Efficiency for lives, equality for everything else: How allocation preference shifts across domains

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Abstract

The allocation of scarce public resources such as transplant organs and limited public funding involves a tradeoff between equality— equal access, and efficiency— maximizing total benefit. The current research explores how preferences shift when allocation decisions involve human lives versus when they do not. Fifteen experiments test this question using a variety of allocation scenarios, including allocation of life-saving medical aid, money, road construction, vaccines, and other resources. The results consistently show an increased preference for efficiency when the allocation involves saving human lives, and equality when the allocation involves outcomes with other consequences. We found no preference shift when stakes were manipulated in allocations where lives were not on the line, suggesting that the effect cannot be explained by life-saving resources simply being higher stakes. These findings suggest a unique preference for efficiency for allocations involving life-and-death consequences that has implications for designing and conveying public resource allocation policies.

Efficiency for lives, equality for everything else:

How allocation preference shifts across domains

When distributing scarce resources, there is often a tradeoff between *equality*, giving beneficiaries equal access, and *efficiency*, maximizing the total benefit achieved. For instance, disaster relief funds might be allocated to all victims equally, or preferentially to those who can put them to the best use. Organ transplant lists can use a first-come, first-served rule to ensure equal access, or prioritize younger, healthier patients to increase total life-years saved. How does the public view these tradeoffs? Do they prefer equality or efficiency?

An extensive literature exists on people's preferences between efficiency and equality in the economic domain (for a review see Gordon-Hecker, Chosen-Hillel, Shalvi & Bereby-Meyer, 2017), but we know very little about how allocation preferences may differ across domains. Specifically, no research has examined whether people hold different allocation preferences for life-saving resources versus other types of resources. The current research, we explore the answer to this question.

Research in the healthcare context suggests that the public prefers equality to efficiency when allocating scarce medical resources. For example, 56% of jurors in one study preferred to allocate screening tests to all Medicaid recipients despite the cost of saving fewer lives in total (Ubel, DeKay, Baron & Asch, 1996). In another study (Ubel & Lowenstein, 1996), the majority of participants did not allocate all transplant livers to children with higher chances of survival. However, the proportion of choices favoring equality over efficiency varies across studies and does not always represent the majority (Ubel et al, 1996; Ubel & Lowenstein, 1996). Other studies in the healthcare context

show that such preferences are malleable and subject to framing effects (Colby, DeWitt, & Chapman, 2015; Li & DeWitt, 2017; Li, Vietri, Galvani, & Chapman, 2010; Ubel, Baron, & Asch, 2001).

Outside of the healthcare context, research on allocation preference has focused primarily on money allocation. In the organizational setting, research shows that in general, monetary resources prompt preferences for differential, and potentially more efficient allocations (Conlon, Porter, & Parks, 2004; DeVoe & Iyengar, 2010; Martin & Harder, 1994; Tornblom & Foa, 1983). This indicates a general preference for efficiency over equality in monetary allocations.

Thus, existing evidence seems to indicate a general preference for equality in allocations involving lives, and a preference for efficiency in allocations involving money. But given that such evidence comes from different lines of literature, these findings are not directly comparable.

Thus, we propose Hypothesis 1: The public's allocation preference shifts towards equality in allocations involving human lives versus allocations involving money. This comparison is narrow. After observing results from two studies, we formed a broader Hypothesis 2: The public allocation preference shifts towards efficiency in allocations involving human lives versus those involving non-lives in general.

Study 1 compared allocation of life-saving resources to the allocation of money; Study 2 compared allocation of life-saving resources to the allocation of highway restoration resources. Results from these studies led us to propose and test Hypothesis 2. Study 3 explored how allocation preferences shift when lives are on the line versus when the same resource is being allocated but lives are not on the line; Studies 4 and 5 explored

stakes as an alternative explanation for the different allocation preferences between lives and non-lives, with Study 4 testing the effect of the numerical magnitude of consequence, and Study 5.1-5.11 testing the effect of different types of stakes outside of life-and-death situations.

Study 1

Study 1 tested how allocation preference varies between allocations involving lives and money.

Methods

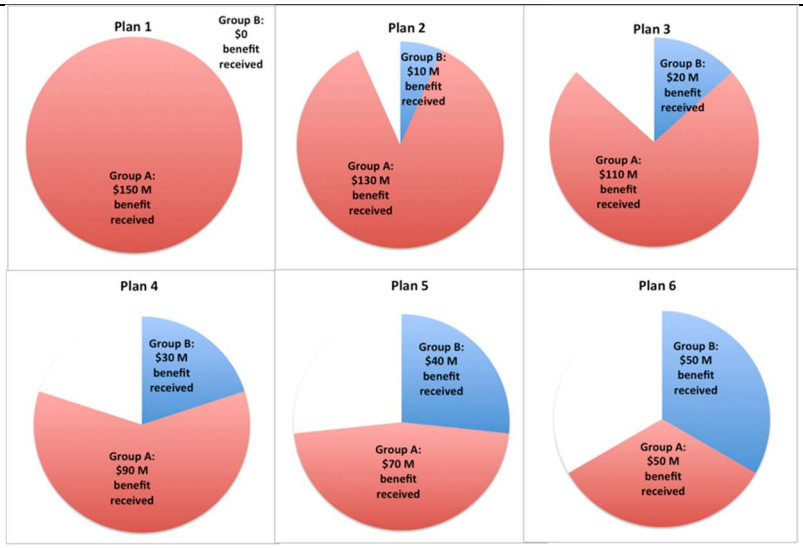
As no prior research has compared allocation preference involving lives and money, we chose large sample sizes to ensure the power of our studies, with about n = 200 per condition in all studies. In Study 1, 417 participants from Amazon Mechanical Turk completed the online study for a small payment. Participants imagined that they worked for a government aid program and needed to allocate a limited pool of resources between two groups of people following a severe earthquake. Participants were randomly assigned to a "money" condition in which the aid was money or a "lives" condition in which the aid was life saving humanitarian resources. In both conditions, participants read that Group A is located in an easier-to-access location and therefore is more successful at translating the resource into a greater benefit than Group B.

Participants then saw six potential allocation plans depicted as pie charts with different colors representing benefits in each group and a gap representing "benefit that was not received due to operating cost" / "lives that are not saved due to the extra hurdles of operation" (see Figure 1). We designed the 6 plans such that each successive plan decreased the benefit to Group A by $20 Million (20 lives) and increased the benefit to

Group B by $10 Million (10 lives), leading to a decrease of overall benefit by $10 Million (10 lives). We explained the tradeoff and pointed out that Plan 1 achieves efficiency the best, while Plan 6 achieves equality the best (see Supplemental Materials for details).

We measure preference as the choice among the six plans (1= most efficient, 6 = most equal), and administered two comprehension check questions on which plan was most efficient and which was most equal. Participants also answered and four additional perception questions. See supplemental materials for description and results related to these questions.

A



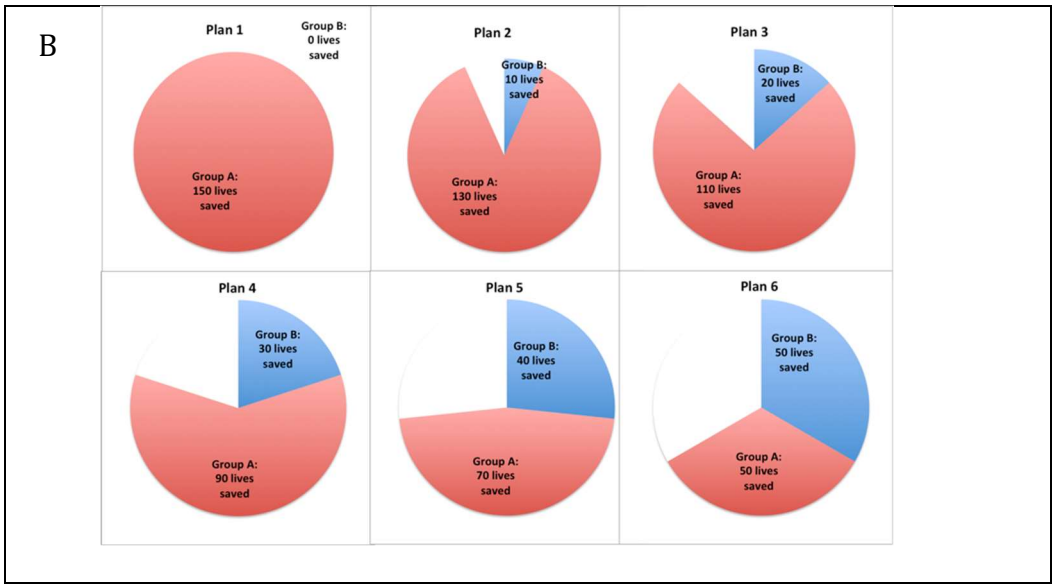


Figure 1. Allocation plans displayed in pie charts in the Money condition (A) and Lives condition (B) in Study 1. Legends accompany pie charts in the Money condition read "*Red: Benefit (in Million $) received by people in Group A. Blue: Benefit (in Million $) received by people in Group B. White gap: Benefit that is not received due to the extra cost of operation."* Legends accompanying pie charts in the Lives condition included "*Red: Lives saved in Group A. Blue: Lives saved in Group B. White gap: Lives that are not saved due to the extra hurdles of operation*."

Results

Of 417 participants, 74% of participants correctly answered both check questions. We performed all analyses twice, once only including these participants and once including all participants. These analyses led to the same conclusions (see supplemental materials for details) and below we present analyses including all participants.

Contrary to Hypothesis 1, participants showed greater preference for efficiency in the Lives condition ($M = 3.25$, $SD = 1.97$) than the Money condition, ($M = 4.54$, SD = 1.53), t (415) = 7.37, $p < .001$, Mean Diff = 1.28, 95% CI [0.94, 1.62], Cohen's D = 0.72. Figure 2 shows the percentage of participants choosing each allocation plan by

condition. Treating the preference measure as an ordinal variable yielded the same conclusion (see Supplemental Materials).

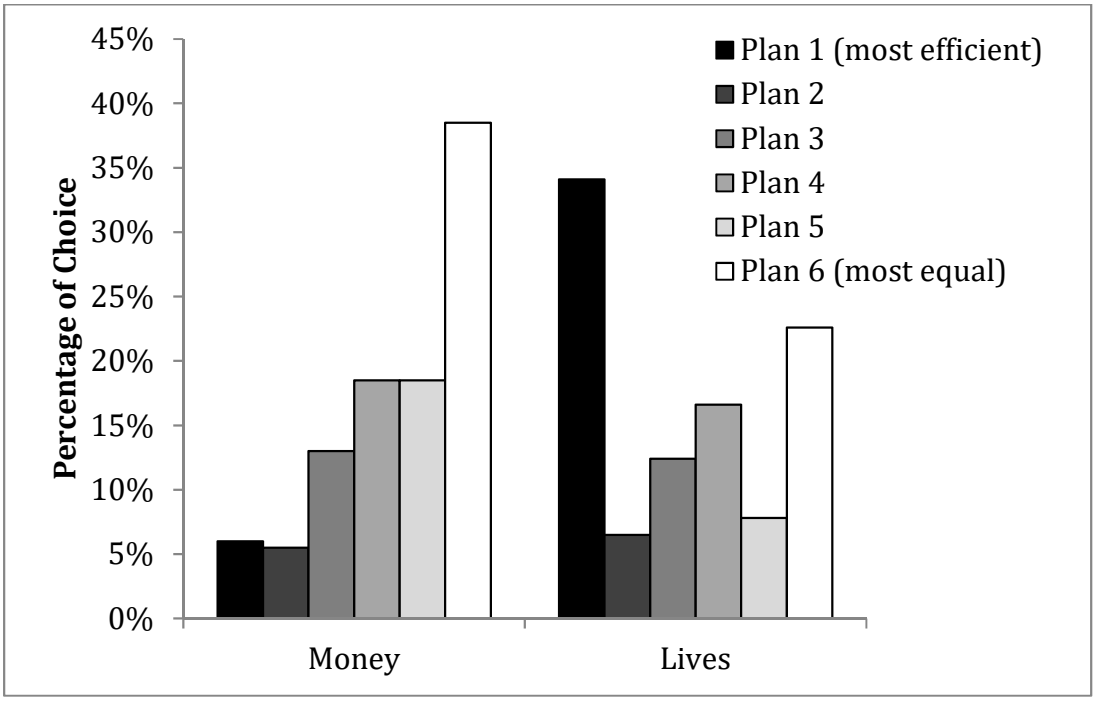


Figure 2. Percentages of participants choosing each plan in the "Money" and "Lives" conditions in Study 1. Plan 1 was the most efficient and to Plan 6 was the most equal plan, with plans in between ranging from efficient to equal in equal intervals.

Discussion

These results demonstrate that when efficiency and equality pose a conflict in the allocation of scarce public resources, people's preference for efficiency is greater when the allocation involves lives compared to when it involves money. This result is in the opposite direction of what Hypothesis 1 predicted, but may not be directly contradictory to existing research due to the different ways the studies that were conducted. We offer a more lengthy discussion in the general discussion. We replicated these findings in a similar study where money was used for poverty relief instead of disaster relief (Study S1, see supplemental materials for details).

Study 2

Does the effect in Study 1 extend to situations where monetary resource leads to non-monetary outcomes? This is a practical policy question, as monetary resources can achieve non-monetary outcomes such as infrastructural or educational improvements. Study 2 answers this question by comparing two allocations of the same "aid resources" that either saves lives or repairs highways.

Methods

Four hundred and fifty-eight participants from Amazon Mechanical Turk were randomly assigned to either a "Highway" or "Lives" condition in an online study. Both conditions used an earthquake relief scenario similar to Study 1, and participants were asked to allocate aid between City A or City B. The resource in both conditions was described as government "humanitarian aid". The "Lives" condition was similar to that used in Study 1. However, the "Highway condition" described the outcomes of the allocation in the miles of highways repaired. As in Study 1, City A is more accessible than City B, but Study 2 made it more explicit that because of this, City B required more resources to produce each unit of benefit.

To allow a more precise measure of allocation preference, we measured allocation using a slider bar that was lined to an interactive pie-chart showing the composition of benefit received in each city in response to the sliding bar (Figure 3). The tradeoff was similar to Study 1, where it costs 1 unit of resource to generate 1 unit of benefit in City A, and 2 units of resource to generate 1 unit of benefit in City B. The benefit in both conditions ranged from 0 lives saved or miles repaired to 150 lives saved or 150 miles repaired. The outcome measure was the amount of benefit allocated to City A, where

greater number indicates greater preference for efficiency (See Supplemental Materials for additional procedural details as well as additional measures collected in this study).

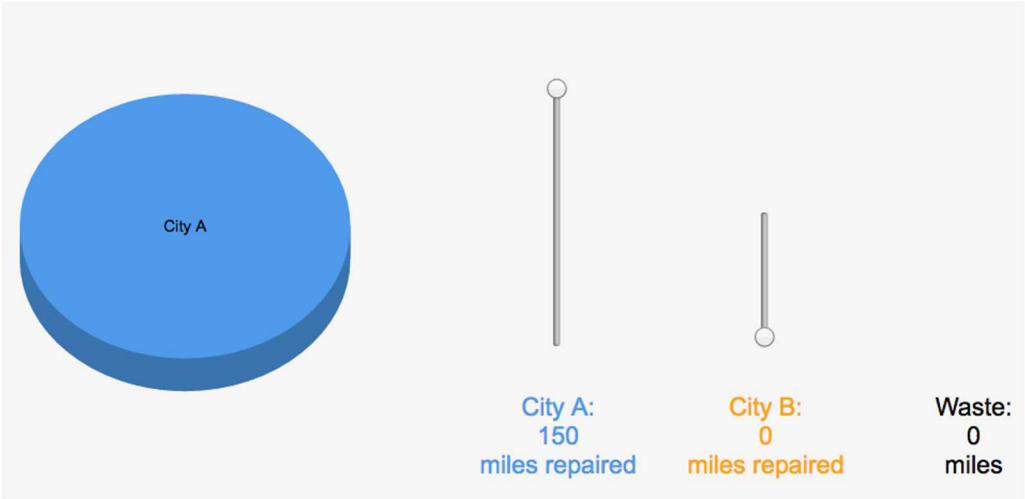


Figure 3. Screen shot of the slider bars and interactive pie chart used in Study 2 to measure allocation preference. The graph shows the initial image of the pie chart and initial location of the slider bars in the "Highway" condition.

Results

Nineteen out of 458 participants (4.1%) chose to allocate more benefit to City B than to City A, leading to outcomes that were neither efficient nor equal. Results were similar in analyses including and excluding these participants (see Supplemental Materials) and we present the analysis including all participants below.

Figure 4 shows the mean units of benefit allocated to City A in the two conditions. Participants allocated more resources to city A and thus allocated them more efficiently in the "Lives" condition (M = 113.69, SD = 36.80) compared to the "Highway" condition (M = 90.39, SD = 34.64), Mean Diff = 23.30, 95% CI [16.74,

29.86], t (456) = 6.98, p < .001, Cohen's D = 0.65. Thus, participants demonstrated a greater preference for efficiency when the allocation involved lives than when it involved highway repairs.

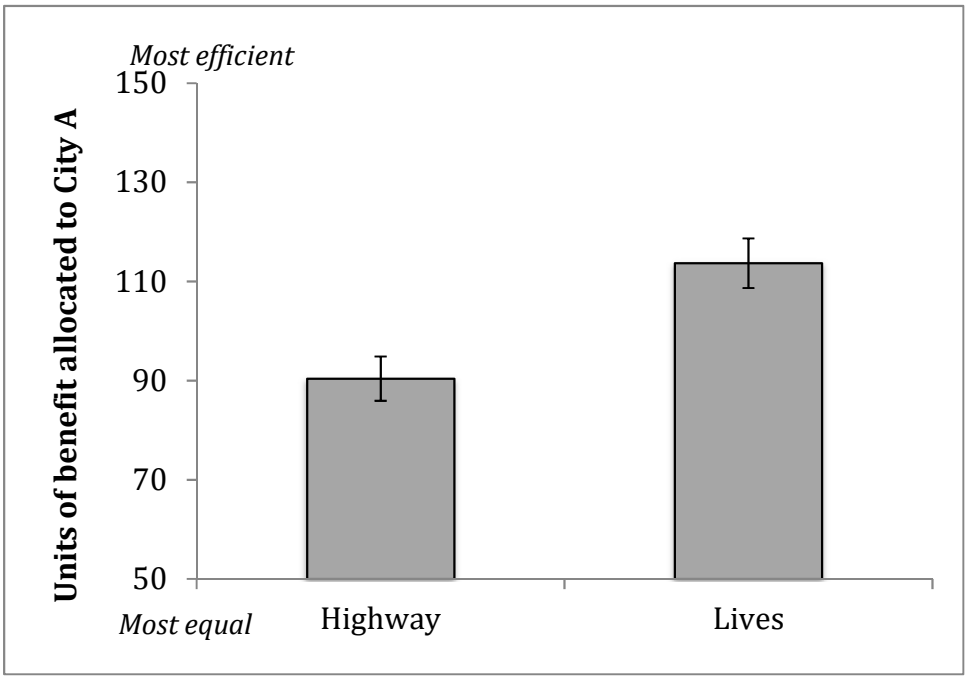


Figure 4. Mean units of benefits allocated to City A in the "Highway" and "Lives" condition in Study 2. Greater values indicate greater preference for efficiency. Error bars: ±2 Standard Errors.

Discussion

Study 2 extended the findings from Study 1, and showed that people demonstrate greater preference for efficiency when the allocation consequence was lives compared to highway repairs. We replicated these findings in a similar study where choices were measured among 6 pie charts (Study S2, see supplemental materials for details).

Study 3

In Study 2, the resource being allocated in both condition was described the same way as "humanitarian aid" but differed whether the consequence of allocation involved lives or highway repairs. If people prefer greater efficiency when the allocation consequence was lives being saved vs. highways being repaired, would they demonstrate a similar preference shift when the allocation consequence is lives being saved vs. something else that is not lives? This leads us to propose Hypothesis 2: The public shows greater preference for efficiency in allocations where lives are on the line compared to allocations where lives are not on the line.

To test Hypothesis 2, Study 3 manipulates the consequence of allocating the same medical resource, so that it involves either life-and-death consequences or mild health symptoms. This allows us to test two different consequences (saving human lives vs. relieving mild health symptoms) in the same general domain of health. In addition, most research in medical resource allocation has used scenarios involving human lives, such as the allocation of organs, life-saving vaccines, or cancer-screening tests (et al, 2015; Li et al., 2010; Li & Dewitt, 2017; Ubel et al, 1996; Ubel & Lowenstein, 1996; Colby), leaving a gap in our understanding of allocation preference in the medical domain when lives are not on the line. Study 3 will help fill this gap.

We used a hypothetical vaccine against the Zika virus, and conducted the study in June 2016, when an outbreak of Zika virus was ongoing in South American and posed an imminent danger of spreading to the U.S. (Stamm & Cameron, 2016).

Methods

Four hundred and fifteen participants from Amazon Mechanical Turk completed the study for a small payment. All participants were given basic facts about Zika adapted

from the Centers for Disease Control and Prevention, including that infection of Zika virus can cause mild symptoms among the general population, but can cause birth defects among pregnant women that could be life-threatening to the infant. Participants were randomly assigned to either a "mild symptom" condition (vaccines for the general population to prevent mild symptoms) or a "birth defect" condition (vaccines for pregnant women to prevent birth defects). Participants imagined that they needed to allocate the first batch of a limited supply of the vaccine to two cities. They were told that because the mosquito species in City B carried a larger amount of Zika virus than the mosquito species in City A, it required two doses to vaccinate one person in City B, while one dose was sufficient per person in City A; thus, allocating more vaccines to City A results in more people being vaccinated, but would be less equal (see Supplemental Materials for complete materials).

Participants indicated their allocation preference by moving the sliding bars linked to an interactive pie chart similar to that used in Study 2, which showed the number of recipients of the vaccine in each city. Additional measures are described in the Supplemental Materials.

Results

Thirty-seven of 415 participants (8.9%) allocated the vaccines in a way that were neither efficient nor equal (more people vaccinated in City B than in City A). Results were similar in analyses including and excluding these participants (see Supplemental Materials) and we present the analysis including all participants below.

As shown in Figure 5, the number of people receiving the vaccine in City A, which served as an index for efficiency, was significantly higher in the birth defect

condition than in the mild symptom condition, $M = 428.85$ ($SD = 161.92$) vs. 380.95 ($SD = 157.86$), t (413) = 3.05, Mean Diff = 47.89, 95% CI [17.02, 78.76], $p = .002$, Cohen's $D = 0.30$.

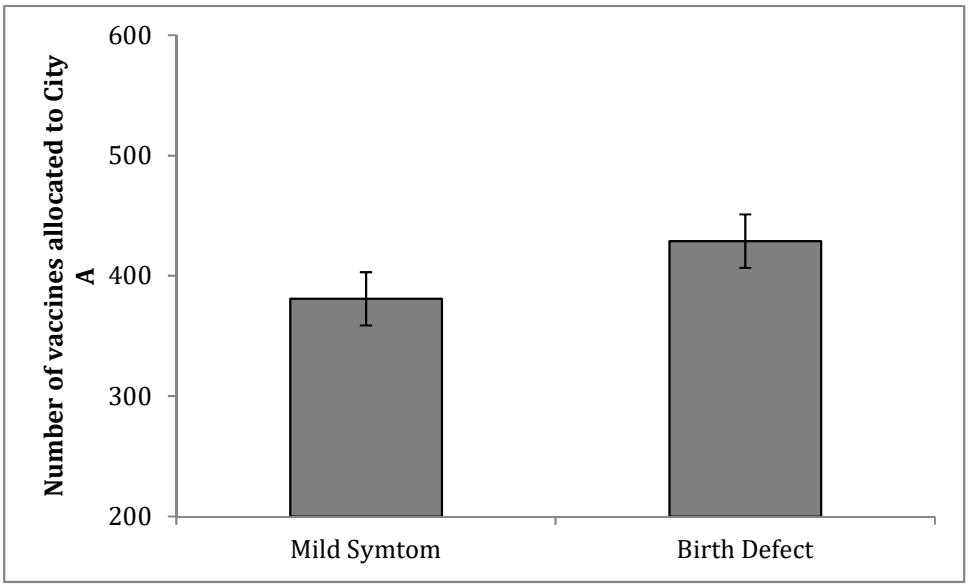


Figure 5. Mean numbers of individuals to receive vaccination in City A as indicated by participants in the "Mild Symptom" and "Birth Defect" condition in Study 3. Greater values indicate greater preference for efficiency. Error bars: ±2 Standard Errors.

Discussion

In Study 3 we directly manipulated the consequence of allocating the same resource and showed that people prefer more efficient allocations when the consequence is life-threatening compared to mild. We also replicated the findings in a similar study (Study S3) where the vaccine only prevents symptoms of the infection but does not prevent transmission to others, thereby eliminating potential considerations for the societal effect of vaccination beyond the direct health consequences we intended to manipulate. (See supplemental materials for details.)

Study 4

Results from the studies so far support Hypothesis 2, that is, people demonstrate a unique preference for efficiency in allocations involving lives compared to allocations involving other consequences. However, life-and-death consequences arguably constitute higher stakes than other consequences. Thus, the results obtained so far could reflect a general preference towards greater efficiency when the stakes involved are high (lives) compared to low (non-lives), rather than a unique perceptions and preferences related to life-saving allocations.

To explore whether stakes can explain for the effects observed so far, Study 4 manipulates the magnitude of stakes. We manipulated numerical magnitude as it serves as a clean manipulation of stakes. At the same time, we also manipulated domain (lives vs. money) of the outcomes as in Study 1. If the greater preference for efficiency we have observed so far is due to the greater stakes involved in life-or-death situations, both high magnitude and the lives condition should lead to greater preference for efficiency, compared to low magnitude and the money condition.

Alternatively, magnitude may produce an opposite effect on allocation preference due to distorted perceptions. Prospect Theory (Tversky & Kahneman, 1979) indicates that people evaluate gains and losses relative to the reference point and derive diminishing marginal utility as the magnitude of gain increases. For example, people may perceive greater utility from 10 units of gain twice (e.g. saving 10 lives in each of two cities) than from 21 units of gain once (e.g. saving 21 lives in one city), and therefore prefer to spread the benefit between two cities (equality). Because diminishing marginal utility becomes more pronounced as magnitude increases, the preference for equality may increase as the magnitude of outcome increases.

Study 4 tests the opposing predictions outlined above. Study 4 used a simplified scenario and described the cost of inefficient allocations in a more neutral fashion than was used in Studies 1-3, using text instead of pie charts with white spaces or "waste" on prominently marked. This paradigm is potentially more realistic, as real-world allocation problems often do not explicitly present the exact numerical cost of efficiency.

Method.

Pre-registration. We pre-registered the study on aspredicted.org on July 31, 2017 and collected data on Aug 7, 2017 (see https://aspredicted.org/6s2y7.pdf for pre-registration and supplemental materials for original data) through Amazon Mechanical Turk with a target of 800 participants, and received responses from 810 participants.

Questionnaire. The study used a 2 (Between-subject: Resource type—money vs. lives) × 7 (Within-subject: Magnitude—1 to 1 million) semi-factorial mixed design, where each participant was randomly assigned 3 of the 7 magnitude levels to prevent fatigue, leading to approximately 170 participants exposed to each magnitude level per resource type. In the money condition, participants were asked to imagine a scenario where limited monetary resources must be distributed to people in need, and that delivering $1 of aid to Group B incurs $1of additional cost, whereas delivering the same aid to Group A incurs no additional cost. In the lives conditions participants were asked to allocate limited "humanitarian aid" in a similar scenario where benefits were indicated in lives saved. The numbers varied across 7 magnitude levels in either dollars received or lives saved (1; 10; 100; 1,000; 10,000; 100,000; 1,000,000). Participants were presented 3 pairs of outcomes in text, one outcome more efficient and one outcome more equal. Responses were recorded as 0-100 on a sliding bar, with higher scores indicating

preference for the efficient allocation. Participants also completed two comprehension check questions. See supplemental materials for original questionnaire.

Results.

Among all 810 participants 87.2% answered both attention check questions correctly. We performed all analyses twice with both yielding similar results. We present the analyses including all participants below, (see Supplemental Materials for the additional analyses).

We used hierarchical linear modeling (HLM) to appropriately handle the repeated-measures aspect of the design (Raudenbush & Bryk, 2002). The HLM analysis used preference as the dependent variable, and treated within-subject responses as Level 1 units and subject as Level 2 units. We used the continuous variable Magnitude (1-7, mean-centered) as the Level 1 predictor, Resource Type (-0.5 money, 0.5 lives) as the Level 2 predictor, and tested the fixed effect of both predictors as well as their interaction in the HLM model. The model also tested the random effects of intercept and magnitude across subjects, and defined covariance type as unstructured, which yielded better fit than other variance structures; random effects were retained in the model if including them yielded better model fit based on chi-square comparisons of -2 Restricted Log Likelihoods. The final model was run using restricted likelihood method (REML).

The results showed greater preference for efficiency in the lives condition than in the money condition, $B = 22.66$, 95% CI [18.12, 27.19], $p < .001$. Contrary to both of the expectations discussed earlier regarding magnitude, however, magnitude had no effect, $B = -0.05$, 95% CI [-0.50, 0.39], $p = .82$, nor was there an interaction between magnitude and resource type, $B = 0.46$, 95% CI [-0.43, 1.35], $p = .31$. Random effect of the Intercept

Var (μ_0) = 1008.49, and random effect of magnitude Var (μ_1) = 18.53 indicate wide variations across participants both on mean preference rating and how magnitude affects preference. Figure 6 illustrates the raw mean preference ratings.

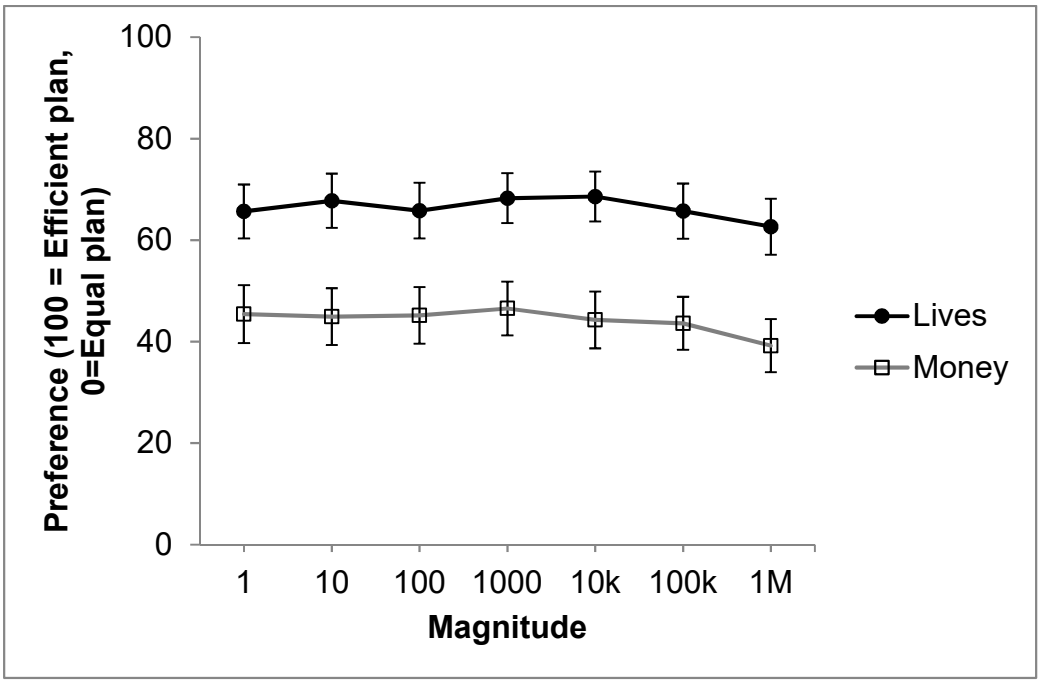


Figure 6. Mean preference between equal outcome and efficient outcome at different levels of magnitude in the lives and money conditions in Study 4. Greater values indicate greater preference for efficiency. Error bars: ±2 Standard Errors.

Discussion

Study 4 replicated the finding that allocation preferences differ between allocations involving lives and those not involving lives. More importantly, we found that such preference was not influenced by the magnitude of outcomes. The lack of magnitude effect is contrary to expectations based on the conceptualization that stakes influence allocation preference, or the decreasing marginal utility of gains. This finding undermines stakes as an alternative explanation to the preference differences observed so far between life-saving situations and other situations.

There are other interpretations for the null effect of magnitude. For one, magnitude may not have altered perceived stakes sufficiently. The embedding effect shows that people would give similar dollar amounts when they are asked how much they were willing to pay to save 2000 versus 200,000 wild birds (Desvousges et al. Wilson, 1993). Thus, it is possible that people may not have perceived much difference between the scenarios at the different levels of magnitude. Alternatively, the opposing effects of stakes and diminishing marginal utility of magnitude may have canceled each other out.

Study 5

Even if magnitude of stakes does not affect allocation preference, it is still possible that people's perceived level of stakes rests largely on the type of stakes. To further test the role of stakes in allocation preference, we conducted a series of eleven experiments (Study 5.1-5.11) using a variety of scenarios that do not directly involve life-and-death outcomes, and manipulated stakes the type instead of magnitude of stakes. We grouped them together because of the similar methods. If the preference differences we observed so far are due to the higher stakes in life-and-death situations compared to other situations, we would also expect allocations with higher stakes to shift preference towards efficiency compared to lower stakes, even when lives are not on the line.

Method.

Pre-registration. We pre-registered one sub-study (Study 5.9) on aspredicted.org on Oct 20, 2017, and collected data on Oct 26, 2017 (see https://aspredicted.org/vx6v9.pdf for pre-registration) through Amazon Mechanical Turk. The other studies were not pre-registered, as they were considered exploratory studies.

Questionnaire. Studies 5.1-5.11 all used a between-subjects comparison of high-stakes and low-stakes allocations (where either pretesting or manipulation checks showed differential levels of stakes) but differed on the allocation scenarios used and the population from which we recruited participants (Table 1). In all studies participants indicated allocation preference between two potential outcomes. Outcome 1: 3,000 (units of benefits) to Group A and 0 to Group B or Outcome 2: 1,000 (units of benefits) to Group A 1,000 (units of benefits) to Group B. We measured preferences between these two outcomes using a 1-7 scale in Studies 5.3 and 5.4, and a 0-100 point slider bar in other studies, with higher scores always representing preference for the efficient outcome.

The manipulation of stakes was implemented in two different ways to increase the validity of the overall finding (Table 1). Six studies used different types of resources expected to have different levels of stakes, contrasting drinking water (high stakes) to coffee (low stakes), water, food, and vaccines to books, deodorants, and sunglasses, and road repair to cell phone chargers; Five studies held the resource constant and directly manipulated stakes in the consequence, contrasting fiction books that helps improve literacy and in turn job prospects (high stakes) to fiction books that are nice to have (low stakes), or sunglasses that prevent blindness to sunglasses that are nice to have. (See supplemental materials for original scenarios). Stakes was manipulated between 2 conditions in all studies except in Study 5.2, where we compared 3 high-stakes between-subject conditions (water, food, vaccines) to 3 low-stakes between-subject conditions (fiction books, deodorants, sunglasses) using a planned contrast.

Table 1. Features of Studies 5.1-5.11.

Study	Setting	High stake condition	Low stake condition	Sample	N
5.1	Natural disaster	Water (unit-drink)	Coffee	Mturk	404
5.2	Africa	Water, food, vaccines	Books, deodorants, sunglasses	Mturk	640
5.3	Wild fire	Water (unit-drink)	Coffee (unit-drink)	Mturk	150
5.4	Wild fire	Water (unit-person)	Coffee (unit-person)	Mturk	153
5.5	Africa	Books-improve literacy	Books-nice to have	Mturk	153
5.6	Africa	Sunglasses-prevent blindness	Sunglasses-nice to have	Mturk	152
5.7	Africa	Books-improve literacy	Books-nice to have	College	116
5.8	Africa	Sunglasses-prevent blindness	Sunglasses-nice to have	College	124
5.9*	Africa	Books-improve literacy	Books-nice to have	Mturk	406
5.10	Natural disaster	Water (unit-person)	Coffee (unit-person)	Mturk	252
5.11	Natural disaster	Road repair	Phone charger	Mturk	256

Note: * pre-registered study.

Results.

In each study, we conducted a t-test (or a contrast in the case of Study 5.2) on preference for efficiency in the high versus low stakes conditions, and computed a raw effect size as measured by Cohen's D, with positive values indicating greater preference for efficiency in the high stakes condition than the low stakes condition, and negative values indicating greater preference for efficiency in the low stakes condition than the high stakes condition. Figure 7 shows the weighted effect size plot for each study.

In the 4 studies comparing water to coffee in a disaster scenario, 2 studies showed a non-significant positive effect (Studies 5.3 & 5.4) and 2 showed a non-significant negative effect (Studies 5.1 & 5.10). The study comparing water, food, and vaccines to books, deodorants, and sunglasses (Study 5.2) showed a non-significant positive effect. The study comparing road repair to cell phone chargers (Study 5.11) showed a non-

significant negative effect. In the 3 studies comparing books for literacy to books that were “nice to have”, 1 study showed a significant positive effect (Study 5.5), 1 study showed a non-significant positive effect (Study 5.9) while the third study showed a non-significant negative effect (Study 5.7). In the 2 studies comparing sunglasses to prevent blindness vs. sunglasses that were “nice to have”, 1 study showed a non-significant positive effect (Study 5.8) while the other showed a non-significant negative effect (Study 5.6).

In total, 5 studies showed a non-significant positive effect, 5 studies showed a non-significant negative effect, and only one study – Study 5.5 showed a significant preference for allocating more efficiently under high stakes than low stakes, though that result would not be significant if we adjusted the significance level to take into account the multiple studies. Moreover, a meta-analysis of these 11 studies shows an overall effect that is indistinguishable from zero: $d = .03$, 95% CI [-0.05, 0.10].

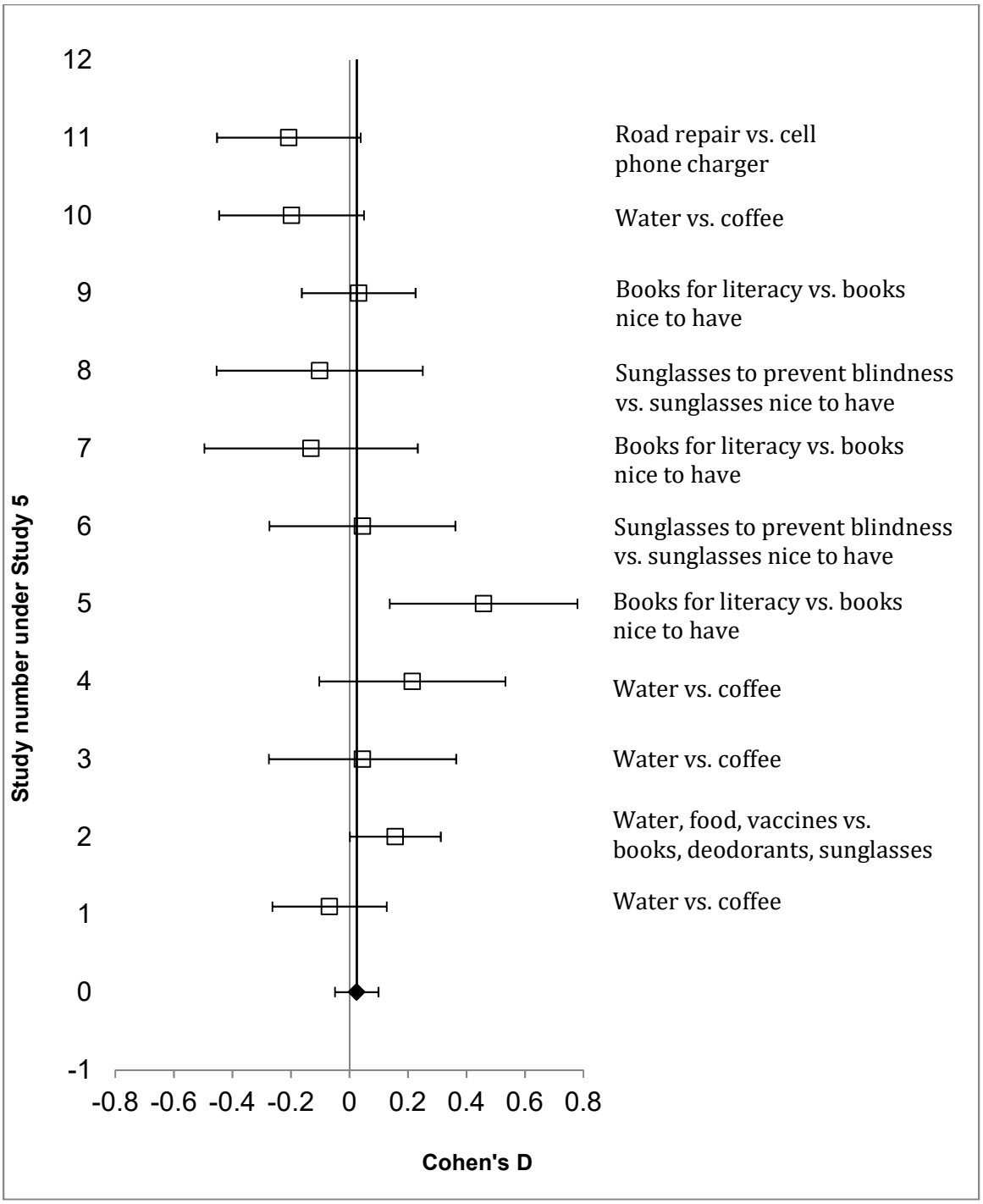


Figure 7. Weighted effect sizes, 95% Confidence Intervals, and resources in the high vs. low stakes conditions in Studies 5.1-5.11, with Study 0 and the solid vertical line the weighted mean effect size.

Discussion

Studies 5.1-5.11 indicate that the type stakes involved in the decision does not influence people's allocation preferences when lives are not on the line, which suggests that there is something special about the allocation of resources that are considered life-saving compared to all other resources.

General Discussion

The tradeoff between efficiency and equality is inevitable in many situations of scarcity. Past research provides some evidence that preferences for efficiency versus equality vary across contexts. We conducted 15 studies (with three additional replications Studies S1-S3 described in the Supplemental Materials) and found a consistent pattern: People demonstrate increased concerns for efficiency when lives are involved in the allocation decision, compared to when lives are not involved. In addition, we demonstrate that the level of stakes (both magnitude and type) does not influence allocation preference beyond the comparison between lives and other consequences.

In Studies 1 and 4, people demonstrated an increased preference for efficiency when allocating lives vs. money. This finding may seem to contradict past research that highlights the concern for equality in medical allocations (Ubel et al., 1996; Ubel & Loewenstein, 1996) and a dominant concern for efficiency in monetary allocation (DeVoe & Iyengar, 2010; Martin & Harder, 1994; Tornblom & Foa, 1983). It is possible that the design differences between our "lives" scenarios and previous research in medical resource allocation contributed to such difference. For example, studies by Ubel and colleagues (Ubel et al., 1996; Ubel & Loewenstein, 1996) involved well-specified beneficiaries (e.g., Medicaid recipients) who reap differential benefits from the same resource, but the the cost of equal allocation was not salient. In contrast, our "lives"

scenarios involved abstract groups such as “Group A/B” who cost differential amounts of resources for the same benefit, and many of our studies made the cost of equal allocations salient as in “number of lives not saved”. In addition, while our money allocation scenarios involve public money, previous research on monetary allocation comes from the organizational setting, where the prevailing preference tends to be equity-based, that is, allocating rewards in proportion to contribution (Bazerman, White, & Loewenstein, 1995; Hochschild, 1981). It is possible that allocation preferences may vary between the private and public sector, especially given that social goals are more associated with equality preferences (e.g. Hoffman, McCabe, & Smith, 1996).

Studies 2-4 indicate that people display a robust preference for efficiency in allocations involving lives compared to those that do not. Studies 4 and 5.1-5.11 found that stakes cannot explain this preference shift. What, then, accounts for this effect if stakes cannot explain it? The preference for equality is a strong social norm in American society, often acting as a heuristic when allocating resources between self and others (Messick, 1993). This suggests that for efficiency to be considered, people need to engage additional cognitive processes to move away from the equality heuristic. When the resource is scarce and the allocation has life-and-death consequences, the allocation becomes a tragic tradeoff between different lives. Past research on the sacred-values-protection model indicates that when faced with tragic tradeoffs, people expect an ethical decision maker to take a long time to deliberate (Tetlock, Kristel, Elson, Green & Lerner, 2000). Potentially, if participants take longer to deliberate when making allocations involving lives, it should allow a more deliberative processes to influence the decision, which in turn would allow the decision maker to move away from a fast, heuristics-based

decision that favors equality. This mechanism for the current results constitutes an avenue for future research.

The current research has important policy implications. Our findings indicate that the public may be willing to sacrifice equality for efficiency when allocating transplant organs, new vaccines in deadly pandemics, or cancer screening tests, but may be reluctant to do so when allocating funds for education, infrastructure, or health resources that improve the quality of life. These preferences may present a difficult problem for policy makers, because multiple public resources can ultimately draw on the same pool of tax revenue when policy decisions are made at the highest level. However, understanding such preferences will equip policymakers with the ability to forecast public reactions to policy changes more accurately. In addition, policymakers may use this knowledge to significant advantage in garnering public support. For instance, these findings suggest that when trying to overcome opposition to an efficient resource allocation strategy, a policy maker may emphasize that such allocations will ultimately affect the life and death of the recipients.

References

Bazerman, M. H., White, S. B., & Loewenstein, G. F. (1995). Perceptions of Fairness in Interpersonal and Individual Choice Situations. *Current Directions in Psychological Science, 4*(2), 39-43.

Colby, H., DeWitt, J., & Chapman, G. B. (2015). Grouping Promotes Equality: The Effect of Recipient Grouping on Allocation of Limited Medical Resources. *Psychological Science*. doi:10.1177/0956797615583978

Conlon, D. E., Porter, C. O. L. H., & Parks, J. M. (2004). The Fairness of Decision Rules. *Journal of Management, 30*(3), 329-349. doi: 10.1016/j.jm.2003.04.001

Desvousges, W. H., Reed Johnson, F., Dunford, R. W., Hudson, S. P., Nicole Wilson, K., & Boyle, K. J. (1993). Measuring natural resource damages with contingent valuation. In *Contingent valuation: A critical assessment* (pp. 91-164). Emerald Group Publishing Limited.

Deutsch, M. (1975). Equity, Equality, and Need: What Determines Which Value Will Be Used as the Basis of Distributive Justice? *Journal of Social Issues, 31*(3), 137-149. doi: 10.1111/j.1540-4560.1975.tb01000.x

DeVoe, S. E., & Iyengar, S. S. (2010). Medium of exchange matters: what's fair for goods is unfair for money. *Psychological Science, 21*(2), 159-162. doi:10.1177/0956797609357749

Gordon-Hecker, T., Choshen-Hillel, S., Shalvi, S., & Bereby-Meyer, Y. (2017). Resource Allocation Decisions: When Do We Sacrifice Efficiency in the Name of Equity? In M. Li & D. P. Tracer (Eds.), *Interdisciplinary Perspectives on Fairness, Equity, and Justice* (pp. 93-105). Cham: Springer International Publishing

Hochschild, J. L. (1981). *What's fair?: American beliefs about distributive justice*: Harvard University Press.

Hoffman, E., McCabe, K., & Smith, V. L. (1996). Social Distance and Other-Regarding Behavior in Dictator Games. *The American Economic Review, 86*(3), 653-660.

Johri, M., & Ubel, P. A. (2003). Setting organ allocation priorities: Should we care what the public cares about? *Liver Transplantation, 9*(8), 878-880. doi:10.1053/jlts.2003.50154

Li, M., & DeWitt, J. (2017). Equality by Principle, Efficiency by Practice: How Policy Description Affects Allocation Preference. In M. Li & D. P. Tracer (Eds.), *Interdisciplinary Perspectives on Fairness, Equity, and Justice* (pp. 67-91). Cham: Springer International Publishing.

Li, M., Vietri, J., Galvani, A. P., & Chapman, G. B. (2010). How Do People Value Life? Psychological Science, 21(2), 163-167. doi:10.1177/0956797609357707

Martin, J., & Harder, J. (1994). Bread and roses: Justice and the distribution of financial and socioemotional rewards in organizations. *Social Justice Research, 7*(3), 241-264. doi:10.1007/bf02334833

Messick, D. M. (1993). Equality as a decision heuristic *Psychological perspectives on justice: Theory and applications.* (pp. 11-31). New York, NY, US: Cambridge University Press

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1): Sage.

Stame, S., & Carmeron, D. (2016, October 26). All the reported cases of Zika in the United Sttates. *The Washington Post.* Retrievd from https://www.washingtonpost.com/graphics/national/us-zika-cases/

Tetlock, P. E., Kristel, O. V., Elson, S. B., Green, M. C., & Lerner, J. S. (2000). The psychology of the unthinkable: Taboo trade-offs, forbidden base rates, and heretical counterfactuals. *Journal of Personality and Social Psychology, 78*(5), 853-870. doi: 10.1037//0022-3514.78.5.853

Tornblom, K. Y., & Foa, U. G. (1983). Choice of a Distribution Principle: Crosscultural Evidence on the Effects of Resources. *Acta Sociologica, 26*(2), 161-173. doi:10.1177/000169938302600204

Tversky, A. & Kahneman, D. (1979) Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), 263-91

Ubel, P., Baron, J., & Asch, D. A. (2001). Preference for Equity As a Framing Effect. *Medical Decision Making, 21*(3), 180-189. doi:10.1177/0272989x0102100303

Ubel, P. A., DeKay, M. L., Baron, J., & Asch, D. A. (1996). Cost-Effectiveness Analysis in a Setting of Budget Constraints—Is It Equitable? *New England Journal of Medicine, 334*(18), 1174-1177. doi:doi:10.1056/NEJM199605023341807

Ubel, P. A., & Loewenstein, G. (1995). The efficacy and equity of retransplantation: An experimental survey of public attitudes. *Health Policy, 34*(2), 145-151.

Ubel, P. A., & Loewenstein, G. (1996). Distributing scarce livers: the moral reasoning of the general public. *Social Science & Medicine, 42*(7), 1049-1055. doi:http://dx.doi.org/10.1016/0277-9536(95)00216-2