Challenges of Evaluating and Modelling Vaccination for prevention of Dengue illness in United Kingdom (UK) Travellers: a Systematic Literature Review (SLR)

POSTER CODE: EE2

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Background

Dengue is a viral infection that spreads from mosquitoes to people. It is commonly found in tropical climates and symptoms include fever, headache, body aches, nausea and rash. Severe cases lead to haemorrhagic fever and death(1).

The UK Health Security Agency (UKHSA) reports that all United Kingdom (UK) dengue fever cases are from travel to endemic areas with an increase in UK incidence in returning travellers over the last 10 years as shown in Figure 1.

There is emerging work to develop a vaccine against this unmet medical need and to prevent UK epidemics due to potential clinical and economic burden. Therefore, an economic evaluation is important to aid recommendations for use of the vaccine and to inform policy decisions within a limited National Health Service (NHS) resource budget.

Hence, a systematic review and critical appraisal of existing economic evaluations for this decision problem was conducted.

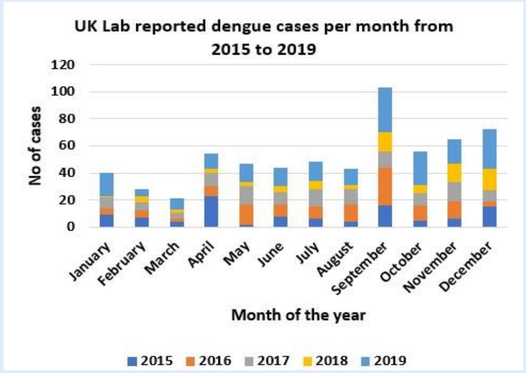


Figure 1: Total reported UK dengue cases per month from 2015 to 2019.
Source: Public Health England, Laboratory-confirmed cases of dengue fever 2015 – 2019

Aims

To inform the model conceptualisation process by identifying relevant economic models of dengue vaccine used for dengue illness, provide an overview of the characteristics of published models, and evaluate applicability to the UK setting.

Methods

A systematic review was conducted in line with Cochrane economic perspectives and economic evidence published guidance and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework(2).

A search strategy was developed combining keywords related to 'economic evaluation', 'dengue', and 'vaccine', and Medical Subject Headings (MeSH) terms for validated MEDLINE search filters relevant to Dengue and study designs.

The information sources utilised for the search were: MEDLINE complete searched on 28th July 2022, Centre for Reviews and Dissemination (CRD) searched on 18th July 2022, PubMed Central searched on 14th September 2022 and 'value in health' journals searched on July 14th, 2022. Date range was limited to 2002 to 2022.

Data from included studies were extracted using a bespoke data extraction form.

Model characteristics extracted included model structure, country and perspective of analysis, intervention and comparator, methods applied, handling of uncertainty.

The CHEERS recommended criteria was used to appraise the quality of identified economic evaluations(3).

Results: Selection of studies (I)

A total of 376 studies were identified from databases. After multiple stage screening, a total of 11 studies met the inclusion criteria and were included in the review with 9 articles from countries in Asia and 2 from South America. None of the studies was conducted in the UK. See figure 2 for the screening process.

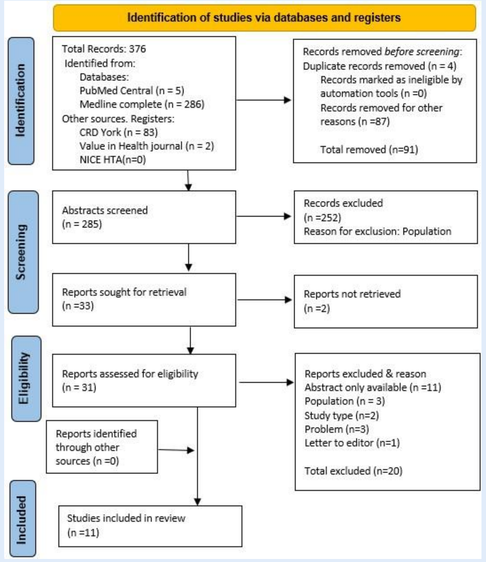
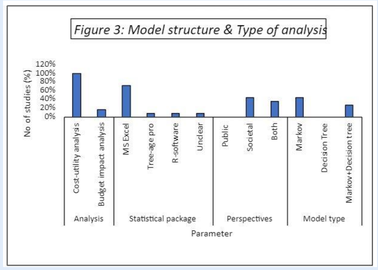


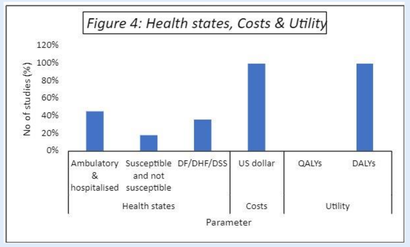
Figure 2: PRISMA flowchart for selection of studies in systematic review

Results: Appraisal of studies. (II)

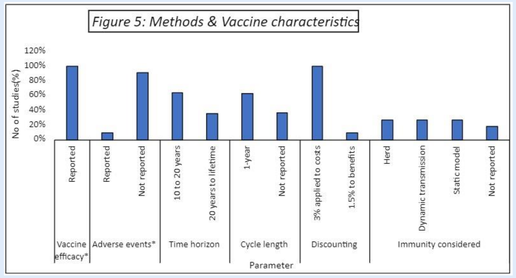
Research question: All studies (n=11, 100%) had a clearly defined research question, with 'dengue vaccine' stated as the intervention and 'no vaccination' as the comparator

Graphical illustration of Systematic Literature Review results

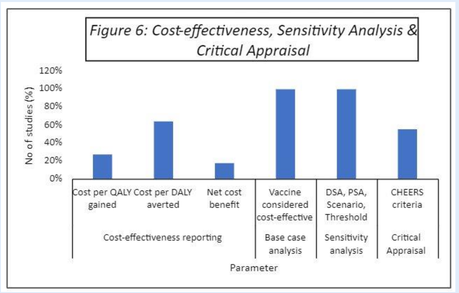




Health states
DF: Dengue Fever
DHF: Dengue Haemorrhagic Fever
DSS: Dengue Shock Syndrome



*Vaccine efficacy: Data ranged from 43% to 95% depending on the prevalence of dengue virus serotype in the study and country setting.
*Adverse events: Mainly Grades 1 and 2 including injection site pain and itching.



Conclusions

This systematic literature review highlights variability in economic evaluations methods and parameters including model structure, perspective of analysis, vaccine efficacy, utility, data inputs, cost methods and types of costs included, choice of utility value, outcome measurement results.

The review also identified data gaps in the published economic evaluations for example lack of patient specific reported outcomes data for dengue for the United Kingdom or Europe.

However, all studies conducted a cost-utility-analysis and found the vaccine to be cost-effective at the willingness to pay threshold price for the country of interest.

Although none of the reviewed economic evaluation studies were conducted in the UK, this SLR was important to understand dengue epidemiology and disease burden.

Three of the studies aided conceptualization of an early economic model, informing model structure and model development in Microsoft excel®. However, EQ-5D utility data, risk of a Traveler acquiring dengue, vaccine efficacy, vaccine price, health state costs, discount rates data were obtained from targeted literature reviews.

Recommendations

The paucity of specific data on cost-effectiveness studies for dengue vaccines for the UK setting, Europe or mainland USA and the variability in data and methods approaches in published economic evaluations makes it challenging for applying to the UK setting.

There is a particular need for economic evaluations of dengue vaccines for UK Travellers to dengue endemic countries given this review found none in the current literature and findings from future economic evaluations will aid recommendations and inform policy decisions within a National Health Service (NHS) resource budget.

This research identifies data gaps and is pertinent for informing future decisions on model parameter values to be obtained from clinical trials research or other outcome research studies for future refinement of a health economic model for assessing dengue vaccines.

References

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2. Page, M.J., McKenzie, J.E., Bossuyt, P.M. et al. (2021) 'The PRISMA 2020 statement: an updated guideline for reporting systematic reviews', Systematic reviews, 10(1), pp.1-11.
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Research in Context

This original research was conducted as part fulfilment of the main author's MSc in Economic Evaluation in HealthCare (Health Economics) dissertation at City, University of London during a pharma industry placement. The main author is a health economist and a hospital pharmacist by background, and brings a health economics perspective to service evaluation in healthcare by working towards valuing innovative health technologies to better inform pricing, policy and decision-making on resource allocation across the United Kingdom's National Health Service and global healthcare systems.

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