Cost-Effectiveness Analysis of Maternal RSVpreF Vaccination for the Prevention of Respiratory Syncytial Virus in Colombian Infants

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BACKGROUND

- Respiratory syncytial virus (RSV) is the leading cause of acute lower respiratory tract infections and hospitalizations in infants worldwide[1]. In Colombia, the disease contributes significantly to infant morbidity and mortality, especially in preterm newborns[2,3].
- The economic impact on the healthcare system is substantial due to hospitalizations, intensive care unit (ICU) stays, and respiratory support.
- Despite the high burden, there is no widely available antiviral treatment or routine immunization strategy targeting RSV in this population[4].
- Maternal immunization with the RSV prefusion F (RSVpreF) vaccine offers a preventive strategy by providing passive immunity to the newborn through placental antibody transfer[5].
- RSVpreF vaccine is available in Colombia through PAHO[6].

OBJECTIVE

- To evaluate the cost-utility of maternal RSVpreF vaccination versus no intervention for the prevention of RSV infection in Colombian infants from the perspective of the national healthcare system.

METHODS

Model Description

- A decision-analytic Markov model to simulate the clinical and economic outcomes of introducing maternal RSVpreF vaccination.
- Clinical outcomes included outpatient, emergency department (ED), and hospital visits related to RSV infection, as well as RSV-attributable deaths. Mortality rates were age-specific and adjusted by gestational age at birth.

Model Inputs

- Clinical inputs were obtained from randomized clinical trials[7], systematic reviews, and Colombian national health statistics. RSV incidence, vaccine efficacy, and healthcare resource use are stratified by infant age in months and gestational age.
- Medical costs were expressed in 2024 USD, using national tariffs and international vaccine pricing[8].

Analyses

Base case

- An uptake of 86.7% is assumed for Maternal RSVpreF vaccination, based on coverage rates for maternal Influenza vaccination in Colombia. The vaccination strategy was compared to no intervention and administered to pregnant women at 24-36 week of gestational age year-round.
- Analysis assumed a hypothetical Colombian birth cohort of 429,363 infants[9] over a 10 year time horizon, although the model focuses on the first year of life.
- A 5% annual discount rate was applied to both costs and QALYs.
- Willingness-to-pay (WTP) threshold was set at USD 7,491 per QALY (equivalent to the GDP per capita in Colombia).

Sensitivity

- One-way deterministic sensitivity analysis (DSA) and probabilistic sensitivity analysis (PSA) using Monte Carlo simulations were conducted.
- Subgroup analysis explored the impact of vaccination in preterm versus full-term infants.

RESULTS

- Maternal RSVpreF vaccination may avert 38,671 (32.12%) RSV cases, including 6,823 hospitalizations (a 48.17% reduction), and 116 deaths (a 48.13% reduction) among infants aged <1 year.

RESULTS (cont)

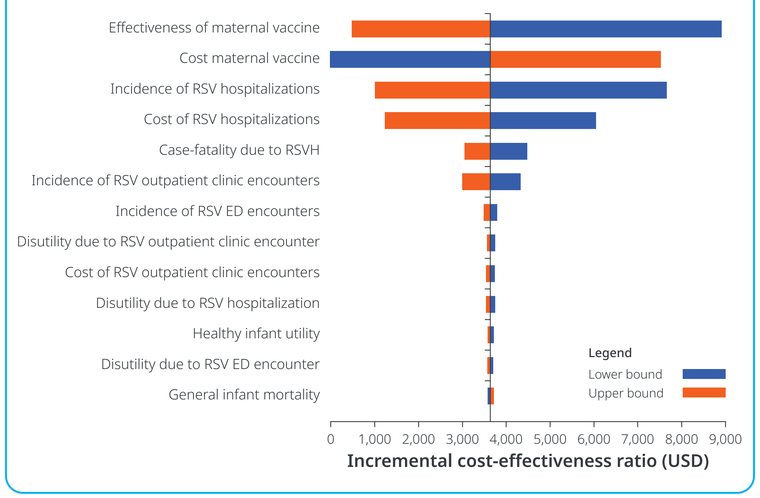
- From an economic perspective, vaccination decreased RSV-related medical expenditures by nearly half (46.3%), compared to no intervention. The cost of implementing a maternal vaccination strategy with RSVpreF at 86.7% uptake would amount to USD $ 18.2 million (Table 1).
- Although the vaccine program introduced additional costs, avoided healthcare utilization offset these, resulting in a favorable incremental cost-effectiveness ratio (ICER) well below the national willingness-to-pay threshold (48.6% of the WTP)[10,11].

Table 1. Summary of Clinical and Economic Outcomes over a 10-Year Horizon: Maternal RSVpreF Vaccination vs. No Intervention

Outcome	RSVpreF Vaccination	No Intervention	Difference (absolute reduction)
Clinical Outcomes			
Total RSV cases	81,713	120,383	–38,671
Hospitalizations	7,340	14,164	–6,823
Emergency department visits	23,315	34,364	–11,050
Outpatient visits	51,057	71,855	–20,798
RSV-related deaths	125	241	–116
Life-years (discounted)	3,216,099	3,215,208	+892
QALYs (discounted)	3,128,105	3,126,948	+1,157
Economic Outcomes			
Direct medical costs (USD millions)	16.20	30.23	–14.03
Vaccine program cost (USD, M)	18.24	0	+18.24
Total cost (USD, millions)	34.44	30.23	+4.21
ICER			
ICER (USD/QALY)			3,643

- One-way sensitivity analysis identified vaccine effectiveness, RSV hospitalization rates and its costs as key drivers of cost-effectiveness (Figure 1).

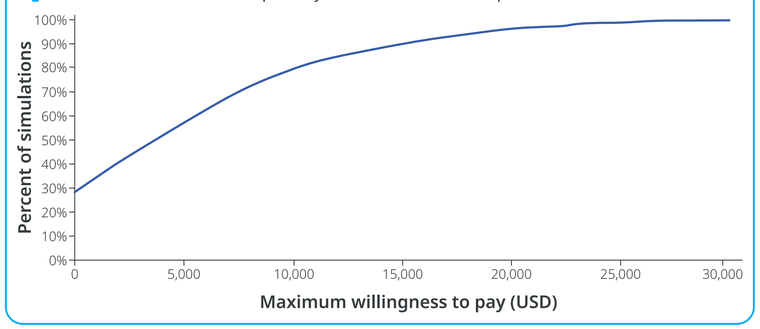
Figure 1. Tornado diagram for the outcomes of the DSA



RESULTS (cont)

- Probabilistic analysis confirmed the robustness of the findings, showing the high likelihood of cost-effectiveness under uncertainty (Figure 2), with an estimated probability of 69.3% under the current willingness to pay threshold.
- Analyses revealed that preterm infants derived the most significant clinical and economic benefit, reinforcing the value of targeting high-risk populations within maternal immunization strategies.

Figure 2. Cost-effectiveness acceptability curve for Maternal RSVpreF Vaccination



CONCLUSION

- In Colombia, maternal RSVpreF vaccination is a cost-effective strategy for reducing RSV-related morbidity, mortality, and healthcare costs. It offers substantial clinical benefits, especially for preterm infants, and contributes to equity by protecting vulnerable populations.
- The maternal vaccination strategy significantly improved health outcomes in the modeled cohort, preventing thousands of RSV-related events and yielding substantial gains in life-years and QALYs. The intervention notably reduced the burden of severe RSV outcomes, particularly hospitalizations and deaths, highlighting its potential to protect infants during their highest-risk period.
- These findings support the inclusion of RSVpreF in national maternal immunization programs and provide strong evidence to guide public health decision-making.

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