Health Economic Evaluation of Therapies for the Treatment of Inherited Retinal Diseases

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Background

- Inherited retinal diseases (IRDs) are a clinically and genetically heterogeneous group of diseases that lead to vision loss[1]
- Vision loss in IRD occurs due to abnormal development dysfunction or degeneration of the photoreceptors or the retinal pigment epithelium[1]
- IRDs are the leading cause of blindness in working age adults. Altogether, they affect around 1 in 4000 people or over 2 million people worldwide[2]
- IRDs impose significant costs, particularly in relation to wellbeing, productivity and informal carer costs.[3]

Objective

- To examine the quality of economic evidence for therapies used to treat IRD with the help of QHES (Quality of Health Economic Studies) and CHEERS (Consolidated Health Economic Evaluation Reporting Standards) checklists.

Methods

- A systematic search was conducted using PubMed, Embase, and Cochrane databases (up to April 16, 2024) as per Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to identify studies on economic evaluations in IRD
- The quality of included studies was assessed using the QHES and CHEERS checklists
- The CHEERS checklist was converted into a quantitative score (0, 0.5 and 1) and compared with QHES scores, using paired Wilcoxon rank test
- A p-value of <0.05 was considered statistically significant.

Table 1: Eligibility criteria

Population	Studies of participants diagnosed with IRD
Intervention/ comparator	Any
Outcomes	Costs, clinically relevant outcome measures (QALY or Life year gained or Blindness-free years)
Study design	Economic evaluations: • Cost-effectiveness analysis (CEA) • Cost-benefit analysis (CBA) • Cost-utility analysis (CUA) • Cost-minimization analysis (CMA)
Geography	Global

Results

- The database search identified 200 publications, of which 10 were selected after screening titles and abstracts. Finally, eight Health economic evaluations (HEEs) that met the inclusion criteria were selected (Table 1), comprising 5 full-text articles and 3 conference abstracts
- Table 2 outlines the detailed characteristics of the included HEEs
- All included studies were cost-effectiveness analyses (CEA) or cost-utility analysis (CUA)
- Most of the articles compared Voretigene Neparvovec (VN) to standard of care (SOC), best supportive care (BSC), or no treatment (n=7). One study was focused on gene therapy for Choroideremia
- All studies developed Markov model to compare cost-effectiveness of therapies over lifetime horizon
- Subgroup analysis questions were not considered from both checklists as IRD is a rare disease.
- As per CHEERS assessment, factors such as setting, perspective, time horizon, and discount rate were clearly described in the included studies. However, justification of data sources, description of heterogeneity, and details on analytics and assumptions were often incomplete or missing
- Around 60% of studies met the accepted standard of good quality, with a score of ≥75% based on CHEERS and QHES assessments
- Understandably, limited information was available in the conference abstracts with respect to estimates utilized, explanation of the direction and magnitude of the potential biases as well as disclosures and funding information
- There was no significant difference between the CHEERS and QHES scores (p=0.9453).

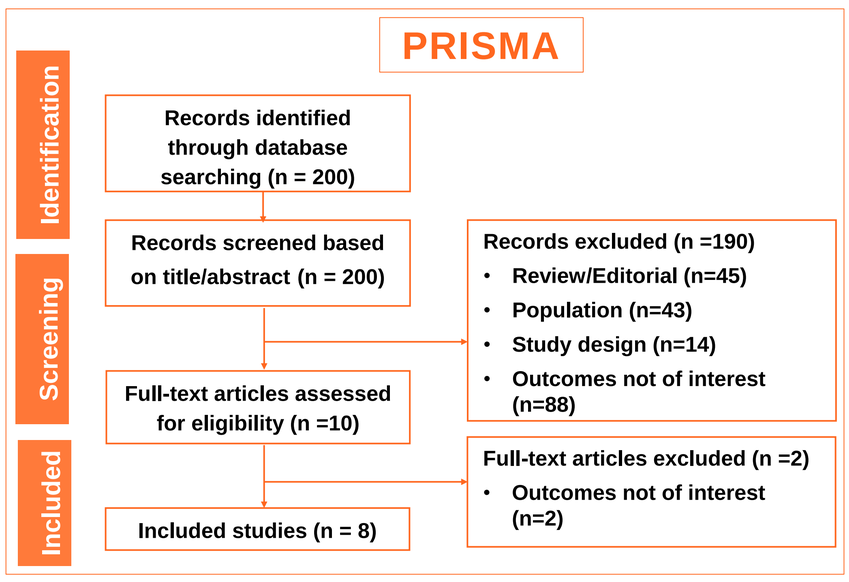
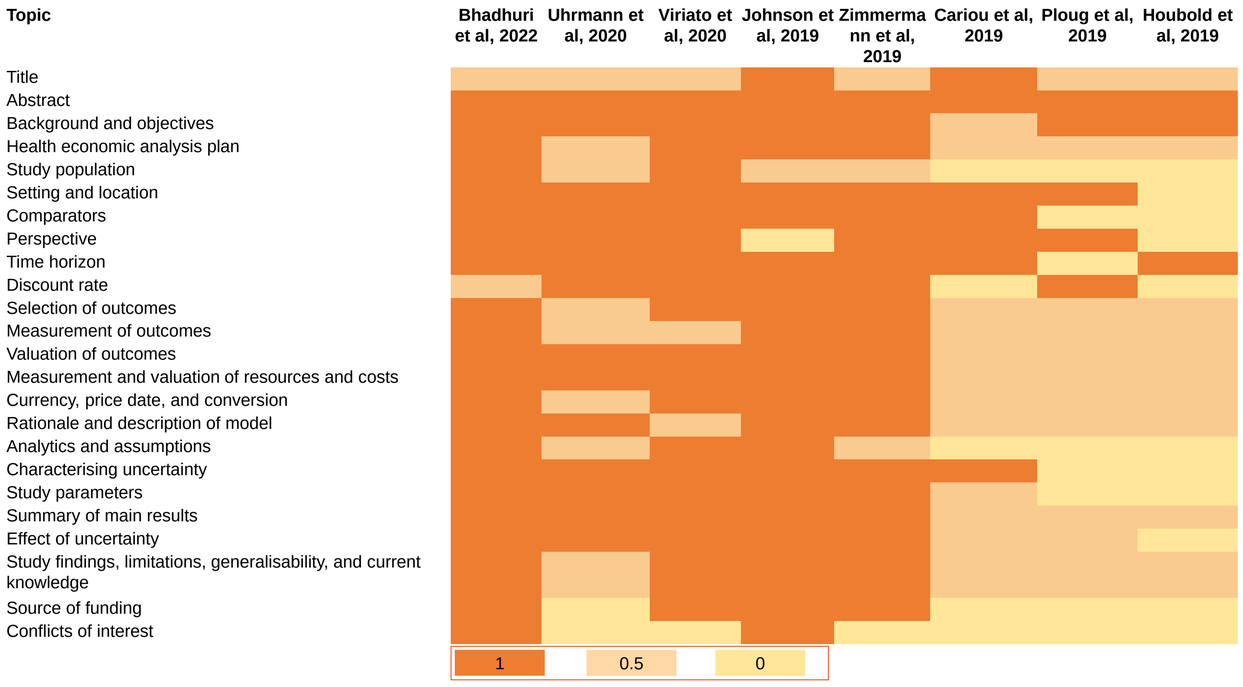


Table 2: Summary of the Selected Studies

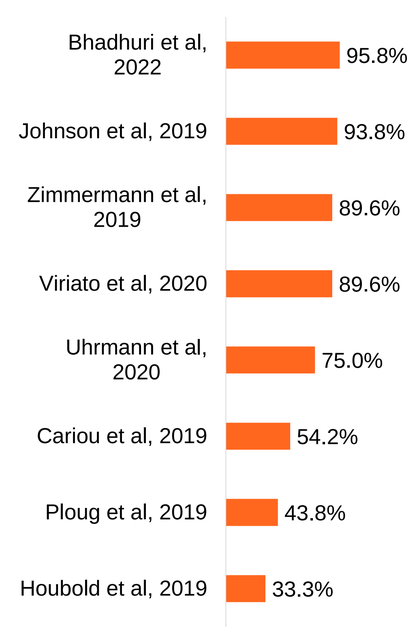
Study	Study design	Country	Perspective	Treatment	Model	Time horizon	Source of data	Effect Measure	WTP Threshold
Bhadhuri 2022[3]	CEA	Switzerland	Healthcare system and Societal	VN vs SOC	Markov	Lifetime	ES	QALY, Blindness-free years	CHF 100,000/QALY
Uhrmann 2020[4]	CEA	Germany	Societal	VN vs SOC	Markov	Lifetime	ES	QALY, life years	NR
Viriato 2020[5]	CEA	UK	Healthcare system and Personal Social Services	VN vs BSC	Markov	Lifetime	ES	QALY	£100,000/QALY
Johnson 2019[6]	CEA	US	NR	VN vs SOC	Markov	Lifetime	ES	QALY	$150,000/QALY
Zimmermann 2019[7]	CUA	US	Healthcare system and Societal	VN vs SOC	Markov	Lifetime	ES	QALY	$250,000/QALY
Cariou 2019[8]	CEA	France	Healthcare system	VN vs BSC	Markov	Lifetime	ES	QALY, Blindness-free years	NR
Ploug 2019[9]	CEA	Denmark	Healthcare system	VN vs no treatment	Markov	NR	ES	QALY	DKK 1,000,000/QALY
Houbold 2019[10]	CEA	NR	NR	Choroideremia GeneTherapy	Markov	Lifetime	NR	QALY	NR

Abbreviations: CEA, Cost-effectiveness analysis; CHF, Swiss Franc; CUA, Cost-utility analysis; DKK, Danish krone; ES, Estimated based on previously published studies or commercial sources; NR, Not Reported; QALY, Quality-Adjusted Life-Years; SOC, Standard of Care; US, United States; UK, United Kingdom; VN, Voretigene Neparvovec

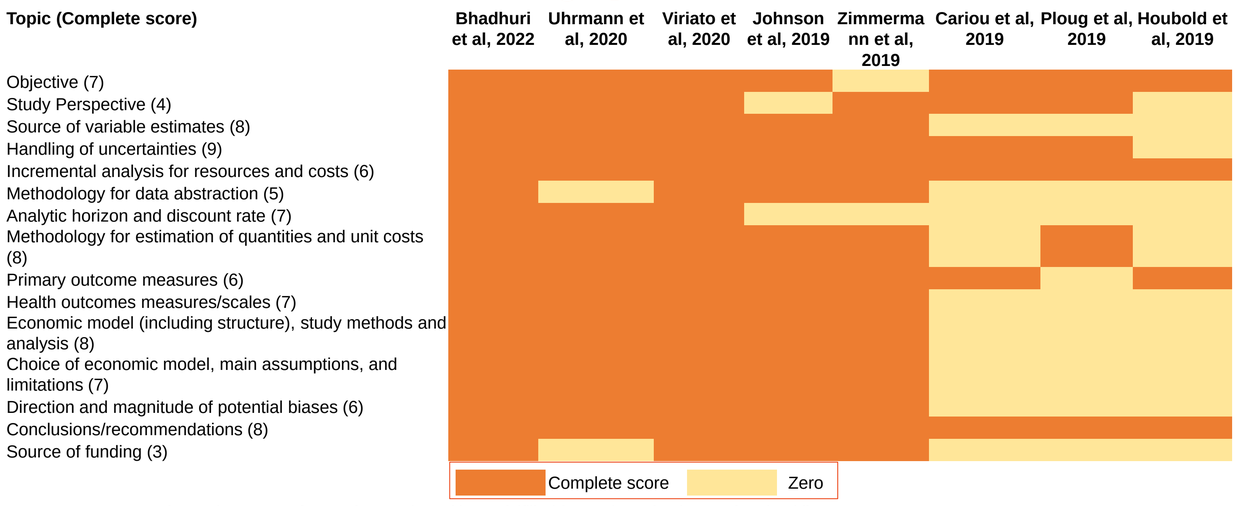
Overview of evaluation using CHEERS criteria



Completeness*



Overview of evaluation using QHES criteria



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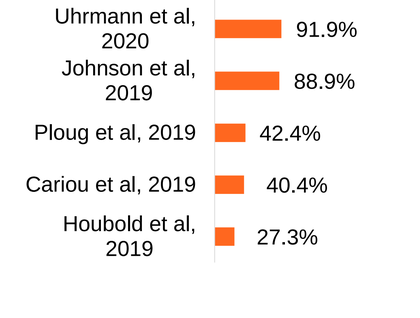

Note: *Percentage of completeness refers to the number of items fulfilled for each evaluation on the checklist

Conclusion

- The present review analyzes the quality of HEEs published in IRD, which is particularly important for supporting decision-making in rare diseases with limited evidence
- The limited literature, consisting of only eight publications, underscores a substantial unmet need in the IRD space and restricts the power and generalizability of the findings
- The absence of significant difference between CHEERS and QHES scores evaluating the quality of studies confirms the lack of transparency in data reporting and potential biases in the literature. This makes it difficult to implement the findings in real-world setting and impedes informed decision-making
- To improve future outcomes, HEE models should prioritize enhancing the validity of results and improving economic modeling accuracy to produce reliable cost-effectiveness outcomes.

References:

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