

Examining the disability paradox and health state utility valuation in achondroplasia

Morgan G¹, Back E¹, Due C², Butt T²

¹HCD Economics, Knutsford, UK; ²BioMarin Pharmaceuticals, London, United Kingdom

Background

- Achondroplasia (ACH) is a rare genetic disorder characterized by severe disproportionate stature and associated with impaired HRQoL and complications of medical complications, interventions and functional consequences.¹
- Health-state-utility-valuations (HSUV) are used in economic evaluations for quality of life (QoL) estimates to inform the cost-effectiveness of new interventions.
- HSUVs are estimated by using preference-based instruments such as the EuroQoL-five dimensions (EQ-5D-5L).²
- The EQ-5D-5L questionnaire is completed in relation to five domains: mobility, self-care, usual activities, pain/discomfort and anxiety/depression each consisting of five levels.
- However, people with genetic and long-term health conditions such as achondroplasia, may adapt to their given health state (ie., The "disability paradox").³
- To reflect the true impact of achondroplasia on health-related quality of life, accurate estimates for the value sets for instruments such as the EQ-5D-5L are required for people with achondroplasia (ACH).

Study Aim

- Our study aims to develop an achondroplasia-specific value set for the EQ-5D-5L to determine whether existing EQ-5D-5L value sets are relevant for this population.

Methods

- An online Discrete Choice Experiment (DCE) with time trade-off (DCE_{TO}) was conducted elicitation to value health states of the EQ-5D-5L for people with ACH in the US, UK and Brazil.
- A total of 90 choice sets were split into 6 blocks. Respondents were asked to choose between 17 pairs of EQ-5D-5L health states with an associated duration, which included one dominated (a check of understanding) and one repeated (a check of consistency) scenario.
- Dominated and repeated scenarios were included to test for inconsistencies in responses and respondents that failed these scenarios were removed from the analysis.
- An example DCE scenario is shown in Table 1.

Table 1. Presentation of a DCE_{TO} task

	Health description A	Health description B
Mobility	I have no problems in walking about	I have severe problems in walking about
Self-care	I have no problems washing or dressing myself	I have moderate problems washing or dressing myself
Usual activities	I have severe problems doing my usual activities	I have no problems doing my usual activities
Pain/discomfort	I have slight pain or discomfort	I have no pain or discomfort
Anxiety/depression	I am extremely anxious or depressed	I am not anxious or depressed
Duration	You live in this health state for 5 years and then you die	You live in this health state for 10 years and then you die
Which scenario do you think is better	☐	☒

Statistical Analysis

- Baseline demographic variables are described by their mean and standard deviation if a continuous variable and by the number and percentage for categorical variables.
- Multinomial (conditional) logistic regressions were then used to analyze responses and produce an adjusted value set for People with ACH.
- The utility value sets were applied to every possible EQ-5D-5L state (all 3125 combinations).
- The utility value set of People with ACH was compared to the existing US EQ-5D-5L value set⁴ in terms of the average utility difference across health states and the frequency the average utility of health states were perceived as of higher or lower utility.

Results

- A total of n=139 People with ACH respondents completed the study, n=123 were left after removal of respondents failing consistency checks
- Table 2 presents the demographics of respondents

Table 2. Demographics of People with ACH

Characteristics	People with ACH (n=123)
Country, n (%)	
US	48 (39.0)
UK	28 (22.8)
Brazil	47 (38.2)
Age (y), mean + SD	34.7 ± 9.3
Gender, n (%)	
Male	63 (51.2)
Female	60 (48.8)

- Table 3 presents the results comparing the application of the value sets of People with ACH against the existing general population (GP) US value set⁴ when applied to each possible EQ-5D-5L health state.
- The average overall EQ-5D-5L score was 0.60 (SD 0.33), with an average EQ-VAS score of 70.3 (SD 18.7).
- The average utility difference between the People with ACH and US value set⁴ when applied to all 3125 EQ5D health states totaled 0.06.
- Figure 1 provides a graphical representation of observed utility of People with ACH compared to the US value set⁴.
- Additionally, the value set of People with ACH resulted in a higher utility than the US EQ-5D-5L value set⁴ in 67% vs 33% when applied to the 3125 health states.

References

- Horton, W. A., et al. (2007). Achondroplasia. *Lancet (London, England)*, 370(9582), 162–172. [https://doi.org/10.1016/S0140-6736\(07\)61090-3](https://doi.org/10.1016/S0140-6736(07)61090-3)
- Weinstein, M. C., et al. (2009). QALYs: The Basics. *Value in Health*, 12(SUPPL. 1), S5–S9. <https://doi.org/10.1111/j.1524-4733.2009.00515.x>
- O'Hara, J., et al. (2021). Evidence of a disability paradox in patient-reported outcomes in haemophilia. *Haemophilia*, 27(2), 245–252. <https://doi.org/10.1111/HAE.14278>
- Pickard, A. S., et al. (2014). Preference-Based Assessments United States Valuation of EQ-5D-5L Health States Using an International Protocol. <https://doi.org/10.1016/j.jval.2019.02.009>
- Corelli, S., et al. (2014). The minimum clinically important difference for EQ-5D index: A critical review. In *Expert Review of Pharmacoeconomics and Outcomes Research* (Vol. 14, Issue 2, pp. 221–233). Expert Reviews Ltd. <https://doi.org/10.1586/14737167.2014.894462>

Disclosures

This research was funded by Biomarin Pharmaceutical Inc.

Table 3. EQ-5D-5L Utility Combination Comparison

People with ACH vs US Value Set General Population (GP) ⁴	
Comparison of the utility score (3125 combinations)	
ACH > GP, n(%)	2084 (67%)
GP > ACH n(%)	1040 (33%)
No difference n(%)	1 (0%)
Difference in utility score (People with ACH vs GP - Pickard)	
Average Difference	0.064
Median Difference	0.062

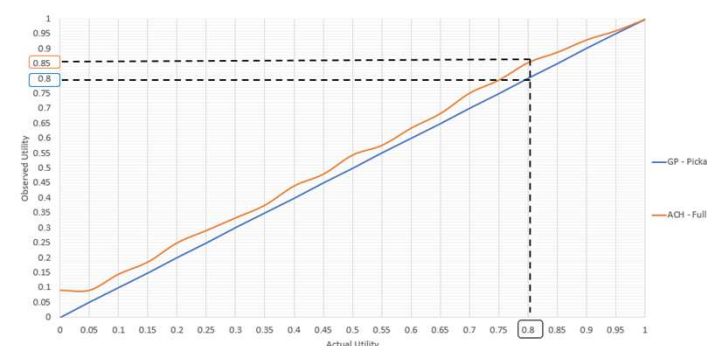


Figure 1. Graphical representation of observed utility of People with ACH compared to the US value set.

Note: GP Pickard refers to the utility that was observed by the general population. Observed utility describes the utility elicited from People with ACH.

Conclusions

- Our study identified evidence of a disability paradox with People with ACH reporting a higher health state valuation than the validated US EQ-5D-5L value set⁴ by a mean health utility difference of 0.06.
- Although these results do not meet the threshold for minimum clinically important difference for the EQ-5D of 0.07 (Coretti et al., 2014) they highlight that the impact of achondroplasia may be underestimated using the existing US EQ-5D-5L value set⁴.
- These findings highlight the importance of capturing the impact of achondroplasia on quality of life, as reported health states may be valued higher and thus the impact of achondroplasia may be underestimated.
- Further research is required to ensure equitable translation of Health Related QoL estimates derived from People with ACH are adjusted appropriately to account for differing preferences to validated country specific value sets.

