Triage Dilemmas: A Window into (Ecologically Valid) Moral Cognition

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Abstract

At the height of the Covid-19 pandemic, frontline professionals at intensive care units around the world faced gruesome decisions about how to ration life-saving medical resources. These events provided a unique context for moral psychologists to understand how the general public reasons about real-world dilemmas involving trade-offs between human lives—in contrast to most prior research pursuing parallel questions via hypothetical thought experiments with limited relevance to the real world. In three studies (total $N = 2387$), we examined people's moral attitudes toward triage of acute coronavirus patients. Our findings indicate that people generally support utilitarian approaches to critical care triage. These utilitarian tendencies do not stem from a *period* change in people's moral attitudes (relative to pre-pandemic levels); rather, people favor utilitarian resolutions of critical care dilemmas more than structurally analogous, non-medical dilemmas. Support for utilitarian triage decisions was rooted in prosocial dispositions, including empathy and impartial beneficence—which defies the received wisdom in moral psychology. Finally, despite abundant evidence of political polarization surrounding Covid-19, moral attitudes toward critical care triage differed modestly between liberals and conservatives. Taken together, our findings highlight people's robust support for utilitarian measures in the face of a global public health threat. Our results also illustrate how the dominant research methods in moral psychology may be handicapped by their reliance on hypothetical stimuli (e.g., trolley cases) and could deliver insights that do not generalize to real-world, ethical priorities.

Keywords: morality; sacrificial dilemmas; values; Covid-19; utilitarianism; external validity.

Public Significance Statement

The Covid-19 pandemic has inspired debate among public health experts concerning the guidelines that ought to govern triage in intensive care units. Our studies find that the public widely supports utilitarian triage policies destined to save the largest number of patient lives. Despite substantial political polarization in reaction to the Covid-19 pandemic, utilitarian attitudes toward triage vary modestly, if at all, when comparing liberals and conservatives. These findings could help to inform public policy debates about the ethical principles by which to ration limited medical resources.

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1. Introduction

Early on in the Covid-19 pandemic, case rates and deaths saw exponential growth. Their trajectory surpassed numerous governments' predictions, and quickly depleted medical resources in many intensive care units (ICUs) around the world. As a result, frontline professionals faced what ethicists imagined would remain an outlandish thought experiment: the choice whether to sacrifice some lives in order to save a larger number of patients (Emanuel et al., 2020). The Covid-19 pandemic brought the infamous trolley problem (Foot, 1967) to life, and provided a unique opportunity for moral psychologists to explore how the public approaches such tragic dilemmas through the lens of ecologically valid scenarios involving triage at the ICU. What should frontline doctors do when faced with the decision whether to sacrifice one patient to prioritize saving more lives? The purpose of our present work is to explore this exact question.

Below, we first distill past findings drawn from the literature on hypothetical sacrificial dilemmas, and echo previous concerns about limits in their ecological validity--which our studies then partly substantiate. Additionally, we review distinct models according to which various contextual elements (e.g., risk of infection, historical period change) could modulate the public's moral attitudes. Turning to our studies, we document pronounced utilitarian tendencies in triage contexts (Study 1), and test two distinct explanations for this effect in Studies 2 and 3: *period change* and *psychological realism*, respectively. In closing, we elaborate on the practical implications of these results for public health guidelines governing the allocation of critical care resources, and highlight their theoretical implications for traditional approaches to the study of moral cognition.

1.1 Sacrificial Dilemmas

Research in moral psychology relies strongly on "sacrificial dilemmas" (Bartels & Pizarro, 2011), i.e., trade-off scenarios in which some impending harm can be redirected from one group of people to a smaller group. Amongst the most famous scenarios of this kind are two versions of the *Trolley Dilemma* (Foot, 1967; Thomson, 1976, 1985), frequently labelled *Bystander* and *Footbridge*: In *Bystander*, a runaway trolley is about to kill five workmen, but can be diverted to another track where it would kill but a single one. In *Footbridge*, a runaway trolley sure to kill five workmen on the tracks can be stopped by pushing a heavy man from a footbridge into the trolley's path. The diverging intuitions across the scenarios spurred an avalanche of philosophical papers. In the early 2000s, psychologists adopted them to empirically explore folk morality. Several hundred studies employing sacrificial dilemmas are in print to date (for reviews, see Christensen & Gomila, 2012), many of which have been very influential (e.g., Bartels & Pizarro, 2011; Cushman et al., 2006; Greene et al., 2001, 2009; Patil, 2015). The trend continues, with some studies exploring whether consequentialist intuitions vary across cohorts (Hannikainen et al., 2018), cultures (Awad et al., 2020), modes of presentation such as virtual reality (Francis et al.,

2016, 2017) or when real harm is administered (i.e., to mice: see Bostyn et al., 2018), to name but a few examples.

The use of sacrificial dilemmas in academic research has a number of advantages (but see Kahane et al., 2015): They are "plug & play" in the sense that central features can be easily exchanged and modified (e.g., see Cushman et al., 2006); their employment has been an exceptional success story in interdisciplinary research spanning philosophy, psychology and neuroscience; and the findings have given rise to sophisticated theories of moral judgment, such as Greene and colleagues' (2001, 2007) *dual process theory*, Mikhail's (2007, 2009) *moral grammar* theory and the *two-dimensional model of utilitarianism* advanced by Kahane, Everett and colleagues (Kahane et al., 2015 2018).

1.2 External Validity

In an influential paper, Bauman et al. (2014) raised concerns regarding the external validity of dilemma studies—that is, the extent to which the findings generalize to other situations (Campbell, 1957). Although exploring folk morality by aid of sacrificial dilemmas *per se* is unproblematic, sacrificial dilemmas from philosophy "are set in fanciful, sometimes absurd, contexts, and these artificial settings may affect the way people approach the situation and decide what to do" (Bauman et al., 2014, p. 536). Dilemmas originally devised to efficiently pump intuitions from the philosophical community might be unsuited for empirical moral psychology, since most people are not familiar with the discipline's conventions and do not strive for maximum logical consistency in belief (Converse, 1964; Tenbrunsel & Messick, 1999). The external validity of dilemma studies is under threat since the scenarios employed are unrealistic in three distinct ways (Aronson et al., 1998): (1) They fail to meaningfully engage the reader (*experimental realism*) for instance due to humorous aspirations; and (2) they are unlike any of the situations participants encounter in their everyday lives (*mundane realism*). Consequently, participants might question central premises (can a heavy man stop a trolley?), and be reluctant to accept the scenario (see e.g. Greene et al., 2009 for evidence). Partly as a consequence of low experimental and mundane realism, the scenarios will thus (3) lack *psychological realism*: They tend not to trigger the same mental processes that people would typically recruit in mundane situations. Unrealistic scenarios might, for instance, fail to produce characteristic reactions such as outrage or contempt towards apparent transgressors or people's dispositions to distance themselves from those who manifest different moral values (for evidence that trolley dilemmas are wanting in this regard, see Baumann et al., 2012, Study 3).

Sacrificial dilemmas related to the Covid-19 pandemic (henceforth *triage/critical care dilemmas*) have none of the shortcomings that might feed concerns regarding external validity. Since March 2020, infection rates and death tolls rose in unprecedented fashion, the news have been reporting about little else, the pandemic's effects on everyone were, and still are, pronounced and serious. Due to shortage of supplies and staff, trade-off situations have been the order of the day in hospitals around the globe just as in our target country, the US, which has fared worse than many other countries during the pandemic. Corona dilemmas are thus not only high in

experimental and mundane realism; they are *real-life situations* most participants are at least indirectly acquainted with. Consequently, their level of psychological realism is high. And indeed, transgressors of health and security measures tend to witness the full spectrum of reactions (e.g., outrage, contempt, disgust, see Rozin et al., 1999) known to accompany moral misbehavior. Different opinions as to the correct political response to the pandemic as well as individual distancing measures have engendered heated debate, manifestations drawing large crowds and destroyed many a relationship, as research regarding distancing from morally dissimilar others would predict (Skitka et al., 2005; Cole Wright et al., 2008).

1.3 Prevalence, Proximity and Period

There is one qualification to the previous section, which informed certain central features of our study design. In contrast to certain punctual events such as 9/11, the pandemic, and awareness thereof, took time to develop and was region-specific. We ran the first wave of studies in mid-April 2020, i.e. relatively early on during the pandemic. At that time, the bulk of infection rates and deaths were limited to a handful of US states, including New York, Pennsylvania and Michigan. Other states, such as Arizona, North Carolina and Virginia, had extremely low infection rates, capacity aplenty in the hospitals, and as of that time next to no coronavirus-related deaths. We thus operationalized state-specific Covid-19 *prevalence* (measured in terms of case and death rates) as a proxy for experimental, mundane and psychological realism. In New York City, with hundreds of deaths a day and poorly equipped hospitals at capacity the force and realism of a triage dilemma, was very different than in Wyoming, which at that time had a total of 296 infections, a plethora of empty hospital beds, and two coronavirus-related deaths (New York Times, 2020).

Another feature that affects the realism of triage dilemmas, and hence external validity, regards participants' personal affectedness by the Covid-19 pandemic. A healthy young corn farmer in the countryside, who only knows about the pandemic from the press might view a triage dilemma differently from an elderly, high-risk person who has had a coronavirus death in the family, or a nurse who is fighting the pandemic working 18 hour shifts day-in and day-out. To account for this feature, which we will label *proximity*, several items in our survey measured the degree to which people were personally affected by the pandemic. Note that whereas *prevalence* is a feature of participants' *general* context, *proximity* is a feature of people's *individual* situation or context.

A final question to explore regards whether the pandemic occasions a change in responses to traditional sacrificial dilemmas. To explore this, we ran a battery of eight standard dilemmas mid-May 2020 (just after the peak of death rates in the US), which we had already tested in 2019 before the virus was discovered. A potential *period* effect in responses, if there is one, however, must be interpreted with care. It might indeed be driven by change in moral attitudes due to the pandemic. However, it might equally be the case that people increasingly made the connection between the "fanciful", somewhat abstract dilemmas and the triage problematic, thus increasing the experimental, mundane, and in particular the psychological realism of standard dilemmas. Given that, at the height of the pandemic, triage dilemmas got a fair share of attention in the media,

and were frequently discussed with reference to classic philosophical thought experiments (e.g., The Atlantic, 2020), a period effect might thus indicate a shift in the perceived realism and relevance of traditional dilemmas, not necessarily in moral attitudes *per se*.

1.4 Overview

In the studies below, we first report attitudes toward a series of critical care dilemmas across high and low prevalence states (Study 1). Then, in Studies 2 and 3, we pursue two potential explanations for the emergence of strong utilitarian tendencies in response to dilemmas involving critical care of coronavirus patients: a period effect (Study 2) and a realism effect (Study 3). After reporting on the three studies, we turn to individual difference analyses which help to further characterize differences between triage and traditional, sacrificial dilemmas.

Participants were adults residing in the United States recruited on Amazon Mechanical Turk (mturk.com) and were excluded if they failed a two-part attention check. Data, stimuli and analysis scripts will be made available on the *Open Science Framework* at osf.io/dpsq9/?view_only=54a7c150e03d4d78819b2954cee3a240.

2. Study 1 – Prevalence Effects

In Study 1, we survey participants' attitudes toward critical care triage at the height of the Covid-19 pandemic. The core questions in Study 1 are: Do people typically favor or oppose utilitarian standards in ICU triage? Do such attitudes toward ICU triage depend upon the magnitude of the Covid-19 threat? To answer our second question, we evaluate the effects of geographic variation in the health burden of Covid-19 (as measured by daily, county-level updates of case and mortality rates), and of subjective beliefs about the severity of Covid-19. In other words, we sampled respondents from high and low prevalence regions of the United States, and also asked participants to report their sense of risk and/or exposure to Covid-19.

2.1 Participants

Between April 17th and April 21st 2020, we recruited 987 crowdworkers (53% women; age: $M = 38.9$, $SD = 13.0$, range = 18 to 75). At the time, these states varied dramatically in terms of Covid-19 case rates. To maximize the ability to detect effects of prevalence, we targeted respondents from five higher prevalence states (> 10 confirmed cases per 10,000 residents; Florida, Georgia, Michigan, New York, and Pennsylvania), and four lower prevalence states (< 10 confirmed cases per 10,000 residents; Arizona, Kentucky, North Carolina, and Texas). Since transmission rates and Covid-19 prevalence are highest in densely populated areas (i.e. metropolitan areas), and these areas also tend to be more Democratic (Wilkinson, 2019), we sought to balance the voting trends of high and low prevalence groups of states (see Table 1).

2.2 Methods and Materials

For Study 1, we devised three different critical care dilemmas: *Reroute*, *Withdraw*, and *Jeopardize*. Each dilemma involves the sacrifice of a human life in order to save a larger number

of lives. In *Reroute*, an oxygen tank is on its way to a hospital where a single coronavirus patient requires urgent treatment. The decision must be made whether to reroute the oxygen tank to a second intensive care unit (ICU) nearby where five, similarly critical, coronavirus patients recently checked in. Meanwhile, in *Withdraw*, an oxygen tank is already in use to treat a single coronavirus patient at a hospital ICU. This time, the decision must be made whether to disconnect the oxygen tank and drive it to a second ICU to save five coronavirus patients. Thus, the Reroute/Withdraw pair serves as a test of the so-called 'equivalence thesis' (Sulmasy & Sugarman, 1994). Finally, in *Jeopardize*, a frail essential worker can be sent to pick up an oxygen tank and drive it to an ICU where five coronavirus patients have just checked in. However, in doing so, the essential worker would likely contract coronavirus and not survive.

In every scenario, we stipulated that—with near-certainty—the patients would survive if they received supplementary oxygen, and would die otherwise. We also stated that the patients cannot be transported (due to their critical condition), that a decision had to be made imminently, and that there were no further alternatives (i.e., additional oxygen tanks, alternative treatments, etc.).

In a 3 × 1 between-subjects design, participants were asked to consider one of three critical care dilemmas: Withdraw, Reroute, Jeopardize. Participants were asked to rate the triage decision through five assessments:

1) <u>Prescription</u>: whether the agent (1) "should" or (0) "should not" perform the utilitarian action.
2) <u>Permissibility</u>: whether it is morally permissible for the agent to:
   a) do nothing: 1 = "Yes"; 0 = "No",
   b) perform the utilitarian action: 1 = "Yes"; 0 = "No".

   In our studies, we compute the normalized average of both dichotomous items after reverse scoring the first item (i.e., *relative permissibility*: 0 = Only Inaction Permissible, 0.5 = Both/Neither Permissible, 1 = Only Action Permissible).
3) <u>Blameworthiness</u>: whether it is morally blameworthy for the agent to:
   a) do nothing: 1 = "Not at all"; 7 = "Very much",
   b) perform the utilitarian action: = "Not at all"; 7 = "Very much".

   We again compute the average of both items, after reverse scoring the first (i.e., *relative blame*).

Following the triage dilemmas, participants completed a battery of individual difference measures. The results of these individual difference analyses are reported in Section 5.

To devise a measure of local prevalence of Covid-19, we divide the recorded number of cases and deaths in each US county by its estimated population. County-level cases and deaths were obtained from the New York Times GitHub repository (github.com/nytimes/covid-19-data), and population estimates were obtained from the US Census Bureau's Population Estimates Program (census.gov/programs-surveys/popest.html).

Table 1

State-Level Sample Sizes, Covid-19 Statistics and Voting Trends

Prevalence	State	N	Cases [1]	Deaths [1]	Dem.:Rep. Ratio [2]
	New York	122	114	6.3	52:29
	Florida	85	48.5	2.5	42:39
High	*Michigan*	105	29.2	2.1	45:38
	Pennsylvania	106	22.1	0.7	46:41
	Georgia	98	14.7	0.6	42:40
	Kentucky	68	6.0	0.3	41:45
	Texas	69	5.8	0.1	38:41
Low	*Arizona*	76	5.8	0.2	40:42
	North Carolina	168	5.2	0.1	44:39

Note. Cases and death rates are per 10000 residents on April 17th 2020 (the first day of data collection). [1]: compiled from the New York Times (2020) GitHub repository. [2]: Gallup (2017) poll data.

2.3 Results

2.3.1 Scenario Differences

Prescriptive judgments differed by scenario, $\chi^2(2, 903) = 74.73$, $p < .001$. Participants were more likely to favor five patients by rerouting the oxygen tank (.87, 95% CI [.83, .91]) than by disconnecting the oxygen tank (.62, 95% CI [.56, .67]), $z = 7.24$, or fatally infecting an essential worker (.60, 95% CI [.55, .66]), $z = 7.09$, ps < .001. Still, it is noteworthy that, by comparison to the uniform distribution, participants tended to favor even *instrumental* sacrifice--whether of a patient (in Withdraw) or an essential worker (in Jeopardize) in order to save a larger number of lives.

Permissibility and blame judgments differed by scenario as well, permissibility: $\chi^2(2, 903) = 24.59$, blame: $F(2, 902) = 35.77$, both ps < .001. Rerouting an oxygen tank was viewed as more permissible (.69, 95% CI [.64, .74]) than disconnecting an oxygen tank (.55, 95% CI [.49, .60]), $z = 3.69$, or placing an essential worker at risk (.51, 95% CI [.64, .74]), $z = 4.65$, ps < .001. Rerouting an oxygen tank was also judged less blameworthy (-0.68, 95% CI [-0.95, -0.40]) than either disconnecting an oxygen tank (0.45, 95% CI [0.16, 0.74]), $t = 5.49$, or infecting an essential worker (0.97, 95% CI [0.70, 1.25]), $t = 8.28$, ps < .001.
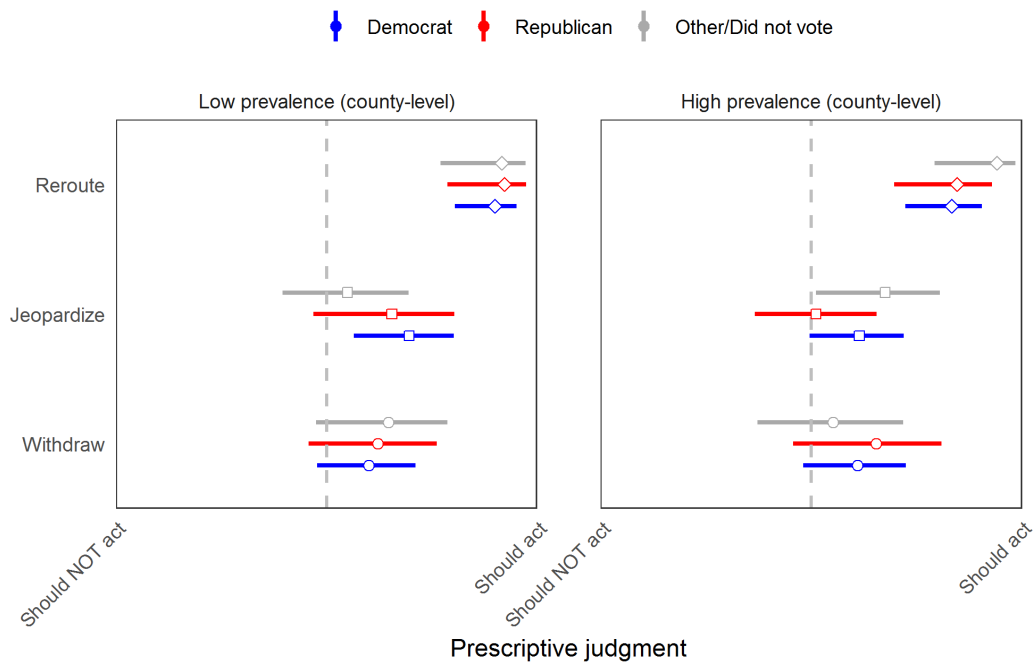
2.3.2 Effects of Covid-19 Prevalence

County-level daily cases predicted participants' self-reported exposure to Covid-19, $OR =$ 1.85, 95% CI [1.10, 3.10], $z = 2.33$, $p = .020$. Participants who reported having had a close friend or family member hospitalized due to Covid-19 were more likely to reside in counties with more Covid-19 cases—serving as validation of our prevalence assessments.

However, county-level Covid-19 prevalence had no effect on people's moral attitude toward critical care dilemmas (prevalence: all χ^2s < 1.40, all ps > .25; prevalence×scenario: all χ^2s < 3.50, all ps > .15). Since prevalence is greater in population-dense areas, and greater population density is associated with a Democratic political orientation, we re-ran the previous analyses entering participants' reported voting intentions. These supplementary analyses revealed qualitatively similar results: Prevalence of Covid-19 did not influence moral attitudes on any dependent measure (prevalence: all χ^2s < 1.70, all ps > .15; prevalence×scenario: all χ^2s < 3.05, all ps > .20; see also Figure 1).

Figure 1

Prescriptive Judgments in Critical Care Dilemmas by Prevalence and Voting Intention

2.3.3 Effects of Covid-19 Severity Beliefs

We included a two-item measure of Covid-19 subjective severity (*Cronbach's a = .73*). This measure revealed a weak effect of perceived severity on moral attitudes toward critical care dilemmas: Viewing Covid-19 as a severe threat was associated with utilitarian attitudes—i.e., that doctors should adopt utilitarian rationing policies ($OR = 1.14$, $z = 2.00$, $p = .045$), and that doing

so is permissible ($B = 0.043$, $t = 2.18$, $p = .030$) and marginally less blameworthy ($B = -0.117$, $t = -1.69$, $p = .091$) than inaction. When controlling for voting intentions, and looking separately by scenario and dependent measure, effects of severity beliefs were small to very small (with $.02 < rs < .14$).

2.4 Discussion

Participants reported relatively favorable attitudes toward utilitarian resolutions of critical care dilemmas. The clearest pattern emerged for collateral death (i.e., in the Reroute scenario): such that participants prescribed utilitarian action, and judged it relatively more permissible and less blameworthy than inaction. For instrumental death, participants continued to prescribe utilitarian action (in the Withdraw and Jeopardize scenarios), despite rating it somewhat more blameworthy than inaction (and comparably permissible). These attitudes were unrelated to local prevalence of Covid-19, though they appeared to be weakly associated with beliefs about the virus's severity.

3. Study 2 – Period Effects

The observation of broad support for utilitarian interventions in Study 1 raises the possibility that the Covid-19 pandemic has precipitated a shift in people's moral attitudes regarding human life. In Study 2, we examine whether the onset of the Covid-19 pandemic increased support for utilitarian sacrifice more broadly. To evaluate this hypothesis, we ran a two-wave longitudinal study contrasting people's views about utilitarian sacrifice prior to versus during the Covid-19 pandemic.

3.1 Participants

913 crowdworkers (48% women; age: $M = 40.5$, $SD = 13.6$, range $= 18$ to 81) were recruited at two time points one year apart: May of 2019 (pre-pandemic $n = 400$), and May of 2020 (mid-pandemic $n = 513$).

3.2 Methods and Materials

In Study 2, we drew on a diverse set of traditional moral dilemmas, adapted from previous studies in moral psychology. Four scenarios involved instrumental sacrifice (i.e., death as a *means* to the greater good; as in Withdraw), and four scenarios involved collateral sacrifice (i.e., death as a *side effect* of pursuing the greater good; as in Reroute). Importantly, none of the dilemmas employed in Study 2 alluded to the Covid-19 pandemic, or described critical care scenarios.

In a 2 (*period*: pre, mid) × 2 (*condition*: instrumental, collateral) between-subjects design, participants were asked to consider a traditional moral dilemma involving either instrumental or a collateral sacrifice. They then made prescriptive and permissibility judgments (but not blameworthiness judgments), as in Study 1. Following the moral dilemma, participants completed a battery of individual difference measures—the results of which are reported in Section 5.

3.3 Results

In logistic regression models, we entered period, condition and the two-way interaction between period and condition (with scenario as a random effect). Through model selection, we observed no main effect of period either on prescriptive judgments, $\chi^2(df = 1) = 0.00$, $p = .97$, or on relative permissibility judgments, $\chi^2(df = 1) = 0.12$, $p = .73$. In other words, collapsing across conditions, prescriptive judgments (*pre* = .62, 95% CI [.48, .75]; vs. *mid* = .63, 95% CI [.49, .75]), $z = 0.13$, $p = .89$, and permissibility judgments (*pre* = -0.16, 95% CI [-1.20, 0.87]; vs. *mid* = -0.10, 95% CI [-1.13, 0.93]), z = 0.06, $p = .74$, were unaffected by period. A Bayesian analysis provided strong evidence for the absence of period effects on either dependent measure (*prescriptive*: $BF_{01} = 13.84$; *permissibility*: $BF_{01} = 12.92$).

We also found no period$\times$condition interaction effect on relative permissibility judgments, $\chi^2(df = 1) = 0.23$, $p = .63$—though we observed a marginally significant trend for prescriptive judgments, $\chi^2(df = 1) = 2.95$, $p = .086$ (see Figure 2). The simple effects of period on prescriptive judgments were statistically non-significant (*collateral: z* = -1.27, $p = .20$; *instrumental*: $z = 1.19$, $p = .23$), and absent from a Bayesian perspective (*collateral:* $BF_{01} = 9.54$; *instrumental*: $BF_{01} = 8.95$).

3.4 Discussion

The results of Study 2 suggest that the Covid-19 pandemic has not affected moral attitudes toward utilitarian sacrifice in general. Therefore, the seemingly elevated utilitarian tendencies in Study 1 cannot straightforwardly be attributed to a period effect. Next, we turn to the realism hypothesis.

4. Study 3 – Realism and External Validity

To investigate the realism hypothesis, we conducted a third study during the Covid-19 pandemic. According to this hypothesis, the psychological salience of Covid-19 could promote more utilitarian attitudes toward scenarios describing triage of coronavirus patients. Specifically, psychological salience renders triage dilemmas more engaging than hypothetical dilemmas and, as a result, triage dilemmas elicit different cognitive processes (see also Francis et al., 2016 2017; Patil et al., 2014). Such a result would imply certain limits on the ecological validity of traditional moral dilemma research.

4.1 Participants

487 crowdworkers (44% women; age: $M = 43.5$, $SD = 14.3$, range = 21 to 79) were recruited in May of 2020.

4.2 Methods and Materials

For this study, we devised matched pairs of vignettes involving either instrumental or collateral sacrifice. In each pair, one vignette (taken from Study 1: i.e., Reroute or Withdraw) involved triage of critical care resources to treat Covid-19 patients, and another involved a tightly-

matched, control dilemma about a house fire. Specifically, in the Collateral condition, a fire truck is rerouted from one smaller house fire to a larger house fire to save a larger number of lives. In the Instrumental condition, a fire truck ceases to extinguish a smaller house fire in order to save a larger number of lives in a larger, nearby fire.

In a 2 within- (*salience*: triage, control) $\times$ 2 between- (*condition*: personal, impersonal) $\times$ 2 between- (*order*: triage-first, control-first) subjects design, participants were randomly assigned to one of four groups. In every group, participants viewed both a triage and a control (i.e., house fire) dilemma, and we manipulated the order in which the dilemmas appeared, as well as whether they involved instrumental or collateral sacrifice of a human life.

4.3 Results
4.3.1 First-Trial Analysis

In a logistic regression model, we entered salience, condition and the two-way interaction between salience and condition as predictors of prescriptive judgments. A model comparison revealed large effects of condition, $\chi^2(df = 1) = 15.74$, and of the salience $\times$ condition interaction, $\chi^2(df = 1) = 16.92$, both $ps < .001$. No main effect of salience was observed, $\chi^2(df = 1) = 2.22$, $p = .14$.
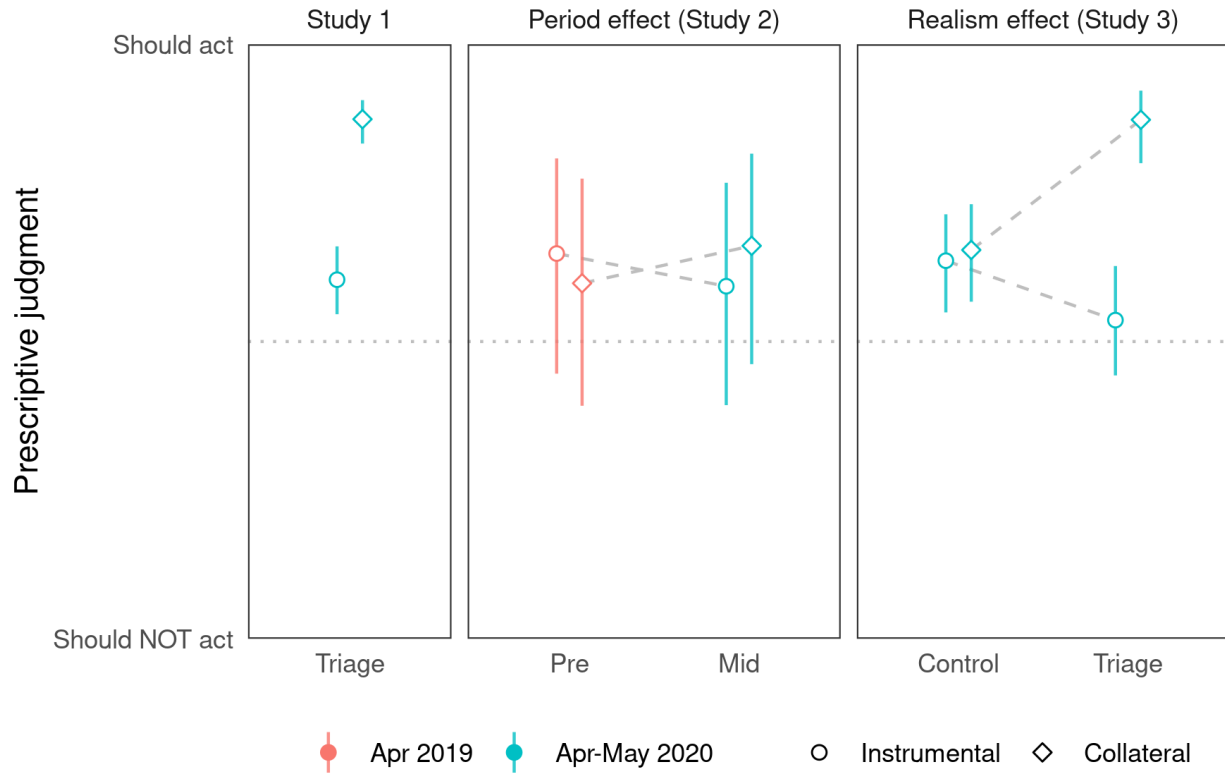
Figure 2 displays the simple effects in the salience $\times$ condition interaction: Participants in the Reroute condition were more likely to prescribe the utilitarian action in a triage context (.87, 95% CI [.80, .92]) than in a control context (.65, 95% CI [.57, .73]), $t = 3.88$, $p < .001$, $\varphi = .26$, 95% CI [.14, .37]--which corresponds to decisive evidence in Bayesian terms ($BF_{10} = 371.53$). The difference in the Withdraw condition was not statistically significant (*triage*: .53, 95% CI [.44, .63]; vs. *control*: .64, 95% CI [.55, .71]), $t = -1.55$, $p = .12$, $\varphi = -.10$, 95% CI [-.22, .03]—which constitutes only anecdotal evidence in favor of the null ($BF_{01} = 2.25$).

This pattern of results was mirrored in the ratings of blame: A two-way ANOVA revealed effects of condition, $F(1, 479) = 15.64$, $p = .001$, salience, $F(1, 479) = 4.44$, $p = .001$, and of the salience $\times$ condition interaction, $F(1, 479) = 17.78$, $p < .001$. Participants in the Reroute condition assigned less blame for utilitarian action in a triage context (-1.03, 95% CI [-1.41, -0.65]) than in a control context (0.17, 95% CI [-0-19, 0.54]), $t = 4.46$, $p < .001$, Cohen's $d = -0.64$, 95% CI [-0.91, -0.38]. The difference in the Withdraw condition was not statistically significant (*triage*: 0.42, 95% CI [0.02, 0.81; vs. *control*: 0.00, 95% CI [-0.37, 0.37]), $t = -1.53$, $p = .13$, Cohen's $d = 0.18$, 95% CI [-0.08, 0.44].

Relative permissibility judgments revealed a different pattern: We observed more modest effects of condition, $\chi^2(df = 1) = 5.41$, $p = .020$, and of the salience $\times$ condition interaction, $\chi^2(df = 1) = 7.18$, $p = .007$. No main effect of salience was observed, $\chi^2(df = 1) = 0.24$, $p = .62$. This time, utilitarian action resulting collateral death was not judged more permissible in a triage context (.66, 95% CI [.60, .73]) than in a control context (.60, 95% CI [.54, .66]), $t = 1.53$, $p = .13$, $\varphi = .10$, 95% CI [-.02, .22]. However, utilitarian action in the Instrumental condition was seen as less permissible in a triage context (.50, 95% CI [.44, .57]) relative to a control context (.60, 95% CI [.55, .66]), $t = -2.26$, $p = .024$, $\varphi = -.10$, 95% CI [-.22, -.03].

Figure 2

Prescriptive Judgments in Studies 1, 2 and 3. Heightened Endorsement of Collateral Sacrifice (Left) is Explained by an Effect of Realism (Right), not of Period (Center)

4.3.2 Order Effect

Through model comparison, we observed a two-way interaction between *condition* and *order* for every dependent measure (prescription: $\chi^2[df = 1] = 13.20$, $p < .001$; permissibility: $\chi^2[df = 1] = 4.49$, $p = .034$; blame: $\chi^2[df = 1] = 14.84$, $p < .001$). At a broad level, judgments of Collateral sacrifice depended on the order in which the dilemmas were presented: When the triage dilemma was presented first, participants were more likely to report that agents should perform the utilitarian action across contexts (*triage*: $z = 3.65$, $p < .001$; *control*: $z = 2.79$, $p = .005$), that inaction was blameworthy in both contexts (*triage*: $t = -3.20$, $p = .001$; *control*: $t = -4.61$, $p < .001$), and that utilitarian action in triage contexts was permissible (*triage*: $z = 2.48$, $p = .013$; *control*: $z = 1.27$, $p = .21$).

4.4 Discussion

The results of Study 3 suggested that heightened utilitarianism in Study 1 may arise from the psychological salience of ICU triage dilemmas during the Covid-19 pandemic. Participants demonstrated more utilitarian attitudes when judging dilemmas involving critical care triage than when considering structurally analogous, control dilemmas—at least in circumstances demanding

collateral sacrifice. This effect then shaped participants' moral attitudes in the subsequent trial, resulting in elevated utilitarian attitudes about control dilemmas when these were preceded by psychologically salient, triage dilemmas. In sum, while we found absence of a period effect in Study 2, we found robust evidence of a realism effect in Study 3.

5. Individual Difference Analyses

The previous studies included a series of individual difference measures, following the experimental manipulation. Here we report aggregate analyses examining individual differences in empathy, utilitarian beliefs and political orientation and their associations with moral attitudes toward triage dilemmas.

5.1 Overview

5.1.1 Empathy

Research on hypothetical moral dilemmas has recurrently found that empathic individuals typically report deontological to sacrificial moral dilemmas (Gleichgerrcht & Young, 2013; also Hannikainen et al., 2018). Conversely, deficits in empathy have been associated with utilitarian attitudes (Patil & Silani, 2014) and may help to explain why psychopaths report more utilitarian judgments than do psychotypical controls (Koenigs et al., 2012). This body of research has grounded a broader conclusion in moral psychology: namely, that utilitarian judgments in hypothetical dilemmas do not reflect a concern for the greater good (Kahane et al., 2015) but rather a reduced aversion to causing harm (Miller et al., 2014) that stems from Dark Triad traits (i.e., Machiavellianism, narcissism, and psychopathy; see Bartels & Pizarro, 2011; Patil, 2015).

5.1.2 Utilitarian Beliefs

The aforementioned literature has inspired broad skepticism about the relationship between trolley-type dilemmas and utilitarian thought in moral philosophy (but see Conway et al., 2018). In particular, the so-called '*two-dimensional model of utilitarianism*' argued that utilitarian tendencies in the general population are best captured by two distinct—and even uncorrelated—facets: endorsement of *instrumental harm*, and attitudes of *impartial beneficence*. Further empirical research has substantiated the concern that trolley-type dilemmas are linked primarily (Kahane et al., 2018), if not exclusively (Kahane et al., 2015), to beliefs about the permissibility of instrumental harm—while being largely unrelated to impartial beneficence.

5.1.3 Political Ideology

Attitudes towards the Covid-19 pandemic vary considerably with political ideology. There are, for instance, significant differences across party lines in the belief that "powerful people intentionally planned the Covid-19 outbreak" (Republican: 34% v. Democrats 18%, Pew Research, 2020a), fears of unwittingly spreading the virus (Republicans: 45% v. Democrats: 77%) or contracting it (Republicans: 35% v. Democrats: 64%; Pew Research, 2020b) as well as Covid-19 constituting a major threat to the health of the US population (Republicans: 46% v. Democrats: 85%, Pew Research, 2020c).

These differences are of importance for our study, since there is a growing body of work suggesting a strong relationship between political ideology and moral values. A lot of this work draws on *moral foundations theory* (Graham et al., 2009), which postulates five basic clusters by aid of which intercultural differences in morality can be explored: Two individualizing foundations which regard the rights and welfare of individuals—harm/care and fairness/reciprocity—and three binding foundations, which regard community welfare and cohesion—ingroup/loyalty, authority/respect, and purity/sanctity. Liberals predominantly draw on the individualizing foundations, whereas conservatives rely on all five foundations (Graham et al., 2009). In our studies, we administered scales of political ideology and conspiratorial beliefs about Covid-19, in addition to our morality measures. This approach enables us to evaluate whether the polarization observed in nationwide surveys also arises in the moral domain; i.e., whether the ethics of critical care triage might constitute a further battlefield of the US "culture wars" (Hunter, 1991)—as do gay marriage, reproductive rights, and immigration policy.

5.2 Measures

5.2.1 Interpersonal Reactivity Index

Participants in Studies 1, 2 and 3 completed the empathic concern (Cronbach's αs = .87, .87, .86) and perspective-taking (Cronbach's αs = .83, .86, .84) subscales of the IRI (Davis, 1983). Scores on the empathic concern subscale have been previously associated with weaker utilitarian tendencies on hypothetical moral dilemmas (Gleichgerrcht & Young, 2013; also Hannikainen et al., 2018).

5.2.2 Oxford Utilitarianism Scale

Participants in Studies 1, 2 and 3 completed the nine-item Oxford Utilitarianism Scale, composed of two subscales: instrumental harm (Cronbach's αs = .77, .81, .77) and impartial beneficence (Cronbach's αs = .76, .81, .79). Support for utilitarian trade-offs in hypothetical moral dilemmas has been associated primarily with scores on the instrumental harm subscale (Kahane et al., 2018).

5.2.3 Social and Economic Conservatism Scale

Participants in Studies 1 and 3 completed the twelve-item Social and Economic Conservatism Scale (Everett, 2013; Cronbach's αs = .87, .88). Participants report their feelings toward twelve sociomoral issues that distinguish liberal from conservative ideology (e.g., patriotism, religion, welfare benefits [reversed], or gun ownership), on a scale anchored at 1: '*Negative*' to 7: '*Positive*'.

5.2.4 Coronavirus Threat Severity

To assess participants' beliefs about the severity of coronavirus, participants were asked to answer two questions in Studies 1 and 3 (Cronbach's αs = .73, .81): (1) "*What is your general attitude towards the current coronavirus situation?*", ranging from 1: '*People are completely*

exaggerating the danger' to 7: '*This is a very serious situation*'; (2) "*Do you think a lockdown as it is carried out in many countries is warranted?*", ranging from 1: '*No, I completely disagree with the lockdown*' to 7: '*Yes, I completely agree with the lockdown*'.

5.2.5 Coronavirus Conspiracy Beliefs

We also introduced a novel five-item assessment of conspiratorial thinking about coronavirus (Cronbach's αs = .93, .93), adapted from the Generic Conspiracist Beliefs Scale (Brotherton, French, & Pickering, 2013). For each item (e.g., "*The spread of coronavirus has been the result of the deliberate, concealed efforts of some governments and scientists*"), participants reported their level of agreement from 1: 'Strongly disagree' to 7: 'Strongly agree'.

5.3 Results

5.3.1 Empathy in Triage versus Traditional Dilemmas

We partially reproduced an association between empathic concern and deontological judgment (Gleichgerrcht & Young, 2013) in the context of standard hypothetical dilemmas: Greater empathic concern predicted reduced permissibility of utilitarian action (relative to inaction), $r(509) = -.094$, 95% CI [-.179, -.007], $p = .034$. No corresponding effect emerged for prescriptive judgments, or with the perspective-taking subscale (see Table 1).

In triage dilemmas, we also found an association between empathic concern and permissibility judgments--though in the *opposite* direction, $r(1132) = .087$, 95% CI [.029, .144], $p = .003$ (see Table 2). In other words, empathic individuals were more likely to view utilitarian triage as permissible, but utilitarian action in hypothetical dilemmas as impermissible.

Thus, the effect of empathic concern on permissibility judgments was moderated by type of dilemma (empathic concern $\times$ dilemma type interaction: $\chi^2[df = 1] = 10.08$, $p = .001$). Still, generally speaking, the role of affect appeared to be fickle in our studies.

Table 2

Semi-Partial Correlation Between IRI Subscales and Moral Judgments in Traditional (Above Diagonal) and Triage (Below Diagonal) Dilemmas

*N*s = 1132 (below); 509 (above).	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
(1) Empathic concern	-	.639 *** [.585, .688]	-.009 [-.074, .056]	**-.094 *** [**-.179, -.007**]	NA
(2) Perspective-taking	.597 *** [.559, .634]	-	.051 [-.036, .137]	-.005 [-.092, .082]	NA
(3) Prescriptive judgment	.041 [-.017, .099]	.046 [-.012, .103]	-	.603 *** [.560, .643]	NA
(4) Relative permissibility	**.087 *** [.029, .144]**	**.068 *** [**.010, .126**]	.631 *** [.594, .664]	-	NA
(5) Relative blame	-.030 [-.088, .029]	-.029 [-.087, .029]	-.380 *** [-.429, -.329]	-.401 *** [-.449, -.351]	-

Note. *: $p < .05$; **: $p < .01$; ***: $p < .005$. Bold cells indicate significant correlations between IRI subscales and moral attitudes.

5.3.2 Utilitarian Beliefs in Triage versus Traditional Dilemmas

Both facets of utilitarianism correlated with judgments for both triage and hypothetical dilemmas (see Table 3).

A series of regression models uncovered significant differences in the role of utilitarian beliefs across dilemma types: First, instrumental harm and impartial beneficence differentially predicted prescriptive judgments across dilemma types (IH×dilemma type: $\chi^2[df = 1] = 5.12$, $p =.024$; IB×dilemma type: $\chi^2[df = 1] = 8.30$, $p = .004$). Specifically, instrumental harm beliefs better predicted judgments about traditional dilemmas ($B = 0.675$, 95% CI [0.494, 0.856]) than about triage dilemmas ($B = 0.426$, 95% CI [0.309, 0.544]), $z = -2.26$, $p = .024$. In turn, impartial beneficence beliefs predicted judgments about triage dilemmas (B = 0.221, 95% CI [0.102, 0.341]), but did not predict judgments of traditional dilemmas (B = -0.090, 95% CI [-0.264, 0.085])--and these coefficients statistically differed from each other, $z = 2.88$, $p = .004$.

Second, instrumental harm beliefs differentially predicted permissibility judgments across dilemma types (IH×dilemma type: $\chi^2[df = 1] = 32.35$, $p < .001$; IB×dilemma type: $\chi^2[df = 1] = 0.78$, $p = .38$). Instrumental harm beliefs predicted judgments of permissibility in the context of traditional dilemmas ($B = 0.075$, 95% CI [0.057, 0.093]), but not triage dilemmas ($B = -0.090$, 95% CI [-0.264, 0.085])—and these effects statistically differed from each other, $z = -5.68$, $p < .001$. Meanwhile, impartial beneficence did not predict permissibility judgments for either dilemma type (traditional: $B = -0.007$, 95% CI [-0.026, 0.012]; triage: $B = 0.003$, 95% CI [-0.010, 0.016]), $z = 0.88$, $p = .38$—that is, when simultaneously controlling for instrumental harm beliefs.

Third, impartial beneficence independently predicted judgments of relative blame in triage dilemmas (B = -0.007, 95% CI [-0.011, -0.003], t = -3.31, p = .001), even after controlling for the effect of instrumental harm beliefs (B = -0.008, 95% CI [-0.012, -0.004], t = -4.00, p < .001). (We did not include the blame dependent measures in Study 2, precluding the comparison across dilemma types.)

Collectively, these results show that views about triage dilemmas depend upon *both* instrumental harm beliefs and impartial beneficence—whereas attitudes toward traditional dilemmas are shaped primarily (or perhaps even solely) by beliefs about instrumental harm.

Table 3

Semi-Partial Correlation Between OUS Subscales and Moral Judgments in Traditional (Above Diagonal) and Triage (Below Diagonal) Dilemmas

Ns = 1132 (below); 509 (above).	(1)	(2)	(3)	(4)	(5)
(1) Instrumental harm	-	.366 *** [.288, .439]	**.348 *** [.270, .422]**	**.396 *** [.320, .466]**	NA
(2) Impartial beneficence	.290 *** [.236, .342]	-	**.096 * [.009, .181]**	**.118 ** [.032, .203]**	NA
(3) Prescriptive judgment	**.261 *** [.205, .314]**	**.176 *** [.119, .232]**	-	.603 *** [.560, .643]	NA
(4) Relative permissibility	**.139 *** [.082, .196]**	**.097 *** [.039, .154]**	.631 *** [.594, .664]	-	NA
(5) Relative blame	**-.163 *** [-.220, -.106]**	**-.107 *** [-.164, -.049]**	-.380 *** [-.429, -.329]	-.401 *** [-.449, -.351]	-

Note. *: p < .05; **: p < .01; ***: p < .005. Bold cells indicate significant correlations between OUS subscales and moral attitudes.

5.3.3 Political Ideology

The 12-item SECS scale discriminated between Democrats (M = 4.13, SD = 0.93), Republicans (M = 5.64, SD = 0.78) and Independents (M = 4.69, SD = 0.99), all pairwise ps < .001. We observed clear associations between political ideology and general attitudes toward Covid-19: Conservatives were more likely to hold conspiratorial beliefs about Covid-19, r(1132) = .200, 95% CI [.143, .255], while liberals were more likely to treat Covid-19 as a serious threat, r(1130) = -.309, 95% CI [-.361, -.255], both ps < .001.

Still, though we replicated ideological disagreements concerning the truth about Covid-19, we observed few *moral* disagreements between liberals and conservatives (see Table 3): No differences arose in either the Jeopardize or Reroute scenarios; meanwhile, in the Withdraw

scenario, conservatives were more likely to blame the utilitarian agent than were liberals—but no parallel differences emerged for permissibility or prescriptive judgments.

In sum, as shown in Table 4, differences in conspiratorial thinking and perceived severity were robust, whereas moral disagreements concerning critical care triage were generally absent. Bayesian model comparisons confirmed that liberals and conservatives revealed robust disagreement concerning the truth about Covid-19 ($BF_{10}s > 10^{11}$), but tended to *agree* in their moral attitudes toward triage dilemmas ($BF_{01}s > 5$; except regarding permissibility, which was inconclusive $BF_{10} < 3$).

Table 4
Ideological Differences in Moral Attitudes, Conspiratorial Thinking and Perceived Severity

	Withdraw	**Jeopardize**	**Reroute**	**Main effect of SECS score (BF)**
*N*s	*386*	*309*	*433*	*1128 (pooled)*
(1) Prescriptive judgment	-.085 [-.183, .015]	.000 [-.111, .111]	-.069 [-.162, .025]	5.92 (*null*)
(2) Relative permissibility	-.020 [-.119, .080]	.015 [-.096, .126]	-.013 [-.107, .081]	15.22 (*null*)
(3) Relative blame	**-.185 ***** [-.279, -.087]	-.063 [-.173, .048]	-.004 [-.099, .090]	2.21 (*alt.*)
(4) Corona-threat	**-.239 ***** [-.331, -.143]	**-.358 ***** [-.451, -.257]	**-.334 ***** [-.415, -.247]	8.31×10^{27} (*alt.*)
(5) Corona-conspiracy	**.141 **** [-.279, -.087]	**.289 ***** [.184, .388]	**.188 ***** [.095, .277]	5.99×10^{11} (*alt.*)

Note. *: $p < .05$; **: $p < .01$; ***: $p < .005$. *null*: in support of null model; *alt.*: in support of alternative model. Bold cells indicate significant correlations with SECS scores.

5.4 Discussion

First, we found limited effects of empathy, which could stem from the self-reported nature of our measures. Most importantly, the role of empathic concern--where present--fully reversed from traditional, trolley-type contexts to psychologically salient, triage contexts.

Second, attitudes toward traditional dilemmas were linked to participants' abstract attitudes toward instrumental harm (in line with Kahane et al., 2015 2018), whereas attitudes toward dilemmas involving critical care were also tied to participants' tendency toward impartial beneficence. Thus, for psychologically salient dilemmas, prosocial attitudes including affective empathy and impartial beneficence can also be predictors of greater utilitarian tendencies (in

contrast to previous work on trolley-type dilemmas; see e.g., Bartels & Pizarro, 2011; Gleichgerrcht & Young, 2013).

Third, we replicated the association between political ideology and beliefs about the origin and severity of Covid-19—revealing substantial polarization. Yet, in their moral attitudes toward critical care triage, liberals and conservatives appeared to be largely in agreement.

6. General Discussion

Our study documented heightened utilitarianism in diverse locations throughout the United States. These attitudes appeared not to depend on the prevalence of Covid-19 confirmed positives; but, rather, arose homogeneously across high and low prevalence regions (Study 1). Plausibly, this effect could arise from a period effect, i.e., heightened utilitarianism following the onset of the Covid-19 pandemic—yet our evidence spoke against period-driven change in moral cognition (Study 2). Alternatively, the effect could be due to the psychological salience of critical care dilemmas. Our second follow-up (Study 3) lent support to this interpretation, demonstrating a selective tendency to favor utilitarian resolutions of triage dilemmas, but not tightly-matched dilemmas unrelated to the Covid-19 pandemic. Furthermore, heightened utilitarianism in triage dilemmas could be the result of prosocial attitudes, such as affective empathy and especially impartial beneficence, and arose among liberals and conservatives alike (Individual Difference Analyses).

6.1 Implications

Our study adds to growing concerns that the literature on trolley dilemmas has generated a series of misconceptions about moral cognition in general, and utilitarian ethics in particular. First, predominant experimental paradigms may have downplayed the extent to which people endorse utilitarian outcomes in real life (see also Francis et al., 2017; Patil et al., 2014). Relatedly, existing work has associated utilitarian ethics to an antisocial personality (Bartels & Pizarro, 2011), and yet our present studies demonstrate that utilitarian attitudes can also arise among prosocial individuals—at least when considering realistic and psychological salient dilemmas.

On a more promising note, our study reveals that—while the origin and severity of Covid-19 are a matter of profound political division—the ethical questions that arise for public health are not. Liberals and conservatives appear to agree, in large part, on the morality of utilitarian resolutions to dilemmas involving critical care triage.

6.2 Limitations and Future Research

First, our studies recruited large samples in order to maximize statistical power. As such, even very small effects (e.g., the effects of empathy and perspective-taking on moral attitudes) reached the typical threshold of statistical significance. However, statistical significance does not entail *practical* significance; so readers should exercise caution and consider both statistical significance and effect size to gauge the relevance of each of our findings.

Second, although we obtained strong evidence that psychological salience exerts an effect on moral judgment, our studies provided limited insight into the mechanism inducing this effect. Moderation analyses in Section 5 yielded tentative evidence that prosocial dispositions may explain people's heightened utilitarianism in critical care dilemmas: Potentially, coronavirus patients elicit attitudes of impartial beneficence to a greater extent than do the nondescript victims of hypothetical moral dilemmas. However, confirmatory research is needed to establish the credibility of this particular explanation.

Third, given rapid change in the circumstances surrounding the Covid-19 pandemic, we cannot confidently describe any constraints on the generality of our findings. Plausibly, as Covid-19 continues to 'normalize', its psychological salience—the very feature at the core of our findings—will dwindle. If so, a deeper understanding of the present findings may require conceptual adaptations of the present methods to novel contexts.

7. Conclusion

Moral psychologists have long debated whether, and under what conditions, people favor utilitarian approaches to the sacrifice of human lives for the greater good. The Covid-19 pandemic provided a unique context to explore this issue in circumstances of unprecedented realism and practical relevance: What should frontline ICU professionals do when faced with the decision whether to sacrifice one patient to prioritize saving a larger number of lives? Despite flagrant political polarization surrounding the origin and severity of Covid-19, liberals and conservatives alike support utilitarian approaches to the rationing of scarce medical resources during the pandemic. This result could not have easily been predicted by previous research on *hypothetical* sacrificial dilemmas, perhaps because these outlandish scenarios fail to muster the same cognitive processes, such as impartial beneficence, that govern utilitarian reasoning about pressing, real-world issues. As a result, our evidence provides grounds for optimism about the multilateral development of public health guidelines to govern triage and allocation of critical care resources.[1]

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