

# Interval Time Trade-Off

Does it reduce satisfying and inconsistencies in valuation studies?

Anabel Estévez-Carrillo MSc, Kim Rand PhD, Juan M. Ramos-Goñi PhD

Maths in Health B.V., Klimmen, The Netherlands

## Introduction

- Identifying exact indifference points in time-trade-off (TTO) tasks is often challenging for participants.
- The task's complexity may lead respondents to express indifference upon initially entering their range of acceptable values, a phenomenon known as satisficing[1].
- TTO responses often exhibit a relatively high rate of logical inconsistencies[2].

## Objective

This study aimed to develop and test a TTO variant, named interval TTO (iTTO), that captures response intervals rather than discrete indifference points using different termination rules.

## Methods

### Study design

In 2021, a sample of 100 individuals valued 10 EQ-5D-5L health states and were randomly assigned to a study arm: regular TTO (cTTO) or interval TTO (iTTO).

### Interval TTO calibration

In our data collection, iTTO tasks terminated either when respondents defined a 0.1-width interval or after 15 iterative steps. We calibrated iTTO task by truncating response paths using:

- IS-IW Rules: Adjusting iterative steps (5-15) and interval width (0.1-0.5).
- TDC Rules: Paths truncated after 2 directional changes

To set the intervals, the "widest" method uses extreme bounds, while the "latest" method uses the latest defined bounds.

### Statistical analysis

- Task Complexity:** We measured TTO complexity using time taken, movement count, and feedback.
- Satisficing Indicator:** We assessed value clustering at TTO sequence points (1, 0.5, 0, -0.5, -1) using density estimation.
- Inconsistencies:** In cTTO, inconsistencies meant valuing worse health states higher. In iTTO, overlapping intervals were allowed.
- Model performance in Value Set Estimation:** We used DCE data for hybrid model value sets and gauged precision by mean standard error.

## Results

We sampled 100 participants: 50 cTTO and 50 iTTO, with no significant demographic differences between groups.

### Finding 1.

More iTTO respondents found TTO tasks easy to understand.

### Finding 2.

iTTO TDC tasks took 13.7 seconds less and 1.7 extra movements than cTTO.

### Finding 3.

iTTO values distribution reduced value clustering (Figure 1).

### Finding 4.

There were no significant inconsistency differences between study arms.

### Finding 5.

The adjusted-scale mean standard errors for cTTO and TDC iTTO were both 0.019.

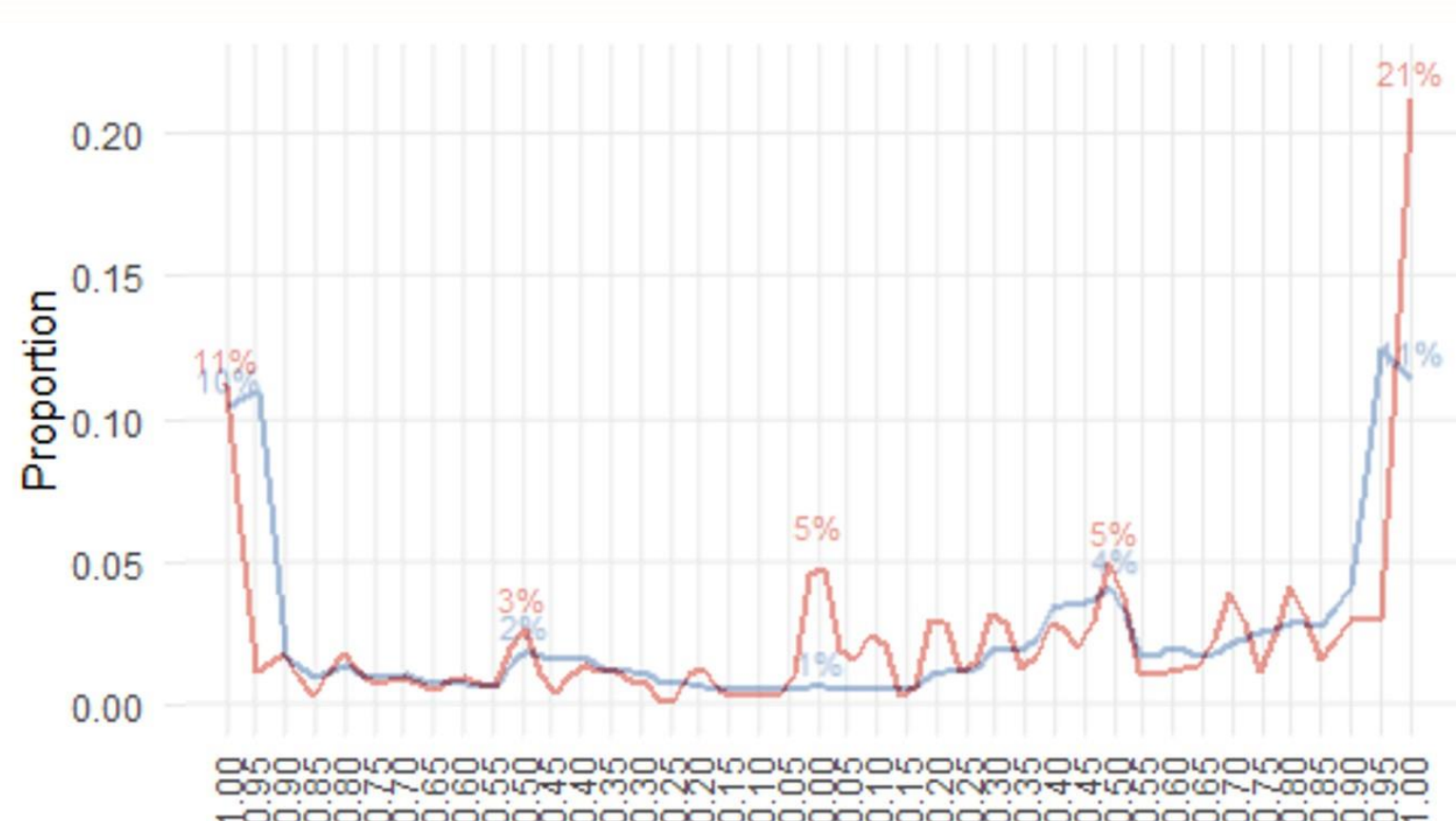


Figure 1. TTO value distribution for all health states.

Variable	cTTO	iTTO colle.	iTTO TDC
Strongly agree / Agree TTO tasks were easy to understand, n (%)	43 (86%)	47 (94%)	
Task time (s), mean (SD)	61.9 (31.0)	59.7 (39.8)	48.2 (38.3)
Task moves, mean (SD)	6.5 (3.0)	10.5 (2.1)	8.8 (2.2)
Inconsistent participants, n (%)	36 (18%)	Widest: 18 (9%)	24 (12%)

## Conclusions

iTTO may potentially improve participants' comprehension and efficiency in task completion time while limiting the impact of satisficing and preserving model precision.

Among the iTTO termination rules tested, we recommend the approach based on two directional changes.

Further research is needed to assess the performance of iTTO in other populations and explore alternative iterative procedures.