Cost-effectiveness of older adult immunisation against RSV

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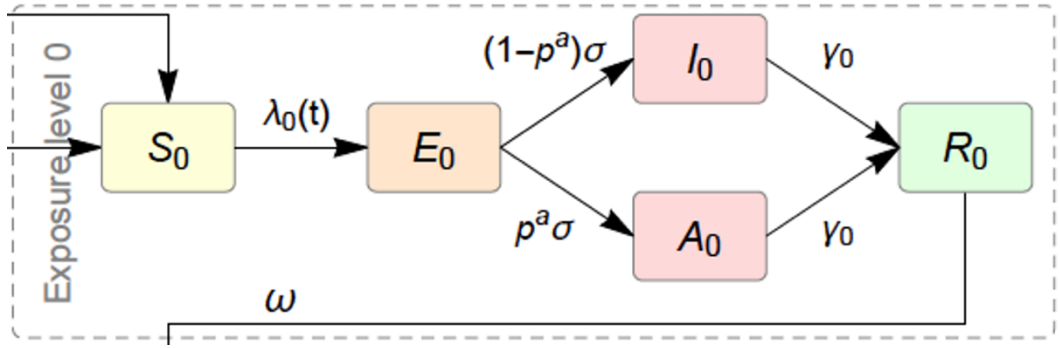
PROMISE-GAM

23/05/23

Modelling RSV transmission

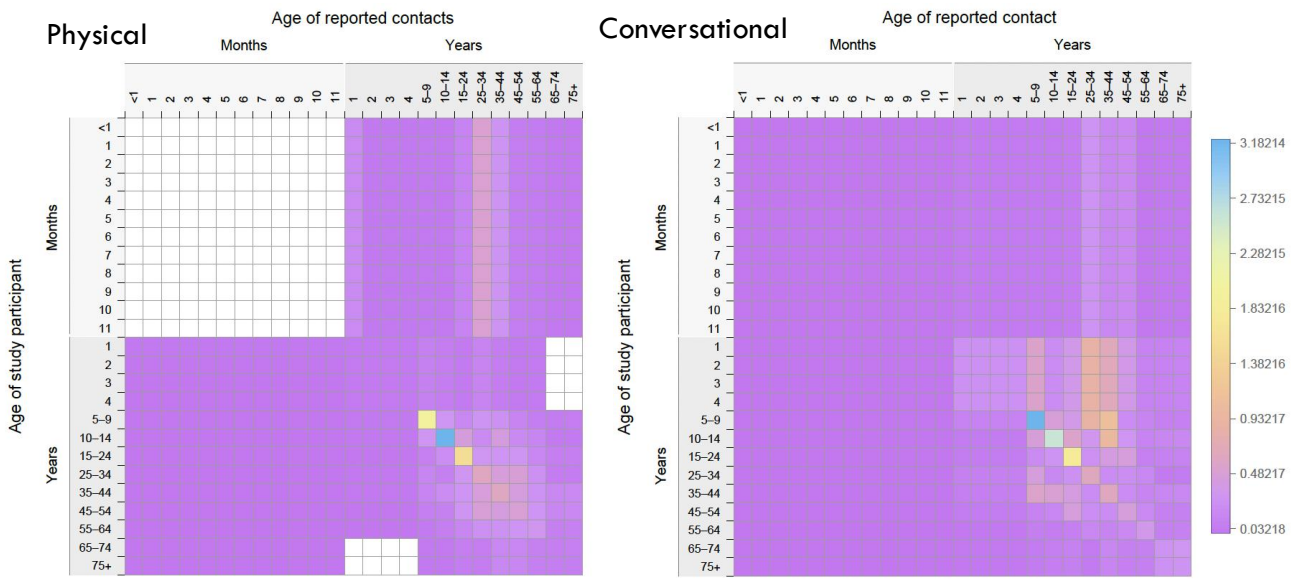
SEIRS model fitted to RDMS (RSV positive samples)



S: susceptible
E: exposure but not yet infectious
A: Infected but asymptomatic
I: Infected but symptomatic
R: Post-infection immunity (temp)

25 age groups:
Monthly up to 11 months, 1, 2, 3, 4, 5-9, 10-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75+ years

Contact matrix from POLYMOD



Updated risks

Symptomatic cases
- Taken from model

Hospital cases
- Reeves et al. 2017 *Influenza Other Respir Viruses*
- Reeves et al. 2019 *J Infect*
- **Taylor et al. 2016 *BMJ***
- Sharp et al. 2022 *Influenza Other Respir Viruses*

GP consultations
- Cromer et al. 2017 *Lancet Public Health*
- **Taylor et al. 2016 *BMJ***
- **Fleming et al. 2015 *BMC Inf Dis***

Annual burden health outcomes of RSV in England and Wales

↓

Estimated risk of health outcome per infection

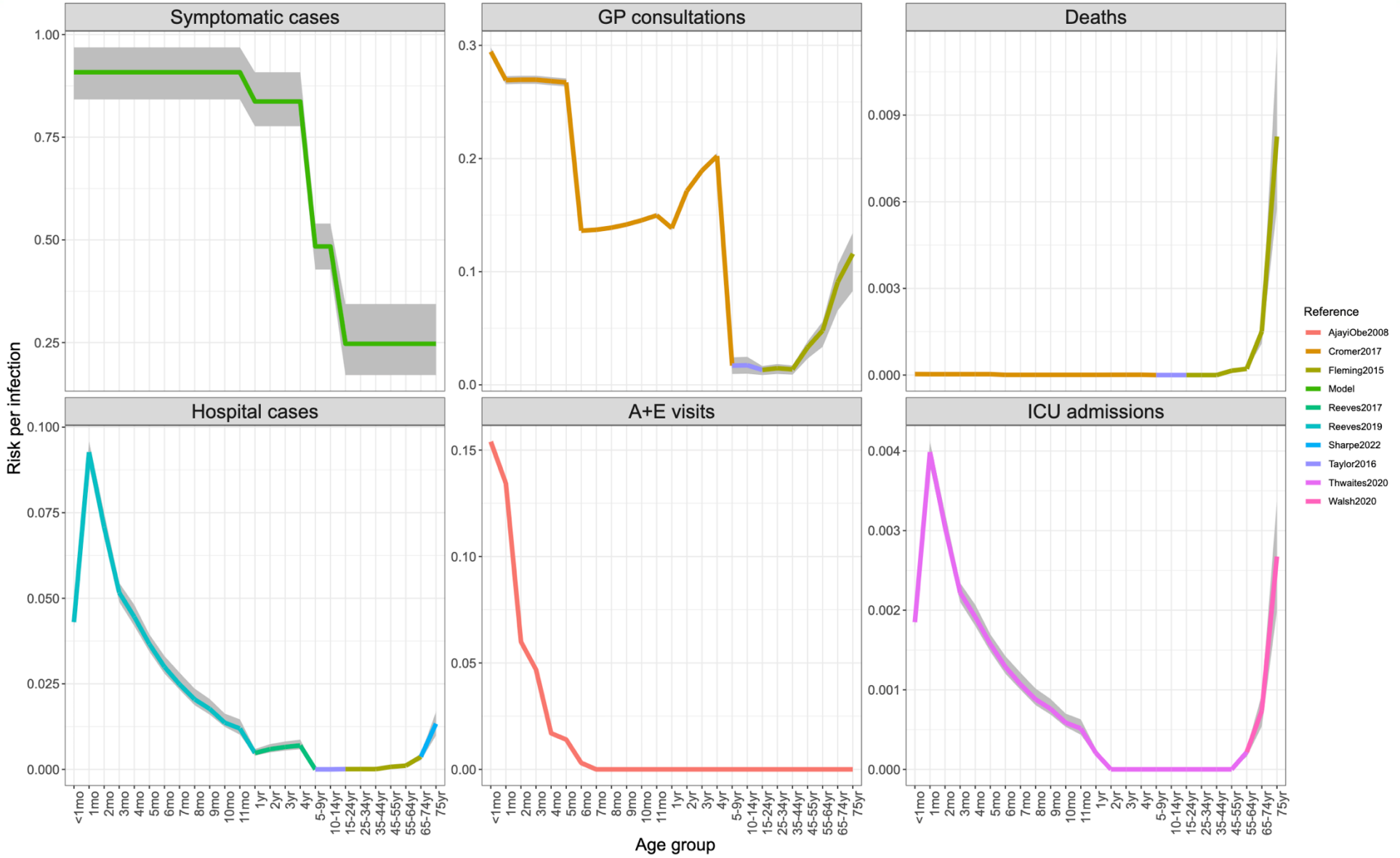
ICU
- Thwaites et al. 2020 *Eur J Pediatr*
- **Walsh et al. 2022 *Health Sci Rep***

A+E
- Ajayi-Obe et al. 2008 *Epidemiol Infect*

Deaths
- Cromer et al. 2017 *Lancet Public Health*
- **Li et al. 2023 *Infect Dis Ther***

Update risks

Risk per infection: outcome incidence/ model predicted incidence



Updated Economic parameters

COSTS

GP consultations:

- £36. *Unit costs manual*

A + E Visits:

- **£182.28.** *National schedule of NHS costs (T0_)*

QALY LOSS

SUBGROUP	QALY LOSS	REFERENCE
< 5 years Symptomatic	2.336×10^{-3} (0.269×10^{-3}–9.255×10^{-3})	Hodgson et al. 2020
≥5 years symptomatic	1.448×10^{-3} (0.135×10^{-3}–5.928×10^{-3})	
< 5 years hospitalisations	4.098×10^{-3} (0.624×010^{-3}–13.141×10^{-3})	
≥5 years hospitalisations	2.990×10^{-3} (0.346×10^{-3}–11.387×10^{-3})	

Hospital cases

	MEDIAN RSV-RELATED HOSPITAL ADMISSION COST (£, 95% CrI)	
AGE GROUP	SHORT-STAY ONLY	SHORT- AND LONG-STAY
<15 years of age	1100.23 (1029.66–1253.16)	1909.86 (1599.19– 3711.22)
>= 15 years of age	652.29 (585.37–740.31)	1753.21 (1233.30– 2739.47)

*Paediatric Acute Bronchiolitis with CC Score 0–5+ (PD15A–PD15D). *National schedule of NHS costs*

*Unspecified Acute Lower Respiratory Infection with/without Interventions 0–13+ (DZ22K–DZ22Q). *National schedule of NHS costs*

ICU admissions

AGE GROUP	MEDIAN RSV-RELATED ICU ADMISSION COST (£, 95% CrI)
<15 years of age	2905.20 (2282.80–3862.67)
>= 15 years of age	2324.80 (1948.25–2653.25)

* Paediatric Critical Care, Advanced Critical Care 1–5 (XB01Z–XB07Z). *National schedule of NHS costs*

*Adult Critical Care, 0–6+ Organs Supported (XC01Z–XC07Z).

Capturing immune waning

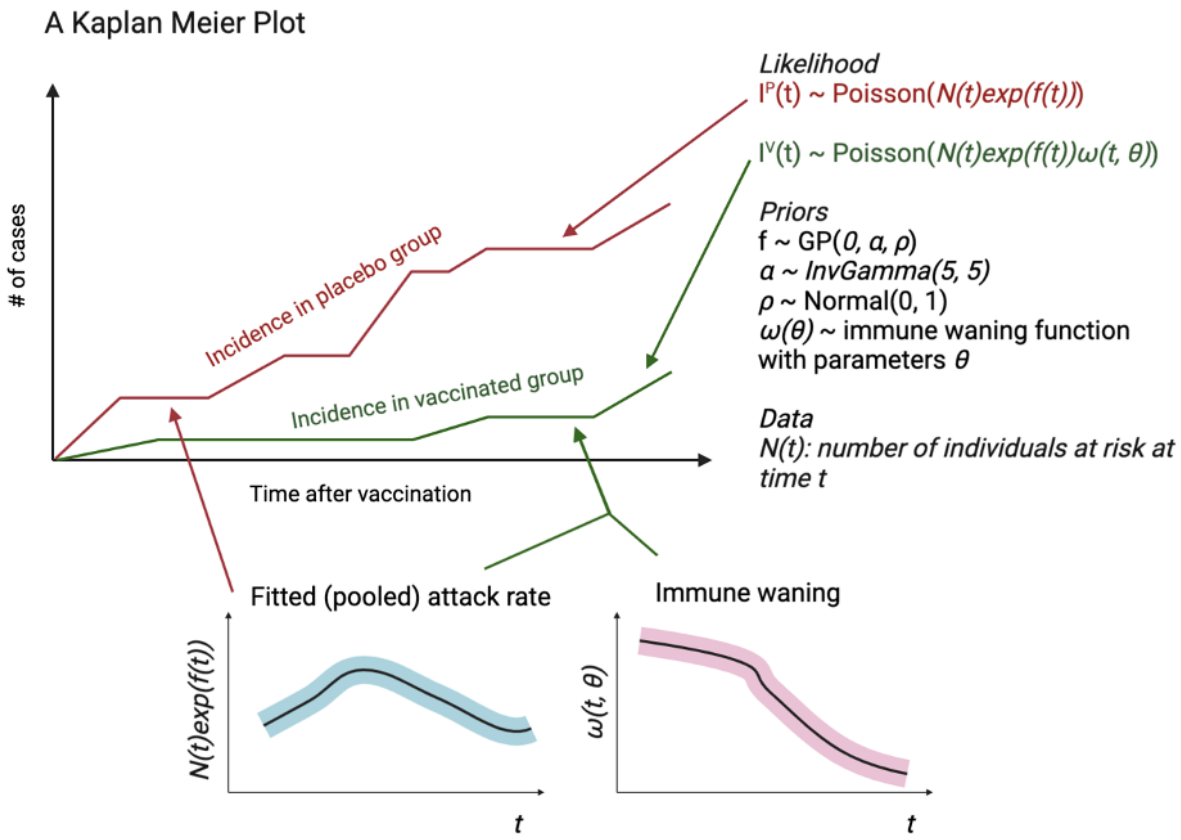


Figure 1. Schematic showing the hierarchical Bayesian model to estimate the time-varying efficacy given a Kaplan Meier plot.

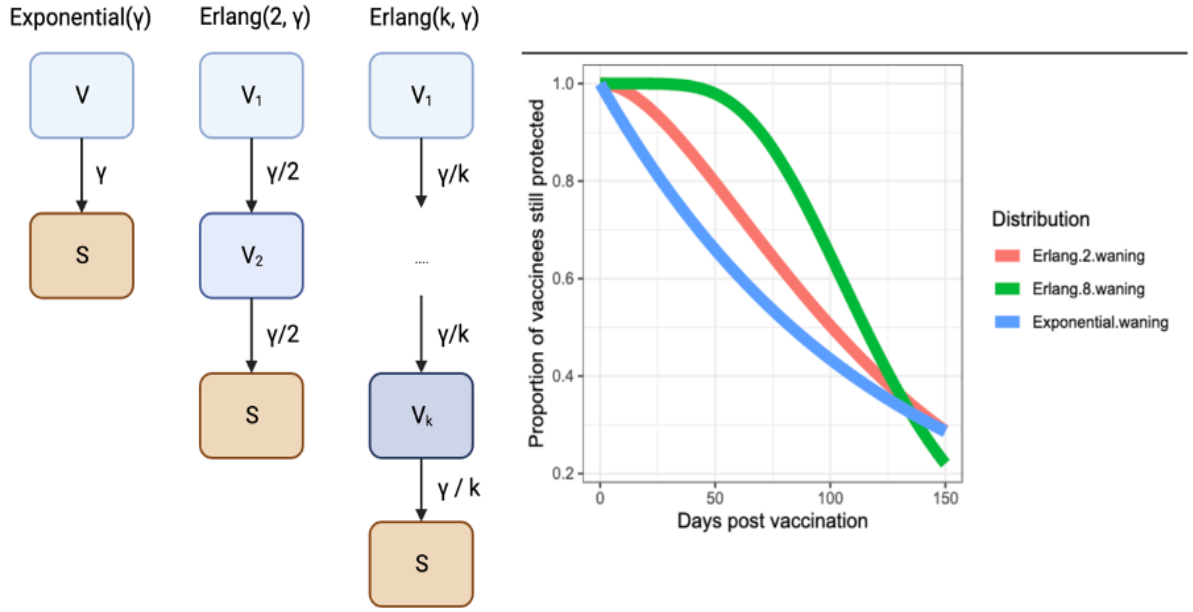


Figure 2. Schematic showing the relationship between exponential and erlang-k distributions in the context of dynamic transmission modelling. By chaining k compartments, the waning following an Erlang-k distribution which has more flexibility in waning structure in comparison to an Exponential distribution.

Older adult vaccination via GSK's RSVPreF3

Implementation of OA vaccination

https://www.gov.uk/government/statistics/seasonal-flu-vaccine-uptake-in-gp-patients-monthly-data-2021-to-2022

Programmes:

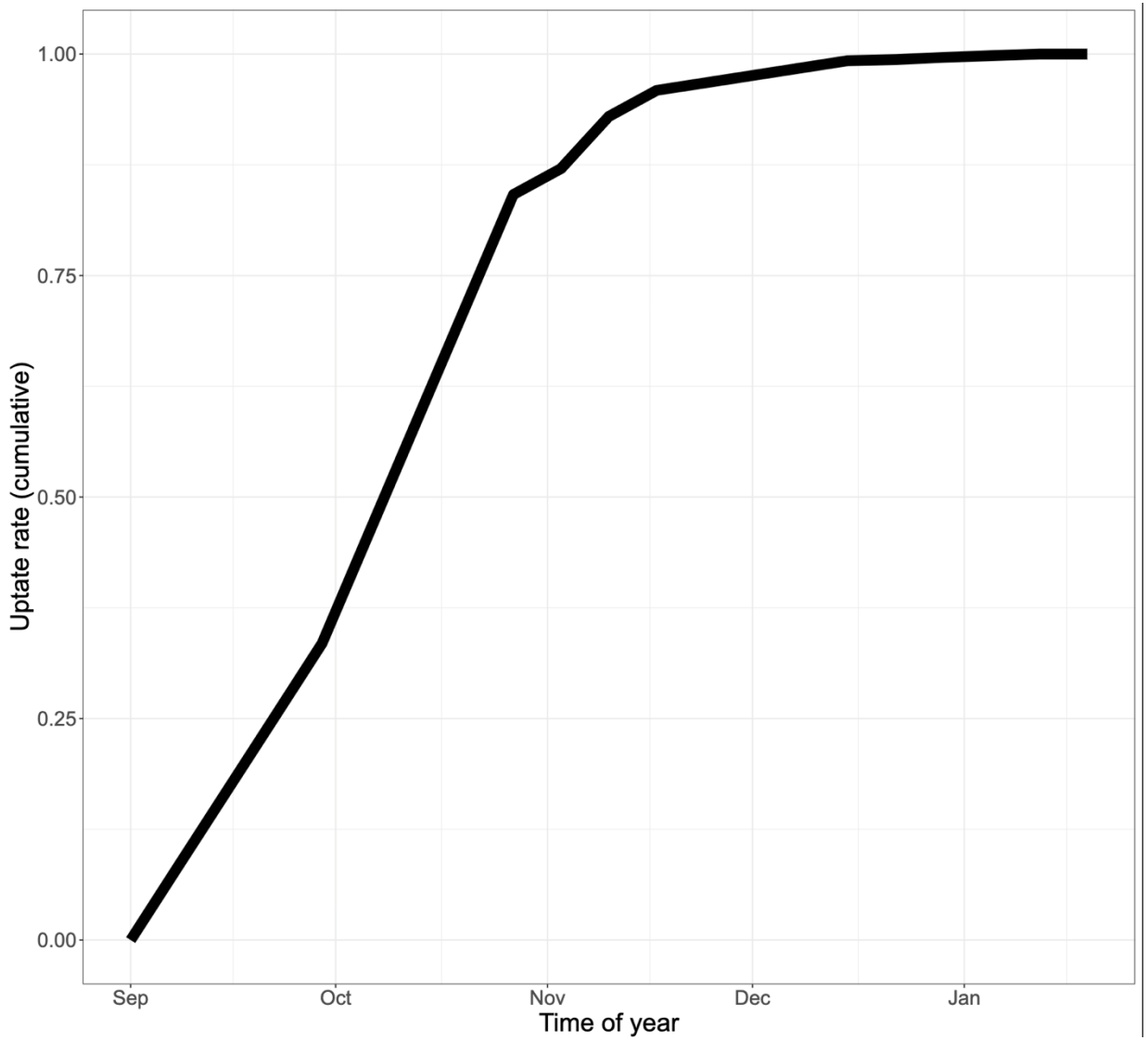
65+ years and older

75 + years and older

Coverage: 70%

Update rate:

As observed for influenza



Modelling OA (implementation)

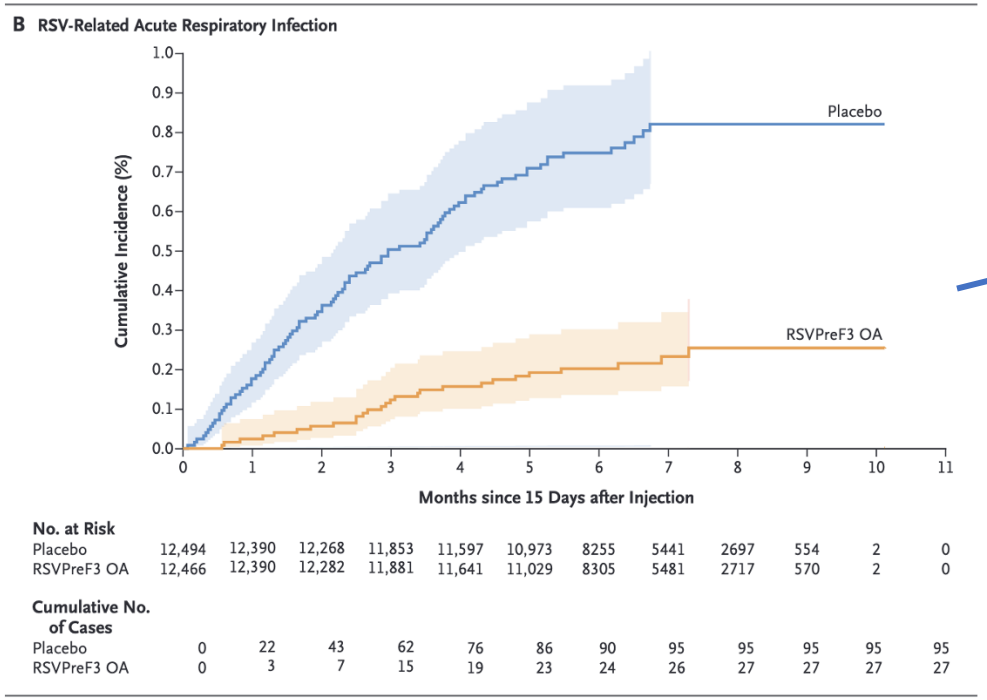
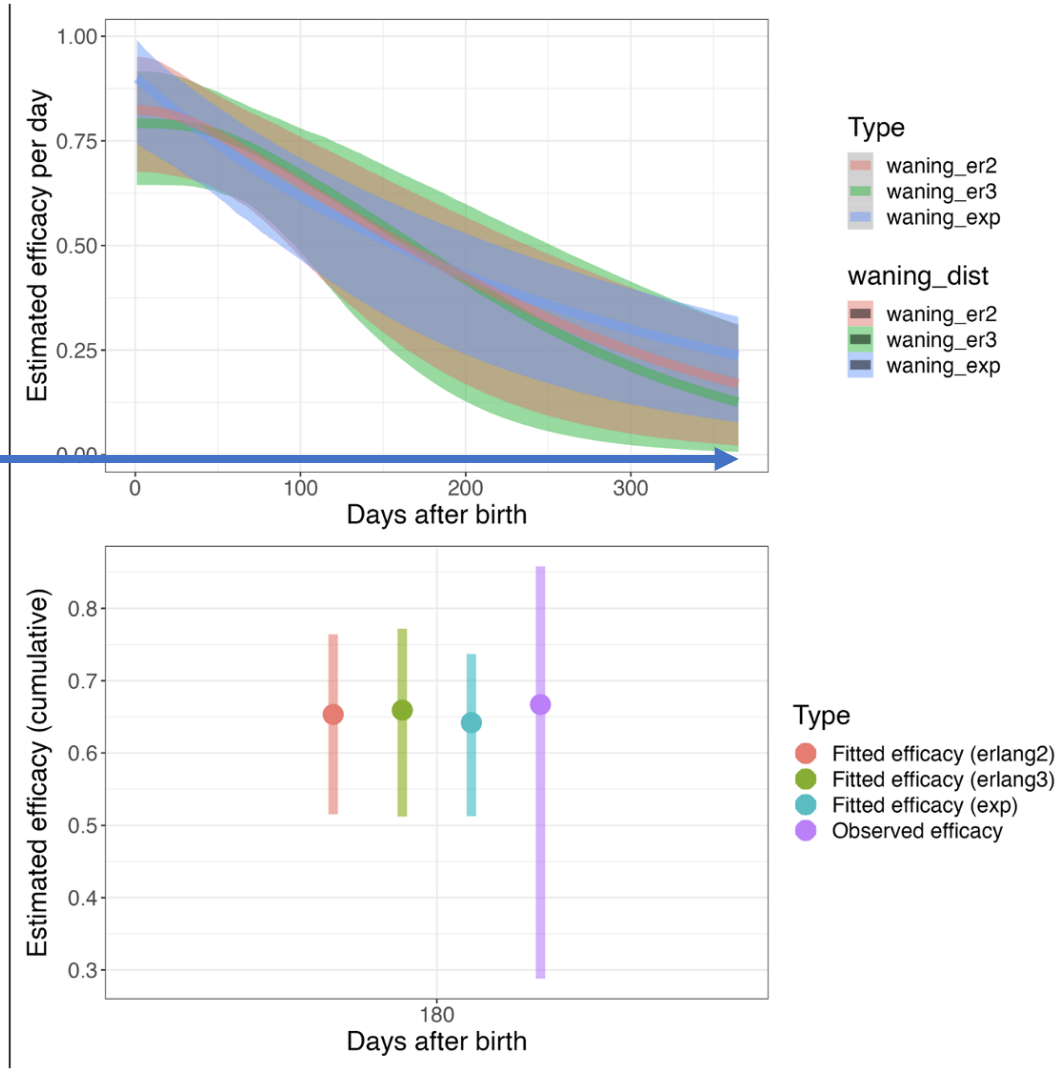


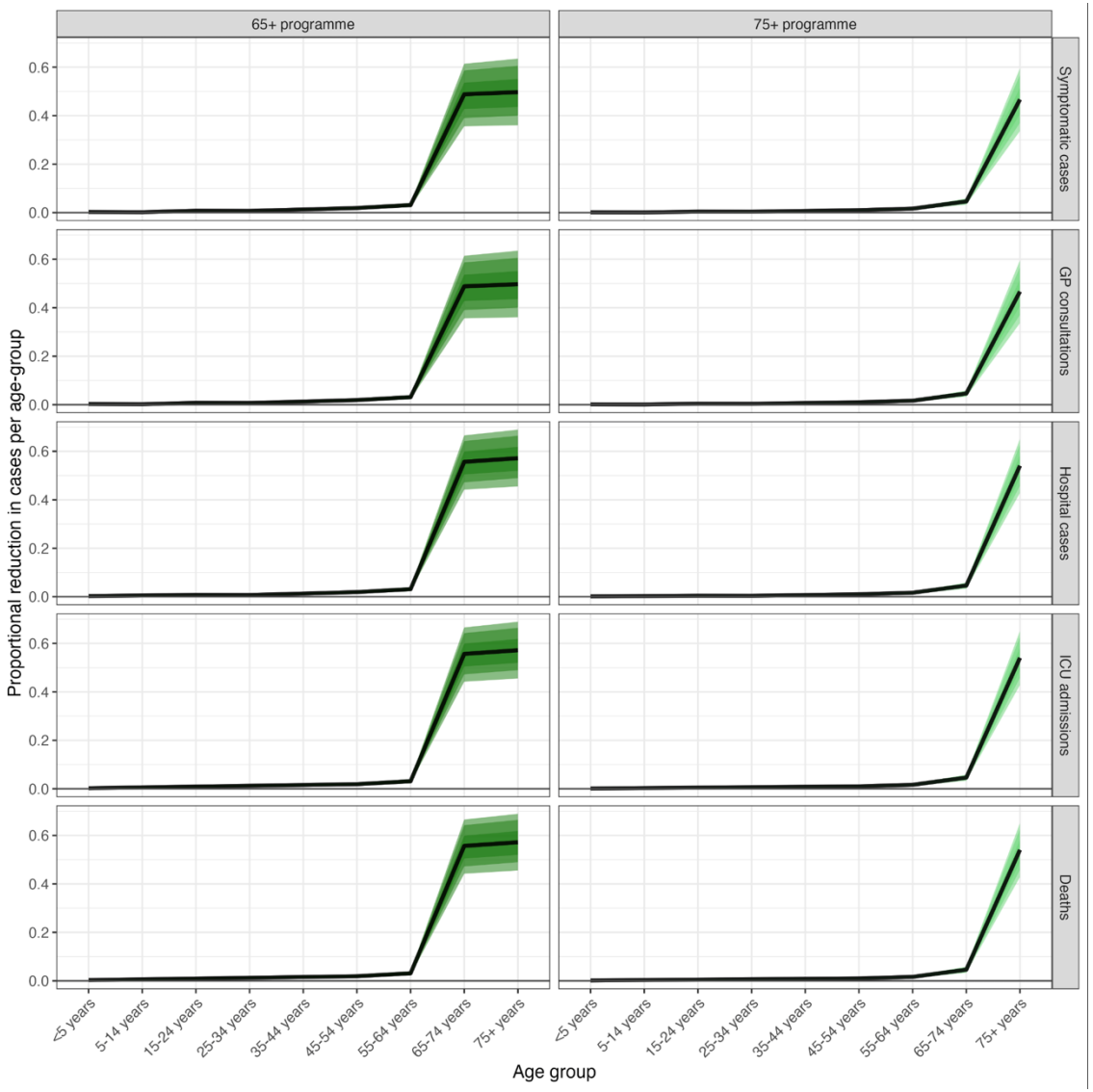
Figure 10. Figure 2B taken from [Papi2023]. The Kaplan-Meier plots show the efficacy of RSVPreF3 OA vaccine in preventing RSV-related Acute Respiratory Infection.



0.137 (95% 0.007–0.308) of infants still have protection 365 days after vaccination.

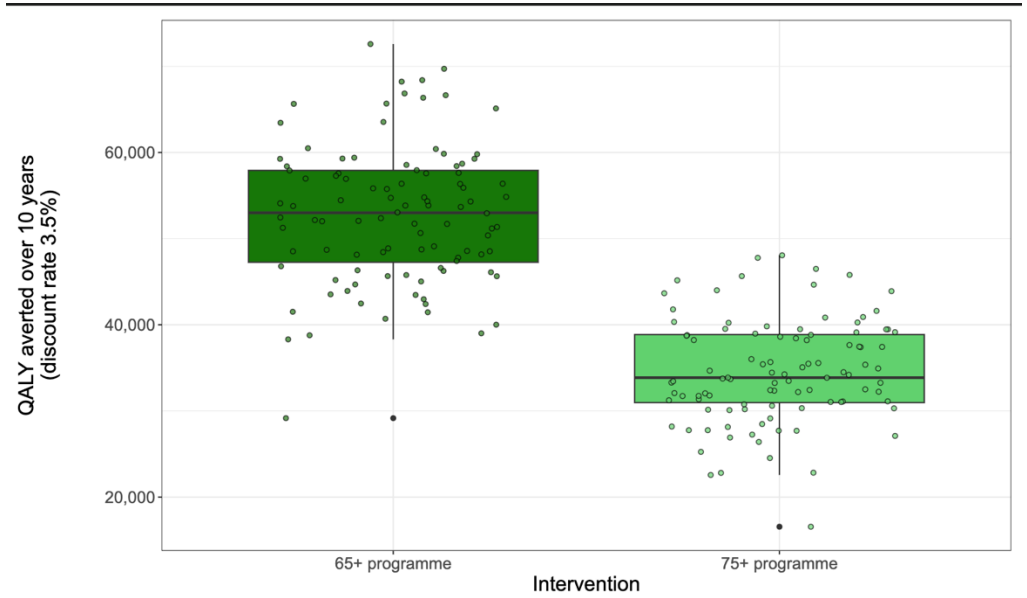
Figure 12. The posterior distributions and comparison to the quoted efficacy in [Papi2023]

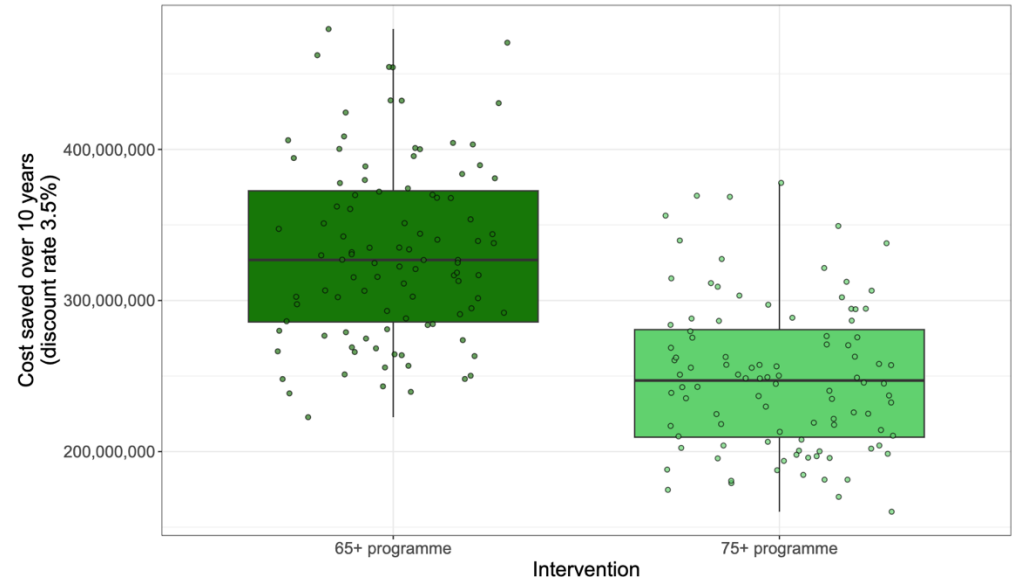
Modelling OA vaccination (impact)

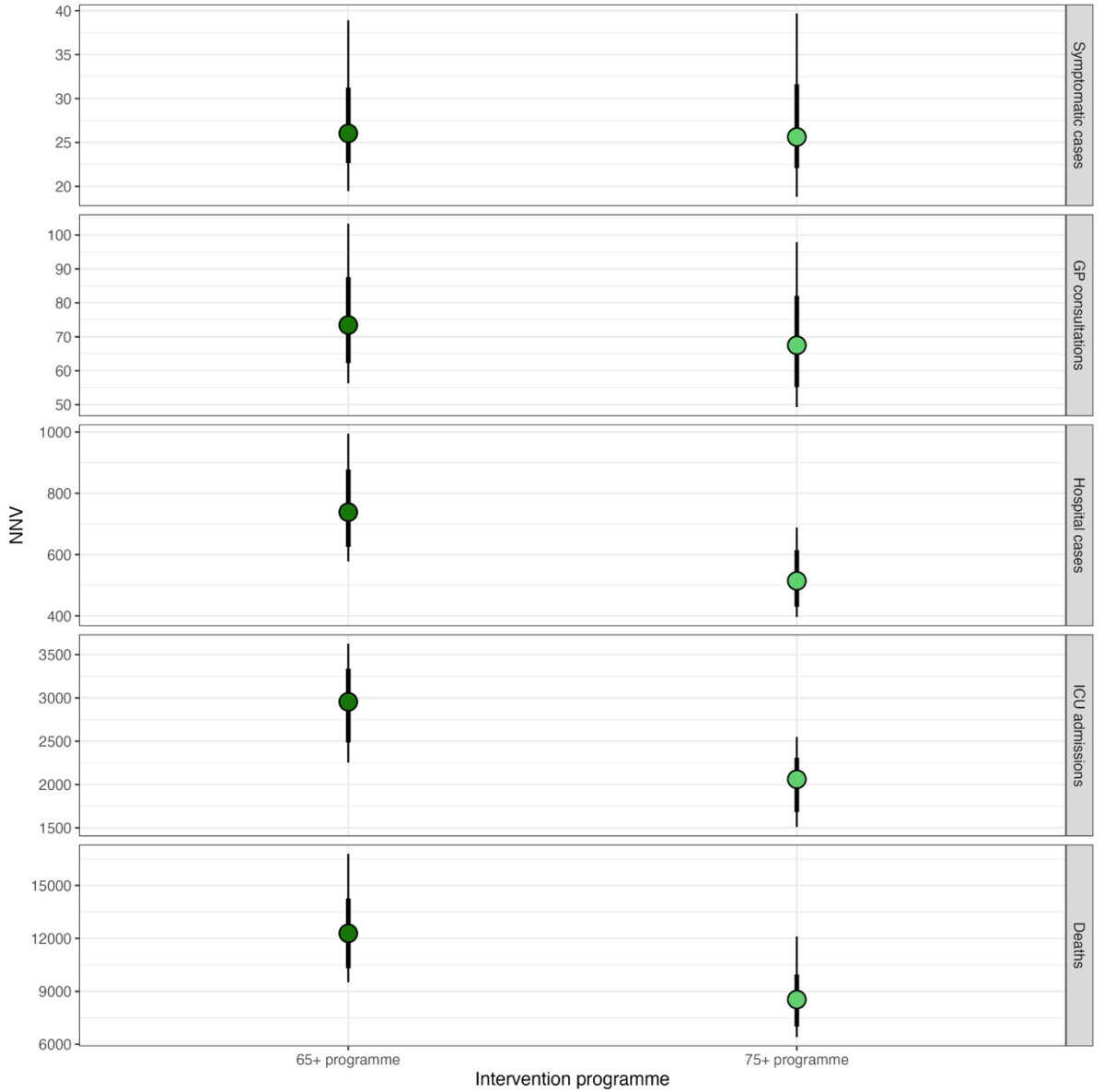


Metric	Annual number of cases averted seasonal 65+ (mean, 95% CrI)	Annual number of cases averted seasonal 75+ (mean, 95% CrI)
Symptomatic	407,118 (282,440-546,598)	220,652 (148,628-299,152)
GP cons.	141,662 (99,388-186,515)	83,732 (58,419-113,506)
Hospital cases	13,999 (10,174-17,700)	10,878 (7,759-14,025)
ICU admissions	3,594 (2,669-4,625)	2,775 (1,913-3,635)
Deaths	863 (603-1107)	672 (450-892)

Modelling OA vaccination (impact)



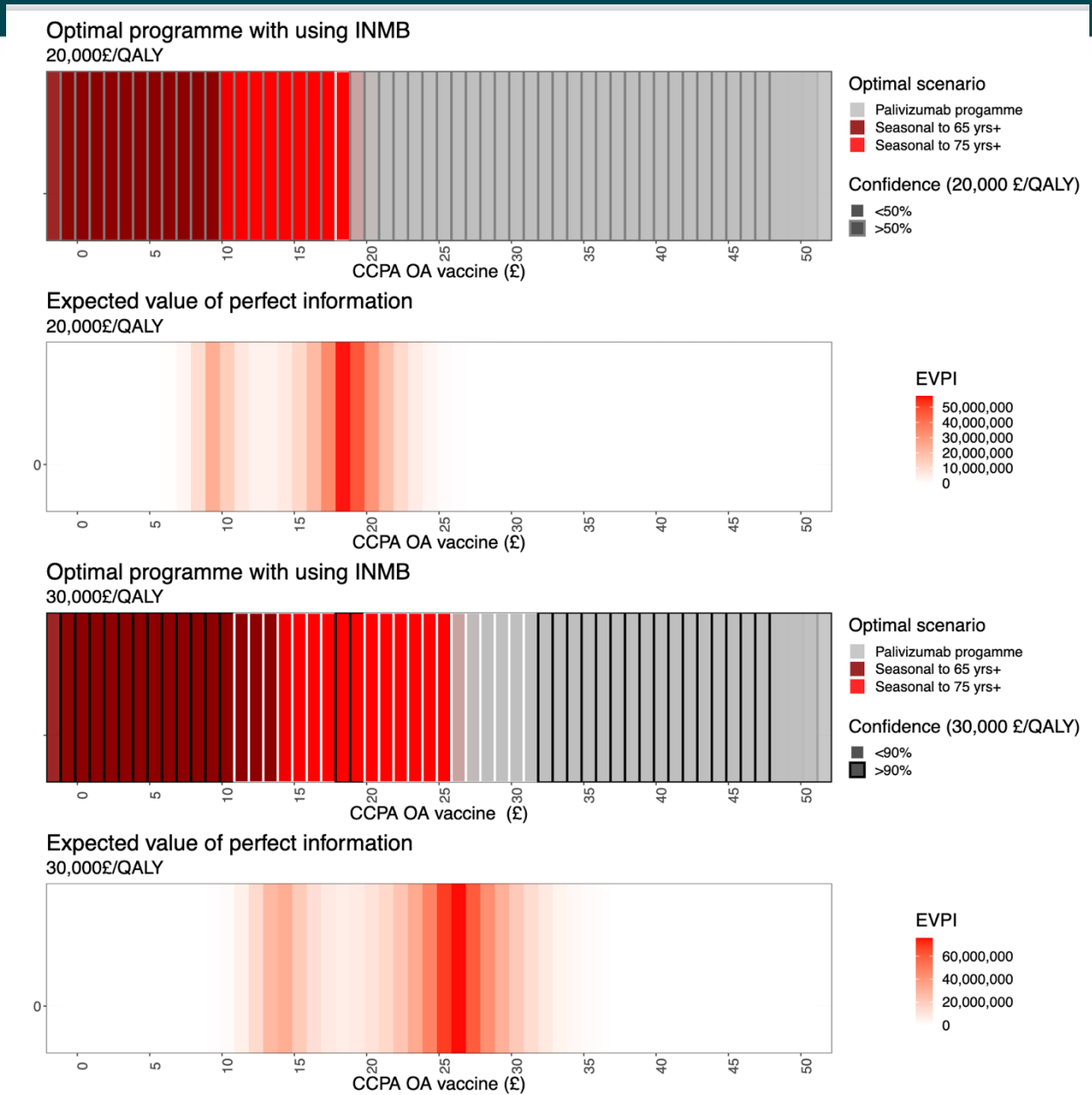




Cost-effectiveness analysis

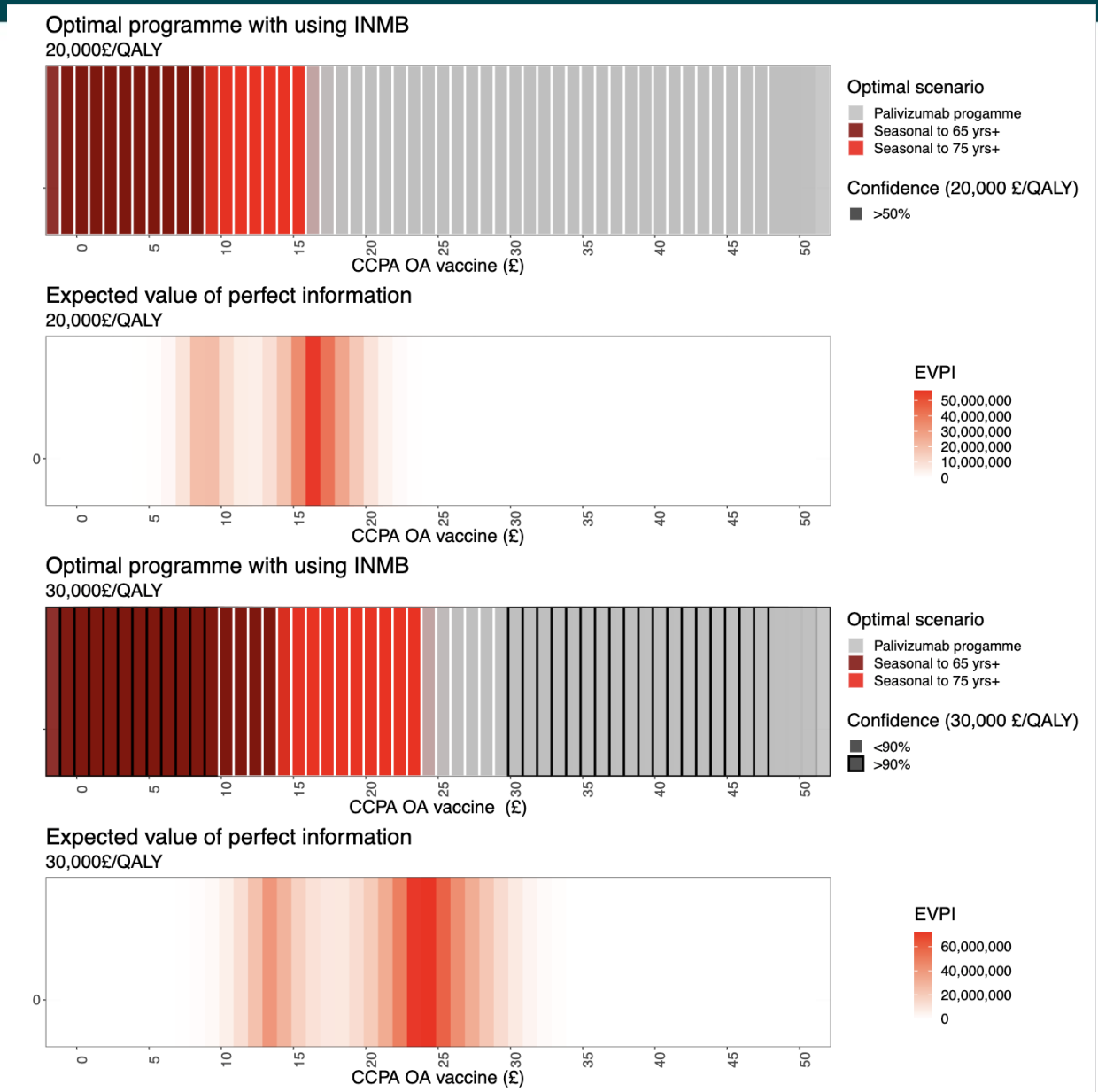
Cost-effectiveness

Long + short stay costs

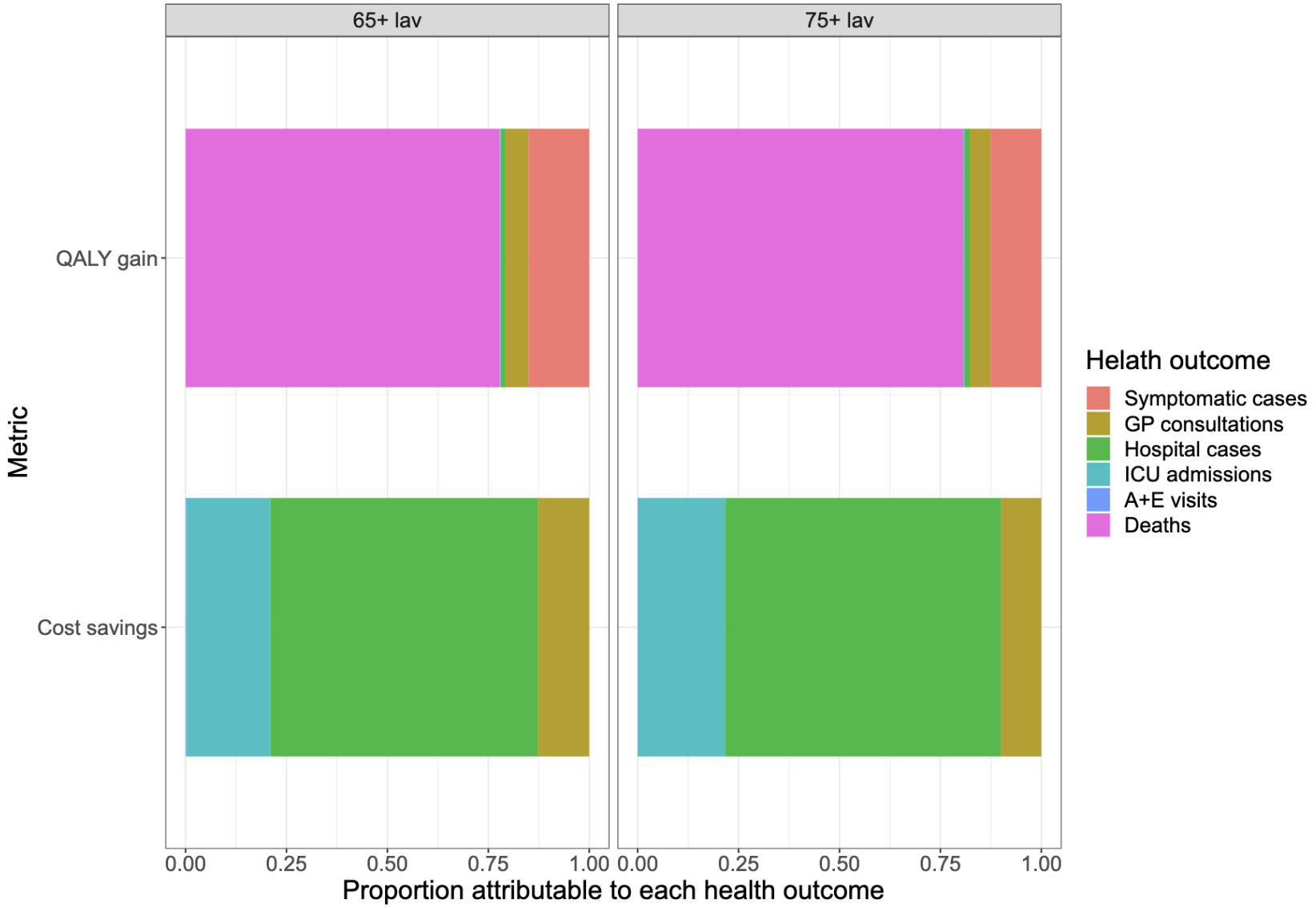


Cost-effectiveness

Short stay costs

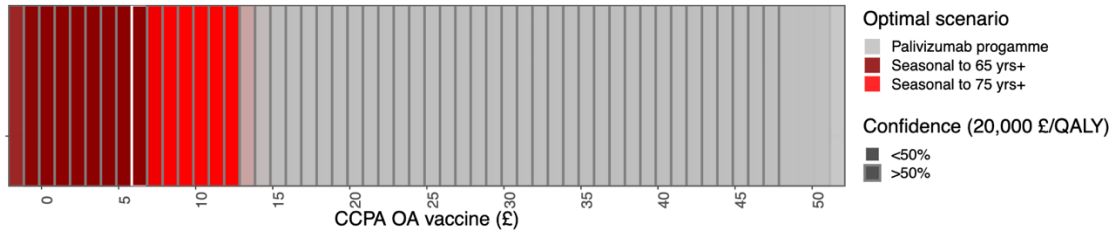


Extra slides

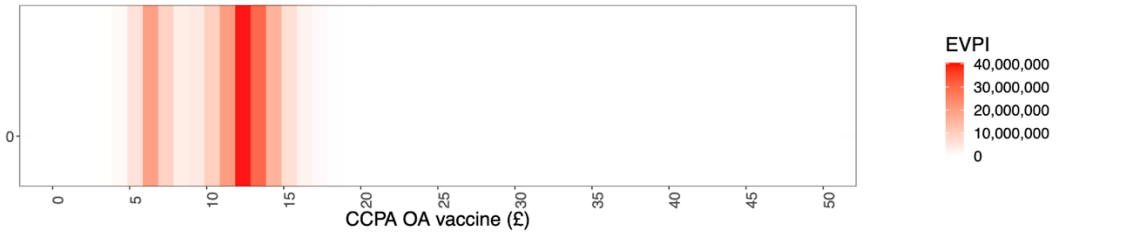

65+ lav
75+ lav
QALY gain
Cost savings
Metric
0.00
0.25
0.50
0.75
1.00
Proportion attributable to each health outcome
Helath outcome
Symptomatic cases
GP consultations
Hospital cases
ICU admissions
A+E visits
Deaths

Short + long stay costs, bounded eff

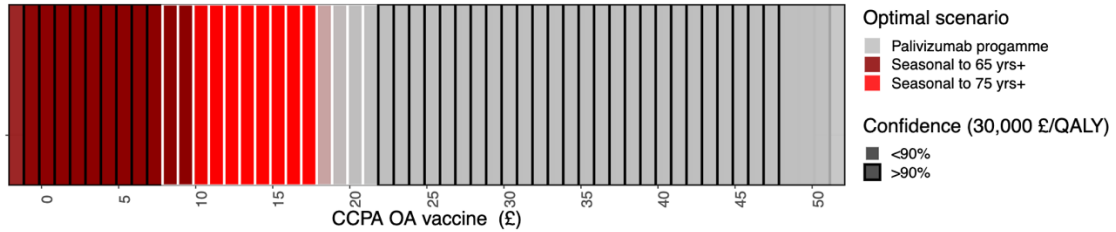
Optimal programme with using INMB
20,000£/QALY



Expected value of perfect information
20,000£/QALY



Optimal programme with using INMB
30,000£/QALY



Expected value of perfect information
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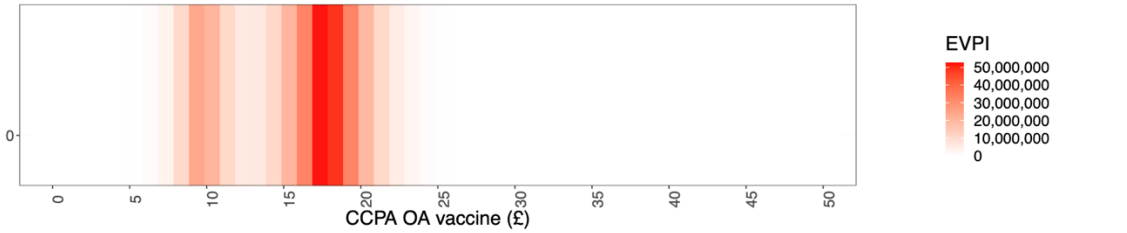
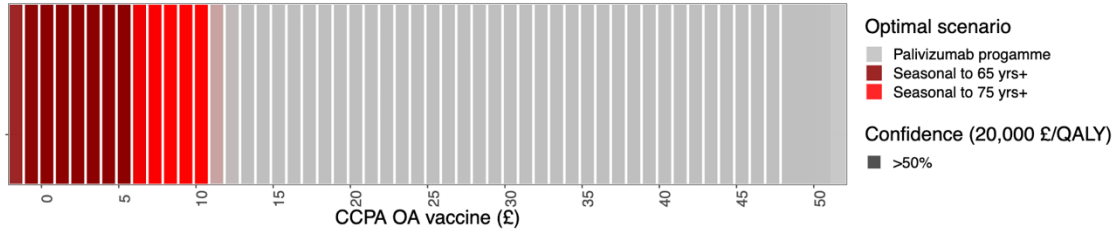


Short stay costs, bounded eff

Optimal programme with using INMB
20,000£/QALY



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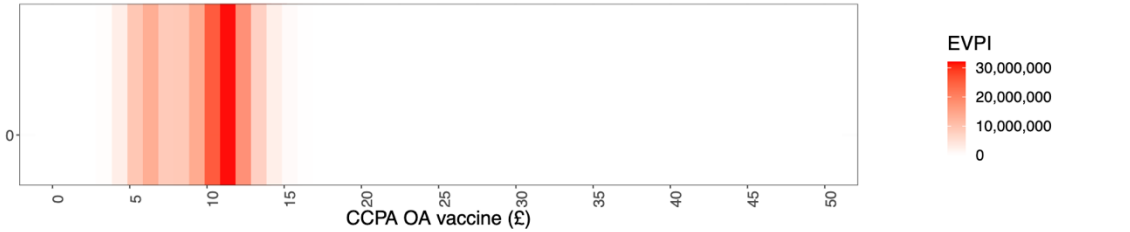

Optimal programme with using INMB
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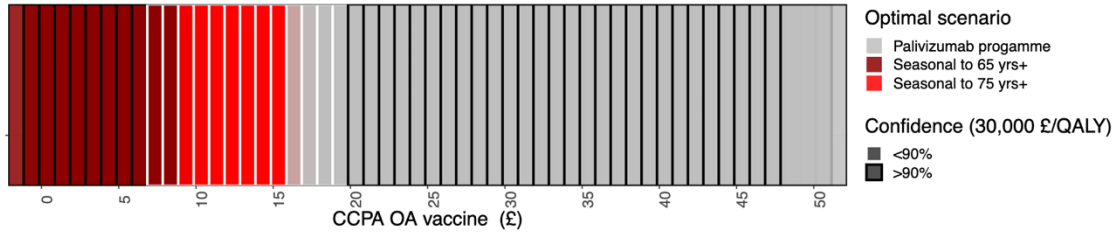

Expected value of perfect information
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