Article

Efficiency for Lives, Equality for Everything Else: How Allocation Preference Shifts Across Domains

Meng Li[1], Helen A. Colby[2], and Philip Fernbach[3]

Abstract

The allocation of scarce public resources such as transplant organs and limited public funding involves a trade-off 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 lifesaving 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 lifesaving 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.

When distributing scarce resources, there is often a trade-off 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 trade-offs? 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 lifesaving resources versus other types of resources. In the current research, we explore the answer to this question.

Research in the health-care 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 & Loewenstein, 1995; Ubel & Lowenstein, 1996). Other studies in the health-care 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 health-care 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.

[1] Department of Health and Behavioral Sciences, University of Colorado Denver, Denver, CO, USA
[2] Department of Marketing, Kelly School of Business, University of Indiana, Indianapolis, IN, USA
[3] Leeds School of Business, University of Colorado Boulder, Boulder, CO, USA

Corresponding Author:
Meng Li, Department of Health and Behavioral Sciences, University of Colorado Denver, PO Box 173364, Denver, CO 80104, USA.
Email: meng.li@ucdenver.edu

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 toward 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 toward efficiency in allocations involving human lives versus those involving nonlives in general.

Study 1 compared allocation of lifesaving resources to the allocation of money; Study 2 compared allocation of lifesaving 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 nonlives, with Study 4 testing the effect of the numerical magnitude of consequence, and Studies 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.

Method

As no prior research has compared allocation preference involving lives and money or lives and non-lives, 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 affected by 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 six plans such that each successive plan decreased the benefit to Group A by US$20 million (20 lives) and increased the benefit to Group B by US$10 million (10 lives), leading to a decrease of overall benefit by US$10 million (10 lives). We explained the trade-off and pointed out that Plan 1 achieves efficiency the

best, while Plan 6 achieves equality the best (see Online 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 Online Supplemental Materials for description and results related to these questions.

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 Online 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 difference $= 1.28$, 95% confidence interval (CI) $= [0.94, 1.62]$, Cohen's $D = .72$. 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 Online Supplemental Materials).

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 were conducted. We offer a more lengthy discussion in the General Discussion section. We replicated these findings in a similar study where money was used for poverty relief instead of disaster relief (Study S1, see Online Supplemental Materials for details).
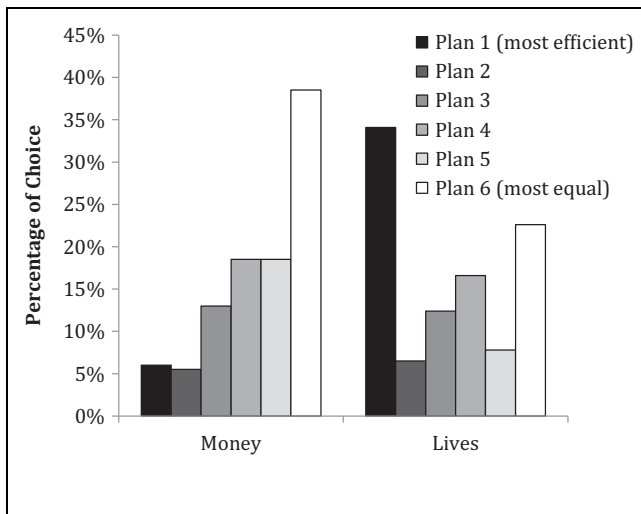
Study 2

Does the effect in Study 1 extend to situations where monetary resource leads to nonmonetary outcomes? This is a practical policy question, as monetary resources can achieve nonmonetary 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.

Method

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
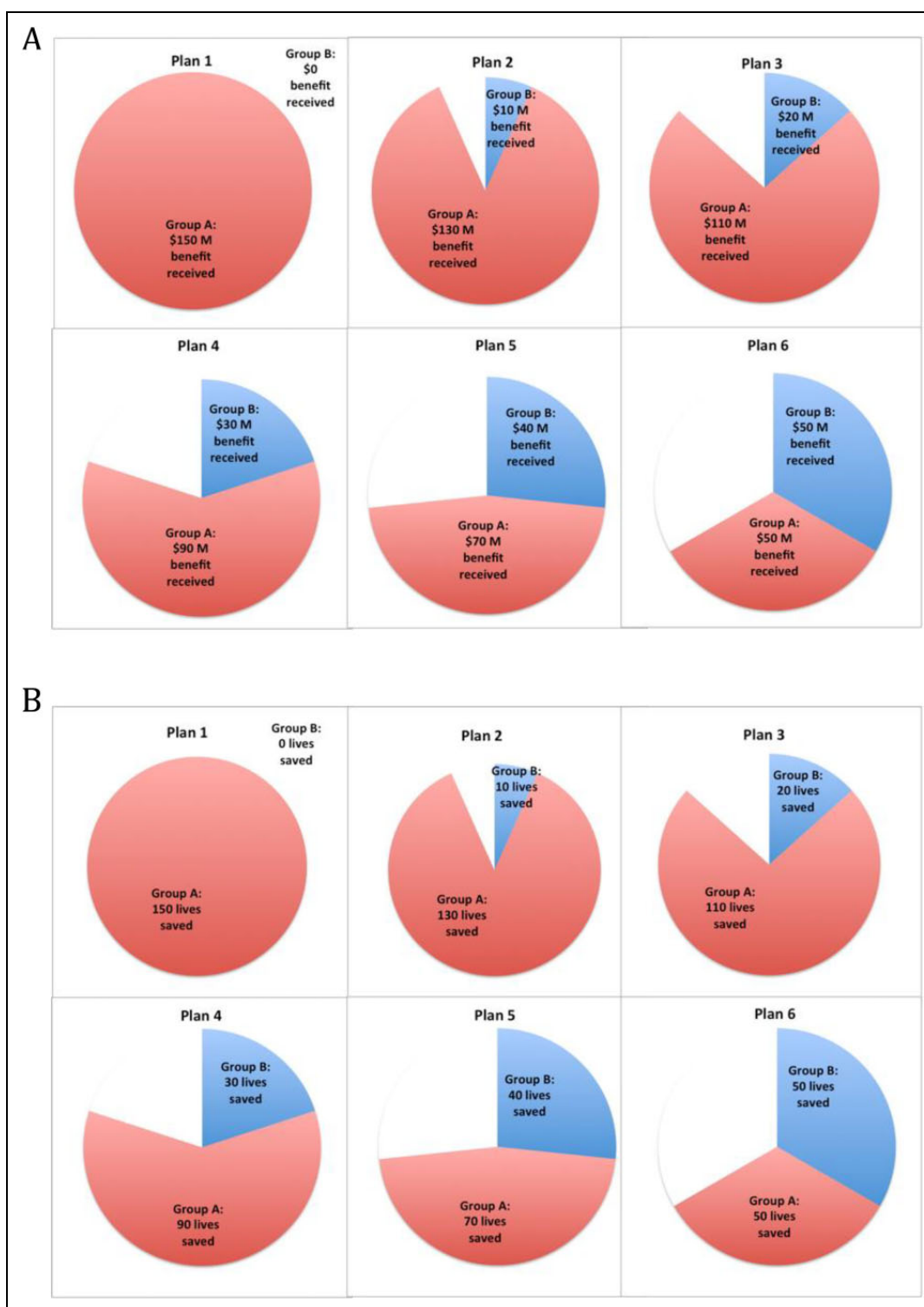
Figure 1. Allocation plans displayed in pie charts in the money condition (A) and lives condition (B) in Study 1. Legends accompany pie charts in the money condition read "Red: Benefit (in million $) received by people in Group A. Blue: Benefit (in million $) received by people in Group B. White gap: 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."

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.

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 linked to an interactive pie chart showing the composition of benefit received in each city in response to the sliding bar (Figure 3). The trade-off 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 Online Supplemental Materials for additional procedural details as well as additional measures collected in this study).

Results

Nineteen of the 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 Online Supplemental Materials) and we present the analysis including all participants below.
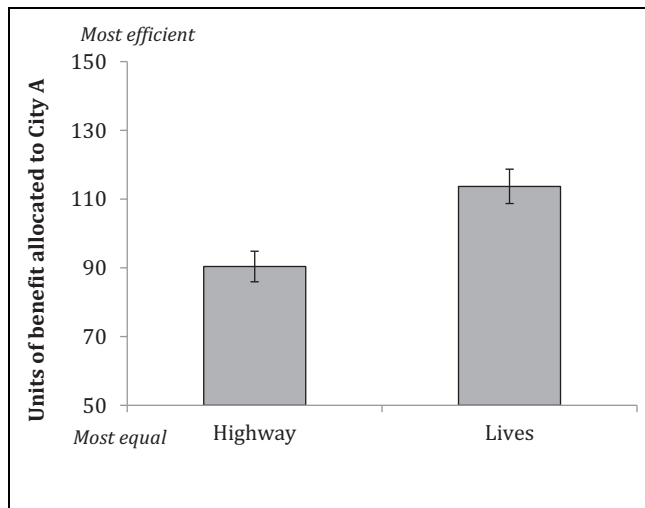
Figure 4 shows the mean units of benefit allocated to City A in the two conditions. Participants allocated more resources to City A and thus allocated them more efficiently in the lives condition ($M = 113.69$, $SD = 36.80$) compared to the highway condition ($M = 90.39$, $SD = 34.64$), mean difference $= 23.30$, 95% CI [16.74, 29.86], $t(456) = 6.98$, $p < .001$, Cohen's $d = .65$. Thus, participants demonstrated a greater preference for efficiency when the allocation involved lives than when it involved highway repairs.

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 allocation preferences were measured among six pie charts (Study S2, see Online Supplemental Materials for details).
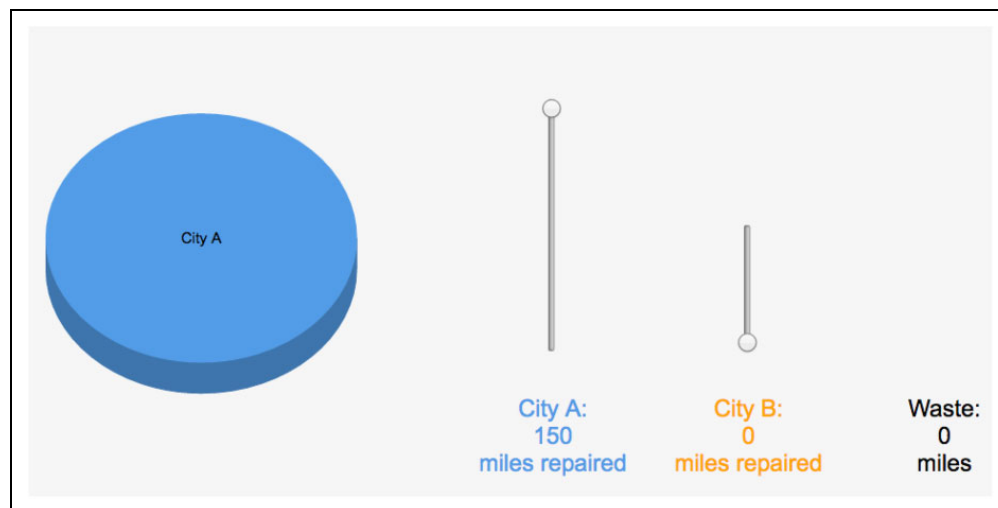
Figure 3. Screenshot of the slider bars and interactive pie chart used in Study 2 to measure allocation preference. The graph shows the initial image of the pie chart and initial location of the slider bars in the "highway" condition.

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.
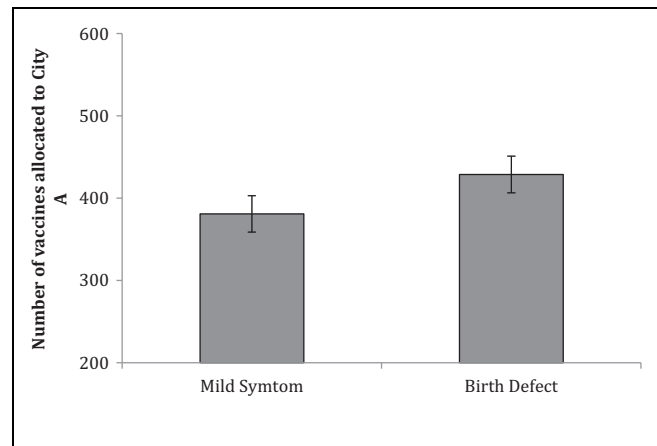
Study 3

In Study 2, the resource being allocated in both conditions 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 versus highways being repaired, would they demonstrate a similar preference shift when the allocation consequence is lives being saved versus 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, lifesaving vaccines, or cancer-screening tests (Colby et al., 2015; Li et al., 2010; Li & Dewitt, 2017; Ubel et al., 1996; Ubel & Lowenstein, 1996), 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 United States (Stame, & Carmeron, 2016).

Method

Four hundred and fifteen participants from Amazon Mechanical Turk completed the study for a small payment. All

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.

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 that could be life-threatening to newborns if pregnant women were infected. 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 Online 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 Online Supplemental Materials.

Results

Thirty-seven of the 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 Online 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, $M = 428.85$ ($SD = 161.92$) versus

$M = 380.95$ ($SD = 157.86$), $t(413) = 3.05$, mean difference = 47.89, 95% CI [17.02, 78.76], $p = .002$, Cohen's $d = .30$.

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 in Online Supplemental Materials), 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 Online 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 toward greater efficiency when the stakes involved are high compared to low rather than a unique perceptions and preferences related to lifesaving allocations versus nonlife saving allocations.

To explore whether stakes can explain 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" 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

Preregistration. We preregistered the study on aspredicted.org on July 31, 2017, and collected data on August 7, 2017 (see https://aspredicted.org/6s2y7.pdf for preregistration and Online 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—1–1 million) semifactorial mixed design, where each participant was randomly assigned three of the seven 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 US$1 of aid to Group B incurs US$1 of 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 seven magnitude levels in either dollars received or lives saved (1; 10; 100; 1,000; 10,000; 100,000; and 1,000,000). Participants were presented three 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 Online 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 Online 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 χ^2 comparisons of −2 restricted log likelihoods. The final model was run using restricted likelihood method.

The results showed greater preference for efficiency in the lives condition than in the money condition, $B = 22.66$, 95%
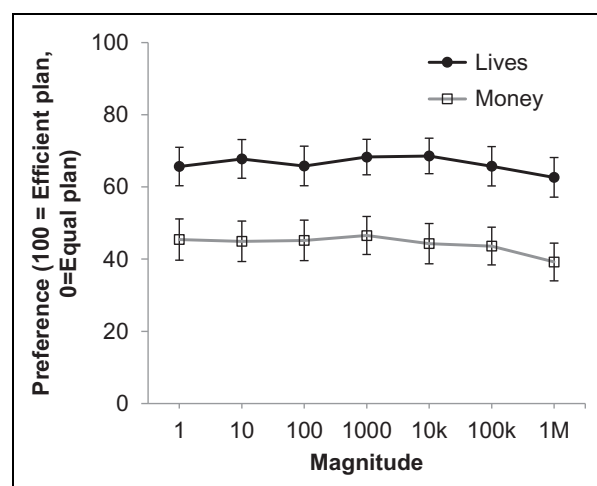
Figure 6. Mean preference between equal outcome and efficient outcome at different levels of magnitude in the lives and money conditions in Study 4. Greater values indicate greater preference for efficiency. Error bars: ±2 standard errors.

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) = 1,008.49 and random effect of Magnitude Var (μ_1) = 18.53 indicate wide variations across participants on both mean preference rating and how magnitude affects preference. Figure 6 illustrates the raw mean preference ratings.

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 lifesaving 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 2,000 versus 200,000 wild birds (Desvousges et al., 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 instead of magnitude of stakes. To further test the role of stakes in allocation preference, we conducted a series of 11 experiments (Studies 5.1–5.11) using a variety of scenarios that do not directly involve life-and-death outcomes and manipulated the type of stakes 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 toward efficiency compared to lower stakes, even when lives are not on the line.

Method

Preregistration. We preregistered one study in this series of studies (Study 5.9) on aspredicted.org on October 20, 2017, and collected data on October 26, 2017 (see https://aspredicted.org/vx6v9.pdf for preregistration) through Amazon Mechanical Turk. The other studies were not preregistered, 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 neither allocation directly involves life-and-death consequences (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 and 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 help 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 Online Supplemental Materials for original scenarios). Stakes were manipulated between two conditions in all studies except in Study 5.2, where we compared three high-stakes between-subject conditions (water, food, and vaccines) to three low-stakes between-subject conditions (fiction books, deodorants, and sunglasses) using a planned contrast.

Table 1. Features of Studies 5.1–5.11.

Studies	Setting	High-Stake Condition	Low-Stake Condition	Sample	N
5.1	Natural disaster	Water (unit drink)	Coffee	Mturk	404
5.2	Africa	Water, food, and vaccines	Books, deodorants, and 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[a]	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

[a]Preregistered 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 four studies comparing water to coffee in a disaster scenario, two studies showed a nonsignificant positive effect (Studies 5.3 and 5.4) and two showed a nonsignificant negative effect (Studies 5.1 and 5.10). The study comparing water, food, and vaccines to books, deodorants, and sunglasses (Study 5.2) showed a nonsignificant positive effect. The study comparing road repair to cell phone chargers (Study 5.11) showed a nonsignificant negative effect. In the three studies comparing books for literacy to books that were "nice to have," one study showed a significant positive effect (Study 5.5), one study showed a nonsignificant positive effect (Study 5.9), while the third study showed a nonsignificant negative effect (Study 5.7). In the two studies comparing sunglasses to prevent blindness versus sunglasses that were nice to have, one study showed a nonsignificant positive effect (Study 5.6), while the other showed a nonsignificant negative effect (Study 5.8).

In total, five studies showed a nonsignificant positive effect, five studies showed a nonsignificant 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 0: $d = .03$, 95% CI $[-0.05, 0.10]$.

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 lifesaving compared to all other resources.

General Discussion

The trade-off 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 Online 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 versus 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 money may not be public and the prevailing preference tends to be equity based, that is, allocating rewards in
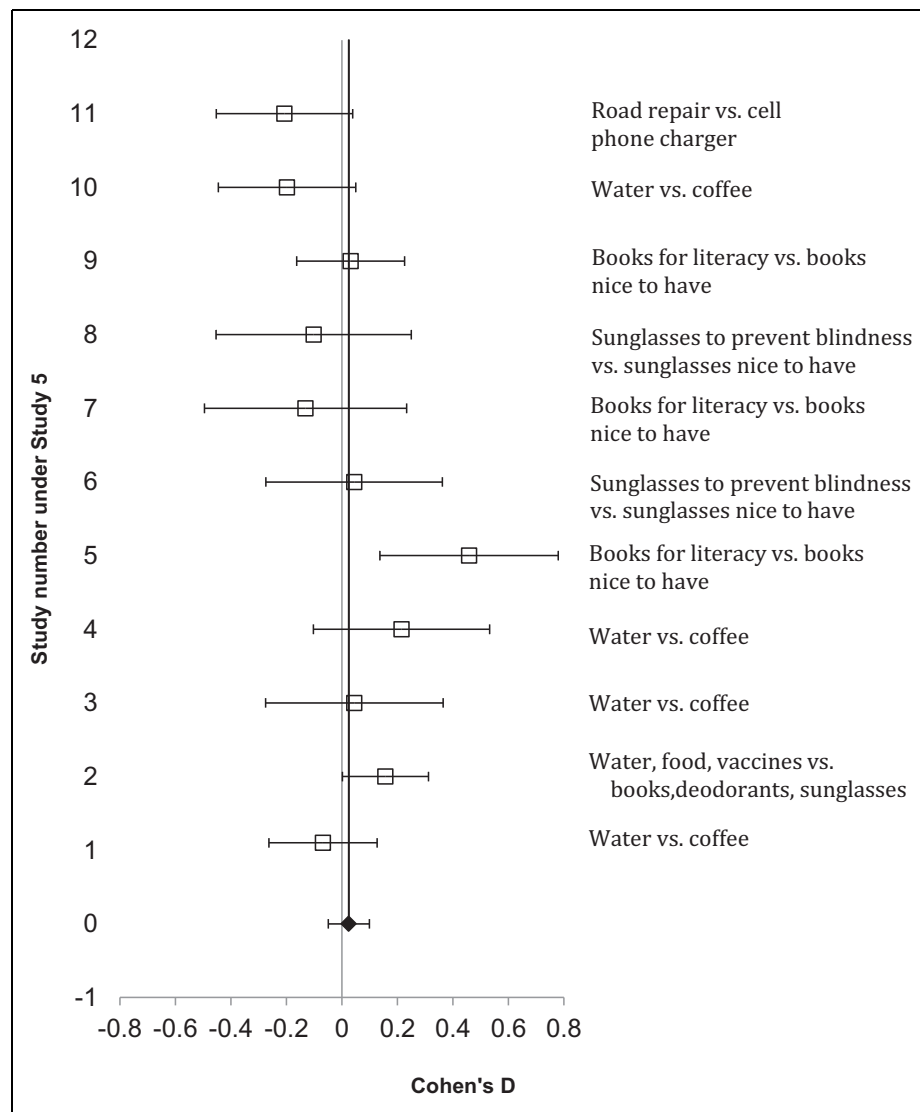
Figure 7. Weighted effect sizes, 95% confidence intervals, and resources in the high- versus low-stakes conditions in Studies 5.1–5.11, with Study 0 and the solid vertical line the weighted mean effect size.

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 trade-off between different lives. Past research on the sacred-values-protection model indicates that when faced with tragic trade-offs, 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 policy makers with the ability to forecast public reactions to policy changes more accurately. In addition, policy makers 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.

Declaration of Conflicting Interests

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Supplemental Material

The supplemental material is available in the online version of the article.

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Author Biographies

Meng Li is an Assistant Professor of Health and Behavioral Sciences at the University of Colorado Denver. She holds a PhD from Rutgers University in Social Psychology and a BS in from Beijing University in Medicine. She studies decision biases and nudge-type interventions that promote optimal behavior such as healthy eating and preventive care practices. She also studies health policy decisions.

Helen A. Colby is an Assistant Professor of Marketing at Indiana University's Kelley School of Business. She holds a PhD in Cognitive

Psychology and Marketing from Rutgers University and BAs in Economics and Psychology from the University of Chicago. Her research focuses on consumer judgment and decision making in economic and health care contexts.

Philip Fernbach is an Assistant Professor of Marketing in the Leeds School of Business, University of Colorado, Boulder. He holds a PhD from Brown University in Cognitive Science and a BA from Williams College where he studied philosophy. His research interests span many areas of consumer behavior including causal reasoning, probability judgment, financial decision-making, and moral judgment.

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