Underlying Wishes and Nudged Choices

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Abstract

Is the inferred preference from a choice to donate stronger when the choice was made under a mandated rather than the automatic default (nudged choice) legislative system? The answer to this is particularly important because families can, and do, veto the choices of their deceased relatives. In three studies, we asked American and European participants from countries that have either a default opt-in or default opt-out system to take on the role of a third party to judge the likelihood that an individual's "true wish" was to actually donate their organs, given that they were registered to donate on the organ donation register. In each study, participants were randomly assigned to one of the organ donation legislative systems (default opt-in, default opt-out, mandated choice or mandatory). Overall, regardless of which country participants came from, they perceived the donor's underlying preference to donate as stronger under the default opt-in and mandated choice systems as compared to the default opt-out and mandatory donor systems. We discuss the practical issues that result from using default systems in the domain of organ donation and propose potential ways to ameliorate the uncertainty around inferences of underlying preference from a nudged choice.

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Public Significance Statement

This study suggests that signals of a donor's underlying preference to donate are stronger when the choice from which preference is inferred was made under a mandated or default opt-in system than a default opt-out system. We found that ambiguous signals of underlying preference that are attached to default opt-out systems contribute to families' veto decisions compared to active choice systems (opt-in, mandated-choice) which are substantially better at signaling intent than passive ones. We proposed potential solutions to ameliorate uncertainty around inferences of underlying preference from a nudged choice.

Underlying Wishes and Nudged Choices

The shortage of transplantable organs remains a pressing global issue. This year in the US there are over 116,000 people on the waiting list to receive an organ and it is estimated that 20 people die each day while waiting on the list (Organdonor.gov, 2017). Similarly, 6,388 people in the UK are currently on the waiting list and approximately 450 patients died while waiting on this list (NHSBT, 2017). To target this worldwide societal problem, behavioral interventions, such as nudges, have been used to provide practical solutions that are based on psychological and behavioral economic research. Nudges refer to behavioral change interventions that alter people's behavior by modifying the choice context in such a way as to make the "better" option most salient/easy to select without substantially changing the underlying incentive structure (Thaler & Sunstein, 2008). The prototypical example of a nudge is an automatic default, such as the ones often used in organ donation legislative system. The defaulted option is automatic enrolment onto the system that presumes one's consent to donate his/her organs, and if individuals do not wish to donate, they have the freedom to opt-out. The objective of the present study is to examine the signals of one's underlying preference based on being registered to donate on the Organ Donor Register (ODR), which is subject to different legislative systems (default opt-in, default opt-out, mandated choice, mandatory). In particular, we use this as a basis on which to assess people's inferences regarding the strength of a donor's underlying wish to donate. This is motivated by issues regarding family refusal rates with the NHS figures showing that families refused donation from 505 registered donors in the last five years (BBC, 2017). We begin by presenting evidence regarding the rationale for proposing defaults, and the evidence regarding their efficacy in increasing donation rates, before discussing the

current findings regarding reasons for which families veto their deceased relative's wishes to donate.

Rationale for defaults in organ donation legislative systems

The rationale behind an automatic default is that it can bridge the gap between a good intention (e.g. to donate one's organs) and the effort needed to implement that intention into practice (i.e. psychological barriers) (Shepherd, O'Carroll, & Ferguson, 2014). Defaults can reduce contemplation costs and negative emotions that arise from thinking about one's mortality, especially given that matters around death are rarely discussed in many societies (Baron & Ritov, 1994; Byrne & Thompson, 2001; Glasson et al., 1994; Shepherd, et al, 2014). Defaults also provide the decision-maker with important signals from policy-makers as to what ought to be the appropriate behavior in situations of uncertainty (Davidai, Gilovich, & Ross, 2013; Johnson & Goldstein, 2003; McKenzie, Liersch, & Finkelstein, 2006). In fact, several studies have shown that default opt-out systems have substantially increased registered donations (Abadie & Gay, 2006; McKenzie et al., 2006; Shepherd et al., 2014; van Dalen & Henkens, 2014). For instance, Rithalia, McDaid, Suekarran, Myers, & Sowden (2009) reviewed five studies comparing donation rates before and after the introduction of legislation for presumed consent and found that donation rates in Austria rose from 4.6 donors per million population (pmp) to 27.2 donors pmp over a 5-year period; In Belgium, kidney donations increased from 10.9 to 41.3 pmp during a 3-year period, and in Singapore, kidney donations increased from 4.7 to 31.3 per year over a 3-year period.

Vetoing decisions and reasons for them

Whilst automatic defaults, such as default opt-out systems, for organ donation appear to increase donation rates, it is important to highlight that most organ donation

legislative systems, default or otherwise, include a clause that allows the final decision to donate to be made by family members (Den Hartogh, 2012). This means that in effect family members can veto the decision made by their deceased relative. In fact, families vetoing decision is claimed to be one of the leading reasons for the gap between supply and demand of organs (Abadie & Gay, 2006; Barber, Falvey, Hamilton, Collett, & Rudge, 2006). In 2010, NHSBT reported that more than 500 families have vetoed organ donations despite being informed that their relative was on the NHS ODR; this translated into an estimated 1,200 people missing out on potential life-saving transplants (NHSBT, 2016).

Several studies have examined the factors that influence families' decisions regarding the overruling of their deceased relative's wishes (Exley, White, & Martin, 2002; Mossialos, Costa-Font, & Rudisill, 2008; Rosenblum et al., 2012; van Dalen & Henkens, 2014). There is good evidence to suggest that if the deceased relative had made their decision known to their family in advance (an unambiguous signal of preference), then the family is more likely to honor their deceased relative's wishes (DeJong et al., 1998; Radecki & Jaccard, 1997; Siminoff & Lawrence, 2002). Consistent with this, evidence from survey work showed that 96.7% of US citizens (U.S. Department of Health and Human Services, 2013) and 88% of UK citizens (NHSBT, 2015) would consent to the donation of a deceased relative's organs if the deceased's wishes were made known in advance to the family. In reality, however, the wishes of the donors are often not known to the family, as revealed by studies showing that less than half of Europeans and North Americans had raised the subject of organ donation with their family (Eurobarometer, 2007; Spital, 1995). From this, one speculation is that, just as the default option in a country's organ donation legislative system may signal to the individual what ought to be the appropriate behavior (Johnson

& Goldstein, 2003), it can also act as a signal to the family as to their deceased relative's underlying preference. In other words, when faced with decisions to consent on behalf of their deceased relative, defaults may also influence families' perceptions of the deceased's true underlying preference to donate given that the deceased was registered to donate. This is because strength of preference and choice satisfaction vary between default systems (i.e. personally made choice in opt-in vs. externally made choice in opt-out); personally choosing leads to greater satisfaction in the choice made (Botti & McGill, 2006; Payne, Bettman, & Johnson, 1993). Therefore, strength of preference and choice satisfaction is likely to be perceived by families as weaker under a default opt-out system because it involves a passive choice to donate compared to a default opt-in system where an active choice to donate is made.

Why might this be the case? In an explicit consent system (i.e. default opt-in), consent is expressed through some overt communication which can be seen as providing reliable evidence that a decision was made. In addition, active choices of this kind are made through a free self-selection process thereby affirming one's personal agency in the choices one makes (Osman, 2014). The meaning attached to the act of donation is seen as an altruistic inclination hence representing a stronger strength of signal of underlying preference to donate. This is different from a presumed consent system (i.e. default opt-out), where the absence of an objection is recorded as consent which can potentially mute the strength of a signal of one's underlying preference to donate. In addition, a default opt-out system sends a signal to the potential donor and their family that organ donation is a socially preferred choice (or recommendation by policy makers) (I. G. Cohen, Lynch, & Robertson, 2016). Indeed, Davidai et al. (2013) has shown that participants assign a lower value to the act of being a donor in the default opt-out system compared to the default opt-in system. Given that donors rarely

communicate their donation wishes with their families, their underlying preference to donate are often inferred from the ODR and this is likely to be weaker and more ambiguous when a passive choice is made. The consequence of this is that it adds uncertainty to the families' decision when deciding whether to donate their deceased relative's organs. As mentioned, in the event of uncertainty, families are more likely to refuse consent. Therefore, by implication, the stronger the signal of underlying preference to donate is, given the type of organ donation legislative system, the less likely it is that families will refuse their relatives' wishes to donate.

To date, there has been much interest in the effects of organ donation legislations, such as the effect of implementing defaults in different organ donation legislations in generating donors (van Dalen & Henkens, 2014), families' attitudes and beliefs to decide whether to consent to organ donation (Exley et al., 2002), and individual's willingness to donate their own or their relative's organs (Mossialos et al., 2008). There has not, however, been any dedicated examination of whether there are differences between default systems (opt-in vs opt-out) regarding the strength of signal of the donor's underlying preferences to donate. Our review of the literature shows that inferences of underlying preference from choice behavior play an important role in the donation process and, without greater understanding, we cannot accurately predict or evaluate the consequences of new policies that involve defaults (Bowels, 1998). In other words, the effectiveness of such policies would depend both on the preferences they induce or evoke (Sunstein, 1993) and, in turn, the inferences relatives make in these instances.

In the present study, we investigate the perceived diagnosticity of an individual's registration on an ODR for inferring their underlying preference. From a Bayesian perspective, the diagnosticity of an item of evidence, here registration on the

ODR, is determined by the likelihood ratio. The likelihood ratio is the ratio of obtaining that evidence in the event that the underlying hypothesis is true (the deceased relative's underlying preference were to donate their organs - 'hit' rate) as opposed to obtaining that evidence in the event that the underlying hypothesis is false (the deceased relative's underlying preference were to *not* donate their organs - 'false positive' rate), $\frac{P(registration|want\ to\ donate)}{P(registration|DON'T\ want\ to\ donate)}$. Where the likelihood ratio is 1, the evidence is just as likely to occur whether the hypothesis is true or false and is therefore maximally uninformative. Where an individual is automatically registered to donate, one might expect more false positives than when a direct choice is made, thus reducing the likelihood ratio towards 1, and decreasing the diagnosticity of the ODR registration. Moreover, there is evidence to suggest that people are sensitive to subtle sources of influences on the diagnosticity of evidence (Harris, Corner, & Hahn, 2013; Lagnado, Fenton, & Neil, 2012).

In the current study, we investigate people's sensitivity to the influence of organ donation legislative systems under which registration was made for judging the diagnosticity of that registration. Specifically, we investigated this across four systems: default opt-in (everyone is automatically a non-donor unless one registers to be a donor), default opt-out (everyone is automatically a donor unless one objects), mandated choice (everyone is required by law to state in advance whether they are willing to be a donor), and mandatory donor (everyone is required by law to be a donor and there is no option to change this). From this, we hypothesize that:

1. People recognize the consequences of the different framings of the decision to be a registered organ donor. They, therefore, see registration as differentially representative of an individual's underlying preference to donate, in the

following order: Default opt-in > Mandated choice > Default opt-out > Mandatory Donor.

2. If Hypothesis 1 is supported, then families making decisions on the basis of their beliefs about the deceased's underlying preferences to donate will be perceived by participants as more likely to agree to donation in line with the predictions of Hypothesis 1.

In the current study, we also elicit the relevant parameters to determine the degree to which these results are consistent with a Bayesian framework.

General Method

In general, the materials presented in Study 1-3 were the same, except for some additional questions in Studies 2 and 3. These additional questions were based on the manipulations regarding the samples we used: Study 1 involved US citizens (the US has a default opt-in system), Study 2 involved citizens from European countries that has a default opt-in system, and Study 3 involved citizens from European countries that has a default opt-out system. It was essential to present a set of studies that systematically address the hypotheses we identified, therefore we carefully changed as few details between the studies as possible. Given the similarities between these studies, and to assist the reader, we present the methods and results of the three studies together to facilitate a better understanding of the overall pattern of findings. For all three experiments ethics approval from QMUL college ethics board was granted, QMERC2014/54.

Participants

Study 1. A total of 493 US citizens (Opt-in Policy) recruited from Amazon Mechanical Turk[1] took part in the online survey 256 females; aged 18-72 years, M_{age} = 35.65 years, SD = 11.65 years), and were compensated $0.50 for their participation.

Study 2. A total of 401 European citizens from countries with a default opt-in system (Germany, Denmark, Lithuania, the Netherlands, Romania, UK) were recruited from Prolific Academic[2] (244 females; aged 18-72 years, M_{age} = 35.50 years, SD = 12.76 years), and were compensated $0.50 for their participation.

Study 3. A total of 400 European citizens from countries with a default opt-out system (Austria, Spain, France, Italy, Belgium, Sweden, Greece, Finland, Poland, Portugal, Turkey, Slovenia, Croatia, Czech Republic, and Norway) were recruited from Prolific Academic (261 females; aged 18-60 years, M_{age} = 29.01 years, SD = 8.27 years), and were compensated $0.50 for their participation.

Design, Materials, and Procedure

Participants were randomly allocated to one of four experimental conditions (Figure 1): **Study 1:** Default opt-in (n = 122), mandated choice (n = 128), default opt-out (n = 118), and mandatory donor (n = 125) with four dependent variables (Perceived belief of the donor's underlying preference to donate; Perceived likelihood estimates of a relative consenting to donate; Relative's consent expressed as a binary choice; Perceived diagnosticity of people's intention to donate measured by Bayesian Likelihood Ratio). **Study 2:** Default opt-in (n = 101), mandated choice (n = 100), default opt-out (n = 101), mandatory donor (n = 99). In addition to the dependent

[1] An online platform for recruiting participants.
[2] An online platform for recruiting participants.

variables in Study 1 (except for relative's consent expressed as a binary choice which was replaced with dropdown list reasons for relatives consenting or vetoing donation), we also included two other questions (these are presented in more detail in the next section), and minor modifications to the elicitation of prior belief question. **Study 3:** Default opt-in (n = 99), mandated choice (n = 100), default opt-out (n = 99), mandatory donor (n = 102). The dependent variables were identical to those included in Study 2.

INSERT FIGURE 1 HERE.

Study 1. Participants were told that this was a social experiment designed to investigate the topic of organ donation. Participants were presented with a 21-item questionnaire (see Supplementary Material – Part 2). The questionnaire first provided the definition of organ donation and, based on this information, participants were required to answer a question to elicit prior beliefs about people's underlying preferences to donate, 1) *P*(*want to donate*): "*Out of 100 people in the U.S., for how many do you think their true preference is to donate their organs?"*[3,4] A fictional scenario immediately followed in which participants read details about a person named Mark who lives in an area that falls under a particular organ donation legislative system (depending on the experimental condition participants were randomly assigned to one of the four organ donation legislative systems: default opt-in, default opt-out, mandated choice, or mandatory donor – see Figure 1).

[3] In preparation of the design and materials for the three studies that are presented here, we carried out a pilot study with UK participants. In this study, the introduction of a prior belief question designed to elicit preferences to donate was not presented at the start of the questionnaire, and responses could have been influenced by other details presented in the experiment, therefore in this paper, we presented the prior belief question at the start of the question for the three main studies. Full details are provided in Supplementary Material – Part 1.

[4] We used a frequency format to elicit the relevant Bayesian parameters as this has been shown to be an easier way for participants to provide responses (see also, e.g., Gigerenzer & Hoffrage (1995)).

In all four conditions participants were explicitly told that Mark was registered as a donor. They were also told that Mark was involved in a fatal accident leaving his vital organs intact. Following on from this, participants were asked 2) "*How likely do you think it is that Mark's true preference was to donate his organs?"* to elicit perceived belief of underlying preference to donate, on a scale of 1(Mark definitely did not want to donate his organs) to 100 (Mark definitely did want to donate his organs). In addition, two other questions were presented to assess what actions should follow given the news that Mark suffered a fatal accident. Participants were asked 3) "*How likely is it that John will agree to his Uncle's organs being donated*?"; responses were provided on a scale from 1 (very unlikely) to 5 (very likely) to elicit perceived likelihood estimates of a relative consenting to the donor's decision to donate. Finally, participants were asked 4) "*What will John decide to do, will he donate his Uncle's organs*?" so as to elicit a binary response (consent, veto) as to the relative's decision.

Questions 5 and 6 elicited the relevant conditional probabilities for calculating the likelihood ratio, which is a measure of the perceived diagnosticity of the deceased's registration on the ODR. Participants were asked 5) "*If we assembled 100 people whose true preference is to DONATE their organs, how many of them do you think will be registered as organ donors on the .... system*?". And then asked 6) "*If we assembled 100 people whose true preference is NOT TO DONATE their organs, how many of them do you think will be registered as organ donors on the .... system?*", on a scale of 0-100 (where "…" is the organ donation legislative system participants were assigned to).

Study 2 and Study 3. Participants were presented with an 18-item questionnaire (see Supplementary Material – Part 3). The main set-up is the same as in Study 1 but with minor modifications. First, questions that had the term "true preference" were replaced with the word "want" so that the question can be better understood. Second,

the cover story now describes the respective organ donation legislative systems before eliciting participant's prior belief, Question 1) "*Out of 100 people living in this country, for how many do you think would want to donate their organs?".* Followed by Question 2) "*How likely do you think it is that Mark wanted to donate his organs?*", the scale has now explicitly labeled the midpoint which ranges from 0 (Mark definitely did not want to donate his organs, 50 (Mark is equally likely to donate or not donate his organs), to 100 (Mark definitely did want to donate his organs). After responding to questions 1 and 2, participants were then told about John and were asked to provide ratings to two additional new questions 3) "*To what extent does being registered to donate under the … system provide a clear indication that Mark wanted to donate his organs?*", on a scale of 0 (Not at all clear) to 100 (Absolutely clear); this question was designed to elicit perceived signal of intent to donate, and 4) *"How likely it is that John believes that Mark wanted to donate his organs?",* on a scale of 0 (John believes Mark definitely did not want to donate his organs), 50 (John thinks it is equally likely that Mark wanted to donate his organs as didn't), to 100 (John believes that Mark definitely want to donate his organs); this question was designed to elicit the likelihood estimates of relative's belief of the donor's underlying preferences to donate.

Depending on the response to Question 5) *"How likely it is that John will agree to his Uncle's organs being donated?"*, participants were presented with additional new question 6) "*Why do you think it is highly unlikely/moderately unlikely/likely/moderately likely/highly likely that John will donate Mark's organs?*", which replaced Question 4 (relative's consent expressed as a binary choice) in Study 1. Participants were presented with up to eleven options as candidate reasons and an option for "none of the above" (five different reasons were presented for a "highly likely", "moderately likely" and "likely" judgments, and eleven different reasons were

presented for "highly unlikely" and "moderately unlikely" judgments) from a dropdown menu. The options presented to people were based on a prior study on potential causes for family refusal decisions (Ghorbani et al., 2011) and the most frequent reasons that emerged in practice (Vincent & Logan, 2012). The reasons participants could select from were: it is a highly traumatic time for relatives and it's just not something they can think about; lack of understanding of the organ donation process; denial and rejection of brain-death criteria; the hope for a miracle; fear about organ donation trade and unknown organ destination; religious beliefs; insecurity about the brain-death diagnosis; unsure about the deceased's wish to donate; belief in body integrity about death; fear of objection by other family members; and there is lack of evidence to indicate that the deceased wanted to donate; but note that this is by no means an exhaustive list. Finally, participants were presented with two questions to elicit the likelihood ratio, Question 7) "*If we assembled 100 people who want to DONATE their organs, how many of them do you think will be registered as organ donors on the … system?*" and Question 8) "*If we assembled 100 people who DO NOT WANT to DONATE their organs, how many of them do you think will be registered as organ donors on the … system?*", on a scale of 0-100.

For all three studies, participants were asked a series of demographic questions (e.g., age, gender, religion), questions regarding their own organ donation status and their view on organ donation (e.g. whether they agree with an default opt-out system, willingness to agree to donation if loved one's wishes are unknown, who should decide donation in the event of death, etc.)

Results

Perceived belief of the donor's underlying preference to donate

The findings were broadly in line with our first hypothesis such that the participant's perceived belief of the donor's (i.e. Mark's) underlying preference to donate reflected sensitivity to the four different organ donation legislative systems (Figure 2). Overall, the evidence revealed that the organ donation legislative system had a significant effect on participants' perceived belief of the donor's underlying preference to donate [*Study 1:* $F(3, 492) = 74.69$, $p < .001$, $\eta^2 = .31$; *Study 2*: $F(3, 400) = 41.55$, $p < .001$, $\eta^2 = .24$; *Study 3*: $F(3, 399) = 24.39$, $p < .001$, $\eta^2 = .16$]. Across the three studies, looking at the effect sizes, the total variance accounted by the organ donation legislative was small to moderate in size.[5]

INSERT FIGURE 2 HERE.

For Study 1 and 2, the participants' perceived belief of the donor's underlying preference to donate decreased in the following order: Mandated choice = Default opt-in > Default opt-out > Mandatory donor. Planned pairwise comparisons confirmed this pattern: The default opt-in system was perceived as a stronger indicator of underlying preference to donate when compared with the default opt-out system [*Study 1*: $t(489) = 9.00$, $p < .001$, $d = 1.20$; *Study 2*: $t(188) = 5.75$, $p < .001$, $d = 0.81$]; and the mandatory donor system [*Study 1*: $t(489) = 12.65$, $p < .001$, $d = 1.51$; *Study 2*: $t(194) = 7.47$, $p < .001$, $d = 1.06$]. The default opt-out system was judged as a stronger indicator of underlying preference to donate when compared with the mandatory donor system [*Study 1*: $t(489) = 3.49$, $p = .001$, $d = 0.43$; *Study 2*: $t(195) = 2.23$, $p = .027$, d = 0.32]. The mandated choice system was judged as a stronger indicator of underlying preference to donate when compared with the default opt-out system [*Study 1*: $t(489) = 7.78$, $p < .001$, $d = 1.07$; *Study 2*: $t(198) = 8.14$, $p < .001$, d = 1.15]; and the mandatory

[5] J. Cohen (1988) provided a benchmark to define small (.1), medium (.3) and large (.5) effects.

donor system [*Study 1*: $t(489) = 11.46$, $p < .001$, $d = 1.40$; *Study 2*: $t(192) = 9.96$, $p < .001$, d = 1.41]. There was no significant difference in underlying preference to donate between the default opt-in system and mandated choice system [*Study 1*: $t(489) = 1.34$, $p = .181$, $d = 0.18$; *Study 2*: $t(182) = 1.11$, $p = .269$, d = 0.16].

For Study 3, the participants' perceived belief of the donor's underlying preference to donate decreased in the following order: Default opt-in > Mandated choice > Default opt-out = Mandatory donor. Planned pairwise comparisons confirmed this pattern: The default opt-in system was judged as a stronger indicator of underlying preference to donate when compared with the default opt-out system [*Study 3*: $t(195) = 7.31$, $p < .001$, $d = 1.04$]; mandated choice system [*Study 3*: $t(196) = 3.16$, $p = .002$, d = 0.45]; and mandatory donor system [*Study 3*: $t(198) = 7.35$, $p < .001$, d = 1.04]. The mandated choice system was judged as a stronger indicator of underlying preference to donate when compared with the default opt-out system [*Study 3*: $t(197) = 3.99$, $p < .001$, d = 0.57]; and the mandatory donor system [*Study 3*: $t(200) = 4.06$, $p < .001$, d = 0.58]. There was no significant difference in underlying preference to donate between the default opt-out system and the mandatory donor system [*Study 3*: $t(199) = .17$, $p = .864$, d = 0.02].

Perceived signal of intent to donate

The findings were broadly in line with our first hypothesis. Participants' perceptions of the donor's (i.e. Mark's) intention to donate reflect sensitivity to the four different organ donation legislative systems (Figure 3); this question was not asked in *Study 1*, but was asked in *Study 2*: $F(3, 400) = 98.77$, $p < .001$, $\eta^2 = .43$, and *Study 3*: $F(3, 399) = 60.73$, $p < .001$, $\eta^2 = .32$.

INSERT FIGURE 3 HERE.

For Study 2, the participants' perceptions of the donor's intention to donate decreased in the following order: Mandated choice = Default opt-in > Default opt-out > Mandatory donor. This is consistent with the pattern found for perceived belief of the donor's underlying preference to donate. Planned pairwise comparisons confirmed this pattern: Default opt-in system was perceived as a stronger signal of intent to donate when compared with the default opt-out system [*Study 2*: $t(188) = 8.37$, $p < .001$, d = 1.78]; and the mandatory donor system [*Study 2*: $t(159) = 12.66$, $p < .001$, d = 1.79]. The mandated choice system was perceived as a stronger signal of intent to donate when compared with the default opt-out system [*Study 2*: $t(166) = 9.77$, $p < .001$, d= 1.38]; and the mandatory donor system [*Study 2*: $t(140) = 13.93$, $p < .001$, d = 1.98]. Similarly, the default opt-out system was perceived as a stronger signal of intent than the mandatory donor system [*Study 2*: $t(185) = 5.23$, $p < .001$, d = 0.74]. There was no significant difference for signal of intent to donate between the default opt-in system and the mandated choice system [*Study 2*: $t(190) = .93$, $p = .355$, d = 0.13].

For Study 3, the participants' perceptions of the donor's intention to donate decreased in the following order: Default opt-in > Mandated choice > Default opt-out > Mandatory donor. Planned pairwise comparisons confirmed this pattern: The default opt-in system was perceived as a stronger signal of intent to donate when compared with the default opt-out system [*Study 3*: $t(180) = 9.80$, $p < .001$, d = 1.39]; the mandated choice system [*Study 3*: $t(195)= 3.00$, $p = .003$, d = 0.42]; and the mandatory donor system [*Study 3*: $t(171) = 11.43$, d= 1.61, $p < .001$]. The mandated choice system was perceived as a stronger signal of intent to donate when compared with the default opt-out system [*Study 3*: $t(189) = 6.89$, $p < .001$, d= 0.98]; and the mandatory donor system, [*Study 3*: $t(181) = 8.74$, $p < .001$, d= 1.23]. Similarly, the default opt-out system was

perceived as a stronger signal of intent to donate than the mandatory donor system [*Study 3*: $t(196) = 2.25$, $p = .025$, d= 0.32].

Perceived likelihood estimates of the relative's belief of the donor's underlying preference to donate

The findings were broadly in line with our second hypothesis such that the perceived likelihood estimates of the relative's belief of the donor's underlying preference to donate reflected sensitivity to the four different organ donation legislative systems (Figure 4). Overall, the evidence revealed that the organ donation legislative system had a significant effect on participants' perceived likelihood estimates of the relative's belief of the donor's underlying preference to donate [this question was not asked for *Study 1*, but was asked in *Study 2:* $F(3, 400) = 64.23$, $p < .001$, $\eta^2 = .33$; and *Study 3:* $F(3, 399) = 29.84$, $p < .001$, $\eta^2 = .18$].

INSERT FIGURE 4 HERE.

For Study 2, the perceived likelihood estimates of the relative's belief of the donor's underlying preference to donate decreased in the following order: Mandated choice = Default opt-in > Default opt-out > Mandatory donor. Planned pairwise comparisons confirmed this pattern: Perceived likelihood estimates of the relative's belief of the donor's underlying preference to donate were higher in the default opt-in system compared to the default opt-out system [*Study 2*: $t(199) = 7.06$, $p < .001$, d = 0.99]; and the mandatory donor system [*Study 2*: $t(197) = 9.06$, $p < .001$, d = 1.28]. Similarly, the default opt-out system had higher perceived likelihood estimates compared with the mandatory donor system [*Study 2*: $t(198) = 2.10$, $p = .037$, d = 0.30]. The mandated choice system had higher perceived likelihood estimates when compared with the default opt-out system [*Study 2*: $t(181) = 10.41$, $p < .001$, d = 1.47] and the

mandatory donor system [*Study 2*: $t(178) = 12.78$, $p < .001$, d = 1.81]. There was no significant difference between the default opt-in system and the mandated choice system [*Study 2*: $t(174) = 1.86$, $p = .064$, d = 0.26].

For Study 3, the perceived likelihood estimates of the relative's belief of the donor's underlying preference decreased in the following order: Mandated choice = Default opt-in > Default opt-out = Mandatory donor. Planned pairwise comparisons confirmed this pattern: Perceived likelihood estimates of the relative's belief of the donor's underlying preference to donate were higher in the default opt-in system compared to the default opt-out system [*Study 3*: $t(396) = 6.43$, $p < .001$, d = 0.90]; and the mandatory donor system [*Study 3*: , $t(396) = 8.18$, $p < .001$, d = 1.18]. The mandated choice system has higher perceived likelihood estimates compared with the default opt-out system [*Study 3*: $t(396) = 4.75$, $p < .001$, d = 0.66] and the mandatory donor system[*Study 3*: $t(396) = 6.50$, $p < .001$, d = 0.93]. There was no significant difference for perceived likelihood estimates between the default opt-in system and mandated choice system [*Study 3*: $t(396) = 1.69$, $p = .092$, d = 0.24]; and between the default opt-out system and mandatory donor system [*Study 3* :$t(396) = 1.71$, $p = .088$, d= 0.24].

Perceived likelihood estimates of the relative's decision to consent

The findings broadly supported our second hypothesis such that perceived likelihood estimates of the relative's decision to consent to donate their family member's organs reflected sensitivity to the four different organ donation legislative systems (Figure 5). Overall, the evidence revealed that the organ donation legislative system had a significant effect on participants' perceived likelihood estimates of the relative's decision to consent to donate [*Study 1*: $F(3, 492) = 21.78$, $p < .001$, $\eta^2 = .12$;

Study 2: $F(3, 400) = 22.12$, $p < .001$, $\eta^2 = .14$; *Study 3*: $F(3, 399) = 5.88$, $p = .001$, $\eta^2 = .08$].

INSERT FIGURE 5 HERE.

In Study 1, the perceived likelihood estimates of the relative's decision to consent to donate their family member's organs decreased in the following order: Mandated choice = Default opt-in > Default opt-out > Mandatory donor. This is consistent with the pattern found for the perceived belief of the donor's underlying preference to donate. Planned pairwise comparisons confirmed this pattern: Participants' perceived likelihood estimates of the relative's decision to consent to donate were significantly higher under the default opt-in system compared to the default opt-out system [*Study 1*: $t(489) = 3.02$, $p = .003$, d = 0.40] and the mandatory donor system [*Study 1*: $t(489) = 6.57$, $p < .001$, d = 0.79]. Similarly, perceived likelihood estimates were higher under the mandated choice system compared to the default opt-out system [*Study 1*: $t(489) = 3.90$, $p < .001$, d = 0.53] and the mandatory donor system [*Study 1*: $t(489) = 7.50$, $p < .001$, d = 0.92]. The default opt-out system was also perceived as more likely to lead to family consent than the mandatory donor system [*Study 1*: $t(489) = 3.47$, $p = .001$, d = 0.45]. There was no significant difference in perceived likelihood estimates when comparing the mandated choice system and the default opt-in systems [*Study 1*: $t(489) = .84$, $p = .399$, d = 0.11].

For Study 2, the perceived likelihood estimates of the relative's decision to consent to donate their family member's organs decreased in the following order: Mandated choice = Default opt-in > Default opt-out = Mandatory donor. Planned pairwise comparisons confirmed this pattern: Participants' perceived likelihood estimates of the relative's decision to consent to donate were significantly higher under

the default opt-in system compared to the default opt-out system [*Study 2*: $t(195) = 3.86$, $p < .001$, d = 0.55] and the mandatory donor system [*Study 2*: $t(197) = 5.74$, $p < .001$, d = 0.81]. Similarly, perceived likelihood estimates were higher under the mandated choice system compared to the default opt-out system [*Study 2*: $t(174) = 5.44$, $p < .001$, d = 0.77], and the mandatory donor system [*Study 2*: $t(181) = 7.68$, $p < .001$, d = 1.09]. There was no significant difference in perceived likelihood estimates of the relative's decision to consent when comparing the mandated choice system and the default opt-in system [*Study 2*: $t(188) = 1.34$, $p = .181$, d = 0.19]; and between the default opt-out system and the mandatory donor system [*Study 2*: $t(196) = 1.52$, $p = .131$, d = 0.21].

In Study 3, the perceived likelihood estimates of the relative's decision to consent to donate their family member's organs decreased in the following order: Mandated choice = Default opt-in = Default opt-out > Mandatory donor. Planned pairwise comparisons confirmed this pattern: Participants' perceived likelihood estimates of the relative's decision to consent to donate were significantly higher under the default opt-in system compared to the mandatory donor system [*Study 3*: $t(396) = 4.06$, $p < .001$, d = 0.59]. Similarly, perceived likelihood estimates were higher under the mandated choice system compared to the mandatory donor system [*Study 3*: $t(396) = 2.93$, $p = .004$, d = 0.41]. The default opt-out system has a higher perceived likelihood estimates than the mandatory donor system [*Study 3*: $t(396) = 2.20$, $p = .028$, d = 0.31]. There was no significant difference in the perceived likelihood estimate of relative's decision to consent when comparing the mandated choice system and the default opt-in system [*Study 3*: $t(396) = 1.14$, $p = .257$, d = 0.16], and between the default opt-in system and the default opt-out system [*Study 3*: $t(396) = 1.85$, $p = .065$, d = 0.26]; as well as between the mandated choice system and the default opt-out system [*Study 3*: $t(396) = .72$, $p = .474$, d = 0.10].

The type of organ donation legislative systems was also significantly related to the binary decision of whether or not participants thought the relative would donate their deceased family member's organs: *Study 1* (the only study in which this question was included), $\chi(3) = 18.71$, $p < .001$. We present the percentage of participants that believe the relative would consent to donation under each organ donation legislative system: Default opt-in system (92.6%), default opt-out system (94.9%), mandated choice system (96.1%), and mandatory donor system (82.4%). However, this measure was less sensitive, as compared to the other questions presented in the three studies.

Reason for Donating

In general, the organ donation legislative system in the participants' country (default opt-in or default opt-out) was significantly related to the reason they gave as to why the relative would consent to donate the deceased family member's organs (this question was not asked for *Study 1*, but was asked for *Study 2* and *Study 3*), $\chi(9) = 23.90$, $p = .004$; but not significantly related to the reasons for the relatives veto decision, $\chi(13) = 17.55$, $p = .176$. Table 1 and Table 2 show the frequency of each of the reasons chosen for consenting or vetoing decisions under each organ donation legislative system.

INSERT TABLE 1 HERE.

INSERT TABLE 2 HERE.

Perceived diagnosticity of people's intention to donate

In addition to the ratings above, we also elicited participants' subjective probability estimates for the likelihood ratio

$$\frac{P\left(registration \middle| want\ to\ donate\right)}{P\left(registration \middle| DON'T\ want\ to\ donate\right)}$$

and the prior, *P*(want to donate).

The findings broadly supported our second hypothesis such that perceived diagnosticity of people's intention to donate, as assessed by the revealed likelihood ratios, again, these reflected sensitivity to the four different organ donation legislative systems (Figure 6). A one-way ANOVA[6] revealed a significant effect of organ donation legislative system on perceived diagnosticity of people's intention to donate [*Study 1*: $F(3, 415) = 9.53$, $p < .001$, $\eta^2 = .065$; *Study 2*: $F(3, 304) = 14.82$, $p < .001$, $\eta^2 = .13$; *Study 3*: $F(3, 336) = 12.78$, $p < .001$, $\eta^2 = .103$].

INSERT FIGURE 6 HERE.

For Study 1, the perceived diagnosticity of people's intention to donate decreased in the following order: Mandated choice = Default opt-in > Default opt-out = Mandatory donor. Pairwise comparisons confirmed this pattern: The default opt-in system was perceived as more diagnostic of underlying preferences to donate than the default opt-out system [*Study 1*: $t(73) = 3.30$, $p = .001$, d = 0.55]; and the mandatory donor system [*Study 1*: $t(77) = 3.35$, $p = .001$, d = 0.55]. The mandated choice system was also perceived as more diagnostic than the default opt-out system [*Study 1*: $t(111) = 3.15$, $p = .002$, d = 0.43]; and the mandatory donor system [*Study 1*: $t(124) = 3.19$, $p = .002$, d= 0.43]. There was no significant difference in perceived diagnosticity between

[6] 78 participants from Study 1, 97 participants from Study 2, and 64 participants from Study 3 provided a false positive rating of 0, and were not included in this analysis, since the likelihood ratio is undefined in this case. Note that the predicted Bayesian posterior is 1 in such cases. Whilst, arguably, unrealistic, these responses can be included in calculating the mean of the Bayesian predictions in the subsequent analysis.

the default opt-in system and the mandated choice system [*Study 1*: $t(140) = .82$, $p = .414$, d = 0.13]; and between the default opt-out system and the mandatory donor system [*Study 1*: $t(184) = .42$, $p = .679$, d = 0.05].

For Study 2, the perceived diagnosticity of people's intention to donate decreased in the following order: Mandated choice > Default opt-in > Default opt-out > Mandatory donor. Pairwise comparisons confirmed this pattern: The default opt-in system was perceived as more diagnostic of underlying preferences to donate than the default opt-out system [*Study 2*: $t(56) = 3.03$, $p = .004$, d = 0.59]; and the mandatory donor system [*Study 2*: $t(50) = 4.11$, $p < .001$, d = 0.83]. The mandated choice system was also perceived as more diagnostic than the default opt-in system [*Study 2*: $t(88) = 2.06$, $p = .042$, d = 0.36], the default opt-out system [*Study 2*: $t(69) = 3.58$, $p = .001$, d = 0.62]; and the mandatory donor system [*Study 2*: $t(67) = 4.04$, $p < .001$, d = 0.70]. Also, the default opt-out system was perceived as more diagnostic than the mandatory donor system [*Study 2*: $t(164) = 2.62$, $p = .010$, d = 0.38].

For Study 3, the perceived diagnosticity of people's intention to donate decreased in the following order: Mandated choice = Default opt-in > Default opt-out > Mandatory donor. Pairwise comparisons confirmed this pattern: The default opt-in system was perceived as more diagnostic of underlying preferences to donate than the default opt-out system [*Study 3*: $t(68) = 3.39$, $p = .001$, d = 0.60]; and the mandatory donor system [*Study 3*: $t(333) = 4.91$, $p < .001$, d = 0.73]. The mandated choice system was also perceived as more diagnostic than the default opt-out system [*Study 3*: $t(93) = 3.36$, $p = .001$, d = 0.53]; and the mandatory donor system [*Study 3*: $t(86) = 4.19$, $p < .001$, d = 0.64]. The default opt-out system was perceived as more diagnostic than the mandatory donor system [*Study 3*: $t(175) = .88$, $p = .033$, d = 0.31]. There was no

significant difference between the default opt-in system and the mandated choice system [*Study 3*: $t(128) = .43$, $p = .666$, d = 0.07].

Direct Ratings vs Bayesian Ratings

The present results indicate a rational basis for participants' different belief ratings across the different organ donation legislative systems. Because of the scale of the likelihood ratio (0 - ∞), it is, however, difficult to directly compare these results with participants' direct ratings of the deceased's underlying preference to donate. For this purpose, we collected participants' prior beliefs, enabling the calculation of Bayesian predictions of participants' likelihood ratings of the donor's underlying preference to donate using Bayes' Theorem[7]:

$$P\left(\textit{want to donate} \middle| \textit{registration}\right) = \frac{P\left(\textit{want to donate}\right) \cdot P\left(\textit{registration} \middle| \textit{want to donate}\right)}{P\left(\textit{registration}\right)}$$

Figure 7 suggests that there is a seemingly good fit between the ratings predicted from Bayes' Theorem (using participants' provided parameter estimates calculated from the formula above) and direct belief ratings (i.e. participants' perceived belief of the donor's underlying preference to donate). A strong correlation between direct belief ratings and those predicted from their Bayesian conditional probabilities suggests a significant association between the Bayesian model to the experimental data [*Study 1*: $r(492) = .54$, $p < .001$; *Study 2*: $r(401) = .39$, $p < .001$; *Study 3*: $r(400) = .42$, $p < .001$]. Indeed, the ordinal pattern of results is identical across the predicted and directly elicited ratings. However, participants seemed to perceive the mandated choice condition (*Study 1*) and the default opt-in condition (*Study 3*) as more diagnostic of the

[7] Three participants from Study 1, five participants from Study 2, and three participants from Study 3 were not included in this analysis, as both their hit rate and false positive estimates were zero, which resulted in an undefined predicted posterior.

donor's underlying preferences than their Bayesian parameter estimates would predict. Nevertheless, on the whole, the effects of the organ donation legislative system appear well captured within a Bayesian framework.

INSERT FIGURE 7 HERE.

The impact of demographics on response patterns in Study 1-3

The demographic questions presented to all participants at the end of each experiment required that they indicate: 1) whether they were on the ODR, 2) whether they knew anyone that was on the ODR, 3) whether they were blood donors, 4) whether they would consent to donating their loved one's organs even if their wishes were unknown, 5) whether organ donation was deemed as forbidden in their religion, and 6) whether they agree with the idea of a default opt-out system. In general, the key findings hold when including the above six factors as covariates (Table 3).

INSERT TABLE 3 HERE.

Across the three studies (N = 1,323), the majority of the samples were non-religious (52%), much of the remainder identified themselves as Christian (40%). For 95% of the participants, organ donation was not forbidden in their religion. The sample also consisted of about 50% blood donors, 66% who knew someone who is registered as an organ donor, and 56% who agree with the idea of an opt-out system. In the event of death, participants agreed that the deceased person's wishes should be respected (75%), with a small minority believing that the family should have a final say (16%), and the remaining participants indicating they don't know (7%). Across the three studies, it appears that less than 50% of the participants have knowledge of the current organ donation legislation in their country (Table 4).

INSERT TABLE 4 HERE.

Individual level analysis based on participants' donor status

In the following set of analyses, irrespective of the organ donation legislative system participants were assigned to in the experiments, we explore their donor status as a potential basis on which they made their responses between default opt-in European countries (Experiment 2) and default opt-out European countries (Experiment 3).[8] First, participant's donor status was significantly associated with a country's organ donation legislative system (even if they did not necessarily know what that system was – see section "The impact of demographics on response patterns in Study 1-3"), $\chi^2(1) = 25.92$, $p < .001$. Overall, there were more organ donors in a country with a default opt-in system (60.2%) compared to a default opt-out system (39.8%). When it came to participant's perceived belief of the donor's (i.e. Mark's) underlying preference to donate, estimates were higher from organ donors ($M = 80.33$, $SD = 20.03$) than non-donors ($M = 70.57$, $SD = 25.33$) in countries with a default opt-in system, $t(399) = 4.30$, $p < .001$. And similarly, in countries with a default opt-out system, estimates were also higher from organ donors ($M = 79.90$, $SD = 18.99$) compared to non-donors ($M = 72.14$, $SD = 22.69$), $t(398) = 3.46$, $p = .001$. However, participant's donor status was not significantly associated with their perceived signal of the donor's (i.e. Mark's) intention to donate their organs in default opt-in countries, $t(399) = .27$, $p = .787$; and default opt-out countries, $t(398) = 1.75$, $p = .081$. On the other hand, organ donors ($M = 77.16$, $SD = 22.39$) gave higher likelihood estimates of the relative's belief of the donor's (i.e. Mark's) underlying preference to donate compared to non-donors ($M = 73.44$, $SD =$

[8] Note that these analyses set out to offer additional insights from the data but donor status was not elicited as one of the independent variables in the study. Therefore, there isn't an even size of donors vs non-donors. Due to a large amount of individual level analysis conducted on this, and for readers that wish to inspect these details further, we have included the additional analyses in the Appendix – Part 4.

22.99) from countries with a default opt-out system, $t(398) = 2.42$, $p = .016$. But in countries with a default opt-in system, participant's donor status had no significant impact on likelihood estimates, $t(399) = 1.64$, $p = .102$. Furthermore, organ donors ($M = 4.34$, $SD = .84$) gave higher likelihood estimates of the relative's decision to consent to donate their family member's organs as compared to non-donors ($M = 4.08$, $SD = 1.00$) from countries with a default opt-in system, $t(399) = 2.86$, $p = .004$. Similarly, organ donors ($M = 4.16$, $SD = .86$) gave higher likelihood estimates of the relative's decision to consent to donate their family member's organs as compared to non-donors ($M = 3.95$, $SD = .91$) from countries with a default opt-out system, $t(398) = 2.24$, $p = .026$.

General Discussion

The focus of this study was to investigate whether being registered to donate one's organs in an explicit consent (default opt-in or mandated choice) system is judged in the same way as a presumed consent (default opt-out) system. To achieve this, the present study examined third-party judgements as a way of gaining insights into inferred underlying preference from nudged choices (under default opt-in or default opt-out systems). The motivation for doing this was to simulate the kind of information families are faced with when making decisions as to whether to donate their deceased relative's organs, as a way to consider a possible reason for high family refusal rates, namely the strength of signals of underlying preference to donate from choices under different organ donation legislative systems.

In the main, the findings across three studies supported Hypothesis 1 which is that people are sensitive to the framing of organ donation legislative systems under which a decision to donate is made. More specifically, when an individual has been

‘defaulted’ into donation under a default opt-out or mandatory donor system, participants perceived the donor’s (i.e. Mark’s) underlying preference to donate as weaker than when that choice was made actively under a mandated choice or default opt-in system (Study 1-3). This pattern was consistent with the perceived signal of the donor’s (i.e. Mark) intent to donate (Study 2 and 3 only). Subsequently, our findings supported Hypothesis 2 which is that families making decisions on the basis of their belief about the deceased’s underlying preference to donate will be perceived by participants as more likely to agree to donate. Indeed, the same pattern was revealed in participants’ perceived likelihood estimates of the relative’s belief of the donor’s (i.e. Mark) underlying preference to donate (Study 2 and 3 only), and perceived likelihood estimates of the relative’s decision to consent to donate a family member’s organs (Study 1 and 2, except for Study 3 where no difference was found between default opt-in and default opt-out systems). That is, these perceived likelihood estimates were judged as weaker under a default opt-out or mandatory donor system compared to a default opt-in or mandated choice system.

Moreover, consistent with the patterns found in Hypothesis 1 and Hypothesis 2, the perceived diagnosticity of this evidence (i.e. Mark’s registration on the ODR across the different organ donation legislative systems) for inferring the underlying preference of the donor’s underlying preference to donate was stronger when he was registered under the default opt-in or mandated choice system compared to default opt-out or mandatory donor systems (Study 1-3); and participants’ direct ratings were broadly in line with the predictions of a Bayesian formalization.

Across the three studies, participants gave different reasons for the relative (i.e. John) consenting or vetoing donation under each organ donation legislative system. The general reason in the default opt-in and mandated choice systems were that “he actively

made a choice to opt-in and donate his organs" and "it is important to respect the deceased's wish". The reason for participants consenting to donate in the default opt-out and mandatory donor system was "Mark didn't opt-out during his lifetime means he wants to donate" and "Mark couldn't opt-out of becoming a donor anyway" respectively. This shows that, among the reasons for consenting to donation, participants were sensitive to the different systems under which the donor (i.e. Mark's) was registered to donate.

What are the implications of these findings? Evidence suggests that people believe that the best way to obtain consent is for each individual to decide for themselves rather than leaving this decision to the family (Spital, 1993, 1995, 1996). Indeed, our study shows that a large majority of participants indicated that the deceased's wishes should be respected no matter what the family thinks. Our findings show that when participants know that an individual has registered their decision to donate through some overt signal (i.e. under a mandated choice or a default opt-in system) this is likely perceived as a less ambiguous signal of a preference to donate. The signal generated from an active decision process typically encourages the agent to explicitly express a positive statement of intent, that is, request to donate or objection to donate. From the relatives' perspective, an active decision of this kind is easier to infer what the deceased would have wanted because the deceased recorded a positive wish to donate or objection to donate, as oppose to no objections to donate in the case of the default opt-out system. Ultimately, the question to ask is whether presumed consent can increase the number of people on the ODR, and at the same time represent a good signal of preference so that it maintains a high family consent rate as well. Based on the evidence from this study, it appears that presumed consent acts as a weaker signal

of underlying preference to donate, and may lead to sustained or higher family refusal rates than active choice to donate.

Lastly, the individual level analysis, irrespective of the experimental conditions (i.e. the four different organ donation legislative systems) participants were assigned to, revealed that participants' donor status has an impact on their responses to the dependent variables (except for perceived signal of intent to donate). Overall, registered organ donors gave higher estimates for the perceived belief of the donor's (i.e. Mark's) underlying preference, perceived likelihood estimate of the relative's belief of the deceased's underlying preference to donate (except in default opt-out countries), and perceived likelihood estimate of the relative's decision to consent to donate their family member's organs as compared to non-donors in countries with a default opt-in and default opt-out system. In practice, this could potentially mean that if there is no clear signal of preference to donate then relatives may rely on their own attitudes towards donation to inform their decision to consent or veto.

Ethical and Policy Implications

The goal of the nudge policy is "to influence choice in a way that will make choosers better off, as judged by themselves" (Thaler & Sunstein, 2008, p. 5). The justification for autonomy here is the preservation of free choice. Although defaults are powerful solutions for decreasing intention-behavior gaps in organ donation, the nudgers (choice architects – policy makers) can only go as far as constructing the choice architecture to increase the number of people on the ODR. Realistically, if the cost of opt-out is low, and if publicity and transparency are guaranteed, then there is far less threat to autonomy (Sunstein, 2015). However, our findings suggest that fewer than 50% of the participants in the default opt-in countries and only 19% from the default opt-out

countries have correctly identified the organ donation legislative system in their country, despite most recent survey showing around 80% of the population support organ donation ‘in principle’ (Department of Health & Social Care, 2017). Though this is cannot be taken as a direct comparison and given the selected samples recruited from Mturk and Prolific Academic, the implication of this finding should be read with care. Nonetheless, this illustrates a potential issue with the lack of awareness of organ donation legislations being implemented in their country, in particular, in presumed consent countries. This may help explain the weaker signal of perceived underlying preference to donate under a default opt-out system. In practical terms, this means if families are unaware that a default opt-out system has been implemented then the families are equally likely to believe that the deceased was also unaware of such system and may have forgotten to record an objection to donate during his/her lifetime. By inference, families are more likely to veto donation because, as revealed by our findings, signals attached to a default opt-out system suggest weaker perceived underlying preference to donate; this is because a passive choice was made as opposed to an active one. After all, the basis of a well-informed system is one which everyone should know about. One way to achieve this is through educational campaigns prior to the introduction of a new organ donation legislative system. This ensures that donors and especially families are aware of the intention and mechanism behind such systems. Indeed, the most recent consultation by Department of Health & Social Care (2017) highlighted that to implement a new system of consent successfully and support increased rates of organ donation, the government must consider an extensive communication campaign before and after the legislation comes into effect.

Our view is therefore in line with Bovens’ (2009) and Johnson et al's (2013) which is that a default system would be a good policy, but only if people’s intentions

are clear and explicitly stated beforehand. We propose that effort should focus on promoting an active choice system which would provide clearer underlying preference. The Behavioural Insights Team (BIT) conducted one of the largest randomized controlled trials (1,085,322 individuals) ever run in the UK testing the effect of including different messages on a high traffic website on GOV.UK that encourages people to actively join the NHS ODR. The results showed that the best performing message was “if you needed an organ transplant, would you have one? If so please help others.” and the least performing message was “Every day thousands of people who see this page decide to register” which contained a picture (Behavioural Insights Team, 2013). In 2014, the best performing message by itself lead to over 350,000 registrations for organ donation via the GOV.UK link (Loosemore, 2014). These findings suggest that a simple change of message can make a vast difference to the number of people actively signing up to the register. This type of online trial would also be more cost effective and less risky compared to implementing a default opt-out system, in addition to providing a clearer signal to families acting a proxy consent because as shown by our findings, the strength of underlying preference to donate is stronger under an active choice system.

Last but not least, for any organ donation legislative systems, we recommend a two-way register. This means there is the option to register for both intentions, namely an expressed positive statement of intention to donate and objection to donate. An example of this is a mandated choice system introduced in our study which makes it a legal requirement that everyone must register their intention to donate or objection to donate during their lifetime. This reduces the noises from the signals attached to a system since an active choice is always made. A recent study has found that the most favorable system from the point of personal preference and the point of perception of

the norm for consenting to donation was the mandated choice system (Hammami et al., 2012). Whilst argument could be made that it undermines autonomy because people are coerced to make a choice, if the aim is to respect individual autonomy then mandated choice promotes autonomy from the point of view that it ensures one's preference is respected.

Conclusion

Family members often have to infer the deceased's underlying preference from the choices they made, which can, in turn, we would argue, be affected by the signal attached to the organ donation legislative systems in place. We found that when an individual is registered as a donor under the mandated choice or default opt-in systems people judged this choice as more indicative of an underlying preference to donate, as compared to the default opt-out or mandatory donor systems. Since families play a central role in the organ donation process, measures should be implemented to minimize the noise/ambiguity in the signals attached to organ donation legislative systems. In the discussion, we offered three solutions that could potentially enhance the strength of the signal of underlying preference. These include educational campaign, increasing registration under an active choice system and adopting a two-way register. Finally, it is important to bear in mind that other factors also play a role in determining whether an increase in registered donors on the ODR translates into real increases in organ transplantation. These include but not limited to the number of hospitals carrying out transplants, the number of intensive-care beds available, relative refusing consent to donate, religious and cultural responses to cadavers, and public attitudes to and awareness of organ donation (Merchant et al., 2008; Mossialos et al., 2008; Shepherd et al., 2014); which should be factored into the implementation of legislation systems in order to evaluate the success of these systems.

Reference

Abadie, A., & Gay, S. (2006). The impact of presumed consent legislation on cadaveric organ donation: a cross-country study. *Journal of Health Economics*, *25*(4), 599–620. http://doi.org/10.1016/j.jhealeco.2006.01.003

BBC. (2017). Hundreds of families block organ donation. Retrieved from http://www.bbc.co.uk/news/health-41671600

Behavioural Insights Team. (2013). *Applying Behavioural Insights to Organ Donation: preliminary results from a randomised controlled trial*. Retrieved from https://gds.blog.gov.uk/2014/03/18/organ-donor-register/

Botti, S., & McGill, A. L. (2006). When Choosing Is Not Deciding: The Effect of Perceived Responsibility on Satisfaction. *Journal of Consumer Research*, *33*(2), 211–219. http://doi.org/10.1086/506302

Bovens, L. (2009). The Ethics of Nudge. In T. Grüne-Yanoff & S. O. Hansson (Eds.), *Preference Change : Approaches from Philosophy, Economics and Psychology* (pp. 217–209). Dordrecht: Springer Netherlands.

Bowels, S. (1998). Endogenous Preferences: The Cultural Consequences of Markets and other Economic Institutions. *Journal of Economic Literature*, *XXXVI*, 75–111.

Byrne, M. M., & Thompson, P. (2001). A positive analysis of financial incentives for cadaveric organ donation. *Journal of Health Economics*, *20*(1), 69–83.

Cohen, I. G., Lynch, H. F., & Robertson, C. T. (2016). *Nudging health : health law and behavioral economics* (Eds). Baltimore: Johns Hopkins University Press.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. New York, NY: Routledge Academic.

Davidai, S., Gilovich, T., & Ross, L. D. (2013). The meaning of default options for potential organ donors. *Proceedings of the National Academy of Sciences*, *109*(38), 15201–15205. http://doi.org/10.1073/pnas.1211695109

DeJong, W., Franz, H. G., Wolfe, S. M., Nathan, H., Payne, D., Reitsma, W., & Beasley, C. (1998). Requesting organ donation: an interview study of donor and nondonor families. *American Journal of Critical Care*, *7*(1), 13–23.

Den Hartogh, G. (2012). The role of the relatives in opt-in systems of postmortal organ procurement. *Medline, Health Care, and Philosophy*, *15*(2), 195–205. http://doi.org/Den Hartogh, G. (2012). The role of the relatives in opt-in systems of postmortal organ procurement. Medicine, Health Care, and Philosophy, 15(2), 195–205. http://doi.org/10.1007/s11019-011-9317-0

Department of Health & Social Care. (2017). *Consultation on introducing "opt-out" consent for organ and tissue donation in England*. Retrieved from https://www.gov.uk/government/consultations/introducing-opt-out-consent-for-organ-and-tissue-donation-in-england/consultation-on-introducing-opt-out-consent-for-organ-and-tissue-donation-in-england

Eurobarometer. (2007). *Europeans and organ donation report*. Retrieved from http://ec.europa.eu/public_opinion/archives/ebs/ebs_272d_en.pdf

Exley, M., White, N., & Martin, J. H. (2002). Why families say no to organ donation. *Critical Care Nurse*, *22*(6), 44–51.

Ghorbani, F., Khoddami-Vishteh, H. R., Ghobadi, O., Shafaghi, S., Louyeh, A. R., &

Najafizadeh, K. (2011). Causes of family refusal for organ donation. *Transplantation Proceedings*, *43*(2), 405–6. http://doi.org/10.1016/j.transproceed.2011.01.031

Gigerenzer, G., & Hoffrage, U. (1995). How to improve Bayesian reasoning without instruction: Frequency formats. *Psychological Review*, *102*(4), 684–704. http://doi.org/http://dx.doi.org/10.1037/0033-295X.102.4.684

Glasson, J., Plows, W. P., Tenery, R. M., Clark, O. W., Ruff, V., Fuller, D., … Leslie, J. (1994). Strategies for Cadaveric Organ Procurement. *JAMA*, *272*(10), 809. http://doi.org/10.1001/jama.1994.03520100071036

Hammami, M. M., Abdulhameed, H. M., Concepsion, K., Eissa, A., Hammami, S., Amer, H., … Al-Gaai, E. (2012). Consenting options for posthumous organ donation: presumed consent and incentivesare not favored. *BMC Medical Ethics*, *13*(32), 1–14. http://doi.org/https://doi.org/10.1186/1472-6939-13-32

Harris, A. J. L., Corner, A., & Hahn, U. (2013). James is polite and punctual (and useless): A Bayesian formalisation of faint praise. *Thinking & Reasoning*, *19*(3–4), 414–429. http://doi.org/10.1080/13546783.2013.801367

Johnson, E. J., & Goldstein, D. G. (2003). Do defaults save lives? *Science*, *302*(5649), 1338–1339. http://doi.org/10.1126/science.1091721

Johnson, E. J., Hassin, R., Baker, T., Bajger, A. T., & Treuer, G. (2013). Can consumers make affordable care affordable? The value of choice architecture. *PloS One*, *8*(12), e81521. http://doi.org/10.1371/journal.pone.0081521

Lagnado, D. A., Fenton, N., & Neil, M. (2012). Legal idioms: a framework for evidental reasoning. *Argument & Computation*, *4*(1), 46–63.

http://doi.org/10.1080/19462166.2012.682656

Loosemore, T. (2014). One link on GOV.UK - 350,000 more organ donors. Retrieved from https://gds.blog.gov.uk/2014/03/18/organ-donor-register/

McKenzie, C. R. M., Liersch, M. J., & Finkelstein, S. R. (2006). Recommendations implicit in policy defaults. *Psychological Science*, *17*(5), 414–20. http://doi.org/10.1111/j.1467-9280.2006.01721.x

Merchant, S. J., Yoshida, E. M., Lee, T. K., Richardson, P., Karlsbjerg, K. M., & Cheung, E. (2008). Exploring the psychological effects of deceased organ donation on the families of the organ donors. *Clinical Transplantation*, *22*(3), 341–7. http://doi.org/10.1111/j.1399-0012.2008.00790.x

Mossialos, E., Costa-Font, J., & Rudisill, C. (2008). Does organ donation legislation affect individuals' willingness to donate their own or their relative's organs? Evidence from European Union survey data. *BMC Health Services Research*, *8*(1), 48. http://doi.org/10.1186/1472-6963-8-48

NHSBT. (2015). *Organ Donation and Transplatation: Activity Report 2014/15*. Retrieved from http://nhsbtmediaservices.blob.core.windows.net/organ-donation-assets/pdfs/activity_report_2014_15.pdf

NHSBT. (2016). Families saying no to donation results in missed transplant opportunities for UK patients. Retrieved from http://www.nhsbt.nhs.uk/news-and-media/news-articles/news_2016_01_15.asp

NHSBT. (2017). Organ Donation and Transplantation: Activity Report 2016/17. Retrieved from https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/4657/activity_report_2016_17.pdf

Organdonor.gov. (2017). The Need is Real: Data. Retrieved February 20, 2016, from http://www.organdonor.gov/about/data.html

Osman, M. (2014). *Future-minded: The Psychology of Agency and Control*. New York: Palgrave Macmillan.

Payne, J. W., Bettman, J. R., & Johnson, E. J. (1993). *The adaptive decision maker*. New York: Cambridge University Press.

Radecki, C. M., & Jaccard, J. (1997). Psychological aspects of organ donation: a critical review and synthesis of individual and next-of-kin donation decisions. *Health Psychology*, *16*(2), 183–95.

Rithalia, A., McDaid, C., Suekarran, S., Myers, L., & Sowden, A. (2009). Impact of presumed consent for organ donation on donation rates: a systematic review. *BMJ*, *338*, a3162.

Rosenblum, A. M., Horvat, L. D., Siminoff, L. A., Prakash, V., Beitel, J., & Garg, A. X. (2012). The authority of next-of-kin in explicit and presumed consent systems for deceased organ donation: an analysis of 54 nations. *Nephrology Dialysis Transplantation*, *27*(6), 2533–46. http://doi.org/10.1093/ndt/gfr619

Shepherd, L., O'Carroll, R. E., & Ferguson, E. (2014). An international comparison of deceased and living organ donation/transplant rates in opt-in and opt-out systems: a panel study. *BMC Medicine*, *12*(1), 131. http://doi.org/10.1186/s12916-014-0131-4

Siminoff, L. A., & Lawrence, R. H. (2002). Knowing Patients' Preferences about Organ Donation: Does it Make a Difference? *The Journal of Trauma*, *53*(4), 754–760. http://doi.org/10.1097/01.TA.0000030052.69240.4F

Spital, A. (1993). A consent for organ donation: Time for change. *Clinical Transplant*, *7*, 525–528.

Spital, A. (1995). Mandated choice: A plan to increase public commitment to organ donation. *JAMA*, *273*(6), 504–506. http://doi.org/10.1001/jama.1995.03520300078045

Spital, A. (1996). Mandated choice for organ donation: Time to give it a try. *Annals of Internal Medicine*, *125*(1), 66–69.

Sunstein, C. R. (1993). Endogenous Preferences, Environmental Law. *The Journal of Legal Studies*, *22*(2), 217–254.

Sunstein, C. R. (2015). Nudges, Agency, and Abstraction: A Reply to Critics. *Review of Philosophy and Psychology*, *6*(3), 511–529. http://doi.org/10.1007/s13164-015-0266-z

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving Decisions about Health, Wealth, and Happiness*. New Haven: Yale University Press.

The Guardian. (2015). Organ donation rates held back by families refusing consent, study finds. Retrieved from https://www.theguardian.com/australia-news/2015/mar/01/organ-donation-rates-held-back-by-families-refusing-consent-study-finds

U.S. Department of Health and Human Services. (2013). *2012 National Survey of Organ Donation Attitudes and Behaviors*. Rockville, Maryland. Retrieved from http://organdonor.gov/dtcp/nationalsurveyorgandonation.pdf

van Dalen, H. P., & Henkens, K. (2014). Comparing the effects of defaults in organ

donation systems. *Social Science & Medicine*, *106*, 137–142. http://doi.org/10.1016/j.socscimed.2014.01.052

Vincent, A., & Logan, L. (2012). Consent for organ donation. *British Journal of Anaesthesia*, *108*(suppl 1), i80–i87. http://doi.org/10.1093/bja/aer353

Table 1.

The combined general reasons in frequencies for opt-in and opt-out countries that John will consent to donate Mark's organs in each organ donation legislative system, where '×' means this option was not displayed for that system.

Reason for likely/moderately likely/highly likely to donate	Opt-In	Opt-Out	Mandated Choice	Mandatory Donor
It is important to respect the deceased's wish	50	22	64	24
This is a gift of life	8	23	15	33
The act of good citizenship	7	18	7	39
There is evidence to suggest that Mark wanted to donate his organs	32	20	40	13
He actively made a choice to opt-in and donate his organs	95	10	68	16
Mark didn't opt-out during his lifetime means he wanted to donate	x	85	x	x
Mark couldn't opt-out of becoming a donor anyway	x	x	x	56
None of the above	0	7	1	9

Table 2.

The combined general reasons in frequencies for opt-in and opt-out countries that John will refuse to donate Mark's organs in each organ donation legislative system, where '×' means this option was not displayed for that system.

Reason for moderately unlikely/highly unlikely to donate	Opt-In	Opt-Out	Mandated Choice	Mandatory Donor
It is a highly traumatic time for relatives and it's just not something they can think about	1	5	3	1
Lack of understanding of the organ donation process	0	1	0	2
Denial and rejection of brain-death criteria	0	1	0	1
The hope for a miracle	0	2	0	0
Fear about organ trade and unknown organ destination	1	0	0	0
Religious belief	2	0	0	0
Insecurity about the brain-death diagnosis	1	0	0	0
Unsure about Mark's wish to donate	0	4	1	2
Belief in body integrity	1	0	0	1
Fear about objection by other family members	0	0	0	0
There is a lack of evidence to indicate that Mark wanted to donate his organs	2	1	1	2
Because Mark didn't opt-out doesn't mean he wanted to donate his organs	x	1	x	x
Mark was forced to donate his organs	x	x	x	2
Mark was forced to make a choice when he wasn't ready	x	x	0	x
None of the above	0	0	0	0

Table 3.

Summary of main findings showing the effect of organ donation legislative systems on the five dependent variables when including the six covariates: 1) whether they were on the ODR, 2) whether they knew anyone that was on the ODR, 3) whether they were blood donors, 4) whether they would consent to donating their loved one's organs even if their wishes were unknown, 5) whether organ donation was deemed as forbidden in their religion, and 6) whether they agree with the idea of a default opt-out system.

	Study 1	**Study 2**	**Study 3**
perceived belief of the donor's underlying preference to donate	$F(3, 483) = 80.79$, $p < .001$, $\eta^2 = .04$	$F(3, 391) = 48.30$, $p < .001$, $\eta^2 = .02$	$F(3, 390) = 26.54$, $p < .001$, $\eta^2 = .01$
perceived signal of donor's intent to donate	N/A	$F(3, 391) = 97.26$, $p < .001$, $\eta^2 = .09$	$F(3, 390) = 63.10$, $p < .001$, $\eta^2 = .07$
likelihood estimates of the relative's belief of the donor's underlying preference to donate	N/A	$F(3, 391) = 66.57$, $p < .001$, $\eta^2 = .03$	$F(3, 390) = 31.79$, $p < .001$, $\eta^2 = .02$
perceived likelihood of the relative's decision to consent to donate their family member's organs	$F(3, 483) = 25.26$, $p < .001$, $\eta^2 = .008$	$F(3, 391) = 23.77$, $p < .001$, $\eta^2 = .01$	$F(3, 390) = 6.14$, $p < .001$, $\eta^2 =.002$
perceived diagnosticity of people's intention to donate	$F(3, 406) = 9.82$, $\eta^2 = .03$, $p < .001$	$F(3, 391) = 48.30$, $p < .001$, $\eta^2 = .10$	$F(3, 295) = 13.12$, $p < .001$, $\eta^2 = .08$

Table 4.

Participants' knowledge of the current organ donation legislation in their country: Study 1 (US, opt-in system), Study 2 (European country, opt-in system), and Study 3 (European country, opt-out system).

	What is the current legislation in your country? (%)		
	Study 1	Study 2	Study 3
Opt-out/Presumed consent	9.2	7.7	18.5
Mandatory/compulsory	1.8	0.5	1.3
Need to carry a donor card	0.8	21.9	9.0
Opt-in	42.8	44.6	18.8
Family or close friend will decide	8.7	3.7	8.8
Don't know	36.7	21.4	43.8

Default Opt-In System

Mark lives in an area with an **OPT IN** system of organ donation.

Under this system, everyone is automatically registered as a NON-DONOR, meaning they will NOT have their organs used in the event of their death. Anyone who wishes to be a donor must make an extra effort by going online and changing their preferences or by calling the donor line.

Default Opt-Out System

Mark lives in an area with an **OPT OUT** system of organ donation.

Under this system, everyone is automatically registered as a DONOR, meaning they will have their organs used in the event of their death. Anyone who wishes to be a NON-DONOR must make an extra effort by going online and changing their preferences or by calling the donor line.

Mandated Choice System

Mark lives in an area with a **CHOICE** system of organ donation.

Under this system, everyone is legally required to choose between being a DONOR OR NON-DONOR before they register for their driver's license.

Mandatory Donor System

Mark lives in an area with a **DONOR** system of organ donation.

Under this system, everyone is automatically REGISTERED AS A DONOR. There is no option for changing this.

Figure 1. The scenario described in each organ donation legislative systems: Default Opt-In, Default Opt-out, Mandated Choice and Mandatory Donor.

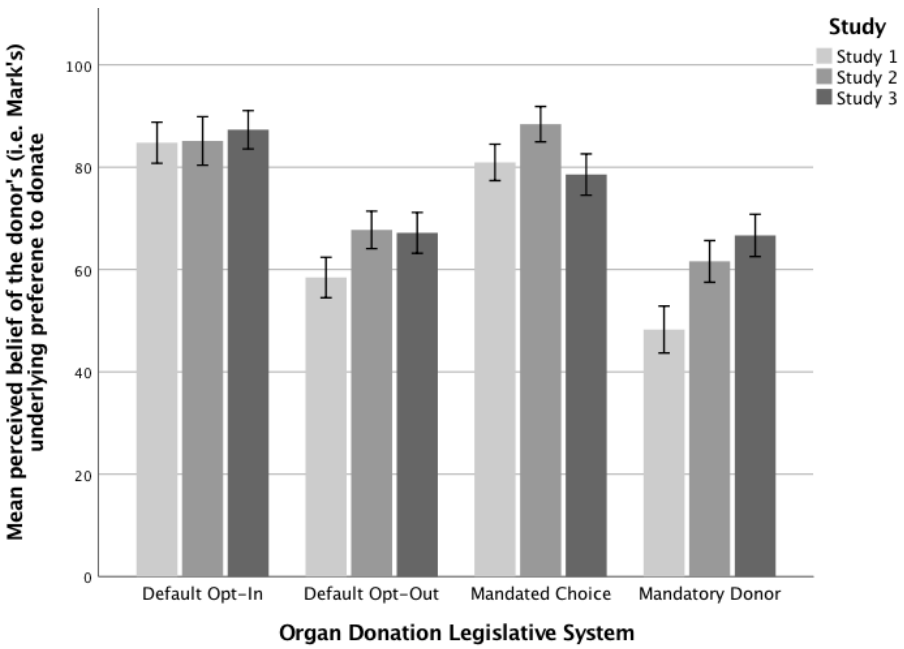

Figure 2. Mean perceived belief of the donor's (i.e. Mark's) underlying preference to donate across the four experimental conditions for Study 1, Study 2 and Study 3. Error bars are at 95% CI.

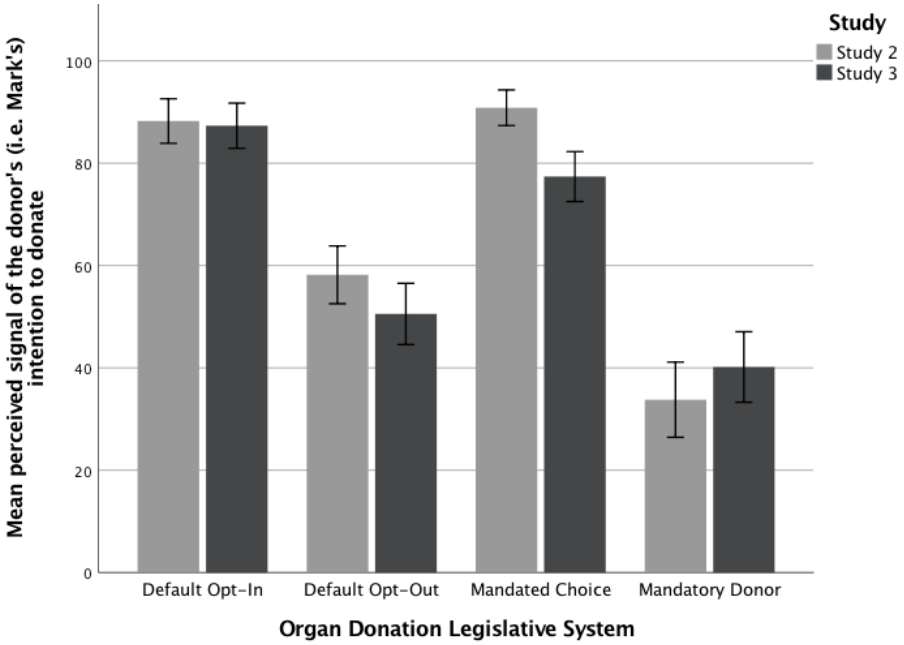

Figure 3. Mean perceived signal of the donor's (i.e. Mark's) intention to donate across the four experimental conditions for Study 2 and Study 3. Error bars are at 95% CI.

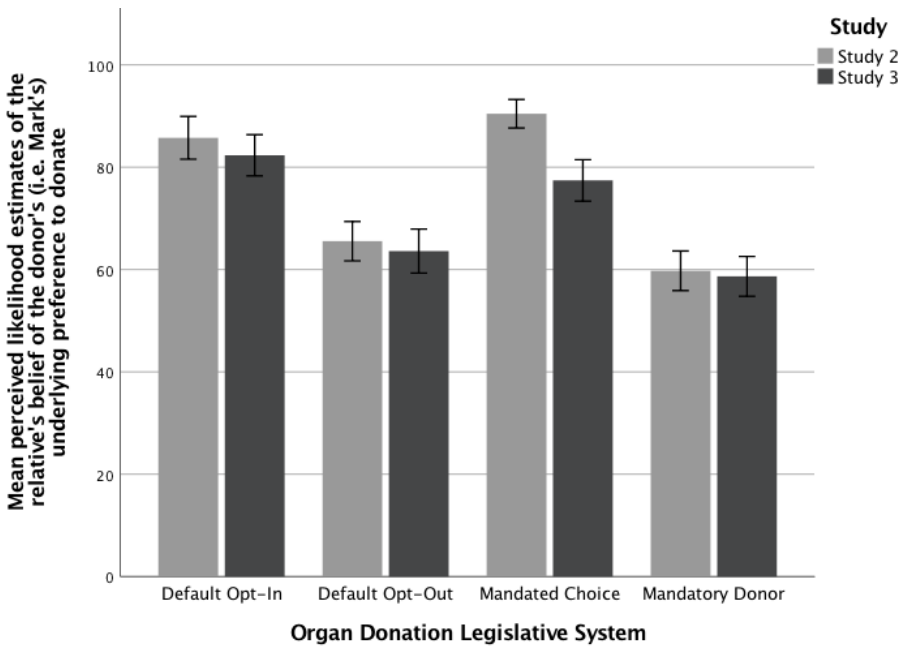

Figure 4. Mean perceived likelihood estimates of the relative's belief of the donor's (i.e. Mark's) belief of the donor's (i.e. Mark's) underlying preference to donate across the four experimental conditions for Study 2 and Study 3. Error bars are at 95% CI.

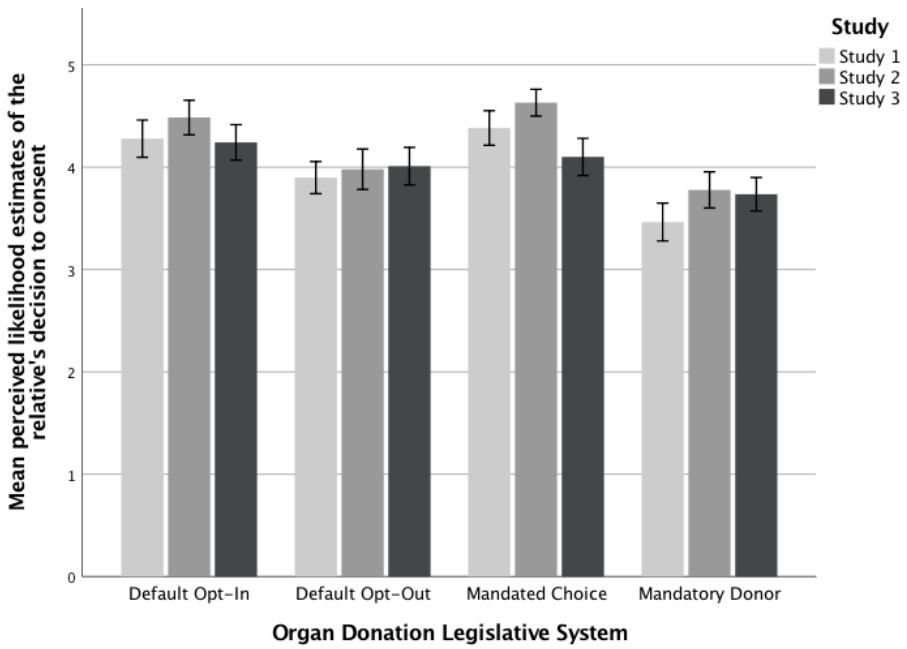

Figure 5. Perceived likelihood estimates of the relative's decision to consent across the four experimental conditions for Study 1, Study 2 and Study 3. Error bar at 95% CI.

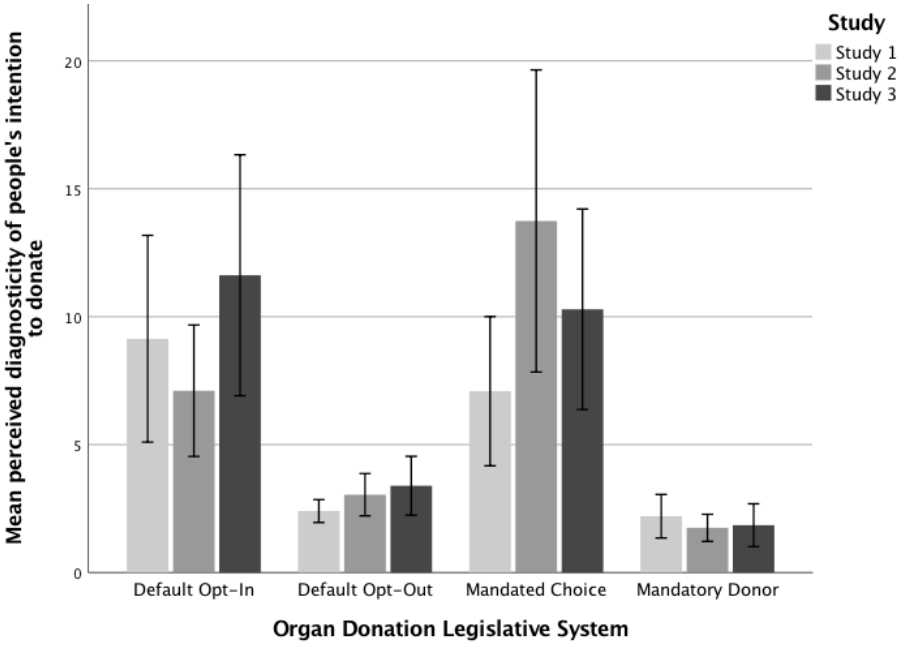

Figure 6. Mean perceived diagnosticity of people's intention to donate across the four experimental conditions for Study 1, Study 2 and Study 3. Error bar at 95% CI.

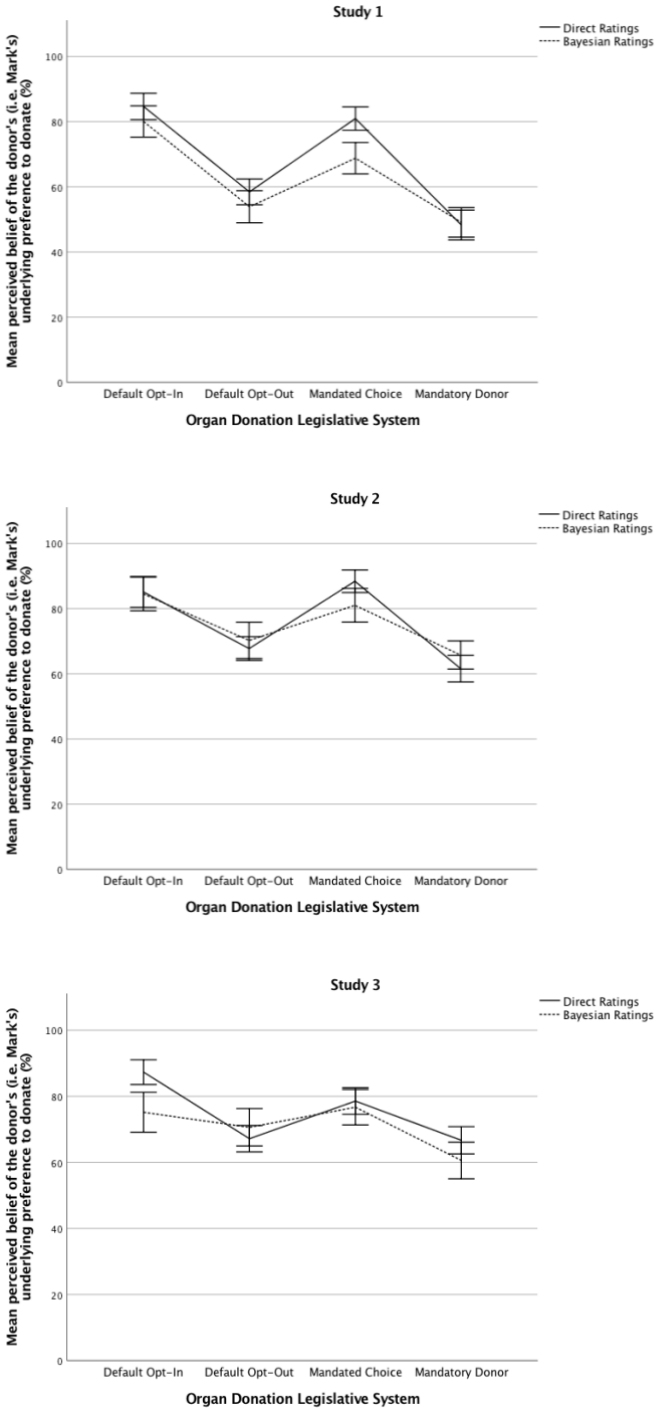

Figure 7. Bayesian predictions of the effects of the organ donation legislative system and the direct ratings of belief in the donor's (i.e. Mark's) underlying preference to donate across the four experimental conditions for Study 1, Study 2 and Study 3. Error bars are 95% CI.