OXFORD POPULATION HEALTH

UNIVERSITY OF OXFORD

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NPEU Health Economics

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Challenges in valuing child health - lessons from EQ-5D-Y valuation exercises

iHEA 'Economics of Children's Health & Wellbeing' SIG Webinar

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Disclaimer

I am a member of the EuroQol Group

The views expressed in this presentation do not reflect the views of the EuroQol Group or my collaborators necessarily

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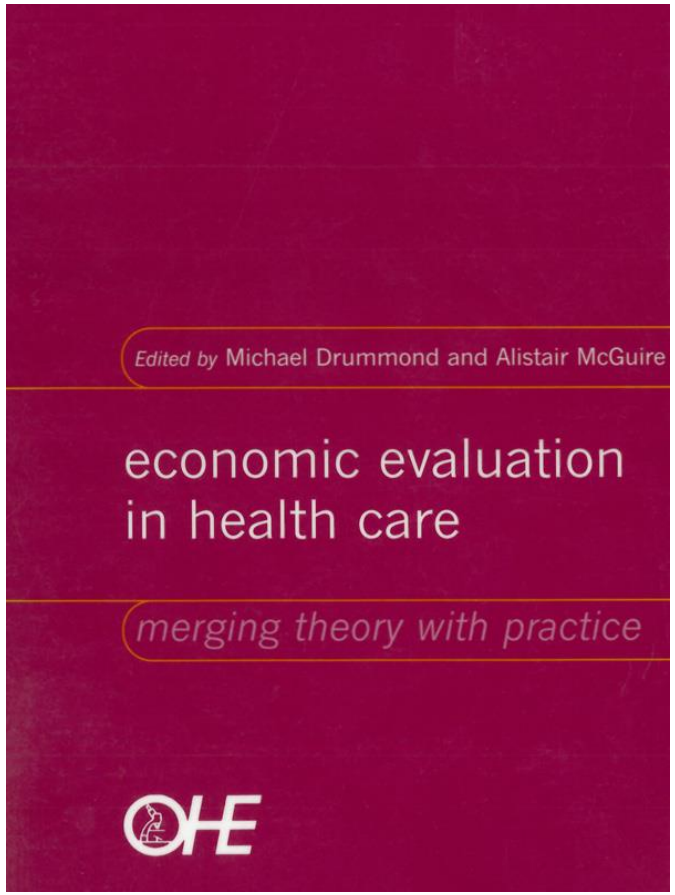
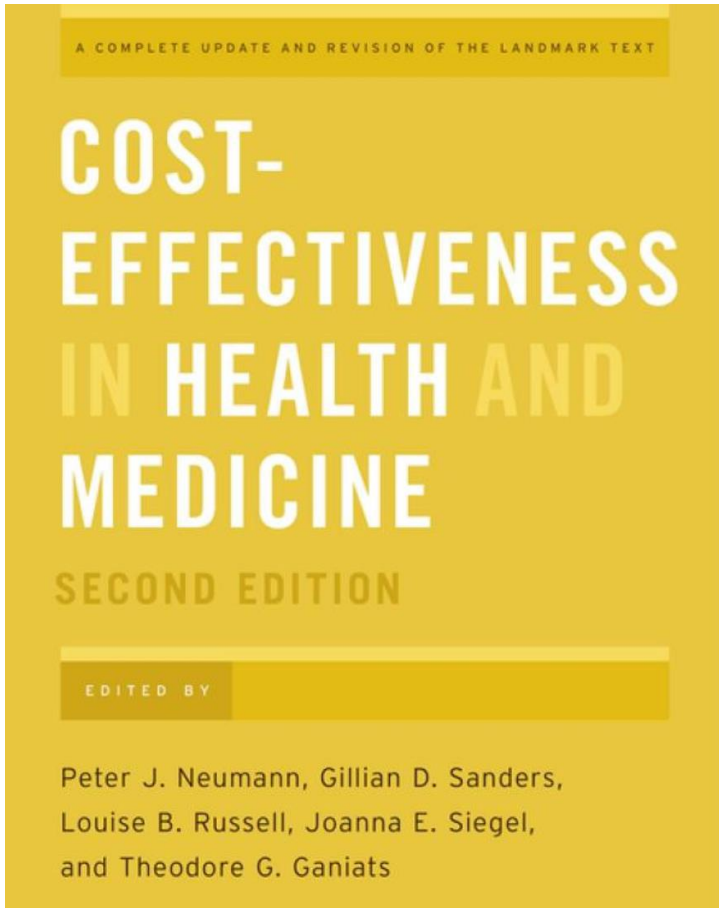
Theoretical considerations in health valuation



Paul Dolan. Output measures and valuation in health. Economic evaluation in health care. Merging theory with practice. OUP

1. **What is to be valued?**
   - **Agreement on QALYs**
2. **How is it to be valued?**
   - **Health state descriptive system and elicitation methods**
3. **Who is to be valued and from which perspective?**
   - **Whose preferences and from which perspective**



Feeny D, Krahn M, Prosser LA, et al. Valuing Health Outcomes. Cost-Effectiveness in Health and Medicine. OUP

Why health valuation in young populations present additional challenges to adult population?

Challenges	Adults	Children/Adolescents
What is to be valued?	QALYs	
What preference-based health state descriptive system to use?	EQ-5D-xL	
Is the chosen elicitation method reliable and valid?	TTO, SG	
Whose preferences?	General Public (+18) Patients	
Which perspective?	Adult's own perspective	

General consensus | Some level of consensus | No consensus

Why health valuation in young populations present additional challenges to adult population?

Challenges	Adults	Children/Adolescents
What is to be valued?	QALYs	QALYs
What preference-based health state descriptive system to use?	EQ-5D-xL	AHUM, AQoL-6D, CHU9D, EQ-5D-Y, HUI2, HUI3, QWB, 16D, 17D
Is the chosen elicitation method reliable and valid?	TTO, SG	TTO, SG, DCE, BWS
Whose preferences?	General Public (+18) Patients	General Public (+18) General Public (adolescents and above) Adolescents (11-17)
Which perspective?	Adult's own perspective	Adult's own perspective Adult's child perspective (what age?) Adolescent's own Adolescent's child perspective (what age?)

General consensus | Some level of consensus | No consensus

Value sets protocols available to derive preference-based values

Measure	Elicitation technique	Whose preferences	Perspective	Anchoring onto [1-0] full health-dead scale
CHU9D	Standard gamble	UK adult general population	Own health	No anchoring needed (utilities on QALY scale)
	Best-worst scaling	Australia and China adolescent general population	Own health	Using adult time trade-off utilities
	Discrete choice experiment (with duration)	Netherlands adult general population	Own health	No anchoring needed (utilities on QALY scale)
EQ-5D-Y [International Protocol]	Discrete choice experiment and time trade-off	Adult general population	Child aged 10 year old	Latent scale values anchored to QALY scale using TTO values
HUI2	Standard gamble and visual analogue scale	UK adult general population	Child aged 10 year old	No anchoring needed (utilities on QALY scale)
HUI3	Standard gamble and visual analogue scale	Canadian adult general population	Own health	No anchoring needed (utilities on QALY scale)

Adapted from Rowen ISPOR HTA Roundtable on children's health-related quality of life

EQ-5D-Y-3L

It describes 243 (3^5) health states

State = 22233

EQ-5D-Y descriptive system
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EQ-5D-Y

Describing your health TODAY

Under each heading, please tick the ONE box that best describes your health TODAY.

Mobility *(walking about)*

- I have no problems walking about ☐
- I have some problems walking about ☑
- I have a lot of problems walking about ☐

Looking after myself

- I have no problems washing or dressing myself ☐
- I have some problems washing or dressing myself ☑
- I have a lot of problems washing or dressing myself ☐

Doing usual activities *(for example, going to school, hobbies, sports, playing, doing things with family or friends)*

- I have no problems doing my usual activities ☐
- I have some problems doing my usual activities ☑
- I have a lot of problems doing my usual activities ☐

Having pain or discomfort

- I have no pain or discomfort ☐
- I have some pain or discomfort ☐
- I have a lot of pain or discomfort ☑

Feeling worried, sad or unhappy

- I am not worried, sad or unhappy ☐
- I am a bit worried, sad or unhappy ☐
- I am very worried, sad or unhappy ☑

Which descriptive system?

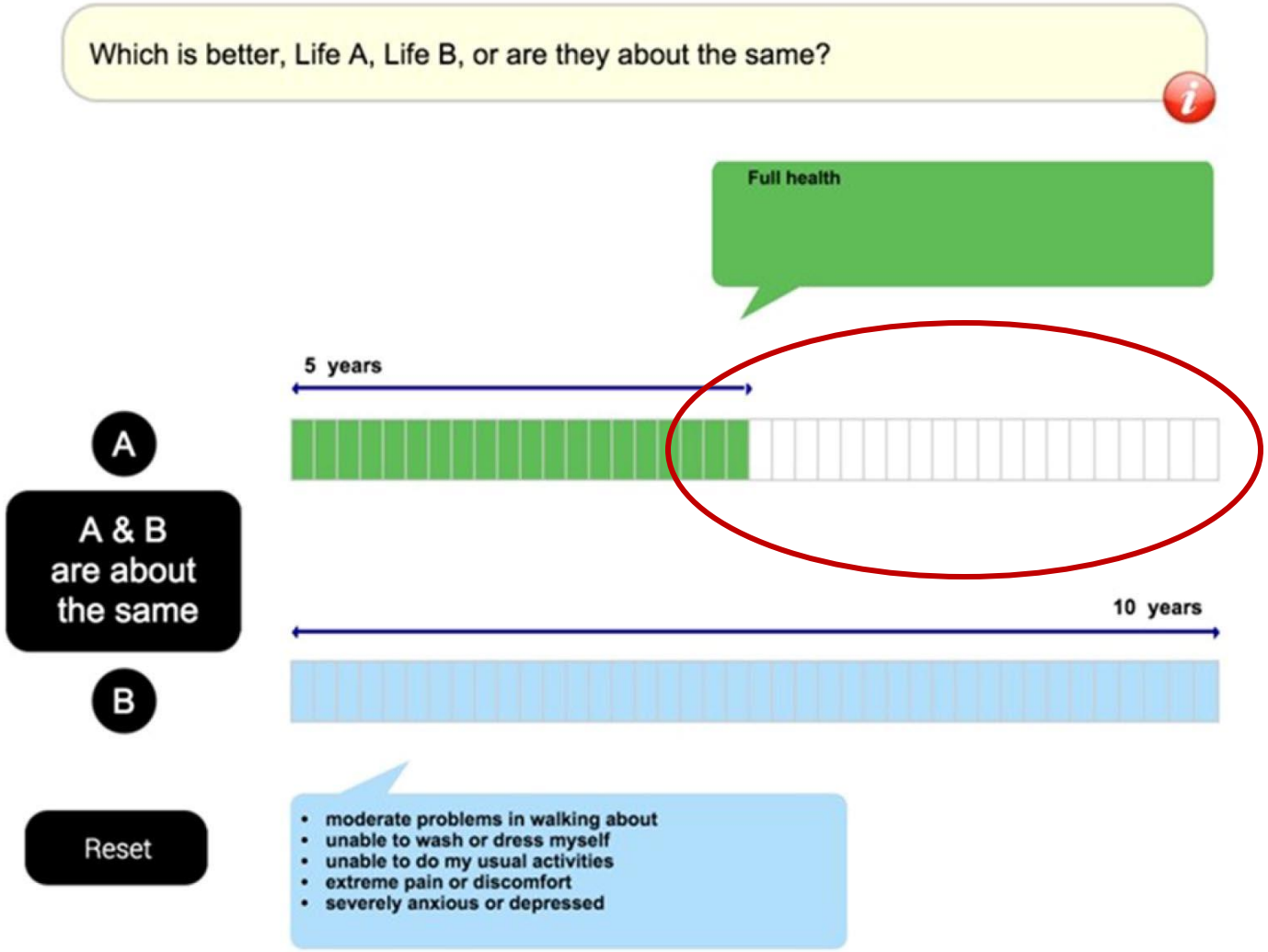
Systematic Literature Review

A Review of the Psychometric Performance of Selected Child and Adolescent Preference-Based Measures Used to Produce Utilities for Child and Adolescent Health

Methodology	
Preference-based measures	Child Health Utility (CHU9D), EQ-5D-Y (3L or 5L), and Health Utilities Index Mark 2 (HUI2) or Mark 3 (HUI3)
Psychometric properties evaluated	Known-group validity, convergent validity, responsiveness, reliability, acceptability, and feasibility
Author's (selected) conclusions	- Heterogeneity of evidence complicates the selection of one measure - CHU9D and EQ-5D-Y explored in fewer studies with good psychometric properties - HUI2 and HUI3 explored in more studies with mixed results about their psychometric properties

Rowen et al. A Review of the Psychometric Performance of Selected Child and Adolescent Preference-Based Measures Used to Produce Utilities for Child and Adolescent Health. Value Health, 2021. 24(3): 443-460.

Which elicitation method to use?



- Time trade-off (TTO) works well (in general) with adults using their owns perspective
  - But very problematic when using a child perspective

Mean TTO values using own health and child perspective with adults for EQ-5D-Y states

EQ-5D-Y health state	11111	11112	22222	32313	33323	33333
Own health	1.0	0.95	0.7	0.28	-0.02	-0.17
Child aged 10 years old	1.0	0.95	0.83	0.54	0.16	-0.14

Based on Kreimeier, S., et al. Value Health, 2018. 21(11): 1291-1298 and adapted on Lipman, S.A., et al. Value Health, 2021. 24(7): 976-982.

Lipman, S.A., et al. Eur J Health Econ, 2021. 22(9): 1507-1518. Recently confirmed that this result is systematic and could potentially affect health gains and associated incremental cost-effectiveness ratios (ICERs)

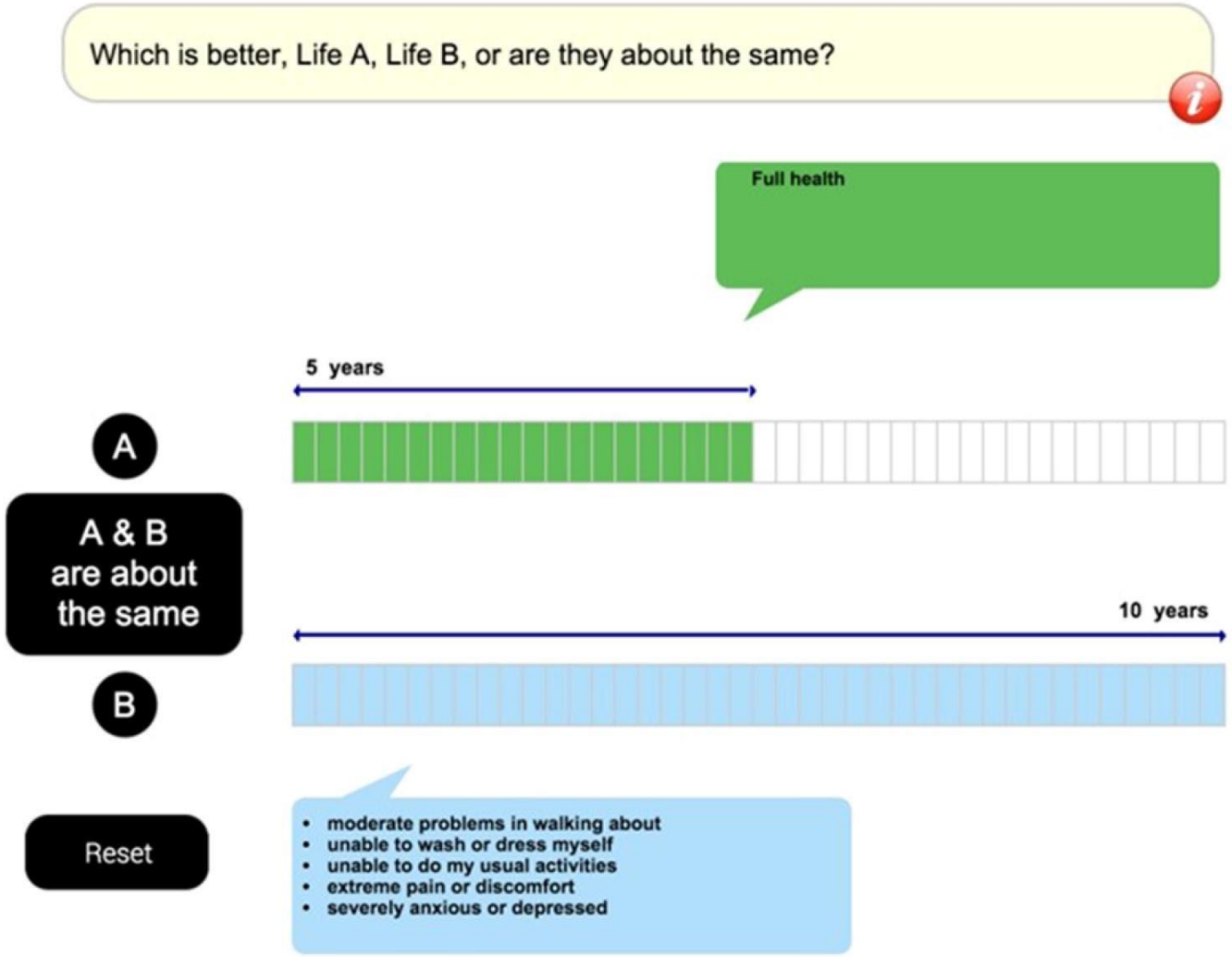
What do adults think when they are asked to value child and adolescent health states?

Figure 3. Thematic framework.

1. General public respond differently in valuation exercises using different perspectives (they express different willingness to trade LYs)
2. Adults find imagining health states and decide for others difficult, particularly children
3. Adults found responding from their own-perspective more acceptable

Powell, P.A., Rowen, D., Rivero-Arias, O., Tsuchiya, A., and Brazier, J.E. Valuing child and adolescent health: a qualitative study on different perspectives and priorities taken by the adult general public. Health Qual Life Outcomes, 2021. 19(1): 222.

Which elicitation method to use?



- Time trade-off (TTO) works well (in general) with adults
  - But very problematic when using a child perspective
- TTO poses several problems in adolescents
  - Cognitive skills needed to understand risks, indifference points and time preference
  - Ethical issues of elicitation tasks involving the notion of death

Selected studies using TTO in adolescents

Author year	Age (Years)	Sample size	Clinical Area	Elicitation method
Saw 2003	High School Students	699	Myopia	SG, TTO
Sung 2003	12-18	22	Oncology, Rheumatology, Hemophilia, Bone marrow transplant	SG, TTO, VAS
Tong 2011	12-21	26	Kidney transplant	TTO
Tong 2013	12-24	27	Chronic kidney disease	TTO
Trent 2011	12-19	134	Pelvic inflammatory disease	TTO, VAS
Yi 2009	11-19	155	Inflammatory bowel disease	SG, TTO
Yi 2003	12-18	65	Cystic Fibrosis	TTO
Chen 2008	14-18	266	Acne	TTO, WTP
Lee 2011	15-18	116	Diabetes	TTO

Adapted from Crump, R.T., Lau, R., Cox, E., Currie, G., and Panepinto, J. Testing the feasibility of eliciting preferences for health states from adolescents using direct methods. BMC Pediatr, 2018. 18(1): 199.

Testing the feasibility of eliciting preferences for health states from adolescents using direct methods

R. Trafford Crump[1*], Ryan Lau[2], Elizabeth Cox[3], Gillian Currie[4] and Julie Panepinto[2]

Abstract

Background: Measuring adolescents' preferences for health states can play an important role in evaluating the delivery of pediatric healthcare. However, formal evaluation of the common direct preference elicitation methods for health states has not been done with adolescents. Therefore, the purpose of this study is to test how these methods perform in terms of their feasibility, reliability, and validity for measuring health state preferences in adolescents.

Methods: This study used a web-based survey of adolescents, 18 years of age or younger, living in the United States. The survey included four health states, each comprised of six attributes. Preferences for these health states were elicited using the visual analogue scale, time trade-off, and standard gamble. The feasibility, test-retest reliability, and construct validity of each of these preference elicitation methods were tested and compared.

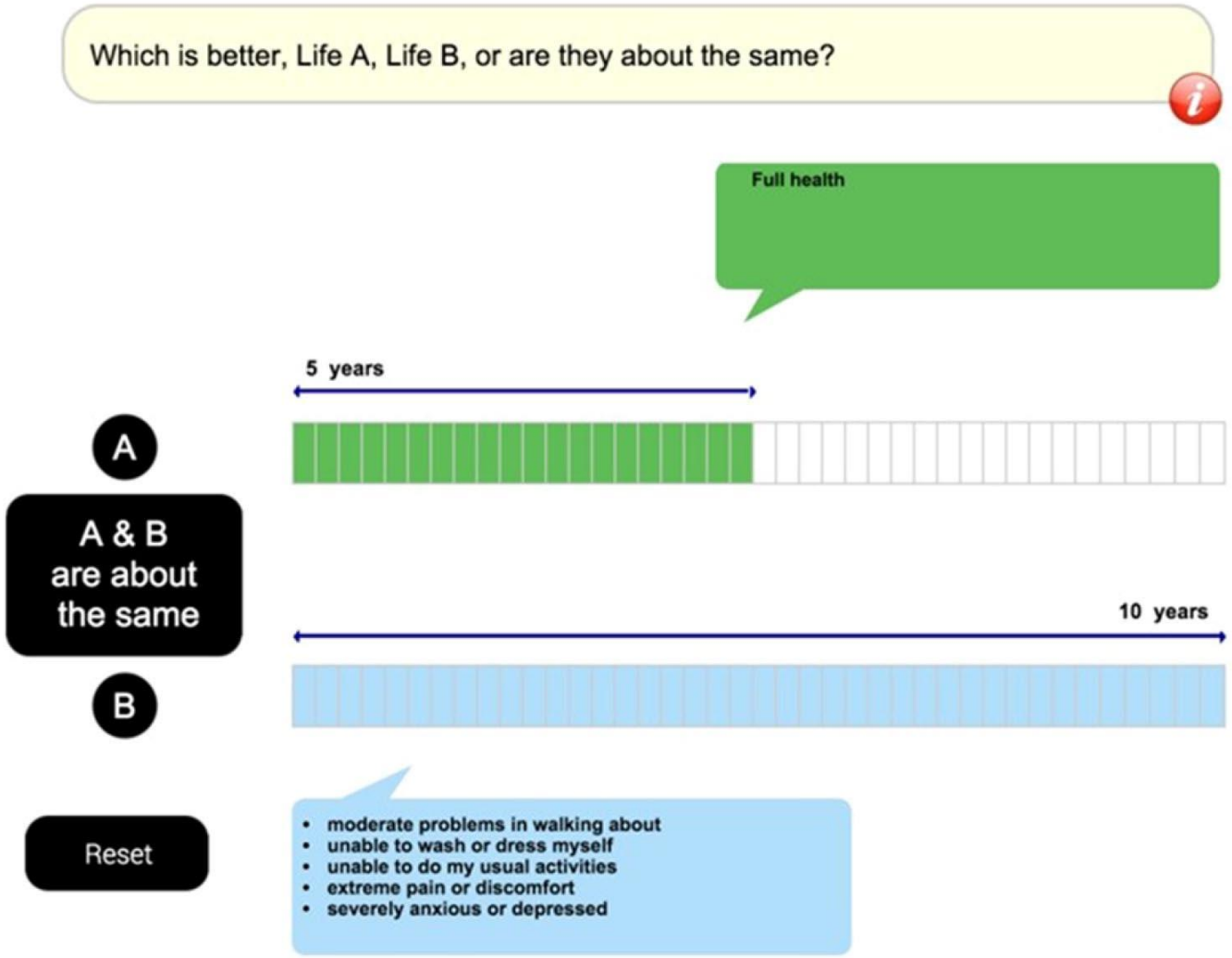
Results: A total of 144 participants were included in this study. Using a web-based survey format to elicit preferences for health states from adolescents was feasible. A majority of participants completed all three elicitation methods, ranked those methods as being easy, with very few requiring assistance from someone else. However, all three elicitation methods demonstrated weak test-retest reliability, with Kendall's tau-a values ranging from 0.204 to 0.402. Similarly, all three methods demonstrated poor construct validity, with 9–50% of all rankings aligning with our expectations. There were no significant differences across age groups.

Conclusions: Using a web-based survey format to elicit preferences for health states from adolescents is feasible. However, the reliability and construct validity of the methods used to elicit these preferences when using this survey format are poor. Further research into the effects of a web-based survey approach to eliciting preferences for health states from adolescents is needed before health services researchers or pediatric clinicians widely employ these methods.

Keywords: Adolescents, Survey, Health states, Preferences, Psychometrics

Crump, R.T., Lau, R., Cox, E., Currie, G., and Panepinto, J. Testing the feasibility of eliciting preferences for health states from adolescents using direct methods. BMC Pediatr, 2018. 18(1): 199.

Which elicitation method to use?



- Time trade-off (TTO) works well (in general) with adults
  - But very problematic when using a child perspective
- TTO poses several problems in adolescents
  - Cognitive skills needed to understand risks, indifference points and time preference
  - Ethical issues of elicitation tasks involving the notion of death
- Alternatives using discrete choice experiments (DCE) and best worst scaling (BWS) have been assessed elicit preferences from younger populations

DCE task example

Question 1 / 16

Considering your views about a 10 year old child: which do you prefer, A or B?

A	B
• no problems walking about • a lot of problems washing or dressing • a lot of problems doing usual activities • some pain or discomfort • very worried, sad or unhappy	• some problems walking about • some problems washing or dressing • a lot of problems doing usual activities • some pain or discomfort • a bit worried, sad or unhappy
A	B

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Screenshot of a BWS task (BWS EQ-5D-Y)

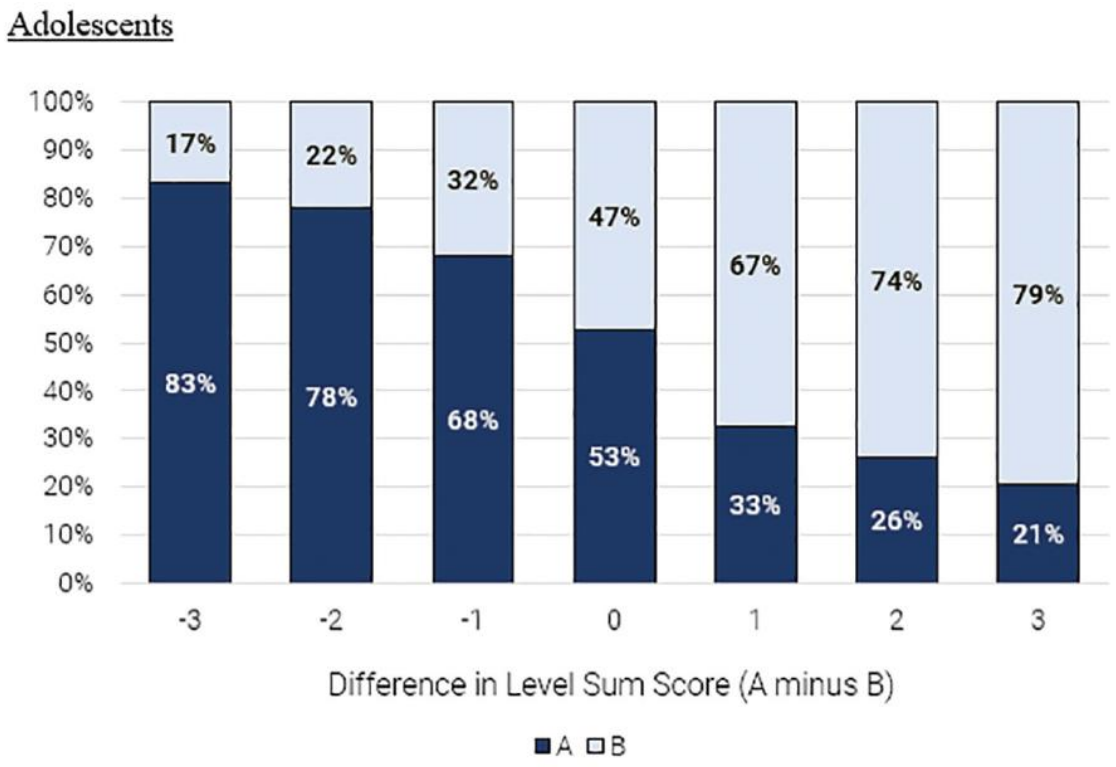
Best		Worst
●	I have no problems walking about	○
○	I have no problems washing or dressing myself	○
○	I have no problems doing my usual activities	○
○	I have a lot of pain or discomfort	●
○	I am a bit worried, sad or unhappy	○

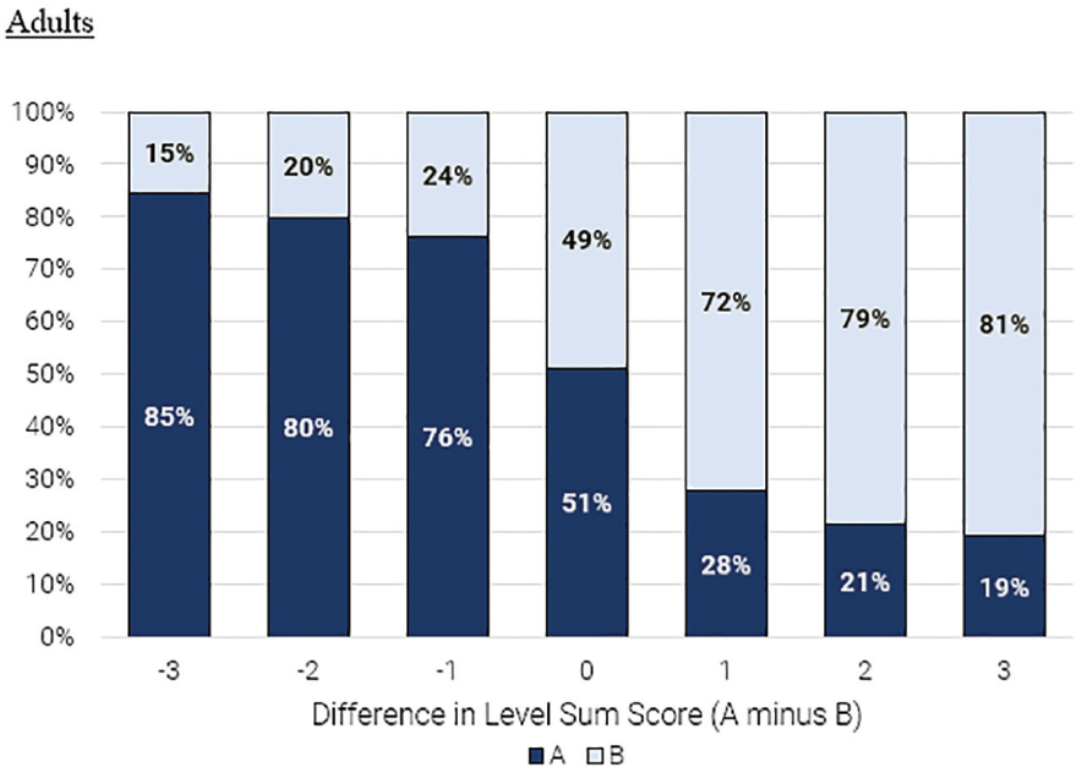
There are three types of BWS tasks and this one describes the profile case BWS (case 2)

Louviere, J. J., Flynn, T. N. and Marley, A. A. J. (2015). Best-worst scaling: methods and applications. Cambridge, Cambridge University Press.

Are DCE preferences from adolescents valid? (Case study using EQ-5D-Y-3L)

State 11122 vs 22233	Adolescents	Adults
Proportion selecting state 11122	88.46%	89.5%

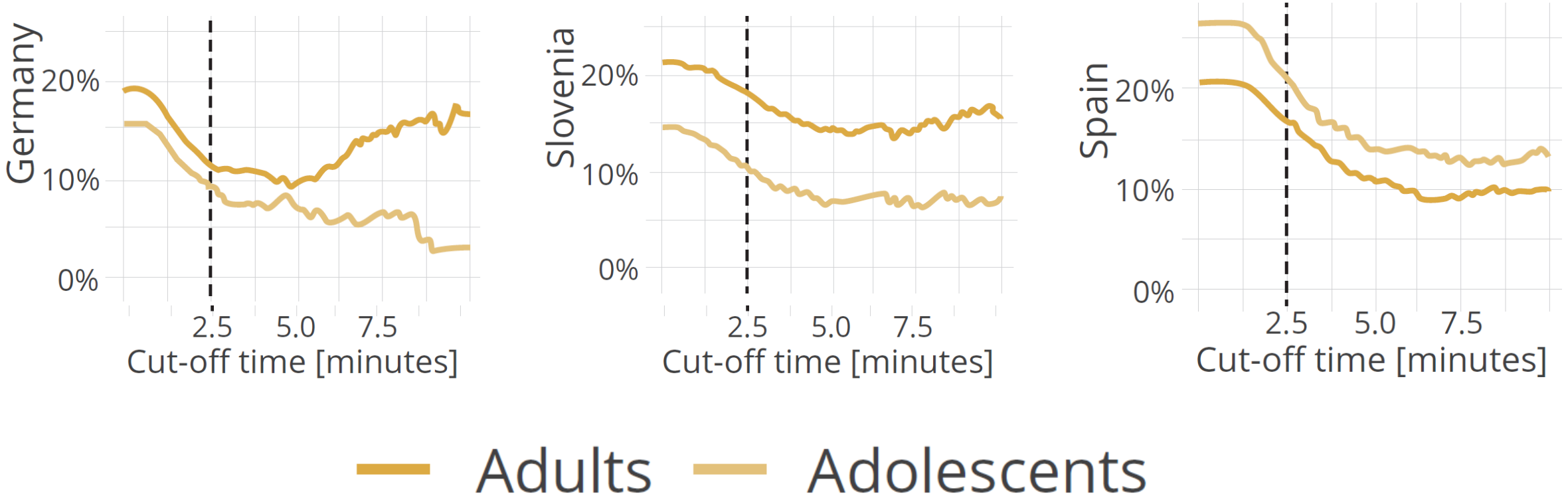




Mott, D.J., Shah, K.K., Ramos-Goni, J.M., Devlin, N.J., and Rivero-Arias, O. Valuing EQ-5D-Y-3L Health States Using a Discrete Choice Experiment: Do Adult and Adolescent Preferences Differ? Med Decis Making, 2021.

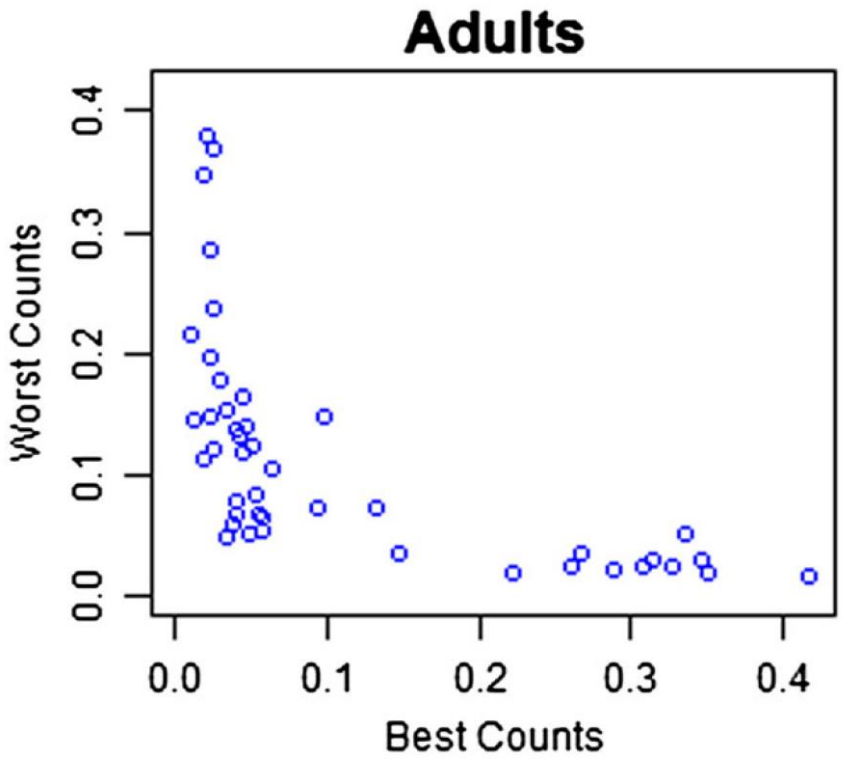
Are DCE preferences from adolescents valid? (Case study using EQ-5D-Y-3L)

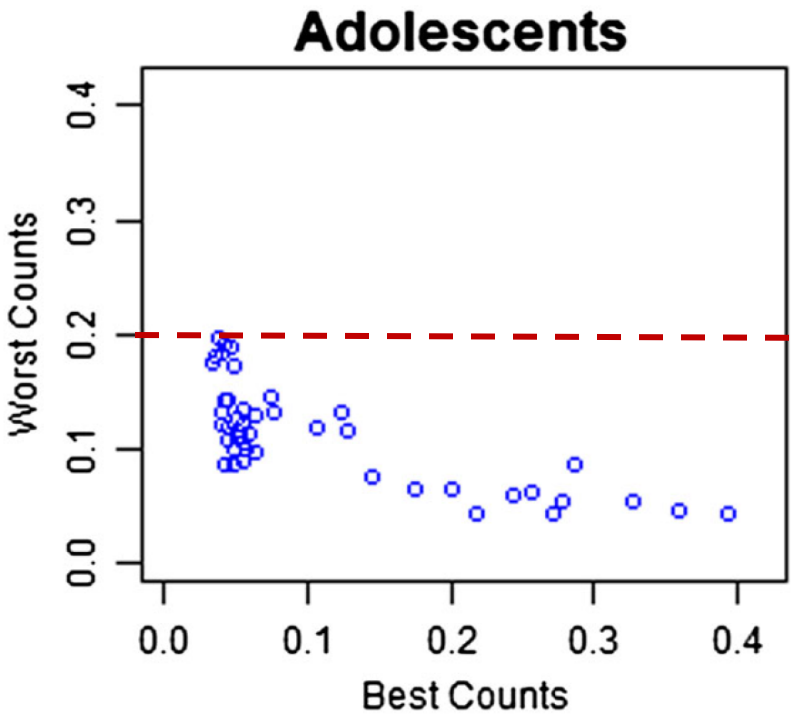
Number of inconsistencies



Prevolnik Rupel, V., Ramos-Goni, J.M., Ogorevc, M., Kreimeier, S., Ludwig, K., and Greiner, W. Comparison of Adult and Adolescent Preferences Toward EQ-5D-Y-3L Health States. Value Health, 2021. 24(9): 1350-1359.

Are BWS preferences from adolescents valid? (Case study using CHU-9D)

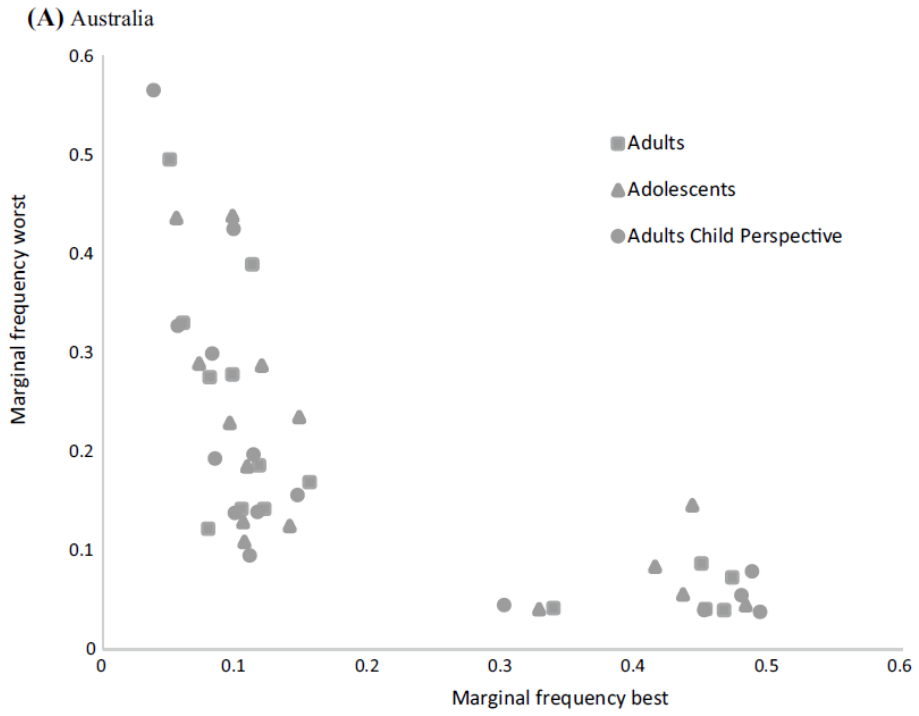


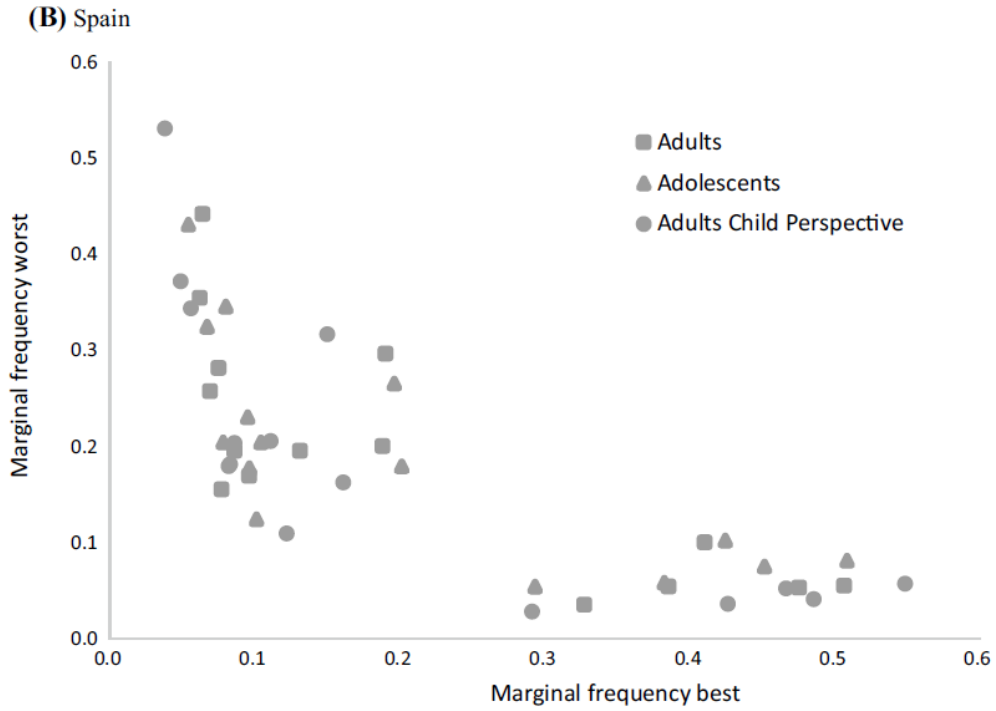


Best and worst choice counts summary

Ratcliffe, J., Huynh, E., Stevens, K., Brazier, J., Sawyer, M., and Flynn, T. Nothing About Us Without Us? A Comparison of Adolescent and Adult Health-State Values for the Child Health Utility-9D Using Profile Case Best-Worst Scaling. Health Economics, 2016. 25(4): 486-496.

Are BWS preferences from adolescents valid? (Case study using EQ-5D-Y-3L)





Best and worst choice counts summary: **A** Australia and **B** Spain

Dalziel, K., Catchpool, M., Garcia-Lorenzo, B., Gorostiza, I., Norman, R., and Rivero-Arias, O. Feasibility, Validity and Differences in Adolescent and Adult EQ-5D-Y Health State Valuation in Australia and Spain: An Application of Best-Worst Scaling. Pharmacoeconomics, 2020. 38(5): 499-513.

Are BWS preferences from adolescents reliable?

	Dimension	ICC for best count (95% CI)	ICC for worst count (95% CI)
Adolescent	Mobility	0.63 (0.59, 0.67)	0.63 (0.59, 0.66)
	Self-care	0.60 (0.55, 0.64)	0.58 (0.54, 0.63)
	Usual activity	0.72 (0.69, 0.75)	0.68 (0.64, 0.71)
	Pain/Discomfort	0.74 (0.71, 0.77)	0.66 (0.62, 0.69)
	Sad/worried	0.61 (0.56, 0.64)	0.58 (0.54, 0.62)
Adult	Mobility	0.57 (0.53, 0.60)	0.60 (0.56, 0.63)
	Self-care	0.66 (0.63, 0.69)	0.59 (0.56, 0.63)
	Usual activity	0.75 (0.72, 0.77)	0.71 (0.68, 0.73)
	Pain/Discomfort	0.70 (0.67, 0.72)	0.69 (0.66, 0.71)
	Sad/worried	0.57 (0.53, 0.60)	0.62 (0.59, 0.65)

Moderate agreement in both groups

Intraclass correlation coefficient (ICC) for best count and worst count between baseline and follow up

Xiong X, Dalziel K, Huang L, Rivero-Arias O. Test-retest reliability of EQ-5D-Y best-worst scaling choices of adolescents and adults. Under review.

Whose preferences?

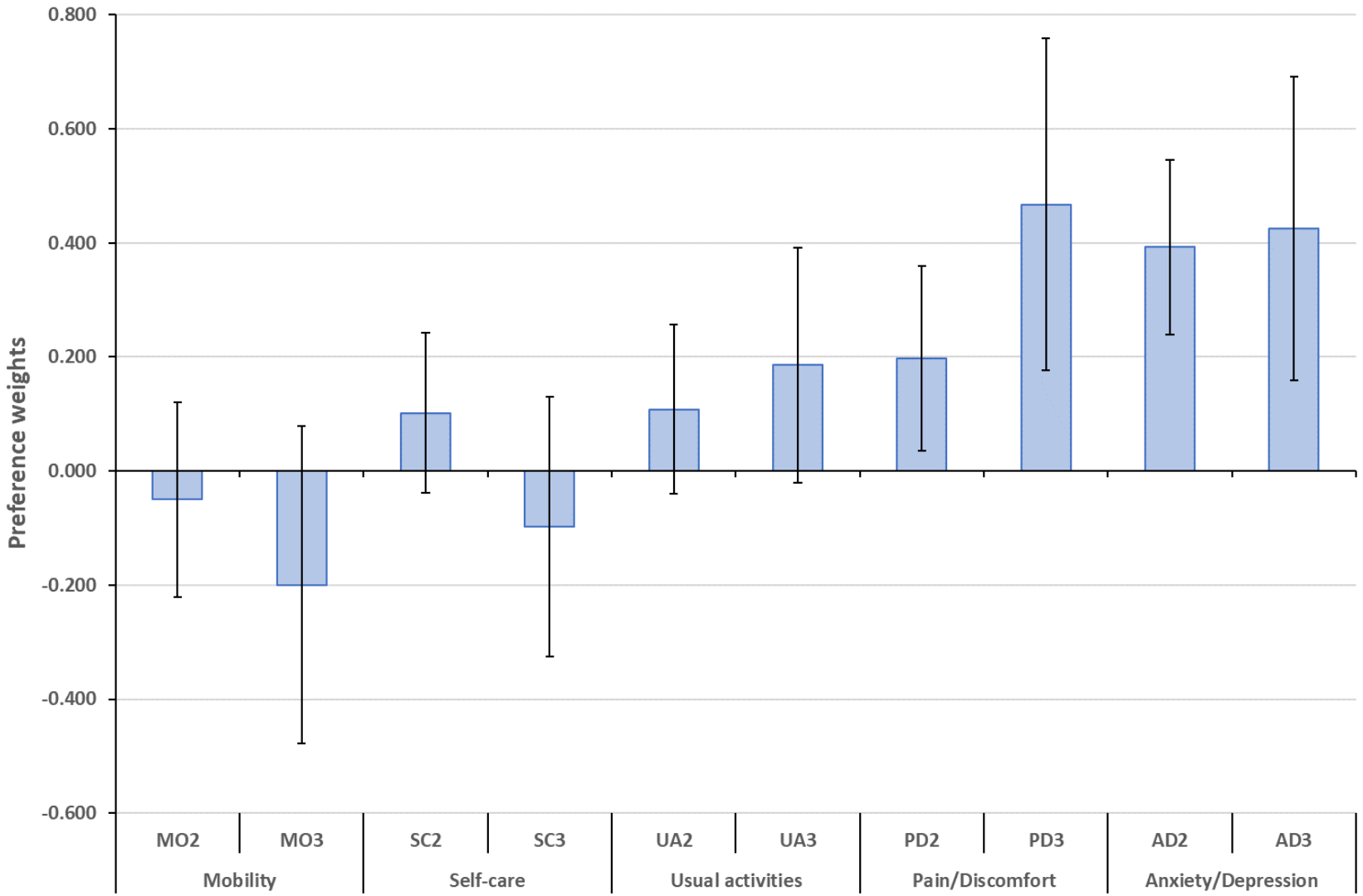
- Position adopted by guidance in the UK, US, Netherlands (amongst others): relevant preferences are those of the **general public**
  - Those who bear the cost of providing health care
  - Those eligible to vote
- Preferences of children and adolescents are relevant because they are potential patients / users of the health care being evaluated
- May be relevant to understand the preferences of children (as patients) – could be relevant in other, non-HTA uses of the instrument (Versteegh and Brouwer, 2016)
- Alternatives to conventional techniques now available that may be suitable for eliciting the preferences of younger people

Versteegh, M.M. and Brouwer, W.B.F. Patient and general public preferences for health states: A call to reconsider current guidelines. Soc Sci Med, 2016. 165: 66-74.

Are DCE preferences between adolescents and adults different? (Case study using EQ-5D-Y-3L)

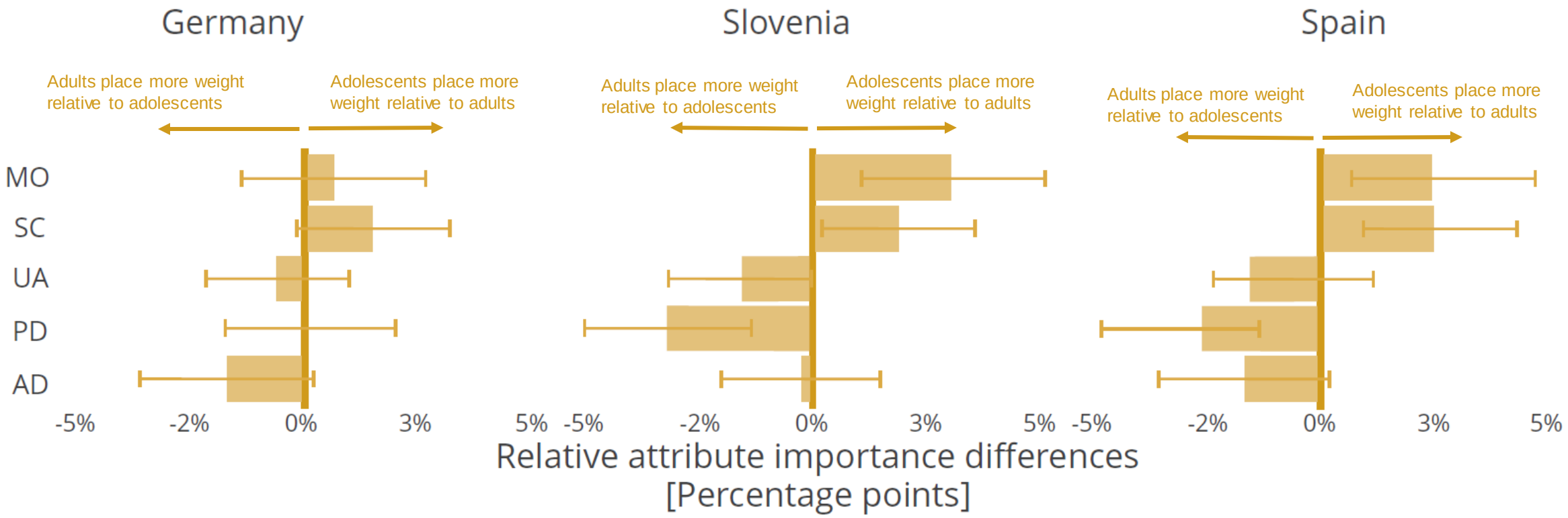
Adults place more weight relative to adolescents

Adolescents place more weight relative to adults



Mott, D.J., Shah, K.K., Ramos-Goni, J.M., Devlin, N.J., and Rivero-Arias, O. Valuing EQ-5D-Y-3L Health States Using a Discrete Choice Experiment: Do Adult and Adolescent Preferences Differ? Med Decis Making, 2021. 41(5): 584-596.

Are DCE preferences between adolescents and adults different? (Case study using EQ-5D-Y-3L)



AD indicates anxiety or depression; PD, pain or discomfort; MO, mobility; SC, self-care; UA, usual activities.

Prevolnik Rupel, V., Ramos-Goni, J.M., Ogorevc, M., Kreimeier, S., Ludwig, K., and Greiner, W. Comparison of Adult and Adolescent Preferences Toward EQ-5D-Y-3L Health States. Value Health, 2021. 24(9): 1350-1359.

Additional challenges

Anchoring DCE values onto QALY scale

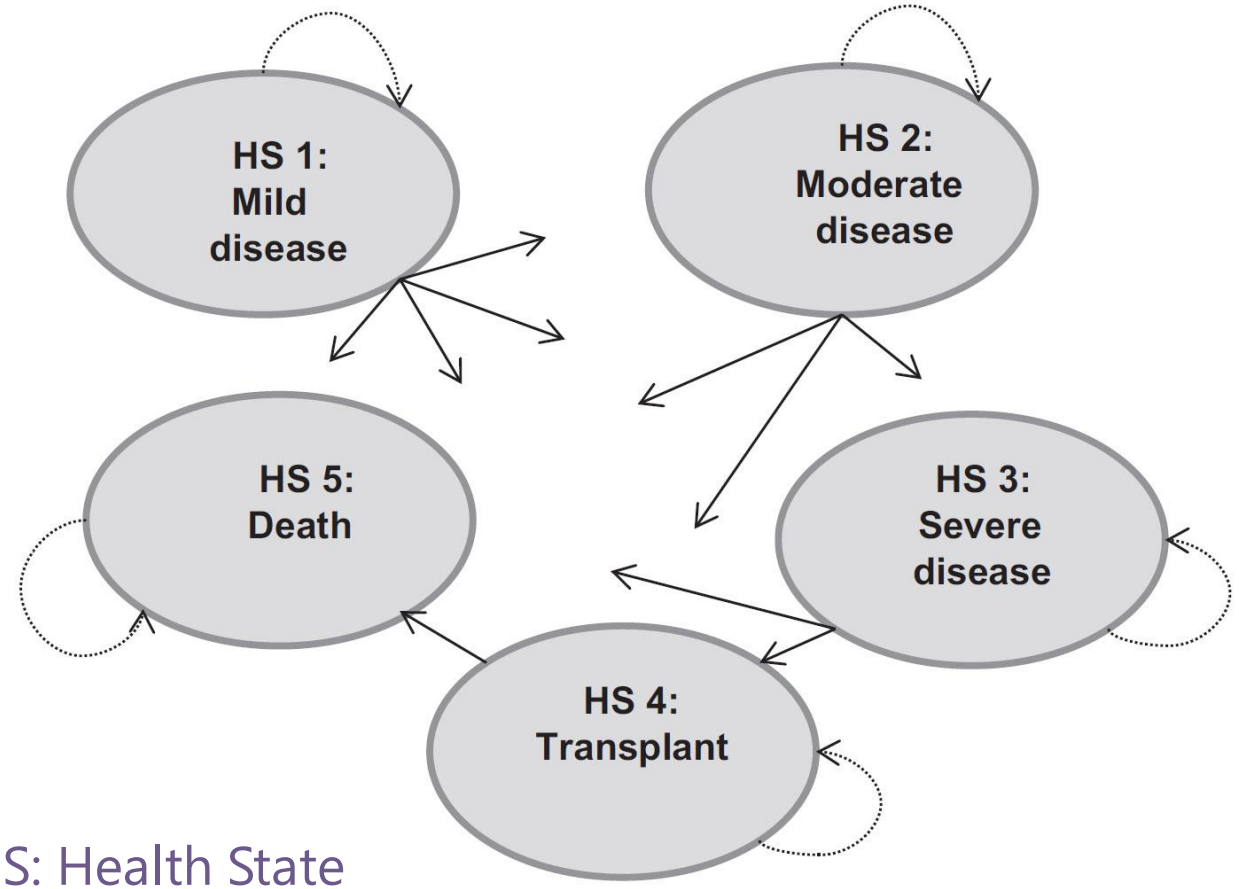
Dealing with discontinuity of utility values over time

Engagement with HTA organisations

What method to use to anchor latent scale DCE values onto the QALY scale?

- Value sets obtained from DCE responses are in an (arbitrary) latent scale and anchoring to the QALY scale is needed
  - Unless an attribute of duration is included
- We can implement broadly three anchoring approaches:
  1. Anchor to a TTO value (e.g. pits EQ-5D-Y 33333)
  2. Mapping latent scale values to available TTO values
  3. Estimating a hybrid model combining DCE and TTO simultaneously
- Empirical evidence seems to suggest that in some cases, the resulting value set in QALY scale is influenced by the anchoring approach
  - Therefore, more guidance in this area is still needed to clarify why resulting value sets are different and situations when they may not
  - Ongoing research project led by David Mott at OHE and funded by the EuroQol Group investigating this research question

The problem of discontinuity of utility values over time

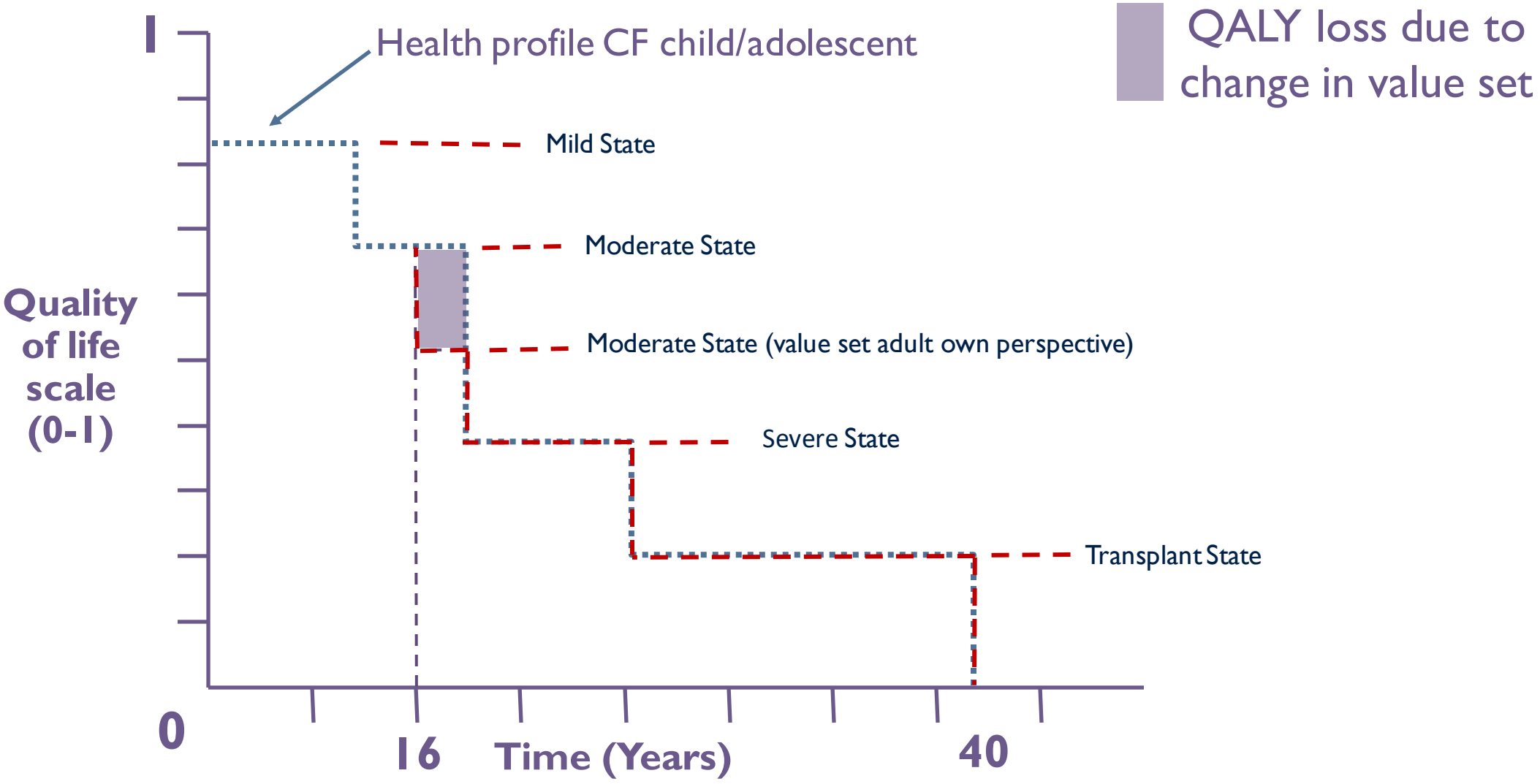


HS: Health State

Disease progression model cystic fibrosis (CF) 8 year and older

Markov Model adapted from van Gool K, Norman R, Delatycki MB, Hall J, Massie J. Understanding the costs of care for cystic fibrosis: an analysis by age and health state. Value Health. 2013;16(2):345-55.

Estimating QALYs for an adolescent with CF



Engagement with HTA organisations

- Researchers face normative issues that need strong value judgments when conducting valuation exercises of children's health states
- The starting point for the current version of the international EQ-5D-Y valuation protocol was to recommend a particular value judgment
  - By end of 2022 ~15 value sets will be completed
- However, we are moving now towards a "collaboration" with relevant HTA organisations and key stakeholders to debate and reach a consensus about whose preferences to use, what technique to use, perspective, anchoring approach and so on
- Strong steer to researchers who would like to undertake country-specific EQ-5D-Y valuation exercises to engage their relevant stakeholders early in the process

ISPOR HTA Roundtable on child HRQoL (October 2020)

- Collaboration with members from ISPOR, NICE International, University of Melbourne and University of Sheffield
- Aims:
  a) to raise awareness of challenges when valuing children's HRQoL and using this information in HTA
  b) to identify areas of consensus and areas of difference in approaches taken by HTA agencies
  c) to understand HTA agencies' current perspective around the existence and development of methods guidance in this area
  d) to find out if HTA agencies have a clear view on normative questions – such as whose preferences should inform value sets

Key findings from the HTA Roundtable on child HRQoL

- **There were 22 attendees representing 11 HTA agencies in England, Scotland, Canada, Singapore, Sweden, Tunisia, Denmark and Hungary**

a) None of the HTA agencies had explicit recommendations or methods guidance around how to measure and value children's HRQoL

b) There was often a lack of data on children's HRQoL to inform HTA evaluations of paediatric technologies

c) None of the HTA agencies had a clear position on key aspects of valuation methods

d) HTA bodies differ in how child and adult QALYs are interpreted and "weighed up" in decision making

Devlin N, Lovett R and Rowen D. Challenges in Measuring and Valuing Children's Health-Related Quality of Life. Value and Outcomes Spotlight. 2021. Vol 7. No 6 (https://www.ispor.org/docs/default-source/default-document-library/ispor_vos_december-2021_online.pdf?sfvrsn=c039eba6_0)

Key summary points

- There are challenges to the valuation of health states experienced by children and adolescents
- The best strategy to inform normative decisions is to engage with HTA organisations with data as presented today to enrich their discussions
- We have moderate level of evidence about the psychometric properties of child-related preference-based instrument (but more research welcome)
- We should at least consider adolescents in the valuation of health states that affects them
- Choice-based methods are a potential valid alternative to matching-methods but introduces more technical issues (e.g. anchoring to QALY scale)
- We do not have robust research about how all the challenges presented today would affect health gains and resulting cost-effectiveness results