EQ-5D-5L Mapping Function Recently Recommended by NICE Is Likely to Generate Higher Utility Values (P42)

Maervoet J, Bergemann R

ISPOR Europe 2024
Tuesday, 19 November
Session 255 - Addressing Challenges With Health-Related Quality of Life Measurement

Authors and disclosures

View all Parexel's posters at ISPOR Europe 2024

Authors

- Johan Maervoet (presenter)
  - PharmD, PhD, MBA
  - Senior Principal HEOR, Parexel Access Consulting

- Contact details
  - M: +32 (0)485 62 77 45
  - E: johan.maervoet@parexel.com

- Rito Bergemann
  - MD, PhD, MBA
  - VP, WW Head of HEOR Parexel Access Consulting

- Contact details
  - M: +49 160 9086 3785
  - E: rito.bergemann@parexel.com

Disclosures

- Both authors are employees of Parexel International, a global CRO and biopharmaceutical services company
- We declare having no conflicts of interest and not having received any internal or external funding for this research

Visit Parexel at booth #1101

Table of contents

EQ-5D-5L

EQ-5D

EQ = EuroQol Group

The Group that has developed the instuments and are copyright owners

5D = 5 Dimensions

5L = 5 Levels
3,125 health states

Mobility
(walking about)

Self-care
(washing or dressing oneself)

Usual activities
(work, study, housework, family, leisure)

Pain / Discomfort

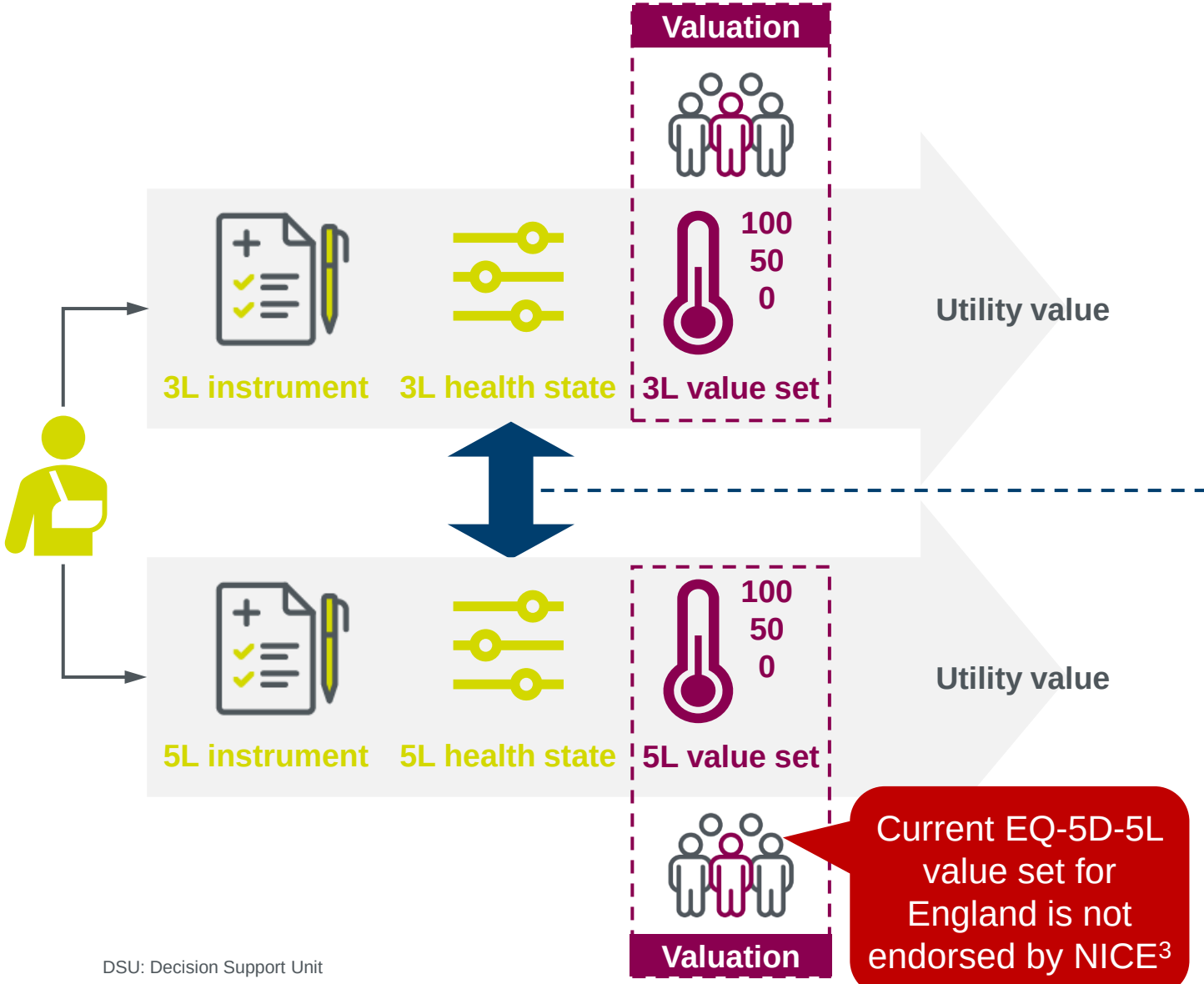
Anxiety / Depression

	Mobility	Self-care	Usual activities	Pain / Discomfort	Anxiety / Depression
No problems	☐	☐	☐	☐	☐
Slight problems	☐	☐	☐	☐	☐
Moderate problems	☐	☐	☐	☐	☐
Severe problems	☐	☐	☐	☐	☐
Unable to / Extreme problems	☐	☐	☐	☐	☐

More information on EQ-5D can be sourced from reference #1 / Illustrations adapted from HITAP Policy Brief Volume 3, Issue 24 (July 2015)

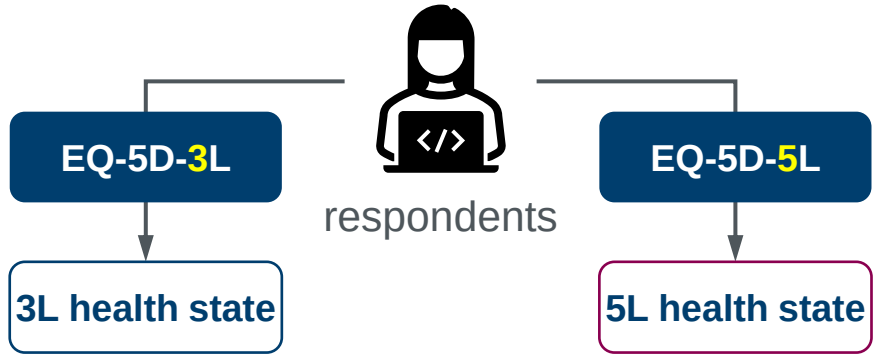
parexel

Challenge 1: A tale of two mapping methods



Current EQ-5D-5L value set for England is not endorsed by NICE[3]

Crosswalk / Mapping



Van Hout Crosswalk (EuroQol)[2,3]

- Developed as interim measure when 5L value sets were not yet available
- Dataset: Questionnaires co-administered to 3,691 patients living in six European countries in 2010
- Approach recommended by NICE **until 2022**

NICE DSU model with EEPRU dataset[4-9]

- More complex mapping function recently developed
- Dataset: Joint 3L and 5L responses collected in large scale online survey in UK (n=49,999) in 2020
- Approach recommended by NICE **since 2022**

DSU: Decision Support Unit

Comparing utility values for both mapping functions

Research aims and methods

Research aims

- To compare utility values for the UK / England derived using these two mapping methods
- To assess the potential impact of the recent change in guidance on NICE decision-making

Methods

- For each of the 3,125 unique health states in the 5L descriptive system, utility values derived with both the van Hout Crosswalk and the DSU EEPRU (M3*) mapping function were obtained and compared
- Absolute differences in resulting values were calculated and graphical plots were generated to identify outliers and allow visual comparison
- Differences in mean utility values were evaluated in subsets of health states, grouped by the level of severity of reported health issues (‘5L misery index’)
- Simulations in hypothetical patient populations were conducted to evaluate the potential impact of the mapping functions on utility values derived from EQ-5D-5L clinical trial data (see infra for details)

* Utility values derived with the DSU EEPRU mapping function vary slightly across gender and age categories. Data presented in this presentation are for the male 45-55 years (M3) subgroup

Comparing utility values for both mapping functions

Scatterplot / Contour plot

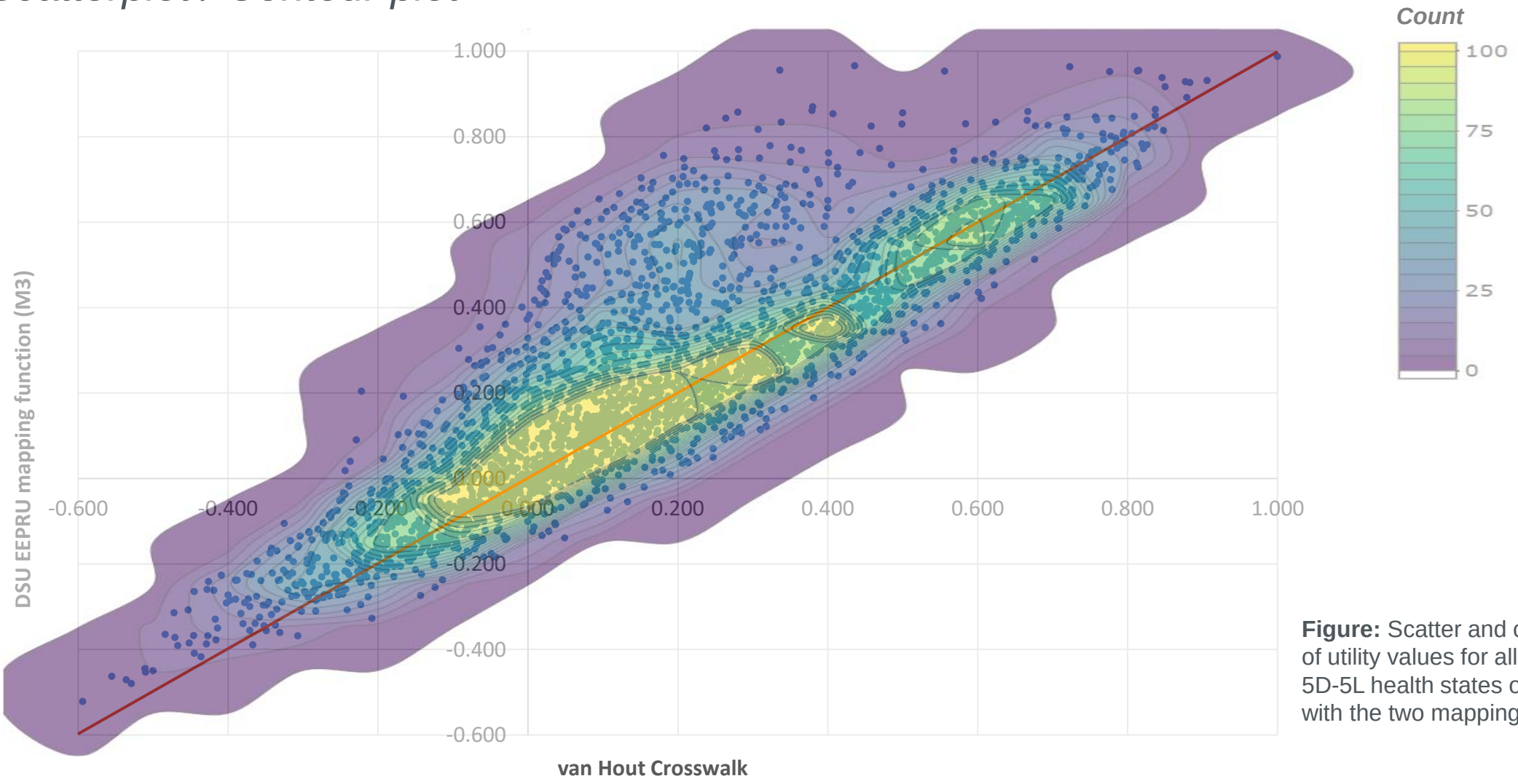


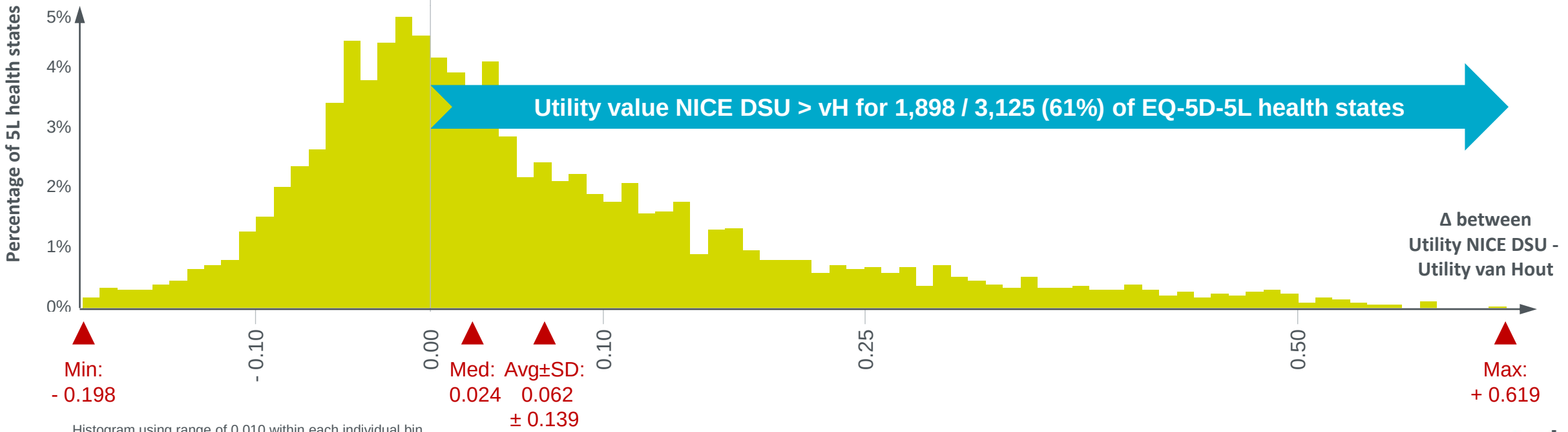
Figure: Scatter and contour plot of utility values for all 3,125 EQ-5D-5L health states obtained with the two mapping functions

*The line in orange goes through the graph's origin and indicates identical utility values on the X and Y axes
.The 2D histogram contour plot was created in R using plotly histogram2dcontour with support from Jack Ettinger

Comparing utility values for both mapping functions

Histogram: difference between the two utility values for individual health states

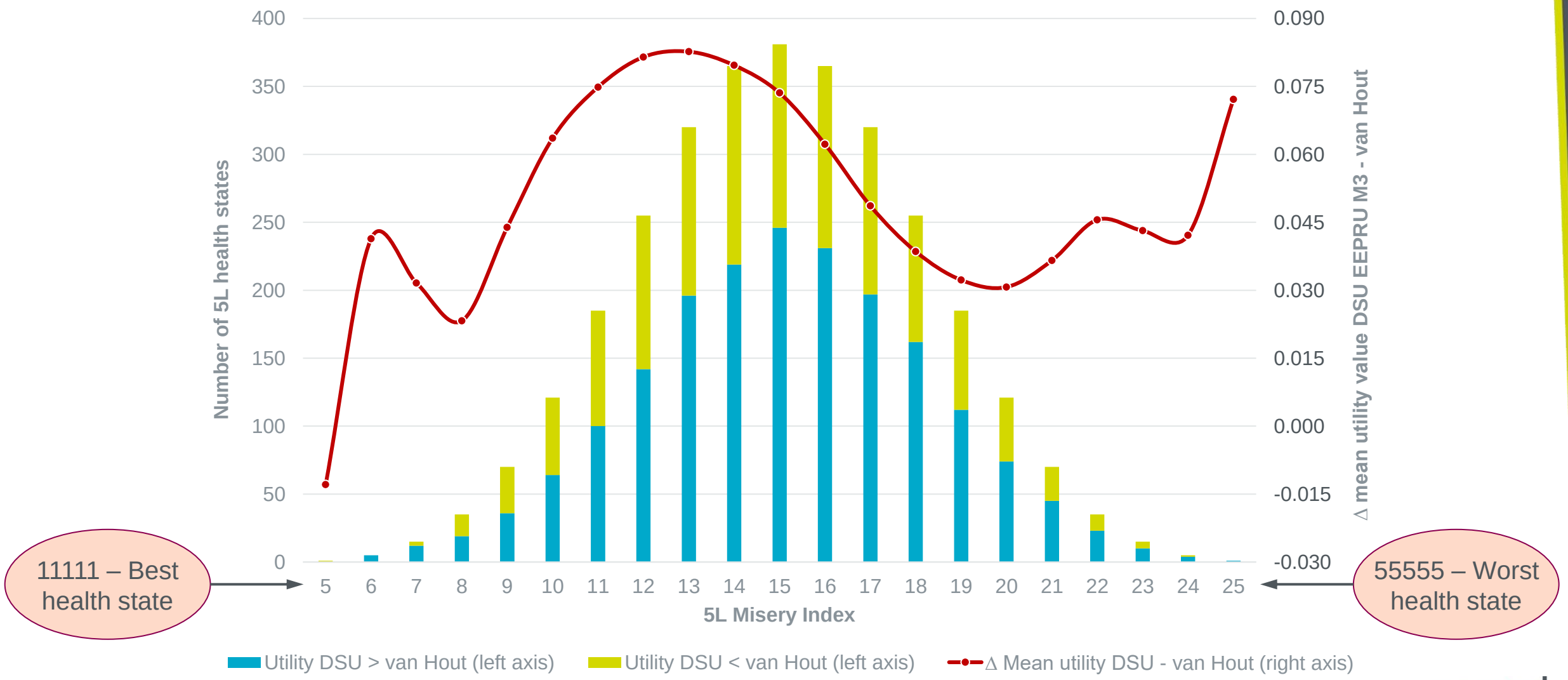
Absolute |Δ| DSU - vH	Health states for which |Δ| is smaller	is larger
± 0.25	2,783 (89%)	342 (11%)
± 0.10	2,038 (65%)	1,087 (35%)
± 0.05	1,307 (42%)	1,818 (58%)
± 0.04	1,078 (34%)	2,047 (66%)
± 0.03	822 (26%)	2,303 (74%)
± 0.02	572 (18%)	2,553 (82%)
± 0.01	269 (9%)	2,856 (91%)



Histogram using range of 0.010 within each individual bin

Comparing utility values for both mapping functions

Comparison across the severity spectrum



Comparing utility values for both mapping functions

Simulations in synthetic patient cohorts

Method

- For each simulation, a cohort size (n = 10,000), distributions for both age and the 5L misery index (i.e. function, mean, standard deviation), and a gender ratio was prespecified
- Individual patient responses to the five EQ-5D-5L items were sequentially sampled in a quasi-random manner using Excel / VBA
  Example: For a patient with a 5L misery index of seven, the response on the first item could only be one, two or three because four additional indices (each with a value of at least one) would subsequently still be drawn for the remaining dimensions
- For each patient, the order of the five EQ-5D dimensions was randomly shuffled before combining them with the five responses sampled in order to generate the respondent's health state and associated utility values with both mapping functions

Results

- Mean utility values were consistently higher (0.01 to 0.09) with the DSU mapping function than with the van Hout Crosswalk
- Differences were smaller in populations with near-perfect health (mean 5L misery index ≤ 8) or extremely poor health (mean 5L misery index ≥ 18)

	Simulation settings				Simulation output - First run			
	Age in years (mean ± SD)	Gender male/female	Cohort size	5L Misery index	# states observed	van Hout utility (mean ± SD)	DSU utility (mean ± SD)	Difference (mean ± SD)
	Simulations conducted to evaluate impact of mapping functions on mean utility values in hypothetical clinical trial cohorts							
1	65.0 ± 5.0	50% / 50%	10,000	7.0 ± 1.5	315	0.802 ± 0.145	0.842 ± 0.121	0.040 ± 0.107
2	65.0 ± 5.0	50% / 50%	10,000	8.0 ± 1.5	492	0.720 ± 0.170	0.783 ± 0.143	0.063 ± 0.145
3	65.0 ± 5.0	50% / 50%	10,000	9.0 ± 1.5	713	0.625 ± 0.188	0.709 ± 0.168	0.084 ± 0.176
4	65.0 ± 5.0	50% / 50%	10,000	10.0 ± 1.5	997	0.541 ± 0.196	0.633 ± 0.184	0.091 ± 0.187
5	65.0 ± 5.0	50% / 50%	10,000	11.0 ± 1.5	1,334	0.454 ± 0.200	0.547 ± 0.198	0.093 ± 0.188
6	65.0 ± 5.0	50% / 50%	10,000	12.0 ± 1.5	1,658	0.377 ± 0.198	0.463 ± 0.203	0.086 ± 0.178
7	65.0 ± 5.0	50% / 50%	10,000	15.0 ± 1.5	2,251	0.154 ± 0.178	0.204 ± 0.197	0.051 ± 0.139
8	65.0 ± 5.0	50% / 50%	10,000	18.0 ± 1.5	1,650	-0.055 ± 0.160	-0.039 ± 0.168	0.016 ± 0.097
9	65.0 ± 5.0	50% / 50%	10,000	21.0 ± 1.5	684	-0.264 ± 0.150	-0.252 ± 0.129	0.012 ± 0.067

Comparing utility values for both mapping functions

Potential limitations and potential impact

Preliminary conclusion

- The new NICE DSU mapping function may shift UK utility values upwards

Potential limitations of our study

- Our observations are currently based on theoretical analyses and would need to be confirmed in the evaluation of real-world data sets
- It is not inconceivable that the difference in utility values estimated by the two mapping functions could potentially be smaller in real-world data sets:
  - If many patients in a population report perfect health (i.e., DSU utility value for 11111 is <1.000)
  - Uncommon or clinically implausible health states may be overrepresented in our analyses

Potential impact

- NICE TA862 was one of the first appraisals conducted under the new 2022 NICE guidance
- The External Assessment Group raised concerns that severity modifier criteria were not met using the DSU mapping algorithm, but were met if the van Hout scoring algorithm would have been used[10]

Challenge 2

Future need to convert between 3L to 5L utilities?

EQ-5D-5L ≠ EQ-5D-3L

- EQ-5D-5L is not an extended version of EQ-5D-3L, and both instuments are not interchangeable
- In comparison to identical individuals using the EQ-5D-3L, administration of EQ-5D-5L usually causes an upward shift in utility values → Less room for potential QALY gains → Higher ICERs[11-13]
- NICE DSU: "*NICE will face inconsistencies in decision-making if it uses 3L and 5L concurrently*."[12]

Utility conversions may be coming

- There is a large historical stock of 3L evidence, whilst the use of EQ-5D-5L will continue to increase
- NICE DSU: "*If, in the future, NICE determines that 5L should be used instead of 3L [for valuation], our mapping [tool] can be used to convert 3L utilities to 5L utilities in economic models*."[8,12]
- The DSU mapping function would first need to be updated with new, NICE-approved 5L value set from an EQ-5D-5L valuation study that is currently still ongoing[14]

a QALY is a QALY is a QALY
but a 3L utility value may not be the same as a 5L utility value

Conclusions

Challenge #1

- Not only the choice of EQ-5D instrument, but also the mapping approach may have an impact on resulting utility values
- The new DSU mapping function may shift UK utility values further upwards, potentially impacting NICE decision-making
- Caveat: Our observations are currently based on theoretical analyses and would need to be confirmed in the evaluation of real-world data sets

Challenge #2

- The use of various combinations of instruments, mapping functions, and tariffs may soon make it challenging to bring together historical EQ-5D-3L evidence and a growing body of EQ-5D-5L-based evidence
- Depending on how they were derived, utility values may need to be converted for use in future economic models

References

1. Devlin NJ, Richard Brooks R. EQ-5D and the EuroQol Group: Past, Present and Future. *Appl Health Econ Health Policy*. 2017;15(2):127-37.
2. van Hout B, Janssen MF, Feng Y, Kohlmann T, Busschbach J, Golicki D, et al. Interim scoring for the EQ-5D-5L: mapping the EQ-5D-5L to EQ-5D-3L value sets. *Value Health*. 2012;15(5):708–15.
3. National Institute for Health and Care Excellence. Position statement on use of the EQ-5D-5L value set for England (updated October 2019). Accessed October 4, 2024. https://www.nice.org.uk/about/what-we-do/our-programmes/nice-guidance/technology-appraisal-guidance/eq-5d-5l
4. Hernández Alava M, Wailoo A, Pudney A. Methods for mapping between the EQ-5D-5L and the 3L for technology appraisal. Report by the Decision Support Unit. 2017. Accessed October 4, 2024. https://www.sheffield.ac.uk/nice-dsu/methods-development/eq-5d-5l
5. Hernández Alava M, Pudney S. Econometric modelling of multiple self-reports of health states: The switch from EQ-5D-3L to EQ-5D-5L in evaluating drug therapies for rheumatoid arthritis. *J Health Econ*. 2017;55:139-52.
6. Hernández Alava M, Pudney S, Wailoo A. Estimating the relationship between EQ-5D-5L and EQ-5D-3L: Results from an English Population Study (Report No. 063). Policy Research Unit in Economic Evaluation of Health and Care Interventions. 2020. Universities of Sheffield and York. Accessed October 4, 2024. https://eepru.sites.sheffield.ac.uk/eepru2-projects/estimating-the-relationship-between-eq-5d-5l-and-eq-5d-3l
7. Hernández Alava M, Pudney S, Wailoo A. Estimating the Relationship Between EQ-5D-5L and EQ-5D-3L: Results from a UK Population Study. *Pharmacoeconomics*. 2023;41(2):199-207.
8. Wailoo A, Hernández Alava M, Pudney S. NICE DSU Technical Support Document 22. Mapping to estimate health state utilities. 2023. Accessed October 4, 2024. https://www.sheffield.ac.uk/nice-dsu/tsds/full-list
9. National Institute for Health and Care Excellence. NICE health technology evaluations: the manual. 2022. Accessed October 4, 2024. http://www.nice.org.uk/process/pmg36
10. Coughlan D, Arisa O, Thomson K, Yu G, Pearson F, Kernohan A et al. Disease Severity Modifier in the NICE Single Technology Appraisal of Trastuzumab Deruxtecan: External Assessment Group Perspective. *Pharmacoeconomics*. 2024;42(1):5-9.
11. Wailoo A, Hernández Alava M, Grimm S, Pudney S, Gomes M, Sadique Z et al. Comparing the EQ-5D-3L and 5L versions. what are the implications for cost effectiveness estimates? Report by the Decision Support Unit. 2017. Accessed October 4, 2024. https://www.sheffield.ac.uk/nice-dsu/methods-development/eq-5d-5l
12. Pennington B, Hernández Alava M, Pudney S, Wailoo A. The Impact of Moving from EQ-5D-3L to -5L in NICE Technology Appraisals. *Pharmacoeconomics*. 2019;37(1):75-84.
13. Thompson AJ, Turner AJ. A Comparison of the EQ-5D-3L and EQ-5D-5L. *Pharmacoeconomics*. 2020;38(6):575-91.
14. Rowen D, Mukuria C, Bray N, Carlton J, Cooper S, Longworth L et al. UK Valuation of EQ-5D-5L, a Generic Measure of Health-Related Quality of Life: A Study Protocol. *Value Health*. 2023;26(11):1625-35.

parexel®

Thank You

With Heart™