Are thoughts and prayers substitutes for material aid?*

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Abstract

Americans are routinely called upon to offer up thoughts and prayers in support of disaster victims, prompting concerns among some that these gestures may crowd out material aid. We conduct a field experiment following Hurricane Dorian to examine this potential effect, and find that participants who choose to support hurricane victims with thoughts and prayers donate substantially less than a control group asked for donations only. Extrapolated to the U.S. population as a whole, the implied annual reduction in disaster relief from Americans’ thoughts and prayers likely amounts to hundreds of millions of dollars.

Keywords: thoughts; prayers; natural disasters; prosocial behavior; charity donations; moral actions

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1. Introduction

Americans are routinely called upon to offer up their thoughts and prayers to victims of national and international catastrophes. This is done privately and publicly, sometimes even as part of public policy. For instance, in 2015, President George W. Bush proclaimed a National Prayer Day in response to the devastation caused by Hurricane Katrina, and in 2017, President Trump proclaimed a National Prayer Day in support of victims of Hurricane Harvey. President Trump and multiple state governors also announced national and state-level prayer days in response to the COVID-19 pandemic. Further, politicians often call for thoughts and prayers—sometimes implicitly, leading by example—in the wake of mass shootings. For instance, on December 2, 2015, many active and former U.S. politicians, including former Senator Rick Santorum, former U.S. Secretary of Housing and Urban Development Ben Carson, and Senator Lindsey Graham, publicly offered their thoughts and prayers for the victims of the San Bernadino mass shooting. Similarly, President Obama and first lady Michelle Obama publicly shared their prayers for victims of the mass shooting in Las Vegas in 2017.

While many people see thoughts and prayers as helpful complements to material aid, others worry that these gestures may crowd out concrete actions (The Atlantic, 2017; Time, 2017). However, there is little empirical evidence to support the claims and counterclaims. In this paper, we examine, both theoretically and empirically, how material aid from Americans may be affected by their engagement with prayers and purposeful thinking in support of those in need.

We consider a situation that most Americans face only all too often, namely one in which (i) their attention is drawn to some natural disaster or other event that adversely affects some group of victims, and (ii) in the days or weeks following that event, they face appeals from a variety of sources—politicians, pastors, charitable organizations, celebrities, social-media contacts—to support those victims. In the U.S., it is common for these appeals to include calls for sympathetic gestures, material aid, or both.


People then need to decide how, if at all, to respond to such calls. They may decide to only engage in a supportive gesture, such as taking a moment to think of or pray for the victims. Alternatively, they may choose to combine a gesture with a donation, or make a donation only. They may also choose to do nothing at all.

We develop a theoretical framework to examine this “moment of decision”, including the trade-offs and complementarities that may play a role when alternative forms of support are considered simultaneously. Further, we employ a field experiment, conducted days after Hurricane Dorian ravaged the Bahamas. Our experimental sample ($N = 959$) is comprised of religious Christians ($N = 472$) and atheists/agnostics ($N = 487$)—the two most common religion-related identities in the U.S. Participants in the baseline treatment were given an opportunity to send donations earmarked for the hurricane victims, via the Red Cross; participants in a ‘thoughts’ treatment were given an opportunity to send either thoughts, donations, or a combination of both; and participants in a ‘prayers’ treatment (restricted to only religious participants) were given the same opportunity, but with prayers replacing thoughts.

We report three main results. First, thoughts and prayers are popular means of showing support—a majority of religious and non-religious participants in our experiment choose to support hurricane victims with a gesture, either alone or in combination with a donation. Second, we find evidence of crowding out: offering the opportunity to support hurricane victims with thoughts or prayers increases the share of participants who choose to donate nothing, and substantially reduces the average donation amount. Whereas only 33 percent of participants in the baseline treatment donate nothing, this share increases to 59 percent in the ‘thoughts’ treatment and 71 percent in the ‘prayers’ treatment. Further, relative to the baseline treatment, religious participants donate on average $1.41 (48 percent) less in the ‘thoughts’ treatment, and $1.75 (60 percent) less in the ‘prayers’ treatment. Non-religious participants donate $0.66 (26 percent) less in the ‘thoughts’ treatment. Third, crowding out is stronger for religious participants—so much so that, averaging over the ‘thoughts’ and ‘prayers’ treatments, they end up donating less than non-religious participants, even though they donate at least as much in the baseline treatment.

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3 Even for a single catastrophe, there need not be only a single such moment. People may later consider providing additional support, again through some combination of gestures and donations. The literature on “narrow bracketing” (Thaler, 1985; Read et al., 1999; Rabin and Weizsäcker, 2009; Andreoni et al., 2018) indicates, however, that they will at that time again focus on the immediate tradeoffs at hand.

4 According to Pew Research Center (2019), religious Christians make up around 65 percent of the population, while atheists and agnostics make up around 9 percent.
To get a sense of how economically significant these observed effects are, we extrapolate the dollar-amount reductions observed in our study to the U.S. population as a whole. Even under conservative assumptions, the estimated annual reduction in disaster relief from Americans’ thoughts and prayers comes out to hundreds of millions of dollars.\(^5\)

Only one study has previously explored a potential interaction effect between supportive gestures and charitable giving. Thunström (2020) finds that when people are prompted to pray in support of hurricane victims and are subsequently (without forewarning) asked to donate, they donate less than in a baseline without any initial prompt to pray.\(^6\) She notes that this result is consistent with findings in the literature on so-called “moral licensing”: just like people appear more willing to act in prejudiced ways after expressing politically correct opinions (Monin and Miller, 2001), or to cheat and lie after buying a green product (Mazar and Zhong, 2010), they appear more willing to skimp on donations after taking time to pray.

Although Thunström’s finding suggests that people treat prayer and donations as alternative methods of supporting victims, the design of her experiment leaves unclear what implications, if any, calls for thoughts and prayers have in everyday life. Perhaps most obviously, in the wake of disasters, people \textit{choose} how to respond to such calls. By allowing people to think/pray by choice, rather than, as in Thunström’s study, in response to a prompt, our field experiment yields insight into how frequently the gestures are actually used in response to disasters.\(^7\) Additionally, Thunström’s finding that people treat prayer and donations as alternative methods of supporting victims, may be an artifact of her experimental design. We show formally in this paper that a moral-licensing effect found when two moral asks are considered sequentially, whereby the first ask is framed as an instruction and the second comes as a surprise, need not imply a substitution effect in the real-world setting we describe above—the “moment of decision” in which people consider two moral asks \textit{simultaneously}, and are free to ignore either or both. The fundamental difference

\(^5\) This ballpark figure may be an underestimate if thoughts and prayers crowd out not just disaster relief, but charitable giving more broadly. On the other hand, it may be an overestimate if calls for thoughts and prayers help raise the salience of disasters, potentially making Americans aware of donation opportunities that they would otherwise remain ignorant of. The latter is unlikely to be the case for major disasters such as Hurricane Dorian, but may be important for less salient events. We return to both caveats in our closing discussion.

\(^6\) Donations do not fall, however, if people first take a moment to think about the victims, or if the donation “ask” is very small.

\(^7\) Moreover, the choice itself may matter to crowding out. People feel more committed to actions they actively choose (Cioffi and Garner, 1996; Keller et al., 2011; Stutzer et al., 2011), so that thoughts and prayers engaged in by choice may, for instance, be more “heartfelt.” If as a result, a chosen prayer is regarded as more effective, then our model in Section 3 suggests this could increase crowding out.
is that, with simultaneous choice, the relative cost-effectiveness of the actions called for comes into play.\(^8\)

We show more specifically that, even if thoughts and prayers are viewed as perfect substitutes for donations in terms of how helpful they are to disaster victims, in which case calls for gestures will generally crowd out donations in a sequential-choice setting, they need not similarly crowd out donations in a simultaneous-choice setting if donations are perceived to be more cost-effective—for example because donating avoids costly emotional involvement, or provides more effective support. The gestures will then simply not be used at all, or used only when options to donate have been exhausted. Moreover, even if donations are \emph{not} always cheaper, in which case crowding out will occur even with simultaneous choice, the effect will in general be smaller than in a sequential-choice setting. We show further that both results hold also if reputation benefits play a role, i.e., if people use support, whether provided through gestures or donations, in part to signal their prosociality. However, if donations additionally signal lack of greed (à la Bénabou and Tirole, 2006), then crowding \emph{in} may occur: gestures may then reinforce donations’ signal value, and thus end up enhancing material aid.

Our study proceeds as follows. After reviewing related research in Section 2, we lay out our theoretical framework in Section 3. This is done in a stepwise fashion, to illustrate how different motivations for prosocial behavior matter to the effect of thoughts and prayers on donations. In Section 4, we present our experimental design and results, linking back to the theory in Section 3. Finally, in Section 5, we discuss policy implications from, as well as limitations of, our study.

2. Overview of related research

2.1. Economics of religion

Our study contributes to a number of existing research areas. At the most general level, it contributes to the literature on the economics of religion, recently surveyed by Iyer (2016). The seminal paper in this literature is Azzi and Ehrenberg (1975), who, building on Becker’s pioneering work that extended the rational choice approach to all aspects of human behavior, model households

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\(^8\) The following analogy might be helpful. It would not be surprising to find that feeding people ice cream cuts into their subsequent consumption of steak, particularly if (i) eating the ice cream is not optional, and (ii) the steak comes as a surprise. One would generally not use this finding, though, to recommend that steakhouse owners leave ice cream off their menu.
as engaged in production of secular and religious commodities, using time and money as inputs. They show that simple substitution between these inputs, driven by differences in their costs for households in different contexts, can explain a broad array of empirical regularities about religious behavior in the U.S. A more recent paper by Gruber (2004), titled “Pay or pray?” extends Azzi and Ehrenberg’s insights to analyze how households trade off money donated to religious institutions—pay—and time spent attending religious services—pray—as alternative inputs to religiosity. Using data from the Consumer Expenditure Survey and the General Social Survey, he finds strong substitution between these inputs: each 1% rise in religious giving induced by changes in the tax treatment of charitable giving leads to a 1.1% decline in religious attendance. Our paper, too, focuses on a substitution effect between paying and praying, but as alternative inputs to provision of support to disaster victims.

2.2. Determinants of charitable giving

Our study relates also to research on philanthropic activity—a topic that engages a wide range of academic disciplines, including economics, marketing, political science, psychology, sociology, and anthropology (see, e.g. Bekkers and Wiepking, 2011, for a review). Within this literature, our study is closest related to the strand of research that examines determinants of charitable giving, and more specifically the effects of different forms of soliciting donations.

For instance, studies have examined the effects on giving (or more broadly provision of public goods) of providing refunds if a minimum threshold of aggregate contributions is not met (e.g., Dawes et al., 1986; Isaac et al., 1989; Rapoport and Eshed-Levy, 1989; List and Lucking-Reiley, 2002), providing matching contributions (e.g., Karlan and List, 2007; Meier, 2007; Rondeau and List, 2008; Anik et al., 2014; Adena and Huck, 2017), providing rebates (e.g., Eckel and Grossman, 2003, 2008, 2017), and allowing donors to gift goods instead of money (e.g., Gershon and Cryder, 2018). While calls of thoughts and prayers are not typically viewed as instruments to boost donations, these calls do frequently co-occur with fundraising drives. Our study therefore adds to this literature by examining a new potential determinant of solicitation success.
2.3. Prosocial behavior and religion

Next, our study relates to the literature on the effect of religiosity on prosocial behavior (e.g., Darley and Batson, 1973; Batson et al., 1989, 1993; Saroglou et al., 2005; Monsma, 2007; Norenzayan and Shariff, 2008). Identifying the causal relationship between the two is difficult, so experimental studies have attempted to vary the salience of people’s religious identity, for instance by providing participants with subtle religious primes (often embedded in a word game) (e.g., Shariff and Norenzayan, 2007; Pichon and Saroglou, 2009; Hadnes and Schumacher, 2012; Duhaime, 2015; Xygalatas, 2013; Benjamin et al., 2016; Shariff et al., 2016). Thoughts and prayers are faith-based gestures, so calls for them may similarly act as a reminder of one’s religious identity. However, it is important to note that the calls do more than that: when religious Christians respond to the calls, they engage in behavior that they often perceive as directly helpful to those in need (particularly when the gesture is a prayer) and that they may therefore treat as a substitute for material aid. In our experiment, any priming effect from inviting prayer appears to have been swamped by that second, substitution effect.

2.4. Slacktivism

Insofar as thoughts and prayers are viewed by some as unhelpful, empty gestures, which take away from substantive support, our study contributes also to the literature on “slacktivism.” Slacktivism (as opposed to activism) denotes willingness to express support for a social cause through low-cost, token actions (often on social media, through liking or forwarding messages, joining Facebook pages, or signing online petitions) while not supporting the same cause in other, more meaningful ways (Kristofferson et al., 2014). While the term is therefore pejorative, there is much debate about whether slacktivist campaigns, through raising awareness of social causes, may further those causes indirectly. The empirical evidence on this is mixed, with some studies finding that online actions increase engagement in other, more concrete forms of support (Lee and Hsieh, 2013; Kwak et al., 2018; Leyva, 2017; Chou et al., 2020).  

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9 Generally, reminding people of their religious identity seems to increase their prosocial behavior, although evidence from the field also suggests that the response to religious primes varies across demographics (Pazhoohi et al., 2017). Note too, though, that the replicability of the religious priming studies has been put into question (Watanabe and Laurent, 2020).

10 Related, in a meta-analysis of the relationship between social media use and participation in civic life, Boulianne (2015) finds an overall positive correlation.
Importantly, whereas most people would agree that merely wearing a pin or forwarding a tweet is not in itself either costly or of direct benefit to others, such agreement cannot be assumed for thoughts and prayers. On the cost side, some people may well experience the act of thinking of or praying for disaster victims as emotionally taxing. On the benefit side, since again religious Christians often view thoughts and prayers as directly beneficial to recipients, sending these gestures may not represent slacktivism at all, even if it comes at the expense of material aid.

2.5. Choice sets and signaling

Lastly, our study has important parallels with studies by List (2007), Bardsley (2008), and Krupka and Weber (2013) showing that, when the action set in dictator-game experiments is expanded to allow taking of money by the dictator, dictator giving declines. The explanation appears to be that, because dictators can signal their prosociality through the novel action of not taking, the signal of giving becomes less important. Analogously, in our setting, when participants can signal their prosociality through sending a gesture, the signal of giving may lose importance. As we show formally in the next section, this in turn may, but need not, cause giving to decline, depending on whether giving additionally signals non-greediness.

3. Theoretical framework

We introduce a theoretical framework for analyzing how decisions to think of, or pray for, hurricane victims may interact with decisions to donate to such victims. Our starting point is a model in which senders of thoughts, prayers, and donations are motivated solely by warm glow from supporting those in need (Andreoni, 1989), but we also explore the implications of senders instead being motivated by “cold prickle” (Andreoni, 1995)—feelings of guilt that arise from failing to provide support. Next, we extend our model to encompass another common motivation for prosocial behavior—signaling to other people (or to oneself) that one is a particular type of person. We thereby focus first on signaling prosociality alone, and thereafter add signaling of being non-greedy (Bénabou and Tirole, 2006).
To make reference to our experimental design, we label a context in which individuals can support hurricane victims only through donations as treatment baseline, and a context in which individuals can show support by both praying and donating as treatment pray. As shown in Section 4, our experiment also has a treatment think, to represent a context in which individuals can show support by both sending thoughts and donating. In this section, any reference to treatment pray will also apply to that treatment think, and more generally any reference to praying will also apply to sending thoughts. As we discuss below, sending thoughts is generally perceived by participants to be less effective in terms of providing support, and can therefore be thought of as “prayer lite.”

3.1. Support motivated by warm glow

Based on the findings of Thunström and Noy (2019) and Thunström (2020), we assume that people perceive donations and prayers to be substitute methods of providing support $s$ to hurricane victims. A simple way to capture this mathematically is to write $s = e_p\tilde{p} + e_d\tilde{d}$, where $\tilde{p}$ represents some quantitative measure of prayer—time spent, perhaps, but possibly also some measure of intensity or emotional involvement (how “heartfelt” a prayer is)—$\tilde{d}$ represents donations of money, and parameters $e_p$ and $e_d$ capture the perceived effectiveness of prayers and donations at providing support.

In our baseline model, individuals derive warm-glow benefit $tb(s)$ from providing support to hurricane victims, where $t$ is a prosociality parameter and $b(\cdot)$ is increasing and strictly convex, with finite initial slope $b'(0)$ and finite upper bound $\bar{b}$.

Over limited ranges of donation amounts (the maximum that participants in our experiment could donate is $5$), the opportunity cost of donations is plausibly linear, so the opportunity cost can be written as $g_d\tilde{d}$, with $g_d$ a utility parameter. In contrast, particularly if the quantitative measure of prayer includes some component of intensity or emotional involvement, the opportunity cost of prayer is likely to have some strict convexity to it, although perhaps only mildly so over some initial range. Let $g_p\tilde{c}(\tilde{p})$ denote this cost, with $g_p$ a utility parameter.

In the analysis of our experimental findings in Section 4, heterogeneity of the perceived effectiveness of thoughts and prayers (parameter $e_p$ in the model) will play an important role. Both Thunström and Noy (2019) and Thunström (2020) find this heterogeneity to be large, as do we in this study. In general, religious Christians believe that both thoughts and prayers are helpful to
victims, but perceive prayers to be particularly effective. Atheists and agnostics, on the other hand, generally perceive neither type of gesture to be all that helpful.\textsuperscript{11} Similarly, people have different beliefs about the effectiveness of donations (parameter $e_d$), and their utility weights $g_p$ and $g_d$ are likely heterogeneous as well.

To simplify our exposition of the model, however, we do not aggregate explicitly over distributions of $e_p$, $e_d$, $g_p$, and $g_d$. Rather, we consider a set of individuals who have identical values of these four parameters, but do differ in terms of prosociality parameter $t$. More specifically, we assume $t$ has distribution $F(t)$ on continuous support $[0, T]$ for this set of individuals, whereby $T$ is large enough to encompass all interesting permutations of equilibrium behavior. Also, let $p = e_p \tilde{p}$ and $d = e_d \tilde{d}$ denote “effective” prayer and donations, respectively, define $c(p) = \tilde{c}(p/e_p)$, and normalize units such that the perceived cost-effectiveness ratios $g_p/e_p$ and $g_d/e_d$ both equal 1. For an individual with given prosociality parameter $t$, the utility from providing any given combination of $p$ and $d$ can then be written as

$$U(p, d) = tb(p + d) - c(p) - d.$$  

Importantly, we make no assumptions about how the normalized costs of a prayer and donations compare, other than assuming that a prayer does not necessarily crowd out donations for all individuals, regardless of how prosocial they are. This amounts to assuming that if $c'(0) < 1$, so that providing support through prayer is cheaper over some initial range, then this range is bounded: there exists some finite $p^*$ such that $c'(p^*) = 1$. The term “cheaper” should thereby be understood throughout as shorthand for “more cost-effective”; in terms of the underlying model, before normalizing, the inequality $c'(0) < 1$ maps to $g_p/e_p \tilde{c}'(0) < g_d/e_d$, and so reflects not just different utility costs of prayer and donations, but also different levels of perceived effectiveness.

Given this setup, the following result is straightforward (see Appendix A for details):

**Proposition 1.** When individuals can show support by both praying and donating, average donations are weakly lower than when they can show support only by donating.

Two cases arise, depending on how the initial marginal cost of a prayer, $c'(0)$, compares to the constant marginal cost 1 of donations. If $c'(0) \geq 1$, so that praying is always more costly than

\textsuperscript{11} Thunström and Noy (2019) find that some people (mainly atheists and agnostics) place negative value on receiving supportive thoughts or prayers. We assume, however, that senders of these gestures believe the gesture to at worst be completely useless, so that the perceived-efficiency parameter is non-negative.
donating, even the most prosocial individuals choose donations over prayer. They only potentially add on prayer after fully exhausting the option to donate, i.e., only if donations have an upper limit $\bar{d}$, and if their desired level of support $s^*(t)$ (implicitly defined by condition $tb'(s) - 1 = 0$) exceeds that limit. As a result, prayer does not “cut into” baseline donations, making donations in a context where prayers can be combined with donations (treatment pray) identical to donations in a context where individuals can donate only (treatment baseline).

In contrast, if $c'(0) < 1$, praying is on the margin cheaper than donating but, given our assumptions on $c(\cdot)$, only up to finite level $p^*$ defined by $c'(p^*) = 1$. Prayer then does cut into baseline donations, causing average donations in treatment pray to drop below those in treatment baseline.

Without any upper limit on donations, the drop is limited to at most $p^*$, because optimal prayer is limited to that level; any desired support above $p^*$ is provided through cheaper (on the margin) donations. If donations do have an upper limit, then the drop may exceed $p^*$, but again only for individuals who exhaust the donation limit, because their desired support $s^*(t)$ exceeds $p^* + \bar{d}$.

Although this is not the focus of our paper, we show in Appendix B that our model rationalizes not just the findings of our own experiment described in Section 4, but also those of Thunström (2020), in her setting where individuals are prompted to pray without forewarning of a subsequent request for donations. In fact, the model explains two findings of Thunström’s that seem puzzling at first blush, namely that (i) thoughts do not crowd out donations in her sequential-choice setting, even though they do in our simultaneous-choice setting, and (ii) neither prayer nor thoughts crowd out donations when the donation limit is lowered from $5 to $0.50.

3.2. Support motivated by cold prickle

Instead of being motivated by feelings of warm glow from “doing one’s bit” to help hurricane victims, support could also be motivated by feelings of guilt that arise from failing to do one’s bit. Plausibly, more prosocial individuals are both more prone to such guilt and more relieved when they assuage it through providing support. Mathematically, this can be captured by letting $-tb$ represent the disutility from guilt experienced by an individual with prosociality parameter $t$, and $tb(s)$ the utility benefit of providing support in terms of relieving that guilt. The individual’s utility
from providing any given combination of prayer and donations then becomes

\[ U(p, d) = -t(\bar{b} - b(p + d)) - d - c(p). \]  

(1)

Because the initial term represents a fixed utility cost, it has no affect on optimal support levels. The analysis of the previous sub-section therefore goes through unchanged. We nevertheless mention this model variant here, because it can explain an otherwise puzzling finding from our experiment, discussed in subsection 4.3 below.

3.3. Support motivated additionally by (self-)signaling of prosociality

Prosocial behavior may also be motivated by reputational concerns, i.e., an individual’s prosocial actions may signal the extent to which she is “caring.” Numerous empirical studies suggest that reputational concerns matter to economic behavior (e.g., Biglaiser and Mezzetti, 1997; Weiss and Fershtman, 1998; Holmstrom, 1999; List, 2006; Gneezy et al., 2012), including studies that explicitly examine signaling and prosocial behavior (Tonin and Vlassopoulos, 2013; Dubé et al., 2017). Related, Soetevent (2005) examines donations by church goers, and finds that donations are higher when they are observable (an open basket is passed to collect money, as opposed to a closed bag), and similarly Ariely et al. (2009) find that people work harder to earn money for charity when their efforts are observed.

Consider then an extension of our model in which providing support sends a signal of prosociality. Following Bénabou and Tirole (2006), we allow the intended recipient of this signal be either other individuals or one’s future self.\(^\text{12}\) Bénabou and Tirole cite Adam Smith (1759) as already suggesting that people make moral decisions to gain the “approbation” or avoid “disapprobation” of an imagined internal judge.

To capture either possibility in the model, rewrite utility as\(^\text{13}\)

\[ U(p, d) = tb(p + d) - c(p) - d + \rho \tau, \]

\(^\text{12}\) While we make no distinction between the two cases, Savary and Goldsmith (2020) interestingly find that, in certain contexts, public signaling may undermine self-signaling. Public recognition may sow internal doubt about whether one’s donation is motivated by genuine altruism or by the desire for recognition.

\(^\text{13}\) Or again possibly as

\[ U(p, d) = -t(\bar{b} - b(p + d)) - c(p) - d + \rho \tau, \]

with no implications for the analysis.
where we can now think of parameter $t$ as the individual’s prosociality “type,” known only to them, and where the new term $\rho \tau$ represents the reputational benefit, weighted by parameter $\rho$, of being perceived to be of type $\tau$. Assume this reputation is formed through Bayesian updating from common prior $F(t)$, based on the observed level of overall support provided—the signal—and on knowledge of the sender’s utility function. The composition of support used to signal prosociality may thereby differ across treatments, but the basic structure of the signaling problem is the same. In particular, utility satisfies the standard single-crossing property of signaling games:

$$\frac{d}{dt} \left( -\frac{U_s}{U_\tau} \right) = -\frac{b'(s)}{\rho} < 0,$$

where $s$ may be either $d$ alone (in treatment baseline), or the sum of $p$ and $d$ (in treatment pray). Assume that if some subset $t$ of types pool on a signal, they are assigned reputation $\tau = E(t|t \in t)$, i.e., the expected value of all types in that pool. If we additionally invoke the standard D1 criterion of Cho and Kreps (1987) to limit out-of-equilibrium beliefs, we obtain the following result (see again Appendix A for details):

**Proposition 2.** With signaling of prosociality through support, Proposition 1 still applies.

Adding the signaling component has quantitative implications—it lowers the threshold of prosociality above which crowding out occurs—but no qualitative implications. Specifically, whereas in treatment baseline without signaling only individuals above a strictly positive threshold of prosociality donate, namely, from the first-order condition associated with problem

$$\max_d U(0, d) = tb(d) - d \quad \text{s.t.} \quad d \geq 0,$$

all individuals with $t > 1/b'(0)$, the added incentive to signal prosociality elicits donations from all types $t > 0$, in order to separate from lower types. As is standard in signaling models, the added reputation benefit also induces all these types to distort their donation level upwards from the level that maximizes their direct (non-reputation-related) net benefits $tb(d) - d$.

As for treatment pray, the added reputation benefit of support does not alter the incentive to provide that support in the cheapest way available. It remains optimal to use donations alone if $c'(0) \geq 1$, and use prayer up to critical level $p^*$ and donations thereafter if $c'(0) < 1$. In the latter case, treatment-pray donations therefore again drop relative to treatment-baseline ones, by up to $p^*$. 

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Additionally, however, compared to the setting without signaling, the upward distortion of overall support reduces the prosociality threshold above which support exceeds $p^c$, while also increasing the donations on top of $p^c$ needed to achieve that higher support. It follows that more types donate, and those that do, donate more than they would in the absence of signaling.

3.4. Donations motivated additionally by signaling of non-greediness

Key to the result of Proposition 2 is that the receiver is interested only in the sender’s prosociality as signaled by support, and makes no distinction between prayer and donations as alternative methods of providing that support. Bénabou and Tirole (2006), however, consider a variety of settings and models in which people are concerned with two reputations: they want to appear as not only prosocial, but also disinterested in monetary or material rewards, i.e., not “greedy.”\textsuperscript{14} They show that signaling aimed simultaneously at both reputations can explain well-known findings that providing material incentives for prosocial behavior, such as paying people to give blood (Mellström and Johannesson, 2008) or fining parents for picking up their children late from daycare (Gneezy and Rustichini, 2000), can be counterproductive.

Plausibly, both reputations may play a role in our setting as well: in particular, monetary donations, but not prayer, may serve as a signal of not just prosociality, but also lack of greed. A fully general analysis of this possible extension, allowing for continuous prayer and donation amounts in the manner of the model above, is beyond the scope of this paper. Nevertheless, some insight into how the two reputations might interact can be gleaned from a greatly simplified model that treats both forms of support as discrete.

Consider then a setting where participants in treatment \textit{baseline} face a choice between not donating at all or donating a fixed amount $d$, and participants in treatment \textit{pray} face an additional choice between not praying at all or praying a fixed amount $p$. Let both quantities be such that $b(p) = b(d) = 1$, so that for a participant with prosociality type $t$, the private benefit of either praying or donating (but not both) is simply $t$. Write the private benefit for that type of both praying and donating, which in the general model would be $tb(p + d)$, as $t(1 + M)$, where $M \in (0, 1]$. With abuse of notation, let $c$ denote the now fixed utility cost of prayer, and assume this cost to be identical for all participants. Importantly, let the utility cost of donating $d$ now vary

\textsuperscript{14} Possibly also to signal their wealth, as in Glazer and Konrad (1996) and Bagwell and Bernheim (1996).
across participants, however, depending on how “greedy” they are. A simple way to capture this is to introduce a new variable \( g \) that simultaneously denotes this utility cost and a participant’s greediness type. Continue to assume that participants’ prosociality type \( t \) has distribution \( F(t) \) with full support \([0, T]\), but now add the assumption that their greediness type \( g \) has distribution \( H(g) \) with full support \([0, G]\). Analogous to \( \tau \) in the general model, let \( \tau^i \) and \( \gamma^i \) denote the receiver’s inference about respectively \( t \) and \( g \) based on the sender’s observed action \( i \), where \( i \in \{0, d\} \) in treatment \textit{baseline} and \( i \in \{00, p0, 0d, pd\} \) in treatment \textit{pray}. Finally, analogous to \( \rho \), let \( \mu \) denote the utility weight that all sender types place their reputation for greed, which, contrary to their reputation for prosociality, enters their utility negatively.

With these assumptions, we obtain the following result:

**Proposition 3.** With signaling of prosociality through support and additionally signaling of non-greediness through donations, calls for thoughts and prayers may crowd in donations.

Because the intuition is difficult to encapsulate in a few sentences, we provide the proof here, which is by numerical example.

Note first that in treatment \textit{baseline}, the choice between donating or not reduces to a comparison between utility \( V^d = t + g + \rho\tau^d - \mu\gamma^d \) from donating and utility \( V^0 = \rho\tau^0 - \mu\gamma^0 \) from doing nothing. Let \( \Delta = (\rho\tau^d - \mu\gamma^d) - (\rho\tau^0 - \mu\gamma^0) \) denote the net reputational gain from donating. In any equilibrium where both actions are chosen by a non-empty subset of participants, we then have that

\[
\tau^d = E(t \mid t \geq g - \Delta), \quad \gamma^d = E(g \mid t \geq g - \Delta), \quad \tau^0 = E(g \mid t < g - \Delta), \quad \gamma^0 = E(g \mid t < g - \Delta).
\]

Panel (a) of Figure 1 illustrates such an equilibrium in \((g,t)\) space, for the especially simple case where \( T = G = 1 \), and where \( t \) and \( g \) are uniformly and independently distributed on \([0, 1] \times [0, 1]\). In the absence of reputation concerns, only types above the dashed 45-degree line in the figure would donate, because for them the private (non-reputation-related) benefit \( t \) of doing so would outweigh the private cost \( g \). When reputation comes into play, however, types between the dashed and solid lines choose to donate as well. For these types, the reputational gain \( \Delta \) from pooling with all types above the solid line who donate, rather than with the types below who do not, outweighs the private loss \( t - g < 0 \).

It turns out that, in this special symmetric case, the reputational gain from donating in terms of higher inferred prosociality, \( \tau^d - \tau^0 \), exactly equals the reputation gain in terms of lower inferred
greed, $\gamma^0 - \gamma^d$. As a result, the overall gain $\Delta$ can be written as $(\rho + \mu)(\tau^d - \tau^0) = (\rho + \mu)(\gamma^0 - \gamma^d)$. This in turn implies that the relative magnitude of utility weights $\rho$ and $\mu$ on the two different reputations is immaterial; only the sum of the weights matters. The case plotted in Figure 1 has $\rho + \mu = 0.7$. 

**Figure 1.**
Introducing the option of praying breaks this symmetry, however, causing the relative magnitudes of $\rho$ and $\mu$ to become important. Panels (b) and (c) of Figure 1 show treatment-pray equilibria for a simple case where (i) $M = 1$, so there are no diminishing returns to adding prayer on top of donations, (ii) the utility cost of prayer is $c = 0.5$, and (iii) $\rho + \mu$ still equals 0.7, so the equilibria can be compared to the treatment-baseline equilibrium of panel (a). In panel (b), however, $\rho = 0.6$ and $\mu = 0.1$, so individuals place a relatively high weight on their prosociality reputation, whereas panel (c), $\rho = 0.1$ and $\mu = 0.6$, so the opposite is the case.

Because $M = 1$, an option to pray would have no effect on overall donations in the absence of reputation concerns. As illustrated in Figure 2, which has $\rho = \mu \approx 0$, its effect would merely be to induce types $t > c$ to add prayer on top of their unchanged donation decisions. Reputation concerns shift the boundaries between the four regions, however. In Figure 1(b), with its relatively high weight on prosociality reputation, types $t$ just below $c$ are induced to pray as well, i.e., to pool with types $t > c$. They do so in order to share in the higher average prosociality reputations $\tau_{pd} > \tau_{0d}$ and $\tau_{p0} > \tau_{00}$ of such types, even though the same types have worse average greed reputations $\gamma_{pd} > \gamma_{0d}$ and $\gamma_{p0} > \gamma_{00}$. The opposite is the case in Figure 1(c), which its relatively high weight on greed reputation. Types $t$ just above $c$ are then induced to no longer pray, i.e., to
pool with types $t < c$, in order to share in these types’ better average greed reputations, despite the same types’ worse prosociality reputations. Note that the positive relation between observed prayer and inferred greed comes about not because of any underlying correlation between $t$ and $g$; it arises purely because of how donations partition $(g, t)$ space.

More importantly for our purposes, reputation concerns also induce types $t$ just below the 45-degree line to donate, in order to pool with types $t > g$ and thereby share in those types’ higher prosociality and non-greediness reputations. In panel (b), however, this signaling effect is smaller than it is in panel (a), implying that average donations fall when the prayer option is introduced. In panel (c), the opposite is the case.

To understand why donations may shift in opposite directions, consider again Figure 2, with $\rho = \mu \approx 0$, and consider more specifically the borderline types $A$ and $B$ shown in both panels of that figure. In panel (a), without the prayer option, choosing to donate enhances both these types’ reputation for prosociality from $\tau^0 \approx E(t|t < g) = \frac{1}{3}$ to $\tau^d \approx E(t|t > g) = \frac{2}{3}$, for a utility gain of $\rho(\tau^d - \tau^0) \approx \frac{1}{3}\rho$. At the same time donating reduces both types’ reputation for greed from $\gamma^0 \approx E(g|t < g) = \frac{2}{3}$ to $\gamma^d \approx E(g|t > g) = \frac{1}{3}$, for an additional utility gain of $\mu(\gamma^0 - \gamma^d) \approx \frac{1}{3}\mu$, and thus an overall gain $\Delta \approx \frac{1}{3}(\rho + \mu)$. When the prayer option is added in panel (b), however, the resulting horizontal partitioning of $(g, t)$ space alters these reputation effects, and does so in opposite directions.

Consider first type $A$, whose prosociality $t = \frac{1}{4}$ is too far below the cost of prayer $c$ to make praying optimal. For this type, the relevant choice is therefore between donating alone or doing nothing. Because the range $[0, c]$ of types $t$ that face this choice has shrunk by half relative to the full range $[0, 1]$ in panel (a), however, the prosociality-reputation boost from donating is much reduced—instead of $\rho(\tau^d - \tau^0) \approx \frac{1}{3}\rho$ in panel (a), it is now just $\rho(\tau^{pd} - \tau^{00}) \approx \frac{1}{3}\rho$. At the same time, the non-greediness-reputation boost is enhanced, from $\mu(\gamma^0 - \gamma^d) \approx \frac{1}{3}\rho$ in panel (a) to now $\mu(\gamma^{00} - \gamma^{pd}) \approx \frac{5}{5}\rho$. For type $B$, whose relevant choice is between either praying and donating or donating alone, the reputation-boost changes are identical, even though the underlying values of $\tau^{pd}$, $\tau^{30}$, $\gamma^{pd}$, and $\gamma^{00}$ are different.

The upshot is that adding the prayer option ends up diluting the signal that donation sends about prosociality, while amplifying the signal it sends about non-greediness. The net effect of both changes then depends on the relative weight $\rho$ and $\mu$ that participants place on both. In panel (b)
of Figure 1, with $\rho > \mu$, the dilution effect dominates, resulting in a drop in average treatment-\textit{pray} donations relative to average treatment-\textit{baseline} donations shown in panel (a); in panel (c), with $\rho < \mu$, the opposite is the case.

Panel (c), then, illustrates a case, derived from assumptions shown by Bénabou and Tirole (2006) to be fruitful for explaining prosocial behavior, in which calls for thoughts and prayers may crowd \textit{in} donations. As a result, the empirical question we address in the next section becomes not just one of magnitude—to what extent do thoughts and prayers substitute for donations?—but also one of sign—do thoughts and prayers possibly complement donations?

4. **Empirical analysis**

4.1. **Experimental design and data**

We tested the effect of thoughts or prayers on donations by designing a field experiment in which participants were given the opportunity to donate to hurricane Dorian victims in the Bahamas. Hurricane Dorian was a category 5 storm that made landfall in the Bahamas on September 1, 2019, causing major and lasting devastation. Our experiment was fielded two weeks later.

The experiment had three treatments, illustrated by Figure 3. In the first treatment (\textit{baseline}), participants were given the opportunity to donate money to the hurricane victims. In the second treatment (\textit{think}), participants could combine their donations with thoughts—they were offered the choice between thinking of the victims, thinking and donating, or donating only. Participants were made aware that they could also opt out from doing anything, by choosing to donate $0. In the third treatment (\textit{pray}), participants could similarly combine their donations with prayers. Religious participants were randomized into one of the three treatments; non-religious participants were randomized into treatment \textit{baseline} or treatment \textit{think} only. All participants in treatment \textit{pray} are therefore religious.

We took steps to minimize any potential discomfort participants might feel from thinking or praying for hurricane victims as part of our study. First, the study was conducted online, enabling participants to send thoughts or prayers without being observed by a monitor. The online environment should also reduce the “experimenter effect,” which is relevant when measuring prosocial behavior (see Caviola and Faulmüller, 2014). Second, our religious participants were self-identified
Christians only. Christians are flexible in the time of the day at which they might pray. In contrast, adherents of other major religions (e.g., Islam) commonly pray during fixed times of the day, which might make it more difficult to pray as part of our study. Third, we asked participants if they believed in God, and dropped any religious participants who answered ‘No’ or ‘I am not sure.’ The goal of this step was to increase the likelihood that religious participants were familiar with the act of praying.

Non-religious people in the U.S. are a quite diverse group (Pew Research Center, 2015). In our study, we limited non-religious participants to self-identified atheists or agnostics who specifically answered ‘No’ or ‘I am not sure’ to the question whether they believed in God.

Our participants were required to be U.S. residents, and were recruited by the research firm Qualtrics.\(^\text{15}\) Our total sample comprises 959 participants (472 religious Christians and 487 atheists/agnostics).\(^\text{16}\) Participants received standard Qualtrics compensation for participating in a survey, and an additional $0-$5 depending on their donation decision in the study.

The sequence of the experiment was as follows (Appendix E presents the full experimental script.)

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\(^\text{15}\) While Qualtrics’ recruitment cost is higher than that of, for instance, Amazon Mechanical Turk or Turk Prime, Qualtrics performs various quality checks, including accuracy checks of background characteristics and avoidance of professional survey takers, which often contaminate online panels (e.g., see Chandler and Paolacci, 2017; Sharpe Wessling et al., 2017).

\(^\text{16}\) Per our pre-registered trial (AEARCTR-0004724), we asked Qualtrics to recruit a total of 756 participants: 474 religious Christians and 282 atheists/agnostics. However, Qualtrics oversampled atheists/agnostics by 202, and undersampled Christians by 2, resulting in a total sample of 956 participants.
Step 1: All participants were asked two screening questions at the front end of the survey about their religious affiliation and belief in God. To reduce priming on religion, we also added questions on common demographics (gender, age, income), political affiliation, organic-food purchases, and spendthriftiness to this initial survey section.

Step 2: All participants were asked to read a short text about the hardships caused in the Bahamas by hurricane Dorian.

Step 3, Treatment baseline: Participants were told that they had been endowed with $5, which could be used for donations to hurricane Dorian victims, via the Red Cross. Anything they did not donate, they would keep.

Treatment pray: Participants were given the choice to pray for hurricane Dorian victims, pray and donate, donate only, or do nothing. The wording of this offer was as follows:\(^{17}\)

As part of this study, you are offered to undertake an activity in support of the victims of hurricane Dorian in the Bahamas.

If you choose an activity that entails donating money, the amount you donate will be subtracted from your $5 additional compensation for participating in this study.

If you do not want to undertake any activity, just choose to make a monetary donation at $0.

Please select your preferred activity below:

- Take a moment to think of the hurricane Dorian victims
- Take a moment to think of the hurricane Dorian victims + make a monetary donation to the victims (0–5) via the Red Cross
- Make a monetary donation to the hurricane Dorian victims (0–5) via the Red Cross

If participants chose the first or second alternative, they were directed to the following message:

We now kindly ask you to please take a moment and pray for the hurricane Dorian victims in the Bahamas, if you feel comfortable doing so.

They were asked a follow-up question about whether they indeed did pray. Those who chose the second alternative (to both pray and donate), also received the following message:

\(^{17}\) Note that we did not provide detail about how the donations might be used by the Red Cross, or otherwise try to reduce any uncertainty participants may have felt about the donations’ effectiveness. We did so for two reasons. First, people are likely to face similar uncertainty when deciding on donations outside of our study. Second, we did not want to bias our participants’ choices in treatment think and treatment pray, by offering detail on the effectiveness of donations and not doing the same for gestures.
You are now offered to donate to help those affected by the devastation caused by hurricane Dorian, via the Red Cross.

The amount you donate will be subtracted from your compensation for participating in this study.

You can choose to donate any amount between $0.00 (i.e. no donation) and $5.00 (your entire additional compensation for participating in this study). Please state any donation to the hurricane Dorian victims you would like to make here: _______.

**Treatment think**: Participants were given the choice to think of hurricane Dorian victims, think and donate, donate only, or do nothing. The wording and procedure was kept as similar as possible to the wording in treatment *pray*.

**Step 4**: Participants were asked about factors that might affect their willingness to donate as part of our study, or their willingness to send thoughts or prayers.

Specifically, because personal experience with disasters has been found to increase prosocial behavior aimed at mitigating such disasters (Small and Simonsohn, 2008), we asked participants if they had previously donated to hurricane Dorian victims, and if they, or someone close to them, had been a victim of a natural disaster.

Because empathy has been shown to increase prosocial behavior (e.g., Small et al., 2007; Fisher et al., 2008; Zhou et al., 2012), we asked participants about their affective and moral responses to the natural disaster. Following Small et al. (2007), we constructed a *Feelings scale* variable based on their responses to these questions. This variable can take any value between 5 and 25, with higher values indicating greater empathy.

We also asked participants about their religiosity, as indicated by church attendance, frequency of praying, frequency of reading religious scripture, and feelings about the Bible.

Finally, and most importantly, we asked participants how beneficial they believed thoughts and prayers to be for intended recipients. Inspired by the Expected Benefits Indices of Thunström and Noy (2019), we constructed two similar indices, one based on questions measuring perceived benefits from thoughts (*EBI Thoughts*) and one based on corresponding questions for thoughts (*EBI Prayers*). Each index can take a value between 4 and 28, with higher values indicating greater perceived benefits. Separate from these, we constructed variables *Thoughts help even if unknown* and *Prayers help even if unknown* based on participants’ stated level of agreement (from 1=strongly disagree to 7=strongly agree) with the statement “My thoughts [prayers] for others are helpful even they do not know I thought of [prayed for] them.”
Table 1. Summary Statistics: religious and non-religious participants

<table>
<thead>
<tr>
<th></th>
<th>Religious</th>
<th></th>
<th></th>
<th>Non-religious</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Std. Dev</td>
<td>N</td>
<td>Mean</td>
<td>Std. Dev</td>
</tr>
<tr>
<td>Catholic</td>
<td>472</td>
<td>0.441</td>
<td>0.497</td>
<td>0</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Protestant</td>
<td>472</td>
<td>0.559</td>
<td>0.497</td>
<td>0</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Frequency attend rel. services</td>
<td>472</td>
<td>4.028</td>
<td>2.073</td>
<td>487</td>
<td>1.201</td>
<td>0.526</td>
</tr>
<tr>
<td>Frequency pray</td>
<td>472</td>
<td>6.008</td>
<td>1.569</td>
<td>487</td>
<td>1.378</td>
<td>1.045</td>
</tr>
<tr>
<td>Atheist</td>
<td>0</td>
<td>.</td>
<td>.</td>
<td>487</td>
<td>0.489</td>
<td>0.500</td>
</tr>
<tr>
<td>Agnostic</td>
<td>0</td>
<td>.</td>
<td>.</td>
<td>487</td>
<td>0.511</td>
<td>0.500</td>
</tr>
<tr>
<td>Female</td>
<td>472</td>
<td>0.697</td>
<td>0.460</td>
<td>487</td>
<td>0.634</td>
<td>0.482</td>
</tr>
<tr>
<td>Age</td>
<td>472</td>
<td>51.023</td>
<td>16.511</td>
<td>487</td>
<td>42.279</td>
<td>16.337</td>
</tr>
<tr>
<td>College</td>
<td>472</td>
<td>0.686</td>
<td>0.464</td>
<td>487</td>
<td>0.749</td>
<td>0.434</td>
</tr>
<tr>
<td>Income</td>
<td>472</td>
<td>56.621</td>
<td>38.909</td>
<td>487</td>
<td>55.672</td>
<td>38.999</td>
</tr>
<tr>
<td>Democrat</td>
<td>472</td>
<td>0.345</td>
<td>0.476</td>
<td>487</td>
<td>0.651</td>
<td>0.477</td>
</tr>
<tr>
<td>Republican</td>
<td>472</td>
<td>0.475</td>
<td>0.500</td>
<td>487</td>
<td>0.109</td>
<td>0.312</td>
</tr>
<tr>
<td>Independent</td>
<td>472</td>
<td>0.180</td>
<td>0.385</td>
<td>487</td>
<td>0.240</td>
<td>0.428</td>
</tr>
<tr>
<td>Previously donated</td>
<td>472</td>
<td>0.263</td>
<td>0.441</td>
<td>487</td>
<td>0.187</td>
<td>0.390</td>
</tr>
<tr>
<td>Been victim</td>
<td>472</td>
<td>0.386</td>
<td>0.487</td>
<td>487</td>
<td>0.366</td>
<td>0.482</td>
</tr>
<tr>
<td>Feelings scale</td>
<td>472</td>
<td>19.663</td>
<td>3.704</td>
<td>487</td>
<td>18.852</td>
<td>3.978</td>
</tr>
<tr>
<td>EBI prayers</td>
<td>472</td>
<td>22.695</td>
<td>4.377</td>
<td>487</td>
<td>8.472</td>
<td>5.192</td>
</tr>
<tr>
<td>EBI thoughts</td>
<td>472</td>
<td>20.449</td>
<td>5.933</td>
<td>487</td>
<td>10.873</td>
<td>6.175</td>
</tr>
<tr>
<td>Prayers help even if unknown</td>
<td>472</td>
<td>5.758</td>
<td>1.367</td>
<td>487</td>
<td>2.033</td>
<td>1.522</td>
</tr>
<tr>
<td>Thoughts help even if unknown</td>
<td>472</td>
<td>5.142</td>
<td>1.745</td>
<td>487</td>
<td>2.472</td>
<td>1.759</td>
</tr>
</tbody>
</table>

Table 1 presents summary statistics of characteristics and attitudes of religious and non-religious participants. Column 3 shows that 44 percent of our total religious participants are Catholic and 56 percent are Protestant. Column 6 shows that 49 percent of our non-religious participants are atheists, and 51 percent are agnostics. Religious participants attend religious services around once a month on average, as implied by the mean value 4 of Frequency attend rel. services, and pray on average 2-3 times a week, as implied by the mean value 6 of Frequency pray. Non-religious participants score on average 1 on both of these variables, which implies that on average they never attend religious services and never pray.

Both groups are similar in income and in terms of the proportion that has been a victim of natural catastrophe. They differ in other characteristics in expected ways. Previous studies find that women (Pew Research Center, 2016), older people (Pew Research Center, 2018) and less educated people (Pew Research Center, 2017) are more likely to be religious. Our data is consistent with those...

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18 Appendix C breaks these down further by treatment.
findings.\textsuperscript{19} Further, the share identifying as Democrat is lower, and that identifying as Republican is higher for the religious (Pearson’s $\chi^2$ tests; $p<0.001$).

4.2. Results

Three key results emerge from our analysis.\textsuperscript{20} We report details of all three before turning to a discussion of how they might be explained by our theory and survey results.

4.2.1. Result I: Thoughts and prayers are frequently used

Table 2 shows the percent of participants in each treatment who choose each of the actions available in that treatment, both pooled across all participants and separately by religious affiliation (recall, though, that treatment \textit{pray} has only religious participants). Figure 4 presents the pooled choices visually.

In treatment \textit{pray}, fully 95 percent of religious participants choose to support hurricane victims by sending a prayer, either alone or in combination with making a donation. In treatment \textit{think}, 87 percent of religious participants and 80 percent of non-religious participants choose to send a thought, again either alone or with a donation. The higher usage by religious participants of prayers, compared to thoughts is statistically significant (Pearson’s $\chi^2$; $p=0.021$), but the higher share of religious participants, compared to non-religious participants, who choose to send a thought is not ($p=0.072$).

\textsuperscript{19} The share of women is higher for the religious (0.697) than the non-religious (0.634) (Pearson’s $\chi^2$ test; $p=0.040$); the average age is higher for the religious (51.023) than the non-religious (42.279) (two-sided $t$-test; $p<0.001$); and the share with some college education is lower for the religious (0.686) than the non-religious (0.749) (Pearson’s $\chi^2$ test; $p=0.030$).

\textsuperscript{20} Our results rely on the assumption that the randomization of participants across treatments successfully eliminated any meaningful differences in relevant covariates across treatments. If this assumption holds up, any inclusion of covariates in our statistical analysis could bias our results (Freedman, 2008). Athey and Imbens (2017) and Mutz et al. (2019) argue that it is appropriate to control for covariates that are a priori expected to impact the outcome variable, if these covariates differ across treatment groups. To determine whether this applies to our analysis, we must first decide on what covariates are “relevant,” i.e., may affect our outcome variables of activity choices and donation amounts, and then decide if those covariates differ meaningfully across treatments.

Appendix D reports our selection and examination of such covariates. In short, we select variables that have been shown in previous studies to covary with altruism, the perceived value of thoughts and prayers, or both. We then calculate normalized differences in means (NDM) of these covariates across pairs of treatments, separately for religious and non-religious participants (since these groups were randomized across treatments), and apply Imbens and Rubin’s (2015) rule of thumb that an absolute NDM above 0.25 is “meaningful.” For no covariate, in any pair of treatments, do we find a value close to 0.25. We therefore refrain from including covariates in our statistical analysis of treatment effects.
Table 2. Choice of supportive activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>All participants</th>
<th>Religious</th>
<th>Non-religious</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Std. Dev</td>
</tr>
<tr>
<td>Donate</td>
<td>395</td>
<td>0.666</td>
<td>0.472</td>
</tr>
<tr>
<td>Do nothing</td>
<td>395</td>
<td>0.334</td>
<td>0.472</td>
</tr>
<tr>
<td>Think and donate</td>
<td>399</td>
<td>0.303</td>
<td>0.460</td>
</tr>
<tr>
<td>Donate only</td>
<td>399</td>
<td>0.140</td>
<td>0.348</td>
</tr>
<tr>
<td>Think only</td>
<td>399</td>
<td>0.526</td>
<td>0.500</td>
</tr>
<tr>
<td>Do nothing</td>
<td>399</td>
<td>0.030</td>
<td>0.171</td>
</tr>
<tr>
<td>Pray and donate</td>
<td>165</td>
<td>0.327</td>
<td>0.471</td>
</tr>
<tr>
<td>Donate only</td>
<td>165</td>
<td>0.024</td>
<td>0.154</td>
</tr>
<tr>
<td>Pray only</td>
<td>165</td>
<td>0.618</td>
<td>0.487</td>
</tr>
<tr>
<td>Do nothing</td>
<td>165</td>
<td>0.030</td>
<td>0.172</td>
</tr>
</tbody>
</table>

Noteworthy also is that in both treatments *think* and *pray*, participants who choose not to donate overwhelmingly choose to send a gesture. Only 3 percent of participants in either treatment choose to do nothing at all.
4.2.2. Result II: Thoughts and prayers reduce donations

As shown in Table 2 and Figure 4 also, in treatment baseline, 67 percent of participants choose to donate. In treatment think, only 44 percent do (30 percent in combination with sending a thought, and 14 percent as a donation alone), a highly significant drop relative to treatment baseline (Pearson’s χ² test; p<0.001). In treatment pray, the share choosing to donate is just 35 percent (33 percent in combination with a prayer, and 2 percent as a donation alone), which is a significant drop relative to both treatment baseline (p<0.001) and treatment think (p=0.044).

Interestingly, some participants who chose to both think and donate in treatment think or both pray and donate in treatment pray ended up subsequently entering zero when asked for their donation amount. Apparently, these participants planned to make a positive donation, but ended up changing their minds after performing their planned gesture. Because of this, the actual share of zero donations, shown in Table 3, is somewhat higher for treatments think and pray than the share implied by the gesture-only and do-nothing entries in Table 2.

The share of participants donating zero in treatment baseline is 33 percent, which is significantly lower than in both treatment think, at 59 percent (p<0.001), and treatment pray, at 71 percent (p<0.001). Essentially the same pattern applies for religious and non-religious participants considered separately. The small differences in shares across these groups in treatments baseline and think are not statistically significant.21

Further, compared to treatment baseline, we find that mean donations are considerably lower in both treatment think and treatment pray. Figure 5 shows mean donations across treatments and religious affiliation. For religious participants, mean donations are $2.92 in treatment baseline, but drop by 48 percent, to $1.52 when participants have the option to combine their donation with sending a thought, and by 60 percent, to $1.18 when they have the option to combine their donation with a prayer. Non-religious participants donate on average $2.49 in treatment baseline, and their mean donation drops by 26 percent, to $1.83, when they have the option to combine their donation with sending a thought.

21 Our study is well powered to detect the effect sizes reported in Table 3. A Pearson’s χ² test (α = 0.05) that compares the proportion of zero donations in treatment baseline to the corresponding proportion in either treatment think or treatment pray (for either religious or non-religious participants only) and applies the associated sub-group sample sizes in Table 3 has (i) 99.99 percent statistical power to detect the effect size of treatment think for religious participants; (ii) > 99.99 percent statistical power to detect the effect size of treatment pray for religious participants; and (iii) 99.73 percent statistical power to detect the effect size of treatment think for non-religious participants.
Table 3. Share of actual zero donations

<table>
<thead>
<tr>
<th></th>
<th>All participants</th>
<th>Religious</th>
<th>Non-religious</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Std. Dev</td>
</tr>
<tr>
<td>Zero donation: baseline</td>
<td>395</td>
<td>0.334</td>
<td>0.472</td>
</tr>
<tr>
<td>Zero donation: think</td>
<td>399</td>
<td>0.586</td>
<td>0.493</td>
</tr>
<tr>
<td>Zero donation: pray</td>
<td>165</td>
<td>0.709</td>
<td>0.456</td>
</tr>
</tbody>
</table>

Figure 5. Mean donations across treatments and religious affiliations

Figure 6 indicates, moreover, that the frequency distribution of donation amounts is highly bimodal: 483 participants donated nothing, while 315 participants donated the maximum amount of $5—fully 798 of the 959 participants (83 percent) therefore chose to donate at either of these extremes. The drops in mean donations across the treatments are therefore not driven by similar-sized drops in individual donation amounts. Rather, they are due largely to shifts in the share of participants donating zero rather than the maximum.

Wilcoxon-Mann-Whitney tests indicate that donations by religious participants in treatment baseline and treatment think differ significantly in terms of distribution ($p < 0.001$), as do donations
in treatment baseline and treatment pray ($p < 0.001$). The same is true also for donations by non-religious participants in treatment baseline and treatment think ($p < 0.001$). Donations by religious participants do not differ significantly across treatments think and pray, however ($p = 0.112$).\footnote{Given that donations are highly bimodal, we also performed analyses of treatment effects with donations converted to a bivariate variable that takes value 1 if donations are $2.50$ or above, and 0 otherwise. Of the 570 participants in our sample who donated less than $2.50$, however, 85 percent donated $0$. The outcome of the analysis with the bivariate donation variable is therefore very similar to the analysis of zero donations—all treatment effects are similar in terms of both magnitude and statistical significance, and the associated statistical tests remain well-powered.}

4.2.3. Result III: Crowding out is stronger for religious participants

While we find that crowding out of donations happens for both religious and non-religious participants, the effects are asymmetric across the two groups. As shown in Figure 5, religious participants donate more in treatment baseline than do non-religious participants, on average $2.92$ vs. $2.49$, although the difference is not statistically significant (Wilcoxon-Mann-Whitney; $p=0.087$). When given the option to combine their donation with a thought or a prayer, however, religious participants donate significantly less: pooled across treatment think and treatment pray, they donate on average $1.34$, whereas non-religious participants in treatment think donate $1.83$ ($p=0.008$).
What might account for the observed usage patterns of thoughts and prayers, and asymmetry of crowding out across religious groups? We use data from the survey questions asked after participants made their choices to explore two potential explanations: heterogeneity in empathy and heterogeneity in perceived effectiveness of gestures.

Starting with the asymmetry of crowding out, note first that religious participants in treatment baseline express more empathy towards the victims of hurricane Dorian, as measured by their score on the Feelings scale. The average score for religious participants is 19.68, while that for non-religious participants is 18.57 (Wilcoxon-Mann-Whitney; $p=0.024$). In light of studies suggesting that empathy increases donations (e.g., Small et al., 2007; Fisher et al., 2008; Zhou et al., 2012), this may explain why religious participants donate somewhat more than non-religious participants in treatment baseline.

In terms of our theoretical framework, the Feelings scale plausibly captures prosociality; in other words, the survey findings could be interpreted to imply that religious participants on average have somewhat higher values of prosociality parameter $t$. Notably, in one variant of the model (with signaling of prosociality and no cap on donations), crowding out in absolute terms—i.e., the difference between optimal donations in treatment pray vs. treatment baseline—is predicted to increase with $t$. Even in that case, however, the crowding-out effect is never so large as to cause treatment-pray donations themselves to fall with $t$. Since this conflicts with our empirical finding that crowding out drives religious participants’ donations in treatments think and pray below those of non-religious participants, differences in the distribution of $t$ alone do not seem to provide a sufficient explanation for the observed asymmetry.

The theoretical framework points also to the importance of a second factor, namely the perceived effectiveness of gestures. Any increase in the perceived effectiveness $e^p$ of prayer in the model has the effect, after the normalization $c(p) = \tilde{c}(p/e^p)$, of making prayer cheaper, i.e., more “cost-effective,” relative to donations. All else equal, this in turn (i) reduces $c'(0)$, thereby expanding the range of $t$ values for which crowding out occurs, and (ii) increases $p^c$, making crowding out more severe whenever it is positive. In other words, optimism about the effectiveness of gestures is predicted to increase both the extent and severity of crowding out.

---

23 Table 1 shows that if we pool across all treatments, a difference in Feelings scale across religious affiliation remains, but scores are more similar: 19.66 for religious and 18.85 for non-religious participants.
Table 4. Survey responses: share that agrees with statements

<table>
<thead>
<tr>
<th>Statement</th>
<th>Religious Agree</th>
<th>Nonreligious Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My prayers for others are helpful even if they do not know I prayed for them</td>
<td>0.83</td>
<td>0.07</td>
</tr>
<tr>
<td>My thoughts for others are helpful even if they do not know I thought of them</td>
<td>0.68</td>
<td>0.15</td>
</tr>
<tr>
<td>To pray for those in distress makes me feel like I am helping them</td>
<td>0.84</td>
<td>0.08</td>
</tr>
<tr>
<td>To think of those in distress makes me feel like I am helping them</td>
<td>0.69</td>
<td>0.16</td>
</tr>
<tr>
<td>When I hear of people in distress, I always pray for them</td>
<td>0.81</td>
<td>0.06</td>
</tr>
<tr>
<td>When I hear of people in distress, I always take a moment to think of them</td>
<td>0.87</td>
<td>0.61</td>
</tr>
<tr>
<td>Observations</td>
<td>472</td>
<td>487</td>
</tr>
</tbody>
</table>

We therefore turn to our survey responses to examine how the perceived effectiveness of gestures differs across religious and non-religious participants. As noted earlier, our survey elicited participants’ agreement with a number of statements about the helpfulness of thoughts and prayers. Table 4 shows the shares of participants that agreed with a subset of these statements (as measured by choosing value 5-7 on the agreement Likert scale), and shows these shares to be starkly different for religious and non-religious participants. Among religious participants, 83 percent agree that prayers for others are helpful, even if those being prayed for are unaware of receiving the prayer, and 68 percent agree that thoughts are directly helpful too. The corresponding shares for non-religious participants are only 7 and 15 percent. Further, 84 percent of religious participants agree that praying feels like helping, and 69 percent that thinking does too. Among non-religious participants, the corresponding shares are only 8 and 16 percent. All four differences are highly significant (Pearson’s $\chi^2$ test; $p < 0.001$) and therefore consistent with the asymmetry of crowding out across the religious groups.

Turning next to the use of prayers vs. thoughts by religious participants, note from the same survey responses in Table 4 that religious participants perceive prayers to be more effective than thoughts. Specifically, a larger share of religious participants agrees with the two statements about prayer helpfulness (83 and 84 percent) than with the corresponding statements about helpfulness of thoughts (68 and 69 percent). Both differences are highly significant (Pearson’s $\chi^2 : p < 0.001$).

Our model predicts that the implied higher perceived effectiveness of prayers relative to thoughts should lead to higher usage of the former by religious participants. Recall from Table 2 that this is exactly what we find. A corollary prediction is that crowding out from prayer should be higher as well. Note that both Table 3 and Figure 5 indeed show somewhat higher crowding out from prayer...
than from thoughts for religious participants, although the difference is not statistically significant. Table 3 shows that zero donations by religious participants are 62 percent in treatment think vs. 71 percent in treatment pray (Pearson’s $\chi^2$; $p=0.097$); Figure 5 shows that the average donation is $1.52 in treatment think and $1.18 in treatment pray (Wilcoxon-Mann-Whitney; $p=0.112$).

4.3. Crowding out when thoughts are perceived to be useless—a potential explanation

An intriguing finding of our experiment is that many participants choose to send thoughts even if they perceive them to generate no benefit at all to recipients, and that this behavior seems to reduce donations. Specifically, of the 399 participants in treatment think, 162 participants strongly disagree or disagree with the statement “My thoughts for others are helpful even if they do not know I thought of them” (which matches the context of our study, given that disaster victims will never learn if they were thought of or prayed for by our participants). Yet, as many as 130 of those 162 participants choose to send a thought, either in combination with a donation (52/130 participants) or as their only means of support (78/130 participants). In the following, we discuss a potential explanation for this behavior.

In Section 3 above, we discuss how people may send gestures to signal prosociality—sending gestures is for at least some participants, at least up to some point, a cheaper signal than donating. However, this raises the question how a gesture that is perceived as useless to recipients can serve as a signal. Standard signaling theory requires that, in order for a signal to be effective, “higher” types (along an appropriately normalized dimension—in this case prosociality) must either enjoy greater private (i.e., non-reputation-related) net benefits or incur lower private net costs from a marginal increase in the signal than do “lower” types—the so-called single-crossing property. If support yields private warm glow, as in the baseline model of subsection 3.1, this requirement is met by our assumption that all types incur the same marginal cost $c'(s)$ of support—whereby support can take the form of sending thoughts or prayers—but that prosocial types derive greater marginal warm-glow benefits $b'(s)$. If sending thoughts is perceived as not benefiting victims, however, it is hard to see how the gesture might generate feelings of warm glow from “doing one’s bit,” in the manner of Andreoni (1989).

24 Strictly speaking, the single-crossing property requires the ratio of the marginal private utility of support to the marginal utility of reputation to increase in type. It is standard, however, to treat the latter marginal utility as constant across types.
Consider instead a case where support relieves guilt, as in our alternative model of subsection 3.2. There is considerable evidence from the social-psychology literature (e.g., Cialdini et al., 1987; Basil et al., 2006) that charitable donations are motivated at least in part by guilt that people anticipate feeling if they were to not donate.\(^{25}\) It seems natural to presume that prosocial types are prone to experience disutility from such guilt, as captured by the first component of the utility term \(-t(b - b(p + d))\) in equation (1). If, in addition, prosocial types feel proportionally more relief of that guilt when they do donate or provide other forms of support, as captured by the second component, then the single-crossing property again applies.

This still leaves the question why sending a thought, if it is not perceived to actually help victims, would nevertheless relieve guilt. A potential answer can be found in Miceli and Castelfranchi’s (1998) analysis of the emotion of guilt and of cognitive defenses against it. Key to their analysis is that guilt is fundamentally distress about inequity: a harmed victim suffers, whereas a guilty harm doer (guilty perhaps by omission, i.e., by failing to act, rather than by commission) does not. Restoring equity and thus relieving the distress about this situation can be accomplished in two ways: (i) by repairing the harm, i.e., reducing the victim’s suffering, or (ii) by punishing the harm doer, i.e., increasing the guilty party’s suffering. Elaborating on (ii), they note that “the sense of guilt itself and the suffering it entails are a form of punishment for the guilty party.” The cognitive point, then, of sending thoughts may be not to reduce the recipients’ suffering, but rather to increase the sender’s suffering. The emotional cost of experiencing victims’ suffering vicariously—literally feeling bad “for” them—may serve as a substitute for the cost of donating to actually help victims out.

### 4.4. Economic significance

To explore the potential economic significance of the crowding out we observe in our experiment, we conduct a back-of-the-envelope calculation that extrapolates our findings to the U.S. population as a whole.

Indirect support for the idea that doing so may be reasonable comes from noting the fairly close match between the shares of participants that chose to pray or think in our experimental treatments

\(^{25}\) Andreoni et al. (2017) recognize this too, noting that the concept of warm glow should be viewed as just a “placeholder” for more specific models of individual and social motivations, including guilt avoidance.
to the shares that claimed, in the survey following the experiment, to “always” do so when they hear about people in distress. Recall from Table 2 that 95 percent of religious participants prayed in our experiment, 87 percent sent thoughts, and 80 percent of non-religious participants sent thoughts also. According to Table 4, 81 percent of religious participants claimed to always pray, 87 percent to always send thoughts, and 61 percent of non-religious participants claimed to always send thoughts also.

Consider, then, the dollar-amount reductions in donations observed in our experiment. The opportunity to send thoughts reduced the average donation of non-religious participants by $0.66, and that of religious participants by $1.41. The opportunity to send prayers reduced religious participants’ average donation by $1.75. Religious participants appeared to prefer to send prayers, however: as just noted, 95 percent sent prayers in treatment _pray_, whereas only 87 percent sent thoughts in treatment _think_. Assume, consistent with this observation, that when faced with calls for “thoughts and prayers,” and thereby implicitly with a choice between the gestures, religious Christians in the U.S. always choose to pray, and then act like religious participants did in our treatment _pray_ rather than our treatment _think_. (Implicitly this assumes that they do not send both thoughts and prayers, or that, if they do, there is no additive or multiplicative effect on their donations from combining the gestures.)

Assume that the donations reductions we observed, rather than being specific to Hurricane Dorian and the $5 cap on donations in our study, apply uniformly across all disasters and donation budgets. Assume also that appeals for support of disaster victims call uniformly for thoughts and prayers as well as for donations. If so, then, whenever religious Christians or atheists/agnostics face such a call, their donation will be reduced by $1.75 and $0.66, respectively, relative to a counterfactual call for donations only.

In the U.S., the number of adult Christians is around 136.5 million (65 percent of 210 million adults) and the number of adult atheists/agnostics is around 18.9 million (9 percent of 210 million). If we assume conservatively that each adult faces just one call for support of disaster victims in any given year, then giving by Christians drops by $1.75 \times 136.5 \text{ million} \approx $239 million, and that by atheists/agnostics by $0.66 \times 18.9 \text{ million} \approx $12.5 million, for a total reduction of around $251 million. With two or three calls, this amount would obviously double or triple.26

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26 According to the report _U.S. Household Disaster Giving in 2017 and 2018_ (LFSP, 2019), the three highest-funded disasters in 2017 were all hurricanes (Harvey, Maria and Irma), suggesting that many Americans that year faced calls for thoughts/prayers and donations at least three times.
In short, crude as this exercise is, it seems not unreasonable to suppose that crowding out of disaster relief from thoughts and prayers may add up to hundreds of millions of dollars a year. As points of reference, the entire value of domestic disaster relief by the American Red Cross from July 2017 through June 2018 was $767 million (American Red Cross, 2018), and overall donations for disaster relief by Americans in 2017 amounted to roughly $10 billion.27

5. Conclusions

In the wake of major catastrophes, Americans are frequently called upon to send their thoughts and prayers to those in need. In this study, we showed that the usage of such gestures can crowd out material aid. Our theory suggests that the underlying reason is really quite straightforward—if people, when faced with appeals for gestures as well as donations, compare the cost-effectiveness of both, they may substitute gestures for donations.

Empirical evidence from our field experiment, carried out in the wake of a major, high-salience disaster, suggests that crowding out is significant. Offering participants the option to send gestures increased the share of zero donations by 21–40 percentage points, and reduced average donations by $0.66–$1.75, out of a maximum of $5.

Further, we find that thoughts and prayers are popular means to show support for others. Across experimental treatments in which these gestures were part of the choice set of supportive actions, 80–95 percent of our participants chose them. The participants’ responses to our follow-up survey lend further support to the idea that Americans routinely use thoughts and prayers to express support of those in need.

Leaning on the latter observation to extrapolate our experimental results to the U.S. as a whole, we find that the frequent use of these gestures is likely consequential. The resulting crowding out of private donations for disaster relief may amount to hundreds of millions of dollars per year.

Conceivably, moreover, the crowding-out effect applies more broadly. In the U.S., private donations fund not just disaster relief, but a wide range of services such as food and shelter, health

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27 American households donated on average $80 to disaster relief in 2017 (LFSP, 2019), and there are around 125 million households.
care, and education, benefiting millions of people. In 2019, total charitable giving from individuals amounted to $310 billion (Giving USA, 2020), far exceeding the roughly $10 billion figure for disaster relief alone. Further, giving is particularly high from religious donors: whereas around 45 percent of religiously unaffiliated households make charitable donations, more than 60 percent of religious households do, and donation amounts are higher for those who are more religious (Austin, 2017). Hence, if thoughts and prayers are used beyond disaster relief as well, these gestures may have a much more extensive impact than the already large effect suggested by this study.

Important caveats apply as well, however. First, the magnitude of crowding out that we observed may have been inflated by our choice of charity organization. Our theoretical framework predicts (and our experimental findings comparing religious and non-religious participants bring out) that crowding out increases with the perceived effectiveness of thoughts and prayers. A corollary prediction is that crowding out should increase also with perceived ineffectiveness of donations. Given that public media reported relatively recently (in 2014) that the Red Cross misrepresented how much of their disaster relief reaches disaster victims, our participants may have been particularly skeptical of the effectiveness of donations in our experiment.

Second, the design of our experiment does not allow us to assess a potential complementary effect that calls for thoughts and prayer may have on donations. Our experimental script had all participants start out by reading a graphic description of hurricane Dorian’s devastating consequences. This was done to put them on the same page in terms of the salience of the hurricane victims’ plight, and to thereby cleanly isolate any substitution effect of calls for thought and prayers from any differential salience effect that the calls may conceivably have as well, relative to calls for donations only. It may be, in other words—our study does not address this, so we have no way of telling—that calls for thoughts and prayers by politicians and pastors are more effective at

28 While an important part of the work by charitable organizations is to redistribute wealth, it is not clear how much of this merely crowds out (or in) redistribution by government. Cloward and Epstein (1965) suggest that the more income redistribution is undertaken by government, the less charitable organizations have focused on that social issue. Specific to religious institutions, Hungerman (2005) finds, in the opposite direction, that when government-provided welfare declines, religious congregations increase their activities to provide similar services.

29 Giving by individuals is the most significant source of charitable giving in the U.S. (around 70 percent in 2019, according to Giving USA, 2020), although charitable giving also originates from bequests, corporations and charitable foundations, and charity organizations are also often government funded, through grants.

30 See https://www.npr.org/2014/12/04/368453320/red-cross-misstates-how-donors-dollars-are-spent. It should also be noted, however, that Charity Watch, an independent organization that evaluates and reports the effectiveness of charity organizations, maintains a high effectiveness rating for the Red Cross; see https://www.sandiegouniontribune.com/opinion/the-conversation/sd-red-cross-donations-for-harvey-relief-20170831-htmlstory.html.
making disasters salient to potential donors (salient enough for them to consider donating) than, say, fundraising drives by the Red Cross. While this seems unlikely for major disasters such as hurricanes, it could conceivably be true for less prominent events, and would then mitigate the crowding-out effect that we identify.

Of course, even if calls for gestures do boost donations through such a differential salience effect, the donations might be boosted further if the calls were combined with attempts to minimize substitution. Our study’s findings suggest, therefore, that calls for gestures, when they are made, should be combined with reminders to also donate or otherwise take concrete actions. In the political sphere, the phrase “thoughts and prayers are not enough” is sometimes invoked, but primarily in the wake of mass shootings (to counteract perceived crowding out of concrete gun-control measures); our study suggests that the same reminder may be useful also in the wake of natural disasters. In the religious/humanitarian sphere, a quote attributed to the famous 19th-century Scottish explorer and missionary David Livingstone is sometimes invoked:31 “Sympathy is no substitute for action.”


Appendix A. Proof of Propositions 1 and 2

Proof of Proposition 1.
Let \( d^b \) denote optimal donations in treatment *baseline*, and let \( p \) and \( d^p \) denote optimal prayer and donations in treatment *pray*. The proof proceeds in three steps:

Step 1: Derivation of the treatment-*baseline* equilibrium
Step 2: Derivation of the treatment-*pray* equilibrium
Step 3: Comparison of donations in both equilibria

In Steps 1 and 2, we derive the equilibria first without and then with a (binding) upper limit \( d \) on donations. It will be useful also to let \( V^b = U(0, d) \) denote utility from providing support through only donations, and to let \( V^s \) denote utility from providing support through potentially a mix of the two.

**Step 1: Treatment-*baseline* equilibrium**

If we initially ignore any upper limit \( d \) on donations, the individual’s problem in treatment *baseline* is

\[
\max_d V^b(d) = tb(d) - d \quad \text{s.t.} \quad d \geq 0,
\]

with Kuhn-Tucker condition

\[
\frac{dV^b}{dd} = tb'(d) - 1 \leq 0, \quad \text{if } <, \ d = 0. \tag{A3}
\]

The solution has \( d^b(t) = 0 \) for \( t \leq 1/b'(0) \), and \( d^b(t) > 0 \), given by \( tb'(d) - 1 = 0 \) (implying \( d^b(t) > 0 \)), for \( t > 1/b'(0) \).

If an upper limit \( \bar{d} \) on donations applies, this limit will bind on individuals with \( t > 1/b'(\bar{d}) \), for whom

\[
\frac{dV^b}{dd} \bigg|_{d=\bar{d}} = tb'(\bar{d}) - 1 \geq 0.
\]

**Step 2: Treatment-*pray* equilibrium**

If we initially ignore any upper limit \( \bar{d} \) on donations, the treatment *pray* problem can be recast as that of choosing overall support \( s = p + d \) to solve

\[
\max_s V^s(s) = tb(s) - \bar{c}(s) \quad \text{s.t.} \quad s \geq 0, \tag{A4}
\]
where \( \tilde{c}(s) \) is the solution to problem

\[
\min_{p,d} c(p) + d \quad \text{s.t.} \quad p \geq 0, d \geq 0, s = p + d. \quad (A5)
\]

Two parametric cases must then be distinguished.

**Case 1.** If \( c'(0) \geq 1 \), we have that \( \tilde{c}(s) = s \) for all \( s \). It is then never optimal to pray, since any desired level of support \( s \) can be achieved more cheaply through donations. It follows that individuals with \( t > 1/b'(0) \) choose \( s(t) > 0 \) given by \( tb'(s) - 1 = 0 \).

**Case 2.** If, \( c'(0) < 1 \), then critical prayer level \( p^c \) defined by \( c'(p^c) = 1 \) becomes important. We then have that

\[
\tilde{c}(s) = \begin{cases} 
    c(s) & \text{for } s = p \leq p^c \\
    c(p^c) + s - p^c & \text{for } s = p^c + d > p^c.
\end{cases}
\]

The solution has types \( t > c'(0)/b'(0) \) pray, since for them

\[
\left. \frac{dV^s}{ds} \right|_{s=0} = tb'(0) - c'(0) > 0,
\]

implying that provision of some support is optimal, and since initially the cheapest form of support is prayer. Only the subset of these individuals with \( t > 1/b'(p^c) \) donate in treatment *pray*, however, because for them

\[
\left. \frac{dV^s}{ds} \right|_{s=p^c} = tb'(p^c) - c'(p^c) = tb'(p^c) - 1 > 0. \quad (A6)
\]

All individuals in this subset choose optimal support \( s(t) \) given by \( tb'(s) - 1 = 0 \), with portion \( p^c \) of that support provided through prayer and remaining portion \( d^p(t) = s(t) - p^c \) provided through donations.

---

If an upper limit \( \overline{d} \) on donations applies, then \( \tilde{c}(s) \) becomes the solution to problem

\[
\min_{p,d} c(p) + d \quad \text{s.t.} \quad p \geq 0, d \geq 0, d \leq \overline{d}, s = p + d. \quad (A7)
\]

**Case 1.** If \( c'(0) \geq 1 \), the minimized cost of support becomes

\[
\tilde{c}(s) = \begin{cases} 
    s & \text{for } s = d \leq \overline{d} \\
    \overline{d} + c(s - \overline{d}) & \text{for } s = p + \overline{d} > \overline{d}.
\end{cases}
\]
Just as in treatment baseline, the upper limit binds for individuals with \( t \geq 1/b'(\bar{d}) \), for whom

\[
\frac{dV^s}{ds} \bigg|_{s=\bar{d}} = tb'(\bar{d}) - 1 \geq 0.
\]

Individuals with \( t > c'(0)/b'(\bar{d}) \) supplement their maximal donation with prayer, however, because for them

\[
\frac{dV^s}{ds} \bigg|_{s=\bar{d}} = tb'(\bar{d}) - c'(0) > 0,
\]

i.e., their optimal support exceeds what they can achieve through donating \( \bar{d} \) alone.

**Case 2.** If \( c'(0) < 1 \), the upper limit changes the minimized cost of support to

\[
\bar{c}(s) = \begin{cases} 
  c(s) & \text{for } s = p \leq p^c \\
  c(p^c) + s - p^c & \text{for } s = p^c + d \in (p^c, p^c + \bar{d}] \\
  c(s - \bar{d}) + \bar{d} & \text{for } s = p + \bar{d} > p^c + \bar{d}.
\end{cases}
\]

The upper limit then binds for individuals with \( t \geq 1/b'(p^c + \bar{d}) \), for whom

\[
\frac{dV^s}{ds} \bigg|_{s=p^c+\bar{d}} = tb'(p^c + \bar{d}) - 1 \geq 0.
\]

**Step 3: Comparison of donations**

To complete the proof, we must show that average donations are only weakly lower under treatment pray than under treatment baseline.

Consider first the case without any limit \( \bar{d} \) on donations. Step 2 showed that in this case, if \( c'(0) \geq 1 \), treatment-pray support is provided through donations alone. Moreover, since \( \bar{c}'(s) = 1 \), the treatment-pray problem (A4) reduces to the treatment-baseline problem (A2), implying that \( d^p(t) = d^b(t) \) for all \( t \). This establishes that average donations need not be lower under treatment pray than under treatment baseline.

In the other parametric case, however—\( c'(0) < 1 \)—average treatment-pray donations are strictly lower. To show this, it suffices to show that in this case \( d^p(t) \leq d^b(t) \) for all \( t \), with strict inequality over some range of \( t \). But Step 1 showed that \( d^b(t) > 0 \), given by \( tb'(d) - 1 = 0 \), for individuals with \( t > 1/b'(0) \), while Step 2 showed that \( d^p(t) > 0 \), equal to \( s(t) - p^c \) with \( s(t) \) given by \( tb'(s) - 1 = 0 \), only for the subset of these individuals with \( t > 1/b'(p^c) \). It follows that \( d^p(t) \leq d^b(t) \) for all \( t \), with strict inequality for \( t > 1/b'(0) \).
With an upper limit on donations, Step 2 showed that if $c'(0) \geq 1$, the limit binds for individuals with $t \geq 1/b'(\bar{d})$ in treatment *pray*, just as it does in treatment *baseline*. In treatment *pray*, the subset of such individuals with $t > c'(0)/b'(\bar{d})$ supplement their maximal donation with prayer, but prayer never cuts into baseline donations. Since therefore $d^p(t) = d^b(t)$ for all $t$, average treatment-*pray* donations equal average treatment-*baseline* ones. Step 2 showed that if $c'(0) < 1$, however, the upper limit binds only for individuals with $t \geq 1/b'(p^c + \bar{d})$. Individuals with $t \in (1/b'(0), 1/b'(p^c + \bar{d}))$ continue to donate strictly less in treatment *pray* than in treatment *baseline*, implying that treatment-*pray* donations are strictly lower on average.

---

**Proof of Proposition 2.**

Let variables $d^b$, $p$, $d^p$, etc., continue to denote solutions in the absence of reputation benefits, and use hats, so $\hat{d}^b$, $\hat{p}$, $\hat{d}^p$, etc., to denote the modified solutions when reputation benefits are present.

The proof proceeds in three steps:

Step 1: Derivation of the treatment-*baseline* equilibrium

Step 2: Derivation of the treatment-*pray* equilibrium

Step 3: Demonstration that Proposition 1 still applies.

In Steps 1 and 2, we derive the equilibria first without and then with a (binding) upper limit $\bar{d}$ on donations.

**Step 1: Treatment-*baseline* equilibrium**

In treatment *baseline*, with prosociality signaled through donations only and without any upper limit $\bar{d}$ on such donations, $\hat{d}^b(t)$ solves

$$\max_d V^b(d) = tb(d) - d + \rho \tau^b(d) \quad \text{s.t.} \quad d \geq 0.$$  

Under the assumptions of the model, following Mailath and von Thadden (2013), the solution is perfectly separating. Type $t = 0$ chooses $\hat{d}^b(0) = \hat{d}^b(0) = 0$, while types $t > 0$ choose $\hat{d}^b(t) > 0$ given by

$$\frac{dV^b}{d\bar{d}} = tb'(d) - 1 + \rho \tau^b(d) = 0. \quad (A8)$$
The equilibrium inference \( \tau^b(d) \) thereby solves differential equation

\[
\tau^b(t) = \frac{1 - \tau^b(d)b'(d)}{\rho}. \tag{A9}
\]

Note that this is just the first-order condition (A8) rearranged, after substituting equilibrium condition \( \tau^b(d) = t \), with initial value \( \tau^b(0) = 0 \) implied by sequential rationality. Inverting (A9) gives that \( \hat{d}^b(t) \) solves

\[
\hat{d}^b(t) = \frac{\rho}{1 - tb'(\hat{d}^b(t))}. \tag{A10}
\]

Because \( \tau^b(t) \) is strictly positive in equilibrium, the additional reputation benefit in (A8) implies that \( \hat{d}^b(t) > d^b(t) \) for all \( t > 0 \).

Suppose now that donations are subject to an upper limit \( \overline{d} \) low enough to bind in equilibrium. Let \( \hat{d}^b(t) \) continue to denote the optimal donation of type \( t \) in the then modified treatment-baseline equilibrium, and let \( \hat{d}^{bs}(t) \) denote the same type’s optimal donation derived above for the fully separating equilibrium without upper limit. The upper limit then binds, making full separation impossible, if \( \overline{d} < \hat{d}^{bs}(T) \). Instead, the equilibrium becomes either semi-separating or fully pooling.

To see this, let \( E_t \) denote the conditional expectation \( E(x|x \geq t) = \int_t^T t \, dF(t)/(1 - F(t)) \) given prior type distribution \( F \), so \( E_0 \) is the unconditional expectation of \( t \). Also let

\[
S(t) = \left[ tb(\hat{d}^{bs}(t)) - \hat{d}^{bs}(t) + \rho t \hat{d}^{bs}(t) \right] - \left[ t \rho \hat{d}(\hat{d}^{bs}(t)) \right] - \rho \hat{d}(\overline{d}) - \hat{d} + \rho E_t
\]

denote the utility gain to type \( t \) from separating by choosing donation \( \hat{d}^{bs}(t) \) rather than pooling on donation \( \overline{d} \), if pooling results in reputation \( E_t \). Finally, let \( \tilde{t} \) denote the critical type implicitly defined by \( \hat{d}^{bs}(\tilde{t}) = \overline{d} \), i.e., the type that would choose donation level \( \overline{d} \) in the fully separating equilibrium without upper limit.

Using that \( \tau^b(\hat{d}^{bs}(t)) = t \), we then have

(i) \( S(\tilde{t}) = \left[ \hat{t} b(\hat{d}^{bs}(\tilde{t})) - \hat{d}^{bs}(\tilde{t}) + \rho \hat{t} \right] - \left[ \hat{t} b(\overline{d}) - \overline{d} + \rho E_\tilde{t} \right] = \rho (\tilde{t} - E_\tilde{t}) < 0 \),

(ii) \( S'(t) = b(\hat{d}^{bs}(t)) - b(\overline{d}) - \rho \hat{d} E_t \right] < 0 \) for all \( t \leq \tilde{t} \)

(iii) \( S(0) = \overline{d} - \rho E_0 \geq 0 \),

where result (ii) uses the envelope theorem. By continuity of \( S(t) \), it follows that if \( \overline{d} > \rho E_0 \), so that \( S(0) > 0 > S(\tilde{t}) \), there is a unique threshold value \( \bar{t} \in (0, \tilde{t}) \) below which all types separate, choosing \( \hat{d}^b(t) = \hat{d}^{bs}(t) \), and above which all types pool, choosing \( \hat{d}^b(t) = \overline{d} \). If, however, \( \overline{d} \leq \rho E_0 \), then all types pool on \( \overline{d} \), so \( \bar{t} = 0 \).
Step 2: Treatment-pray equilibrium

In treatment pray, prosociality is signaled through the combination of prayers and donations, i.e., through the overall level of support, and \( \hat{s}(t) \) solves

\[
\max_s V^s = tb(s) - \bar{c}(s) + \rho \tau^s(s) \quad \text{s.t.} \quad s \geq 0.
\] (A11)

The solution is perfectly separating, with type \( t = 0 \) choosing \( \hat{s}(0) = s(0) = 0 \), while types \( t > 0 \) choose \( \hat{s}(t) > 0 \) given by

\[
\frac{dV^s}{ds} = tb'(s) - \bar{c}'(s) + \rho \tau^{st}(s) = 0.
\] (A12)

The equilibrium inference \( \tau^s(p) \) thereby solves differential equation

\[
\tau^{st}(s) = \frac{\bar{c}'(s) - \tau^s(s)b'(s)}{\rho}
\] (A13)

with initial value \( \tau^s(0) = 0 \). Equivalently, \( \hat{s}(t) \) solves

\[
\hat{s}'(t) = \frac{\rho}{\bar{c}'(\hat{s}(t)) - tb'(\hat{s}(t))}.
\] (A14)

If there is no upper limit \( \bar{d} \) on donations, \( \bar{c}(s) \) thereby solves (A5). If then \( c'(0) \geq 1 \), this solution has \( \bar{c}(s) = s \) and thus \( \bar{c}'(s) = 1 \): it is never optimal to pray, so support is provided entirely through donations. If \( c'(0) < 1 \), however, then donations are more expensive than prayer up to support level \( p^c \): we have

\[
\bar{c}(s) = \begin{cases} 
  c(s) & \text{for } s = p \leq p^c \\
  c(p^c) + s - p^c & \text{for } s = p^c + d > p^c.
\end{cases}
\]

Consider then critical value \( t^c > 0 \) defined by \( \hat{s}(t^c) = p^c \), where \( \hat{s}(t) \) solves (A14) with \( \bar{c}'(\hat{s}(t)) = c'(\hat{s}(t)) \). Types \( t \in (0, t^c] \) will provide support purely through prayer, while types \( t > t^c \) add in donations equal to \( d^p(t) = \hat{s}(t) - p^c \).

If donations are subject to an upper limit \( \bar{d} \) low enough to bind in equilibrium, \( \bar{c}(s) \) solves (A7). If \( c'(0) \geq 1 \), this solution has

\[
\bar{c}(s) = \begin{cases} 
  s & \text{for } s = d \leq \bar{d} \\
  \bar{d} + c(s - \bar{d}) & \text{for } s = p + \bar{d} > \bar{d}.
\end{cases}
\]
As a result, the upper limit $\bar{d}$ on donations kicks in for types $t$ at or above critical value $\tilde{t} > 0$ defined by $\hat{s}(\tilde{t}) = \bar{d}$. These types continue to separate, however, by adding on prayer $\hat{p}(t) = \hat{s}(t) - \bar{d}$.

If $c'(0) < 1$, the solution to (A7) has

$$\bar{c}(s) = \begin{cases} c(s) & \text{for } s = p \leq p^c \\ c(p^c) + s - p^c & \text{for } s = p^c + d \in (p^c, p^c + \bar{d}] \\ c(s - \bar{d}) + \bar{d} & \text{for } s = p + \bar{d} > p^c + \bar{d}. \end{cases}$$

The upper limit $\bar{d}$ on donations then binds on types $t$ at or above critical value $\tilde{t} > 0$ defined by $\hat{s}(\tilde{t}) = p^c + \bar{d}$, and these types continue to separate by adding on prayer $\hat{p}(t) = \hat{s}(t) - \bar{d}$ beyond critical value $p^c$.

**Step 3: Proposition 1 still applies**

We are to show that average donations are only weakly lower under treatment $pray$ than under treatment $baseline$.

Step 2 showed that if $c'(0) \geq 1$ without a binding upper limit $\bar{d}$, treatment-$pray$ support is provided entirely through donations. Moreover, since $\bar{c}'(s) = 1$, differential equation (A14) determining $\hat{s}(t) = \hat{d}^p(t)$ is identical to differential equation (A10) determining $\hat{d}^b(t)$, implying that $\hat{d}^p(t) = \hat{d}^b(t)$ for all $t$. This establishes that average donations need not be lower under treatment $pray$ than under treatment $baseline$.

In the three other possible cases, however—$c'(0) \geq 1$ with a binding limit $\bar{d}$, and $c'(0) < 1$ either without or with a binding limit—average donations are strictly lower under treatment $pray$. To show this, it suffices to show that in these cases $\hat{d}^p(t) \leq \hat{d}^b(t)$ for all $t$, with strict inequality over some range of $t$.

Step 2 showed that if $c'(0) \geq 1$ with a binding upper limit $\bar{d}$, support in treatment $pray$ is still provided entirely through donations for types $t \in (0, \tilde{t})$, but types $t \geq \tilde{t}$ add on prayer, because limit $\bar{d}$ kicks in. Meanwhile, Step 1 showed that in treatment $baseline$, a binding upper limit $\bar{d}$ induces pooling on $\bar{d}$ by types $t \geq \bar{t}$, where $\bar{t} < \tilde{t}$. The upshot is that average donations under treatment $pray$ fall below those under treatment $baseline$ by amount

$$\int_{\bar{t}}^{\tilde{t}} (\bar{d} - \hat{d}^b(t)) f(t) \, dt > 0.$$
For the case where \( c'(0) < 1 \) without binding \( \overline{d} \), Step 4 showed that \( \hat{d}^p(t) = 0 \) for \( t \in [0, t^c] \). For types \( t \geq t^c \), however, additional support is provided through donations in treatment \( \text{pray} \), with the same marginal cost as donations in treatment \( \text{baseline} \). As a result, for these types both treatment-\( \text{baseline} \) donations \( \hat{d}^b(t) \) and treatment-\( \text{pray} \) overall support \( \hat{s}(t) \) follow the same differential equation—(A10) or, equivalently, (A14) with \( c'(-\hat{s}(t)) = 1 \)—but do so with different starting values: \( \hat{d}^b(t^c) < \hat{s}(t^c) = p^c \).

The latter inequality follows because \( \hat{d}^b(t) < \hat{s}(t) \) for all \( t \in (0, t^c] \). This is not immediate from comparing (A10) and (A14) with \( c'(-\hat{s}(t)) = c'(-\hat{s}(t)) \), but is implied by the following argument (adapted from Andreoni and Bernheim, 2009). First, \( \hat{d}^{bt}(0) = \rho < \rho/c'(0) = \hat{s}'(0) \), so the inequality holds close to \( t = 0 \). Suppose now, toward a contradiction, that \( \hat{d}^b(t) = \hat{s}(t) \) for some \( t \in (0, t^c] \), and let \( t' \) be the lowest such \( t \). Since \( \hat{d}^b(t') = \hat{s}(t') \) implies that \( \hat{d}^{bt}(t') = \rho/(1 - \rho)(\hat{d}^b(t')) < \rho/c'(\hat{s}(t')) = \hat{s}'(t') \) and since \( \hat{d}^{bt}(t) \) and \( \hat{s}'(t) \) are continuous, some interval \([t'', t']\) must exist over which \( \hat{d}^{bt}(t) < \hat{s}'(t) \). But then \( \hat{d}^b(t'') = \hat{d}^b(t') - \int_{t''}^{t''} \hat{d}^{bt}(t) \, dt > \hat{s}(t'') - \int_{t''}^{t'} \hat{s}'(t) \, dt = \hat{s}(t''), \) a contradiction.

Since identical differential equations with different starting values cannot cross, it follows that \( \hat{d}^b(t) < \hat{s}(t) \) for all \( t \). This in turn implies, from comparing (A10) to (A14) with \( c'(-\hat{s}(t)) = 1 \) but \( \hat{d}^b(t) < \hat{s}(t) \), that \( \hat{d}^{bt}(t) > \hat{s}'(t) \) for all \( t > t^c \). But then, since \( \hat{d}^p(t) = \hat{s}(t) - p^c \) for all such \( t \), and therefore \( \hat{d}^{pt}(t) = \hat{s}'(t) \), it follows that \( \hat{d}^p(t) < \hat{d}^b(t) \) for all \( t > t^c \) as well, with in fact the gap \( \hat{d}^b(t) - \hat{d}^p(t) \) widening with increasing \( t \) from its initial value \( p^c \) at \( t^c \).

Lastly, for the case where \( c'(0) < 1 \) with binding \( \overline{d} \), Step 2 showed that in treatment \( \text{pray} \), the limit binds on types \( t \) at or above critical value \( \overline{\ell} > 0 \) defined by \( \hat{s}(\overline{\ell}) = p^c + \overline{d} \). Step 1 meanwhile introduced critical value \( \overline{\ell} > 0 \) defined by \( \hat{d}^b(\overline{\ell}) = \overline{d} \). Recall also that, in the absence of the limit, \( \hat{d}^p(t) < \hat{d}^b(t) \) for all \( t \), with both functions continuous and strictly increasing. Combining this with \( \hat{d}^p(\overline{\ell}) = \overline{d} \) then yields the implication that \( \overline{\ell} > \overline{\ell} \). Recall further from Step 1 that for types \( t \in [\overline{\ell}, \overline{\ell}] \), the donation limit in fact causes treatment-\( \text{baseline} \) donations to increase, from \( \hat{d}^b(t) \) to \( \overline{d} \), because of pooling. It follows that the limit shrinks the range of types for which \( \hat{d}^p(t) < \hat{d}^b(t) \) from \( (0, \overline{T}] \) to \( (0, \overline{\ell}] \), but does not make this range disappear, regardless of how low \( \overline{d} \) is.
Appendix B. Application of the model to Thunström’s (2020) setting

In this appendix, we apply the model of Section 3 to the different setting of Thunström (2020). We show that the model is consistent with the pattern of findings across Thunström’s three experiments and our own experiment, precisely when (as is true in all four experiments) participants do not perceive thoughts to be all that effective in terms of actually helping victims.

In Thunström’s (2020) experiments, participants were asked how much of an initial endowment of \( x \) dollars, or \( \bar{d} = xe_{d} \) “effective” dollars, they wished to donate to the Red Cross in order to help hurricane victims. In the experiments’ treatment baseline, this was all they were asked. Ignoring for the moment that the upper bound \( d \) on donations might bind, participants therefore faced problem

\[
\max_{d} U(0, d) = tb(d) - d \quad \text{s.t.} \quad d \geq 0. \tag{B15}
\]

Participants in treatment pray, in contrast, were in a first stage of the experiment asked to pray for the victims, without advance notice that they would subsequently, in a second stage, be asked to donate. In that first stage, these participants therefore faced problem

\[
\max_{p} U(p, 0) = tb(p) - c(p) \quad \text{s.t.} \quad p \geq 0 \tag{B16}
\]

and in the second stage, problem

\[
\max_{d} U(p, d) = tb(p + d) - c(p) - d \quad \text{s.t.} \quad d \geq 0, \tag{B17}
\]

with \( p \) at that point predetermined.

Thunström’s main finding was that average donations in treatment pray were significantly lower than donations in treatment baseline, which raises the question whether calls by politicians and religious leaders for “thoughts and prayers” following major disasters might negatively affect donations.

As noted in the text, the external validity of Thunström’s finding seems limited. In real-world settings, when citizens are called on to send thoughts and prayers, they do not usually consider whether to answer such calls in isolation, independent from a subsequent decision to donate. Rather, during the days or weeks that the disaster is in the news, they usually face calls for thoughts and prayers as well as donations all at the same time, from a variety of sources. It seems more reasonable,
then, to model their problem as that of choosing both prayer and donations simultaneously, as we do in the text, and to compare that to a hypothetical situation with calls for donations only.

This seemingly minor difference turns out to make a potentially large difference to the model’s predictions, both qualitatively and quantitatively. Comparing the sequential- and simultaneous-choice settings, we obtain the following results:

**Proposition B1.**

(a) If donations are not subject to a binding upper limit, then average treatment-pray donations are strictly lower than average treatment-baseline donations

(b) If donations are subject to a binding upper limit, then average treatment-pray donations may become equal to average treatment-baseline donations if the limit is sufficiently low.

Before presenting the proof, we first discuss the intuition for both results.

Result (a) follows because, with sequential choice, individuals in stage 2 of treatment pray face the same marginal cost of donations as in treatment baseline. If they have already prayed a positive amount in stage 1, however, they get a lower marginal benefit: the assumed strict concavity of \( b(\cdot) \) implies that \( tb'(p + d) < tb'(d) \). In fact, it is immediate from comparing the first-order conditions for problems (B15) and (B17) that any individuals who donate at all choose the same optimal level of overall support \( s(t) \) in both treatments, given by \( tb'(s) - 1 = 0 \). Whereas they provide that support entirely through donations in treatment baseline, however, they may provide it through a mix of prayer and donations in treatment pray.

Result (b) follows because, if the upper limit \( \bar{d} \) on donations is low and costs of prayer relatively high, all individuals prosocial enough to incur that high cost in stage 1 of treatment pray may in stage 2 have high desired support level \( s^*(t) > p + \bar{d} \), and thus donate at the upper limit. But since then \( s^*(t) > \bar{d} \) also, these same individuals donate at the upper limit in treatment baseline as well. Meanwhile, individuals not prosocial enough to pray in stage 1 of treatment pray obviously donate the same amount in both treatment baseline and treatment pray also, implying that average donations overall are the same.

This second result is interesting in light of two findings of Thunström’s that at first blush seem puzzling, namely that (i) thoughts do not crowd out donations in her sequential-choice setting, even though they do in our simultaneous-choice setting, and (ii) neither prayers nor thoughts crowd out donations in her experiment 3, which lowered the donation limit from $5 to $0.50. Although
Thunström treats the second finding as anomalous, and suggests that different mechanisms might come into play when donations are small, the results of all three experiments are in fact consistent with the model presented in this paper.

As we show in the proof below, the precise bound on \( \tilde{d} \) below which crowding out disappears in Thunström’s setting is implicitly defined by \( c'(0)/b'(0) = 1/b'(\tilde{d}) \), and is therefore increasing in \( c'(0) \). Because \( c'(0) \) is in turn the marginal cost of the first “effective” unit of support provided through a gesture, \( c'(0) \) is higher, the less effective the gesture is perceived to be, i.e., the lower the perceived-effectiveness parameter \( e_p \) in the underlying model. Combining these two effects implies that the critical, “too low” level of \( \tilde{d} \) declines with \( e_p \). It is possible therefore that for prayers, with relatively high \( e_p \), a limit of $0.50 is “too low,” but a limit of $5 is not—consistent with Thunström’s finding of crowding out from prayer in her experiments 1 and 2, but not in 3. At the same time, it is possible that for thoughts, with relatively low \( e_p \), even a limit of $5 is “too low”—consistent with Thunström’s finding of no crowding out from thoughts in either of her experiments 1 and 3.\(^ {32} \)

Proof of Proposition B1.

Because treatment baseline is identical in Thunström’s setting and ours, the proof proceeds in the following three steps:

Step 1: Derivation of the treatment-pray equilibrium

Step 2: Comparison of treatment-baseline and treatment-pray donations without a binding limit on donations

Step 3: Comparison of treatment-baseline and treatment-pray donations with a binding limit on donations

\(^ {32} \) It should be noted that the absence of crowding out from thoughts in Thunström’s study may at least in part be due to framing. Because Thunström’s experiment was about a sequential, moral-licensing effect, she purposely in stage 1 did not tell treatment-think and treatment-pray participants of a subsequent, stage-2 donation request. The prompt in treatment think was simply

We now kindly ask you to please take a moment to think about the hurricane Harvey flooding victims.

while that in treatment pray was

We now kindly ask you to please take a moment and pray for the hurricane Harvey flooding victims, if you feel comfortable doing so.

Note that the treatment-think prompt did not frame “thinking about” as supportive in the manner of our current study, either explicitly or, by mentioning it in the same breath as donations, implicitly. Participants may therefore have interpreted the prompt to think as an attempt to enhance the salience of the victims’ plight. This would be consistent with the slight (albeit not statistically significant) increase in their subsequent donations relative to treatment baseline.
Step 1: Treatment-pray equilibrium with sequential choice

In stage 1 of treatment pray with sequential choice, the individual faces problem
\[
\max_p V^p(p) = tb(p) - c(p) \quad \text{s.t.} \quad p \geq 0,
\]
with Kuhn-Tucker condition
\[
\frac{dV^p}{dp} = tb'(0) - c'(0) \leq 0, \quad \text{if } <, \ p = 0. \tag{B18}
\]
The solution has \( p(t) = 0 \) for \( t \leq c'(0)/b'(0) \) and \( p(t) > 0 \) otherwise, with \( p'(t) > 0 \).

In stage 2, if we initially ignore any upper limit \( \bar{d} \) on donations, the individual’s problem of how much to donate on top of stage 1 prayer can be recast as choosing overall support \( s \) so as to solve
\[
\max_s V^s(s) = tb(s) - s \quad \text{s.t.} \quad s \geq p(t).
\]
Thus recast, the problem of whether to donate in stage two becomes that of whether to choose a support level in excess of \( p(t) \). Doing so is optimal if
\[
\left. \frac{dV^s}{ds} \right|_{s=p(t)} = tb'(p(t)) - 1 > 0, \tag{B19}
\]
where \( p(t) \) is given by (B18).

Two parametric cases must then be distinguished.

Case 1. If \( c'(0) \geq 1 \), so also \( c'(0)/b'(0) \geq 1/b'(0) \), then condition (B19) reduces to \( t > 1/b'(0) \).
To see this, note that the condition fails for \( t \leq 1/b'(0) \) because from (B18), \( p(t) \) is zero for all \( t \leq c'(0)/b'(0) \), and so \( tb'(p(t)) - 1 = tb'(0) - 1 \leq 0 \). The condition holds, however, for \( t \in (1/b'(0), c'(0)/b'(0)] \), because for all such \( t \), \( p(t) \) is zero also, and so \( tb'(p(t)) - 1 = tb'(0) - 1 > 0 \). Moreover, since \( tb'(p(t)) \) is easily shown to strictly increase in \( t \), the condition must then hold for \( t > c'(0)/b'(0) \) as well, where \( p(t) \) is positive.

Case 2. If \( c'(0) < 1 \), so also \( c'(0)/b'(0) < 1/b'(0) \), then condition (B19) reduces to \( t > 1/b'(p^c) \), where \( p^c \) is implicitly defined by \( c'(p^c) = 1 \). To see this, note that the condition fails for \( t \leq c'(0)/b'(0) \), because from (B18), \( p(t) \) is zero for all such \( t \), and so \( tb'(p(t)) - 1 = tb'(0) - 1 < 0 \). It fails also for \( t \in (c'(0)/b'(0), 1/b'(p^c)] \), because from (B18), \( p(t) \) is positive and given by \( tb'(p) - c'(p) = 0 \)

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for all such \( t \), and so \( tb'(p(t)) - 1 = c'(p(t)) - 1 \leq 0 \). The condition holds for all \( t > 1/b'(p^c) \), however, because for all such \( t \), \( p(t) \) is positive and given by \( tb'(p) - c'(p) = 0 \) also, and so \( tb'(p(t)) - 1 = c'(p(t)) - 1 > 0 \).

In either parametric case, any types that do donate choose optimal support \( s(t) \) given by \( tb'(s) - 1 \), with portion \( p(t) \) of that support provided through prayer and remainder \( d^p(t) = s(t) - p(t) \) provided through donations.

The same parametric cases matter also if an upper limit \( \bar{d} \) on donations applies. This limit will bind if

\[
\left. \frac{dV}{ds} \right|_{s=p(t)+\bar{d}} = tb'(p(t) + \bar{d}) - 1 \geq 0. \tag{B20}
\]

It can be shown (by example) that, contrary to the term \( tb'(p(t)) \) in (B19), the term \( tb'(p(t) + \bar{d}) \) in this condition need not be monotonic in \( t \). As a result, the condition may, depending on the precise shapes of the \( b(\cdot) \) and \( c(\cdot) \) functions, hold or fail to hold over multiple alternate intervals of \( t \).

**Case 1.** If then \( c'(0) \geq 1 \), so types \( t > 1/b'(0) \) donate and \( p(t) = 0 \) for the subset of donors with \( t \in (1/b'(0), c'(0)/b'(0)] \), all we can say in general is that the infimum of the set of individuals (if any) on which the upper limit \( \bar{d} \) binds—i.e., individuals for whom, from (B20), \( t \geq 1/b'(p(t) + \bar{d}) \)—must weakly exceed critical value \( t = 1/b'(\bar{d}) \).

**Case 2.** If, \( c'(0) < 1 \), however, so \( p(t) > p^c \) for all individuals with \( t > 1/b'(p^c) \) that donate, the infimum must strictly exceed critical value \( t = 1/b'(p^c + \bar{d}) \).

**Step 2: Comparison of unlimited donations across treatments**

To complete the proof of result B1(a), we must show that if donations are not subject to a binding upper limit \( \bar{d} \), average donations are strictly lower under treatment pray than under treatment baseline. A sufficient condition for this to be the case is that \( d^p(t) \leq d^b(t) \) for all \( t \), with strict inequality over some range of \( t \).

Step 1 in the proof of Proposition 1, in Appendix A, showed that \( d^b(t) > 0 \), given by \( tb'(d) - 1 = 0 \), for \( t > 1/b'(0) \). Step 1 above showed that \( d^p(t) = s(t) - p(t) \), with \( s(t) \) given by \( tb'(s) - 1 = 0 \), for the same range of \( t \). It follows that \( d^p(t) \leq d^b(t) \) for all \( t \), with strict inequality for any \( t > 1/b'(0) \) at which \( p(t) > 0 \). Step 1 above showed that \( p(t) > 0 \) for \( t > c'(0)/b'(0) \), so \( d^p(t) < d^b(t) \) for \( t > \max\{1/b'(0), c'(0)/b'(0)\} \).

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Step 3: Comparison of limited donations across treatments

To complete the proof of result B1(b), we must show that if donations are subject to a binding limit, average treatment-pray donations may become equal to average treatment-baseline donations if the limit is sufficiently low.

Step 1 in the proof of Proposition 1, in Appendix A, showed that in treatment baseline, individuals with \( t > 1/b'(0) \) donate, and any upper limit on donations binds on individuals with \( t \geq 1/b'(d) \). Step 1 above showed that in treatment pray with sequential choice, if \( c'(0) \geq 1 \), individuals with \( t > 1/b'(0) \) donate, individuals with \( t > c'(0)/b'(0) \) also pray, and the infimum of the set of individuals (if any) on which the upper limit on donations binds must weakly exceed \( t = 1/b'(d) \).

If then \( d \) is sufficiently high to have \( c'(0)/b'(0) < 1/b'(d) \), individuals with \( t \in (c'(0)/b'(0), 1/b'(d)) \) are still guaranteed to have \( d^p(t) < d^b(t) \), because their prayer will cut into their baseline donations. But if \( d \) is so low that \( c'(0)/b'(0) \geq 1/b'(d) \), the guarantee disappears; there may then be no individuals at all for whom \( d^p(t) < d^b(t) \), because all individuals prosocial enough to pray are also prosocial enough to donate at the upper limit, just like they would in treatment baseline. A simple example where \( d \) is “too low” in this sense is when \( b(s) = 1 - e^{-s} \), \( c(p) = e(e^p - 1) \), and \( d \leq 1 \). In this case, \( p(t) = \max\{0, \frac{1}{2}[\log(t) - 1]\} > 0 \) for \( t > c'(0)/b'(0) = e \), but for all such \( t \), \( d^p(t) = \max\{0, \min\{\frac{1}{2}[\log(t) + 1], d\}\} = d = \max\{0, \min(\log(t), d)\} = d^b(t) \). As a result, treatment-pray donations are identical to treatment-baseline donations for all \( t \). Treatment-pray donations would for \( t \in (e, e^d) \) be lower, however, were \( d \) raised above 1.

It can be shown (the proof is available upon request) that even in cases where the simultaneous-choice inequality is strict, the drop in average donations is smaller than it is with sequential choice. Moreover, this comparative result holds also if reputation benefits play a role in the manner of subsection 3.3, i.e., if individuals get an additional benefit from signaling prosociality.
### Table C1. Summary statistics: Treatments Baseline and Think, religious participants

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<tr>
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<tr>
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Table C2. Summary statistics: Treatment Pray, religious participants

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Table C3. Summary statistics: Treatments Baseline and Think, non-religious participants

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Appendix D. Normalized differences in means

To examine if the randomization of participants across treatments was sufficiently successful, we follow Imbens and Rubin (2015) and calculate normalized differences in means (NDM) across pairs of treatments, for variables that we believe could be diagnostic for our two outcome variables (activity choices and donation amounts). Results are shown in the tables below. Given that we randomized religious and non-religious participants separately across treatments, we perform the analysis on each of these groups separately.

We base our selection of variables on participant characteristics or attitudes known to affect either general altruism or beliefs about the direct helpfulness of thoughts or prayers. We err on the side of inclusiveness when selecting those variables.

The covariates that could be expected to affect our outcome variables differ across religious and non-religious participants. Religious denomination might matter for both activity choices and donations, as suggested by the literature examining how religion may affect prosocial behavior (reviewed in subsection 2.3 of the text). It may matter, therefore, whether our religious participants are Catholic or Protestant, and whether our non-religious participants identify as Atheist or Agnostic. For religious participants, level of religiosity (Frequency attending religious services; Frequency pray) may matter also, as may expected benefits from prayers (EBI prayers).

In treatment think, expected benefits from thoughts (EBI thoughts) may affect outcomes for both religious and non-religious participants. Women (Female) and men may differ in their relationship to their faith, and may differ in general altruism, as suggested by a range of studies (see, e.g., the meta-analysis of dictator game outcomes by Engel, 2011). Income may matter for both activity choices and donations. Participants who donated to hurricane Dorian victims before participating in our study (Previously donated) may be less inclined to donate as part of our study, and participants who have been a victim (Been victim) of a natural catastrophe may be expected to donate more (Small and Simonsohn, 2008). People who feel more empathy towards the victims (Feelings scale) may donate more also (Small et al., 2007).

Imbens and Rubin’s (2015) rule of thumb for when a difference is “large” (i.e., should be considered in the analysis of treatment effects) is that NDM > |0.25|. As shown in the tables below, we find no large differences in potentially diagnostic variables across any treatments, for either
religious or non-religious participants. We conclude that our samples are sufficiently balanced across treatments.

Table D1. Normalized differences: Treatment Baseline vs. Think, religious participants

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<td>Variance</td>
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<td>4.303</td>
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<td>0.724</td>
</tr>
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<td>56.891</td>
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<td>0.252</td>
<td>0.435</td>
<td>0.190</td>
<td>0.263</td>
</tr>
<tr>
<td>Been victim</td>
<td>0.325</td>
<td>0.470</td>
<td>0.221</td>
<td>0.404</td>
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<tr>
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Table D2. Normalized differences: Treatment Baseline vs. Pray, religious participants

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### Table D4. Normalized differences: Treatment Baseline vs. Think, non-religious participants

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</table>
Welcome to our study,

You have been invited to participate in a study on economic decision making. You must be at least 18 years of age to participate. If you agree to participate in this study you will be asked to make economic decisions in the study. You will also be asked to respond to a short survey. Your participation may last up to 10 min. There are minimal risks involved with participating in this study that do not go beyond those of everyday life. Participation in this study is voluntary. Apart from the payment from your panel provider, you may earn up to $5 in additional panel currency from participating in this study, depending on the economic decisions you make. You may refuse to participate or withdraw at any time, without penalty or loss of benefits to which you are otherwise entitled. No personal identifiers will be collected in this study. Each person is assigned an identification number that cannot be linked to their identity. The data collected in this study will be stored on a password protected computer in Dr XXXX’s office and only the researchers stated above will have access to all the data.

Please undertake the study in private, keeping distractions to a minimum (phone, computer, TV, etc.). If you have questions about the study, please contact any of the participants in the research group.

Researcher contact information:

XXXX

Please indicate below if you consent to participating in this study.

- [ ] Yes, I consent.
- [ ] No, I do not consent.

General instructions

You are given $5 in additional panel currency for participating in this study. Your final earnings from this study (between $0 and $5, in additional panel currency) will depend on your decisions in the study.
What is your gender?
- Male
- Female

What is your age?
- 15 to 19 years ...
- 90 years or over

What is your religious preference?
- Jewish
- Muslim
- Mormon
- Protestant
- Catholic
- Buddhist
- Hindu
- None -- I identify with atheism
- None -- I identify with agnosticism
- Other

Do you believe in God?
- Yes
- No
- I am not sure

How often do you buy organic food products?
- At least once a week
- Less than once a week
- Less than once a month
People differ in how they feel about spending money. Please answer the questions below about how you feel spending money. Which of the following description fits you better?

- 1: "Tightwad" (difficulty spending money)
- 2
- 3
- 4
- 5
- 6: About the same or neither
- 7
- 8
- 9
- 10
- 11: "Spendthrift" (difficulty controlling spending)

What is your individual annual, pre-tax, income (including bonuses and commissions) in U.S. dollars?

- $0 - $25,000
- $25,001 - $50,000
- $50,001 - $75,000
- $75,001 - $100,000
- $100,001 - $125,000
- $125,001+

What is your highest level of education?

- Less than high school
- High school
- Professional degree
- Some college
- College degree

End of Block: Top block, background and screening questions
Hurricane Dorian made landfall as a deadly Category 5 hurricane on September 1, killing at least 44 people and causing major devastation throughout the Bahamas.

Daniella Silva and Mariana Henninger (September, 2019, NBC news) describe the impact of hurricane Dorian:

"On the island of Great Abaco, wrecked boats and flipped-over cars were strewn across streets of completely flattened houses, crushed businesses and mangled playgrounds. Downed power lines and the frames of buildings lined the sides of the roads. Some cars were impaled by flying pieces of wood and steel. The smell of death was in the air.

The catastrophic Category 5 storm pummeled the islands with sustained winds of 185 mph, storm surges and torrential rain in a sustained two-day assault. At least 44 people were killed during the storm, the country's health minister said Sunday night, but with many others still reported missing, that number is feared to dramatically rise. Most deaths were here in the Abaco Islands, which were home to some 17,000 people."

Similarly, journalists Patrick Oppmann, Jaide Timm-Garcia and Jose Arnijo (September, 2019, CNN) report the following from the Bahamas:

"At least 45 people are dead, hundreds are missing and some 70,000 are homeless. There is no power or running water. Aid is arriving slowly on the island of Grand Bahama, where Dorian parked for almost two days and caused damage one usually witnesses in a war zone."

"It's impossible to fully capture the devastation we see every day. We're only about 80 miles from Florida, but the miles of rubble Dorian left in its wake have made this part of the Bahamas feel as remote as any place on Earth."
You are now offered to donate to help those affected by the devastation caused by hurricane Dorian, via the Red Cross. The amount you donate will be subtracted from your compensation for participating in this study. You can choose to donate any amount between $0.00 (i.e. no donation) and $5.00 (your entire additional compensation for participating in this study). Please state any donation to the hurricane Dorian victims you would like to make here:
As part of this study, you are offered to undertake an activity in support of the victims of hurricane Dorian in the Bahamas. If you choose an activity that entails donating money, the amount you donate will be subtracted from your $5 additional compensation for participating in this study. If you do not want to undertake any activity, just choose to make a monetary donation at $0. Please select your preferred activity below:

- Take a moment to think of the hurricane Dorian victims
- Take a moment to think of the hurricane Dorian victims + make a monetary donation to the victims ($0-$5) via the Red Cross
- Make a monetary donation to the hurricane Dorian victims ($0-$5) via the Red Cross

We now kindly ask you to please take a moment to think about the hurricane Dorian victims in the Bahamas. Please let us know if you took a moment to think about the hurricane Dorian victims.

- I did think about the hurricane Dorian victims.
- I did not think about the hurricane Dorian victims.

You are now offered to donate to help those affected by the devastation caused by hurricane Dorian, via the Red Cross. The amount you donate will be subtracted from your compensation for participating in this study. You can choose to donate any amount between $0.00 (i.e. no donation) and $5.00 (your entire additional compensation for participating in this study). Please state any donation to the hurricane Dorian victims you would like to make here:

__________________________________________________________________________

End of Block: Donate directly
[If chose to take a moment to think and make a donation]

Start of Block: Chose to think + donate

We now kindly ask you to please take a moment to think about the hurricane Dorian victims in the Bahamas.

Please let us know if you took a moment to think about the hurricane Dorian victims.

- I did think about the hurricane Dorian victims.
- I did not think about the hurricane Dorian victims.

You are now offered to donate to help those affected by the devastation caused by hurricane Dorian, via the Red Cross.

The amount you donate will be subtracted from your compensation for participating in this study. You can choose to donate any amount between $0.00 (i.e. no donation) and $5.00 (your entire additional compensation for participating in this study). Please state any donation to the hurricane Dorian victims you would like to make here:

__________________________________________________________

End of Block: Chose to think + donate
As part of this study, you are offered to undertake an activity in support of the victims of hurricane Dorian. If you choose an activity that entails donating money, the amount you donate will be subtracted from your $5 additional compensation for participating in this study. If you do not want to undertake any activity, just choose to make a monetary donation at $0. Please select your preferred activity below:

- Take a moment to pray for the hurricane Dorian victims
- Take a moment to pray for the hurricane Dorian victims + make a monetary donation to the victims ($0-$5) via the Red Cross
- Make a monetary donation to the hurricane Dorian victims ($0-$5) via the Red Cross

---

If chose to take a moment to pray only

We now kindly ask you to please take a moment and pray for the hurricane Dorian victims, if you feel comfortable doing so.

---

Page Break

Please let us know if you prayed for the hurricane Dorian victims.

- I did pray for the hurricane Dorian victims.
- I did not pray for the hurricane Dorian victims, since I did not feel comfortable doing so.

---

If chose to make a donation only

You are now offered to donate to help those affected by the devastation caused by hurricane Dorian, via the Red Cross. The amount you donate will be subtracted from your compensation for participating in this study. You can choose to donate any amount between $0.00 (i.e. no donation) and $5.00 (your entire additional compensation for participating in this study). Please state any donation to the hurricane Dorian victims you would like to make here:
We now kindly ask you to please take a moment and pray for the hurricane Dorian victims in the Bahamas, if you feel comfortable doing so.

Please let us know if you prayed for the hurricane Dorian victims.

- I did pray for the hurricane Dorian victims.
- I did not pray for the hurricane Dorian victims, since I did not feel comfortable doing so.

You are now offered to donate to help those affected by the devastation caused by hurricane Dorian, via the Red Cross.

The amount you donate will be subtracted from your compensation for participating in this study. You can choose to donate any amount between $0.00 (i.e. no donation) and $5.00 (your entire additional compensation for participating in this study). Please state any donation to the hurricane Dorian victims you would like to make here:

________________________________________________________________

[END OF TREATMENTS]
<table>
<thead>
<tr>
<th>Question</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>How upsetting is the situation of the hurricane victims at Bahamas to</td>
<td>Not at all</td>
</tr>
<tr>
<td>you?</td>
<td></td>
</tr>
<tr>
<td>How sympathetic did you feel while reading about the situation of the</td>
<td></td>
</tr>
<tr>
<td>hurricane victims at Bahamas?</td>
<td></td>
</tr>
<tr>
<td>How much do you feel it is your moral responsibility to help out the</td>
<td></td>
</tr>
<tr>
<td>hurricane victims at Bahamas?</td>
<td></td>
</tr>
<tr>
<td>How touched were you by the situation described of the hurricane victims</td>
<td></td>
</tr>
<tr>
<td>at Bahamas?</td>
<td></td>
</tr>
<tr>
<td>To what extent do you feel that it is appropriate to give money to aid</td>
<td></td>
</tr>
<tr>
<td>the situation of the hurricane victims at Bahamas?</td>
<td></td>
</tr>
<tr>
<td>To what extent do you feel that it is appropriate to send thoughts to</td>
<td></td>
</tr>
<tr>
<td>aid the situation of the hurricane victims at Bahamas?</td>
<td></td>
</tr>
<tr>
<td>To what extent do you feel that it is appropriate to pray to aid the</td>
<td></td>
</tr>
<tr>
<td>situation of the hurricane victims at Bahamas?</td>
<td></td>
</tr>
</tbody>
</table>
### Attitudes to prayers and thoughts

Please state to what degree you agree/disagree with the below statements.

Imagine that you are praying for the well-being of someone else. The other person knows you are praying for him/her. How do you think your prayer might affect the other person?

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Some what disagree</th>
<th>Neither agree nor disagree</th>
<th>Some what agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe my prayer could cause divine interventions that improve his/her health or wealth</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I believe my prayer gives him/her emotional comfort</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Please state to what degree you agree/disagree with the below statements.

Imagine that you are sending good thoughts in support of the well-being of someone else. The other person knows you are thinking of him/her. How do you think your thoughts might affect the other person?

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Some what disagree</th>
<th>Neither agree nor disagree</th>
<th>Some what agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe my thoughts could directly improve his/her health or wealth</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
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<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

### More attitudes to prayers and thoughts

Start of Block: More attitudes to prayers and thoughts
Please state to what degree you agree/disagree with the below statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Some what disagree</th>
<th>Neither agree nor disagree</th>
<th>Some what agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe prayers have healing power.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Praying for others is sometimes more helpful than providing material help.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>My prayer for a person in distress helps relieve some of his/her distress.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Others' prayers for me (when I'm in distress) help relieve some of my distress.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Praying for others makes me more aware of their distress.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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</tr>
<tr>
<td>Praying for others increases my empathy towards them.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>My prayers for others can help them materially, even if they are unaware of my prayer for them.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>My prayers for others are only helpful if they know I prayed for them.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>My prayers for others are helpful even if they do not know I prayed for them.</td>
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<td>☐</td>
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<td>o</td>
<td>o</td>
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</tr>
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</tr>
</thead>
<tbody>
<tr>
<td>When I hear of people in distress, I always pray for them.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>When I hear of people in distress, I always take a moment to think of them.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>To pray for those in distress makes me feel like I am helping them.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

End of Block: More attitudes to prayers and thoughts
Traditional religiosity measure questions

How often do you pray?
- Never
- Less than once a month
- Once a month
- 2-3 times a month
- Once a week
- 2-3 times a week
- Daily

How often do you read religious scripture?
- Never
- Less than once a month
- Once a month
- 2-3 times a month
- Once a week
- 2-3 times a week
- Daily

How often do you attend religious services?
- Never
- Once or twice a year
- Less than once a month
- Once a month
- 2-3 times a month
- Once a week
- Twice a week or more
Which of these statements comes closest to describing your feelings about the Bible?

- The Bible is the actual word of God and is to be taken literally, word for word.
- The Bible is the inspired word of God but not everything in it should be taken literally, word for word.
- The Bible is an ancient book of fables, legends, history and moral percepts recorded by men.

End of Block: Traditional religiosity measure questions

Start of Block: Background questions

Do you think of yourself as closer to the Democratic or the Republican party?

- I'm closer to the Democratic party
- I'm closer to the Republican party
- I don't think of myself as closer to either of them

Have you previously (i.e., before participating in this study) donated to a charity organization specifically to help the Dorian victims at Bahamas?

- Yes
- No
- I do not know

Have you, or someone close to you, ever been a victim of a natural catastrophe?

- Yes
- No

What is your favorite color (this is a quality control question)?

End of Block: Background questions