Cost-Effectiveness of Mixed-Approach Maternal RSVpreF/Infant Nirsevimab Immunization versus Nirsevimab Alone for the Prevention of Respiratory Syncytial Virus in Chile

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INTRODUCTION

- Respiratory syncytial virus (RSV) is a leading cause of lower respiratory tract illness (LRTI) among infants in Chile[1,2]
- In 2024, the Chilean Ministry of Health (MoH) implemented a Winter Campaign to encourage use of nirsevimab, a single-dose monoclonal antibody, to protect infants in Chile from LRTI associated with RSV (RSV-LRTI)[3,4]
- Another intervention to prevent RSV-LRTI in infants, RSVpreF maternal vaccine, has recently been approved for use among pregnant women in Chile[5]
  - Given the difference in target population, the interventions could be used in a complementary manner

OBJECTIVE

- **To evaluate cost-effectiveness of a mixed approach to immunization comprising maternal RSVpreF with complementary nirsevimab for unprotected infants compared to nirsevimab alone for the prevention of RSV-LRTI among infants in Chile**

METHODS

Model Overview

- Population-based cohort model evaluated clinical outcomes and economic costs of RSV in the first year of life, lifetime consequences of RSV-related death, and the expected impact of interventions (i.e., RSVpreF and nirsevimab):
  - Clinical outcomes: medically attended RSV-LRTI (i.e., hospital [RSV-H], emergency ward [RSV-EW]), attributable deaths, and quality-adjusted life-years (QALY)
  - Economic outcomes: direct costs (i.e., medical care, intervention) and indirect costs (i.e., caregiver work loss, future lost earnings due to premature RSV-related death)
- Clinical/economic RSV-related outcomes among women vaccinated during pregnancy were also tallied within the model
- Model population comprised infants born during a one-year period, characterized by age, calendar month of birth, and term status defined by gestational age in weeks (wGA) at birth (full-term [FT], ≥37 wGA; late preterm [LPT], 32-36 wGA; early preterm [EPT], 28-31 wGA; extreme preterm [ExPT], ≤27 wGA)

Estimation of Model Inputs

- Model inputs related to infants and vaccinated mothers are set forth in Table 1
  - All model inputs related to infants are detailed in the recent publication by Bolanos et al.[6]; cost inputs have since been inflated to 2024 US dollars[7]
  - The model estimates lifetime RSV-related outcomes for women vaccinated during pregnancy who are assumed to be protected by RSVpreF for the following 41 months (~3.5 years) based on extrapolation of efficacy data from the RENOIR trial[8]; inputs related to maternal benefit of RSVpreF were therefore estimated for model years 1-5, and ≥6, respectively, representing weighted averages for persons aged 29-34 years and 34-99 years (assuming average age of pregnant women was 29 years)

Table 1. Model inputs

Parameter	Value	Reference
Model input related to infants		
No. live born infants	209,516	4
Incidence rates	*See Table 2*	6
Case-fatality rate	0.28 per 100 hospitalizations	6
Intervention effectiveness	*See Figure 1*	6
Intervention costs	RSVpreF: $75.98 (economically-justifiable price assuming willingness-to-pay of $16,710/QALY (based on 1x GDP in Chile); nirsevimab: $260.00	9,10
Administration costs	$4 (for both interventions)	Assumption
Medical care costs	RSV-H: FT/LPT: $2,312 for <2 mo., $740 for 2-<12 mo.; EPT/ExPT: $2,312 RSV-EW: $70	6,7
Cost of caregiver work loss	RSV-H: $89-226 per episode; RSV-EW: $57 per episode	6,7
Cost of RSV-related mortality	$85,154	6,7
Infant QALY loss	RSV-H: 0.0157; RSV-EW: 0.0061	11
Intervention uptake	90% (for both interventions)	12,13
Model inputs related to mothers		
No. pregnant women	206,623	6
Average age of pregnant women	29 years	14
Incidence rates (per 100,000)	RSV-H: 13.7 for years 1-5 post vaccination; 32.8 for years ≥6 RSV-EW: 19.6 for years 1-5; 303.0 for years ≥6	15-17
Case-fatality rate (per 100)	2.12 for years 1-5; 10.2 for years ≥6	18,19
Maternal QALY loss	RSV-H: 0.0167; RSV-EW: 0.054	21
Medical care costs	RSV-H: $4,007; RSV-EW: $125	22,23
Indirect costs	RSV-H: $336 for years 1-5; $171 for years ≥6 RSV-EW: $167 for years 1-5; $84 for years ≥6	24-26

EW: emergency ward; H: hospital; FT: full-term; LPT: late preterm; EPT: early preterm; ExPT: extreme preterm; QALY: quality-adjusted life year

Analyses

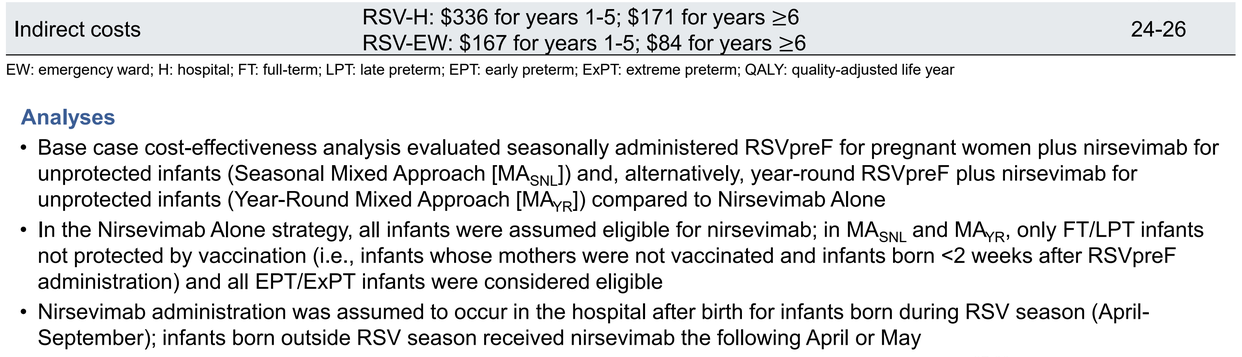
- Base case cost-effectiveness analysis evaluated seasonally administered RSVpreF for pregnant women plus nirsevimab for unprotected infants (Seasonal Mixed Approach [MA_{SNL}]) and, alternatively, year-round RSVpreF plus nirsevimab for unprotected infants (Year-Round Mixed Approach [MA_{YR}]) compared to Nirsevimab Alone
- In the Nirsevimab Alone strategy, all infants were assumed eligible for nirsevimab; in MA_{SNL} and MA_{YR}, only FT/LPT infants not protected by vaccination (i.e., infants whose mothers were not vaccinated and infants born <2 weeks after RSVpreF administration) and all EPT/ExPT infants were considered eligible
- Nirsevimab administration was assumed to occur in the hospital after birth for infants born during RSV season (April-September); infants born outside RSV season received nirsevimab the following April or May
- RSVpreF was assumed to be administered to pregnant women between 32-36 weeks of gestation[27-30]:
  - In MA_{SNL}, RSVpreF was assumed to be administered from February-August (i.e., to target infants born during peak RSV season [April-September])
  - In MA_{YR}, RSVpreF was assumed to be administered to infants born year-round
- Maternal benefit was calculated as the incremental difference in clinical and economic outcomes among women who received maternal RSVpreF (compared to having not received vaccine)
- Costs are reported in 2024 US dollars; future costs and QALYs were discounted 3% annually
- Scenario analyses were conducted in which RSVpreF uptake was varied (i.e., to 50% and 70%) for both Mixed Approaches

Table 1. Rates of RSV per 1,000 by care setting, age, and term status

	Month of Age											
	<1	1 - <2	2 - <3	3 - <4	4- <5	5 - <6	6 - <7	7 - <8	8 - <9	9 - <10	10 - <11	11 - <12
Hospital												
FT	48	115	92	60	40	41	37	32	27	24	20	17
LPT	84	200	160	148	100	102	64	54	45	40	34	29
EPT/ExPT	23	54	43	142	96	98	255	215	182	161	136	118
EW												
FT	54	177	199	269	297	183	209	143	142	142	103	142
LPT	94	308	347	666	734	451	356	244	242	242	176	242
EPT/ExPT	26	84	94	640	706	434	1,425	977	969	969	704	969

FT: full term; LPT: late preterm; EPT: early preterm; ExPT: extreme preterm

Figure 1. Estimates of intervention effectiveness*

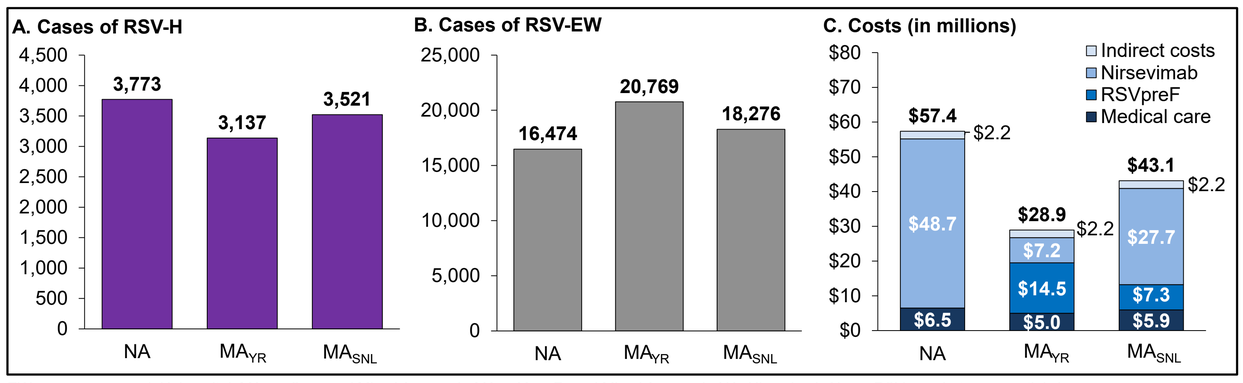


*RSVpreF effectiveness assumed to be 0% for infants born <2 weeks after vaccine was administered and early/extreme preterm infants
EW: emergency ward; H: hospital; RSV: respiratory syncytial virus

RESULTS

- With Nirsevimab alone, there were 20,247 cases of RSV-LRTI, including 3,773 hospitalizations, and associated costs of $57.4 million (medical: $6.5M, intervention: $48.7M, and indirect: $2.2M (Figure 2)
- MAYR would prevent 635 additional infant hospitalizations and reduce maternal hospitalizations by 98, with a total cost reduction of $29.8 million due to decreased nirsevimab use and maternal health benefits (Table 3)
- MASNL would prevent 251 additional infant hospitalizations and reduce maternal hospitalizations by 49, resulting in a total cost savings of $14.9 million
- Both Mixed Approaches yielded dominant incremental cost-effectiveness ratios (i.e., more effective and less costly than Nirsevimab Alone)
- In scenario analyses for both Mixed Approaches, total costs decreased as RSVpreF uptake increased (Figure 3)

Figure 2. RSV-related outcomes among infants in base case analyses (not including maternal benefit)



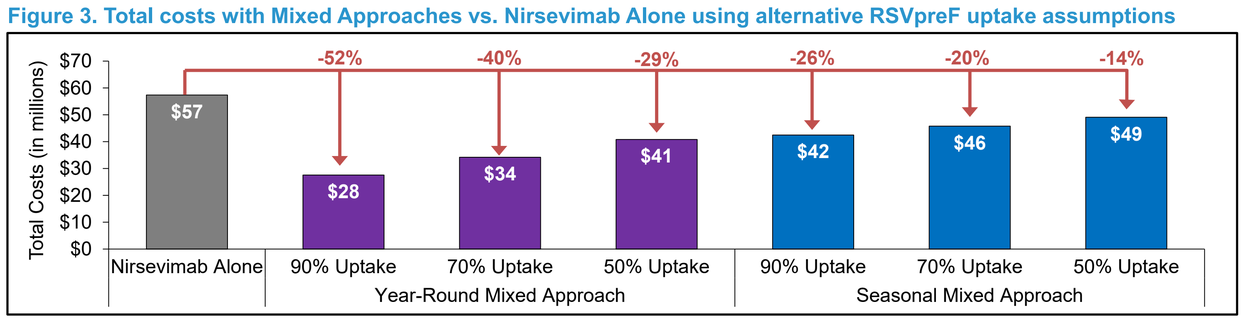
EW: emergency ward; H: hospital; MA_{SNL}: Seasonal Mixed Approach; MA_{YR}: Year-Round Mixed Approach; NA: Nirsevimab Alone; RSV: respiratory syncytial virus

Table 3. Incremental outcomes attributable to infant and maternal benefit with use of Mixed Approaches vs. Nirsevimab Alone for primary protection of infants aged <1 year in Chile

	Base Case		Scenario Analyses			
	90% RSVpreF Uptake		70% RSVpreF Uptake		50% RSVpreF Uptake	
	Year-Round	Seasonal	Year-Round	Seasonal	Year-Round	Seasonal
Use of interventions						
No. RSVpreF doses administered	181,555	90,945	141,210	70,735	100,864	50,525
No. infants protected by RSVpreF	177,761	89,010	138,259	69,230	98,756	49,450
No. infants receiving nirsevimab*	-159,806	-80,095	-124,294	-62,296	-88,781	-44,497
Clinical outcomes						
No. of cases						
Infants						
RSV-H	-635	-251	-494	-196	-353	-140
RSV-EW	4,295	1,802	3,340	1,402	2,386	1,001
Maternal benefit**						
RSV-H	-98	-49	-76	-38	-54	-27
RSV-EW	-71	-35	-55	-28	-39	-20
No. of RSV-related deaths						
Infants	-2	-1	-1	-1	-1	0
Maternal benefit**	-2	-1	-2	-1	-1	-1
QALYs gained						
Infants	35	13	27	10	20	7
Maternal benefit	75	37	58	29	41	20
Total (infant+maternal)	110	50	85	39	61	28
Economic outcomes (in millions)						
Infants						
Medical care costs	-$1.5	-$0.5	-$1.2	-$0.4	-$0.8	-$0.3
Indirect costs (non-medical)	-$0.02	$0.01	-$0.01	$0.00	-$0.01	$0.00
Maternal benefit**						
Medical care costs	-$0.4	-$0.2	-$0.3	-$0.2	-$0.2	-$0.1
Indirect costs (non-medical)	-$0.9	-$0.4	-$0.7	-$0.3	-$0.5	-$0.2
Intervention						
RSVpreF	$14.5	$7.3	$11.3	$5.7	$8.1	$4.0
Nirsevimab	-$41.4	-$21.0	-$32.2	-$16.3	-$23.0	-$11.7
Total (infant+maternal+intervention)	-$29.8	-$14.9	-$23.1	-$11.6	-$16.5	-$8.3
Cost-effectiveness (incl. Maternal Benefit)						
Cost per QALY (societal perspective)	Dominant	Dominant	Dominant	Dominant	Dominant	Dominant

*No. infants receiving nirsevimab with Nirsevimab Alone: 187,728
**Outcomes among women who received maternal vaccine during pregnancy
EW: emergency ward; H: hospital; RSV: respiratory syncytial virus; QALY: quality-adjusted life year

Figure 3. Total costs with Mixed Approaches vs. Nirsevimab Alone using alternative RSVpreF uptake assumptions



LIMITATIONS

- Because effectiveness against infant RSV was employed as estimated by Hodgson et al.,[10] model outcomes are not necessarily aligned with trial endpoints; additionally, based on Hodgson et al., nirsevimab effectiveness was assumed to be invariant by age at administration
- Lacking data specific to pregnant women, effectiveness inputs employed to quantify maternal benefit were assumed consistent with observed effectiveness among the non-pregnant sample of adults from the RENOIR trial[8]
- Chile-specific data were employed to extent possible; otherwise, data from comparable country settings were employed (e.g., QALY loss, distribution of rates by age/term status)
- Several potential benefits of vaccination are not captured in the model (e.g., indirect impact on other populations, prevention of upper respiratory tract infections)

CONCLUSIONS

- **Complementary strategies would prevent a larger number of severe RSV-LRTI episodes than nirsevimab alone at a substantially lower cost**
- **Higher uptake of maternal vaccination is expected to further enhance cost savings with complementary strategies vs. nirsevimab alone**
- **The benefits of complementary strategies are even greater when accounting for potential direct projection of RSVpreF to vaccinated mothers**

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