The Impact of Framing on Decision-Making in the Context of COVID-19

Abigail Furdak

Northwestern University Department of Economics*

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Abstract

Through framing, identical information can be portrayed in different ways. Existing literature finds that receiving positively framed information makes people more risk-averse than receiving negatively framed information, but disagreement remains on the strength of this effect and the conditions under which it occurs. In this study, 503 participants were surveyed about their willingness to go out to dinner during the COVID-19 pandemic given three infection probabilities: 2.75%, 5.50%, and 8.25%. Responses were collected in February and March 2021. Subjects either received a negative frame survey, which provided the likelihood of becoming infected with COVID-19 at the dinner, a positive frame survey, which outlined the chance of staying safe from the virus upon going out, or a relationship frame survey, which gave the probability of exposing one's household to COVID-19 after the meal. Participant decisions were compared across frames using regression models. The regressions controlled for demographic variables such as pre-existing medical conditions, age, and political affiliation. Results indicate that receiving the positive frame significantly increases the probability of dining out relative to receiving the negative frame for the 5.50% and 8.25% infection risk levels. This risk-seeking behavior under the positive frame contrasts with prior research. The current study also demonstrates that for all three infection risks analyzed, receiving the relationship frame significantly decreases the likelihood of going out compared with receiving the negative frame. Risk-aversion under the relationship frame aligns with previous research and the theory of illusory superiority. Throughout the remainder of COVID-19 and in future pandemics, public health officials could employ relationship framing to inspire risk-aversion and potentially save lives.

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Introduction

People can make different decisions based on the same set of facts depending on the framing, or phrasing and presentation, of that information. (Why, 2021, para. 1) For instance, would you rather buy "75% lean" meat or "25% fat" meat? (Levin, 1988, p. 374) You may realize the equivalence of these two options, but given the choice, you would probably prefer to think about putting lean protein, not fat, into your body. Choosing between meats at the grocery store might feel insignificant, but this study examines the impact of scenario framing on decisions that influence people's own health and the wellbeing of their friends and family.

The COVID-19 pandemic creates daily decision points where people's choices influence their risks of contracting the virus and spreading it to those around them. With 581,302 American COVID-19 deaths and counting, these choices can have grave consequences. (Allen, 2021, et al.) Often, citizens look to public health agencies, politicians, and community leaders for advice on these decisions, such as whether or not to meet up with friends, wear a mask, or travel. Recent CDC guidance indicates that "attending events and gatherings increases your risk of getting and spreading COVID-19." (Personal, 2021, para. 1) Could alternative wording of this statement decelerate the spread of the virus? For example, the CDC could have made their warning harsher by replacing "getting and spreading COVID-19" with "becoming infected with COVID-19 and putting others' lives at risk." (Personal, 2021, para. 1) Alternatively, the CDC could have softened the guidance by discussing the increased chances of safety from avoiding gatherings. If these adjustments impact the effectiveness of the guidance, more lives could be saved with the same information.

This study focuses on the decision to either go out to dinner with friends during the pandemic or stay in and avoid potential exposure. Through online surveys, 503 participants were

asked if they would go out to dinner given 2.75%, 5.50%, and 8.25% chances of contracting COVID-19. Respondents either received a negative, positive, or relationship frame survey. The negative survey explained the consequences of the dinner through the likelihood of becoming infected with COVID-19, while the positive survey provided the chance of staying safe from the virus. The relationship survey outlined the probability of exposing one's household to COVID-19 after choosing to go out. The goal of this research is to determine if the framing of the dinner scenario influences participants' likelihood of going out during the pandemic. To accomplish this objective, responses are compared across frames using regression models for each infection risk level. The regressions control for five demographic variables: pre-existing medical conditions, political affiliation, sex, age, and living situation.

Results demonstrate that receiving the positive frame survey increases the likelihood to go out to dinner relative to receiving the negative frame survey. Dining out represents the risk-seeking choice. This finding contrasts with prior research about positive and negative framing. Previous studies found that receiving positively framed information caused people to make more risk-averse decisions than receiving negatively framed information. The results of this study also indicate that receiving the relationship frame decreases the probability of going out compared with receiving the negative frame. Thus, participants were more risk-averse under the relationship frame than the negative frame. This result supports and builds upon prior findings about the effectiveness of relationship framing in COVID-19 guidance. Overall, this research illustrates that framing impacts decision-making in the context of COVID-19.

Literature Review

Disease Problem and Prospect Theory

This project was inspired by Tversky and Kahneman's (1981) *Disease Problem*, an early exploration of the effect of framing on decision-making. While Behavioral Economics literature widely refers to this experiment as the *Asian Disease Problem*, this paper will identify the study as the *Disease Problem* due to the insensitive ethnicization of the former name. Under the premise of a hypothetical new disease expected to kill 600 people, Tversky and Kahneman (1981) gave the following two problems to separate groups of respondents. (p. 453) The bracketed percentages indicate the share of participants who selected each program.

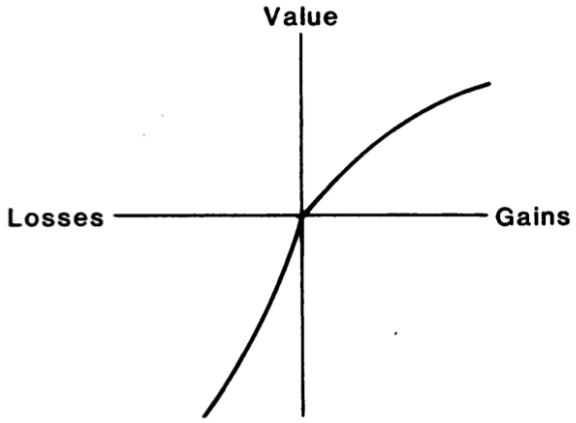
> If Program A is adopted, 200 people will be saved. [72 percent] If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved. [28 percent] Which of the two programs would you favor?
>
> If Program C is adopted 400 people will die. [22 percent] If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die. [78 percent] Which of the two programs would you favor? (Tversky and Kahneman, 1981 p. 453)

Despite the different frames, the two problems are the same in reality and should theoretically garner similar responses. However, Tversky and Kahneman (1981) found that people were more risk-averse given the first, positively framed problem and more risk-seeking under the second, negatively framed problem. (p. 453) The framing effect occurs "when our decisions are influenced by the way information is presented," not just the content of the information. (Why, 2021, para. 1) In this instance, the framing of the scenario impacted respondents' actions.

Standard expected utility theory fails to explain the *Disease Problem's* results, so Tversky and Kahneman (1981) account for their findings through prospect theory. Prospect theory has four key tenets. First, it suggests that "outcomes are expressed as positive or negative

deviations (gains or losses) from a neutral reference outcome." (Tversky and Kahneman, 1981, p. 454) Often, this reference point reflects a person's current reality. Second, the perceived value of a gain or loss diminishes as the size of the gain or loss increases. (Tversky and Kahneman, 1981, p. 454) Third, humans dislike losses more than they like equivalent gains. (Tversky and Kahneman, 1981, p. 454) This principle demonstrates why more *Disease Problem* respondents selected the riskier option under the negative frame: for the chance of avoiding any deaths. Fourth, people do not weigh outcomes by their exact probability of occurrence. Instead, they apply decision weights that overvalue small probabilities and slightly undervalue high probabilities. (Tversky and Kahneman, 1981, p. 454) This facet of prospect theory is particularly relevant to this paper because COVID-19 has much lower infection rates than the *Disease Problem*'s mortality rates. All of these elements combine to create the following prospect theory value function:

Figure 1: Sample Prospect Theory Value Function



(Tversky and Kahneman, 1981, p. 454)

As portrayed in Figure 1, the prospect theory value function stems from the reference point at the graph's origin. It has a steeper slope on the losses side than the gains side, but the line flattens on both ends as it gets further from the reference point.

Disease Problem Replication and Other Framing Studies

The original *Disease Problem* led to several replication efforts and additional analyses of framing. Some studies, such as Druckman (2001) and Klein et al. (2014), successfully replicated the initial experiment. In addition to finding a framing effect of similar size to that of the original srudy, Druckman (2001) determined that framing had a similar impact on both men and women. (p. 98) In contrast, Fagley and Miller (1990) displayed a more prominent framing effect among female respondents than male respondents. (p. 507) Follow-up studies also produced conflicting results regarding the magnitude of framing effects. In an aggregation of over 100 framing studies, Kühberger (1998) observed consistent framing effects regardless of sample demographics, but the size of the framing effects varied significantly based on experimental design. (p. 23) Bless et al. (1998) reproduced the original framing effect when they presented participants with the classic *Disease Problem* and wrote "medical research" at the top of the questionnaire. (p. 289) Yet when the authors wrote "statistical research" at the top of the questionnaire, the impact of the frames nearly disappeared. (Bless et al., 1998, p. 289) Their results reveal the importance of context on framing effects.

If such a minor change in context could alter the role of framing, then larger contextual adjustments could produce vastly different results. Fagley and Miller (1987) created a similar experiment with cancer as the disease and a 2/5 probability of saving patients through the risky program. (p. 268) The researchers asked respondents to justify their decision, and participants could claim indifference between programs. (Fagley and Miller, 1987, p. 268) Under this structure, Fagley and Miller (1987) did not observe a framing effect. (p.264) Their findings contradict the results of Tversky and Kahneman (1981). The risk-averse option was the most popular for both the positively and negatively framed surveys, and Fagley and Miller (1987) did not find a statistically significant relationship between frame and program choice. (p. 269) The

researchers performed further analysis to determine the conditions under which framing may or may not occur. Miller and Fagley (1991) suggested that "framing effects may be limited to situations where no rationale is requested and where probability of success in the risky option is less than 2/3." (p. 521) And when framing did have an impact, the effect was smaller than what Tversky and Kahneman (1981) had found. (Miller and Fagley, 1991, p. 521-522) Similarly, Bohm and Lind (1992) found that framing had less of an impact on decision-making than in the original *Disease Problem* based on a related experiment with Swedish participants. (p. 361) Overall, *Disease Problem* follow-up experiments have not always produced consistent results, and variables such as context, respondent sex, and probabilities can influence the size of the framing effect. The framing effect may be weaker than originally believed.

Applications to the COVID-19 Pandemic

Since the start of the COVID-19 pandemic, researchers have applied the *Disease Problem* to COVID-19 and other real diseases. This work matters because people may react differently to fictional diseases and real diseases which they experienced firsthand. In a large, international study, Rachev et al. (2020) asked participants the original *Disease Problem* questions along with questions about stress, COVID-19 concern, and trust in their government to control the virus. (pp. 14-16) The authors found a larger framing effect during COVID-19 than Klein et al. (2014) had displayed pre-pandemic. (Rachev et al., 2020, p. 29) In evaluating the impact of emotions of the framing effect, Rachev et al. (2020) found that "perceived stress and concerns over coronavirus were positively associated with the framing effect." (p. 3) Otterbring et al. (2021) replicated the *Disease Problem* exactly, put it in the context of swine flu, and put it in the context of COVID-19. (p. 1) For the second and third scenarios, the researchers asked participants to suppose that COVID-19 or swine flu, not a hypothetical disease, was expected to

kill 600 people. (Otterbring et al., 2021, p. 3) Otterbring et al.'s (2021) results aligned with Tversky and Kahneman's (1981) results for both the fictional and real diseases. (p. 1) Regardless of scenario, participants were risk-averse under the positive frame and risk-seeking under the negative frame, but they were more risk-averse when asked about swine flu and COVID-19 overall. (Otterbring et al., 2021, p. 1) Nilsson and Eriksson (2020) put the original questions in the context of COVID-19 and used the same probabilities as the *Disease Problem*, but the researchers scaled up the potential number of deaths to 3,900 from 600 to be more realistic to the COVID-19 pandemic. (p. 32) Participants were risk-averse under the positive frame, though to a lesser extent than in the original study; in contrast to Tversky and Kahneman (1981), participants were risk-neutral under the negative frame. (Nilsson and Eriksson, 2020, p. 13) The COVID-19 pandemic is quite reminiscent of the *Disease Problem*, and these studies took excellent first steps in applying the concepts from the original study to a real disease. However, the questions are more applicable to government officials or hospital administrators than everyday people. This paper aims to build on these studies by providing more realistic scenarios and probabilities for average citizens.

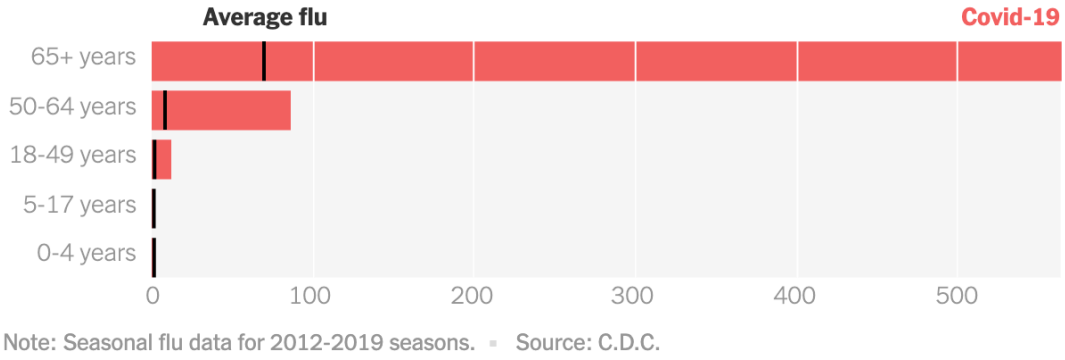
Gantiva et al. (2021) and Ceylan and Hayran (2021) worked toward this same goal of creating realistic COVID-19 framing experiments, and the two studies appealed to the personal relationships of their respondents. Gantiva et al. (2021) asked participants to evaluate two pieces of COVID-19 guidance, which both told participants to follow quarantine restrictions and wash their hands. (p. 4) The first message told participants to take these actions due to the risk of hospitalization from COVID-19, while the second told them to abide in order to protect their friends and family. (Gantiva et al., 2021 p. 4) Respondents said that they were more likely to follow the guidance that appealed to their relationships. (Gantiva et al., 2021, p. 6) However,

further differences exist between each piece of guidance beyond the frames. The hospitalization version provides the numerical chance of hospitalization, while the relationship version does not provide a quantitative risk level. Therefore, respondents might evaluate the guidelines differently given other hospitalization rates in the first message. Ceylan and Hayran (2021) examined social distancing guidance and found that "when a message emphasizes benefits for everyone in society, rather than solely for the individual, citizens find the message more persuasive to engage in social distancing." (p. 1) Both of these studies create value because of their applicability to everyday people. Nevertheless, they could both be improved by getting closer to participants' true behavior. For instance, respondents might rate one message as more persuasive than another, but even the more persuasive option may not cause respondents to quarantine or social distance in reality. This paper aspires to improve upon the existing literature by employing realistic COVID-19 scenarios while maintaining a strong experimental design and combining negative, positive, and relationship framing into one study.

Impact of COVID-19 on Different Demographic Groups

When responding to the original *Disease Problem* questions, participants can separate themselves and their personal health from the hypothetical pandemic scenario. However, real diseases impact individuals in disparate ways. Consequently, it is critical to understand the traits that may lead someone to have more or less concern about COVID-19. According to the CDC, "risk for severe illness with COVID-19 increases with age, with older adults at highest risk." (Older, 2021, para. 1) This statement means that senior citizens face higher likelihoods of death or hospitalization due to COVID-19 than young people. Figure 2 demonstrates the elevated mortality risk of COVID-19 relative to the seasonal flu for older Americans.

Figure 2: COVID-19 and Seasonal Flu Deaths per 100,000 people



(Leonhardt, 2021, para. 12)

Several medical conditions, such as heart disease, immunocompromisation, obesity, and type 2 diabetes, increase one's risks of hospitalization and death as well. (People, 2021, para. 4) Finally, men have experienced higher COVID-19 death rates than women. (Bwire, 2020, para. 1) While almost anyone can contract COVID-19, different demographic groups experience wide-ranging risk levels for severe illness, and these disparities could cause individuals to have unique risk tolerances for exposure to the virus.

Methods

Survey Design

Data were collected through three online surveys, all created and hosted on the Qualtrics platform. The surveys consisted of COVID-19 scenario questions, which were framed differently for each survey, and demographic questions, which remained the same for each survey. The scenario questions asked participants if they would go out to dinner with friends for a given risk of contracting COVID-19 or stay home for zero risk of contracting the virus. Because COVID-19 mortality rates differ across demographic groups, participants were given chances of infection, unlike the *Disease Problem*, which provided chances of death. (Tversky and Kahneman, 1981, p. 453)

The aim of the scenario questions was to ask participants questions realistic to the COVID-19 pandemic. A Georgia Tech COVID-19 risk tool was used to select infection probabilities. The tool estimates the probability that at least one person would have COVID-19 at gatherings ranging from 10-300 people in each county of the United States. For a gathering of ten people in Cook County, IL in late January 2021, the tool estimated an 11% chance that at least one person would have COVID-19. (Weitz et al., 2020) Cook County was used as a proxy location. Given the study's affiliation with Northwestern University and the convenience sampling methods used, it was expected that many respondents would live in Cook County. Additionally, Cook County had an intermediate risk level relative to other parts of the country at the time of the survey's design. (Weitz et al., 2020) It was estimated that a respondent would be exposed to ten other people at the hypothetical dinner between friends, waitstaff, and other nearby patrons. If one of these people had the virus, the respondent's chance of contracting it from them would depend on several variables, such as seating arrangement and length of the outing. Someone would not know these details when deciding to go out or stay in. Consequently, each participant was given three scenario questions with infection probabilities evenly spaced from 0-11%: 2.75%, 5.50%, and 8.25%.

All scenario questions in Survey 1 were negatively framed. Participants were told the chance that they would "become infected with COVID-19" if they elected to go out. (see appendix A2) Survey 2 was positively framed, providing respondents with the probability that they would "be safe from COVID-19" if they went out (one minus the infection probabilities from Survey 1). (see appendix A3) Survey 3 employed the relationship frame. [1] It told participants the likelihood that they would "expose [their] household to COVID-19" if they went

[1] In addition to the academic studies about relationship framing mentioned in the literature review, an interview between Rachel Maddow and Stephen Colbert about COVID-19 fears and relationships motivated the relationship frame aspect of this study. (The Late Show with Stephen Colbert, 2020)

out for dinner and included the same infection probabilities as Survey 1. (see appendix A4) Thus, all surveys contained identical infection risk levels. Participants were instructed to only take one survey, so each respondent was exposed to only one frame.

After answering the scenario questions, all respondents were asked the same demographic questions: sex assigned at birth, age, if they had any pre-existing medical conditions, political affiliation, highest level of education pursued, and if they lived alone. (see appendix A5) These variables were chosen as controls due to their potential impact on COVID-19 decision-making. Men stereotypically take more risks than women. As noted in the literature review above, senior citizens and those with pre-existing medical conditions experience higher risks of COVID-19-related hospitalization and death. (Older, 2021, para. 1; People, 2021, para. 4) More educated people may follow public health guidance more stringently due to increased scientific knowledge. Finally, people who live with others might harbor concerns about spreading the virus to their housemates. All questions besides the pre-existing conditions question were required in an effort to collect a complete dataset. Though the surveys were anonymous, with no participant names or contact information collected, the pre-existing conditions question was made optional due to its personal nature. Please see appendices A2-A5 for exact questions received by participants.

Because this study involved human participants, it followed Institutional Review Board (IRB) guidelines. Subjects consented to participation in the study by submitting their responses at the end of the survey. The study was fully explained to participants before they consented and submitted. (see appendices A1 and A6) Vulnerable people, such as children, prisoners, and cognitively impaired adults were not recruited for this study. The project was approved by the Northwestern University IRB as exempt human subjects research.

Survey Distribution

Links to the online Qualtrics surveys were distributed through three primary methods. First, Northwestern University Economics professors posted the surveys to their class Canvas pages or emailed the links to students. This method targeted younger respondents. Second, survey links were posted to Facebook Groups, such as the Northwestern University Parents Group, and this method targeted older respondents. Third, the researcher sent survey links to family and friends, some of whom forwarded the links to their networks. This method targeted both younger and older participants. Therefore, convenience sampling was used to obtain survey responses. 50 responses per survey, or 150 responses in total, were identified as a feasible minimum sample size. However, in order to increase the statistical significance of results, the aim was to exceed 150 total responses. The final data contained at least 165 responses per survey and 503 responses overall.

Hypothesis Development

As stated in the literature review, Tversky and Kahneman (1981) found that participants were more risk-averse for the positively framed problem and more risk-seeking under the negatively framed problem. (p. 453) However, I hypothesize that this study will yield opposite results: respondents will be more risk-averse when given the negative frame and more risk-seeking when given the positive frame. This study differs from the *Disease Problem* for two main reasons. First, all infection probabilities in this study are under 10%, while the smallest probability in the *Disease Problem* was much higher at 33%. According to prospect theory, people overweight small probabilities when making decisions. (Tversky and Kahneman, 1981, p. 454) Second, this study only gives participants one side of each probability: either the small chance of infection or the large chance of staying safe, but not both. The *Disease Problem*

provides participants with both the 33% chance that everyone is saved (or that nobody dies) and the 67% chance that nobody is saved (or that everyone dies). (Tversky and Kahneman, 1981, p. 453) Therefore, I hypothesize that subjects who receive the negative frame will make more risk-averse decisions than those who receive the positive frame. I expect the negative frame recipients to overweight the small probabilities of infection not seen by positive frame recipients, and the reactions of the negative frame recipients will not be dampened by seeing high probabilities of safety. Because all probabilities in this study fall below 10%, I expect this result to occur for all three probabilities and to be statistically significant at the 5% level.

Participants in the Gantiva et al. (2021) and Ceylan and Hayran (2021) studies deemed COVID-19 guidance more powerful if it mentioned respondents' friends, family, or fellow citizens. Furthermore, humans can be extremely self-centered. Psychologist Daniel Gilbert wrote that “the self considers itself to be a very special person.” (Gilbert, 2006, p. 230) Studies confirm Gilbert’s assertion and demonstrate that people overrate themselves in a wide range of fields from IQ to driving ability. (Ghose, 2013, paras. 7-8) Another psychologist, David Dunning, reveals that this “phenomenon, known as illusory superiority, is so stubbornly persistent that psychologists would be surprised if it didn't show up in their studies.” (Ghose, 2013, para. 3) Given the ubiquity of illusory superiority, I would expect individuals to see themselves as above average in their ability to survive COVID-19. The negative frame in this study focuses on the respondent’s own risk of contracting COVID-19, while the relationship frame focuses on the risks to a respondent’s household if the respondent contracted the virus. As a result, I hypothesize that relationship frame subjects will make more risk-averse decisions than negative frame subjects. While respondents may feel confident that they would only experience mild symptoms upon testing positive, reading the relationship scenarios could cause participants to

worry if their parents, significant other, or roommates might fall seriously ill. I would not expect illusory superiority to vary across probabilities, so I hypothesize this result to be statistically significant at the 5% level for all three risk levels.

Analysis Strategy

Prior researches employed two key strategies to analyze the impact of framing on decision-making. Druckman (2001) explains that one of these strategies, the "unidirectional effect" method, "entails comparing the percentage of participants who opted for the risk-averse alternative (or the risk-seeking alternative)" across frames and assessing if there is a significant difference between decision profiles. (p. 94) The current study takes the unidirectional approach, using bivariate and multivariate regression models to analyze the survey data. Regression models work well for this study because they can evaluate the relationship between framing and respondent decisions while also controlling for demographic factors. For all models, the dependent variable is a dummy representing the respondent's decision to go out or stay in, and the independent variable is a dummy delineating the frame that each participant received. Each regression only compares two frames at a time – either negative and positive or negative and relationship. Each infection probability is analyzed separately. Four models are used for each frame pair and infection risk level. The first is a bivariate regression with no control variables. The second only controls for pre-existing conditions. The third model controls for pre-existing conditions and political affiliation. The fourth model controls for pre-existing conditions, political affiliation, sex, age and living situation. Variance inflation factor (VIF) tests were performed to identify sources of multicollinearity in the models, and the models do not include any variables whose VIF value exceeded 5. As a result, the education variable was not included in the regression models, which utilized all other control variables. All regressions and tests were

conducted in R, and regressions were performed using the lm function. Survey responses were downloaded from Qualtrics and uploaded to RStudio for analysis.

The second framing analysis strategy, the "bidirectional effect" method, involves analyzing whether a "significantly greater than (a risk-neutral) 50% of respondents opt for the risk-averse alternative under the gains format and significantly fewer than 50% of respondents opt for the risk-averse alternative under the losses format." (Druckman, 2001, p. 94) The bidirectional effect strategy is less applicable to this study because the approach requires the expected value of the risk-averse and risk-seeking choices to be equal. For example, all options in the *Disease Problem* have an expected value of 200 people saved and 400 deaths. In this study, however, the value of dining out is more abstract. The benefit of the dinner out minus the expected loss from contracting COVID-19 may not equal the utility of staying home, and these preferences vary from person to person. Therefore, 50% is not a meaningful benchmark for this study, so the bidirectional effect method was not undertaken.

Results

Descriptive Statistics

This study involved 503 participants: 168 respondents for the negative frame survey, 170 respondents for the positive frame survey, and 165 respondents for the relationship frame survey. As seen in Table 1, 41% of all participants were male. 33% of participants were 18-22 years old, or college-aged, but respondents had a mean age of just over 38 years old. 18% of participants had pre-existing medical conditions linked to increased COVID-19 mortality risk. Due to the convenience sampling methods used, participants skewed heavily Democratic and highly

educated. Only 10% of respondents identified as Republicans, and 95% of participants had pursued collegiate or graduate-level education. Only 12% of respondents lived alone.

Table 1: Descriptive Statistics for Demographic Variables Across All Surveys

Variable	Mean	Standard deviation	Sample size
Share male	0.41	0.49	503
Age	38.14	16.59	503
Share with pre-existing condition	0.18	0.38	500
Share who are Democratic	0.57	0.50	503
Share who are Independent	0.33	0.47	503
Share who are Republican	0.10	0.30	503
Share whose highest education level pursued was high school	0.05	0.21	503
Share whose highest education level pursued was college	0.58	0.49	503
Share whose highest education level pursued was graduate school	0.37	0.48	503
Share who live alone	0.12	0.33	503

Note: Sample size is smaller for the pre-existing condition variable because the question was optional.

Table 2 portrays participants' responses to the scenario questions. For each frame, the percentage of 'go out' responses decreases as infection probability increases. For all probabilities, the positive frame survey saw the highest share of 'go out' responses, followed by the negative frame survey. The relationship frame survey garnered the lowest share of 'go out' responses for all probabilities. These trends support my hypothesis that respondents would be more risk-averse under the negative frame relative to the positive frame and more risk-seeking under the negative frame compared with the relationship frame. However, the response percentages alone do not speak to the statistical significance of the trends, nor do they account for demographic factors. The subsequent regression models provide a more meaningful evaluation of the survey results.

Table 2: Respondent Decisions to Go Out or Stay In for Each Frame and COVID-19 Probability

Infection Probability	2.75%		5.50%		8.25%	
Decision	Out	In	Out	In	Out	In
Negative frame (168)	48%	52%	38%	62%	26%	74%
Positive frame (165)	57%	43%	52%	48%	41%	59%
Relationship frame (170)	31%	69%	22%	78%	13%	87%

Note: Sample sizes appear in parentheses.

Regression Models: Negative and Positive Frame Comparisons

The first set of models, displayed in Table 3, compare responses to the negatively and positively framed surveys at the lowest infection probability, 2.75%. The independent variable is a dummy variable equal to zero for receiving the negative frame or one for receiving the positive frame. The dependent variable is a dummy equal to zero if the respondent chose to stay in or one if he or she elected to go out. In Model 1, the bivariate model, receiving the positive frame increases the probability to go out to dinner by 0.094,[2] and this result is statistically significant at the 10% level. However, Model 1 suffers from omitted variable bias because it does not account for other factors relevant to COVID-19 such as pre-existing conditions or age. Model 2 controls for pre-existing conditions through a dummy variable equal to one if the respondent had a medical condition linked with elevated COVID-19 mortality risk. After incorporating this control, the impact of framing falls to 0.078 and is no longer statistically significant. Due to the politicization of pandemic precautions such as mask wearing and social distancing, Model 3 controls for respondents' political affiliations through dummy variables for Democratic, Independent, and Republican identifications. Receiving the positive frame increases the likelihood of going out by 0.077 according to Model 3. This effect size remains similar to that of Model 2 and likewise fails to achieve statistical significance. In addition to the variables from the previous models, Model 4 incorporates dummy variables for sex (equal to one if male) and living

[2] Equivalent to increasing the probability of dining out by 9.4 percentage points.

situation (equal to one if alone). It includes a quantitative variable for age as well. Framing has the smallest impact in Model 4; receiving the positive frame only raises the probability of going out by 0.056, and this result is not statistically significant. In all Table 3 regressions which incorporate them, pre-existing conditions decrease the likelihood of going out, and these results are significant at the 10% level or better in each instance. In Models 3 and 4, Republican political affiliation increases the chance to go out, an effect significant at the 1% level in both cases. Older age decreases the likelihood to dine out, while living alone increases the probability of going out according to Model 4. Both of these results achieve statistical significance at the 1% level.

Model 4 is the preferred specification because it incorporates the largest number of control variables. At the same time, VIF values remain below two for all variables in Model 4, indicating that the additional controls do not create multicollinearity issues. (see appendix A7) Model 4 has the largest adjusted R^2 of the Table 3 regressions at 0.116. The positive frame does not have a statistically significant impact on participants' decisions to go out to dinner according to the preferred specification. Therefore, Model 4 contradicts my hypothesis that respondents who received the positive frame would be more risk-seeking than those who received the negative frame.

Table 3: Regression Results for Sample Who Received Negative or Positive Frame at Lowest Risk Level (2.75% chance to get COVID-19)

	Dependent variable:			
	Dummy = 1 if respondent answered that they would go out to dinner			
	(1)	(2)	(3)	(4)
Received positive frame	0.094*	0.078	0.077	0.056
	(0.054)	(0.054)	(0.054)	(0.052)
Has pre-existing condition		-0.225***	-0.218***	-0.135*
		(0.072)	(0.073)	(0.072)
Political affiliation is Independent			0.047	0.045
			(0.060)	(0.059)
Political affiliation is Republican			0.266***	0.285***
			(0.078)	(0.075)
Sex assigned at birth is male				0.088
				(0.059)
Age				-0.006***
				(0.002)
Lives alone				0.197***
				(0.071)
Constant	0.476***	0.521***	0.478***	0.613***
	(0.039)	(0.041)	(0.047)	(0.089)
Observations	338	337	337	337
Adjusted R^2	0.006	0.029	0.047	0.116

Note: Robust standard errors appear in parentheses. *p<0.1; ** p<0.05; ***p<0.01

The regression models in Table 4 analyze the negatively and positively framed survey responses at the middle infection probability, 5.50%. Only one difference exists between Table 3 and Table 4: the dependent variable in the Table 4 models is a dummy variable equal to one if the respondents elected to dine out given a 5.50% chance of contracting COVID-19, instead of a 2.75% risk of infection. The participant pool, independent variable, and control variables remain identical for each of the four models in Tables 3 and 4.

For the 5.50% infection probability, receiving the positive frame increases the likelihood of going out according to all four models. The result achieves statistical significance at the 5% level or better in each situation. In the preferred specification, Model 4, receiving the positive frame increases the probability to go out to dinner by 0.113. Identifying as Republican increases the probability to go out according to Models 3 and 4, significant at the 5% level. Once again, being older decreases the likelihood of dining out. This result is significant at the 1% level. The adjusted R^2 of Model 4 is 0.123, the highest of all models in Table 4. VIF values stay the same across corresponding negative and positive frame comparison models, regardless of infection risk. (see appendix A7) Receiving the positive frame significantly increases the probability to go out given a 5.50% infection risk, so Table 4's preferred model supports my hypothesis that the positive frame leads to more risk-seeking behavior than the negative frame.

Table 4: Regression Results for Sample Who Received Negative or Positive Frame at Medium Risk Level (5.50% chance to get COVID-19)

	Dependent variable:			
	Dummy = 1 if respondent answered that they would go out to dinner			
	(1)	(2)	(3)	(4)
Received positive frame	0.149***	0.135**	0.136**	0.113**
	(0.054)	(0.054)	(0.053)	(0.052)
Has pre-existing condition		-0.176**	-0.169**	-0.070
		(0.069)	(0.069)	(0.066)
Political affiliation is Independent			0.108*	0.101*
			(0.059)	(0.058)
Political affiliation is Republican			0.203**	0.219**
			(0.090)	(0.090)
Sex assigned at birth is male				0.112*
				(0.060)
Age				-0.007***
				(0.002)
Lives alone				0.106
				(0.076)
Constant	0.375***	0.410***	0.353***	0.529***
	(0.037)	(0.041)	(0.045)	(0.089)
Observations	338	337	337	337
Adjusted R^2	0.019	0.032	0.046	0.123

Note: Robust standard errors appear in parentheses. *p<0.1; ** p<0.05; ***p<0.01

The next set of regression models, portrayed in Table 5, examine responses to the negatively and positively framed surveys at the 8.25% infection probability, the highest risk level in the study. The participants, independent variable, and control variables stay the same for each of the four Table 5 models as in Tables 3 and 4. However, the dependent dummy variable in Table 5 represents participants' decisions to go out or stay in for the 8.25% infection risk scenario question. Receiving the positive frame increases the likelihood of going out according to all four high infection probability models. As in the medium infection risk cases, the framing effects in the high infection risk models each achieved statistical significance at the 5% level or better. Receiving the positive frame increases the probability to go out to dinner by 0.125 for the preferred specification, Model 4. Having a pre-existing medical condition decreases respondents' chances of going out, and this effect is statistically significant at either the 5% or the 1% level in all three models which include the variable. In Models 3 and 4, Independent political affiliation significantly increases the likelihood of dining out, but Republican affiliation has an even larger impact in both instances. Model 4 has an adjusted R^2 of 0.080, which is the highest of the Table 5 models, but also reveals that the included independent and control variables only explain a small fraction of the overall variation in decisions to go out or stay in at the high infection probability.

Since receiving the positive frame increases participants' likelihood to go out, and this effect is statistically significant at the 5% level for the preferred specification, Model 4 in Table 5 supports my hypothesis. Participants make more risk-seeking decisions under the positive frame than negative frame at the 8.25% COVID-19 infection probability.

Table 5: Regression Results for Sample Who Received Negative or Positive Frame at Highest Risk Level (8.25% chance to get COVID-19)

	Dependent variable:			
	Dummy = 1 if respondent answered that they would go out to dinner			
	(1)	(2)	(3)	(4)
Received positive frame	0.150***	0.136***	0.138***	0.125**
	(0.051)	(0.051)	(0.050)	(0.050)
Has pre-existing condition		-0.195***	-0.188***	-0.148**
		(0.058)	(0.057)	(0.058)
Political affiliation is Independent			0.145**	0.130**
			(0.056)	(0.056)
Political affiliation is Republican			0.179**	0.176*
			(0.090)	(0.093)
Sex assigned at birth is male				0.103*
				(0.057)
Age				-0.002
				(0.002)
Lives alone				0.063
				(0.078)
Constant	0.256***	0.294***	0.228***	0.260***
	(0.034)	(0.037)	(0.040)	(0.082)
Observations	338	337	337	337
Adjusted R^2	0.022	0.041	0.062	0.080

Note: Robust standard errors appear in parentheses. *p<0.1; ** p<0.05; ***p<0.01

In summary, Tables 3, 4, and 5, compare the impact of receiving negatively and positively framed scenario questions on the probability of going out given 2.75%, 5.50%, and 8.25% infection risks respectively. For a 2.75% chance of contracting COVID-19, the frame does not play a significant role in decision-making according to the preferred specification. However, receiving the positive frame increases the probability to go out to dinner by 0.113 for a 5.50% infection risk, and this result is significant at the 5% level. In the preferred specification for the 8.25% COVID-19 probability, framing plays a larger role: receiving the positive frame increases the chance of going out by 0.125. This effect also achieves 5% level significance. Interestingly, these findings demonstrate that the size of the framing effect increases as the probability of infection increases. I hypothesized that receiving the positive frame would make participants more risk-seeking than the negative frame. My hypothesis does not hold for the lowest infection risk, but it holds for the medium and highest infection risks.

Regression Models: Negative and Relationship Frame Comparisons

The Table 6 models analyze the impact of receiving the negative or relationship frame on participants' decisions to go out to dinner, when going out presents a 2.75% chance of contracting COVID-19. The participant pool contains respondents to the negative and relationship frame surveys and does not include respondents to the positive frame survey. The independent variable is a dummy variable equal to zero if the participant received the negative frame and one if the participant received the relationship frame. The dependent variable is a dummy equal to zero for a 'stay in' decision and one for a 'go out' decision at the 2.75% risk level. The control variables remain the same as the controls in the previous three sets of models. Once again, Model 4 is the preferred specification because it includes the most control variables while limiting multicollinearity according to VIF tests. (see appendix A7)

In each Table 6 model, receiving the relationship frame decreases the probability to go out to dinner. The framing effects achieve statistical significance at the 1% level in all four instances. For the preferred specification, receiving the relationship frame decreases the likelihood of going out by 0.137. In Models 2, 3, and 4, pre-existing conditions decrease the chance of going out, significant at the 1% level in each case. Independent and Republican political affiliations both significantly increase the probability to dine out, with Republican identification having the larger impact of the two. Age decreases the likelihood to go out, while living alone increases the probability to dine out. Both effects are statistically significant according to Model 4. Model 4 has an adjusted R^2 of 0.169, the highest in Table 6.

I hypothesized that receiving the relationship frame would make respondents more risk-averse than receiving the negative frame. Because receiving the relationship frame decreases the probability of going out in the preferred specification, and the effect achieves significance at the 1% level, these results support my hypothesis given a 2.75% infection risk.

Table 6: Regression Results for Sample Who Received Negative or Relationship Frame at Lowest Risk Level (2.75% chance to get COVID-19)

	Dependent variable:			
	Dummy = 1 if respondent answered that they would go out to dinner			
	(1)	(2)	(3)	(4)
Received relationship frame	-0.167***	-0.157***	-0.166***	-0.137***
	(0.053)	(0.052)	(0.051)	(0.051)
Has pre-existing condition		-0.246***	-0.231***	-0.159***
		(0.057)	(0.057)	(0.058)
Political affiliation is Independent			0.122**	0.112**
			(0.057)	(0.056)
Political affiliation is Republican			0.362***	0.384***
			(0.083)	(0.081)
Sex assigned at birth is male				0.062
				(0.057)
Age				-0.006***
				(0.002)
Lives alone				0.158**
				(0.079)
Constant	0.476***	0.525***	0.447***	0.609***
	(0.039)	(0.040)	(0.046)	(0.085)
Observations	333	330	330	330
Adjusted R^2	0.026	0.064	0.111	0.169

Note: Robust standard errors appear in parentheses. *p<0.1; ** p<0.05; ***p<0.01

The next set of models examine the negative and relationship frames at the 5.50% infection risk level. The Table 7 models have much in common with the Table 6 models aside from infection risk, contained in the dependent variable. Receiving the relationship frame decreases the probability of going out and has an effect significant at the 1% level in each Table 7 model. In the preferred specification, Model 4, receiving the relationship frame decreases the likelihood of going out by 0.122. As in previous models, pre-existing conditions and older age decrease the probability to go out. However, the effect of pre-existing conditions diminishes and becomes less significant following the inclusion of the Model 4 controls. Republican and Independent political affiliations increase the chances of going out to dinner, though Republican identification plays a larger role. Both effects are significant at the 5% level or stronger. Model 4 has the highest adjusted R^2 in Table 7 at 0.164, and VIF values correspond for all negative and relationship frame comparisons. (see appendix A7)

Since the preferred specification demonstrates that receiving the relationship frame significantly decreases the probability to dine out, Model 4 confirms my hypothesis at the 5.50% infection risk level. I expected participants to behave more risk-aversely under the relationship frame than the negative frame.

Table 7: Regression Results for Sample Who Received Negative or Relationship Frame at Medium Risk Level (5.50% chance to get COVID-19)

	Dependent variable:			
	Dummy = 1 if respondent answered that they would go out to dinner			
	(1)	(2)	(3)	(4)
Received relationship frame	-0.157***	-0.150***	-0.156***	-0.122***
	(0.049)	(0.049)	(0.048)	(0.047)
Has pre-existing condition		-0.181***	-0.170***	-0.086*
		(0.052)	(0.051)	(0.051)
Political affiliation is Independent			0.141**	0.130**
			(0.054)	(0.052)
Political affiliation is Republican			0.257***	0.281***
			(0.088)	(0.085)
Sex assigned at birth is male				0.075
				(0.055)
Age				-0.007***
				(0.002)
Lives alone				0.131*
				(0.077)
Constant	0.375***	0.411***	0.338***	0.529***
	(0.037)	(0.039)	(0.044)	(0.083)
Observations	333	330	330	330
Adjusted R^2	0.026	0.049	0.082	0.164

Note: Robust standard errors appear in parentheses. *p<0.1; ** p<0.05; ***p<0.01

The final set of models, presented in Table 8, explore the impact of the negative and relationship frames on participants' decisions to go out given an 8.25% infection risk. As in previous negative and relationship frame models, receiving the relationship frame decreases the probability to go out according to each Table 8 regression. All four effects attain statistical significance at the 1% level. Receiving the relationship frame decreases the chance of going out by 0.119 in the preferred specification. While the impact of political affiliation remains similar to previous models – Independent and Republican identifications significantly increase the likelihood to go out – other control variables do not play the same roles in Table 8. Pre-existing medical conditions and age do not have statistically significant effects in Model 4. However, being male increases the likelihood to dine out, a significant result at the 5% level. Model 4's adjusted R^2 of 0.123 is the highest in Table 8.

In short, receiving the relationship frame decreases the likelihood of going out given an 8.25% chance of contracting COVID-19 based upon the preferred specification. Because this effect is significant at the 1% level, the result confirms my hypothesis that the relationship frame would make participants more risk-averse than the negative frame.

Table 8: Regression Results for Sample Who Received Negative or Relationship Frame at Highest Risk Level (8.25% chance to get COVID-19)

	Dependent variable:			
	Dummy = 1 if respondent answered that they would go out to dinner			
	(1)	(2)	(3)	(4)
Received relationship frame	-0.129***	-0.125***	-0.132***	-0.119***
	(0.043)	(0.043)	(0.041)	(0.041)
Has pre-existing condition		-0.105**	-0.093**	-0.074
		(0.045)	(0.044)	(0.046)
Political affiliation is Independent			0.153***	0.135***
			(0.048)	(0.048)
Political affiliation is Republican			0.288***	0.278***
			(0.086)	(0.085)
Sex assigned at birth is male				0.096**
				(0.048)
Age				-0.001
				(0.001)
Lives alone				0.141*
				(0.078)
Constant	0.256***	0.277***	0.197***	0.199***
	(0.034)	(0.036)	(0.038)	(0.067)
Observations	333	330	330	330
Adjusted R^2	0.024	0.032	0.091	0.123

Note: Robust standard errors appear in parentheses. *p<0.1; ** p<0.05; ***p<0.01

Overall, Tables 6, 7, and 8 display the impact of receiving the negative or relationship frame on the likelihood to go out to dinner during the COVID-19 pandemic. Each set of models examines this relationship for a different probability of contracting the virus at the meal: 2.75%, 5.50%, or 8.25%. In the preferred specification for each infection risk, receiving the relationship frame decreases the chance of going out. This effect achieves statistical significance at the 1% level for all infection probabilities. These findings support my hypothesis that receiving the relationship frame would make respondents more risk-averse than the negative frame in their decisions to either to go out or stay in. Exposure to the relationship frame decreases the likelihood of going out by 0.137 for the 2.75% chance of infection, 0.122 for the 5.50% chance of infection, and 0.119 for the 8.75% chance of infection. Therefore, the magnitude of the effect decreases as infection risk increases, suggesting that framing plays a smaller role for higher chances of infection. This trend contrasts with the trend of the negative and positive frame comparison models, where the magnitude of the framing effect increases as infection risk increases. Despite this distinction, the range of the framing effects remains similar for both categories of models. Where framing has a statistically significant impact on decision-making, the magnitude is between 0.110 and 0.140 in either the positive or negative direction.

Discussion

While previous studies have not always arrived at consistent conclusions about framing effects, the results of this study contradict the more prevalent findings from the existing literature. Tversky and Kahneman (1981), Druckman (2001), and Klein et al. (2014) all found that people who received positively framed information made more risk-averse decisions than those who received the same information framed negatively. Rachev et al. (2020) and Otterbring

et al. (2021) replicated this effect when putting Tversky and Kahneman's (1981) *Disease Problem* in the context of COVID-19. However, this study finds a reverse relationship: participants who received the positive frame were more likely to make risk-seeking decisions than those who received the negative frame.

Some critical differences between this research and previous work may explain the contradictory results. As mentioned in the hypothesis development section, the infection risks in this study all fall below 10%, while the *Disease Problem* provides a 33% probability of death. (Tversky and Kahneman, 1981, p. 453) Prospect theory states that people overweight small probabilities, so participants in the present study may have made more risk-averse decisions upon overweighting the infection risk under the negative frame. (Tversky and Kahneman, 1981, p. 454) This study only provides one side of the probability, either the chance of contracting COVID-19 or the chance of staying safe. Therefore, the other side of the probability does not mediate the small probability effect in the negative frame. Next, the risk-averse options in this study guarantee safety from COVID-19. None of the choices guarantee infection. However, people could potentially die under each program in the *Disease Problem*, and some options involve certain death. (Tversky and Kahneman, 1981, p. 453) This distinction could contribute to the opposing results.

Furthermore, the present study creates more personal scenarios. The *Disease Problem* questions ask participants to make healthcare decisions for imaginary people. (Tversky and Kahneman, 1981, p. 453) This study asks respondents to make choices that would impact their own health. Imagining a real person getting sick with a well-known virus could cause respondents to behave more cautiously than if they imagined a nameless, faceless person getting sick with a hypothetical disease. By employing language about contracting the virus, the negative frame of this study would more likely evoke these thoughts than the positive frame.

While less research exists on relationship framing, the results of this study align with the findings Gantiva et al. (2021) and Ceylan and Hayran (2021), who determined that COVID-19 guidance was more effective when it mentioned the health of one's friends, family, or community members. This study finds that receiving the relationship frame increases risk-aversion compared with receiving the negative frame. Participants behaved more cautiously when thinking about the health of others than the health of themselves. Psychologists Daniel Gilbert and David Dunning reveal that people overrate themselves and view themselves as "special" or superior relative to others. (Gilbert, 2006, p. 230; Ghose, 2013 paras. 7-8) Gilbert and Dunning's claims could explain the findings of this study and of prior research. Their theories suggest that individuals believe they have a better chance of surviving COVID-19 than other members of their household. Alternatively, guilt could explain the results. The relationship frame could have spurred risk-aversion because participants feared the guilt of infecting their friends or family, even if the participants had confidence that the friend or family member would survive.

Future research could strive to determine the most accurate explanation by asking respondents to justify their decision. However, this research effort could encounter difficulties because asking for rationale eliminated framing effects in Miller and Fagley's (1991) study. (p. 521) Instead, follow-up work could ask negative frame recipients to estimate their chance of surviving COVID-19 while asking relationship frame recipients to estimate the average chance of surviving COVID-19 for their other household members. Differences between self-estimated survival probabilities and participants' estimated survival probabilities for their housemates could point towards illusory superiority as an explanation for risk-aversion under the relationship frame. Additionally, future researchers could rework scenario questions to create a survey that is both realistic and more similar to the *Disease Problem*'s design. They could frame the

consequences of going out to dinner in terms of death and survival probabilities but only distribute the surveys to members of certain demographic groups with similar COVID-19 mortality rates (i.e. women in their forties without pre-existing conditions). Researchers could adjust probabilities for different demographic groups. By surveying senior citizens with pre-existing conditions, this type of study could approach the certain-death scenarios provided in the *Disease Problem*.

The present study builds on prior research by asking participants realistic COVID-19 scenario questions and examining multiple infection risk levels. It also combines negative, positive, and relationship framing in one experiment, whereas previous studies were limited to two of the three frames. However, the current study has limitations which provide ample opportunity for improvement in future work. First, this study's convenience sampling methods created a heavily Democratic and highly educated participant pool. In the future, researchers from states with different political and educational profiles could collaborate on data collection by recruiting participants in their separate communities and aggregating responses. Second, this research does not control for participant income or socioeconomic status. The cost of healthcare and the threat of lost wages due to COVID-19 infection could cause lower income respondents to make more risk-averse decisions regardless of frame. Therefore, incorporating income or socioeconomic status could yield meaningful results. However, this study does not include these variables because it incorporated many college students. One college student may earn zero income but maintain a high socioeconomic status due to financial support from wealthy parents. Another student may have income from a campus job but hold a lower socioeconomic status because he supports himself financially. Consequently, respondent income could be a misleading variable for this study. Asking respondents their socioeconomic status could also create misleading data because of the question's subjectivity. Two respondents with the same income

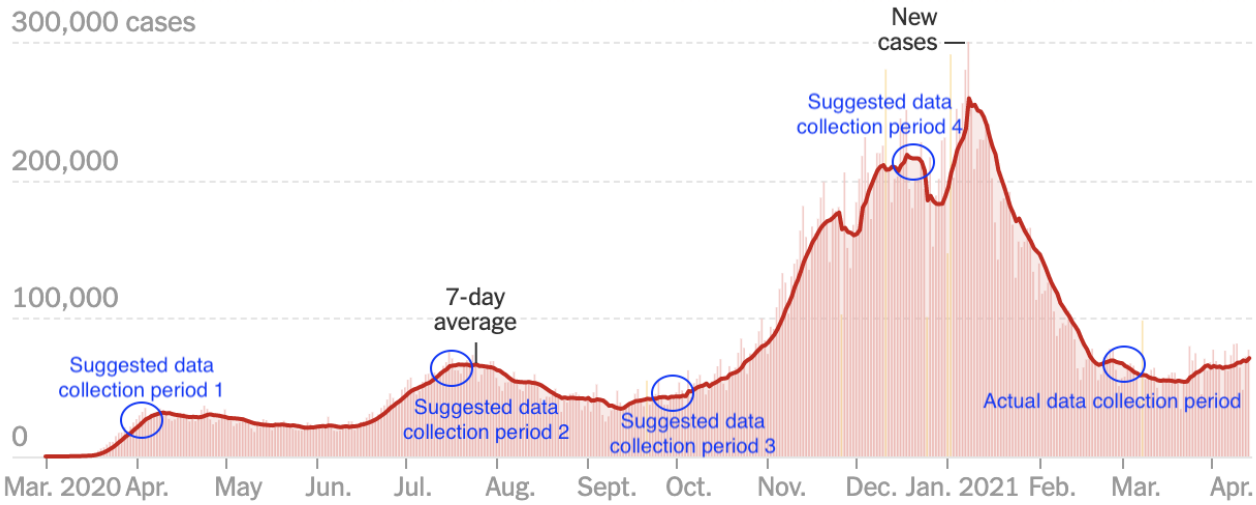
might view themselves in different socioeconomic classes. To address these issues, future researchers could conduct a similar study but recruit older participants. The surveys could ask respondents their income and if they are a student so that researchers could eliminate student responses. This methodology would account for socioeconomic status while avoiding misleading information. Given the private nature of income, though, researchers may encounter difficulties finding participants willing to disclose their pay.

The regression models in this study have fairly low adjusted R^2 values, all below 0.2, and accounting for socioeconomic status could cause the models to explain a higher portion of the variation in participants' decisions. Moreover, personal experiences may explain a meaningful portion of variation in the data. For instance, one participant may feel more risk-averse about COVID-19 because her friend had a difficult course of the virus. Another participant might feel more risk-seeking because his brother had an asymptomatic case. Future surveys could ask participants if they knew anyone hospitalized with COVID-19 or anyone with an asymptomatic case, as these data points could provide insight into each respondent's mindset towards the virus.

Follow-up research could also focus on different time periods during future pandemics. Survey responses for this study were collected between February 24, 2021 and March 8, 2021 due to the timing of the Northwestern Economics senior thesis program. At this point, U.S. cases had recently dropped from their highest peak of the pandemic according to Figure 3. The vaccine rollout had already begun. (Pfizer, 2020, para. 1) These factors may have created optimism and risk-seeking behavior among participants overall. While future pandemics will not follow the exact trajectory of COVID-19, Figure 3 outlines other interesting times for data collection using the COVID-19 pandemic as an example. Suggested Period 1 occurs at the onset of the pandemic, when people had limited knowledge about the virus and restrictions had only been in place for a few weeks. Suggested Period 2 takes place in the summer. Vacation time in the summer could

increase desire for social interaction, but the peak in cases could increase respondents' levels of caution. Period 3 occurs during a valley in cases, which could cause people to let their guards down. Events such as football games could fuel gatherings during this time. Period 4 coincides with the holidays, when family gatherings abound. However, record-high case numbers could encourage risk-aversion. On another note, period 4 takes place just after the Pfizer vaccine's emergency use authorization. (Pfizer, 2020, para. 1)

Figure 3: Daily New COVID-19 Cases and Seven-Day Average New Cases in the U.S.



(Allen et al., 2021)

These four suggested data collection periods provide diversity in terms of seasons, social traditions, and pandemic trajectory. These factors could cause participants to behave differently at each point in time. Future researchers may want to conduct a related experiment during the next pandemic with multiple survey times, using Figure 3 as a guide. This work would produce even more expansive results.

Therefore, several opportunities exist to build upon this study. Future explorations of framing could work to clarify points of disagreement within the existing literature as well. Despite these areas for expansion, the results of this research provide interesting implications for public health guidance. For example, if a future pandemic worsens and public health officials

would like citizens to take more precautions, the officials could use relationship framing in their guidance to make society more risk-averse. Conversely, officials may have a positive outlook on a pandemic and want to spur economic activity. In this circumstance, they could employ the positive frame to encourage citizens to go out and consume. This research demonstrates that framing can cause people to react to the same information differently. In the future, public officials can employ framing to increase the effectiveness of their guidance.

Conclusion

In summary, this study finds that framing can significantly impact decisions related to COVID-19 exposure. While disagreement exists among prior research on framing effects, many studies found links between receiving positively framed information and making risk-averse decisions. This study builds upon the existing literature by examining the impact of framing on decision-making under realistic COVID-19 scenarios for multiple infection probabilities. It combines negative, positive, and relationship framing into one project as well. Results of this research indicate that receiving positively framed information increases the likelihood of going out to dinner compared with receiving negatively framed information for 5.50% and 8.25% infection probabilities. These findings support my hypothesis, while the inconclusive result at the 2.75% risk level contradicts my hypothesis. The magnitude of the framing effect increases as infection risk increases for the negative and positive frame comparison. This study yields a reverse of the framing effect found in prior work. Differences in risk levels and context between this research and the existing literature could account for the conflicting results.

Additionally, this study aims to expand understanding of relationship framing. Findings demonstrate that receiving the relationship frame decreases the probability of going out

compared with receiving the negative frame for all three infection risk levels analyzed. These results support my hypothesis that receiving the relationship frame would increase risk-aversion. In the negative and relationship frame comparisons, the magnitude of the framing effect decreases as infection probability increases. The risk-aversion displayed under the relationship frame aligns with existing research. Illusory superiority could explain these results if individuals have overconfidence in their own ability to combat the virus.

Future research could improve upon this study to produce even more expansive results. Follow-up studies could recruit participants from broader geographic areas to develop a larger, more diverse set of respondents. This study did not account for income due to the many student participants, but future experiments could focus on older respondents and control for income. During the next pandemic, researchers could conduct similar surveys at different points in time to develop more holistic conclusions. Despite these areas for improvement, this study provides meaningful results. It expands on prior framing studies by getting closer to participants' actual behavior. Public health officials could utilize these findings to craft more effective pandemic guidance. Through relationship framing, officials could generate public risk-aversion, potentially reducing disease transmission and saving lives.

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Appendix

A1. Survey introduction and consent information received by all respondents

Please read before continuing: You are being asked to participate in the Northwestern COVID-19 Decision Study. This survey is completely anonymous. We will not collect any personally identifying information or contact information. The survey is voluntary, and you are free to exit at any time. If you exit before submitting, your responses will not be used in the study. The following questions will ask how you would behave in hypothetical COVID-19 scenarios. There will also be demographic questions, and the questions will take roughly 5 minutes to complete in total. Responses will be used to study decision-making patterns in the context of the pandemic. We cannot tell you every detail of this study ahead of time, but if you are willing to participate under these conditions, we will explain the procedure to you fully after your participation. You must be 18+ years of age to participate. By submitting the survey after the final question, you consent to the use of your responses in the study. This survey is being conducted by Abby Furdak and Eric Schulz in affiliation with Northwestern University. Please contact

abigailfurdak2021@u.northwestern.edu or eschulz@northwestern.edu with any questions or concerns. **If you have already filled out a survey for the Northwestern COVID-19 Decision Study, please do not complete this survey.**

Thank you for your participation!

A2. Scenario questions and answer choices received only by respondents of the negative frame survey

Your friends are going out to dinner. If you join them, there is a 2.75% chance that you will become infected with COVID-19. If you stay home, there is a 0% chance that you will become infected with COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

Your friends are going out to dinner. If you join them, there is a 5.5% chance that you will become infected with COVID-19. If you stay home, there is a 0% chance that you will become infected with COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

Your friends are going out to dinner. If you join them, there is a 8.25% chance that you will become infected with COVID-19. If you stay home, there is a 0% chance that you will become infected with COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

A3. Scenario questions and answer choices received only by respondents of the positive frame survey

Your friends are going out to dinner. If you join them, there is a 97.25% chance that you will be safe from COVID-19. If you stay home, there is a 100% chance that you will be safe from COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

Your friends are going out to dinner. If you join them, there is a 94.5% chance that you will be safe from COVID-19. If you stay home, there is a 100% chance that you will be safe from COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

Your friends are going out to dinner. If you join them, there is a 91.75% chance that you will be safe from COVID-19. If you stay home, there is a 100% chance that you will be safe from COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

A4. Scenario questions and answer choices received only by respondents of the relationship frame survey

Your friends are going out to dinner. If you join them, there is a 2.75% chance that you will expose your household to COVID-19. If you stay home, there is a 0% chance that you will expose your household to COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

Your friends are going out to dinner. If you join them, there is a 5.5% chance that you will expose your household to COVID-19. If you stay home, there is a 0% chance that you will expose your household to COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

Your friends are going out to dinner. If you join them, there is a 8.25% chance that you will expose your household to COVID-19. If you stay home, there is a 0% chance that you will expose your household to COVID-19. Would you go out or stay home?

- o Go out
- o Stay home

A5. Demographic questions and answer choices received by all respondents

What is your sex assigned at birth?

- Male
- Female

What is your age?

Do you have any pre-existing health conditions that could increase your Covid-19 mortality risk? (the survey is anonymous, but this question is optional if you do not feel comfortable providing this information)

- Yes
- No

Which option most closely describes your political affiliation?

- Republican
- Democrat
- Independent

What is the highest level of education that you have pursued?

- High School
- College
- Graduate School

Which option most closely describes your living situation?

- Live alone
- Live with others

A6. Survey conclusion and debriefing received by all participants

The survey is now complete. Click the arrow button to consent and submit. Thank you for participating!

Debriefing:

Title of Research Study: The Impact of Framing on Decision-making in the Context of COVID-19
Principal Investigator: Eric Schulz
Study Number: STU00214427
Thank you for your participation in our study. Your participation is greatly appreciated. This form provides further information about the study purpose and procedures that was not fully disclosed during the consent process.
Study Purpose and Procedures: Earlier in this study, in the consent process, we informed you that the study was about COVID-19 decision-making. While this is true, the study is also about the impact of framing on these decisions. Framing is the way in which a scenario or question is phrased, described, or presented. Separate participant groups have been given differently framed COVID-19 scenarios with the same levels of risk, and we will study whether responses differ across frames. For instance, the same situation could either be framed as a 5% chance of becoming infected with COVID-19 or a 95% chance of staying healthy. Our findings could help public health officials issue more effective guidance in future pandemics. In order to properly test our hypothesis, we could not provide you with all of these details prior to your participation. This ensures that your reactions in this study were spontaneous and not influenced by prior knowledge about certain aspects of the study. We hope you understand the reason for it.
Confidentiality: Please note that although the description of the study's purpose has changed from the originally stated description, everything else on the consent form is correct. This includes the ways in which we will keep your data confidential. No personally identifying information has been collected. Now that you are fully informed about the study purpose and procedures, you may decide that you do not want your data used in this research. If you do not want your responses used in this research, please exit the window without submitting, and your answers will not be saved. Please do not disclose research procedures and/or hypotheses to anyone who might participate in this study in the future as this could affect the results of the study. Contact Information: If you have any questions or concerns regarding this study, its purpose or procedures, or if you have a research-related problem, please feel free to contact the Principal Investigator, Eric Schulz, at eschulz@northwestern.edu. If you have any questions concerning your rights as a research participant, you may contact the Northwestern University Institutional Review Board office by calling (312) 503-9338 or emailing irb@northwestern.edu
Please keep a copy of this form or print this from your screen, for your future reference. Once again, thank you for your participation in this study.

A7. Variance Inflation Factor Table

Table 9: Variance Inflation Factors for Preferred Specifications

	Negative and positive frame models	Negative and relationship frame models
Received positive frame	1.01	
Received relationship frame		1.02
Has pre-existing medical condition	1.10	1.12
Political affiliation is Independent	1.11	1.10
Political affiliation is Republican	1.08	1.11
Sex assigned at birth is male	1.18	1.18
Age	1.26	1.30
Lives alone	1.03	1.04