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SYSTEMATIC REVIEW

How do Health State Values Differ When Respondents Consider Adults Versus Children Living in Those States? A Systematic Review

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Abstract

Objectives This systematic review examines how different perspectives influence the valuation of child health-related quality of life (HRQoL). Specifically, it explores differences in values when health states are assessed by children, adolescents, or adults (or some combination of these), from the perspective of the first person (self) or the third person (other), and whether specifying (or not) the age of the person living the described health state affects the valuations. Recent studies suggest discrepancies for descriptively similar health states potentially owing to differences in respondents' willingness to trade length-of-life for quality-of-life for children, though findings are inconsistent. This review aims to assess: (1) differences in peoples' willingness to trade, (2) differences between the relative importance of dimensions, and (3) factors influencing these differences.

Methods This systematic review follows PRISMA guidelines. A search in Ovid MEDLINE, Ovid Embase, and EconLit up to November 2024 was undertaken. We included studies where different perspectives and different valuation instruments were considered. We extracted information on study characteristics, instruments, valuation methods, perspective, study design, analytical methods, sample characteristics, differences in values by respondents, and perspective. A multi-level meta-regression assessed the impact of factors affecting the mean differences between perspectives.

Results In total, 24 studies were included, which were from 2004 to 2024. Studies used a range of preference elicitation methods and nearly half (38%) used mixed valuation methods. Most studies (71%) used the EQ- 5D-Y- 3L instrument. Overall, 54% of studies compared adults valuing health states for themselves, or other adult versus adults valuing for other children or themselves as children. The multi-level meta-regression found that the severity of the health state and the valuation method has a significant impact on the mean differences between child and adult values for child health states. In most of the studies when adults are respondents, pain or discomfort was considered as the most important dimension. When adolescent respondents value health states the results are mixed. Qualitative studies identified respondents' difficulty imagining a child in ill health and becoming emotional while thinking about child poor health and early death as potential reasons behind differences in child values versus adult values.

Conclusions The evidence suggests that differences in mean values arise when different perspectives are used in valuing severe child health states by adults. These differences are influenced by factors such as health state severity and valuation method. While the review identified the key factors influencing the differences in mean values, an uncertainty remains regarding the optimal choice of preference elicitation and anchoring methods for child health state valuations. Addressing these gaps could refine future valuation methods for child health-related quality-of-life instruments.

1 Introduction

There are a number of health-related quality of life (HRQoL) instruments accompanied by value sets that enable the calculation of quality-adjusted life years (QALYs). These represent a subset of instruments to measure HRQoL in children and adolescents [1]. Generic multi-attribute utility instruments (MAUIs) are used to generate HRQoL values to calculate QALYs and are designed to be applicable across conditions and the general population. The measures include a descriptive system to measure health and a scoring algorithm to value the health states described. Reviews by Kwon [1] and Chen and Ratcliffe [2] identified generic MAUIs that have been developed for children and adolescent

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Key Points for Decision Makers

Differences in mean values are observed when valuing severe child health states from different perspectives.

The influence of preference elicitation methods and anchoring approaches on these differences in mean values remains underexplored.

These findings highlight the potential to refine future valuation methods for child health-related quality-of-life instruments.

populations (Table 1). Since these reviews, further research has been undertaken on developing a version of the HUI3 for preschool children [3] and to generate value sets for the PedsQL instrument [4].

MAUIs use different preference elicitation methods to generate utilities for HRQoL. Preference elicitation techniques are used to convert health state profiles into a single value, including time trade-off (TTO), standard gamble (SG), visual analog scale (VAS), discrete choice experiments (DCEs), and best–worst scaling (BWS). These methods typically involve trade-offs between HRQoL and an appropriate numeraire such as length of life or probability of death. For example, TTO asks respondents to value health states by quantifying their willingness to trade quality of life with duration of life. In the case of generating a child health utility value, typically an adult will be asked to make this trade-off given "your views about a 10-year-old child" [18]. They will choose between different hypothetical health states (according to the instrument) for 10 years (which would imply the 10-year-old child dying at age 20 years) or a shorter period of time in full health when valuing child health states. DCE tasks will provide different health states and ask respondents which health state they would prefer, considering their views about a 10-year-old child.

Preference elicitation studies to value child HRQoL can be implemented in very different ways. For example, states described by MAUIs may be valued: (i) by children, adolescents, or adults (or some combination of these); (ii) from the perspective of the first person (self) or the third person (other); and (iii) by specifying (or not) the age of the person living the described state. An alternative approach is direct elicitation [19] in which children or adolescents value their own health using preference elicitation methods (e.g., [20, 21]), although this is rarely undertaken owing to additional ethical considerations of direct preference elicitation with young people. The EQ- 5D-Y- 3L valuation protocol [18] asks adult respondents to value health states for a hypothetical 10-year-old child, whereas several Child Health Utility 9D (CHU9D) value sets are calculated by eliciting preferences from adolescents [22, 23]. When adolescents or children are asked to value hypothetical health states it could be either for themselves or another adolescent or child. Recent quantitative evidence has found differences in values for descriptively similar health states when adults value from a child's perspective compared with an adult valuing from an

Table 1 Generic MAUIs developed for children and adolescent populations

Instrument	Target age	Number of dimensions	Number of levels	Number of health states
1. Adolescent Health Utility Measure (AHUM) [5]	12–18 years	6	4–7	16,800
2. Assessment of Quality of Life- 6 Dimensions (AQoL- 6D)-adolescent [6]	15–18 years	6	4–6	7.8×10^{13}
3. Child Health- 6 Dimensions (CH- 6D) [7]	7–12 years	6	3–4	2,304
4. Child Health Utility 9D (CHU9D) [8]	7–11 years	9	5	1,953,125
5. Comprehensive Health Status Classification System-Preschool (CHSCS-PS) [9]	2–5 years	10	3–5	19,660,800
6. EQ- 5D-Y (3L, 5L) [10]	8–15 years	5	3 (Y- 3L), 5 (Y- 5L)	243 (Y- 3L), 3,125 (Y- 5L)
7. Infant health-related quality of life Instrument (IQI) [11]	0–1 years	7	4	16,384
8. Quality of Well-Being (QWB) [12]	n/a	4	2–4	945
9. The Health Utility Index Mark 2 (HUI2) [13]	5–18 years	7	3–5	24,000
10. The Health Utility Index Mark 3 (HUI3) [14]	8–18 years	8	5–6	972,000
11. Toddler and infant health related quality of life instrument (TANDI)/EQ-TIPS [15]	0–3 years	5	3	729
12. 16-dimension (16D) [16]	12–15 years	16	5	1.5×10^{11}
13. 17-dimension (17D) [17]	8–11 years	17	5	7.6×10^{11}

adult's perspective [24–26]. Several explanations have been proposed for this difference. Studies have identified a reluctance to trade off years-of -life for children when compared with adults (i.e., utility values are higher when adults complete from a child's perspective compared with an adult's perspective) [27, 28], and an additional emotional burden when undertaking valuation from a child's perspective for some respondents [29, 30]. Astrom et al. [29] reported that respondents "felt horrible" when valuing a health state for a 10-year-old child. Reckers-Droog et al. [30] found evidence that respondents sometimes feel emotionally attached to a child which makes it difficult for them to value from a child's perspective. When using a third person ("other") perspective, the valuation question usually specifies an age for the hypothetical child (e.g., in the EQ- 5D-Y- 3L, 10 years was used). However, it is unclear whether the hypothetical age could have an impact on the valuation [30].

There is a gap in the literature on our understanding of the differences in health state values for children and adolescents when using different perspectives, and what may cause these differences. It is important to understand any differences, and the factors that may contribute to them, since it would influence the estimation of QALYs within economic evaluations and ultimately impact resource allocation decisions. Furthermore, a better understanding of these differences could inform future valuation methods for child HRQoL instruments. The purpose of this review was to synthesise knowledge around the impact of adopting different perspectives when valuing child and adolescent HRQoL.

The main aims of the review were to:

1. Explore differences between individuals' willingness to trade length-of-life versus quality-of-life when valuing child HRQoL compared with adult HRQoL.
2. Explore differences between the relative importance of dimensions when valuing child HRQoL compared with adult HRQoL.
3. Explore what factors may drive the difference in individuals' willingness to trade length versus quality of life for child HRQoL compared with adult HRQoL. Specifically, does willingness to trade length versus quality of life differ by the valuation method used, geographical location, respondent characteristics, or the severity of health states being valued?

2 Methods

The systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [31]. The protocol was registered with the Prospective Register of Systematic Reviews (PROSPERO ID: CRD42023429906). Changes to the original protocol were made during the review process to ensure a more comprehensive review. The changes are mentioned in the supplementary file.

2.1 Search Sources and Search Terms

Three databases were searched from 1946 up to 11 November 2024: Ovid MEDLINE (Medline & Pubmed), Ovid EMBASE, and EconLit. A search strategy was developed, and the search was developed to cover different perspectives (e.g., adults from a child's perspective, and adults from their own perspective), valuation methods (e.g., TTO, DCE, and VAS) and instruments (e.g., EQ- 5D-Y, CHU9D, HUI2, and HUI3). Search terms are provided in Table A and B of the Electronic Supplementary Material (ESM).

2.2 Eligibility Criteria

2.2.1 Inclusion Criteria

Both quantitative and qualitative empirical studies were included if they were published in English and respondents completed valuation of health states from different perspectives. Possible combinations of respondent and perspective comparisons are listed in Table 2 along with the number of studies reported under each perspective. Studies were included if one of the comparisons below was made:

(1) Adults valuing health states for themselves (SA_A[1]) *or* for Other Adult (OA_A[2]) versus adults valuing child health states with adults imagining themselves as a child (SC_A[3]) or adult as a proxy (from a child's perspective) for children (OC_A).
(2) Children or adolescents valuing child health states from their perspective (SC_C) or another child or adolescent (OC_C[4]) versus children or adolescents imagining themselves as an adult (SA_C) or for other adults (OA_C).
(3) Children or adolescents valuing child health states for themselves (SC_C) or another child or adolescent (OC_C) versus adults as a proxy for children or adolescents (OC_A).
(4) Children or adolescents valuing child health states for themselves (SC_C) or another child or adolescent (OC_C) versus adults valuing for themselves (SA_A) or another adult (OA_A)

[1] SA refers to Self-Adult (Subscript A refers to an adult respondent).
[2] OA refers to Other-Adult.
[3] SC refers to Self-Child.
[4] OC refers to Other-Child (Subscript C refers to a child respondent).

Table 2 Possible combinations of respondents and perspectives, as they relate to study inclusion and exclusion criteria and the number of studies

	Respondent	Perspective				Number of studies
		Own/self		Other		
		Adult	Child/adolescent	Adult	Child/adolescent	
1.	Adults	SA_A	SC_A	OA_A	OC_A	13
2.	Child/adolescent	SA_C	SC_C	OA_C	OC_C	0
3.	Adults				OC_A	8
	Child/adolescent		SC_C		OC_C	
4.	Adults	SA_A		OA_A		2
	Child/adolescent		SC_C		OC_C	
5.	Adults	SA_A			OC_A	1
	Child/adolescent		SC_C		OC_C	

SA self adult, *OA* other adult, *SC* self child, *OC* other child

2.2.2 Exclusion Criteria

Studies in which only children or adolescents completed the valuation task from their own perspective, only adults completing the valuation task from their own perspective, or only adults completing the valuation task from a child's or adolescent's perspective were excluded because there was no comparison between perspectives within these studies. Studies were also excluded if they were: (1) psychometric/measurement studies; (2) studies which only produce a value set for a pediatric HRQoL instruments (valuation studies) and had no comparison of perspectives; (3) reviews, protocols, and abstracts; and (4) studies which did not report differences (e.g., utility scores and dimension ranking) between perspectives.

2.3 Selection Process

The execution of the search strategy in the databases was conducted by one reviewer (A.D.). Overall, 71% of titles and abstracts were screened by two reviewers (A.D. and A.H.) independently. In the 39% of cases when A.D. was not sure whether to include or not, this was raised with the other senior authors (T.P.A. and T.P.E.). Full-text screening was conducted as follows: the lead reviewer (A.D.) screened 100% of the papers, and they were doubled screened (91%) by either A.H. or Z.L. Disagreements were discussed and agreed upon among all three reviewers.

2.4 Data Extraction

Each study had data extracted by one of the three reviewers (A.D., A.H., and Z.L.). Two studies were independently extracted by all three reviewers to ensure comparability and to test the data extraction template. The following data were extracted: study characteristics, sample population (sample, sample size), study design (data collection method, perspective), valuation methods (instrument, preference elicitation method, number of health states, hypothetical age considered for the perspective), statistical methods, study results (summary of findings), and study limitations.

2.5 Quality Assessment

To assess the quality of the included studies, we developed a checklist based on the RETRIEVE checklist [32] and Mixed Methods Appraisal Tool (MMAT) [33]. The RETRIEVE checklist [32] assesses the quality of studies reporting values for child HRQoL. The short version of the RETRIEVE checklist includes 14 items, and the long version includes 83 items. The MMAT, developed by Hong et al. [33], is designed to assess the quality of empirical studies covering qualitative studies, quantitative randomized controlled trials, quantitative non-randomized controlled trials, and quantitative descriptive and mixed methods. This includes 25 items. The checklist developed for this review (Supplementary Table C of the ESM) includes 13 items from the RETRIEVE checklist, 7 items from the MMAT, and 5 items developed by the authorship team. The reason for developing bespoke items was to ensure the reporting quality of studies which compare values between perspectives. The checklist therefore includes 18 general items, 4 items for qualitative studies, and 3 items for quantitative studies with a simple scoring system: 1 = yes, clearly addressed; 2 = probably or cannot tell; 3 = no; and 4 = not applicable. One reviewer (A.D.) conducted the quality assessment.

2.6 Synthesis Method

We provide a descriptive summary of study characteristics, perspectives, instruments, elicitation methods, and modes

of administration. We report key results relevant for each type of study design.

For studies that reported mean values for different perspectives, we reported mean scores and standard deviations for each perspective and calculated the differences in the means, which was defined as: child perspective reported mean value minus adult perspective reported mean value. The results were illustrated using forest plots of health states and elicitation methods (TTO and VAS) for studies that reported values with uncertainties around the mean. Where VAS values were reported on 0–100 scale they were rescaled to 0–1. Forest plots were constructed using Stata.

In the context of the EQ- 5D instruments, the level sum score (LSS) treats each response level as a number. Each number is summed to produce a score with a minimum value of 5 (for health state 11111) and a maximum score of 15 (for health state 33333) for both the EQ- 5D- 3L and EQ- 5D-Y- 3L. The LSS is a simple, non-preference-based indication of the severity of the health state, with a higher number representing a poorer quality of life. The forest plots illustrate the mean difference and standard error of the difference. Where the included studies involved several countries, results will be presented by country (if country specific data is available) if not, data will be presented as a combination of countries.

To combine the findings from studies using different valuation methods, perspectives, and health states, we conducted a meta-regression. Given that the review data consists of different levels of data with multiple health states valued within each study, we conducted a multi-level meta-regression [34] using the restricted maximum likelihood method [35]. This approach gives additional weight to estimates with a lower sampling error and enables exploration of the overall effects of different factors on the differences in the means between child and adult perspectives. The dependent variable was the differences in the means between the perspectives and the independent variables, including the LSS of the health state being valued, the preference elicitation method, and the perspective adopted. The coefficients, 95% confidence intervals, *p*-values, and heterogeneity were reported. Multilevel heterogeneity was reported using the multi-level Higgins–Thompson I^2 statistic. This statistic describes the heterogeneity existing in different levels of the data [36].

For studies that reported the relative importance of dimensions, we summarized the rank order of dimensions. For studies examining the factors contributing to the differences, we provided a narrative summary.

3 Results

3.1 Study Selection

Figure 1 presents a PRISMA flow diagram of the literature search and screening. The literature search identified 509 papers, of which 168 papers were excluded owing to being duplicates. A total of 308 papers were then excluded by title and abstract screening. Hence 33 papers were reviewed for full-text screening and 8 were excluded. The final 25 papers include the study by Kreimeier et al. [24], which was a sister paper of Lipman and Reckers-Droog [37], which included the same dataset, but the analysis process and findings were different. Here, these papers are considered as one study. Papers involving different countries were counted as one study. Therefore, this review consists of 24 studies (25 papers). Of these, 20 studies were predominantly quantitative, 3 qualitative, and 1 mixed method. A list of the eight studies excluded at full-text screening, and the reason for their exclusion, can be found in Supplementary Table D of the ESM and in Fig. 1. All studies identified were in English.

3.2 Study Characteristics

Table 3 summarizes the characteristics of each study. Further details of the individual studies are included in ESM Supplementary Table E. All studies were published between 2004 and 2024. Of the 24 studies, 12 used a single valuation method, among which 5 were DCE, 3 were BWS, 2 were TTO, 1 was SG, and 1 was VAS. In total, nine used mixed valuation methods and three used a self-reporting scoring system (PedsQL studies). The majority of studies were European (15, 63%). In terms of instruments, most of the studies used the EQ- 5D-Y- 3L (17, 71%). Sample sizes ranged from less than 20 to more than 6,133, with 33% having more than 1000 respondents. In terms of perspectives, 54% compared adults valuing for themselves (SA_A) or other adults (OA_A) versus adults valuing for children (SC_A or OC_A); 33% compared children or adolescents valuing from their own perspective (SC_C) or another child (OC_C) versus adults valuing for children (OC_A); 8% compared adults valuing for themselves (SA_A) or another adult (OA_A) versus children or adolescents valuing from their own perspective (SC_C) or another child (OC_C); and the remainder compared adults valuing for themselves (SA_A) and for other children (OC_A) versus children or adolescents valuing from another child's perspective (OC_C) (Table 2).

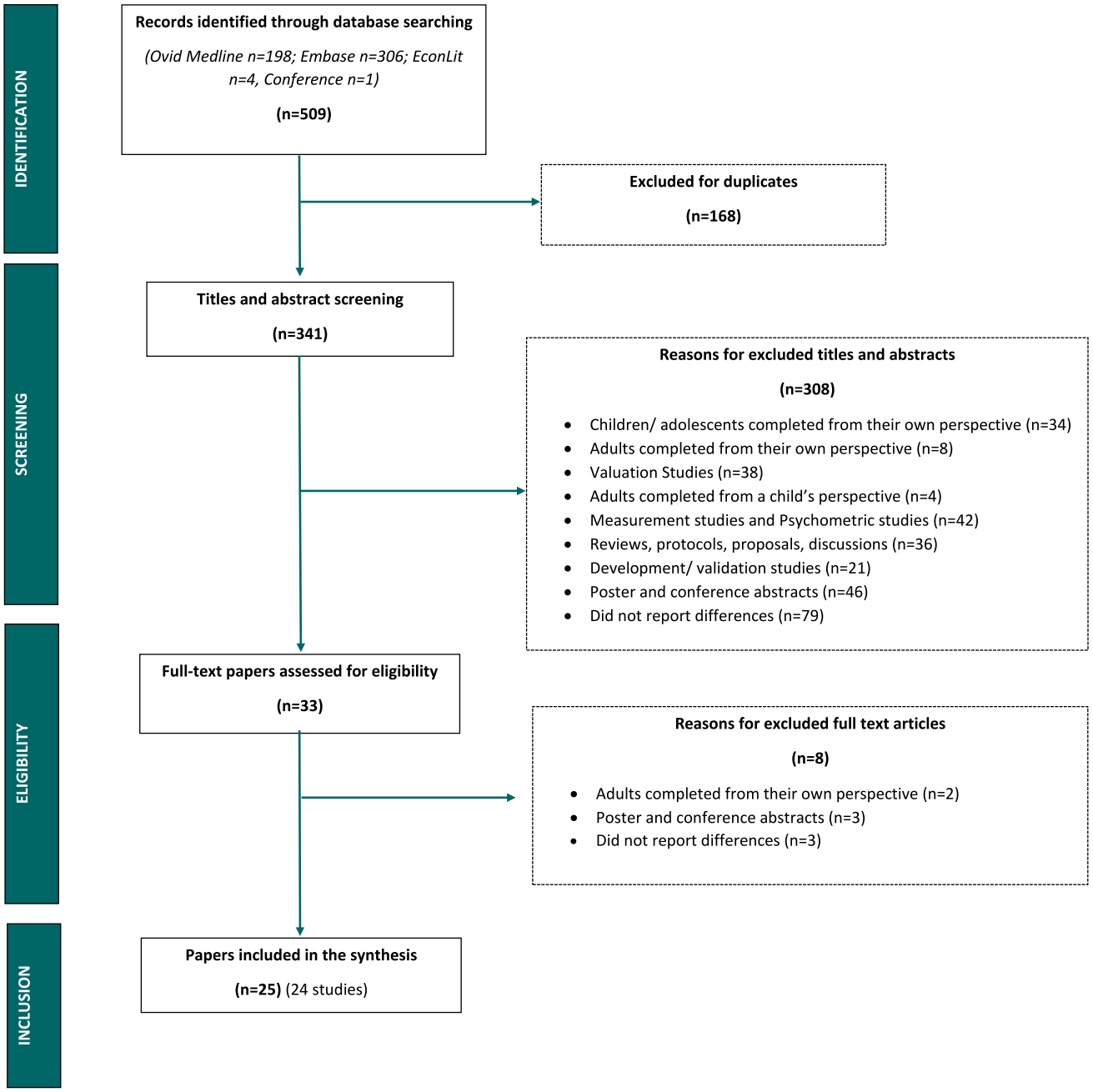

Fig. 1 PRISMA flow chart

3.3 Reporting Quality

The reporting quality assessment scores and details of assessments across each criterion and an overview for each criterion across the studies are summarized in Supplementary Figs. A and B; and Supplementary Tables C and F of the ESM.

Of the 25 quality assessment criteria, the four included qualitative studies were judged to have high quality in 16–20 of the criteria. For the 21 included quantitative studies this ranged from 13 to 19 criteria. The only area with concern for both qualitative and quantitative studies was regarding studies not reporting or justifying the target sample size (Q6, Q7, Q8). Most of the qualitative studies did not report whether the mode of administration (Q16) affected the data quality.

Table 3 Summary of characteristics of included studies: location, sample size, data collection method, perspective, instrument, valuation method, and study design

Author/year	Location	Sample size	Sample	Data collection method	Perspective		Hypothetical age of the child	Instrument	Valuation method	Study design
					Adults	Adolescents				
Astrom [29] (2022)	Sweden	20	General (adults and adolescents)	Online via an interviewer	OC_A	OC_C	10 years	EQ- 5D-Y- 3L	Mixed: TTO and DCE	10 TTO health states 15 DCE pairs
Attema [38] (2023)	The Netherlands	150	General (adults)	Online via an interviewer	OA_A, OC_A		10 years	EQ- 5D-Y- 3L	Mixed: TTO, VAS, and PTO	4+ coma and death
Brunner [39] (2004)	USA	238	General and disease group (adults and adolescents)	Face to face via an interviewer	OC_A	SC_C	Their own child	PedsQL	Self-reporting scoring system	1 health state
Dalziel [10] (2020)	Australia and Spain	6133	General (adults and adolescents)	Online—self-complete	SA_A, OC_A	SC_C	10 years	EQ- 5D-Y- 3L	BWS	13 health states
Dewilde [40] (2022)	England, Belgium, The Netherlands	78	General (adults)	Face to face via an interviewer	OA_A, OC_A		8 years	EQ- 5D-Y- 3L & EQ- 5D- 3L	Mixed: cTTO and VAS	4 health states
Essers [41] (2023)	The Netherlands and China	3052	General (adults)	Online—self-complete	OA_A, OC_A		10 years and 15 years	EQ- 5D-Y- 3L	DCE (not anchored)	24 DCE pairs
Kind [26] (2015)	Germany, Spain, England	1085	General (adults)	Online—self-complete	SA_A, OA_A, OC_A		10 years	EQ- 5D-Y- 3L	VAS	8/9 health states
Klaassen [42] (2010)	Canada	124	General and disease group (adults and adolescents)	Face to face without an interviewer	OC_A	SC_C	Their own child	PedsQL, HUI2, HUI3	Self-reporting scoring system	1 health state
Kreimeier [24] (2018) Lipman [37] (2024)	Germany, The Netherlands, Spain, England	805	General (adults)	Face to face via an interviewer	SA_A, OC_A		10 years	EQ- 5D-Y- 3L EQ- 5D- 3L	Mixed: TTO and DCE (not anchored)	17 TTO health states 19 DCE health states
Lang [27] (2023)	England	151	General (adults)	Online via an interviewer	SA_A, OC_A		10 years	EQ- 5D-Y- 3L	TTO	4 health states
Lipman [28] (2021)	The Netherlands	205	General (adults)	Online—self-complete	SA_A, OA_A, SC_A, OC_A		10 years	EQ- 5D-Y- 3L	Mixed: TTO and VAS	8 health states
Lipman [43] (2023)	The Netherlands	219	General (adults)	Online—self-complete	SA_A, OC_A		10 years	EQ- 5D-Y- 3L	TTO	8 health states
Lloyd [44] (2010)	England and Scotland	195	General and disease group (adults and adolescents)	Face to face via an interviewer	SA_A, OC_A		Their own child	Vignette	SG	7 health states
Mott [45] (2021)	England	2005	General (adults and adolescents)	Online—self-complete	OC_A	SC_C	10 years	EQ- 5D-Y- 3L	DCE (not anchored)	15 DCE pairs

Table 3 (continued)

Author/year	Location	Sample size	Sample	Data collection method	Perspective		Hypothetical age of the child	Instrument	Valuation method	Study design
					Adults	Adolescents				
Powell [46] (2021)	England	30	General (adults)	Face to face via an interviewer	SA_A, OA_A, OC_A		10 years	EQ- 5D-Y- 3L	Mixed: TTO and DCE	2 health states
Prevolnik Rupel [47] (2021)	Germany, Spain, and Slovenia	5238	General (adults and adolescents)	Online—self-complete	OC_A	SC_C	10 years	EQ- 5D-Y- 3L	DCE (not anchored)	18 DCE pairs
Ramos-Goni [48] (2022)	UK and USA	2603	General (adults)	Online—self-complete	SA_A, OC_A		5–7 years, 11–13 years, 14–15 years	EQ- 5D-Y- 3L	DCE (not anchored)	28 DCE pairs
Ratcliffe [49] (2016)	Australia	1190	General (adults and adolescents)	Online—self-complete	SA_A	SC_C	Their own self	CHU9D	BWS	10 health states
Reckers-Droog [30] (2022)	The Netherlands	25	General (adults)	Face to face via an interviewer	SA_A, OC_A		10 years and 15 years	EQ- 5D-Y- 3L	Mixed: TTO and DCE	3 TTO tasks 10 DCE health states
Sawyer [50] (2004)	Australia	59	General and disease group (adults and adolescents)	Face to face via an interviewer	OC_A	SC_C	Their own child	PedsQL	Self-reporting scoring system	1 health state
Shah [25] (2020)	England	349	General (adults)	Face to face via an interviewer	SA_A, OC_A		10 years	EQ- 5D-Y- 3L EQ- 5D- 3L	Mixed: TTO, DCE (anchored using VAS, LT TTO, DCEd, and LOD)	2 TTO health states 1 VAS 7 DCE pairs
Sung [51] (2004)	Canada	44	Disease group (adults and adolescents)	Face to face via an interviewer	OC_A	OC_C	Their own child	HUI2, HUI3, Vignette	Mixed: TTO, DCE, and SG	3 health states
Xiong [52] (2023)	Spain	2006	General (adults and adolescents)	Online—self-complete	SA_A	SC_C	Their own self	EQ- 5D-Y- 3L	BWS	13 health states
Yu [53] (2024) (unpublished)	Australia	955	General (adults)	Online via an interviewer	SA_A, OC_A		10 years	EQ- 5D-Y- 5L	DCE (anchored)	15 DCE choice tasks (3 health states)

Adults valuing for themselves: SA_A; adults valuing for other adult: OA_A; adults valuing themselves as a child/adolescent; SC_A; adults valuing for other child/adolescent: OC_A. Child valuing for themselves: SC_C; child valuing for other child/adolescent: OC_C; child valuing themselves as an adult: SA_C; child valuing for other adult: OA_C

SA self-adult, *OA* other adult, *SC* self-child, *OC* other child, *TTO* time trade-off, *DCE* discrete choice experiment, *BWS* best–worst scaling, *SG* standard gamble, *VAS* visual analog scale, *cTTO* composite time trade-off, *LT-TTO* lag time TTO, *DCEd* discrete choice experiment with duration, *LOD* location of dead

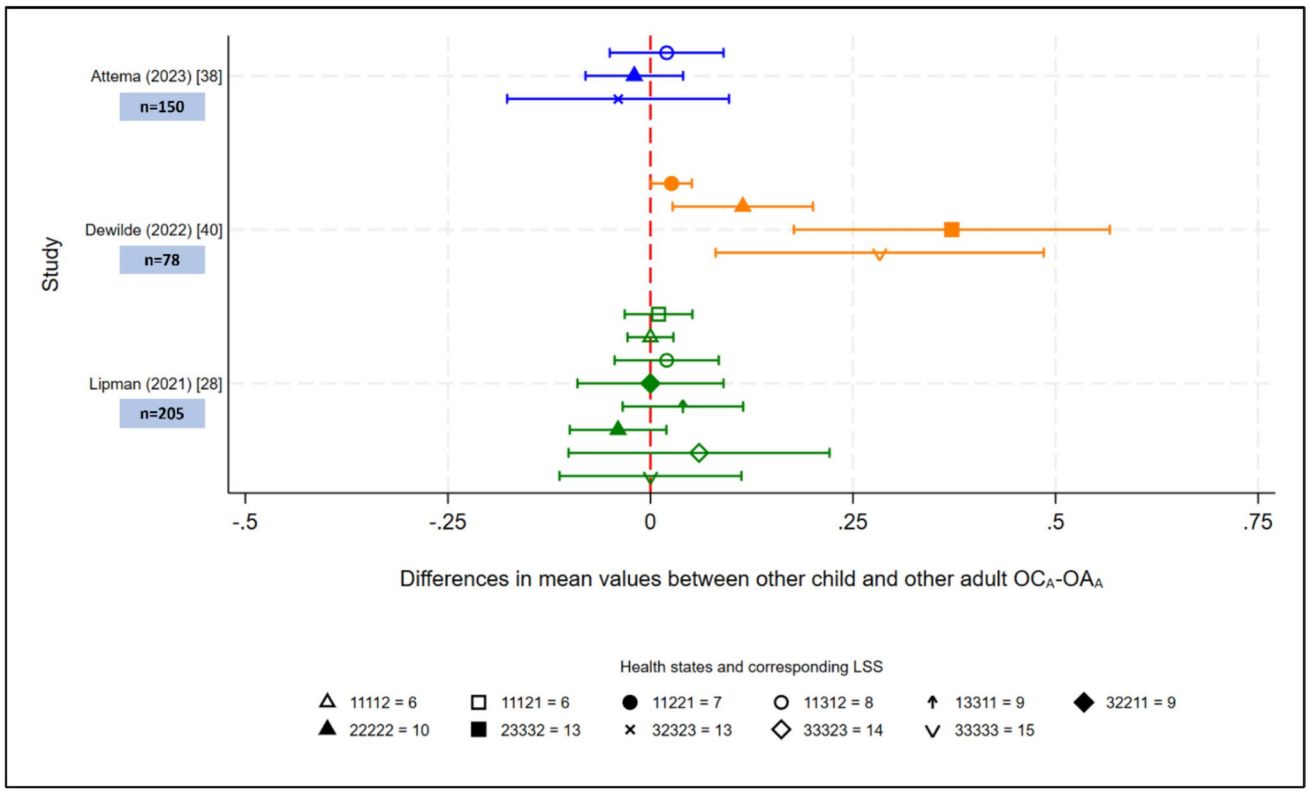

Fig. 2 Differences in TTO mean values between other child and other adult perspectives [OC_A–OA_A] Adults valuing for another adult: OA_A; adults valuing for other child/adolescent: OC_A

3.4 Overall Synthesis

3.4.1 Differences Reported

Eight studies reported differences in mean values between perspectives. Out of which, four reported TTO values, three reported both TTO and VAS values, and one reported only VAS values. All eight studies used EuroQol instruments. More detailed information on the quantitative results is provided in Supplementary Table G of the ESM.

Three of the studies reported the differences in mean TTO values between "other child" (OC_A) and "other adult" (OA_A) perspectives (Fig. 2). Health states are ranked from lower LSS to higher LSS (poorer HRQoL).

Two studies reported mean values using the EQ- 5D-Y-3L instrument for both perspectives [28, 38] and one study used the EQ- 5D-Y- 3L for the child's perspective and EQ-5D- 3L for the adults' perspective [40]. Of the three studies, for only one study [40] the population mean difference did not cross the line of no effect for all the health states (red line = 0), which implies the population mean-difference was higher in the OC_A perspective (i.e., health states valued by adults taking a child's perspective). The confidence interval in two of the studies [28, 38] indicates the population mean-difference could be positive, negative, or zero between the OC_A and OA_A perspectives.

Five studies reported the differences in mean TTO values between "other child" (OC_A) and "self-adult" (SA_A) perspectives (Fig. 3).

It is evident that for most of the health states, when valued by adults as a proxy for children (OC_A) versus adults for themselves (SA_A), the TTO values for children are higher than for adults for child HRQoL [24, 27, 43]. This implies adults are reluctant to trade life years for an improvement in HRQoL in children and/or when valuing for another person. For most of the health states the population mean-differences crossed the line of no effect. Shah et al. [25] did report cTTO values; however, they did not report the uncertainties.

The studies in Figs. 2 and 3 showed that when the health state values concern severe states (e.g. 33333, 33323, and 32223) there is a larger standard deviation around the mean differences.

Three studies reported the differences in mean VAS values between other child (OC_A) and other adult (OA_A) perspectives (Fig. 4).

Three studies reported the differences in mean VAS values between other child (OC_A) and self-adult (SA_A) perspectives (Fig. 5).

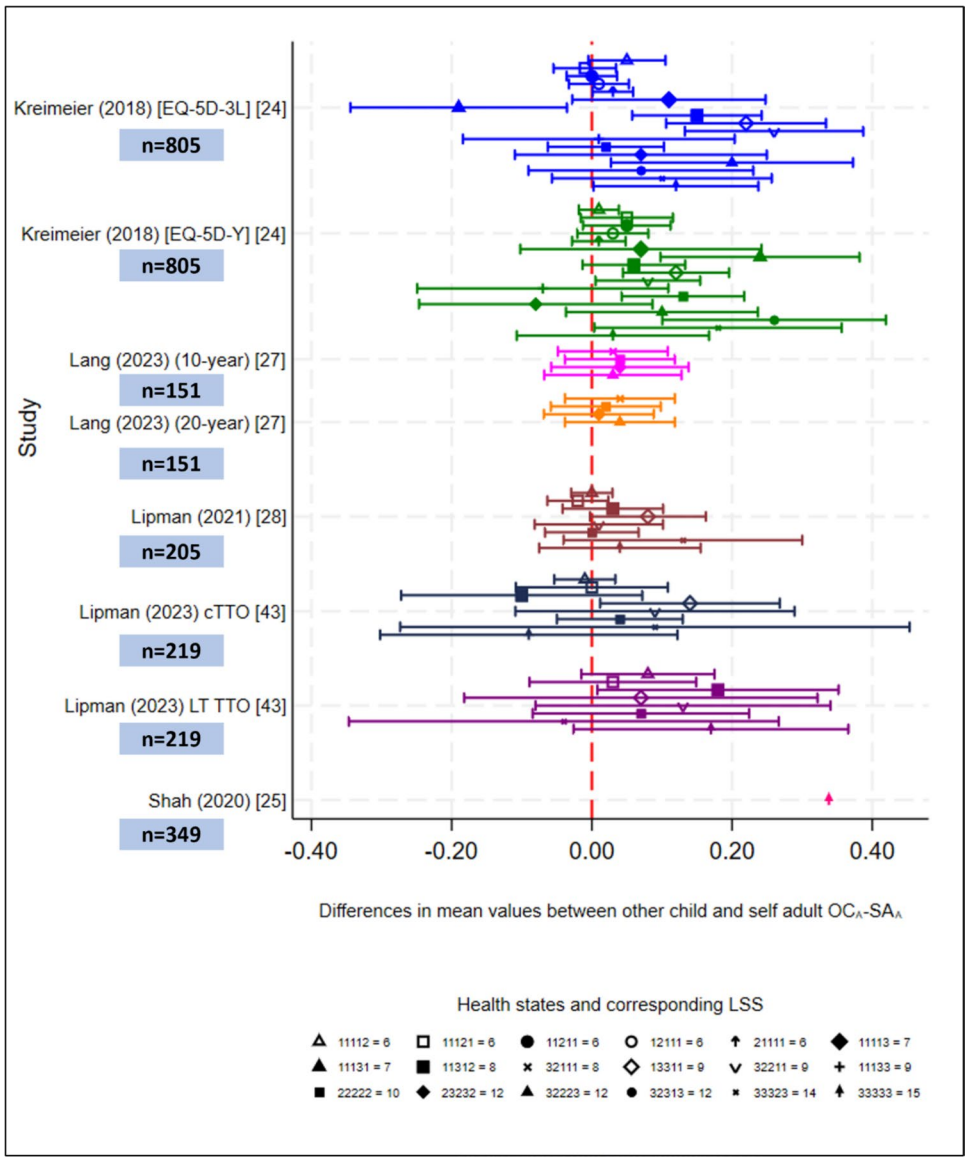

Fig. 3 Differences in TTO mean values between other child and self-adult perspectives [OC_A–SA_A] Adults valuing for themselves: SA_A; adults valuing for other child/adolescent: OC_A

Figures 4 and 5 show mixed evidence on the VAS values when using OC_A, SA_A, or OA_A. Dewilde et al. [40] reported higher values for children than for adults for all child health states; Lipman et al. [28] found "the differences between perspectives are generally small to non-existent between health states"; Kind et al. [26] found mean values were higher in both adult's perspective (self and other) than for the "other child" perspective. Differences in mean values were statistically significant for all the health states reported by the German population for both OC_A–OA_A and OC_A–SA_A perspectives.

Lipman et al. [28] reported comparisons between SC_A–OA_A and SC_A–SA_A which was included in the meta-regression. They reported mixed evidence of the differences in mean values.

Two studies used DCE and included comparisons with death to explore values for health states. Only one study used the worst health state and was anchored. Kreimeier et al. [24] included forced-choice paired comparisons of the EQ- 5D-Y- 3L and EQ- 5D- 3L health states with immediate death and reported that the probability of an adult choosing immediate death from a child's perspective (using Y- 3L) is lower compared with an adult perspective (using EQ- 5D- 3L). Shah et al. [25] tested four different methods to obtain anchors for latent scale EQ- 5D-Y values but they only reported anchored values for the worst health state. Both these studies found values for 33333 were higher in the child perspective in EQ- 5D-Y- 3L compared with the "adult own" perspective in the EQ- 5D- 3L. Yu et al. [53] used a nonlinear DCE approach to value the EQ- 5D-Y- 5L and compared adults valuing for themselves (SA_A) versus adults valuing

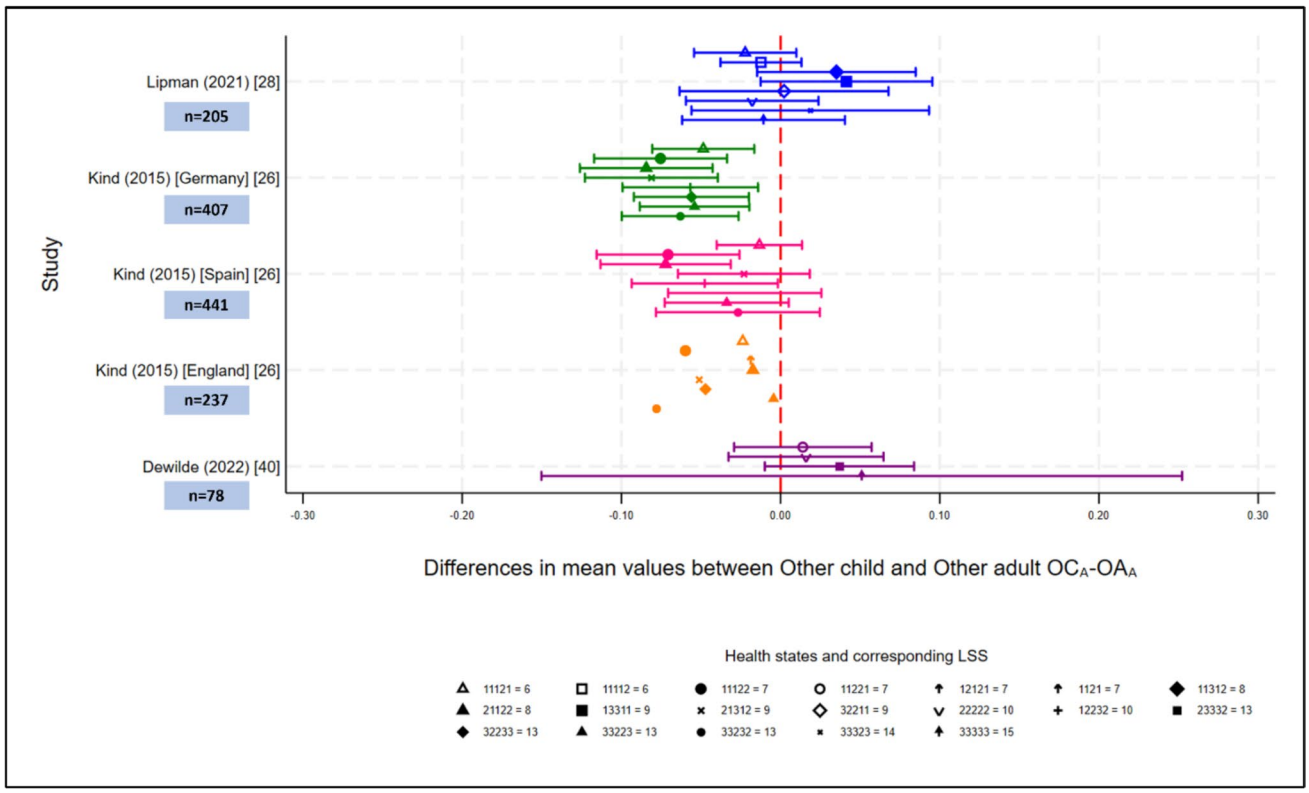

Fig. 4 Differences in VAS mean values between other child (OC_A) and other adult (OA_A) perspectives Adults valuing for another adult: OA_A; adults valuing for other child/adolescent: OC_A. Data for the German and Spanish populations from the study by Kind [26] were retrieved from the author. However, data for the UK sample could not be retrieved

for a 10-year old child (OC_A). They reported more health states were valued worse than dead when the respondents were asked to imagine a 10-year-old child. A summary of empirical evidence on the impact of different perspectives on EQ- 5D-Y- 3L health state valuations is provided in ESM Supplementary Table H.

The results of the multi-level meta-regression are shown in Table 4, and additional information in relation to the multi-level meta-regression is shown in ESM Supplementary Table I. For the other child (OC_A) and other adult (OA_A) perspectives, a TTO valuation method and a LSS of 6 were set as the reference. The constant indicates that the differences in mean values were lower in the other child (OC_A) and other adult (OA_A) perspectives ($\beta = -0.009$; 95% CI −0.04, 0.02) using TTO to elicit preferences, and the LSS of the health states valued were 6. There is an association between the differences in mean values and the LSS. The difference in mean values (child perspective–adult perspective) is significantly greater for LSS values of 8, 9, 12, 13, 14, and 15 relative to LSS 6. Since the higher LSS indicates more severe health states, the regression results indicate that for severe health states the differences in mean values do increase; however, there is no clear pattern. We do see evidence for an association between differences in mean values and valuation methods at a significance level of 10% ($p = 0.074$). If VAS was used as a valuation method the difference in mean values (child perspective–adult perspective) decreases compared with using TTO. We do not see any evidence for an association between the differences in mean values and perspectives.

Six studies reported the relative importance of dimensions, all of which used the EQ- 5D-Y.

As shown in Table 5, in most of the studies when adults are respondents, no matter which health states they value or from which perspective (self-adult, other adult, or other child), pain or discomfort was considered as the most important dimension. However, this was not the same for the German population results reported by Prevolnik Rupel et al. [47]. When adolescent respondents value health states the results are mixed. Mott et al. [45] and Xiong et al. [52] reported pain or discomfort as the most important dimension. Dalziel et al. [10], Prevolnik Rupel et al. [47], and Ramos-Goni et al. [48] reported anxiety and depression as the most important dimension for adolescents for the Australian, German and US populations, respectively. Children and adolescents considered mobility more important for themselves compared with adults valuing for children (OC_A) in three of the studies [45, 47,

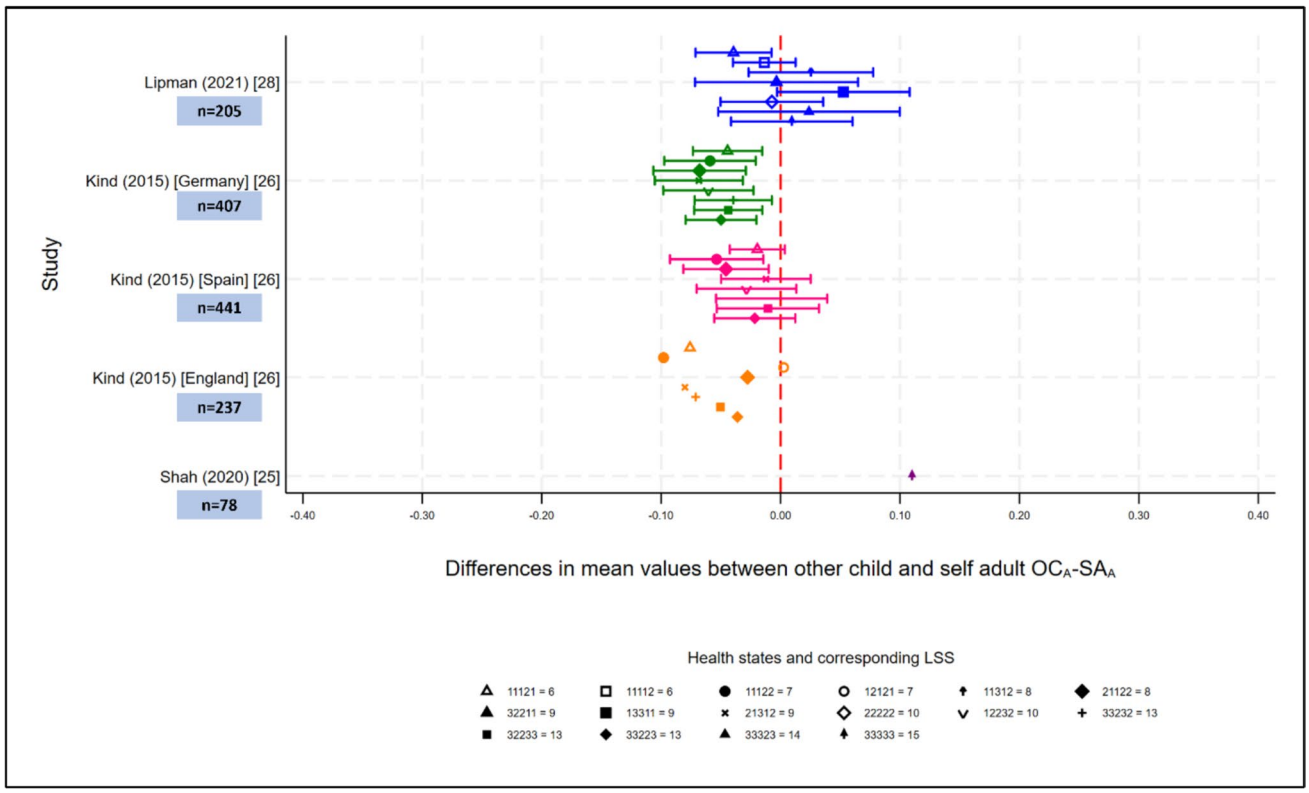

Fig. 5 Differences in VAS mean values between other child (OC_A) and self-adult (SA_A) perspectives Adults valuing for themselves: SA_A; adults valuing for other child/adolescent: OC_A. Data for the German and Spanish populations from the study by Kind [26] were retrieved from the author. However, data for the UK sample could not be retrieved

Table 4 Multi-level meta-regression of differences in mean values between perspectives

	β	*p*-value
Constant	− 0.009	0.566
Perspectives		
OC_A–OA_A	Reference	
OC_A–SA_A	0.007	0.189
SC_A–OA_A	− 0.003	0.696
SC_A–SA_A	− 0.001	0.895
Valuation method		
TTO	Reference	
VAS	− 0.011	0.074*
Level sum score (LSS)		
6	Reference	
7	0.016	0.377
8	0.029	0.034**
9	0.050	0.000***
10	0.022	0.104
12	0.044	0.072*
13	0.032	0.036**
14	0.057	0.016**
15	0.044	0.025**

***Significant at 1%, **significant at 5%, *significant at 10%

52]. In all perspectives self-care was ranked as the least important dimension.

In the included qualitative studies respondents discussed what health states could be more important to a child or adolescent than to an adult. Some adults believed that having problems associated with mental health (defined in the EQ- 5D-Y as being worried, sad, or unhappy), or being in pain or discomfort could be more challenging to a 10-year-old [46] compared with adults. This was also seen in one of the quantitative studies which reported that anxiety and depression are more important for a child compared with an adult (where usual activity is more important [25]). In addition, there were adult respondents who felt that problems with walking, looking after themselves, and doing usual activities would be easier for themselves and a 10-year-old than to a 15-year-old because the 15-year-old needs to be independent [30].

3.4.2 Potential Reasons for Differences in Valuation of Health States

Our review summarizes potential reasons explaining the differences between perspectives.

Table 5 Relative importance of dimensions

Dimension	Dalziel et al. [10]						Shah et al. [25]		Mott et al. [45]		Prevolnik Rupel et al. [47]						Ramos-Goni et al. [48]				Xiong et al. [52]	
	Australia			Spain			UK		UK		Germany		Slovenia		Spain		UK		USA		Spain	
	SC_C	SA_A	OC_A	SC_C	SA_A	OC_A	SA_A	OC_A	SC_C	OC_A	SC_C	OC_A	SC_C	OC_A	SC_C	OC_A	SA_A	OC_C	SA_A	OC_C	SC_C	SA_A
Mobility	4	4	4	3	4	3	*5*	*5*	3	4	4	4	3	4	2	3	4	4	4	4	2	3
Usual activities	3	3	3	2	2	2	**1**	3	4	3	3	3	4	3	4	4	3	3	3	3	3	2
Self-care	*5*	*5*	*5*	*5*	*5*	*5*	–	–	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	4	4
Pain or discomfort	2	**1**	**1**	**1**	**1**	**1**	–	–	**1**	**1**	2	2	**1**	**1**	**1**	**1**	**1**	**1**	**1**	2	**1**	**1**
Anxiety or depression	**1**	2	2	4	3	4	3	**1**	2	2	**1**	**1**	2	2	3	2	2	2	2	**1**	*5*	*5*

Rank 1: bold. Rank 5: italic. Adults valuing for themselves: SA_A; adults valuing for other child/adolescent: OC_A. Child valuing for themselves: SC_C; child valuing for another child/adolescent: OC_C; Missing values indicate that they have only discussed about the best, middle, and worst dimension ranking

SA self-adult, *OA* other adult, *SC* self-child, *OC* other child

(1) Respondent Characteristics

Seven studies examined the statistical differences in values by parental status. Sung et al. [51] compared parents valuing for a child (OC_A) and adolescents valuing for another child (OC_C), and reported that parents and adolescents rate HRQoL similarly using SG. Dewilde et al. [40] found that VAS values reported by parents for child health states are significantly higher than respondents without children, but the results from the TTO analysis indicated that there was no effect of parenting status on the utilities. However, Kind et al. [26] reported that in the Spanish population, child health states are valued higher by non-parents for all the health states and this was similar to some of the health states reported by the German and English populations. Yu et al. [53] reported results were similar between parents and non-parents in the child's perspective. However, there was a greater contrast between parents versus non-parents when valuing health states for themselves. Brunner et al. [39], Klaassen et al. [42], and Sawyer et al. [50] compared values for disease populations between parent-proxy versus child reports. They valued the PedsQL using a self-reporting scoring system. Brunner et al. [39] and Klaassen et al. [42] reported that there was a good agreement between parent-proxy and child self-reports. Sawyer et al. [50] reported that parents reported higher levels of problems in the area of physical and emotional functioning, and children reported higher problems in physical functioning. Two qualitative studies reported that being a parent may affect how they respond to the question if the health state described their own child [30, 46].

Attema et al. [38] ran regression models to identify differences between perspectives and dimensions, analyzing whether any other factors contributed towards these differences. They found that older and more-educated people give more weight to treating children than younger and less-educated people using equity weights measured in PTO tasks.

Essers et al. [41] ran a logistic regression to analyze the DCE choices and reported that the age used in the DCE questions affect the respondents' choices. But these choices are different for each country. The DCE choices were similar across all ages in the Netherlands. Strong differences in age were reported in the Chinese population, where the lowest values were reported for a 70-year-old.

(2) Method of Anchoring

VAS was used as the preference elicitation method by several studies [25, 26, 28]. However, the differences in values between perspectives were contrasting. Kind et al. [26] reported lower VAS value for a child's perspective (OA_A > SA_A > OC_A), which was also similar for some of the health

states reported by Lipman et al. [28]. These studies did not anchor the VAS values on a scale from 0–1, in which 0 is equivalent to dead. However, Shah et al. [25] reported higher VAS values for the child's perspective for the 33333 health state, and this value was anchored. Therefore, the choice of anchoring method may impact the differences observed across perspectives.

(3) Difficulties in Completing Valuation Tasks

Few studies explained that respondents faced several difficulties in completing valuation tasks. Heuristic valuation strategies are simple strategies that are taken by respondents to make the valuation task easier [37]. Examples of these include tallying (likely picking the health state with the lowest LSS) and dominant decision making (picking the health state with the lowest problems for a dimension the respondent feels is most dominant). Lipman and Reckers-Droog [37] analyzed the data from Kreimeier et al. [24] to find if the differences between perspectives are affected by heuristic valuation strategies. They found evidence that the time to complete composite time trade off (cTTO) tasks and DCE tasks did not differ between perspectives; however, all-in trading response patterns (− 1 utilities; worse than dead) could be identified in the adult's perspective. This was identified as a potential reason for differences in values between child and adult perspectives.

Many respondents found it difficult to imagine a child or adolescent with ill health and they were uncertain around who to imagine [30], and expressed difficulty in making trade-offs for children [46]. Respondents get emotional while answering from a child's perspective, which may result in a reduced willingness to trade a child's length of life. Astrom et al. [29] and Reckers-Droog et al. [30] reported that respondents are affected by emotional ties, for example thinking that the 10-year-old is their own child or someone they are attached to, when valuing for children. Dewilde et al. [40] and Powell et al. [46] found evidence that parents of children feel emotional when valuing child health states.

(4) Hypothetical Age Considered

As shown in Table 3, 15 out of the 24 studies used the age 10 years for the hypothetical child. However, Ramos-Goni et al. [48], Reckers-Droog et al. [30], and Essers et al. [41] used different age groups for the hypothetical child to analyze the domain importance. Essers et al. [41] reported there were only a few differences in dimensions related to age for 10 and 15-year-olds. Few differences were reported in dimension ordering in 5–7 years and 8–10 year perspectives compared with adult perspectives by Ramos-Goni et al. [48]. Conversely, in a qualitative study, Reckers-Droog et al. [30] reported that mobility, usual activities, and self-care were more important to a 15-year-old adolescent than to a 10-year-old.

(5) Participant's thought process on children being in a health condition

Respondents made choices on the basis of their belief system. There were respondents who felt children could easily adapt to a difficult situation (ill-health) because they were more flexible and resilient to poor health [40], whereas some respondents believed that a younger population could find it very difficult and stressful to cope with mental health issues [46].

4 Discussion

Our review summarizes evidence on the impact of different approaches to valuing child health states on the comparability of child and adult values. To our knowledge, this is the first comprehensive review that synthesises comparative evidence from different respondents, perspectives, and valuation methods to understand their effect on values for pediatric HRQoL. This review helps us better understand why health states are valued differently when based on different perspectives.

We found differences in values between different perspectives, but they were not consistent between perspectives. Larger variations were found in the differences between child and adult values elicited from adults in more severe health states (higher LSS), and for these severe health states the adults valued children's health states (OC_A) higher than those same health states when considered for themselves (SA_A) or other adults (OA_A). This may suggest that when adults value severe health states compared with mild health states for a child, they are less willing to trade-off life years and may indicate an unwillingness to assign values that are worse than dead. The review also found that the preference elicitation method may impact the differences in mean values.

The review found that whether health is valued by adults for themselves, adults for children, or valued by children for themselves, the most important dimension (pain or discomfort) and the least important dimension (self-care) remain consistent. However, it might impact the ranking of the other dimensions. For example, adolescents ranked mobility higher for themselves compared with adults ranking for a child [47]. Most of the studies that explored the ranking of dimensions used the EQ- 5D-Y- 3L. It is unknown how generalizable the findings are to other instruments.

Quantitative studies analyzing the differences in mean values based on the age of the hypothetical respondent in

the valuation tasks did not find statistically significant differences. However, in qualitative studies respondents believed that age may affect preferences as they considered the future impact for the child living in the described health state [30]. One of the limitations of the review was that it could not identify if there was an effect of age on the differences in mean values because most of the studies included only one age group for children defined by a single age (10 years). Few studies included different age groups to distinguish between children, younger children, and adolescents [30, 48]. As these studies provided limited evidence that the age of the child might affect the differences in perspectives, this was identified as a potential limitation.

Our review also found evidence of differences between parents valuing a child's health state versus a non-parent valuing a child's health state; however, the direction was contrasting between studies. Qualitative studies suggest that parents may become emotional when asked to value their own child's health [40, 46]. The thought process behind parents versus non-parents was further illustrated by De Silva et al. [54], who conducted a person trade-off study examining the factors driving age-related preferences for health gains. They found that parents with children with health conditions often prioritize a younger age for healthcare decisions, explaining how personal experience can affect the decisions.

The question of who should be involved in valuing child health states is an ongoing debate. Powell et al. [55] found strong support for having parents and young people conduct the valuation of child health states, but little evidence for the involvement of tax paying adults. Similarly, a qualitative study involving Canadian stakeholders found that 12 out of 15 participants suggested that children and adolescents should be involved in the valuation tasks [56]. Powell et al. [55] reported that respondents felt that both adult and young people should be included in the valuation so that the children could help the adults understand their views and the adults could help children make more informed decisions. Reaching a consensus on the most appropriate approach of valuing child health states may be challenging until more is known about why parents value health states differently to non-parents and the extent to which this is driven by parents being better informed of the impact of health states and/or differences in preferences between parents and non-parents.

There is some evidence that parents of a child with disease also value health states differently than children themselves, although it is unknown how this differs from the valuation of child health states more generally. The methods for these studies [39, 42, 44, 50] also differed, which limits comparisons (greater use of PedsQL and vignettes).

Another limitation identified through the quality assessment is that most of the studies did not mention a target sample size or whether the target sample was achieved. Failure to clearly define the target sample size could undermine the statistical power of the comparisons, which might be a concern in identifying the effect sizes in the meta-analysis.

Our review has identified a few areas for future research. An evidence gap, related to limits to the generalizability of the evidence was identified as a limitation in the literature. More than half of the studies were from the European region, and only one study reported results from Asia. Since the population, cultures, and belief systems are quite different in non-European countries, more evidence is needed from Asian, African, and American regions. Second, there is limited understanding around whether the ranking of dimensions differ based on other instruments, since the review only found evidence of studies which used the EQ- 5D-Y instrument. Third, we aimed to explore the reasons why people value child health states differently than adult health states. However, the review only identified four qualitative studies, therefore there is a need to conduct more qualitative research to understand the reason behind people's choices. Most of the studies (63%) only considered the age of 10 years for a hypothetical child. Since the results are inconclusive on whether different ages considered for the hypothetical child have an impact, further analysis is needed to understand if the age of the child could be a potential factor in valuing child health states differently than for adults.

Health technology assessment (HTA) considers issues related to children and is also expected to account for parents' views in the decisions related to children [57]. However, current use of child-specific utilities in HTA decision-making is limited. Bailey et al. [58] found that in 85% of medicines evaluated by the Pharmaceutical Benefits Advisory Committee (PBAC) in Australia did not use child-specific utilities, which contributed to uncertainty in decision-making. Similarly, a review by Hill et al. [59] found limited use of child-utilities in National Institute for health and Care Excellence (NICE) technology assessments in the UK. Therefore, future research should also focus on the impact of the differences in child and adult values for children's health states on HTA decision-making, methods to incorporate child-specific utilities in HTA, and on which valuation perspectives for valuing child health states are preferred by decision-makers.

This review finds small differences in child values versus adult values, where values are higher for children for more severe child health states, and when different preference elicitation methods are being used (TTO and VAS). The difference in mean values is lower when VAS is used. There were a few studies which involved adolescents as respondents in the valuation process which looked at differences in perspectives in dimension ranking. These studies found some differences between dimension rank ordering in SC_C and OC_A perspectives [10, 45, 47]. Even if pediatric population motivated instruments (e.g. EQ- 5D-Y) are being used

in these studies the values are different based on different perspectives.

Four studies in the review used VAS to elicit preferences and these studies revealed inconsistent patterns. Among the four studies, three used a non-anchored VAS, while one used VAS anchored to the dead (0) to 1 (full health) scale. Two of the non-anchored VAS studies reported higher values from the child's perspective, either for all the health states [40] or for selected health states [28]. However, one of the VAS studies [26] showed the differences in mean values between perspectives, but for all health states they found a different direction (mean values were higher from an adult's perspective) to the other studies included in this review. Therefore, there is a need to understand whether using VAS and anchoring child and adult health states provides differences in mean values as the review identified.

5 Conclusions

This review summarizes the available evidence for a range of valuation methods (TTO, DCE, VAS, SG, and BWS), instruments (EQ- 5D-Y, EQ- 5D- 3L, CHU9D, HUI, HUI2, and vignettes), and perspectives (SA, OA, SC, and OC) of valuing child health states. Our evidence suggests that there are small differences in respondents' choices and values when different perspectives are used in valuing severe child health states. The review identified key points which might have driven these differences. First, the differences are larger when valuing severe health states (higher LSS). Second, the differences decrease if VAS is used to elicit preferences compared with TTO. Third, the ranking of dimensions may differ but does not appear to impact the most important and least important dimensions. Fourth, differences may occur owing to respondent characteristics e.g., between parents versus non-parents. Finally, the review identified that valuation tasks for child health states could be emotionally burdensome for respondents. However, there remains uncertainty regarding the preference elicitation method to use in valuing child HRQoL. It is unclear whether the differences in mean values between child and adult values occurs because of an effect from the VAS elicitation method or how these values are anchored on a scale from 0 to 1.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s40273-025-01493-0.

Declarations

Conflict of interest Ashwini De Silva reports that financial support was provided by EuroQol Research Foundation. Tessa Peasgood, Richard Norman, and Tianxin Pan report a relationship with the EuroQol Group that includes: funding grants and travel reimbursement. Nancy Devlin reports a relationship with the EuroQol Group that includes: board membership, funding grants, and travel reimbursement. All other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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