BEHAVIORAL CONSIDERATIONS IN STATED PREFERENCE VALUATION OF HUMAN LIFE METRICS: COST VECTOR EFFECTS, ANCHORING AND SCOPE-INSENSITIVITY

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INTRODUCTION

This study centers on a critical investigation into the robustness of estimates for the **value of statistical life (VSL)** derived from stated preference valuation methodologies, specifically from the **Discrete Choice Experiment (DCE)** method. Our focus primarily rests on comparative analysis, assessing the degree to which selected behavioral effects influence these estimates. The examination encompasses the cost vector effect, the anchoring effect, and scope insensitivity.

OBJECTIVE

The study's significance lies in its potential to enhance the reliability and quality of stated preference health studies. Amidst a proliferation of health-oriented stated preference studies, only a minority delve into fortifying their robustness. While scope sensitivity issues affecting willingness-to-pay estimates are spotlighted in recent literature, VSL estimates remain somewhat overlooked, even though they might be more susceptible. Given their central role in health economics' cost-benefit analyses guiding policy decisions, confirming the stability of these measures against behavioral influences assumes paramount importance. Without such validation, the authenticity of findings could be compromised, rendering insights misleading.

METHODOLOGY

The core of the study was a Discrete Choice Experiment (DCE) designed to assess willingness-to-pay (WTP) for **mortality risk reductions related to cardiovascular diseases**. The analysis employed discrete choice models grounded in the random utility maximization framework, specifically **mixed logit models (MXL) with correlated random parameters** in preference space. These models were estimated using 10,000 draws with Owen and Faure-Tezuka scrambling, incorporating covariates of the mean. To further evaluate whether the selection of cost vectors influenced preferences, additional WTP questions - **Double-Bounded Dichotomous Choice (DBDC) and Open-Ended (OE) formats** - were posed at the end of the survey.

A variety of statistical methods were employed to analyze WTP differences, including the Poe et al. (2005) test for differences in empirical distributions, the two-proportions z-test, permutation test, two-sample t-test, and the Mann-Whitney U test (Wilcoxon Rank-Sum test).

The study also incorporated several treatments. (i) To assess participants' comprehension of mortality risk reductions, test questions were used, with only half of the sample receiving correct-answer feedback. (ii) **Respondents were exposed to different cost vectors within the DCE, categorized into three treatments based on the starting value and intervals size: low (50 to 300 PLN with +50 PLN increments), medium (100 to 600 PLN with +100 PLN increments), and high (200 to 1,200 PLN with +200 PLN increments).** (iii) Additionally, before the DCE, half of the participants were shown a screen that disclosed the attributes and levels featured in the experiment.

RESULTS

Table 1. Results of Three Mixed Logit Models with Correlated Random Parameters and Simulated VSL Estimates

	Low cost vector model (LC)		Medium cost vector model (MC)		High cost vector model (HC)	
Attributes	**Means (mu)**	**Standard Deviaitons (sigma)**	**Means (mu)**	**Standard Deviaitons (sigma)**	**Means (mu)**	**Standard Deviaitons (sigma)**
Risk==1 (norm dist.)	4.49*** (0.47)	5.38*** (0.73)	4.49*** (0.40)	4.59*** (0,48)	5.37*** (0.55)	6.06*** (0,74)
Risk==2 (norm dist.)	6.52*** (0.50)	5.57*** (0,85)	6.15*** (0.44)	4.69*** (0,54)	7.04*** (0.59)	6.36*** (0.82)
Risk==4 (norm dist.)	9.36*** (0.65)	7.59*** (0.97)	8.84*** (0.59)	6.73*** (0.70)	9.10*** (0.69)	7.63*** (0.91)
Annual Cost/100 in PLN (log-norm dist.)	0.05 (0.15)	2.22*** (0.16)	-0.29** (0.13)	2.92*** (0.19)	-0.68*** (0.13)	2.83*** (0.19)
VSL calculations (in PLN)						
	Mean (std. dev)	**CI 2.5% CI 97.5%**	**Mean (std. dev)**	**CI 2.5% CI 97.5%**	**Mean (std. dev)**	**CI 2.5% CI 97.5%**
VSL_1 in PLN	1,872,097 *** (329,596)	1,299,887 2,585,449	2,157,493 *** (363,595)	1,512,231 2,923,614	3,977,938 *** (815,843)	2,577,096 5,758,576
VSL_2 in PLN	1,773,041 *** (267,889)	1,312,038 2,355,516	2,092,717 *** (276,159)	1,599,326 2,677,394	3,171,265 *** (548,337)	2,220,568 4,371,797
VSL_4 in PLN	1,318,987 *** (197,386)	976,551 1,748,492	1,541,007 *** (204,174)	1,181,176 1,985,275	2,172,506 *** (348,900)	1,565,591 2,922,823

Finding #1 (cost vector effects)

Poe et al. (2005) test reveals that VSL estimates from low- and medium-cost DCEs are statistically similar, whereas VSL estimates from high-cost DCE are significantly larger (compared to both low- and medium-cost DCEs).

Finding #2 (scope-sensitivity)

Poe et al. (2005) test indicate that VSL estimates calculated with WTP for mortality risk reduction by 1 and by 2 are not statistically different. In contrast, VSL estimates derived from WTP for mortality risk reduction by 4 are significantly smaller, a consistent pattern observed across all three cost-vector models.

Finding #3 (stability of preferences)

The results (from the two-proportions z-test, permutation test, two-sample t-test, and the Mann-Whitney U test) regarding responses to DBDC and OE questions suggest that the selection of DCE cost does not significantly affect preferences. This finding provides evidence for the stability of preferences, while underscoring the importance of proper experimental design in DCEs (specifically, the selection of cost vector elements).

Finding #4 (behavioral effects - anchoring, level of comprehension, and disclosure of attributes)

The MXL model with interactions (covariates of means) confirms the findings regarding cost vectors. While no differences emerged between low- and medium-cost DCEs, respondents exposed to high-cost DCEs exhibited distinct preferences. Additionally, neither the disclosure of attributes nor the inclusion of marginal cost elements (lowest or highest values) in the first choice set influenced preferences. Interestingly, while the level of comprehension regarding mortality risk reductions (measured by three test questions) had an impact on responses, this effects was similar for both informed (about the correct answer) and uninformed participants.

Note: The results of MXL model with interactions are not presented on the poster.

Table 2. Acceptance Rates for DBDC WTP Questions and Descriptive Statistics for OE WTP Responses

			Total sample			LC DCE			MC DCE			HC DCE		
N			1299			416			433			450		
			488	423	388	156	123	137	175	137	121	157	163	130
	X (starting point)		200	400	600	200	400	600	200	400	600	200	400	600
DBDC	**Yes-Yes**	400/800/1200	35%	25%	19%	31%	25%	15%	33%	23%	18%	41%	27%	23%
	Yes-No	400/800/1200	22%	19%	15%	20%	20%	12%	27%	23%	18%	18%	17%	15%
	No-Yes	100/200/300	11%	14%	14%	15%	15%	17%	10%	12%	13%	8%	13%	12%
	No-No	100/200/300	32%	42%	52%	34%	40%	56%	30%	42%	50%	32%	43%	49%
OE	**Mean**	378	325	421	400	321	463	299	260	396	468	400	410	441
	Median	150	150	200	140	100	200	150	150	150	120	200	200	150

CONCLUSIONS

The selection of arbitrarily high-cost vectors in DCEs can distort results, a problem exacerbated by cognitive biases like the anchoring effect and yea-saying, which are prevalent in stated preference valuation studies. However, our findings from the DBDC and OE questions indicate that cost selection in DCEs does not significantly alter preferences. This suggests that the observed distortions and deviations from 'true' willingness-to-pay (WTP) estimates may stem from the wide intervals between cost vector elements. Specifically, narrower intervals, as seen in low- and medium-cost vectors, appear to offer greater precision in capturing true preferences and reducing uncertainty. Based on these insights, we hypothesize that adopting an individual-based pivot-designed cost vector could provide a robust solution to these challenges.

CONTACT INFORMATION

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If you have any questions about my research or would like to discuss related topics, feel free to reach out! I'm happy to answer inquiries in person when available or via email at your convenience.

I'm also open to collaboration opportunities, particularly if your research interests align with mine. Whether it's exploring shared ideas or exchanging insights, I'd be excited to connect and work together. Don't hesitate to get in touch!

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