 3.02$, $SD = 1.52$; $t(194) = 6.71$, $p < 0.0001$, $d = 0.96$). Thus, the friend was perceived to be closer than the colleague.

Study 5: Dinner Study: Participants were recruited from MTurk. Participants imagined that they were invited for a dinner. The exact conditions read as follows: *"Imagine [colleague's / friend's name] is planning a dinner with themselves and their partner at her/his place in about three weeks from now. [colleague's / friend's name] asks if you want to join. Importantly, you do not know whether [colleague's / friend's name] engaged in social distancing as suggested by the health authorities in the course of the coronavirus pandemic"*

Importantly, participants received the instructions that both had to live in the same city to guarantee that the invitation was realistic. In the friend condition, participants imagined they were invited by the friend that they named. In the colleague condition, participants imagined being invited by the distant colleague that they had named. Also, given that there were limitations that made it impossible to meet somebody in parts of the US when we ran the study, we highlighted the fact that the dinner would take place in three weeks from now.

Next, we asked a series of questions asking participants about how high they estimated the risk of contracting the coronavirus. In this study we reduced the scale of *18* to five items (α = 0.72). We also measured perceived trust using a 3-item scale ("*How much can you count on [colleague's / friend's name],*" "*How much do you trust [colleague's / friend's name],*" "*How dependable is [colleague's / friend's name],*" , ranging from 1 = "not at all" to 7 = "very much"; *27*; α = 0.94). We measured closeness to the person using a 1-item scale ("*To what extent do you feel close to [colleague's / friend's name]?*" ranging from 0 = "Not close at all" to 100 = "Very close"), belief in social distancing ("*To what extent do you believe that [colleague's / friend's name] follows social distancing guidelines?*", 1 = "Strongly agree" to 7 = "Strongly disagree"; this item was reversed for the analysis). Finally, we asked participants about their willingness to accept the invitation to dinner ("To what extent would you be inclined to accept the invitation of [colleague's / friend's name] for dinner?" ranging from 0 = "very unlikely" to 100 = "very likely"). Then participants answered several demographic questions.

The manipulation check of closeness showed that the manipulation worked as intended. The t-test of condition on perceived closeness was significant (M_{Friend} = 78.34, *SD* = 17.68, $M_{\text{Colleague}}$ = 39.32, *SD* = 27.43; $t(398) = 17.00$, $p < 0.0001$, $d = 1.71$). Thus, the friend was perceived to be closer than the colleague.

Study 6*:* Park Interaction. Participants were recruited from MTurk to four conditions (colleague vs. friend vs. friend direct vs. friend social distancing) of this between-subjects experiment. We excluded participants who indicated that they tested positive for COVID-19. This led to a final sample of 802 participants, slightly exceeding the preregistered sample size (i.e., $N = 800$). This study and all measures were preregistered on aspredicted.org (preregistration number "41200", registered May 17 2020; http://aspredicted.org/blind.php?x=5cx7qx).

Participants imagined that they met a person in a park. Again, we asked participants to indicate two persons: A good friend and a distant work colleague. Importantly, participants received the instructions that had to live in the same city to guarantee the invitation was realistic.

Next, we presented participants with the interventions. Across all conditions participants first read the sentence: "*The new coronavirus has become a major health crisis. In the US alone, more than 1.5 mill people are infected with the virus and more than 90.000 have died.*" Again, the interventions only were provided in the "friends" conditions (but not in the colleague condition), as they should attenuate the effect of friends on risk and intention to attend the event.

The first intervention ("friend risk") directly aimed at making people more attuned to the idea that friends pose a significant risk. The condition read as follows: "*Friends are most likely to spread COVID-19: One gets closer when speaking to friends (i.e., less than 6 feet) and talks longer than with anyone else (i.e., more than 15 minutes). This increases the likelihood of transmitting of COVID-19. In pandemics, friends are your enemies!*"

The second intervention ("friend distance") was included to test whether generic social distancing measures could already attenuate the bias exhibited against friends. Thus, we included a message reminding people of social distancing, which read as follows: "*Lack of physical distance makes it likely to spread COVID-19: If one is close to others (i.e., less than 6 feet) and if one talks longer (i.e., more than 15 minutes), more virus material is seeded. This increases the*

likelihood of transmitting of COVID-19. Do not get too close to anybody!" The time was fixed between 15 and 40 seconds to make sure all participants closely read the text of the shown intervention. The site was followed by a message again displaying the last sentence of the intervention.

Next participants imagined that they would meet the friend (vs. colleague) in the park. In the friend condition, participants were asked to imagine they met the friend in the park while in the colleague condition they had to imagine the colleague. The exact conditions read as follows: *"Imagine you now meet [colleague's / friend's name] in the park. Imagine talking with [colleague's / friend's name] for some minutes."*

Participants then had to rate the risk of contracting coronavirus from the imagined person: "*Assess following answers and statements concerning the risk of contracting coronavirus of [colleague's / friend's name].*" Participants also rated the same five statements as in the previous studies (α = 0.81). Then participants had to indicate how close they would stand to the person using an online social distancing task (this study could not be conducted offline as none of the authors' universities would have allowed that study). The task displayed a scene in the park including the shadow of a person. Participants were asked to imagine that this person was their friend (vs. colleague): "*In the previous situation when you imagined meeting in the park, how close would you stand to [colleague's / friend's name]? You are the green person on the left-hand side, indicate how close you would go to on the right. To do so, drag and drop the green person. Then click 'Submit'.*" The online social distancing task is shown in the appendix. To measure the distance that people too, we used the vertical distance between both people that was automatically registered by the task (i.e., the pixels on the x-axis were registered automatically. Then, participants answered several questions about their demographics (i.e., age, gender, political orientation) and several COVID-19 related control variables, such as whether they

currently leave their homes ("How often do you leave home at the moment (e.g., for shopping, the pharmacy)?", ranging 1 = "Once per month or less" to "More than twice per day").

The manipulation check of closeness showed that the manipulation worked as intended. The one-way ANOVA showed that the colleague condition was perceived to be less close than all other conditions irrespective of the intervention ($M_{Colleague}$ = 3.04, SD = 1.45, M_{Friend} = 5.38, SD = 1.64, $M_{FriendRisk}$ = 5.32, SD = 1.66, $M_{FriendDistance}$ = 5.40, SD = 1.52; $F(3,798) = 111.25$, $p < 0.0001$). All contrasts with the colleague condition were significant (ps < 0.0001) and none of the contrasts among the friend conditions were significant (ps > 0.60).

References

1) Anderson, R. M., Heesterbeek, H., Klinkenberg, D., and Hollingsworth, T. D. (2020). How will country-based mitigation measures influence the course of the COVID-19 epidemic? *The Lancet*, 395(10228), 931-934.
2) Bavel, J.J.V., Baicker, K., Boggio, P.S. et al. (2020), "Using social and behavioural science to support COVID-19 pandemic response," *Nature Human Behaviour*, 395 (Suppl. 3), https://doi.org/10.1038/s41562-020-0884-z.
3) Böhmer, Merle M, Udo Buchholz, Victor M Corman, Martin Hoch, Katharina Katz, Durdica V Marosevic, Stefanie Böhm, Tom Woudenberg, Nikolaus Ackermann, Regina Konrad, Ute Eberle, Bianca Treis, Alexandra Dangel, Katja Bengs, Volker Fingerle, Anja Berger, Stefan Hörmansdorfer, Siegfried Ippisch, Bernd Wicklein, Andreas Grahl, Kirsten Pörtner, Nadine Muller, Nadine Zeitlmann, T Sonia Boender, Wei Cai, Andreas Reich, Maria an der Heiden, Ute Rexroth, Osamah Hamouda, Julia Schneider, Talitha Veith, Barbara Mühlemann, Roman Wölfel, Markus Antwerpen, Mathias Walter, Ulrike Protzer, Bernhard Liebl, Walter Haas, Andreas Sing, Christian Drosten, and Andreas Zapf (2020), "Investigation of a COVID-19 outbreak in Germany resulting from a single travel-associated primary case: a case series," *The Lancet Infectious Diseases*, 1–9, https://doi.org/10.1016/S1473-3099(20)30314-5.
4) Burke, Rachel M., Midgley, Claire M., Dratch, Alissa, Fenstersheib, Marty, Haupt, Thomas, Holshue, Michelle, Ghinai, Isaac, Jarashow, M. Claire, Lo, Jennifer, McPherson, Tristan D. Rudman, Sara, Scott, Sarah, Hall, Aron J., Fry, Alicia M., Rolfes, Melissa A. (2020), "Active Monitoring of Persons Exposed to Patients with Confirmed COVID-19 — United States, January–February 2020,"; Weekly / March 6, 2020 / 69(9);245–246, Accessed at: https://www.cdc.gov/mmwr/volumes/69/wr/mm6909e1.htm?s_cid = mm6909e1_w
5) Campbell, L. F., & Stewart, A. E. (1992). Effects of group membership on perception of risk for AIDS. *Psychological reports*, 70(3_suppl), 1075-1092.
6) Chu, Derek K, Elie A Akl, Stephanie Duda, Karla Solo, Sally Yaacoub, Holger J Schünemann, Derek K Chu, Elie A Akl, Amena El-harakeh, Antonio Bognanni, Tamara Lotfi, Mark Loeb, Anisa Hajizadeh, Anna Bak, Ariel Izcovich, Carlos A Cuello-Garcia, Chen Chen, David J Harris, Ewa Borowiack, Fatimah Chamseddine, Finn Schünemann, Gian Paolo Morgano, Giovanna E U Muti Schünemann, Guang Chen, Hong Zhao, Ignacio Neumann, Jeffrey Chan, Joanne Khabsa, Layal Hneiny, Leila Harrison, Maureen Smith, Nesrine Rizk, Paolo Giorgi Rossi, Pierre AbiHanna, Rayane El-khoury, Rosa Stalteri, Tejan Baldeh, Thomas Piggott, Yuan Zhang, Zahra Saad, Assem Khamis, Marge Reinap, Stephanie Duda, Karla Solo, Sally Yaacoub, and Holger J Schünemann (2020), "Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis," *The Lancet*, 1–15. Doi: https://doi.org/10.1016/S0140-6736(20)31142-9.
7) Covello, V. T., Peters, R. G., Wojtecki, J. G., & Hyde, R. C. (2001). Risk communication, the West Nile virus epidemic, and bioterrorism: responding to the commnication challenges posed by the intentional or unintentional release of a pathogen in an urban setting. *Journal of Urban Health*, 78(2), 382-391.
8) Duncan, L. A., Schaller, M., & Park, J. H. (2009). Perceived vulnerability to disease: Development and validation of a 15-item self-report instrument. *Personality and Individual differences*, 47(6), 541-546.

9) Faulkner, J., Schaller, M., Park, J.H., & Duncan, L.A. (2004). Evolved disease-avoidance mechanisms and contemporary xenophobic attitudes. *Group Processes and Intergroup Behavior*, 7, 333–353.
10) Flaxman, Seth, et al. (2020), "Report 13: Estimating the number of infections and the impact of non-pharmaceutical interventions on COVID-19 in 11 European countries," *Imperial College COVID-19 Response Team*, Working Paper.
11) Ghinai, Isaac, Tristan D McPherson, Jennifer C Hunter, Hannah L Kirking, Demian Christiansen, Kiran Joshi, Rachel Rubin, Shirley Morales-Estrada, Stephanie R Black, Massimo Pacilli, Marielle J Fricchione, Rashmi K Chugh, Kelly A Walblay, N Seema Ahmed, William C Stoecker, Nausheen F Hasan, Deborah P Burdsall, Heather E Reese, Megan Wallace, Chen Wang, Darcie Moeller, Jacqueline Korpics, Shannon A Novosad, Isaac Benowitz, Max W Jacobs, Vishal S Dasari, Megan T Patel, Judy Kauerauf, E Matt Charles, Ngozi O Ezike, Victoria Chu, Claire M Midgley, Melissa A Rolfes, Susan I Gerber, Xiaoyan Lu, Stephen Lindstrom, Jennifer R Verani, Jennifer E Layden, Sarah Brister, Kristin Goldesberry, Stacey Hoferka, Dejan Jovanov, Dawn Nims, Lori Saathoff-Huber, Chantel Hoskin Snelling, Hira Adil, Raabiah Ali, Elaina Andreychak, Kelley Bemis, Mabel Frias, Pearl Quartey-Kumapley, Kristin Baskerville, Elizabeth Murphy, Emily Murskyj, Zach Noffsinger, Janice Vercillo, Apryll Elliott, Uche S Onwuta, Danielle Burck, Glen Abedi, Rachel M Burke, Ryan Fagan, Jennifer Farrar, Alicia M Fry, Aron J Hall, Amber Haynes, Connor Hoff, Shifaq Kamili, Marie E Killerby, Lindsay Kim, Stephanie A Kujawski, David T Kuhar, Brian Lynch, Lakshmi Malapati, Mariel Marlow, Janná R Murray, Brian Rha, Senthil Kumar K Sakthivel, Sarah E Smith-Jeffcoat, Elizabeth Soda, Lijuan Wang, Brett L Whitaker, and Timothy M Uyeki (2020), "First known person-to-person transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in the USA," *The Lancet*, 395(10230), 1137–44.
12) Greenstone, M., and Nigam, V. (2020). Does Social Distancing Matter? University of Chicago, Becker Friedman Institute for Economics Working Paper, (2020-26).
13) Gudbjartsson, Daniel F, Agnar Helgason, Hakon Jonsson, Olafur T Magnusson, Pall Melsted, Gudmundur L Norddahl, Jona Saemundsdottir, Asgeir Sigurdsson, Patrick Sulem, Arna B Agustsdottir, Berglind Eiriksdottir, Run Fridriksdottir, Elisabet E Gardarsdottir, Gudmundur Georgsson, Olafia S Gretarsdottir, Kjartan R Gudmundsson, Thora R Gunnarsdottir, Arnaldur Gylfason, Hilma Holm, Brynjar O Jensson, Aslaug Jonasdottir, Frosti Jonsson, Kamilla S Josefsdottir, Thordur Kristjansson, Droplaug N Magnusdottir, Louise le Roux, Gudrun Sigmundsdottir, Gardar Sveinbjornsson, Kristin E Sveinsdottir, Maney Sveinsdottir, Emil A Thorarensen, Bjarni Thorbjornsson, Arthur Löve, Gisli Masson, Ingileif Jonsdottir, Alma D Möller, Thorolfur Gudnason, Karl G Kristinsson, Unnur Thorsteinsdottir, and Kari Stefansson (2020), "Spread of SARS-CoV-2 in the Icelandic Population," *New England Journal of Medicine*, DOI: 10.1056/NEJMoa2006100.
14) Kachanoff, Frank, Bigman, Yochanan E., Kapsakis, Kyra, Gray, Kurt (2020) "Measuring Two Distinct Psychological Threats of COVID-19 and their Unique Impacts on Wellbeing and Adherence to Public Health Behaviors," doi: 10.31234/osf.io/5zr3w.
15) Li, Guangdi, and Erik De Clercq (2020), "Therapeutic options for the 2019 novel coronavirus (2019-nCoV)," *Nature*, 19, 149-150.
16) Lu, X., Xie, X., and Liu, L. (2015). Inverted U-shaped model: How frequent repetition affects perceived risk. *Judgment & Decision Making*, *10*(3).
17) Meischke, H., Sellers, D. E., Sellers, D. E., Goff, D. C., Daya, M. R., Meshack, A., & Hand, M. M. (2000). Factors that influence personal perceptions of the risk of an acute myocardial infarction. *Behavioral Medicine*, 26(1), 4-13.

18) Napper, Lucy E, Dennis G Fisher, and Grace L Reynolds (2011), "Development of the Perceived Risk of HIV Scale," *AIDS and Behavior*, 16 (4), 1075–83.
19) Oosterhoff, B. and Palmer C. (2020). Psychological correlates of news monitoring, social distancing, disinfecting, and hoarding behaviors among US adolescents during the COVID-19 pandemic, accessed at 10.31234/osf.io/rpcy4 (accessed May 20, 2020).
20) Paolacci, Gabriele, Jesse Chandler, and Panagiotis G. Ipeirotis (2010), "Running Experiments on Amazon Mechanical Turk," *Judgment and Decision Making*, 5(5), 422–419.
21) Painter, Marcus and Qiu, Tian, Political Beliefs affect Compliance with COVID-19 Social Distancing Orders (April 8, 2020). Available at SRN: https://ssrn.com/abstract = 3569098.
22) Poon, L. L., and Peiris, M. (2020). Emergence of a novel human coronavirus threatening human health. *Nature medicine*, 26(3), 317-319.
23) Schaller, M., and Park, J. H. (2011). The behavioral immune system (and why it matters). *Current directions in psychological science*, 20(2), 99-103.
24) Sen-Crowe, B., M. McKenney & A. Elkbuli (2020), "Social distancing during the COVID-19 pandemic: Staying home save lives," *American Journal of Emergency Medicine*.
25) Slovic, P. (1987). Perception of risk. *Science*, 236(4799), 280-285.
26) Song , H. & N. Schwartz (2009), "If It's Difficult to Pronounce, It Must Be Risky," *Psychological Science*, 20(2), 135-138.
27) Thomson, Matthew (2006), "Human Brands: Investigating Antecedents to Consumers' Strong Attachments to Celebrities," *Journal of Marketing*, 70 (3), 104-119.
28) Weinstein, N. D. (1982). Unrealistic optimism about susceptibility to health problems. *Journal of Behavioral Medicine*, 4, 441-460.
29) Weinstein, N. D. (1983). Reducing unrealistic optimism about illness susceptibility. *Health Psychology*, 2, 11-20.
30) WHO (2020): "Behavioural insights are valuable to inform the planning of appropriate pandemic response measures", http://www.euro.who.int/en/media-centre/sections/statements/2020/statement-behavioural-insights-are-valuable-to-inform-the-planning-of-appropriate-pandemic-response-measures. Date accessed: May 13, 2020.
31) Wölfel, Roman, Victor M Corman, Wolfgang Guggemos, Michael Seilmaier, Sabine Zange, Marcel A Müller, Daniela Niemeyer, Terry C Jones, Patrick Vollmar, Camilla Rothe, Michael Hoelscher, Tobias Bleicker, Sebastian Brünink, Julia Schneider, Rosina Ehmann, Katrin Zwirglmaier, Christian Drosten, and Clemens Wendtner (2020), "Virological assessment of hospitalized patients with COVID-2019," *Nature*, 1–17.
32) Yong, Sarah Ee Fang, Danielle Elizabeth Anderson, Wycliffe E Wei, Junxiong Pang, Wan Ni Chia, Chee Wah Tan, Yee Leong Teoh, Priyanka Rajendram, Matthias Paul Han Sim Toh, Cuiqin Poh, Valerie T J Koh, Joshua Lum, Nur-Afidah Md Suhaimi, Po Ying Chia, Mark I-Cheng Chen, Shawn Vasoo, Benjamin Ong, Yee Sin Leo, Linfa Wang, and Vernon J M Lee (2020), "Connecting clusters of COVID-19: An epidemiological and serological investigation," *The Lancet Infectious Diseases*, 1–7.
33) Zhang, Y., Jiang, B., Yuan, J., and Tao, Y. (2020), "The impact of social distancing and epicenter lockdown on the COVID-19 epidemic in mainland China: A data-driven SEIQR model study," Accessed at: https://doi.org/10.1101/2020.03.04.20031187 (accessed May 20, 2020).