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Cost-effectiveness analysis of the TAK-003 dengue vaccine introduction in Argentina

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INTRODUCTION

- Dengue is a major public health challenge worldwide due to its epidemiological, social and economic impact. Its global incidence has increased considerably over the last decades.
- The Region of the Americas, which reported 4,5 million cases in 2023, is one of the most severely affected.
- In recent years, the increasing incidence of dengue in Argentina has significantly strained both public health and economic resources [1].
- The TAK-003 vaccine (Qdenga®) has demonstrated a balanced safety profile and efficacy in preventing dengue in >20,000 children and adolescents in the TIDES study (DEN-301 trial; NCT02747927) [2].
- The TAK-003 vaccine was approved in Argentina in April 2023 for individuals > 4 years of age and regardless of serostatus [3]. Understanding its potential clinical and economic value can help guide public health policymakers in vaccine implementation.

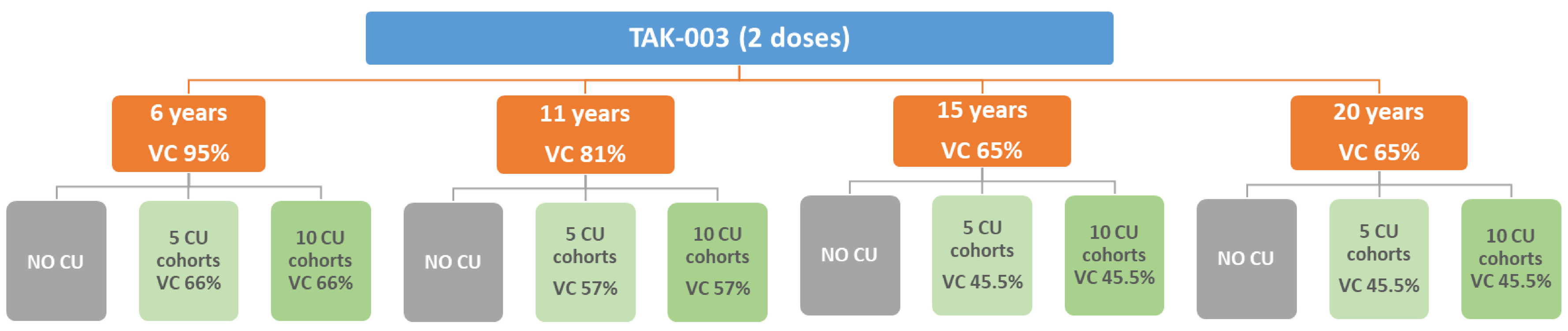
OBJECTIVE

- This study aims to assess the health benefits, costs, and cost-effectiveness of dengue vaccination with TAK-003 in Argentina, across various routine and catch-up vaccination strategies.

METHODS

- We used a static model with a dynamic component to assess the public health and economic impact of TAK-003 vaccination over a 20-year time horizon from a payer & societal perspectives.
- The model was populated with country specific data for demographics, epidemiology, quality of life and cost [4-9]. Vaccine efficacy data were extrapolated from the DEN-301 trial.
- We assessed different vaccination strategies with and without catch-up **(Figure 1).**
- A willingness to pay of one gross domestic product per capita was assumed (USD 13,650; Year 2022). Deterministic and probabilistic sensitivity analysis was performed to assess the robustness of the results.

Figure 1. Model vaccination strategies

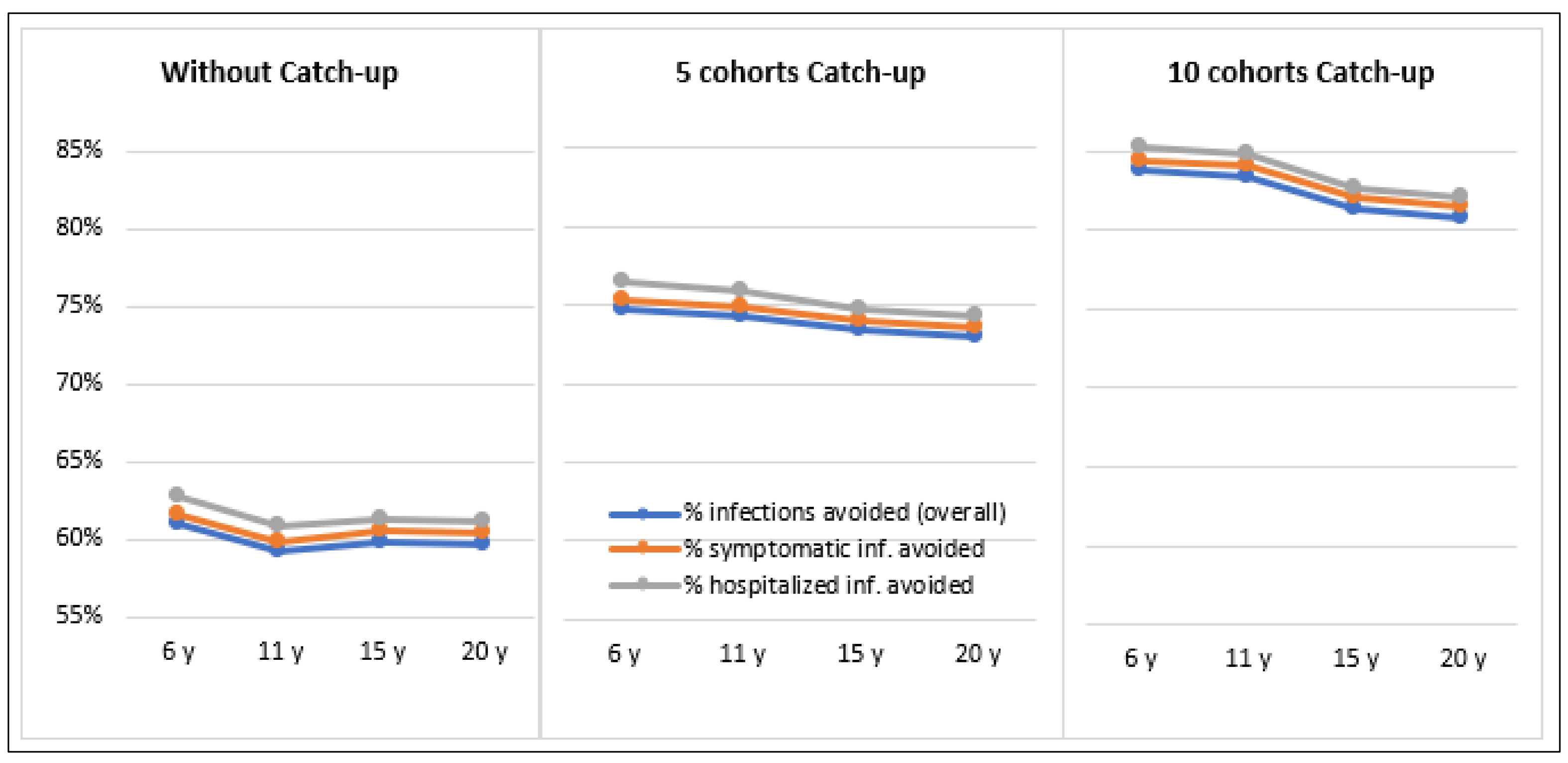


CU: Catch-up; VC: Vaccination coverage. Coverage was estimated considering vaccination coverage during 2022 in Argentina for DTP (6 years) and dTpa (11 years). For 15 and 20 years, 80% of 11 years coverage was estimated.

RESULTS

- Although vaccine coverage is lower among individuals vaccinated at ages 15 or 20, starting vaccination at these ages provides comparable health benefits to vaccinating during childhood or early adolescence **(Figure 2).** This is due to the higher incidence of dengue observed in older adolescents and adults.
- The number of dengue infections avoided increases with catch-up campaigns. Without catch-ups, infections are reduced by 59-61%, while introducing 5 or 10 catch-up cohorts would avoid 73-75% or 81-84% of dengue infections, respectively **(Figure 2).**

Figure 2. Proportion of infections avoided by strategy (20-year time horizon vs no vaccination)



- All strategies from payer & societal perspectives resulted cost-effective or dominant. Starting vaccination at ages 15 or 20, without catch-up or with a 5-cohort catch-up, showed dominance in both scenarios **(Table 1).**

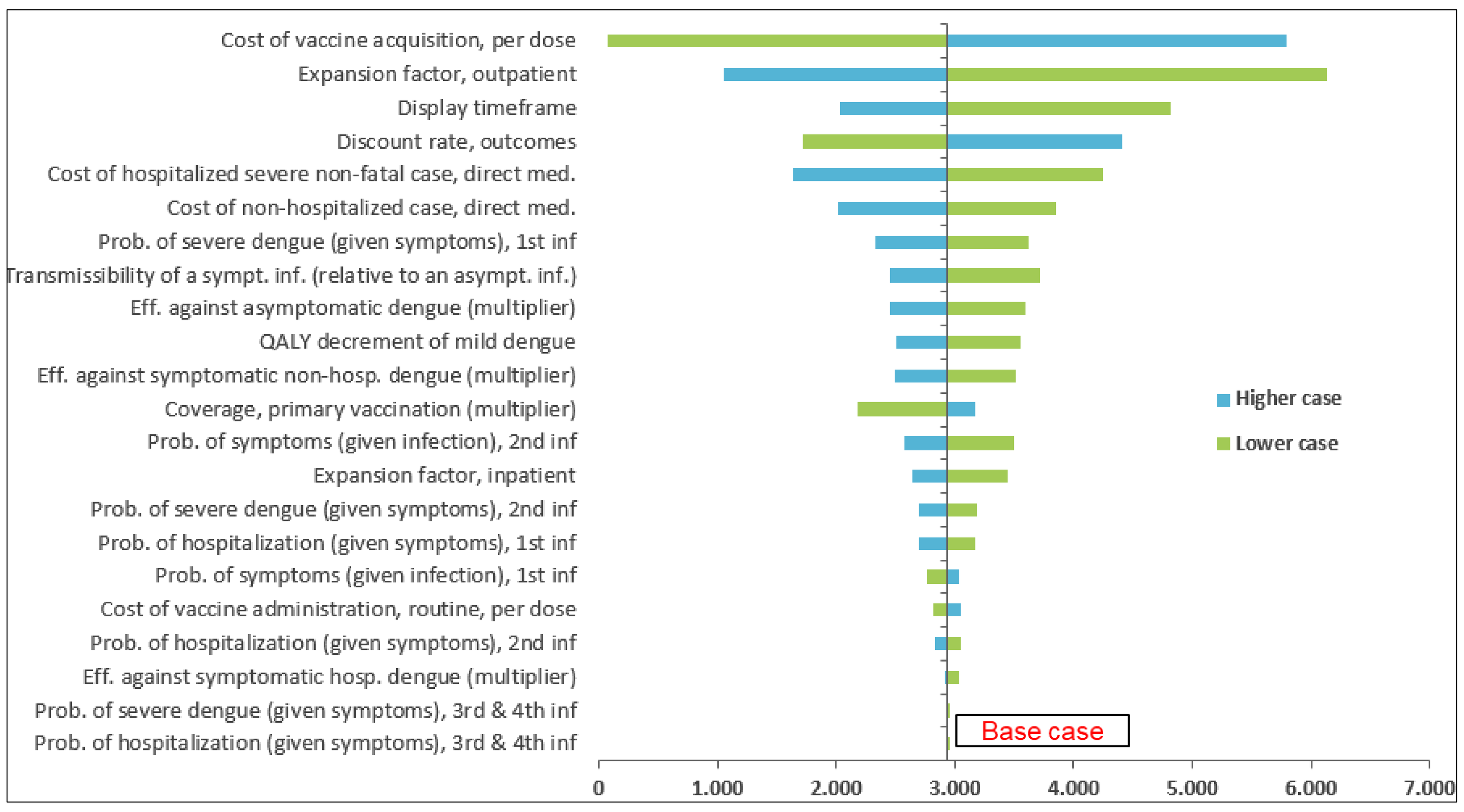
RESULTS

Table 1. Incremental cost-effectiveness ratio (ICER) per quality-adjusted life years

		ICER (USD/QALY gained)		
Vaccination scenario		Without catch-up	With 5 catch-up cohorts	With 10 catch-up cohorts
6 years	Payer	2,939	2,997	3,706
	Societal	673	737	1,451
11 years	Payer	1,497	1,325	1,943
	Societal	Dominant	Dominant	Dominant
15 years	Payer	Dominant	Dominant	4.53
	Societal	Dominant	Dominant	Dominant
20 years	Payer	Dominant	Dominant	62
	Societal	Dominant	Dominant	Dominant

- Main drivers of incremental cost were vaccination acquisition price, the expansion factor for ambulatory cases, the time horizon, the discount rate, and the direct medical costs **(Figure 3).**

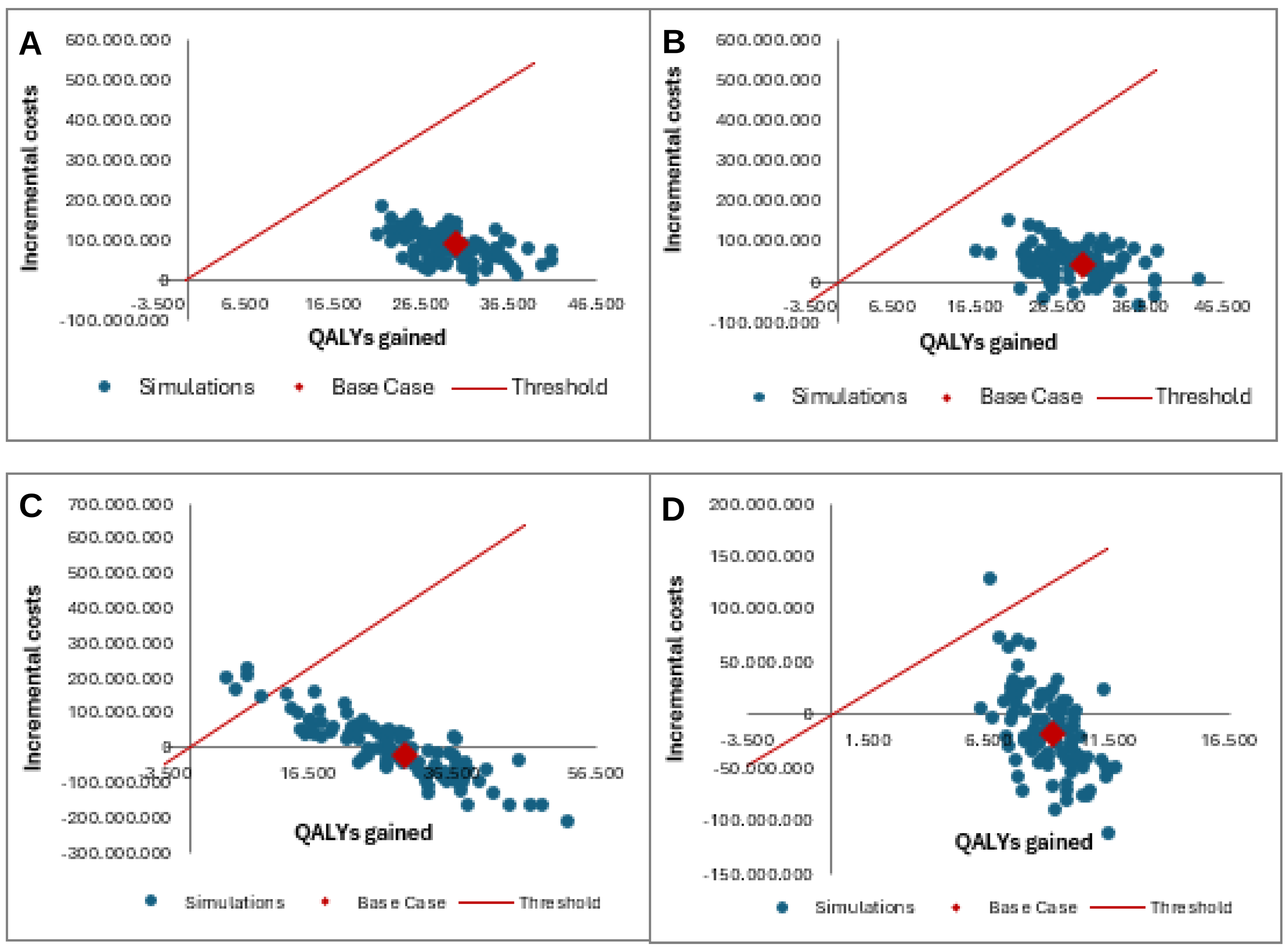
Figure 3. Deterministic sensitivity analysis. Incremental cost-effectiveness ratio (ICER): Payer´s perspective (vaccination at 6 years-old without catch-up)



Tornado diagram. ICER (USD) per QALYs gained. Eff: Effectiveness; Prob: Probability; Inf: Infections; Nb: Number; Med: medical.

- In terms of uncertainty, the probabilistic sensitivity analysis showed, from the payer´s perspective, that starting vaccination at 6, 11, 15 and 20 years old without catch-up resulted cost-effective in 100%, 100%, 95%, and 100% of simulations, respectively, and were dominant in 1%, 14%, 54%, and 68% of simulations, respectively **(Figure 4).**

Figure 4. Probabilistic sensitivity analysis (100 simulations). Cost-effectiveness plane: Payer´s perspective



Montecarlo chart. ICER (USD) per QALY gained (payer´s perspective) by scenarios. A) 6 years without catch-up; B) 11 years without catch-up; C) 15 years without catch-up; D) 20 years without catch-up.

CONCLUSION

Dengue vaccination strategies should be designed based on country-specific epidemiology.

- In Argentina, while all explored scenarios are expected to yield significant health and economic benefits, vaccinating individuals aged 15-20 years, with a 5-cohort catch-up, seems to be the optimal choice from a cost-effectiveness perspective.
- The sensitivity analysis confirmed the robustness of the results.

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