EHMA 2024

Shaping and managing innovative health ecosystems

Health economic evaluations of vaccination strategies: an umbrella review

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Introduction 1/2

- Infectious diseases are one of the leading causes of morbidity and mortality and are associated with substantial costs
- Vaccinations are effective and cost-effective tools for the prevention of infectious diseases. According to the latest World Health Organization (WHO) data, vaccination prevents 2–3 million deaths every year
- While awareness of childhood vaccination is well established, the importance of vaccination for the elderly and for at-risk individuals is not as well perceived. Missed opportunities for adult vaccinations contribute also to an overall disease burden (e.g. in 2014 $26.5 billion was spent in U.S. among persons aged 50 years and older due to non-vaccination for influenza, pneumococcal disease, Herpes Zoster, and pertussis (Leidner et al., 2019)

Introduction 2/2

- Immunization guidelines released by WHO, the United States (US) Centers for Disease Control and Prevention (CDC), the European Center for Disease Control (ECDC), and many countries include vaccination recommendations for adults and the elderly. These are influenza vaccination, pneumococcal vaccination, Tdap (tetanus, diphtheria, and whooping cough) booster, the HZV vaccine, and COVID-19 vaccination

- Many systematic reviews on the cost effectiveness of vaccines are available in the literature, but they vary in terms of perspective, population, methods, and quality

Objective

This work aims to summarize the existing evidence by conducting a review of systematic reviews (i.e., umbrella review) on the cost effectiveness of vaccines for influenza, pneumococcal, Herpes Zoster, tetanus, diphtheria, and whooping cough, and COVID-19 globally for among the elderly and at-risk adults, examining the quality of reporting, and providing recommendations after synthesizing the body of evidence

Methods 1/3

Our umbrella review followed the Joanna Briggs Institute (JBI) and Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement

Inclusion criteria and study selection

Population Intervention Comparator Outcome (PICO) model:

P: the elderly and at-risk adults

I: FLU, HZ, Tdap, COVID-19 and pneumococcal vaccines

C: no comparator was taken into consideration

O: the results of the cost effectiveness of the vaccination

Only systematic reviews with or without meta-analyses, written in English
Two authors work independently and disagreements were resolved by discussions

Methods 2/3

Search strategy

Database: PubMed, Scopus and WebOfScience

Boolean search string: combination of Medical Subject Headings (MeSH) terms and unstructured keywords ('adult', 'Aged', 'Frail Adult', 'Influenza Vaccines', 'Herpes Zoster Vaccine', 'Pneumococcal Vaccines', 'Diphtheria-Tetanus-acellular Pertussis Vaccines', 'COVID-19 Vaccines', 'Cost-Effectiveness Analysis', 'Economic Evaluation', 'Cost Benefit', 'Incremental Cost Effectiveness Ratio')

Data collection

Authorship, year published, name of journals, study objectives, data source, time horizon covered, year range of included studies, country/region, perspective, number of HPV-related studies in each review, funding of systematic reviews and individual studies in each systematic review, study design, type of economic analysis, target population, vaccination strategy, measurement of effectiveness, time frame for modeling, thresholds for cost effectiveness, tools for quality/risk bias assessment, score/ rating for the assessment, discount, sensitivity analysis, incremental analysis, results, and main conclusions

Methods 3/3

Data analysis

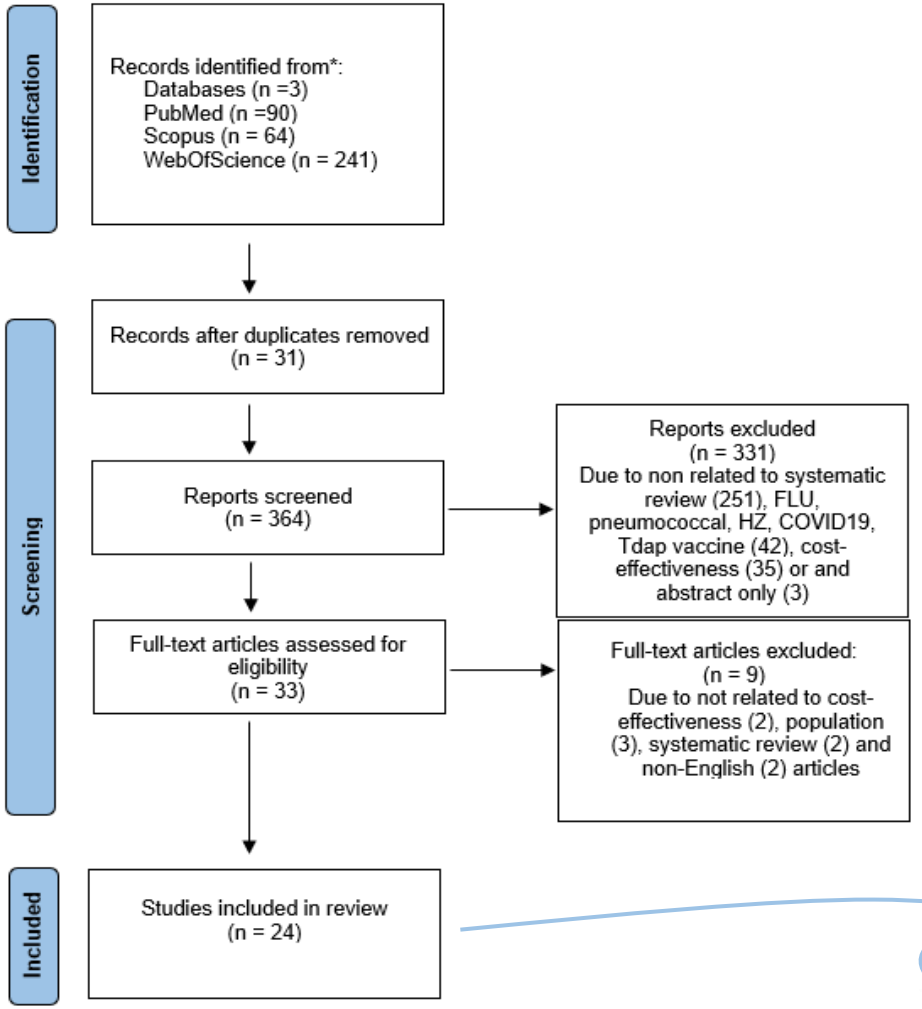
Qualitative and quantitative findings for the outcomes of interest were presented in the table format

Quality assessment

The quality of the eligible systematic reviews was assessed using the A MeaSurement Tool to Assess systematic Reviews 2 (AMSTAR2)

Main results

diagram flow cha



- FLU vaccination (8)
- HZ vaccination (6)
- Pneumococcal vaccination (3)
- Tdap vaccination (1)
- COVID-19 vaccination (1)
- Various vaccination (5)

Main results

Influenza vaccination (12)

12 studies (de Boer et al., 2017; Shields et al., 2017; Ting et al., 2017; Loperto et al., 2019; Colrat F et al., 2021; Dilokthornsakul et al., 2022; Loong et al.,2022; Gharpure et al., 2024; Cortés et al., 2013; García-Altés, 2013; Wong et al., 2017; Leidner et al., 2019) collectively indicate that influenza vaccination is generally cost-effective, especifically for:

- Elderly: Influenza vaccination is cost-effective or cost-saving in elderly populations in Europe and high-income economies, offering significant benefits from both societal and healthcare perspectives.
- High-Risk Adults: Vaccination is cost-effective for adults with chronic illnesses and front-line healthcare workers, providing economic benefits by reducing infection risks and associated costs

Main results

pneumococcal vaccination (10)

10 studies (Ogilvie et al., 2009; van de Vooren et al., 2014; Porchia et al., 2017; Nishikawa et al., 2018; Shao et al., 2020; Du et al., 2023; Cortés et al., 2013; García-Altés, 2013; Sartori et al., 2017; Leidner et al., 2019)

analyzed the cost-effectiveness of pneumococcal vaccines, particularly PCV13 and PPSV23, in adult populations across different countries and age groups. The findings consistently indicate that pneumococcal vaccination is generally cost-effective, with some studies demonstrating it as cost-saving.

- Vaccination in adults, especially those aged 65 and older, is predominantly cost-effective, often falling below the $50,000 per QALY threshold
- Also immunizing at-risk adults shows economic advantages, with cost savings pronounced

Main results

Herpes Zoster vaccination (4)

- 2 studies (Szucs and Pfeil, 2013; Chiyaka et al., 2019) reported general agreement that most HZ vaccination scenarios are cost-effective, but their findings are influenced by varying input data, model assumptions, and cost-effectiveness thresholds

- Meredith and Armstrong (2022) highlight the consistent cost-effectiveness of the recombinant zoster vaccine (RZV) over no vaccine and its dominance over the zoster vaccine live (ZVL), supporting RZV's adoption despite variations by age group

- Leidner et al. (2019) report that while no studies found HZ vaccination cost-saving, a substantial proportion did find it cost-effective, especially at higher cost-effectiveness thresholds

Main results

Tetanus, diphtheria, and whooping cough vaccination (2)

- Fernandes et al. (2019) claimed that cost-effectiveness of Tdap vaccinations varied widely due to assumptions about underreporting, herd protection, and vaccine coverage

- Leidner et al. (2019) noted that 23% of age-based and 40% of indication-based outcomes for U.S. Td/Tdap vaccinations reported cost savings. Cost-effectiveness estimates under $50,000/QALY were found in 30% of age-based and 25% of indication-based outcomes for Td/Tdap. Additionally, 50% of age-based outcomes for Td/Tdap reported costs under $100,000/QALY

COVID-19 vaccination (1)

- Wong et al. (2023) proved that COVID-19 vaccination is either cost-saving and cost-effective compared to no vaccination in all included studies

Conclusions

- This umbrella review found that vaccination is cost-saving and cost-effective in elderly or high-risk groups
- A universal vaccination strategy should be encouraged when the supply of vaccines is sufficient, and prioritization should be taken into consideration when the supply is limited

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Thank you!

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