

The Economic and Humanistic Burden of Food Allergies and Cost-Effectiveness of Treatment Options: A Systematic Review

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BACKGROUND

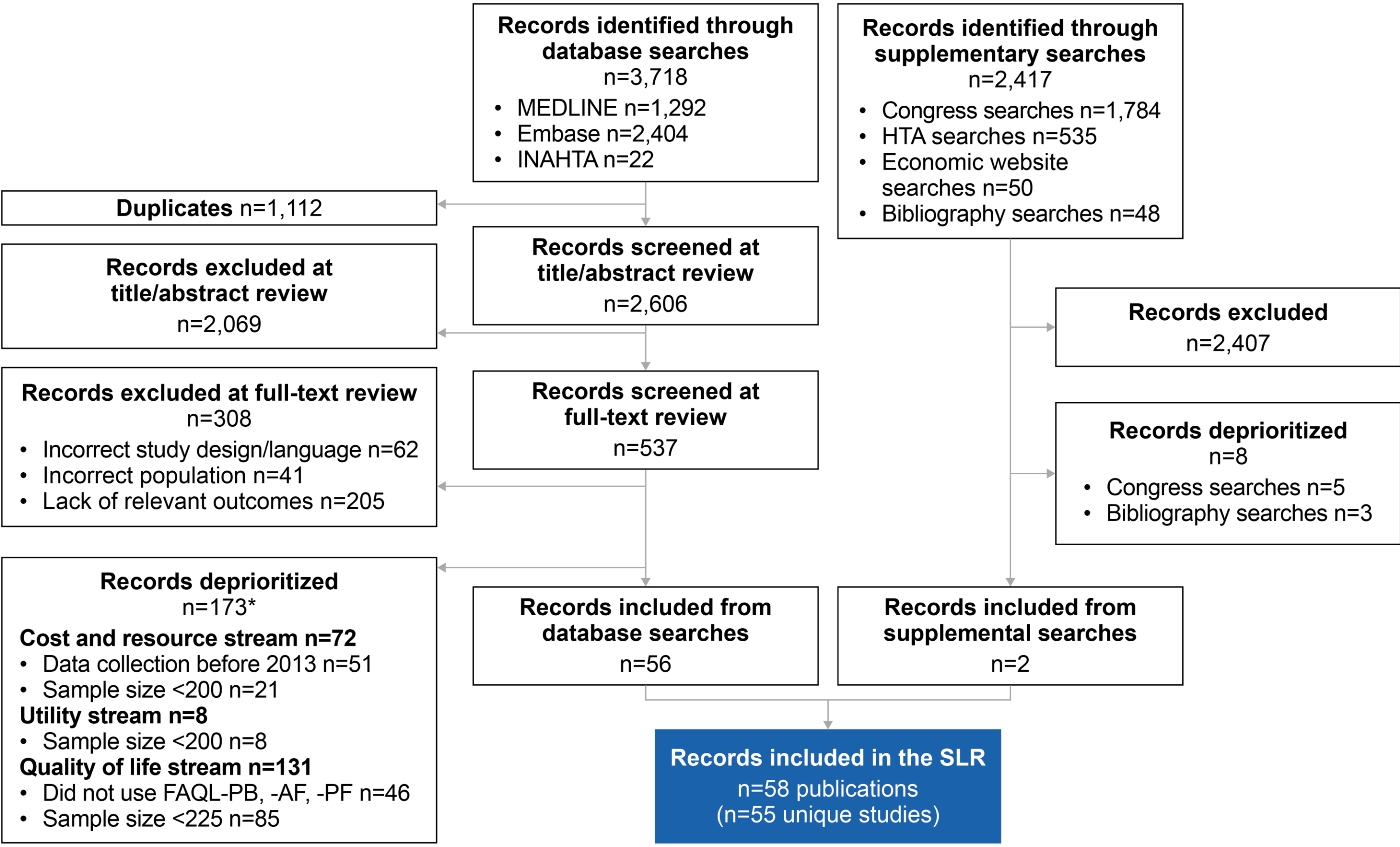
- IgE-mediated food allergy is a growing international public health issue and poses a substantial burden to individuals, families, and the healthcare system.¹
- As no cure exists, management primarily consists of avoidance of allergens and use of medications such as antihistamines and emergency adrenaline auto-injectors.²
- Immunomodulatory therapies (OIT, SLIT, and EPIT) and, more recently, biological therapies that block IgE have been approved or are in the development pipeline as food allergy treatments.^{3–5} Comprehensive assessments of the health and economic value of these therapies are warranted to understand their value to the healthcare system and society.
- This systematic review aimed to investigate the economic and humanistic burden of food allergy and the cost-effectiveness of food allergy treatments.

RESULTS

Search Results

- Of 5,023 records screened, 58 articles reporting on 55 unique studies were included (HRQoL/utilities n=29; cost/healthcare resource use [HCRU] n=25; economic evaluations n=5) (**Figure 1**).
- Studies were predominantly conducted in North America (United States [n=11 HRQoL/utilities; 9 HCRU; 4 economic evaluations]; Canada [n=7 HRQoL/utilities; 5 HCRU; 1 economic evaluation]) and most frequently reported outcomes in people or their caregivers with mixed allergies, including peanut, tree nut, dairy, fish, sesame, and/or other allergies (n=33), or with exclusively peanut (n=9) allergies.
- Studies had a low-to-moderate risk of bias.

Figure 1. PRISMA diagram for the SLR

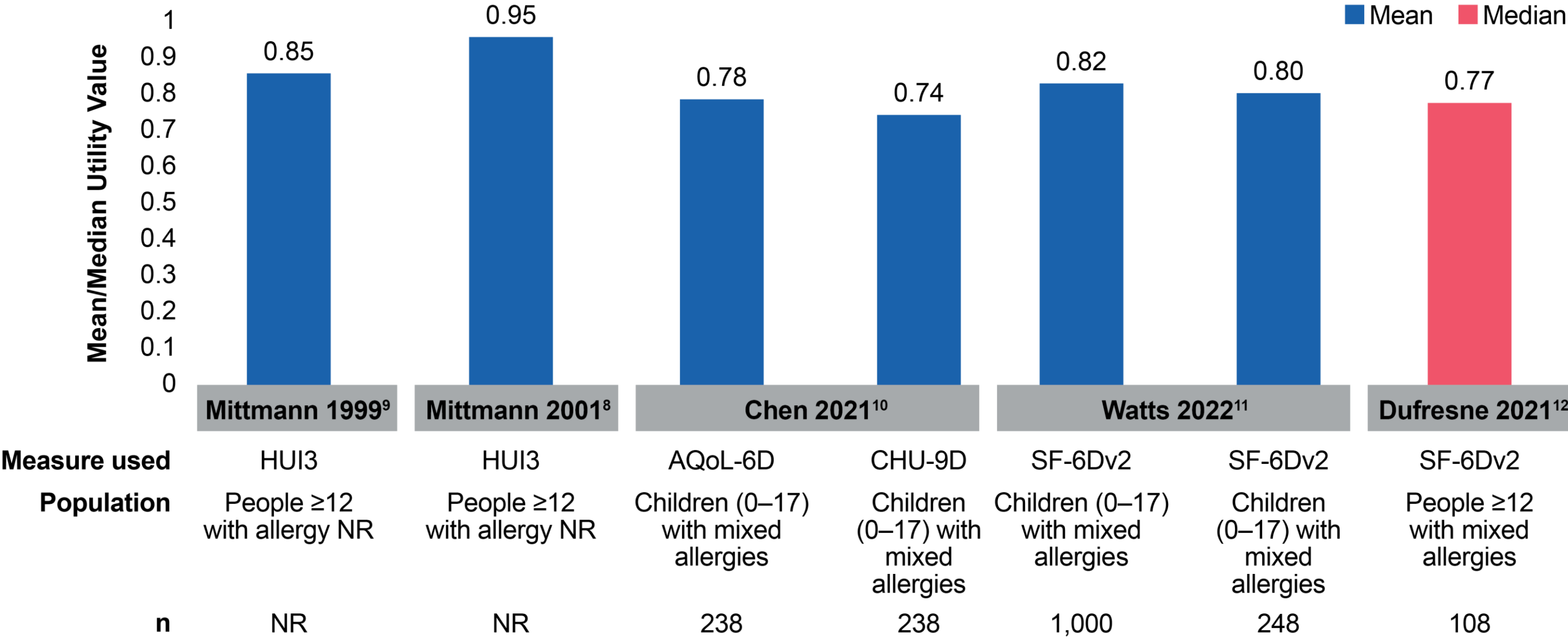


Footnote: *The number of records deprioritized by stream does not sum to the total number of deprioritized records as some records were deprioritized across multiple streams.

Health-Related Quality of Life and Utilities

- Utility values were limited (n=5, **Figure 2**) with only one study reporting caregiver utility. Only one study used a paediatric-specific health utility instrument, and none used a food allergy-specific utility measure.^{8–12}
- Twenty-six studies reported HRQoL outcomes. The mean HRQoL of adults (3.2–5.41), children (1.8–4.56) and their caregivers (1.78–3.8) were similar, highlighting that food allergy impacts people with food allergies and those who care for them.^{13–18}
- The degree of HRQoL impairment varied by allergen-causing food (such as milk, egg, or fish allergy), number of allergies and allergy severity. More severe allergy correlated with greater impairment.^{13,19}

Figure 2. Utility values in people with food allergy



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Abbreviations

AQoL-6D: Assessment of Quality of Life-6D; AUD: Australian dollar; CAD: Canadian dollar; CHU-9D: Child Health Utility 9D; EPIT: epicutaneous immunotherapy; ER: emergency room; FAQLQ-PB/AF/PF: food allergy quality of life-parental burden/adult form/paediatric form; GBP: British pound sterling; HCRU: cost/healthcare resource use; HRQoL: health-related quality of life; HTA: health technology assessment; HUI3: Health Utilities Index-Mark III; ICER: incremental cost effectiveness ratio; IgE: immunoglobulin E; INAHTA: International Network of Agencies for Health Technology Assessment; SF-6Dv2: Short-Form; Six-Dimension version 2; NICE: National Institute for Health and Care Excellence; NHS: National Health Service; OIT: oral immunotherapy; POIT: peanut oral immunotherapy; PRISMA: preferred reporting items for systematic reviews and meta-analyses; PSS: Personal Social Services; SLIT: sublingual immunotherapy; UK: United Kingdom; USA: United States of America; USD: United States dollar; WTP: willingness-to-pay.

CONCLUSIONS

- Food allergy presents a substantial humanistic and economic burden for affected individuals, caregivers, and healthcare systems, indicating an unmet need for long-term treatment options.
- Health-utility outcomes in food allergy are sparse and no food-allergy specific index exists. As a result, published utilities in food allergy are unlikely to reflect disease burden.
- High variability in cost-effectiveness results for food allergy treatments was reported, largely due to discrepancies in model inputs and product pricing. This variability further underscores a need for disease-sensitive methods to evaluate health utility values in food allergy to better inform economic evaluations for decision making.

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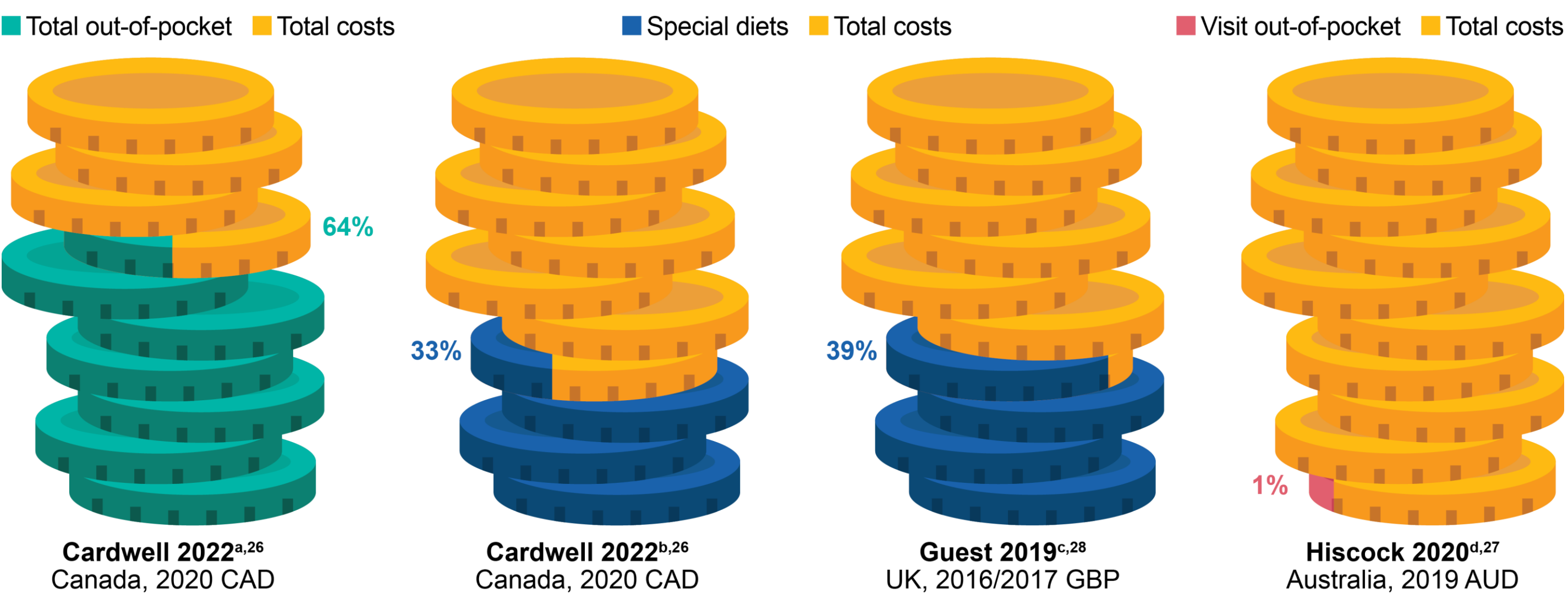
METHODS

- MEDLINE, Embase, the National Health Service Economic Evaluation Database, and the Health Technology Assessment database were searched in July 2023, supplemented by hand-searches of conference proceedings (2021–2022) and grey literature (**Table S1**).
- Studies reporting humanistic burden (HRQoL assessed using FAQLQ-PB/AF/PF; utility values), economic burden (HCRU published in or after 2013), or economic evaluations of food allergy treatment (published in or after 2013) were eligible (**Table S2**).
- All records were screened by two independent reviewers, and relevant data were extracted by one reviewer and validated by a second.
- Study quality was assessed using the Drummond checklist⁶ (economic evaluations) or the Alberta Heritage Foundation for Medical Research tool (non-economic evaluation) by one individual and verified by another for each included study.⁷

Cost and Resource Use

- Total cost burden was high, with direct costs driven by high proportions of individuals requiring ER visits (21.3–72%), inpatient visits (7–31%), and medication use (antihistamines [94.1%], steroids [47.1%], and emergency medication [36–50%]) over the lifetime.^{12,20–24}
- The rate of food allergy-related ER visits for infants significantly increased over time (2.2 per 1,000 infants in 2016 to 5.7 per 1,000 in 2018).²⁵
- Out-of-pocket and indirect costs contributed to the economic burden of food allergy, with out-of-pocket costs accounting for up to 64% of total costs, driven by the cost of special diets (**Figure 3**).^{26–28}
- Indirect costs included high productivity costs (\$14,732 CAD for adults with food allergy [of which \$2,912 CAD is lost earnings] and for caregivers, \$4,173 CAD [of which \$259 is lost earning] and \$339.20 AUD, annually).^{26,27,29}

Figure 3. Proportion of total costs driven by out-of-pocket costs and special diets in children with food allergies



Footnotes: ^aTotal out-of-pocket expenses include nontraditional medicines, special diets and allergen-free foods, additional child care, legal guidance, mental health services, change in school, and other. Total costs were defined as all healthcare costs and out-of-pocket costs. ^bSpecial diets were defined as special diets and allergen-free foods. Total costs were defined as all healthcare costs and out-of-pocket costs. ^cSpecial diets were defined as clinical nutrition. Total costs were defined as the sum of costs from GP visits, specialist visits, dietitian visits, hospital admissions, accident and emergency attendances, prescribed drugs, and clinical nutrition. ^dVisit out-of-pocket expenses include visits to health professionals, including general practitioners, pediatricians, allergy specialists and dietitians, as well as costs associated with travel to visits. Total costs were defined as total cost to the health-care system plus total visit out-of-pocket costs.

Economic Evaluations

- EPIT was found to be potentially cost-effective in one study but not in another, while peanut OIT was cost effective in two studies, not cost effective in two others, and inconclusive in one.^{30–35} Results differed across contexts, economies, and healthcare perspectives (**Table 1**).
- Most studies relied on indirect methods for health utility estimation such as HRQoL scores converted to utility or hypothetical gain, and only one study directly measured utility. No studies employed food allergy-specific measures to estimate utility.³⁴

Table 1. Summary of cost-effectiveness findings for paediatric POIT and EPIT treatment

Treatment	Source	Setting and perspective	Model	ICER	Cost-effectiveness
POIT	ICER 2019 ^{31,35}	USA health sector	Markov	\$88,000 (USD)	Primary analyses indicated that cost-effectiveness was dependent on drug pricing; however updated analyses including extension trial data and updated drug costs indicated treatment was not cost-effective
		USA societal	Markov	\$27,000 (USD)	
		USA healthcare payer (extension trial data)	Markov	\$442,200 (USD)	
	NICE 2022 ³⁴	UK NHS/PSS	Markov	£23,142 (GBP)	Cost-effective (WTP £20,000–£30,000/QALY [GBP]) [*]
	Shaker 2017 ³²	USA societal	Markov	\$2,142 (USD)	POIT with probiotic may be cost-effective, however patients who receive treatment may have a higher rate of peanut-associated allergic reactions and anaphylaxis
	Shaker 2019 ³⁰	USA societal	Markov	\$255,431 (USD)	Not cost-effective (WTP \$100,000/QALY [USD])
EPIT	Shaker 2021 ³³	Canada healthcare payer	Markov	Dominant	Cost effective (WTP \$100,000/QALY [CAD/USD])
		Canada societal	Markov	Dominant	
		USA healthcare payer	Markov	Dominant	
	ICER 2019 ^{31,35}	USA societal	Markov	Dominant	Cost-effectiveness was indicated to be dependent on pricing
		USA health sector	Markov	\$216,000 (USD)	
		USA societal	Markov	\$155,000 (USD)	
EPIT	Shaker 2019 ³⁰	USA societal	Markov	\$216,061 (USD)	Not cost-effective (WTP \$100,000/QALY [USD])

Footnote: ^{*}The NICE WTP threshold was not reported, but is assumed based on published thresholds.

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