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HEALTH STATE UTILITIES FOR ACHONDROPLASIA: A TIME TRADE-OFF STUDY

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Background

- Achondroplasia is a rare genetic disorder that prevents the changing of cartilage to bone, leading to disproportionate short stature, which can have serious complications that impact quality of life (Horton et al, 2007).
- Treatment options include surgical limb lengthening, as well as nonsurgical strategies (Kim et al, 2012). Vosoritide (a modified C-type natriuretic peptide) is a therapy approved in the EU, US, Japan and other countries, shown to be an effective treatment to improve growth (Savarirayan et al, 2020).
- Given the novel therapies in the treatment landscape, utility data for relevant complication- and age-specific achondroplasia health states is necessary aimed to obtain health-state valuations (HSVs) for previously developed health states (HS) – see Figure 1.

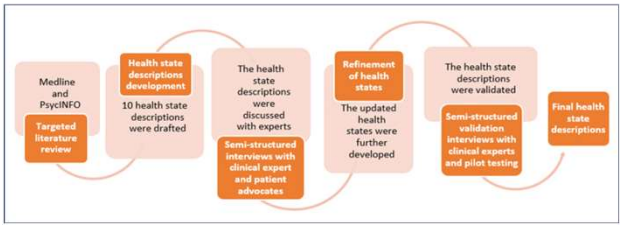

Figure 1 - Overview of health state development

Methods

- We used a composite time trade off (cTTO) study to evaluate the following health states (HS):
  - **HS1-nC and HS1-C** (**infant less than 2 years**, caregiver perspective) – with no major complications (nC) , and with complications (C), respectively
  - **HS2-nC and HS2-C** (**young child 2-4 years**, caregiver perspective) – with no major complications, and with complications, respectively
  - **HS3-nC and HS3-C** (**child 5-14 years**, patient perspective) – with no major complications, and with complications, respectively
  - **HS4-nC and HS4-C** (**teenager 15-18 years**, patient perspective) – with no major complications, and with complications, respectively
  - **HS5-nC and HS5-C** (**adult >18 years**, patient perspective) – with no major complications, and with complications, respectively
- A sample of 400 was targeted for the UK and the USA adult general population to participate (200 per country), aiming to match by age and gender.
- Participants were presented the cTTO survey face-to-face, with a moderator ensuring data quality.
- The bespoke interview tool created for this study was built in MS PowerPoint, based on EuroQol's portable valuation technology (EQ-PVT) principles (Oppe et al, 2016).
- For each HS, respondents were asked whether they prefer to live in the HS situation for 10 years, followed by death, or have a life in full health for a shorter duration (t). The value for t was iteratively varied until the point of indifference between the scenarios was found.
- Descriptive statistics were used to describe HSVs and sample characteristics. Analysis of variance (ANOVA) analyses with Bonferroni correction were conducted to compare utilities across gender and country subgroups. Quality checks were performed to identify any respondents that valued all health states as 1 or valued all HS the same (non-trading).

Results

- In the full sample (n=420), 66 respondents were non-traders. For all analyses, these non-traders were removed, the sample totaled n=354.
- Overall, 53.6% of respondents were female, with a mean age of 40.6 years (SD 14.5). The highest level of education for most of the UK sample was sixth form/college (37.8%), while in the US the highest level was high school (55.9%).

Gender, n (%)	*UK (n=177)*	*US (n=177)*	*Total (n=354)*
Male	73 (41.2%)	90 (50.8%)	163 (46.0%)
Female	104 (58.8%)	86 (48.6%)	190 (53.6%)
Other	0 (0.0%)	1 (0.6%)	1 (0.4%)
Age, mean (SD)			
	44.9 (14.5)	36.4 (13.1)	40.6 (14.5)
Highest education level, n (%)			
Primary school	2 (1.1%)	1 (0.6%)	3 (0.8%)
High school (UK) / Secondary school (US)	60 (33.9%)	4 (2.3%)	64 (18.0%)
College (UK) / High school (US)	67 (37.8%)	99 (55.9%)	166 (46.9%)
Bachelor's degree	41 (23.2%)	67 (37.8%)	108 (30.5%)
Post-graduate degree	6 (3.4%)	5 (2.8%)	11 (3.1%)

Table 1. Sample demographic characteristics

- HS2-nC (young child 2-4, no complications) had the highest mean utility (0.76; SD 0.34).
- HS5-C (adult with complications) had the lowest (0.55; SD 0.34).
- Differences between HS3-HS5 were statistically significant at p<0.05 level, across complication & no complication pairs, for each age group.

Health states	Utility values mean (SD)	T-test two-tailed p-value
1. HS1-nC (N=178)	0.73 (0.39)	0.98
2. HS1-C (N=176)	0.72 (0.29)	
3. HS2-nC (N=176)	0.76 (0.34)	0.19
4. HS2-C (N=178)	0.71 (0.37)	
5. HS3-nC (N=178)	0.70 (0.31)	0.0002**
6. HS3-C (N=176)	0.57 (0.37)	
7. HS4-nC (N=176)	0.65 (0.27)	0.007**
8. HS4-C (N=178)	0.55 (0.36)	
9. HS5-nC (N=176)	0.64 (0.35)	0.01**
10. HS5-C (N=178)	0.55 (0.34)	

***, statistical significance at p<0.01 level*

Table 2 – Mean health state valuations

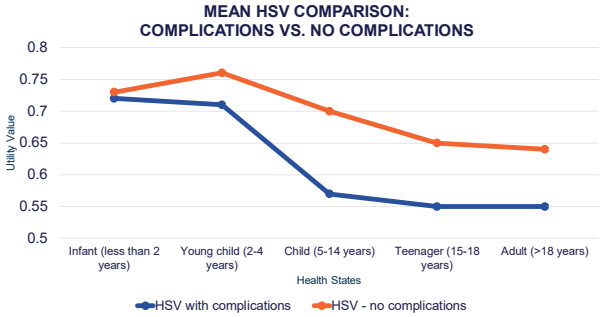

Figure 2. Comparison of mean utilities per HS

- ANOVA with Bonferroni correction was performed and no significant differences in HSV by gender were found.
- T-tests to check for differences across countries (UK vs. US) were also performed, revealing no statistically significant differences between UK and US.
- Overall, the mean HSVs followed a similar logical pattern across both countries: within each pair per age group, the HS with complications yielded the lower HSV mean.

Conclusions

- A TTO study was conducted with the general population to elicit utility data, based on achondroplasia health states. The differences within each age pair were notable, and patient health states with complications showed significantly lower utility values.
- The highest HSVs elicited were for the two youngest states, without complications, with mean values of 0.73 (SD 0.39) and 0.76 (SD 0.34). The lowest mean HSVs were noted for two patient states, with complications (HS4-C, HS5-C), with mean values of 0.55 (SD 0.36) and 0.55 (SD 0.34).
- When comparing to country-specific EQ-5D normative utility values, even the highest utility value elicited in this study (0.76) appears lower, for both UK - EQ-5D-3L norm: 0.85 (Janssen et al, 2019) and for US - EQ-5D-5L norm: 0.85 (Jiang et al, 2021).
- Overall, this study contributes to the limited literature reporting utilities for achondroplasia and may be used in models estimating the value of new treatments for achondroplasia.

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