

# WHEN DO SCIENCE DENIERS FOLLOW THE SCIENCE? ISSUE SERIOUSNESS AND EXPERT ADVICE

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## [Note on follow-up study:]

The paper below represents the first iteration of our study on the impact of issue seriousness on the authority of expert advice. Based on initial results, we were not convinced that the original vignette design was fully able to capture the impact of seriousness.

While we still believe in the basic idea in the study, we have therefore designed a follow-up study with a revised vignette design (based on the cancer vignette in the study) that is ready to be fielded very soon. We are thus especially interested in feedback on the addition of this follow-up study and its potential to strengthen the paper.

The follow-up study is described in more detail in Appendix 2 immediately after the presentation of the original vignette design (Appendix 1). In that section we explain why we are launching an additional study, as well as what we intend to gain with it. We appreciate all comments.

## Abstract

In this study, we examine whether the acceptance of expert advice changes with the seriousness of the problem facing the individual. This is particularly interesting in situations where citizens' dependence upon specialized expertise is pitted against their potential opposition to science and expert institutions. Our premise is that stating an abstract position for or against science may be considered relatively 'free' for most members of the public, *unless* they are in situation where decisions have direct and serious consequences. The study is built on a pre-registered survey with two vignette experiments. The data was collected from over 7,500 respondents across five countries (US, UK, the Netherlands, Denmark, and the Czech Republic). The first vignette experiment presents participants with various problems (climate change, gender transition, immigration, and home birth) and asks them to follow a specific piece of advice from an expert authority. The second vignette experiment directly manipulates the seriousness of the problem by asking participants to put faith in a doctor's advice when faced with a hypothetical diagnosis of cancer with varying survival rates. We find that across a broad range of situations, individuals are more likely to accept expert advice when they *perceive* an issue is serious. We found similar results even for individuals who are disinclined to accept the advice, either because they have low levels of trust or because they have prior beliefs which run counter to the advice given. Regardless of the way we measured trust, we find that low-trust individuals are more likely to accept advice when they perceive an issue as serious, though low levels of trust did attenuate the relationship. The effect of prior beliefs is similar but not identical. Individuals with prior beliefs which run contrary to the expert advice are much less likely to accept that advice, yet they increase acceptance in accordance with perceived seriousness to the same degree as those who have prior beliefs which match the expert advice. To put all this together, these results paint a robust picture. Individuals, across a broad range of topics are likely to rely more on expert advice when they perceive an issue is serious, even when they might be disinclined to do so.

**Keywords:** expertise; acceptance; science denial; info-seeking; issue seriousness

# Introduction

During the past decade, widespread concerns have been voiced across the globe about public beliefs in knowledge and science, and whether large groups of voters had turned their back on science in favor of 'alternative' facts or other types of 'post-truth' reasoning. While it is far from given that the public has in fact turned its back on science or on its role in democracies (Mann & Schleifer 2020; Bertou 2022; Bertou & Caramani 2020), it is nevertheless obvious that social and political changes are often accompanied by controversies over science and expertise. Some voice their resistance to scientists they disagree with emphatically while others march the streets in support of science. The Global pandemic did not create these controversies, but has likely provided lay citizens with a wider catalogue of possible reasons for them to either accept or to be skeptical of science.

Whether one is assessing a political proposal or deciding whether to accept medical advice, individuals have to navigate between their prior beliefs about the issue and their judgment of the suggestions being given. This includes checking the plausibility or accuracy of information embedded in the issue and the trustworthiness of the source (Mercier 2020: 47). This paper investigates a key component embedded both in voters' assessment of political proposals and medical advice, namely whether or not people view the underlying issue or problem as serious. Do people assess expert proposals differently depending on whether they view the underlying problem as being very serious or only of minor importance? Would it be conceivable, for instance, that moderate vaccine skeptics would overcome their opposition in a situation where they believed the underlying health problem addressed by the vaccine to be very serious?

It is relevant for scholarship on public opinion to study the impact of issue seriousness on following expert advice, because it may enable us to better understand the depth of science skepticism and other types of resistance to expertise. It is further relevant to the field of public opinion, because political authorities often transmit expert-based problems and solutions to voters when they explain policy choices to the public. Whether coming from science or policy-makers, voters thus have to evaluate the validity of various elite cues side by side. Some of these may argue that a problem is so urgent that we should accept solutions we might otherwise oppose, such as supporting nuclear power despite legitimate concerns when faced with the severity of climate change.

The core objective in this article is to investigate whether and in which ways perceptions of seriousness influence the acceptance of expert advice. Are subjective perceptions of seriousness, for instance, most important, of rather more objective measures of risk (e.g. different mortality rates)? And is there a different impact of seriousness related to nearby, bodily risks like disease as opposed to abstract or structural problems such as climate change or unemployment?

We focus on seriousness as a broad category which encompasses risk, as well as a subjective measure of importance. We concentrate on seriousness because we believe it should play a key role in the importance individuals place on getting a decision right. While individuals may always want to get a decision right, if the situation is serious, then there is only more incentive to do so. If you believe an illness is more serious, you will be more incentivized to make wise health-decisions and potentially to disregard prior critical opinions of modern medicine. In a political context, if you believe an election is very important, you will be more motivated to vote, and vote for the right party or candidate. From the other point of view, if you see a problem

as trivial or unreal, you may be less motivated to get the decision right. This is potentially where some of the sweeping, premature claims about post-truth go wrong: They do not consider that stating an abstract position for or against science is relatively 'free' for most people unless they are in situation where decisions have direct and serious consequences.

Yet when forced to make a difficult decision, it is not always straightforward how individuals will rely on expertise. On the one hand, if people view a matter as complex, where one needs technical expertise to solve it, research indicates they are more likely to accept the advice of an expert authority (Harrits & Larsen, 2021). On the other hand, even in complex situations, trust should not be considered a default response. A central feature of reasoning is learning how to deal with the fact that people (including experts!) may be dishonest or simply incorrect. As a result, individuals tend to be skeptical and difficult to persuade – especially when they take a decision seriously (Mercier, 2020).

Another dimension is whether different groups of people react differently to seriousness. First, we can consider individuals who already have low levels of trust in expert institutions. Why would we expect them to become more inclined to trust expert advice because they believe the issue is serious, unless perhaps more serious problems make them doubt their own competence? Second, we can consider individuals who have prior beliefs which diverge from what the experts are advising. As seriousness increases, would we expect those individuals to compromise their prior beliefs and depend more on expert authorities which may know more than them?

We tested these ideas with large, quota-based surveys with 7,500 respondents across five countries (United States, United Kingdom, the Netherlands, Denmark, and the Czech

Republic). We pre-registered our main analyses, which utilized two vignette experiments. The first vignette experiment presents participants with various problems (climate change, gender transition, immigration, and home birth) and asks them to follow a specific piece of advice that is either supported (or not) by an expert source and explained with either a strong or weak argument. The second vignette experiment manipulates the 'objective' seriousness of the problem experimentally by asking participants to put faith in a doctor's advice when faced with a hypothetical diagnosis of colon cancer with a stated survival rate of either 10, 50, or 90%.

Exposure to cancer risk obviously increases the demand for medical expertise, but the vignette is designed to present a stronger dilemma for skeptics of science and medicine as respondents are asked to blindly accept an 'experimental' treatment with significant side effects. Both experiments also asked participants to evaluate how serious they – subjectively – think the presented problem is whether they would likely search for more information. We also support our survey experiments with a large number of additional survey questions, to ascertain our respondents' levels of trust and prior beliefs on the relevant topics.

Across a broad range of situations, including ones where individuals would not typically rely on expert advice, individuals are more likely to accept expert advice when they perceive an issue is serious. They are also more likely to indicate they will seek out information when they perceive an issue is serious – this however was a much more minimal effect, likely due to a ceiling on responses. We also find that the impact of argument quality increases when people perceive an issue is serious. This implies that, although they are more likely to accept advice when a problem is serious, this is magnified when the expert body supports their advice with stronger arguments. We also tested whether these effects varied for individuals who are

disinclined to accept the advice, either because they have low levels of trust or because they have prior beliefs which run counter to the advice given.

Regardless of how we measure trust (populist attitudes, institutional trust scales, science perceptions, and Covid vaccination status), we find that both high- and low-trust individuals are more likely to accept advice if they perceive an issue as serious, though trust does moderate the relationship. At higher levels of perceived seriousness, the gap between high- and low-trust individuals increases. A bigger difference between the two groups can be seen for info-seeking. High-trust individuals tend to indicate that they will seek out more information regardless of their level of perceived seriousness. On the other hand, low-trust individuals are much more responsive to the seriousness of the issue, and only when the issue is very serious indicate that they are as likely as high-trust individuals to seek out more information.

The effect of prior beliefs is similar but not identical. Individuals with prior beliefs which run contrary to the expert advice are much less likely to accept that advice, yet they increase acceptance in accordance with perceived seriousness to the same degree as those who have prior beliefs which match the expert advice. Similarly to the above, those whose prior beliefs accord with the expert advice have relatively similar levels of info-seeking, regardless of the issue's seriousness. In contrast, those whose prior beliefs clash with the experts' are very responsive to seriousness. However, in this case – unlike with trust levels – at high levels of seriousness, those whose prior beliefs clash, indicate much greater likelihood of seeking out more information, as compared to those who agree with the expert advice.

To put all this together, these results paint a robust picture. Individuals, across a broad range of topics are likely to rely more on expert advice when they perceive an issue is serious. Even

among individuals who are disinclined to trust expert advice, when they perceive an issue as serious, their likelihood of accepting advice increases. This points perhaps to something fundamental about how people respond to difficult problems. If individuals feel something is serious, they would be reluctant to ignore the advice of those who may know better. This also indicates that even those who indicate they distrust expert institutions, still do not deny the societal role of expert institutions when they are faced with a difficult matter.

## Theory and Hypotheses

The impact of seriousness on acceptance of expert advice is not a well-established study object in existing scholarship, and as such, we are not building on top of a broad literature here. Rather, our study brings together and combines concepts and approaches from different subdisciplines including the sociology of professions, expertise, and medicalization as well as scholarship from public opinion and political psychology.

We may begin with the sociology of knowledge and expertise, which is where the study's main dependent variable, acceptance of expert advice, originates. That focus is inspired in part by Weber's original notion of authority defined as "the probability that certain specific commands (...) will be obeyed by a given group of persons' (1978: 212)". Most of the sociological literature on authority further stipulates that since traditional sources of authority have eroded or are perceived as optional rather than given (Bauman 1987; Sennett 1980; Furedi 2013), citizens are thus left with the difficult decision of 'whose authority is to be taken as binding' (Giddens 1994: 87). These individual decisions are difficult, because lay citizens typically do not know or understand all the details, dilemmas or complex relationships embedded in expert recommendations, and they may thus feel like they have no choice but to follow expert recommendations. This difficulty is accentuated in the ancient Roman idea that authority is a

type of "advice which one may not safely ignore" (cited in Arendt 2006: 122). Individuals may thus choose to ignore expert advice, but rarely without a sense of risk or uncertainty about potential consequences.

The notion of 'advice not safely ignored' has been applied in a previous study of lay people's acceptance of different types of professional authority (Harrits & Larsen 2021). This study found that types of professional expertise based on specialized, formal knowledge (Freidson 2001) were able to command higher acceptance of expert advice, because the problems or work tasks of higher-ranked professions were understood as having a higher degree of 'legitimate complexity' (Starr 2017), thus making lay decisions more dependent on advice. Other studies have similarly tried to map out how various types of expertise are ranked (Zhou 2005; Gauchat & Andrews 2018).

Prior research into risk perceptions has often focused on the expert side of the equation: does your trust in authorities raise or lower your subjective risk assessments (e.g. Siegrist 2021; Sjöberg 1999)? That is an important question, helping us to understand how experts can shape our perceptions of the world. An important point here is that the 'problems' to which expert advice offers solutions do not simply reflect the problems perceived by lay citizens in their everyday lives. Strong professions or fields of expertise typically cultivate the need for their expertise over long stretches of time (Abbott, 1988: 61), typically through a codification of specialized formal knowledge (Freidson, 2001: 32), and they are often better able to explain to the public why their work tasks are important and legitimately complex.

The literature on medicalization draws a similar picture of how public perceptions emerge of what constitutes a serious health problem worthy of a diagnosis and medical treatment. As



argued by Conrad (2007: 132), there are different 'engines' or drivers behind medicalization, which may increase lay citizens' acceptance of expert-based solutions, but which also in some situations generate resistance, for instance in social movements or subcultures critical of conventional medicine. A key lesson from the medical sociology on resistance to medical authority is that antivaxxers, for example, are not necessarily opposed to modern medicine in general, but refuse vaccine uptake based on their own combination of knowledge and resources (Reich 2020). Thus, we cannot simply assume that refusal of expert advice is indicative of a particular type of underlying motivation, as individuals may ascribe many different reasons to either acceptance or rejections of expertise.

A related challenge is that there may be multiple meanings of what makes a given problem serious in the eyes of a lay citizen. Serious problems may be perceived in some contexts as urgency, in others as danger or risk, in others again as uncertainty, and in yet other situations seriousness may refer to inherent complexity similar to the notion of 'wicked' problems (Rittel & Webber 1973). Even if we could somehow differentiate these conceptually, however, we do not really know much about how respondents would distinguish between them. Further, seriousness may be perceived differently related to different topics whether in policy or other aspects of life. Consequently, it makes the most sense to simplify it somewhat in this study where we only ask whether respondents views the presented problem as 'serious'.

If we seek to understand how individuals make decisions about following expert advice, we may also draw on scholarship on 'epistemic vigilance' (Mercier 2020). This perspective suggests that individuals make decisions about who to believe and how to act on it by evaluating the plausibility of claims presented to them, whether these claims are expert-based knowledge or simply factual claims about reality. Because individuals are wary of being fooled,

they do not simply go all overboard with what they believe in, whether this is science or conspiracy theory. This makes the decisions more complex, as individuals adjust their 'accuracy goals' (not being fooled) against other motivations or directional goals they may have. Believing a given problem to either be very serious, moderately serious or not so serious may therefore in theory influence whether people stick with their initial goals or motivations (for instance, being hesitant about experimental cancer treatment with built-in risks and uncertainties).

While we are examining how individuals rely on experts when they view an issue as serious, we are also interested in how they react in another way: do they wish to seek out more information. Although a very different domain, research in political psychology has found that, when making decisions, people will be more likely to seek out more information if they believe the issue is important and if there is uncertainty and anxiety around their decision (Marcus et al., 2000). In some ways this runs contrary to accepting the advice they are given. We include this therefore to see if these two impulses are stimulated at the same time when an issue is serious – even if in reality, people may have to face a dilemma as to whether to accept the advice they are given, or wait until they've gathered more information.

Based on these theoretical reflections, we formulate these four hypotheses all of which have been preregistered. First is the main hypothesis stipulating that seriousness increases acceptance overall.

*H1: The seriousness of a problem increases acceptance of the advice of authority.*

Second, we examine whether seriousness is associated with wanting to gather more information. We do not believe that this desire is at odds with following expert advice, nor does it imply the respondent is rejecting authority.

*H2: The seriousness of a problem increases search for further information.*

Third, some vignettes (see below) also manipulate the backing of advice by various expert sources, and here, we expect respondents to rely more on expert sources when problems are perceived as serious or complex.

*H3: Seriousness of a problem will moderate the impact of expert source on advice acceptance. As seriousness increases, the impact of expert source increases.*

Finally, and in continuation of H3, we also manipulate the arguments presented to respondents in some of the vignettes, because we expect strong arguments to count more when seriousness is perceived to be high. We explain further below how all the vignettes were designed.

*H4: Seriousness of a problem will moderate the impact of argument quality on advice acceptance. As seriousness increases, the impact of argument quality increases.*

# Data and Methods

In this section we will give an overview of our data, the structure of our survey experiments and our key variables.

## Data

After receiving ethical approval, and pre-registration, data for this paper was gathered in the summer of 2022. We launched surveys, using Qualtrics Panels, in five countries: The United States, The United Kingdom, Denmark, The Czech Republic, and The Netherlands. We aimed to get at least 1500 respondents per country, with the goal of having a large, generalizable sample. For each country we had demographic quotas in place. The main issue however, was that we struggled to recruit low-educated respondents, and we had to open up those quotas in order to complete our data gathering.<sup>1</sup> Our sample is 51% female, covers a wide spread of ages and geographic regions (as per the quota). Although we had trouble with the lowest level of education, 64% of our sample is without a university degree.

## Two vignette approaches

All of our respondents went through two vignette experiments.

In the first vignette experiment, all respondents went through four scenarios, which covered four separate topics. In two of them, the respondents were asked to support a political proposal, in two of them they were presented with a medical scenario in which they were given medical

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<sup>1</sup> We used our surveys, and these vignettes, for additional projects, aimed at answering different research questions.

advice. The topics were: climate change, immigration, where to give birth, and how to treat a transgender child. For each vignette, we varied the position of the expert, the quality of the argument (better or worse), and whether there was an additional, ultimate expert source of the advice (government or independent).

In the second vignette experiment, we had our respondents read a scenario in which they are diagnosed with colon cancer. We varied the severity of the prognosis, with survival rates of 10%, 50%, and 90%. There they were asked whether they would accept the doctors' treatment plan, which was a blend of standard of experimental treatments and came with significant side effects. By varying the severity of the prognosis, we hoped to have a more objective measure of seriousness. Unfortunately, either because cancer itself is so serious, or because our least serious condition was still quite serious, we did not find much variation in how serious our respondents perceived these to be. In the most mild condition, people perceived the level of seriousness as 4.14 (on a 5 point scale), while in the most severe condition, people perceived it as 4.44. In other words, moving from 90% survival to 10% survival, increased the perceived seriousness on this scale by about 7%.

Please see the appendix for the texts of all our vignettes.

### **Dependent variables**

Our hypotheses concern two main issues: first and most primary is whether people will accept the advice given to them by an expert authority. Secondarily is whether people will indicate they want to obtain more information. As noted previously, these appear to conflict with each other, and one can imagine an alternative design in which respondents were asked to choose

between them. However, we do not believe these two dependent variables are strictly incompatible, as individuals can accept advice and look for more information simultaneously. Similarly, individuals may feel pulled in two directions at the same time, if they believe a problem is very serious. They may both want to rely on an expert authority *and* want more information to better understand the problem. If, in reality, they are being forced to choose, this may be a reluctant choice.

In the non-cancer vignettes, the two versions of the acceptance item were: “How likely it is you would support the proposal?” and “How likely is it you would follow this advice?”, in the political and medical scenarios, respectively. In the cancer vignette, we asked people “How likely are you to trust the doctors to direct your treatment?”

To assess info-seeking behavior, we asked the respondents in the non-cancer vignettes: “How likely is it that you would look for additional information before making up your mind? (e.g. searching the internet)” and in the cancer vignette, we asked respondents: “How likely are you to search for more information online before making up your mind?” and “How likely are you to get a second opinion before making up your mind?”, which we averaged together.

the political acceptance item reads either “How likely is it that you would support the proposal?” or “How likely is it that you would follow this advice?”, depending on the topic of the case.

## Seriousness variables

This paper focuses on seriousness – using it as a broad term which will cover concepts such as risk and importance. In the non-cancer vignettes we use an item which asks the respondents: “How serious do you find the problem of [...] described in this scenario?” – where the blank is for the topic of the vignette. In certain vignettes there is ambiguity about the main issue to be dealt with, and so we were forced to choose what we wanted the respondents to focus on. For instance, our immigration vignettes discussed the economic consequences of immigration. Is the critical issue immigration or the economy? In that instance, we wanted them to focus on the economy.

In our cancer vignettes, the issue is more straightforward, and we simply asked the respondents: “How serious do you think the situation described in the scenario is?” This is our way of tackling perceived seriousness. As discussed above, we have three versions of the cancer vignette, varying the severity of the prognosis, which is a more objective measure of seriousness.

In the non-cancer vignettes there is an additional concern, that perceived seriousness could be correlated with one’s position. By measuring the participants’ prior stances on the advice to be given, we were able to create measures of their prior attitudes. We then checked the correlations between their positions and their measure of perceived seriousness.<sup>2</sup> We found meaningful, but

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<sup>2</sup> Note that the positions relate to the advice given – as we wanted to measure how much the advice diverged from their prior beliefs. The issue which we measured perceived seriousness did not always match. For instance, we asked people in the climate change vignettes how serious the problem of climate change was to them, but the prior attitudes were about the usefulness of organic farming (as the advice was about either increasing or decreasing organic farming). Similarly, in the immigration scenario, we asked about the seriousness of the economic issues, but the prior attitudes pertaining to increasing or decreasing immigration.

slight correlations here. The largest was in the birth vignette, where it rose to  $r = 0.22$ . Note, that we attempt to deal with the issues this introduces in a robustness check in the analysis.

An additional concern could be that the perceived seriousness is influenced by the vignettes themselves. We do not believe this is *necessarily* a problem, because we are not interested in how serious people viewed an issue prior to reading the vignettes, but rather how they react in light of their current level of perceived seriousness. We find, however, that a good quality argument increases perceived seriousness in three out of the four cases, and two of the four cases (immigration and births) one of the positions being argued increased perceived seriousness relative to the other. As noted above, we attempt to deal with this with a robustness check, but do not believe this is a theoretical problem.

### **Modeling approach**

In all cases, we have pooled over all countries, using a fixed effect for country. For analyses on the non-cancer vignettes, when pooling over scenario, we use a multilevel model with a random intercept for each respondent. All regressions are OLS. In this text we are presenting the results for respondents who have passed a post-vignette comprehension check question in which they have been asked to indicate (from a list of ten) the topics of the vignettes they read about. Approximately 71% of the sample passed this check.



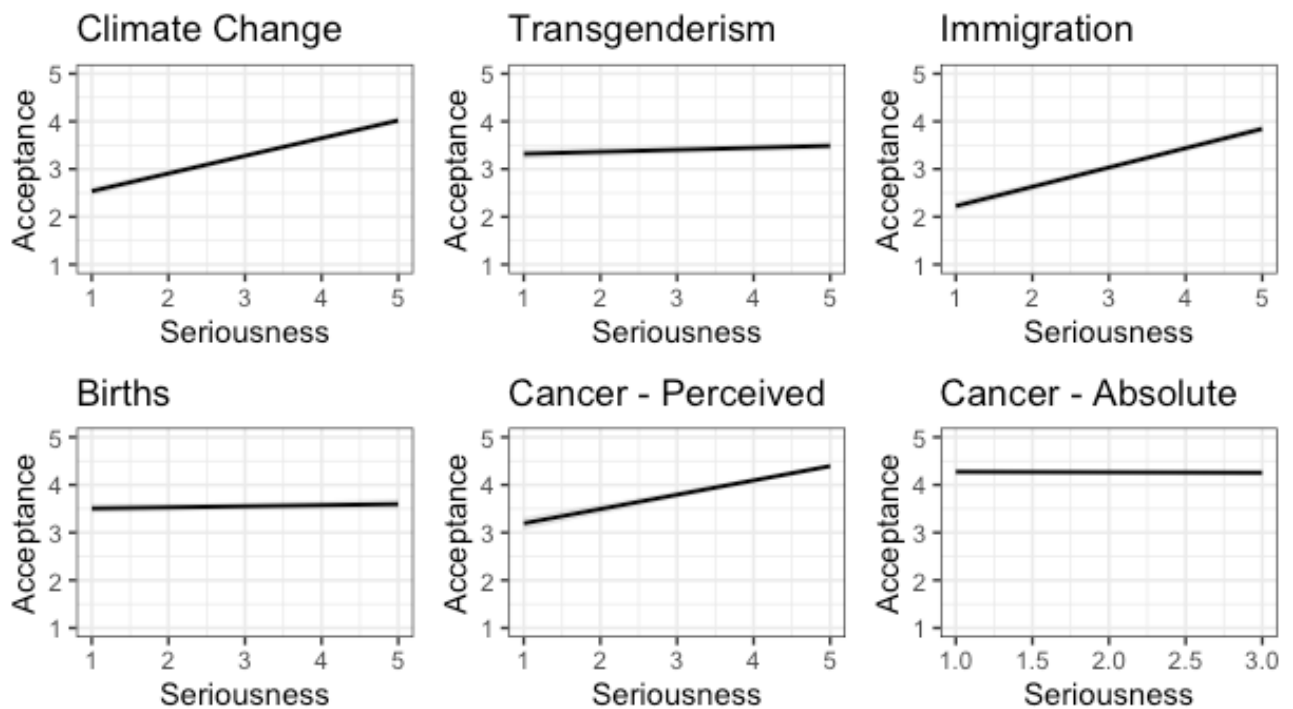
# Results

In this section we will go through our results, combining analyses from both vignette experiments. We will first go through our pre-registered hypotheses and then move onto additional analyses.

## **H1: Seriousness of a problem increases acceptance of the advice of authority.**

The first question to consider is whether the seriousness of a problem increases acceptance of authority. We found that by pooling together the first vignettes, there was a significant relationship here ( $b = 0.18$ ,  $p < 2e-16$ ), however, looking at it case by case showed more variation in effect size (and significance). Additionally, with the cancer vignette, we see a difference between the objective, experimental condition – where we attempted to manipulate the level of seriousness – and the subjective rating of seriousness. Only the latter case had a significant association with acceptance of advice. This is likely due to the fact, as shown in the previous section, that there was little difference between how serious people assessed the cancer vignettes. All were viewed as very serious. Therefore the subjective ratings can be seen as individual variation around how serious someone believes a cancer diagnosis is.

**Figure 1:** Acceptance over all six versions



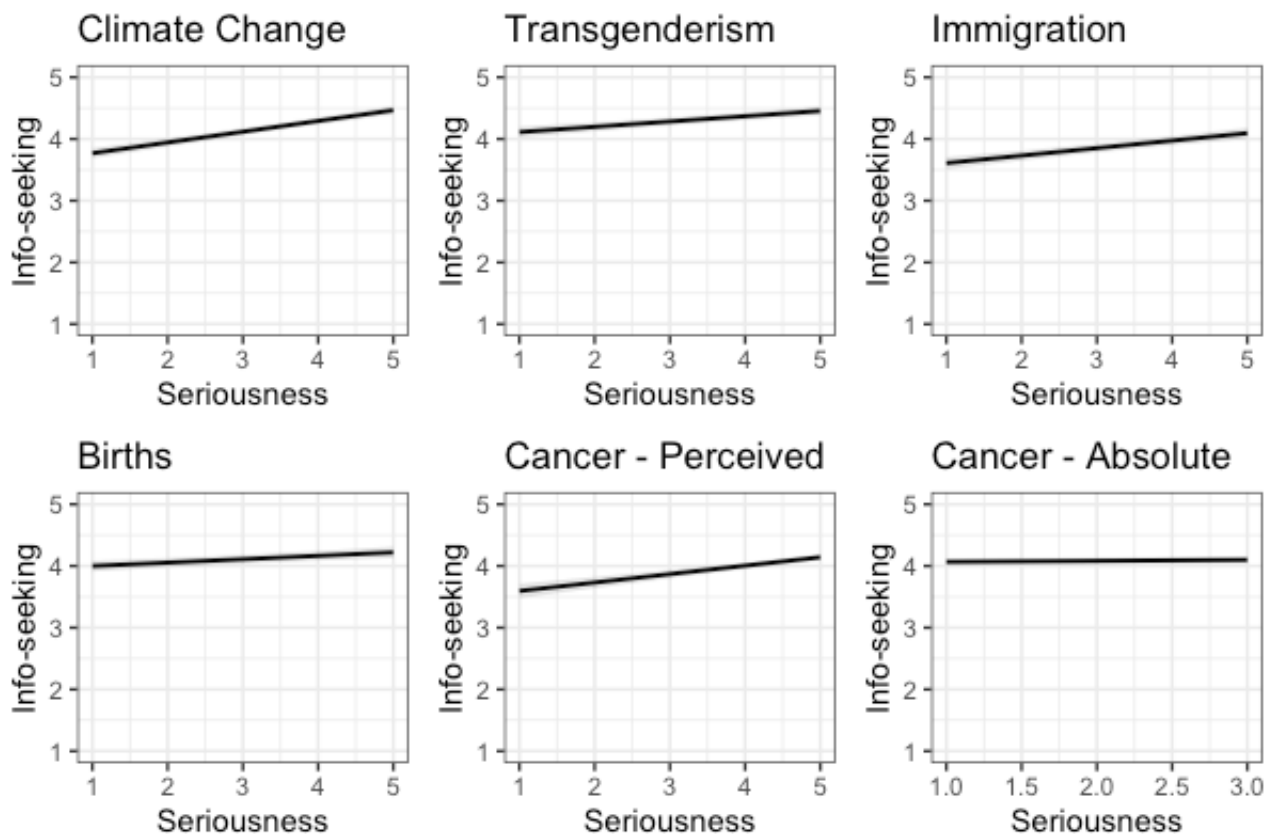
It is notable that the two clearly political vignettes show a close relationship between perceived seriousness and acceptance of advice. It is precisely those vignettes where individuals typically feel freest to follow their own feelings. Additionally, the two more medical vignettes showed almost no effect of perceived seriousness (it is significant only in the transgenderism case, but only marginally). As there is the potential that, especially in these political cases, some of these results are due to perceived seriousness being associated with one's prior position on the issue, or how well someone was persuaded by the vignette, the four non-cancer vignette regressions were run, controlling for the respondent's prior agreement with the side being advocated, a binary for what that side was, and a binary for the quality of the argument. The two relevant cases are climate change and immigration. In the robustness check for climate change, the results were nearly identical for the seriousness coefficient. However, for the immigration

vignette, the effect size decreased from 0.40 to 0.25, though still remaining highly significant ( $p < 2e-16$ ).

## H2: Seriousness of a problem increases search for further information.

Next we assess how seriousness impacts the search for further information. As noted previously, in our design we allowed people to indicate they would accept the advice *and* that they would search for more information/get a second opinion. An alternate design in which respondents are forced to choose one or the other, or to indicate which side they leaned towards, would have different results.

**Figure 2: Info-seeking over all six versions**

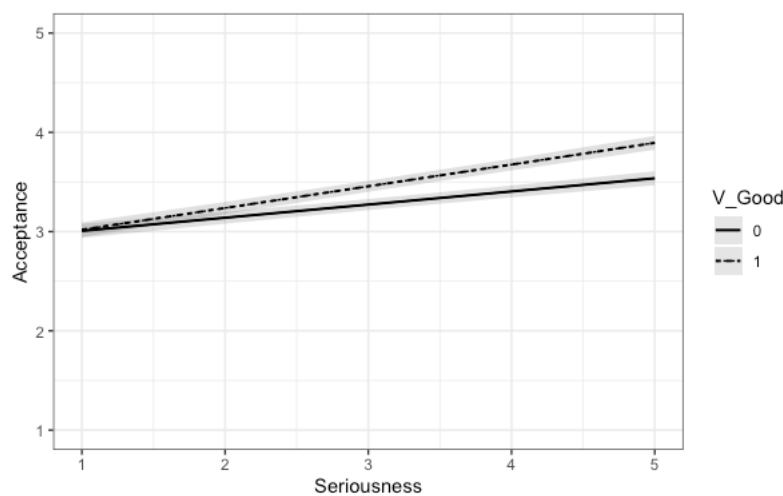


With this design, we see that in all but the experimental manipulation of cancer, there's a significant association, however, it has quite a small effect size in all cases. This is likely due to a ceiling effect. There appears little reason to not say you would seek more information. And even if one were to accept the expert advice, one might in parallel try to understand the situation better by reading more. However, as we will see in further analyses, there is some interesting variation in responses here.

**H3: Seriousness of a problem will moderate the impact of expert source on advice acceptance. And, H4: Seriousness of a problem will moderate the impact of argument quality on advice acceptance.**

We wanted to know whether acceptance would be moderated by either the additional expert source being cited or by the argument quality. For H3, the additional expert source, there is no moderating relationship. However, for H4 – the quality of argument, there is.

**Figure 3: How seriousness is moderated by argument quality**



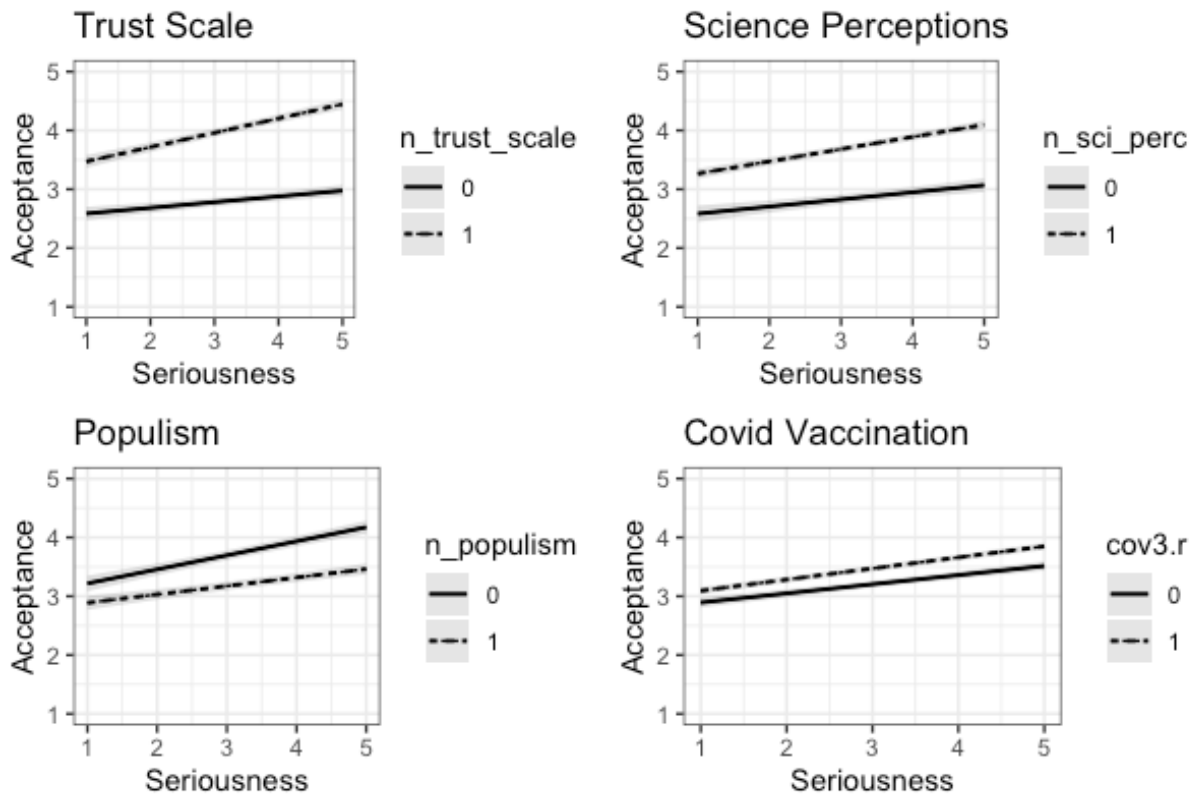
We see that the effect of a good quality argument increases when people perceive the issue as serious. In fact, when people believe an issue is not serious, they seem to ignore the quality of the argument entirely. Only when they are motivated to get it right, are they influenced by the actual argument. The difference in acceptance rate, at the highest level of seriousness, is about 0.5 points on a 5 point scale.

Now we can move onto some further analyses. These were not pre-registered, however they aim to understand whether the relationships we have studied above vary on some level between those who would be inclined to disbelieve in the expert advice, and those who would not.

### **Do these relationships vary depending on trust levels?**

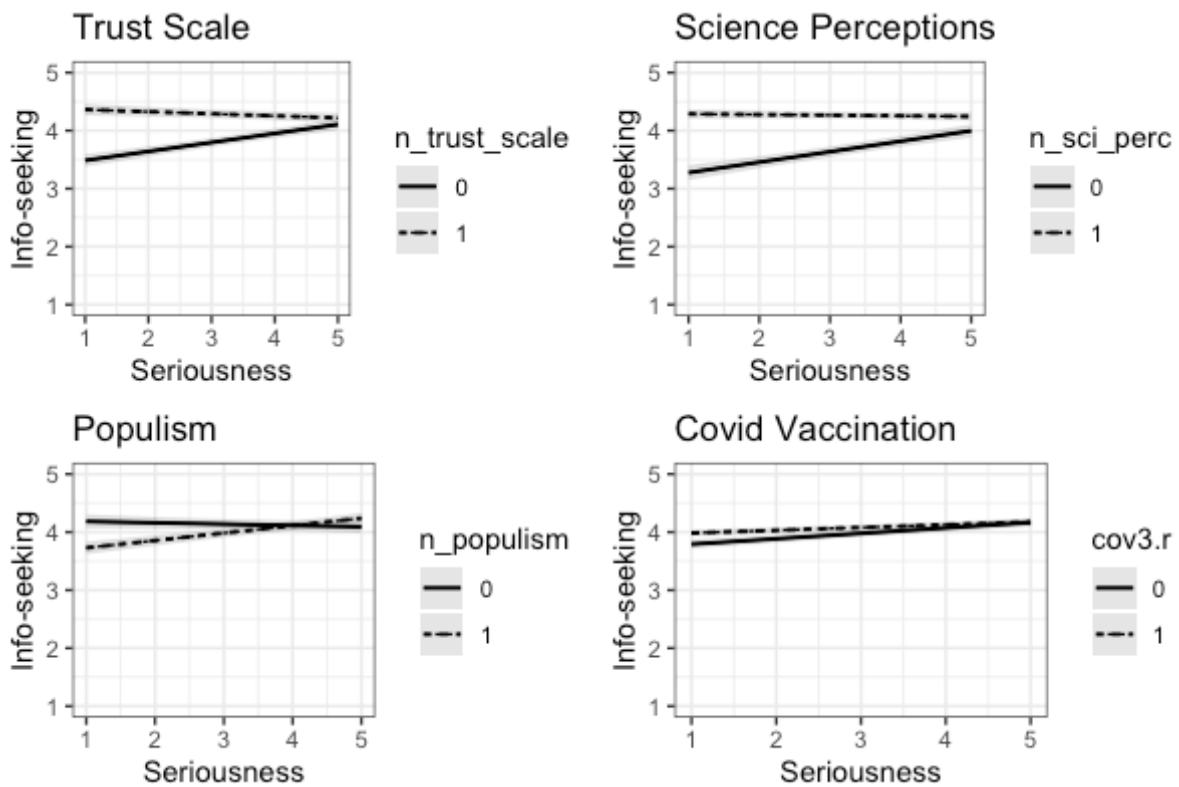
First we try to understand whether these relationships will vary depending on one's level of trust. We have a number of potential measures of trust, and, therefore we replicate the analysis with each. These are the responses to a trust battery, perceptions of science, level of populism, and whether one received a Covid-19 vaccination.

**Figure 4:** Acceptance and four measures of trust



We see in all cases that those with the lowest level of trust are less responsive to seriousness than those with the highest level, however, they still respond to increasing seriousness with increasing trust.

**Figure 5:** Info-seeking and four measures of trust

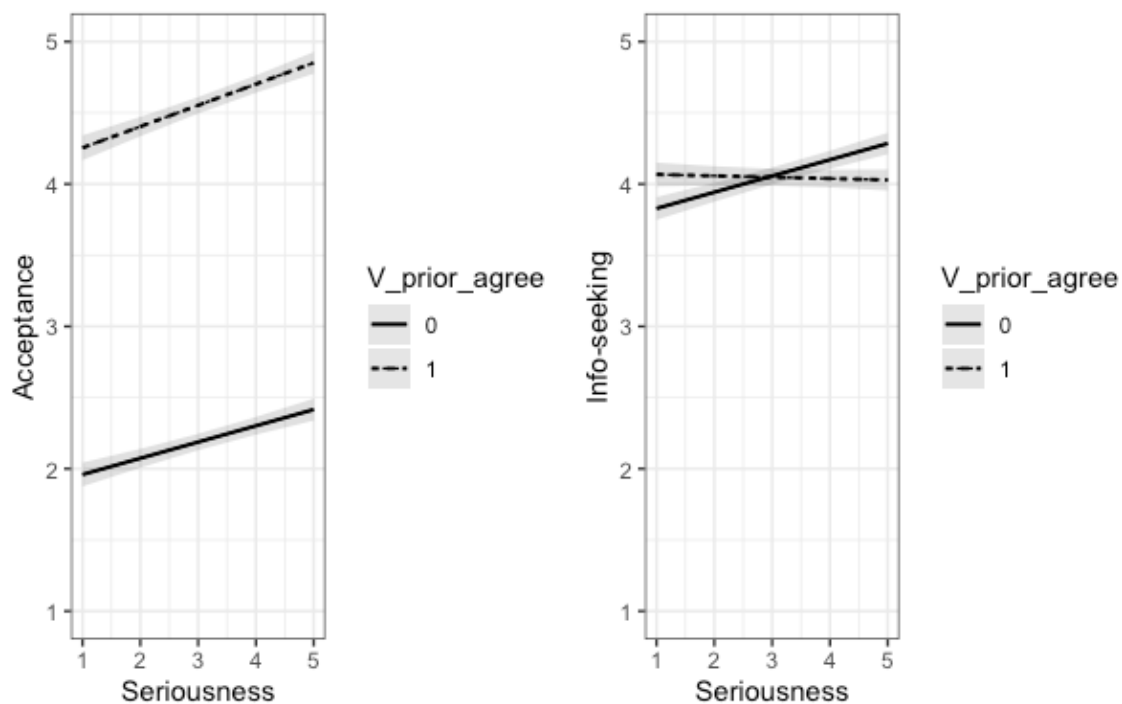


While those interactions are all significant, the effects are much larger for info-seeking. For info-seeking, we see that the main effect is most similar to the behavior of the high-trust individuals. That is, they tend to say they will look for more information regardless of the seriousness. Low-trust individuals, in contrast, vary their info-seeking behavior (or more accurately: their reporting of what they expect they would do) dependent on how serious the problem is. In many ways, this is a very reasonable approach. If you do not think a problem is particularly serious, why spend a lot of time researching it? We can't all be academics.

## Do these relationships vary depending on prior beliefs?

An alternative approach is to divide the respondents by whether or not they agreed with the advice given. We asked the respondents two questions about each topic (before the vignettes) to create a measure of their prior position on the topic, we used that to create a measure of their prior agreement with the specific advice they were given. Here we look at the predicted values, when prior agreement is taken to its maximums.

**Figure 6:** Interactions with prior beliefs (maybe pooled over mains)



We see that there is no significant interaction between prior beliefs and seriousness when it is a matter of acceptance. Those with beliefs which are at odds with the advice they are receiving also increase their acceptance as the level of perceived seriousness increased. However,



although the probability they accept the advice increases, the mean level is below the threshold of “acceptance”. That is to say, most of them still would be unlikely to accept the advice. An alternative interpretation could be that they become less confident in their choice. Unlike when comparing the high- and low-trust respondents, the gap in acceptance levels is very large here.

We see a similar pattern with info-seeking as we saw with trust-levels. Those who agree previously all tend to say they’ll seek out more information, but those who disagreed with the advice are very likely to vary their info-seeking behavior in response to perceived seriousness. Unlike with trust levels, however, at the highest levels of seriousness, they now exceed the info-seeking of the individuals who agreed with the advice given.

## Discussion and Conclusion

In this paper, using a variety of measures, we show that perceived seriousness – but not an objective, experimentally varied measure of seriousness – was broadly associated with accepting expert advice. This relationship was not universal, however, and in two vignette scenarios the effect was either insignificant, or extremely marginal. It is not clear why in those cases the effect was so limited. It is striking too that those were medical scenarios, in which individuals would be likely to be accustomed to accepting expert advice. Future research can try to understand better why this effect may vary, depending on the topic and scenario.

One possible explanation to the variation could be due to relationships with prior positions – including how well they agree with the expert advice given. What is notable is that even when presented with arguments which run against what they believe, the respondent’s level of

perceived seriousness still predicted an increase in likely acceptance. Similarly, low-trust individuals, regardless of the way in which that was measured, showed increases in acceptance as they perceived an issue to be serious. These results indicate that that this pattern is widespread and that expertise, even among low-trust individuals, still holds a high value and may be relied upon when issues are perceived to be important.

We also examined in this paper the effect seriousness has on info-gathering behavior. We found that this does take place, but in general the effect is quite weak, likely due to a ceiling effect. People nearly universally indicate they want to gather more information, regardless of how serious they perceive a problem to be. Those disinclined to accept the advice, however, are the one exception. Whether due to being low-trust, or with prior attitudes which conflict with the advice given, there we see a greater response to perceived seriousness. However, there too the effect is quite small.

As discussed earlier, we did not force our respondents to choose between acceptance and advice gathering, nor did they place themselves on a scale between the two extremes. It is inevitable that those designs would find something different, as the respondents would then be forced to weigh the pros and cons of each option. Such a design would help us understand individual responses to seriousness in more detail.

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# Appendix 1

## NON-CANCER VIGNETTE TEXTS

### *Climate Change*

#### Increase + Stronger

##### **Now please imagine the following situation**

Faced with the severe consequences of climate change, a new proposal is put forward that aims to reduce climate change by making significant changes to agriculture and food production.

##### **Proposal:**

The proposal suggests that increasing the amount of organic farming could make a real difference in terms of stopping climate change. The proposal involves a plan in which conventional farming initiatives are cut, and instead, support is given to organic farmers to expand the production of organic food.

##### **Why?**

The proposal argues that because organic farming is less energy intensive and more sustainable, it does not have the same detrimental impact on ecosystems as conventional farming does. Research also indicates that organic farming methods result in significantly greater carbon sequestration in the soil, thereby preventing much carbon from being emitted into the atmosphere. As a result, the plan argues we can greatly reduce the negative impact of food production on the climate by increasing the use of organic farming.

#### Increase + Weaker

##### **Now please imagine the following situation**

Faced with the severe consequences of climate change, a new proposal is put forward that aims to reduce climate change by making significant changes to agriculture and food production.

##### **Proposal:**

The proposal suggests that increasing the amount of organic farming could make a real difference in terms of stopping climate change. The proposal involves a plan in which conventional farming initiatives are cut, and instead, support is given to organic farmers to expand the production of organic food.

##### **Why?**

The proposal argues that organic farming is natural and therefore good for the environment. Lots of people currently believe increasing organic farming is a good idea. There's not much conclusive research, but according to the scientists, it's a reasonable assumption based on their understandings. As a result, the plan argues that we can greatly reduce the negative impact of food production on the climate by increasing the use of organic farming.

#### Decrease + Stronger

##### **Now please imagine the following situation**

Faced with the severe consequences of climate change, a new proposal is put forward that aims to reduce climate change by making significant changes to agriculture and food

production.

**Proposal:**

The proposal suggests that reducing the amount of organic farming could make a real difference in terms of stopping climate change. The proposal involves a plan in which support towards organic initiatives is cut, and instead, support is given to farmers to purchase modern fertilizers and pesticides.

**Why?**

The proposal argues that because modern farming methods are much more efficient, they do not have the same detrimental impact on ecosystems as organic farming does. Recent research demonstrates that because organic farming is far less effective in how much food can be produced per square mile, it results in deforestation and considerably increased carbon emissions. As a result, the plan argues we can significantly reduce the carbon footprint of food production by cutting the use of organic farming and using more technologically advanced farming methods.

Decrease + Weaker

**Now please imagine the following situation**

Faced with the severe consequences of climate change, a new proposal is put forward that aims to reduce climate change by making significant changes to agriculture and food production.

**Proposal:**

The proposal suggests that reducing the amount of organic farming could make a real difference in terms of stopping climate change. The proposal involves a plan in which support towards organic initiatives is cut, and instead, support is given to farmers to purchase modern fertilizers and pesticides.

**Why?**

The proposal argues that although organic farming is natural, it is worse for the environment. Lots of people currently believe reducing organic farming is a good idea. There's not much conclusive research, but according to the scientists, it's a reasonable belief based on their understandings. As a result, the plan argues that we can greatly reduce the negative impact of food production on the climate by cutting the use of organic farming.

Government source

This proposal has been developed by climate researchers working for the Environmental Protection Agency (EPA).

The EPA strongly recommends this plan, which it believes can have a significant impact on reducing climate change, but leaves it for the voters to decide.

Independent source

This proposal has been developed by leading, independent climate researchers from Massachusetts Institute of Technology (MIT).

The climate researchers strongly recommend this plan, which they believe can have a significant impact on reducing climate change, but leave it for the voters to decide.

### Control

The authors of the proposal strongly recommend this plan, which they believe can have a significant impact on reducing climate change, but leave it for the voters to decide.

### *Trans treatment*

#### Hormones + Stronger

##### **Now please imagine the following situation**

After being unhappy for a number of months, your 11 year old son tells you that he is transgender and would like to live life as a girl. You discuss this with a team of doctors who specialize in gender-based issues.

##### **Advice:**

They affirm his new identity and recommend that he begin hormone treatments to postpone puberty.

##### **Why?**

The doctors tell you that it is essential they do this, because if he were to go through male puberty, the possibility of a full transition and passing as a woman would become much more limited. The better he can live life as a woman, the better his future mental health is likely to be. Recent research indicates, for instance, that trans youth who undergo such treatments have significantly lower rates of suicidal thoughts. Therefore, the best approach for your son is to begin treatment before puberty begins.

#### Hormones + Weaker

##### **Now please imagine the following situation**

After being unhappy for a number of months, your 11 year old son tells you that he is transgender and would like to live life as a girl. You discuss this with a team of doctors who specialize in gender-based issues.

##### **Advice:**

They affirm his new identity and recommend that he begin hormone treatments to postpone puberty.

##### **Why?**

The doctors tell you this is what should be done. They believe doing otherwise could be bad for his future. If he says that he is a woman, we have to take him at his word and begin treatment. There's very limited long-term research on this, but this is what lots of doctors, medical establishments, and clinics are doing nowadays. Therefore, the best approach for your son is to begin treatment before puberty begins.

#### Therapy + Stronger

After being unhappy for a number of months, your 11 year old son tells you that he is transgender and would like to live life as a girl. You discuss this with a team of doctors who specialize in gender-based issues.

##### **Advice:**

The doctors tell you that before undergoing any medical intervention, they recommend therapeutic counselling.

**Why?**

The doctors tell you that many children can become confused about their gender. However, this is often temporary. Recent research indicates that if a trans identity were affirmed now, it may make these feelings more long-lasting, leading to more depression. Additionally, any sort of medical intervention, such as blocking puberty, carries risks. In this case, risks that we don't fully understand yet. Therefore, the best approach for your son is to get him counselling.

Therapy + Weaker

**Now please imagine the following situation**

After being unhappy for a number of months, your 11 year old son tells you that he is transgender and would like to live life as a girl. You discuss this with a team of doctors who specialize in gender-based issues.

**Advice:**

The doctors tell you that before undergoing any medical intervention, they recommend therapeutic counselling.

**Why?**

The doctors tell you this is what should be done. They believe doing otherwise could be bad for his future. Although he says that he is a woman, he could be confused. There's very limited long-term research on this, but this is what lots of doctors, medical establishments, and clinics are doing nowadays. Therefore, the best approach for your son is to get him counselling.

Government

The doctors tell you that they are following guidelines developed by researchers at the National Institutes of Health (NIH).

The NIH promotes this approach, and the doctors tell you this is what they recommend, but the decision is left with you.

Independent

The doctors tell you that they are following guidelines developed by medical specialists in gender related issues at Harvard Medical School.

The gender specialists promote this approach, and the doctors tell you this is what they recommend, but the decision is left with you.

Control

The doctors tell you this is what they recommend, but the decision is left with you.

*Immigration*

Increase + Stronger

**Now please imagine the following situation**

Due to consistent economic challenges in your country, immigration has been identified as

an important issue to address. A proposal has been made to change the immigration laws, with the goal of improving the economy.

**Proposal:**

The proposal is that we significantly increase the number of labor migrants allowed into the country.

**Why?**

The proposal argues that increasing the amount of labor migrants in the country will serve two important functions for the economy. First, the new immigrants will do many jobs which locals either can't or won't do. Research indicates that allowing more people to immigrate for work results in a more dynamic economy with higher levels of economic growth due to immigrants filling gaps in the labor market. Second, as we have an ageing population, we have a strong need for more young people and workers, both to serve as carers for the elderly, but also to support social services through taxes. Given these two reasons, immigration can result in strong economic gains for the country.

Increase + Weaker

**Now please imagine the following situation**

Due to consistent economic challenges in your country, immigration has been identified as an important issue to address. A proposal has been made to change the immigration laws, with the goal of improving the economy.

**Proposal:**

The proposal is that we significantly increase the number of labor migrants allowed into the country.

**Why?**

This proposal argues that increasing the amount of labor migrants in the country will support the economy. There are many reasons behind this. The proposal argues that increasing labor migration can improve the economy in many different ways - from improving the labor market to increasing economic growth. It is quite difficult for carefully designed research studies to measure these improvements, however, the proposal claims that, based on their knowledge of how the economy works, most economists believe that there are large improvements to be had by increasing labor migration into the country.

Decrease + Stronger

**Now please imagine the following situation**

Due to consistent economic challenges in your country, immigration has been identified as an important issue to address. A proposal has been made to change the immigration laws, with the goal of improving the economy.

**Proposal:**

The proposal is that we significantly cut down on the number of labor migrants allowed into the country.

**Why?**

The proposal argues that decreasing the amount of labor migrants in the country will serve two important functions for the economy. First, immigrants from poorer countries tend to displace local workers. These immigrants do jobs at wages locals won't accept. By cutting



the number of immigrants, we can gradually bring up wages which will support local workers, and since they won't be sending their income out of the country, this will improve the economy overall. Second, as many of these migrants work in a low-skill capacity, recent research indicates that their social service usage exceeds the amount of taxes they pay. This therefore has a net negative effect on the national budget. Given these two reasons, reducing labor immigration can result in strong economic gains for the country.

#### Decrease + Weaker

##### **Now please imagine the following situation**

Due to consistent economic challenges in your country, immigration has been identified as an important issue to address. A proposal has been made to change the immigration laws, with the goal of improving the economy.

##### **Proposal:**

The proposal is that we significantly cut down on the number of labor migrants allowed into the country.

##### **Why?**

This proposal argues that decreasing the amount of labor migrants in the country will support the economy. There are many reasons behind this. The proposal argues that decreasing labor migration can improve the economy in many different ways - from improving the labor market to increasing economic growth. It is quite difficult for carefully designed research studies to measure these improvements, however, the proposal claims that, based on their knowledge of how the economy works, most economists believe that there are large improvements to be had by decreasing labor migration into the country.

#### Government

This proposal has been developed by experts working for the US Treasury.

The Treasury strongly recommends this plan, which it believes can have a significant impact on the national economy, but leaves it for the voters to decide.

#### Independent

This proposal has been developed by leading, independent labor market researchers at the University of Pennsylvania.

The researchers strongly recommend this plan, which they believe can have a significant impact on the national economy, but leave it for the voters to decide.

#### Control

The authors of the proposal strongly recommend this plan, which they believe can have a significant impact on the national economy, but leave it for the voters to decide.

#### *Birth Options*

#### Home + Stronger

##### **Now please imagine the following situation**

You and your partner are expecting your first child. It is a low-risk pregnancy, and you go to

see your doctor to discuss the possibility of giving birth at home rather than at the local hospital.

**Advice:**

The doctor recommends a home birth.

**Why?**

For low-risk pregnancies, research has demonstrated significant improvements to the well-being of both mother and newborn when childbirth takes place within the quiet, natural surroundings of the home rather than at a busy hospital. This comfortable environment can make the complications of childbirth less likely to occur. The doctor also assures you that many medical interventions can be safely carried out by trained midwives, and that in case there is an emergency, you can be quickly taken to the local hospital, where they will be ready to help you. With all this in mind, the doctor suggests you should plan for a home birth and not a hospital birth.

Home + Weaker

**Now please imagine the following situation**

You and your partner are expecting your first child. It is a low-risk pregnancy, and you go to see your doctor to discuss the possibility of giving birth at home rather than at the local hospital.

**Advice:**

The doctor recommends a home birth.

**Why?**

For low-risk pregnancies, giving birth at home usually goes fine. It's generally a lot nicer to give birth at home. The research is unclear if it's safer or riskier, but more and more women are choosing to give birth at home. As a result, more and more doctors recommend it. Most of the women seem happy with their decision. It's reasonable to believe you would be happy with the decision too. With all this in mind, the doctor suggests you should plan for a home birth and not a hospital birth.

Hospital + Stronger

**Now please imagine the following situation**

You and your partner are expecting your first child. It is a low-risk pregnancy, and you go to see your doctor to discuss the possibility of giving birth at home rather than at the local hospital.

**Advice:**

The doctor recommends giving birth at the local hospital.

**Why?**

The doctor makes this recommendation because home births may involve some risk to both mother and newborn. Even if your pregnancy is considered low-risk, no pregnancy is truly risk free. The hospital provides the best options for specialized medical care in the event of unforeseen complications at birth. Childbirth has become dramatically safer for both baby and mother, but that is largely due to medical interventions which may be needed in emergencies. Being at the hospital can save crucial time. A meta-analysis in a top medical journal concluded that home births were two to three times more likely to result in neonatal

death than a planned hospital birth. With all this in mind, the doctor suggests you should plan for a hospital birth and not a home birth.

### Hospital + Weaker

#### **Now please imagine the following situation**

You and your partner are expecting your first child. It is a low-risk pregnancy, and you go to see your doctor to discuss the possibility of giving birth at home rather than at the local hospital.

#### **Advice:**

The doctor recommends giving birth at the local hospital.

#### **Why?**

The doctor makes this recommendation because this is what most women choose to do, and most doctors recommend it, so your doctor thinks it's probably the best option for you too. Although it's usually a lot nicer to give birth at home, the hospital is the more common place to give birth. The research is unclear if it's safer or riskier to give birth at the hospital, but it's what's traditionally done. Most women seem happy with their decision. It's reasonable to believe you would be happy with the decision too. With all this in mind, the doctor suggests you should plan for a hospital birth and not a home birth.

### Government

The doctor tells you that they are following guidelines developed by researchers at the National Institutes of Health (NIH).

The NIH promotes this approach, and the doctor tells you this is what they recommend, but the decision is left with you.

### Independent

The doctor tells you that they are following guidelines developed by leading birth specialists at Johns Hopkins Medical School.

The specialists promote this approach, and the doctor tells you this is what they recommend, but the decision is left with you.

### Control

The doctor tells you this is what they recommend, but the decision is left with you.

## **CANCER VIGNETTES**

### Mild:

#### **Now please imagine the following situation**

After having abdominal pain for a long period, you are diagnosed with colon cancer. The oncology specialists at your regional hospital explain that your disease is a less serious type where usually 90% survive.

**Advice:**

The oncologists suggest starting cancer treatment right away. The doctors propose a customized treatment plan that involves both standard and experimental types of treatment. Going through the plan will not be easy and will likely come with significant side effects.

The doctors ask you to put your trust in them to make the best medical decisions about your cancer treatment.

Medium:

**Now please imagine the following situation**

After having abdominal pain for a long period, you are diagnosed with colon cancer. The oncology specialists at your regional hospital explain that your disease is a serious type where usually 50% survive.

**Advice:**

The oncologists suggest starting cancer treatment right away. The doctors propose a customized treatment plan that involves both standard and experimental types of treatment. Going through the plan will not be easy and will likely come with significant side effects.

The doctors ask you to put your trust in them to make the best medical decisions about your cancer treatment.

Severe:

**Now please imagine the following situation**

After having abdominal pain for a long period, you are diagnosed with colon cancer. The oncology specialists at your regional hospital explain that your disease is a very serious type where usually 10% survive.

**Advice:**

The oncologists suggest starting cancer treatment right away. The doctors propose a customized treatment plan that involves both standard and experimental types of treatment. Going through the plan will not be easy and will likely come with significant side effects.

The doctors ask you to put your trust in them to make the best medical decisions about your cancer treatment.

## Appendix 2: Revised vignette design for follow-up study

There are four main justifications behind the decision to add a follow-up study:

1. To correctly manipulate seriousness: The main problem with the initial (cancer) design was that we failed in manipulating seriousness. The “objective” level of seriousness in the cancer vignettes were neither predictive of acceptance of advice, nor were they strongly correlated with perceived seriousness. We think this could be due to a floor effect, meaning that even the lowest mortality rate in the original design was high enough to make most respondents perceive it as quite serious – therefore reducing needed variation. The newly designed treatment thus uses much lower thresholds for objective risk, and it also explain in more details the side effects and necessary sacrifices involved in the treatment, as the cost to accepting the advice may have been conversely too low. Being able to replicate the analyses successfully with a manipulated measure of seriousness, and not simply perceived seriousness, will make this a much strong study.
2. Study seriousness in non-medical setting: We are also unsure whether the original manipulation did not work both because the risk of cancer overdetermines people’s evaluation of seriousness, and because in a medical setting people are used to accepting the advice they receive. We therefore add a second vignette about climate change here to see whether the manipulation of objective seriousness matters in a non-medical setting where the risk is more systemic rather than immediate, bodily risk, and where people are less accustomed to accepting advice. The two empirical settings – cancer and climate change – will of course never be entirely comparable, but it nonetheless serves to study some of the key conceptual factors in another context and to dissociate it from only being about health.
3. Separate the scope and urgency of seriousness: As we wrote up the initial paper, we realized that in some situations, seriousness may refer to the scope of a certain type of risk – how big a problem it is or how risky is it. In other situations, however, it may refer to the temporal dimension – how urgent it is to act in order to avoid risk. We have therefore added an urgency treatment in both the new vignettes. Some respondents will be told that it is urgent to make a decision right away, while others will get the vignette without this extra sentence.

4. Study the durability of key interactions: The initial study found instances of similar and dissimilar behavior between those who ought to be inclined to trust the advice and those who ought to be disinclined (either because they had low levels of trust in general, or because they had priors which conflicted with the advice given). We want to see whether the patterns of interactions are replicated again. In the first instance we did not preregister hypotheses based on these interactions, but this time we plan to. Additionally, if we can successfully manipulate the level of perceived seriousness through the treatments, we wish to see whether these relationships are maintained with those measures too.

### **Basic medical vignette design**

After having abdominal pain for a long period, you are diagnosed with colon cancer. The oncology specialists at your hospital explain that you have a type where 1 out of **10/100/1000** typically die if the disease is left untreated.

The oncologists recommend a treatment plan that can lower the risk of dying significantly. However, they also underline that it is partially experimental, and that it comes with significant, unpleasant side effects. Most typically, that will mean nausea and vomiting, as well as headaches and exhaustion. The course of treatment typically lasts approximately six months and will require you to make significant sacrifices in your normal lifestyle. If the condition returns, treatment may need to be restarted.

The doctors recommend this experimental treatment plan and ask you to put your trust in them to make the best medical decisions about your care.

**They say that there is no time to wait and that it is urgent that you start the treatment right away.** [alternative: leave this sentence out]

How likely are you to follow their advice and accept the treatment plan?

- [likert scale of likelihood]

### **Basic climate vignette design**

After more extreme weather in recent years and advances in the ability to measure and predict changes in the climate, an international group of leading climate scientists have reassessed the risks of climate change.

In their new assessment, the scientists say that we are on track for approximately:

**[Respondents will get one of these three risk scenarios]**

- A global temperature rise of 1°C (1.8°F). This would mean slightly greater risks of extreme weather, including hurricanes, flooding, and droughts.

- A global temperature rise of 3.0°C (5.4°F). This would mean much greater risks of extreme weather, including hurricanes, flooding, and droughts. It would also lead to sea-level rises, threatening major population centers around the world.
- A global temperature rise of 10.0°C (18.0°F). **This represents a severe threat to human survival.** This would mean much greater risks of extreme weather, including hurricanes, flooding, and droughts. It would also lead to large sea-level rises, meaning major population centers around the world would likely need to be abandoned. Due to extreme heat, large parts of the world would become uninhabitable, and food and water could become scarce for billions of people.

The climate scientists propose a new comprehensive plan to vastly reduce carbon emissions and thereby greatly lower these risks. The plan would cover large investments in green technology across several economic sectors, as well as detailed regulations aimed at transforming the ways we generate and use energy. To implement the plan, tax rates would need to be significantly increased. Similarly, energy prices are expected to be significantly higher under this plan. Due to these increased costs, many individuals will have to make significant sacrifices in their lifestyles, such as cutting out red meat, driving and flying less, and using less heat and electricity at home. Although it will be difficult for all of us, the researchers argue that these sacrifices are necessary to fight climate change.

**The scientists say that given the risks of climate change it is urgent that we adopt their plan and start implementing it right away. [alternative: leave this sentence out]**

If you were given the option to vote on this plan, how likely would you be to follow the scientists' advice and accept the climate plan?

- [likert scale of likelihood]

#### Notes:

- We will include a trust battery as well as items which measure prior attitudes towards medical treatment and climate change.
- We will have additional post-vignette questions about info-seeking, factors which led to their decision, trust for the experts giving the advice, as well as subjective seriousness of a problem, both to serve as a manipulation check and a measure we can use in our analysis, as we did in study 1.