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Preference-Based Assessments

Health Inequality Aversion in the United States

Julia F. Slejko, PhD, Salome Ricci, PharmD, MS, Susan dosReis, PhD, Richard Cookson, PhD, Stacey Kowal, MSc

ABSTRACT

Objectives: Health inequality aversion parameters are used in distributional cost-effectiveness analysis, direct equity-based weighting to reflect societal preferences for improving total health ("efficiency"), and reducing health inequality between more and less socially advantaged groups ("equity"). We elicited a health inequality aversion parameter for the US population.

Methods: We adapted a benefit trade-off (BTO) instrument used in a UK study. Participants comprised the adult general public from June to December 2023. The online survey comprised (1) demographics and health views questions, (2) instructional videos, and (3) BTO exercise. The BTO asked participants to trade off quality-adjusted life expectancy from the better-off to worse-off quintiles of the US population, described by indicators of social vulnerability. Response patterns were classified into 15 ranks with corresponding inequality aversion parameters and implied equity weights.

Results: Among 1864 complete responses, inequality aversion was assessed for 1290 participants. The sample approximated US Census data for gender, race/ethnicity, and income. The median Atkinson parameter was 12.12, the corresponding equity weight was 6.7, and 88% were willing to trade off total health to reduce health inequality. Multivariable regression indicated no significant subgroup variation in trade-off responses by age or region; however, lower income groups and ethnic minority groups were slightly more averse to health inequality.

Conclusions: The inequality aversion statistics derived from this sample illustrate support for more robust and routine integration of equity concerns into healthcare decisions in the policy and health technology assessment arenas to advance distributional cost-effectiveness analysis in the United States.

Keywords: benefit trade-off, distributional cost-effectiveness analysis, health equity, health inequality aversion, quality-adjusted life expectancy.

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Highlights

- We estimated inequality aversion among a sample of the American public: the willingness to forgo improvements in total population health to reduce inequality between better- and worse-off groups.
- An estimated 88% of our sample prioritized health gains compared with those in the worse-off population quintile, weighting them 6 to 7 times as highly as gains compared with those in the better-off quintile, indicating a preference in the general population to assign extra value to health gains for those facing social vulnerability and poor health, based on the distribution presented in the study instrument.
- Results from our study sample support more robust and routine integration of equity concerns into healthcare decisions for policy and health technology assessment in the United States.

Introduction

Reducing inequalities in health between more and less socially advantaged groups-or "equity"-is a shared objective across value assessors, health technology assessment (HTA) bodies and other healthcare decision makers.[1-3] This has led to the development of several methods of health equity analysis.[4,5] These methods require new types of data to characterize current health gaps between more and less socially advantaged groups and to understand values placed on interventions with equity implications.[6] For example, distributional-cost-effectiveness (DCEA) is a method to quantify intervention impacts across equity-relevant population subgroups and examine questions of equity alongside efficiency. Although developed largely in the UK setting, its use is growing in the United States.[7-9]

Rich data are needed to inform several DCEA inputs.[10] In the United States, recent work has described the baseline distribution of health,[11] but important gaps remain.[6] In particular, DCEA requires an estimate of health inequality aversion: the degree to which a decision maker is willing to forgo improvements in total population health to reduce inequality in health between more and less socially advantaged groups.[10] Health inequality aversion parameters (IAP) can be formulated in mathematical terms using health-related social welfare functions[12-14] For example, an IAP value of zero indicates no concern for reducing health inequality, as in standard cost-effectiveness analysis, whereas higher values indicate higher degrees of concern for reducing health inequality between more and less socially advantaged groups.[10] Conversely, negative values represent preference for inequalities and distributing resources in favor of advantaged groups. These parameters allow DCEA to examine equity-efficiency trade-offs, by quantifying the added value placed on reducing health gaps between groups.[15] Beyond DCEA, IAPs can also inform the estimation of direct equity weights that place more importance on costs and outcomes for specific subgroups of the population according to specific characteristics and societal preferences.[4,16] These parameters can be used to understand factors important for decision making, such as deliberative health technology assessment processes.

Health IAPs have been elicited for a number of countries,[17] but so far there is no known health inequality aversion parameter for the United States.[18] Without this information, DCEAs for the United States must apply metrics from another country, which carries the assumption that public values from those settings are similar for the US population. Various methodologies have been used to elicit trade-offs between health equity and efficiency.[19-22] Robson et al[23] applied a method for eliciting inequality aversion parameters using a benefit trade-off (BTO) experiment, which presents a series of choices between 2 programs with different health benefits for different social advantage groups, allowing for the estimation of an implied IAP for each respondent. This method has been adapted for other countries but so far has not been used in the United States.[24,25]

Two more recent methods have also been used to elicit inequality aversion. Hurley et al[20] use a "level trade-off" approach, which is similar to the BTO but only presents information on final levels of health without information on baseline levels of health and benefits compared with those baseline levels. Robson et al[26] recently introduced the "constrained resource allocation" approach, which requires several inequality aversion parameters: a pure 1 and 1 for each dimension of equity, such as socioeconomic status and ethnicity. A benefit to this newer approach is that, although more complicated, it explicitly allows for errors in responses, thereby reducing the need to exclude observations due to invalid response patterns.

In this study, we adapted the earlier[23] BTO approach by Robson et al[23] to elicit inequality aversion for the US population. Although there are well-known limitations of this method, it has now been used in several countries, allowing for comparisons of ordered categorical findings about the direction and strength of concern for reducing health inequality. The other methods are newer, their limitations are less well understood, and their findings are harder to compare and generalize between countries.

Our study objective was to describe the proportion of the US population averse to health inequalities, in terms of their willingness to forgo improvement in total health to reduce inequality in health between more and less socially advantaged groups, and to describe this proportion across subgroups of the population. This study also elicited an IAP, which can be used to inform equity analysis in the United States and to facilitate comparability across country settings.

Methods

Survey Overview and Adaptation

We adapted a BTO instrument used in a previous UK study and included one of its investigators on our study team.[23] The instrument was developed for online distribution and comprised 5 sections: (1) Participant eligibility screening, 2) Questions on health attitudes and views on health inequalities, (3) Instructional and contextual videos, (4) BTO exercise, (5) Participant demographics (see Appendix 1 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015). This article focuses on the methods and results of the BTO specifically including differences across population subgroups. The qualitative formative work that guided our adaptation, as well as pretesting and pilot testing phases, are described elsewhere.[27] Methods and results for the health attitudes and views questions are not reported here.

BTO Exercise

To adapt the original UK-based BTO exercise, we used data on the baseline distribution of health in the United States to approximate the quality-adjusted life expectancy (QALE) for the "better-off" and "worse-off" quintiles of the population. There is extensive literature on social determinants of health and root causes of health disparities in the United States.[28-31] We used published data available on US baseline distribution of health inequalities based on the social vulnerability index (SVI)[11,32] to describe QALE for 25 groups of the US population across 5 race and ethnicity subgroups and quintiles of the SVI within each subgroup, described further in Appendix 1 and 2 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015.To the authors' knowledge, these data represent the only US national assessment of existing health disparities across equity-relevant groups, which are defined based on characteristics (eg, race and ethnicity, socioeconomic status, or geographic location) most relevant when seeking to understand inequities in access to healthcare and health outcomes.[33,34]

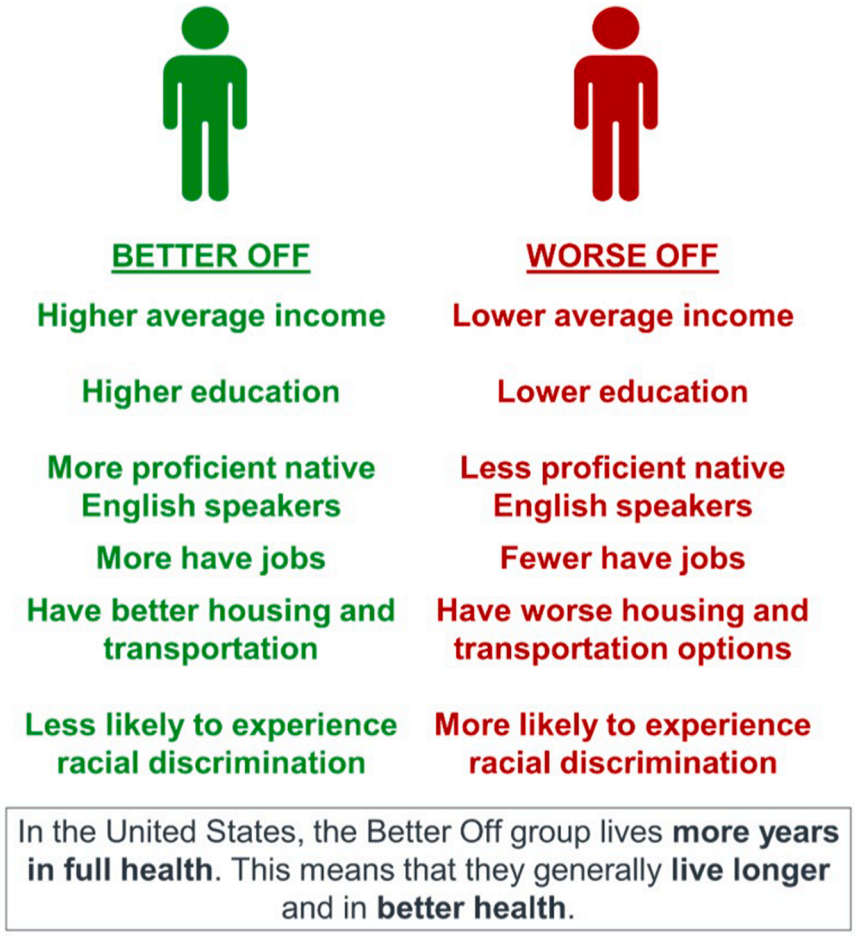
We aggregated these 25 groups, ranked from best to worst in terms of QALE and regrouped into quintiles based on that ranking. The highest and lowest quintiles with respect to QALE were described and compared in the BTO. These groups were described as the "better-off" and "worse-off" quintiles of the population by listing various factors relating to geographic social vulnerability and social determinants of health (Fig. 1) and are described further in Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015.[32] Using components of the SVI, we developed descriptions related to resource access, as well as ethnic and minority status, without explicitly describing the race composition of each group because the goal was to describe overall social advantage/disadvantage and not race/ethnicity-based inequalities. Qualitative formative work and pretesting guided the development of the group descriptions used in the survey (Fig. 1). Baseline QALE for the "better-off" and "worse-off" groups were 69 and 59 years, respectively, illustrating a 10-year gap between groups (Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015).

Participants were introduced the concept of the "better off" and "worse off" at the beginning of the survey, and these descriptions were used in the questions leading up to the BTO, as well as in 2 instructional videos (described further below). In the BTO instructions and animated tutorial video, participants were instructed to imagine 2 large government programs (program A vs program B) that cost the same, both improved population health to the better off (20%) and worse off (20%) groups but did not affect the middle group (60%). Each program was illustrated with a bar graph describing the baseline QALE of the better and worse off groups, how much QALE is gained by each program, and the resulting gap in QALE after program implementation. The BTO exercise asked participants to trade-off QALE from the better off to worse off quintiles of the population. Over 7 questions, participants were asked to choose between program A and program B, in which program A always gave more QALE to the better-off group: 7 years vs 3 years to the worse-off group, resulting in a QALE gap of 14 years. Program B varied in how much QALE is distributed to the better- and worse-off groups, ranging from 3 years to the better off and 8 years to the worse off, resulting in a gap of 5 years, to 3 years to the better off and 2 years to the worse off, resulting in a gap of 11 years. Appendix 1 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015 illustrates the BTO exercise questions.

Participant Recruitment

A Qualtrics panel was used to recruit participants from the US general public from June to December 2023, targeting US Census balance on age, sex, race, ethnicity, education, and household

Figure 1. Contextual framing for survey questions and benefit trade-off exercise.



income. Eligibility criteria included English-speaking adults aged 18 to 88 who resided in the United States. Participants were required to demonstrate comprehension of a bar graph with a correct answer to a simple bar graph question (see Appendix 1 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015). Participants who met these criteria were asked to provide consent before starting the survey instrument. The study was reviewed by the University of Maryland Baltimore Institutional Review Board and was classified as exempt.

Survey Flow and Data Collection

After participants consented, they were presented with explanations of the better-off and worse-off groups and asked to respond to 8 questions about their views on health inequalities pertaining to these groups. Participants were then required to watch a 2-minute video that provided a tutorial on the BTO exercise, after which they were given 2 practice exercises to confirm their comprehension of the instructions. Participants were required to answer these 2 questions correctly to advance to the BTO section of the survey. Otherwise, they automatically exited the survey. Participants continuing the survey watched a second 5-minute video highlighting 4 characters that represented the primary profile types that result from trade-off responses, as described by Robson et al.[23] This video further described concepts of health inequality trade-offs. Participants then completed the BTO and demographic questions, including whether they considered themselves to be in the better- or worse-off group. The survey instrument is available in Appendix 1 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015.

We implemented several strategies to ensure data quality, including screening criteria to ensure bar graph understanding, a tutorial and quiz on the BTO questions to ensure comprehension, duplicate participant age questions to check for matching responses, and evaluation of total survey response time. Additionally, the data vendor implemented bot detection and response screening to omit duplicate responses to remove low-quality responses. All questions required a response or the participant's response was considered to be incomplete (see Appendix 1 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015).

Statistical Analysis

Following established methods, response patterns for the BTO were classified into 15 possible ranks.[23] We used the method of Robson et al[23] to numerically solve the equally distributed equivalent level of health to determine the Atkinson parameter for each of the 15 ranks (see Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015). The resulting participant responses were matched to the possible BTO response patterns with corresponding Atkinson IAPs. Based on participants' response patterns, they were categorized into the following respondent profiles: pro-advantaged (will always

prefer gains to the better-off group), health maximizer (will maximize total health gains over inequality reduction; Atkinson parameter = 0), weighted prioritarian (will trade off between improving total health and reducing inequality), maximin (will choose the largest gains to the worse-off group), or egalitarian (will reduce health inequality by reducing gains to the better off even if health of worse off is not increased).[23] As in past experiments using this method, responses that did not match one of the 15 response patterns were considered invalid and excluded from the analytic sample (Appendix 2).

Participant demographic characteristics were described using frequency and percentages of categorical variables. We compared these variables among the total sample and the analytic sample using the Pearson chi-square test for categorical variables. Median Atkinson IAP and equity weight were calculated for the entire analytic sample and across subgroups. The proportion of each subgroup with a parameter greater than 0 was calculated to represent the proportion who were inequality averse, and proportions were compared using the Pearson chi-square test for categorical variables. Appendix 3 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015 describes the approach for subgroup and sensitivity analyses.

We analyzed whether inequality aversion was associated with sociodemographic characteristics, including characteristics for which our analytic sample was not balanced to the Census: age and education. We created an inequality aversion score using the number of years of healthy life respondents were willing to forgo to reduce health inequality, scaled from −1.5 (the first category, representing the most extreme "pro-advantaged" category) to 5.5 (the 15th category, representing the most extreme "strict egalitarian" category), with a score of 0 representing "health maximizer" (see Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015). A 0.5-unit change in this simple score thus represents a 1-rank change in response category. The Atkinson parameter is less useful for this purpose because it assigns exponentially increasing weight to a 1-rank change and is undefined for the "maximin" and "strict egalitarian" categories. Ordinary least squares regression was used to estimate the association between the dependent variable, the inequality aversion score, and the independent variables, including factors related to social vulnerability: race, ethnicity, age, education, insurance status, income, and employment. Several model specifications were tested, starting with a parsimonious model including age, race, ethnicity, and household income. We tested models that also included employment and education, representing additional factors related to SVI (Appendix 2).

Results

Of 18 889 survey invitations, 12 247 participants entered the screener. Of those, 5789 did not meet eligibility requirements (age, English language, US location, and bar graph comprehension) and the remaining 6458 proceeded to the health views questions, of whom 3451 exited the survey before watching the first video. Of 3007 who were presented with the BTO graph tutorial questions, 473 did not correctly answer and did not proceed to the BTO. Of the 2534 participants who proceeded to the BTO, 474 did not complete the BTO. In summary, 2064 eligible participants consented, provided correct graph questions and a complete response (Fig. 2). Among 2064 complete responses, an IAP was calculated for 1290 participants, whereas 774 did not provide a valid BTO response (Fig. 2). Appendix 4 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015 describes the proportion of unmatched (n = 774) versus valid, matched (n = 1290) BTO responses across sample characteristics. The analytic sample (n = 1290) demographics approximated US Census data in regard to gender, race, Hispanic ethnicity, and household income (see Appendix 5 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015). Our sample had greater proportions in older age groups and with higher educational attainment than found in the general population. Table 1 reports the proportion inequality averse across sociodemographic subgroups. Statistically significant differences in the proportion averse were observed by age, gender, and income. Appendix 4 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015 provides a comparison among participants who proceeded to the BTO versus those who did not pass the graph comprehension questions.

The median Atkinson parameter among the sample was 12.12 (interquartile range [IQR]: 5.97-∞); the corresponding equity weight was 6.7 (Table 2). The implied equity weight is for the distribution of quality-adjusted life-years presented in the example: marginal health gain to the worse-off fifth of the population compared with the marginal health gain to the better-off fifth of the population at initial QALE.

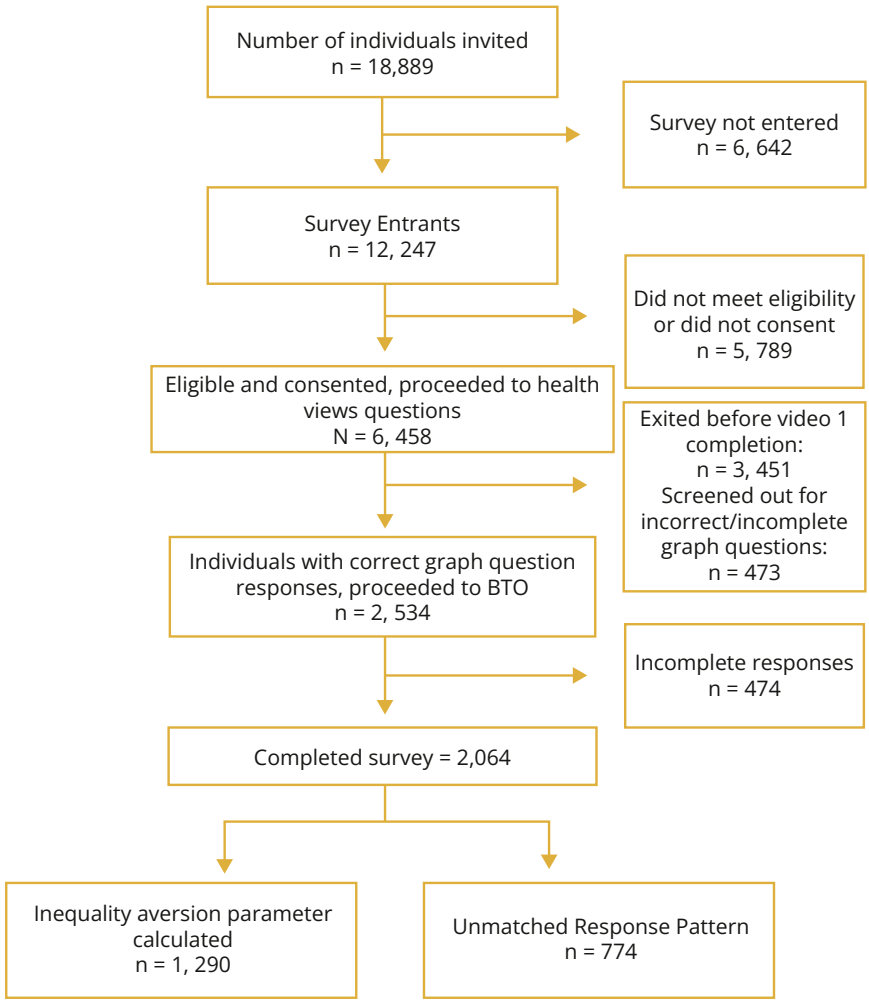
Figure 3 illustrates the cumulative proportion of responses across 15 ranked categories. In total, 88% of eligible participants with matched, valid responses had parameters greater than 0, and were considered inequality averse, ie, willing to trade-off total health to reduce health inequality. Figure 3 illustrates the proportion with parameters less than zero (9.3%), equal to 0 (2.3%), greater than 0 (88.5%) and provides a description for each of these response types.

Results from the multivariable regression (Table 3) indicated that the simple score intercept (3.4 units) representing the mean score corresponded to the 11th response category (the "weighted prioritarian" category just before "maximin") with an Atkinson parameter of 12.12 (see Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015). Black race was associated with a 0.48 unit increase in the simple score, compared with White race (P = .005). Annual household income levels of $50K to $99K and ≥$100K were associated with −0.33 and −0.78 unit decreases in the simple score, respectively, compared with annual household income of <$50K ($P$ = .012, P < .001). Relative to changes on the 15-rank scale (Fig. 3), a ∼0.5 unit increase or decrease is approximately equivalent to a 1 rank difference (Table 3). These results suggest that, on the 15-rank scale, the adjusted mean score is in the 11th category within weighted prioritarian, Black respondents are at least 1 category higher (more averse), and those with highest household income level are at least 1 category lower (less averse). Additional regression results are available in Appendix 3 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015. Model fit statistics, such as adjusted R-square, suggest that public preferences for inequality aversion cannot be explained by the observed participant characteristics (Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015).

Subgroup Sensitivity Analysis

We examined median Atkinson IAPs across several subgroups. Participants who considered themselves to be in the better-off group had a median parameter of 5.97 (Table 2). Those in the worse-off group, or middle group, had parameters of 12.12; the same as the overall median. However, the interquartile range of the worse-off group was (8.25-∞) vs the middle group (5.97-∞). Additional subgroup and sensitivity analyses are described in Appendix 3 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015.

Figure 2. Study participant flow diagram, study invitations issued from June to December 2023.



BTO indicates benefit trade-off.

Discussion

In this study of 1290 individuals balanced to the US population on gender, race, ethnicity, and household income, we found that the majority of eligible participants with valid responses (88%) would prefer to reduce health inequalities between better-off and worse-off population groups, even if this meant forgoing gains in total population health. This indicates widespread concern for reducing health inequality among the American public. Using a BTO questionnaire, we elicited stated preferences on health inequality aversion between social advantage groups, finding a median Atkinson IAP value of 12.12. This value implies a direct equity weight of 6.7, for the distribution of quality-adjusted life-years presented in the example. This suggests that the average American may value health gains to the worse-off fifth of society 6 to 7 times more highly than corresponding health gains to the better-off fifth. The median parameter was similar across most demographic characteristics, although we found some statistically significant differences by race and income. Participants who self-reported to be in the better-off subgroup of population were slightly less averse to inequalities, whereas the worse-off group was slightly more averse.

This study has a number of strengths related to the use and adaptation of the BTO. Although the instrument and BTO exercise were originally developed and tested on UK populations, it has now also been used in a number of other countries, and its strengths and limitations are reasonably well understood. By working closely with an investigator from the original study and by consulting with a group of Australian researchers simultaneously conducting a similar study, we were able to share best practices for adaptation[27] and ensuring quality responses. We recreated the animated video for a US audience and created an additional BTO tutorial along with comprehension checks for the BTO exercise. Another strength was the anchoring of our instrument to a publicly available measure of health inequality between groups that captures multiple aspects of social advantage without unduly highlighting any one specific aspect, such as race or income, which might trigger specific biases.[35] Finally, the representation of race, ethnicity, and income, among our US sample should be viewed as a strength of our study.

The results from this study should be considered in light of several possible limitations related to the study design and the responses. There are 2 important limitations of the BTO study design. As with all questionnaire studies, there is potential for

Table 1. Study participant characteristics, for the analytic sample (n = 1290).

Characteristic	Frequency per category n, (%)	Proportion inequality averse† per category %	P value*
Age, in years			<.01
18-34	151 (12)	94.7	
35-54	500 (39)	90.4	
55+	639 (50)	85.5	
Sex‡			<.01
Male	645 (50)	85.1	
Female	631 (49)	91.9	
Nonbinary	13 (1)	92.3	
Ethnicity			.16
Hispanic	149 (12)	92.0	
Non-Hispanic	1141 (89)	88.0	
Race			.11
Caucasian	990 (77)	87.1	
African American	172 (13)	94.2	
American Indian/Native American or Alaska Native	22 (2)	90.9	
Asian	51 (4)	92.2	
Native Hawaiian or Other Pacific Islander	5 (0)	100.0	
Other	50 (4)	90.0	
Geographic region, n (%)			.12
Northeast	197 (15)	86.3	
South	514 (40)	89.1	
Midwest	287 (22)	85.7	
West	292 (23)	91.4	
Highest level of education			.57
Some high school or less	17 (1)	100.0	
High school diploma or GED	249 (19)	88.0	
Some college, associates or technical degree	569 (44)	90.0	
Bachelor's degree	291 (23)	87.3	
Graduate or professional degree	164 (13)	87.2	
Total household income before taxes during the past 12 months‡			<.01
$24 999 or less	256 (20)	91.8	
$25 000-49 999	346 (27)	92.2	
$50 000-$99 999	394 (31)	88.4	
$100 000+	273 (21)	83.5	

*Chi-square test was used for categorical variables.
†Atkinson parameter >0, described as prioritarian, maximin, or egalitarian.
‡Missing values are due to nonresponse.

bias because of framing effects.[36] In our study, the possibility of framing or priming with the views questions and/or video should be acknowledged. For this reason, we followed the format of past studies closely. A particular concern with BTO is the potential for insensitivity to quantity, whereby the pattern of ordered categorical responses does not change much with different levels of baseline health inequality. This could potentially generate large differences in health IAP estimates between studies using different baseline health inequality gaps, and smaller differences in implied direct equity weights. This is seen when comparing our study with those that have similarly sized gaps[23] and smaller sized gaps.[24] Therefore, the choice of underlying data to illustrate differences in baseline health inequality will result in different gaps, which lead to the potential range of IAP estimates. We described the QALE gap by quintiles of SVI and race/ethnicity, based on the data available for the US population and its suitability for health economics and outcomes research.[11,37] Therefore, the elicited IAPs may not be generalizable to studies that examine different gaps, such as income. Our study is specifically examining health inequality aversion across social subgroups, not individuals, but it is important to acknowledge the literature that describes and differentiates these topics.[38-40] Next, health inequality concern is asymmetrical, in the sense that concern focuses on reducing the pro-advantaged patterns of inequality in life expectancy and health that are overwhelmingly observed in practice (the "social gradient in health"), whereas the Atkinson social welfare function is symmetrical, in the sense that it would also embody concern for reducing anti-advantaged inequality in life expectancy and health if that were to exist. This theoretical mismatch could potentially generate bias.

Second, there are potential limitations related to the sample of respondents and the responses used in the analysis. Generalizability may be limited in 2 demographic categories: age and education of participants. Although we targeted a Census-balanced sample, requiring participants to both interpret bar graphs and correctly answer 2 tutorial questions undoubtedly restricts the sample available to participate and potentially excludes a broad range of educational or literacy levels. In our unadjusted analysis, we found that although age was associated with inequality aversion, education level was not. In multivariable regression results, we found that neither attribute was associated with inequality aversion. Therefore, although our

Table 2. Median inequality aversion parameters by perceived group membership.

	Median Atkinson parameter (IQR)
Total (n = 1290)	12.12 (5.97-∞)
Perceived group membership*	
Better-off group (n = 248)	5.97 (.89-∞)
Somewhere in the middle (n = 757)	12.12 (5.97-∞)
Worse-off group (n = 279)	12.12 (8.25-∞)

*Does not include n = 6 who preferred not to report group membership. IQR indicates interquartile range.

sample may not be representative of the population on these particular attributes, we do not believe they are key drivers of our inequality aversion results. Additionally, our regression results suggest that more work is needed to understand the factors that are associated with inequality aversion.

We required participants to read and speak English and to interpret bar graphs. It is important to note that our study excluded the preferences of these who were not able to meet the inclusion criteria and of those who did not complete the survey or provide valid responses. Future studies should consider simplified elicitation techniques and survey instruments in languages other than English and a BTO format that is less reliant on participant numeracy to be more inclusive and accessible to a broader range of participants. Our results suggest that participants who did not pass the graph comprehension questions differed from those who proceeded on to the BTO in their responses to the views questions (see Appendix 4 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2025.08.015). Therefore, it is possible that selection bias exists in our analytic sample. Incomplete data on participants who exited early limit our ability to thoroughly compare these groups. This suggests that further exploration of reasons for survey dropout would be informative for future study designs.

Stated preference experiments can be cognitively burdensome, and this may increase the potential for illogical or invalid responses. Because the design includes a discrete set of possible response patterns, ~37% of responses were not categorized into a valid response pattern and were not used in the analysis. In a recent study of risk preferences over health, ~35% of the sample was excluded because of their response type.[41] The foundational work by Robson et al[23] found that 47% of individuals who completed the survey yielded invalid responses. Several specific techniques were effective in retaining valid responses in our study, including additional cognition checks (ie, graph screener, second instructional video). Two important points should be noted about the exclusion unmatched, invalid responses. Straight line responses (ie, choosing only program A or only program B) constitutes a valid response and could drive the resulting median value. We found that the proportion of these responses (AAAAAAA: n = 98 and BBBBBBB: n = 253). was in line with past surveys. Although straight line program A or B responses were valid responses associated with IAPs, responses of "equally good" for all questions were not able to be used, similar to past studies. This response pattern (n = 39) was excluded because it was not associated with an IAP. Similarly, responses with 2 or more switching or indifference points were excluded, although we found that our results were not sensitive to imputing a switching/indifference point and including them. It is important that individuals' views on inequality are complex, and it may be possible for individuals to hold multiple indifference points, ie, the omitted responses may not be "errors" and future work should focus on how to characterize complex patterns of indifference, including respondents who chose "equally good" for all questions.

A key benchmark for this study is the foundational work conducted in the United Kingdom.[23] Overall, the distribution of inequality aversion response category ranks, the median Atkinson parameter (ie, 12.12 vs 10.95), as well as the percent of respondents willing to trade gains in overall health to address

Figure 3. Cumulative proportion of trade-off responses by ranked category (n = 1290). Rank descriptions based on Robson et al, 2017.[23]

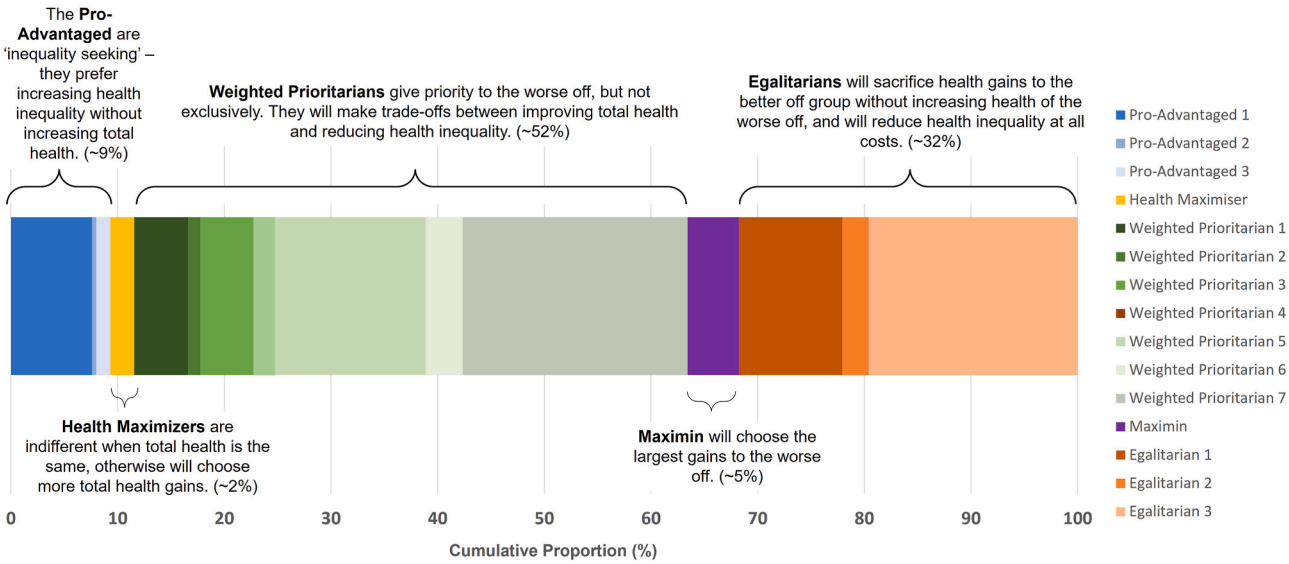


Table 3. Multivariable regression results.

Variable	Coefficient estimate	Standard error	*P* value
Intercept	3.425	0.196	<.0001
Age, in years (ref: 18-34)			
35-65	−0.234	0.189	.215
65-88	−0.325	0.205	.114
Ethnicity (ref: non-Hispanic)			
Hispanic	0.263	0.191	.167
Race (ref: White or Caucasian)			
Black or African American	0.483	0.170	.005
American Indian/Native American or Alaska Native	0.240	0.433	.580
Asian, Native Hawaiian, or Other Pacific Islander	0.392	0.280	.161
Other	0.419	0.310	.177
Total household income before taxes during the past 12 months (ref: less than $50 000)			
$50 000-$99 999	−0.328	0.130	.012
$100 000 or more	−0.777	0.148	<.0001

Note. Model and fit statistics. Number of observations read: 1290; number of observations used: 1269; number of observations with missing values: 21; and R-square: 0.0384, adj R-square: 0.0316.

disparities (88% vs 82%) were similar across studies. Two recent studies in Australia and Japan can also be compared with ours for their methodology and findings.[24,42] Future studies should aim to systematically compare the methodology and results across BTO studies because the ability to compare results depends on attributes of the BTO itself (eg, size of the gap presented, number of comparisons, etc).

Our BTO study can be considered alongside other studies of public views that used different methodological approaches. Two recent reviews examined past studies of equity and efficiency trade-off elicitation[19] and US public views on health equity.[18] Both reviews found evidence of inequality aversion in the United States, but these studies did not elicit parameters. There are several studies that describe inequality aversion in North America. Cropper et al[43] estimated "pure" health variation Atkinson parameters for environmental health risks in a US sample (median = 2.8). It is uncertain whether this parameter would also apply to healthcare resource distribution such as DCEA. The Hurley et al[20] study "level trade-off" approach yielded lower implied equity weights for the poorest fifth of Canadian society compared with the richest fifth. Respondents displayed either little aversion or very high aversion to health inequalities. They found few individual characteristics associated with levels of health inequality aversion, similar to our study findings. Finally, a working article by Iragorri et al[44] reported inequality aversion of the Canadian public, stating a strong aversion to income-related health inequalities in Canada.

Our BTO results can also be compared with new elicitation methods. The Robson et al[26] "constrained resource allocation" approach elicited implied that equity weights for the poorest fifth of people in the United Kingdom compared with the richest fifth were slightly lower than ours—although it is hard to specify precisely how much lower given the differences in methods and underlying assumptions.

This study on stated preferences of the American public is relevant in 2 major ways. First, our results signal that it is likely that a large proportion of the general population is averse to inequalities in health between social advantage groups. Second, this finding supports the use of health inequality weighting in cost-effectiveness analysis. Health equity is increasingly important in supporting the process and decisions in HTA.[1] The application of these findings is relevant because it allows for more formal integration of equity into value assessment and other forms of healthcare decision making.[4] This work fills critical data gaps for DCEA and for broader integration of equity into HTA. For example, direct equity weights may play a role in contemporary methods for value assessment such as multicriteria decision analysis. Beyond HTA, patients, providers, payers, policy makers and other key stakeholders have signaled priority in factoring equity into decisions. Prior work indicates that HTA stakeholders, including patient advocates, value equity elements for value assessment.[3] Although we report an elicited IAP, it is important to note that it is vulnerable to the aforementioned biases. Decision makers can use this piece of evidence among others to inform social value judgments.

Future work is needed to test other study designs and also the magnitude of bias owing to the potential mechanisms listed above as limitations to the BTO. Furthermore, future work should elicit the views of policymakers and other health care stakeholders in different settings. For example, a venue that allows deliberations among stakeholders and the public would allow more opportunity for feedback and reflection on responses, which is not possible in an online survey instrument.

Conclusions

In conclusion, our findings indicate that a vast majority of our BTO respondents with calculated IAPs (88%) would prioritize health improvement for worse-off compared with better-off populations, even if that sometimes means forgoing potential gains in total population health. This inequality aversion signals a

preference in the general US population to assign extra value to health gains for people in social groups facing the "double disadvantage" of both social disadvantage (eg, in terms of social vulnerability) and poor health. The inequality aversion statistics derived from this sample illustrate support for more robust and routine integration of equity concerns into healthcare decisions in the policy and HTA arenas to advance DCEA in the United States.

Author Disclosures

Author disclosure forms can be accessed below in the Supplemental Material section. Dr Julia F. Slejko is an editor for *Value in Health* and had no role in the peer-review process of this article.

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Author Affiliations: Patient-Driven Values in Healthcare Evaluation (PAVE) Center, Department of Practice, Sciences, and Health Outcomes Research, University of Maryland School of Pharmacy, Baltimore, MD, USA (Slejko, Ricci, dosReis); Center for Health Economics, University of York, York, England, UK (Cookson); Genentech, Inc, South San Francisco, CA, USA (Kowal).

Correspondence: Julia F. Slejko, PhD, Patient-Driven Values in Healthcare Evaluation (PAVE) Center, Department of Practice, Sciences and Health Outcomes Research, University of Maryland School of Pharmacy, 220 Arch St, 12th Floor, Room 01-214, Baltimore, MD 21201, USA. Email: jslejko@rx.umaryland.edu

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