Economic Evaluation of a Booster Dose of Tdap Vaccine to Adolescents in Spain

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BACKGROUND

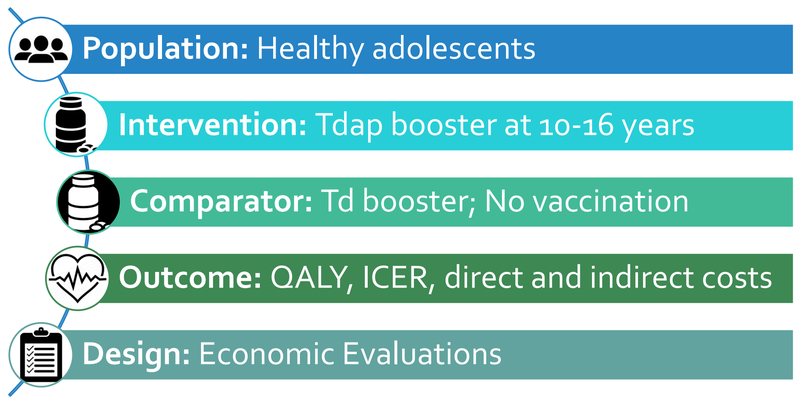
- In 2023–2024, **pertussis cases increased in Spain** despite high vaccination coverage: 98.2% with the paediatric vaccine against tetanus, diphtheria, and pertussis (DTaP) and 88.5% with the adult vaccine (Tdap) in pregnant women.
- In 2024, **30,982 cases were reported**, including 540 hospitalisations and 5 deaths. Most cases (63.9%) **affected children under 15**, especially aged 10–14.
- This resurgence prompts a reassessment of vaccination strategies, particularly focusing on **adolescent prevention through systematic Tdap boosters at ages 11–14.**

OBJECTIVE

To explore the economic aspects of systematic vaccination of adolescents, 11-14 years old, with a booster dose of Tdap.

METHOD

We carried out a **systematic bibliographic search** in general and health economic-specific databases of cost-effectiveness studies on the administration of a booster dose of the Tdap vaccine to adolescents, as a first step toward economic evaluation.



This was complemented by **targeted search** to identify recent international **recommendations** for adolescents pertussis vaccination schedules.

RESULTS

Figure 1. Study flow diagram

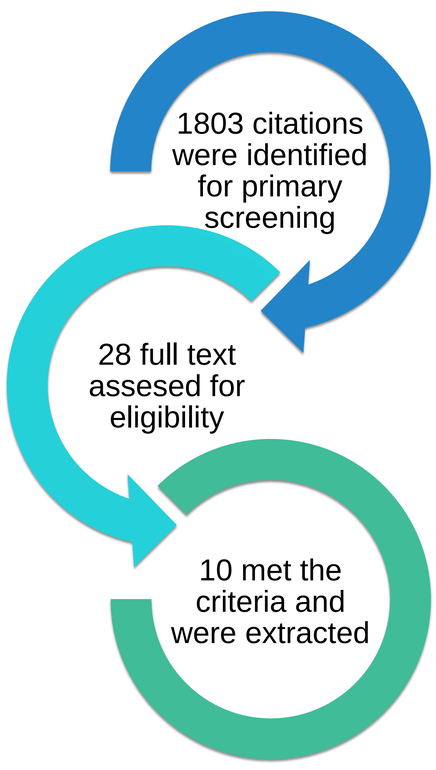


Figure 2. Geographical distribution

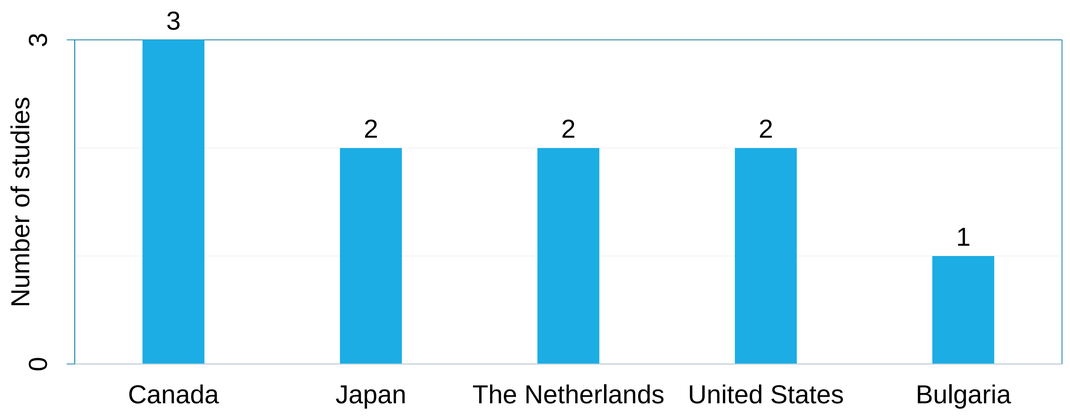


Figure 3. Economic approach: CUA: Cost-utility analysis, CEA: Cost-effectiveness analysis, CBA: Cost-benefit analysis; n –number of studies

REGULATIONS. Pertussis booster for adolescents recommended or mandatory: 24 out of 30 European Economic Area (EEA) countries: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Norway, Poland, Romania, Slovakia, Slovenia, Sweden. The pertussis vaccine booster is also administered in the United States at ages 11-12, in Canada between ages 14-16, and in Australia at ages 12-13.

Findings: 2 studies found the intervention cost-saving, 4 found it cost-effective, in two cost-effectiveness depended on the incidence, in one it depended on the age of intervention and 1 found the negative cost-benefit ratio.

Table 1. Models implemented

Study	Model applied
Iskedijan et al (2004)	Predictive, spreadsheet-based, dynamic-cohort
Iskedijan et al (2005)	
Lee et al (2005)	Markov
Coudeville et al (2009)	Dynamic transmission
De Vries et al (2010)	Discrete Event Simulation
Rozenbaum et al (2012)	Dynamic transmission
Itatani et al (2013)	Markov
Anyiwe et al (2019)	Markov
Mangurov et al (2021)	Dynamic transmission
Tanaka et al (2024)	Markov

- The **vaccination coverage rates** reported range **from 70% to 95%**, and **the effectiveness** of the vaccination programme ranges **from 85% to 92%.**
- The estimated **duration of immunity conferred** by the pertussis vaccine varies between **4 and 12 years**.
- The **incidence of pertussis** reported in the studies ranges from **0.62 to 511 cases per 100,000** inhabitants and eight of them apply some type of **correction factor**.
- **Perspective**: society in 5, both the healthcare perspective (or third-party payer) and social perspectives in 4, and one from the third-party payer only.
- The time horizon varies between **9 and 100 years**.

CONCLUSIONS

- Given the epidemiological evolution of pertussis, **the inclusion of a booster dose** of the Tdap vaccine for adolescents in the Spanish vaccination schedule **should be supported by high-quality evidence on the cost-effectiveness** of pertussis immunization alternative strategies.
- Reported cases of pertussis substantially underestimate the true incidence of the disease; therefore, careful estimation—**such as through the use of correction factors**—is essential. This parameter is particularly critical, as it significantly influences the cost-effectiveness of pertussis vaccination programs
- Dynamic transmission models are appropriate for assessing the cost-effectiveness of diseases where **herd immunity** plays a significant role. However, in the case of pertussis, **acellular vaccines seem to offer only partial protection**—preventing clinical disease but having limited impact on bacterial colonization or transmission. Therefore, careful consideration of the modeling approach is required.

REFERENCES

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