EE41

Digital poster
Supplemental data

SCAN ME

Adjuvanted RSVPreF3 Vaccine for Respiratory Syncytial Virus Prevention in the United Kingdom, Spain and Australia: A Climate Change Impact Analysis

A vaccination programme using one dose of the adjuvanted RSVPreF3 vaccine for older adults has the potential to substantially reduce CO_2e emissions associated with RSV disease burden and management.

Anna Puggina[1], **Eleftherios Zarkadoulas[2]**, James Clark-Wright[3], Sohaib Ashraf[3], Andrea Garcia[4], Masnoon Saiyed[5], Weiwei Xu[6], Shanky Varghese[7], Rachel Castle[3], Chloe Cross[3], Chelsea Cormack[8], Nidhi Dani[9], Melissa Pegg[10]

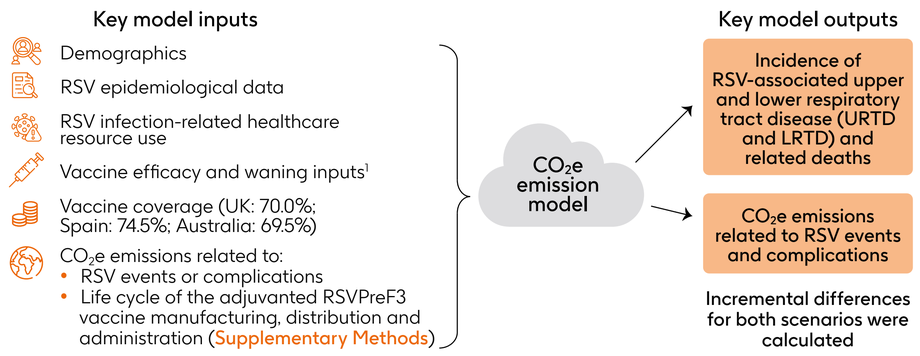
[1]GSK, Verona, Italy; [2]GSK, Wavre, Belgium; [3]GSK, London, UK; [4]GSK, Madrid, Spain; [5]GSK, Victoria, Australia; [6]IQVIA, Amsterdam, Netherlands; [7]IQVIA, Bengaluru, India; [8]GSK, Montrose, UK; [9]GSK, Zug, Switzerland; [10]York Health Economics Consortium, York, UK

Objectives

- To model the potential climate change impact of a single-dose respiratory syncytial virus (RSV) vaccination programme using the adjuvanted RSVPreF3 vaccine among older adults aged ≥80 years in the United Kingdom (UK), and aged ≥75 years in Spain and Australia.

Methods

- **Study design:** Static, multi-cohort, Markov model, based on a previously published cost-effectiveness analysis.[1,2]
  - Climate change was measured as vaccine-related or patient pathway-related carbon dioxide equivalent (CO_2e) emissions (Supplementary Methods).
- **Scenarios:** Single dose of the adjuvanted RSVPreF3 vaccine versus no vaccination.
- **Time horizon:** Vaccine efficacy is observed across 3 consecutive RSV seasons, thus a 5-year time horizon is considered with a modelled waning of efficacy.
- **Population:** Adults aged ≥80 years in the UK, ≥75 years in Spain and ≥75 years in Australia.



Results

RSV-LRTD incidence

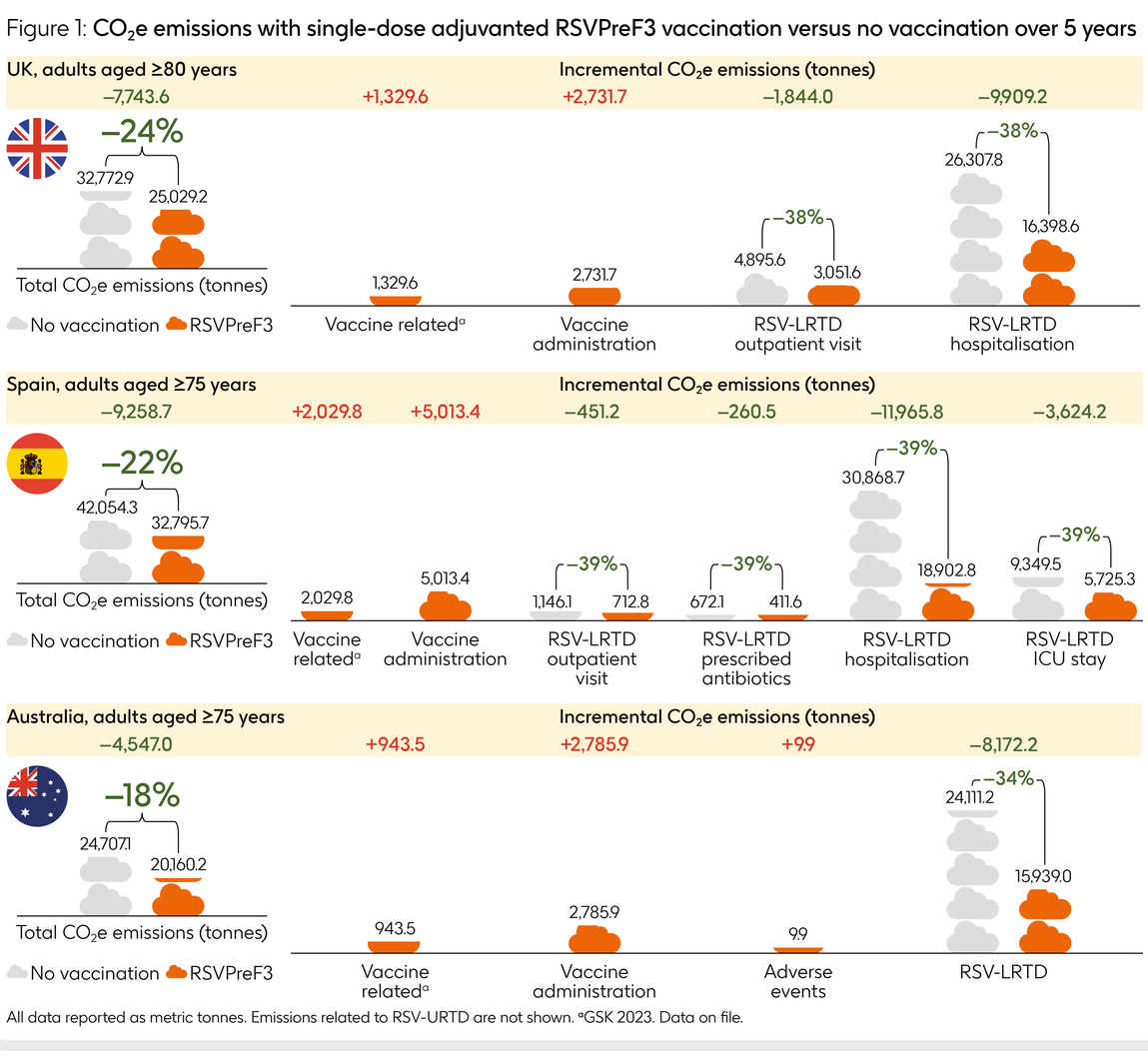
- Over a 5-year period, a single dose of the adjuvanted RSVPreF3 vaccine, compared with no vaccination, could reduce the incidence of RSV-LRTD disease events by:

37.7% UK (≥80 years) | 38.8% Spain (≥75 years) | 33.8% Australia (≥75 years)

Total reductions in CO_2e emissions

- In the UK, a single dose of the RSVPreF3 vaccine could reduce total CO_2e emissions by 24% in adults aged ≥80 years compared with no vaccination over 5 years, mostly attributed to a decrease in emissions due to RSV-LRTD-associated events (38%; Figure 1).
- The Spain and Australia analyses similarly demonstrated that adjuvanted RSVPreF3 vaccination could reduce total CO_2e emissions by 22% and 18%, respectively, among adults aged ≥75 years compared with no vaccination (Figure 1).
  - This reduction was primarily attributed to a decrease in RSV-LRTD-associated events with vaccination versus no vaccination in both countries.

Figure 1: **CO_2e emissions with single-dose adjuvanted RSVPreF3 vaccination versus no vaccination over 5 years**



All data reported as metric tonnes. Emissions related to RSV-URTD are not shown. [a]GSK 2023. Data on file.

Per patient reductions in CO_2e emissions

- Compared with no vaccination, a single dose of adjuvanted RSVPreF3 vaccination is associated with the greatest per patient CO_2e emission savings over 5 years in the UK, followed by Australia and Spain (Figure 2).

Figure 2: **Drivers of per patient CO_2e emission reductions with RSVPreF3 vaccination per country**

	Per patient CO_2e savings	Drivers: Emission input[a]	Drivers: Population[b]
UK	2.24 kg	Moderate	Oldest, requiring highest intervention
Spain	1.88 kg	Lowest	Relatively shorter length of stay for hospitalised patients
Australia	2.00 kg	Highest	Population requiring considerable intervention

[a]Emission inputs related to the management of RSV-associated LRTD. [b]Population of 3.45M (UK), 4.92M (Spain) and 2.28M (Australia).

Equivalent CO_2e emission savings

- Over five years, CO_2e savings across the UK, Spain, and Australia are equivalent to the emissions from roughly 5.4 million hospital visits, more than 36,000 one-way transatlantic flights, or the annual energy use of over 16,000 households (Figure 3).

Figure 3: **CO_2e emission savings with RSVPreF3 vaccination as equivalent to flights, hospital trips and household electricity consumption**

	UK	Spain	Australia
Hospital trips[a]	1,335,110	3,501,310	572,742
One-way transatlantic flights[b]	13,125	15,693	7,707
Annual household electricity consumption[c]	8,435	7,046	1,080

[a]An average two-way self-travel to the nearest hospital expected to be associated with 5.8 kg (UK), 2.6 kg (Spain) and 7.9 kg (Australia) CO_2e emissions for a round trip. [b]An average one-way transatlantic flight from London to New York is expected to be associated with 590 kg CO_2e emissions. [c]An average household's annual energy consumption is associated with 0.9 (UK), 1.3 (Spain) and 7.9 (Australia) metric tonnes CO_2e emissions.

Background

- Healthcare systems contribute to 4–5% of global greenhouse gas emissions.[3,4]
- Current literature has suggested that climate change is associated with adverse effects on human health.[5]
- A product carbon footprint for the adjuvanted RSVPreF3 vaccine was calculated following internationally recognised standards and was third party verified by the Carbon Trust in 2023.
- Alleviating the burden of vaccine-preventable diseases can both directly improve individual health outcomes and, by reducing CO_2e emissions generated by healthcare systems, indirectly improve public health.[6]

Conclusions

- A single-dose adjuvanted RSVPreF3 vaccination programme for older adults aged ≥75 years in the UK, Spain, and Australia has significant potential to reduce the CO_2e emissions associated with RSV treatment and management over 5 years.
- These findings suggest that RSV vaccination improves not only public health outcomes, but also reduces the CO_2e emissions associated with RSV disease management, hence contributing to national environmental goals.
- The incorporation of these results in the evaluation of vaccines is crucial to support policymakers and clinicians in making decisions about the wider benefits of RSV prevention programmes.

Abbreviations

CO_2e, carbon dioxide equivalent; **ICU,** intensive care unit; **LRTD,** lower respiratory tract disease; **M,** million; **UK,** United Kingdom; **URTD,** upper respiratory tract disease; **RSV,** respiratory syncytial virus.

References

1. Waize M et al. *Exp Rev Vaccin.* 2025;24(1):782–796.
2. La EM et al. *Hum Vaccin Immunother.* 2024;20(1):2432745.
3. Lenzen M et al. *Lancet Planet Health.* 2020;4:e271–79.
4. Rodríguez-Jiménez L et al. *J Adv Nurs.* 2023;79:2830–44.
5. Rocque RJ et al. *BMJ Open.* 2021;11(6):e046333.
6. Patenaude B et al. *J Clim Change Health.* 2022;6:100127.

Disclosures

AP, EZ, JCW, RC, CCr, CCo, ND: Employees of, and hold financial equities in GSK. **SA, AG, MS, AA:** Employees of GSK. **WX, SV:** Employees of IQVIA. **MP:** Participated in board, society, committee or advocacy groups in a leadership or fiduciary role for the HTAi Environmental Sustainability in HTA working group.

Acknowledgements

This study was funded by GSK (VEO-001582). The authors acknowledge Ashwanee Ashock Kjelsnes for contributions to the study. The authors also acknowledge Evie Jackson, Costello Medical, London, UK for medical writing and editorial assistance based on author input and the Costello Medical Creative team for design support. All costs associated with development of this poster were funded by GSK.

Presenting author: Eleftherios Zarkadoulas, eleftherios.x.zarkadoulas@gsk.com

Adjuvanted RSVPreF3 Vaccine for Respiratory Syncytial Virus Prevention in the United Kingdom, Spain and Australia: A Climate Change Impact Analysis

Supplemental Data

Anna Puggina[1], **Eleftherios Zarkadoulas[2]**, James Clark-Wright[3], Sohaib Ashraf[3], Andrea Garcia[4], Masnoon Saiyed[5], Weiwei Xu[6], Shanky Varghese[7], Rachel Castle[3], Chloe Cross[3], Chelsea Cormack[8], Nidhi Dani[9], Melissa Pegg[10]

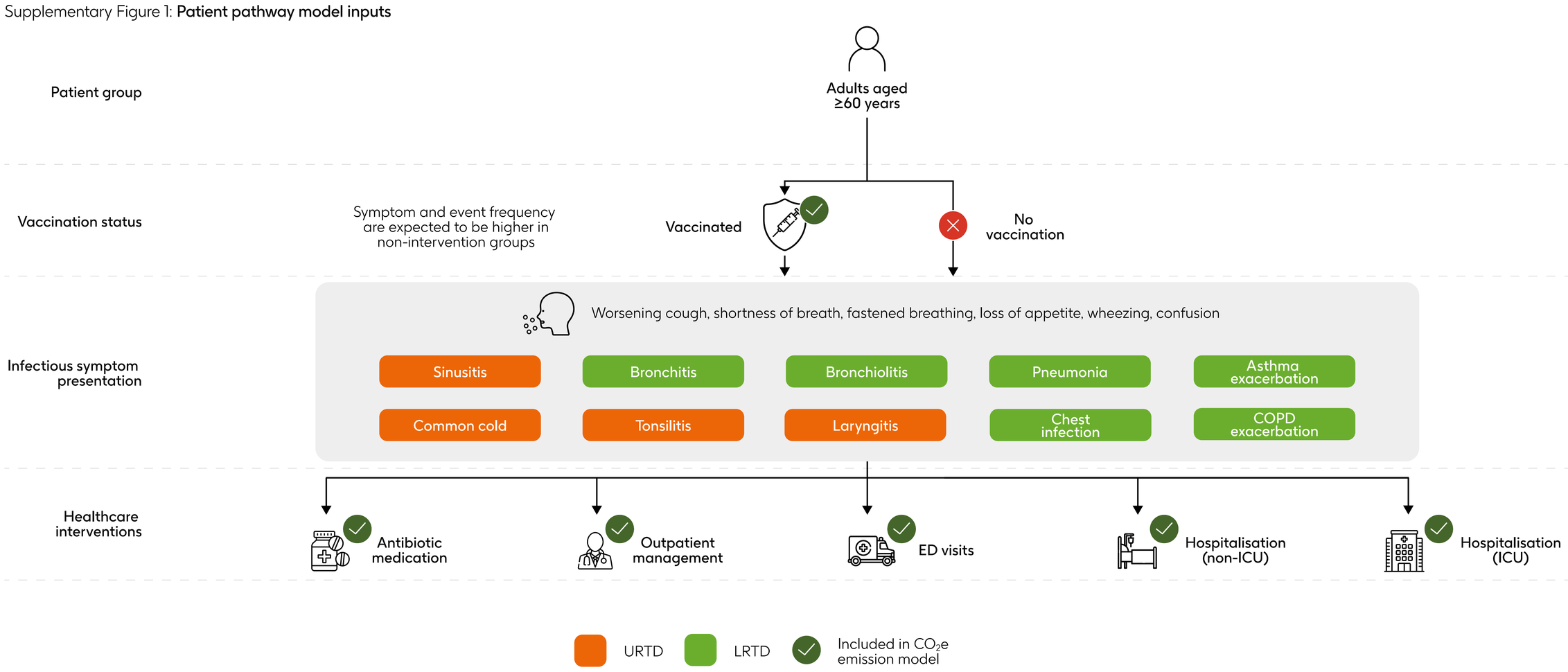
[1]GSK, Verona, Italy; [2]GSK, Wavre, Belgium; [3]GSK, London, UK; [4]GSK, Madrid, Spain; [5]GSK, Victoria, Australia; [6]IQVIA, Amsterdam, Netherlands; [7]IQVIA, Bengaluru, India; [8]GSK, Montrose, UK; [9]GSK, Zug, Switzerland; [10]York Health Economics Consortium, York, UK

Supplementary Methods

CO_2e emission inputs

- All vaccine-related CO_2e emissions were derived from a third party-verified product carbon footprint of the RSVPreF3 vaccine for the UK market, based on 2022 manufacture. This value was assessed as the same for Spain and adjusted for Australia, due to the increased impact of distribution.
- Patient pathway model inputs are summarised in Supplementary Figure 1. For other inputs (beyond vaccine-related inputs), Sustainable Health Coalition (SH Coalition) estimates of carbon emissions associated with common healthcare interactions were used. SH Coalition estimates were prioritised due to clear definitions of processes included and boundaries considered and the availability of an average estimate for a disease-agnostic patient.
  - This included emission data for general practitioner consultation, patient and ambulance travel (for the UK) and hospitalisation (daily for the UK).
- Emissions not covered by SH Coalition were estimated using existing benchmarks, conversion factors and direct estimations identified through secondary research.
  - Medication emissions were estimated based on available molecule benchmarks influenced by the complexity of molecule synthesis.
  - Patient travel and ambulances outside the UK were estimated based on average travel distances for these markets, and published conversion factors (CO_2e per km [kg]).
  - Emissions estimated using secondary research included those associated with hospitalisation and ICU (daily for Spain and Australia), diagnostic tests (Australia) and ED visits (Australia).

Supplementary Figure 1: **Patient pathway model inputs**



Abbreviations

CO_2e, carbon dioxide equivalent; **COPD,** chronic obstructive pulmonary disease; **ED,** emergency department; **ICU,** intensive care unit; **LRTD,** lower respiratory tract disease; **RSV,** respiratory syncytial virus; **SH Coalition,** Sustainable Health Coalition; **UK,** United Kingdom; **URTD,** upper respiratory tract disease.

Presenting author: Eleftherios Zarkadoulas, eleftherios.x.zarkadoulas@gsk.com