SUPPLEMENTARY APPENDICES

for the article: ***Health-economic impacts of age- and sex-targeted Lassa fever vaccination in endemic regions of Nigeria, Guinea, Liberia and Sierra Leone: a modelling study***

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CONTENTS:

APPENDIX 1: MODEL CALIBRATION AND PARAMETERISATION

We extended a previously developed epidemiological model, which predicts human Lassa fever burden across West Africa,[1] to estimate the health and economic impacts of a range of risk-targeted Lassa fever vaccination campaigns targeting different age and sex groups. We extended this model by: (i) focusing on areas of West Africa classified as endemic for Lassa fever in an updated risk map from the World Health Organization (WHO); (ii) accounting for the distributions of age, sex and pregnancy status in each area, projected forward through time from 2025 to 2037; (iii) using seroprevalence data from the Enable study to estimate age-specific infection risk; (iv) using case data from the Nigeria Centre for Disease Control and Prevention (NCDC) to predict infection seasonality and age- and sex-specific infection-hospitalisation risk (IHR); (v) using clinical outcome data from the *Lassa fever outcomes and prognostic factors in Nigeria* (LASCOPE) study to predict age- and sex-specific case-fatality risk (CFR); (vi) updating meta-analyses to quantify risks of mortality, foetal loss and neonatal death in pregnant women hospitalised with Lassa fever; (vii) analysing individual patient-level audiometry data to quantify the risk, duration and disability of Lassa fever-induced SNHL; (viii) accounting for age- and sex-specific productivity losses, including those resulting from SNHL; (ix) using age-stratified mortality projections to calculate the monetised value of life-years lost using a value of statistical life-years (VSLY) approach; and (x) developing updated risk-targeted vaccine rollout scenarios considering distinct estimates of vaccine efficacy against moderate and severe disease. A model schematic is provided in **Figure S1**.

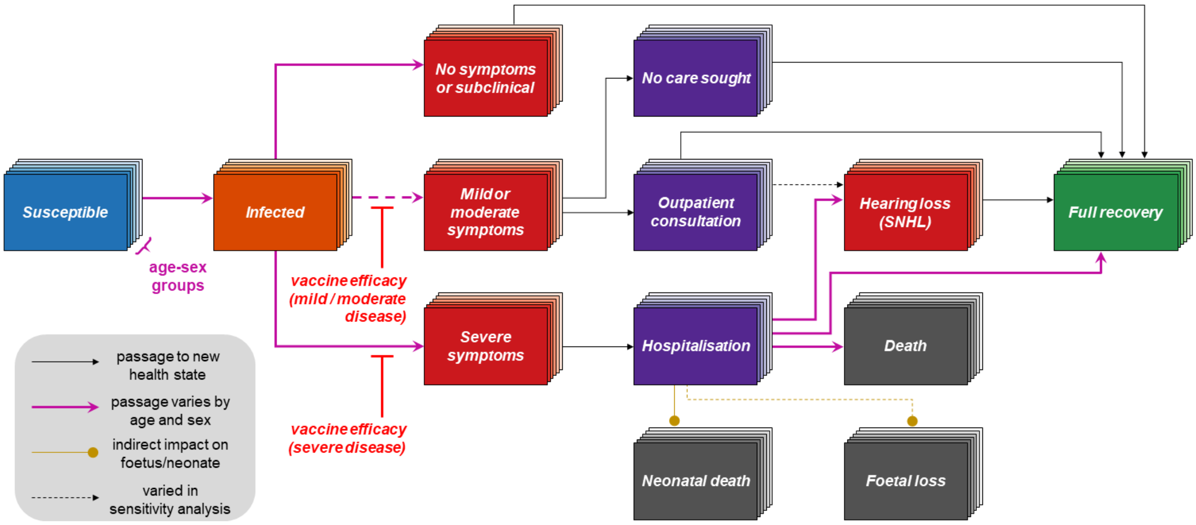


Figure S1. **Model schematic.** Flow diagram showing how individuals of different ages and sexes with Lassa virus infection move through the health states included in the model (see methods and supplementary appendix for technical details regarding model structure, parameterisation, simulation and outcome calculation). Economic outcomes associated with different health states are not shown. SNHL = sensorineural hearing loss.

We adapted the model to focus only on zoonotic infection, as human-to-human transmission is primarily associated with healthcare settings—although substantial nosocomial outbreaks are rare—and is estimated to account for only a small minority of total human LASV infections, even in geographically constrained outbreak contexts.[2-4]

1a. Setting and demography

The 19 *areas* classified as Lassa fever endemic include 14 states in Nigeria (Bauchi, Benue, Delta, Ebonyi, Edo, Enugu, Gombe, Kaduna, Kogi, Nasarawa, Ondo, Oyo, Plateau and Taraba), 3 counties in Liberia (Bong, Grand Bassa and Nimba), 1 region in Guinea (Nzérékoré) and 1 province in Sierra Leone (Eastern Province).[5]

The population sizes of each area and their distributions by age, sex and pregnancy status were projected from 2025 to 2037. First, UN World Population Prospects (2024 revision) by single year ages (medium variant) were used to define the number of males and females in each 1-year age-band living in each country from 2025 to 2037, where all individuals aged 80+ were binned together.[6]

To account for pregnancy, national-level UN estimates from 2023 of the number of women in different age groups giving birth annually were divided by the number of women in each corresponding country-age group in 2023.[7] These proportions were assumed to be stable, whereby in population projections the number of women having a live birth from 2025 to 2037 was calculated by multiplying these annual age-specific live birth probabilities by the corresponding number of women in each country-age group.

Finally, the proportion of each country's population living in each area was quantified by extracting rasterised UN-adjusted population estimates from WorldPop in 2020 for each country and dividing the number of individuals in each area by the national population size.[8] National-level population projections were then multiplied by these proportions to arrive at area-level population projections, where each country's distributions of age, sex and pregnancy status were assumed to be the same in each area within that country and stable through time.

All analyses were conducted at the level of single year age-bands before aggregation into age groups for final presentation of results. In all cases where model input data were stratified by age groups, data were translated to single-year estimates, accounting for the underlying population distributions in the corresponding age group in each area or country, depending on the level of reporting.

A cross-section of projected population pyramids for target age groups in each area in 2025 are shown in **Figure S2**, and estimates of the proportion of women of different ages having a live birth annually are shown in **Figure S3**.

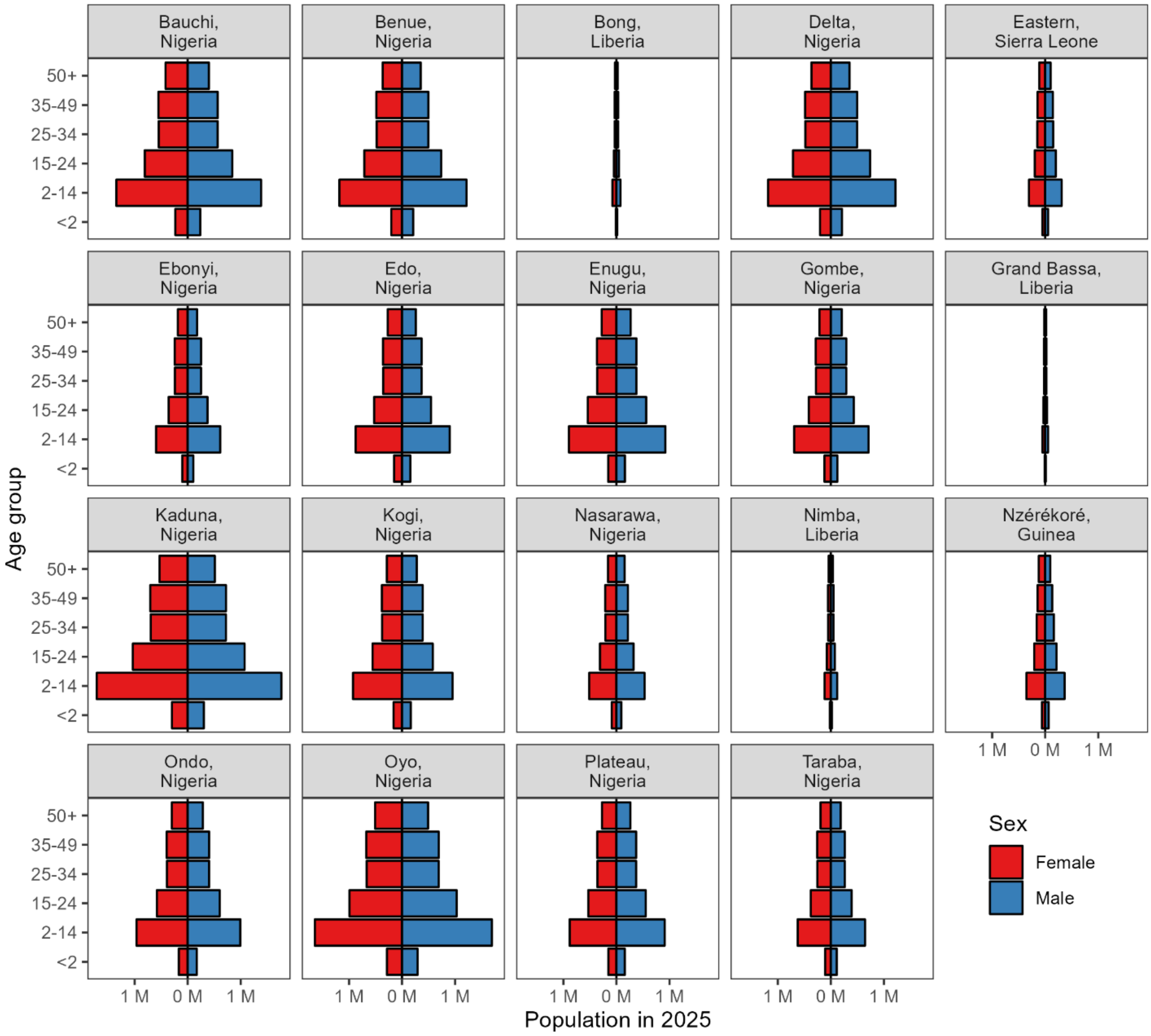


Figure S2. Population pyramids showing the projected number of males and females in each age group in 2025 across each of the included areas.

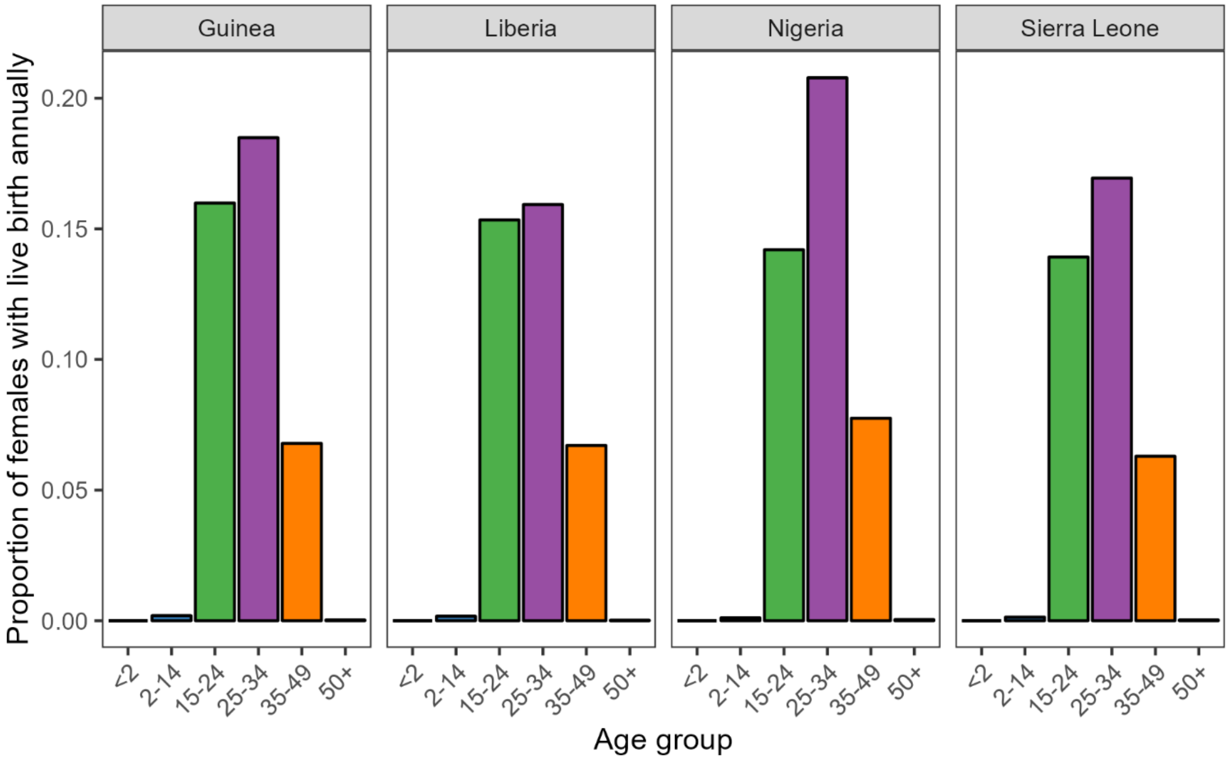


Figure S3. Estimates of the proportion of females in each age group in each country having a live birth annually.

1b. *Age-specific infection risk*

Estimates of LASV zoonosis incidence used in this work are built upon a geospatial risk map developed by Basinski *et al*. that predicts zoonosis risk using *M. natalensis* occurrence data from 167 locations in 13 countries from 1977 to 2017, rodent LASV seroprevalence data from 13 studies in 6 countries from 1972 to 2014, human LASV seroprevalence data from 94 community-based serosurveys in 5 countries from 1970 to 2015, and rasterised estimates of human population size and 11 landcover features across continental West Africa.[9] The Lassa fever model developed by Smith *et al.* used these rasterised spillover risk estimates to predict human LASV infection incidence at the pixel level.[1] Resulting estimates of infection incidence and total infections in 2019 in the 19 areas included in the present study are shown in **Table S1**.

Table S1. **Estimated annual zoonotic Lassa virus infections occurring in each area in 2019.** These numbers correspond to estimates generated previously in Smith et al. (2024), for the areas highlighted as having endemic Lassa fever transmission in the 2024 WHO risk map.

Country	Area	Infections per 100,000 population (2019)	Total infections (2019)
Guinea	Nzérékoré	695 (566, 830)	12,501 (10,184, 14,941)
Liberia	Nimba	536 (402, 680)	3,349 (2,511, 4,249)
	Bong	575 (440, 719)	2,301 (1,760, 2,879)
	Grand Bassa	501 (375, 636)	1,384 (1,036, 1,757)
Nigeria	Delta	623 (481, 773)	38,161 (29,484, 47,405)
	Ebonyi	697 (566, 834)	21,520 (17,485, 25,767)
	Edo	683 (540, 834)	30,894 (24,444, 37,732)
	Enugu	676 (538, 822)	31,372 (24,964, 38,148)
	Gombe	812 (668, 963)	29,092 (23,931, 34,501)
	Kaduna	853 (702, 1,012)	75,833 (62,367, 89,916)
	Kogi	635 (493, 787)	30,447 (23,611, 37,721)
	Nasarawa	930 (766, 1,102)	24,800 (20,425, 29,372)
	Ondo	601 (469, 742)	30,047 (23,450, 37,058)
	Oyo	612 (471, 762)	52,141 (40,170, 64,895)
	Plateau	846 (704, 994)	38,671 (32,195, 45,435)
	Taraba	700 (560, 848)	22,712 (18,167, 27,516)
	Bauchi	734 (590, 887)	51,121 (41,062, 61,745)
	Benue	692 (558, 834)	42,343 (34,145, 50,986)
Sierra Leone	Eastern	726 (601, 856)	12,214 (10,121, 14,406)

Age-specific LASV seroprevalence estimates from the Enable study—the largest prospective community-based multi-country LF cohort study—were used to estimate the age structure of infection incidence. Using Enable's publicly available interim results,[10] mean estimates and 95% confidence intervals (CI) of age-specific LASV seroprevalence pooled across the study's seven sites (3 in Nigeria and 1 each in Benin, Guinea, Liberia and Sierra Leone) were digitised using the online tool PlotDigitizer (www.plotdigitizer.com/app) to convert data from images to a digital format. These estimates range from 7.5% (95% CI: 5.7%, 9.5%) in children < 5 years old to 35.8% (95% CI: 33.8%, 37.9%) in those aged 50+. The sample size underlying seroprevalence in each age group was not reported, so these were estimated by assuming normally distributed confidence intervals and solving,

$$n_a = \frac{z^2 \cdot p_a \cdot (1 - p_a)}{(p_a - l_a)^2}$$

where p_a is the mean and l_a is the lower bound of the CI for age group a, giving the squared margin of error in the denominator, and z is the z-value corresponding to the 95% CI (z=1.96). The resulting sample size pooled across all age groups (n=15,804) is within 4.8% of the reported number of individuals tested (n=16,604), noting that it is unclear whether all individuals tested are necessarily included in reported age-stratified pooled seroprevalence estimates (e.g., due to potential missing age or test result data).

A Bayesian serocatalytic model was fitted to these age-stratified pooled seroprevalence data to generate estimates of age-specific force of infection (FOI). As our study focuses on areas where Lassa fever is considered endemic, the model assumes that age-specific FOI is time-invariant, i.e. that there is a stable per-person risk of acquisition from the rodent host within each age group annually. Consistent with the underlying zoonosis risk map and overall analysis, there was assumed to be no LASV seroreversion, meaning that seroprevalence represents the proportion of individuals who have been infected with LASV by a certain age. The expected seroprevalence S_a for an age group a is given by:

$$S_a = 1 - e^{-\lambda_a \alpha_a}$$

where λ_a denotes age-specfic FOI and α_a denotes the midpoint age for age group a.

The model was implemented in R using the rstan package, which provides an interface to Stan modelling the likelihood of the seroprevalence data using a binomial distribution. Posterior distributions of age-specific FOI and the resulting seroprevalence for each group were obtained by running 4 Markov Chain Monte Carlo chains with 2,000 iterations each, discarding the first 1,000 iterations as burn-in (resulting in 4,000 posterior draws total, of which 500 were randomly sampled and carried forward in analysis). All *Rhat* values were close to 1, indicating good mixing and convergence.[11] A summary of resulting FOI estimates is provided in **Table S2**.

The number of human LASV infections, L, can be estimated directly by multiplying age-specific FOI by the age-specific population at risk:

$$L_{d,a} = \lambda_a \times N_{d,a} \times (1 - S_a)$$

where $N_{d,a}$ is the total population size of each age group in each area. Applying λ_a and S_a estimates from Enable to the combined population size of all 19 areas in 2019 resulted in 1,042,989 (967,606, 1,125,853) infections. However, Enable study sites were chosen because of a particularly high risk of LASV infection,[12] which may lead to overestimation of incidence when aggregating over all 19 areas. To remain conservative, we used these results only to calculate the proportion f_a of all infections estimated to occur in each age group,

$$f_a = \frac{L_a}{\sum_a L_a}$$

and multiplied these proportions by the total number of infections estimated previously in each area in 2019, $L_{d,2019}$,

$$L_{d,a,2019} = f_a \cdot L_{d,2019}$$

to then estimate age-specific LASV incidence in each area. This scaling conserves our previous, spatially heterogeneous incidence estimates (**Table S1)** while accounting for the relative age-specific risk of infection estimated from the age-stratified serocatalytic model. A summary of final age-specific incidence across all areas is provided in **Table S2**.

Table S2. Age-specific seroprevalence, estimated age-specific force of infection and total annual LASV spillover infections. Spillover infections were first calculated in the age groups reported in Enable then allocated to 1-year age bands, controlling for the number of individuals in each age band in each area, before regrouping to the final age groups considered in the model and summing across areas.

Parameter (unit) *Symbol*	Age group	Mean (95% UI)	Source
Seroprevalence (%)	<5	7.5 (5.7, 9.5)	[10]
	5-17	18.0 (17.0, 19.0)	
S_a	18-24	26.8 (25.1, 28.7)	
	25-34	28.1 (26.2, 30.0)	

Parameter (unit) ***Symbol***	**Age group**	**Mean (95% UI)**	**Source**
	35-49	34.3 (32.5, 36.3)	
	50+	35.8 (33.8, 37.9)	
Force of infection (%) λ_a	<5	3.14 (2.45, 3.91)	Estimated
	5-17	1.80 (1.69, 1.92)	
	18-24	1.49 (1.37, 1.61)	
	25-34	1.12 (1.03, 1.21)	
	35-49	1.00 (0.93, 1.07)	
	50+	0.68 (0.63, 0.73)	
Annual LASV spillovers (n, 2019) L_a	<2	76.6 K (65.1 K, 88.7 K)	Estimated
	2-14	276.3 K (259.7 K, 292.7 K)	
	15-24	97.8 K (88.7 K, 107.4 K)	
	25-34	45.2 K (40.5 K, 50.2 K)	
	35-49	37.0 K (33.5 K, 40.9 K)	
	50+	17.7 K (15.9 K, 19.6 K)	

1c. Projecting infections through time

National case data from the NCDC were used to distribute LASV infections seasonally. Weekly counts of the number of laboratory-confirmed Lassa fever cases occurring each year from 2019 to 2023 were digitised using PlotDigitizer from the Lassa Fever Situation Report corresponding to Epi Week 25 of 2024.[13] For each year, the proportion of cases occurring in each epidemiological week was calculated and a rolling mean (k=7) was applied to define average seasonality (**Figure S4**). To estimate infection timing from reported cases, the rolling average was shifted by 3 weeks, the approximate sum of mean estimates of the incubation period (10.3 days) and the delay from symptom onset to hospital admission (9.3 days).[1,14] From the 3-week shifted rolling mean, the proportions of cases occurring in each epidemiological week were applied to annual infection projections to simulate weekly infection incidence.

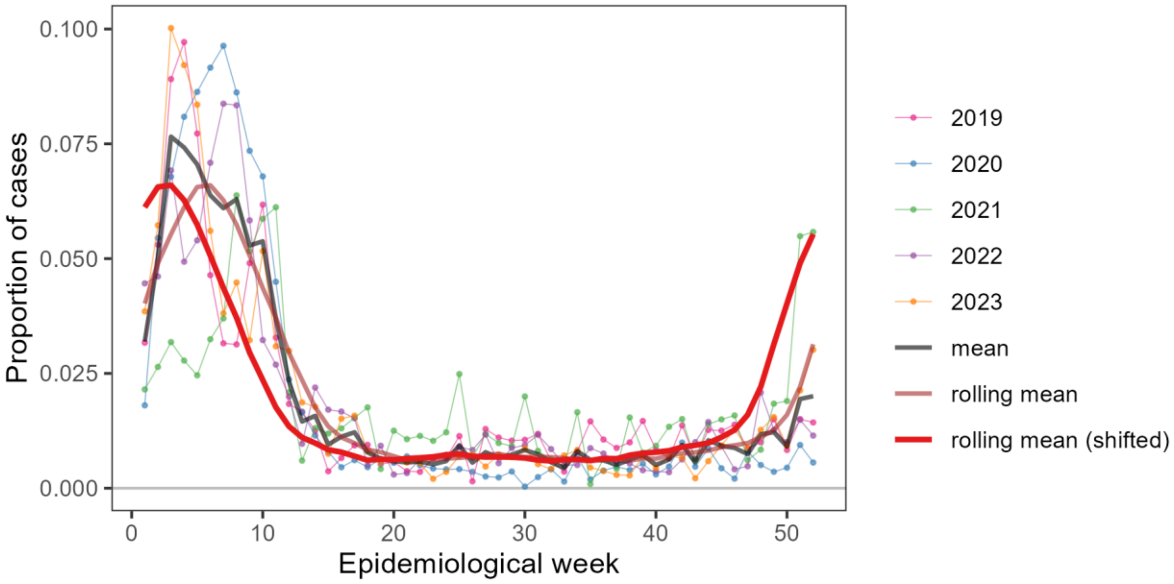


Figure S4. **The proportion of Lassa fever cases occurring in each epidemiological week from 2019 to 2023.** The shifted rolling mean represents estimated infection timing and was calculated assuming a 3-week delay from infection acquisition to case reporting.

1d. Symptomatic Lassa fever risks stratified by age, sex and pregnancy status

In the base case analysis, the probability of infected individuals developing any symptoms, $\mathbb{P}(symptoms|infection)$, was assumed to be constant across age groups (**Figure S5 panel A**). However, a sensitivity analysis was included whereby infection-symptom risk increases across the six included age groups while maintaining the total number of symptomatic infections, $N^{symptoms}$, from the population-wide estimate (**Figure S5 panel B**). This was calculated by scaling age-specific risk relative to baseline risk by a coefficient ρ_a and minimising an objective function over each matched parameter draw by solving for the coefficient φ,

$$\varphi^* = \arg\min_{\varphi} \left(N^{symptoms} - \sum_a L_a \cdot \mathbb{P}(symptoms|infection) \cdot \rho_a \cdot \varphi \right), \qquad \rho_a = 0.5, 1, \ldots, 3$$

where ρ_a was increased by increments of 0.5 across the six included age groups, from 0.5 in children <2 to 3 in adults 50+, giving final age-specific estimates,

$$\mathbb{P}_a(symptoms|infection) = \mathbb{P}(symptoms|infection) \cdot \rho_a \cdot \varphi^*$$

In one simulation (0.2%), symptom risk in adults aged 50+ was >1 so was truncated to equal exactly 1.

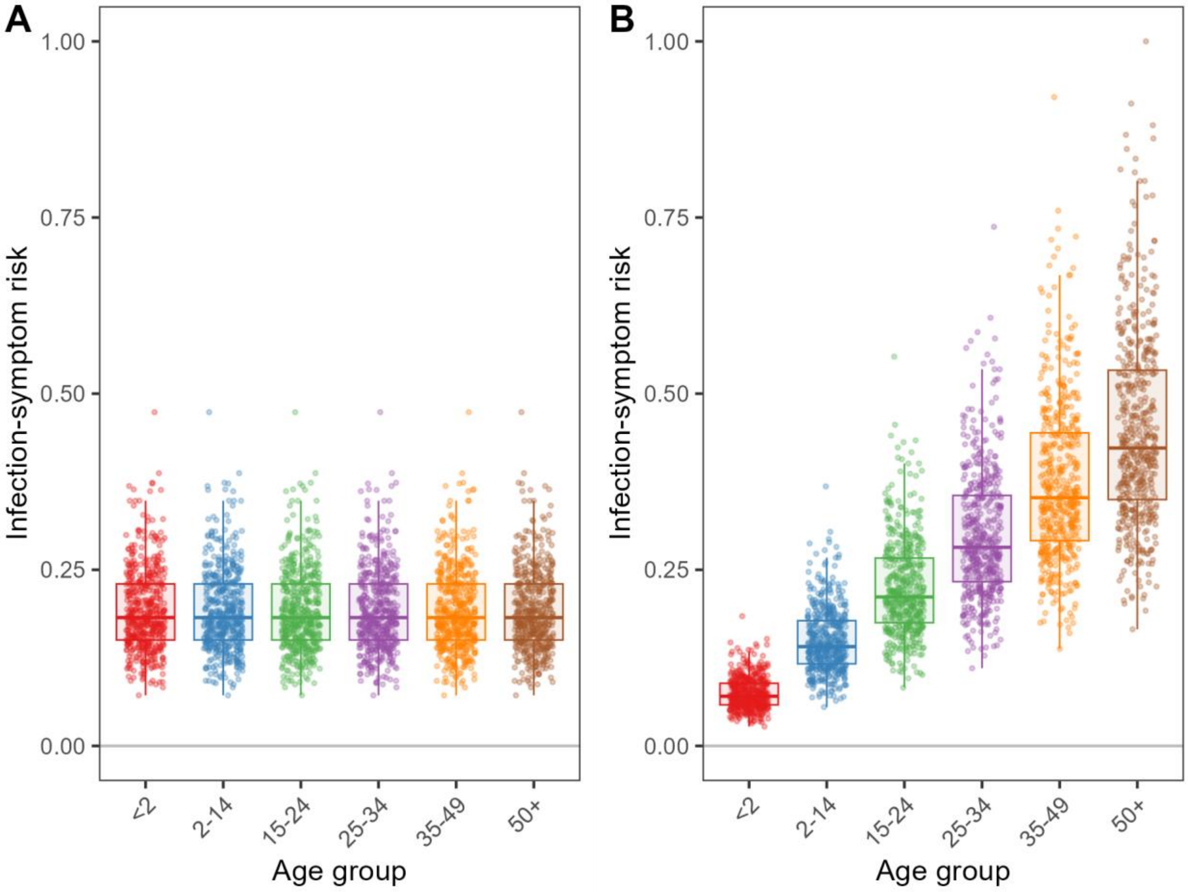


Figure S5. **Infection-symptom risk model input parameters.** (**A**) Each point is a draw (n=500) from an inverse-logit transformed Normal distribution from an inverse variance meta-analysis and generalised linear model fit to data describing the proportion of LASV infections associated with illness in a prospective cohort study in four villages in Sierra Leone.[15] In the base case analysis, infection-symptom risk is assumed to be identical across age groups. (**B**) Each point is a draw (n=500) of the data from panel A after rescaling by ρ_a in a sensitivity analysis assuming increasing symptom risk with age. Boxplot whiskers extend to the most extreme value no further than 1.5 × IQR from the nearest hinge.

We previously estimated the infection-hospitalisation risk (IHR) for human LASV infection to be 0.86% (95% CI: 0.56%–1.12%).[1,16] This estimate was generated by dividing the annual number of laboratory-confirmed hospitalised Lassa fever cases in the high surveillance states of Edo and Ondo between 2018 and 2021 by the annual number of infections occurring in those states in 2019, as estimated by our geospatial risk map. To estimate age-specific IHRs, 500 draws of total zoonotic infections in Nigeria were matched to 500 draws of the overall IHR and multiplied to generate a distribution of the predicted total number of hospitalisations occurring in Nigeria. The number of NCDC-reported laboratory-confirmed hospitalised Lassa fever cases occurring in each age-sex group in Nigeria from 2019 to 2023 were then extracted and summed.[13] These data cover all states of Nigeria and were assumed to be representative of the age-sex structure of all hospitalised cases nationally. The proportions of all hospital cases occurring in each age-sex group were then fit to a Dirichlet distribution. A total of 500 stochastic draws from this distribution (**Figure S6 panel A**) were multiplied by the distribution of predicted total hospitalisations to stratify predicted hospitalisations into corresponding age-sex groups. Finally, this estimate was divided by the projected number of infections in each age-sex group in Nigeria to recover age- and sex-specific IHR (**Figure S6 panel B**).

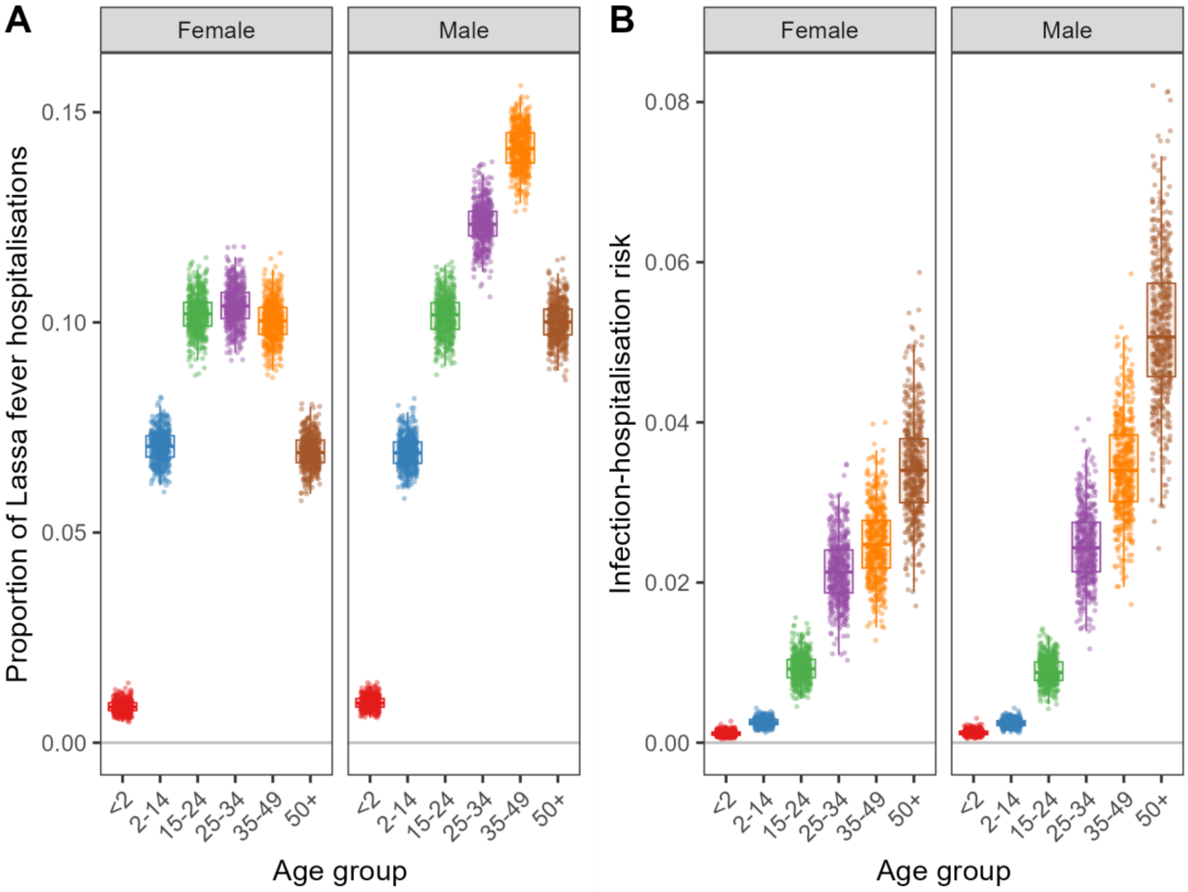


Figure S6. **Hospitalisation risk model input parameters.** (**A**) Each point is a draw (n=500) from a Dirichlet distribution fit to the proportion of all Lassa fever hospitalisations reported by NCDC from 2019 to 2023 occurring in each age-sex group,[13] after age group transformation. (**B**) Each point is a draw (n=500) of the estimated proportion of infections that result in severe disease and hospitalisation in each age-sex group. Boxplot whiskers extend to the most extreme value no further than 1.5 × IQR from the nearest hinge.

Data from the LASCOPE study were used to estimate age-specific case-fatality risk (CFR) among hospitalised Lassa fever patients. The LASCOPE study included patients without age restrictions with laboratory-confirmed Lassa fever presenting to the Lassa fever ward of Owo Medical Centre between April 2018 and March 2020.[14] A follow-up paediatric study including all patients <15 years old presenting to the same ward between April 2018 and February 2023 has since been published.[17] To increase sample size and improve estimates of mortality risk in children for patients aged <12 years old, data from the original study were replaced with data from the follow-up paediatric study. The resulting data set includes data on 87 children (2 deaths) aged 1 month to 11 years and 460 individuals aged 12+ (59 deaths). Neonates aged <1 month (n=8) were excluded, as risk of neonatal death was estimated separately using results from a systematic review and meta-analysis (see below). Duvignaud *et al.* (2021) reported a greater mortality risk in those aged ≥45 than those <45 but found no association with sex.[14] Therefore, males and females were pooled together and age-specific CFRs were calculated as the number of deaths in each age group divided by the number of cases. Given the relatively low sample size, patients and deaths in each age group were bootstrap resampled 500 times to generate a distribution of CFR estimates in each age group (**Figure S7**).

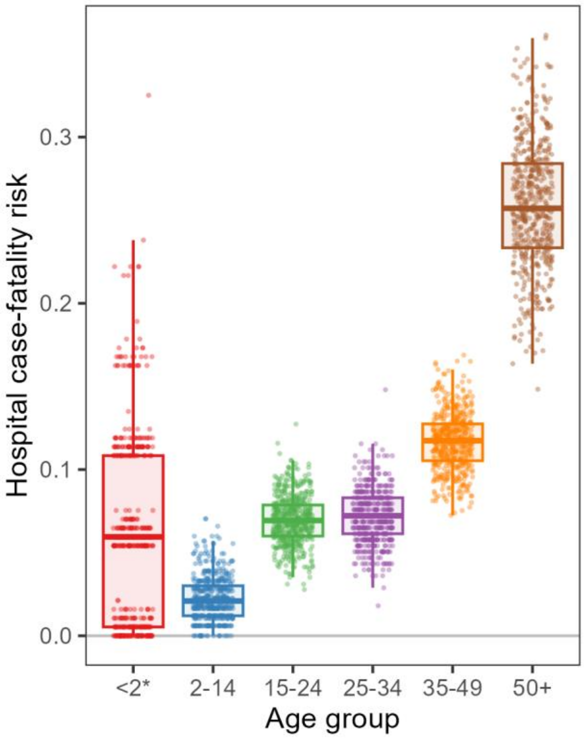


Figure S7. **The estimated proportion of hospitalised cases that result in death, stratified by age group.** Each point is a draw (n=500) from bootstrapped cases and deaths reported in the LASCOPE studies.[14,17] The age group <2 excludes children <1 month, as neonatal Lassa fever deaths were quantified using data from a systematic review and meta-analysis of neonatal risk. Boxplot whiskers extend to the most extreme value no further than 1.5 × IQR from the nearest hinge.

Pregnant women with Lassa fever are known to be at increased risk of death relative to non-pregnant women and at high risk of foetal and neonatal demise. Data from a systematic review and meta-analysis from Kayem *et al.* (2020) were used to quantify these risks, including an estimated odds ratio for death in pregnant women relative to non-pregnant women of $OR_P = 2.86$ (95% CI: 1.77, 4.63).[18] This odds ratio was used to estimate age-specific CFR in pregnant women, $CFR_{P,a}$, relative to the baseline risk in men and women, CFR_a, as,

$$CFR_{P,a} = \frac{\left(\frac{CFR_a}{1 - CFR_a} \cdot OR_p\right)}{1 + \left(\frac{CFR_a}{1 - CFR_a} \cdot OR_p\right)}$$

By increasing mortality risk among pregnant women, the overall mortality risk among women exceeds that of men. To counteract this and maintain equal overall mortality risk in hospitalised men and women, as reported in the LASCOPE study,[14] the CFR in non-pregnant women, $CFR_{N,a}$, was calculated by solving the following equation, assuming that the overall age-specific CFR is the weighted average of the age-specific CFR in pregnant and non-pregnant women,

$$CFR_a = CFR_{N,a} \times \rho_{N,a} + CFR_{P,a} \times \rho_{P,a}$$

where $\rho_{P,a}$ is the age-specific proportion of women with Lassa fever who are pregnant when hospitalised, assuming pregnancy lasts 40 weeks and is distributed uniformly throughout the year,

$$\rho_{P,a} = \mathbb{P}_a(livebirth\ in\ the\ year) \cdot \frac{40}{52}$$

and

$$\rho_{N,a} = 1 - \rho_{P,a}$$

This resulted in CFR estimates in non-pregnant women that are slightly lower than in men of the same age, with a greater effect in female age groups with a greater share of the hospitalised population being pregnant (**Figure S8**). Nigerian data were used for $\mathbb{P}_a$*(livebirth in the year)* because Nigerian data were also used to estimate baseline values of CFR_a.

For simplicity, it was assumed that pregnant women are not at increased risk of severe disease and hospitalisation but rather only at increased risk of severe outcomes once hospitalised. This assumption has face validity, as the mean share of WCBA with Lassa fever that are pregnant upon hospitalisation in the model (11%) is consistent with the share reported in LASCOPE (10%).[14]

A final summary of acute Lassa fever disease risks stratified by age and sex is provided in **Table S3**.

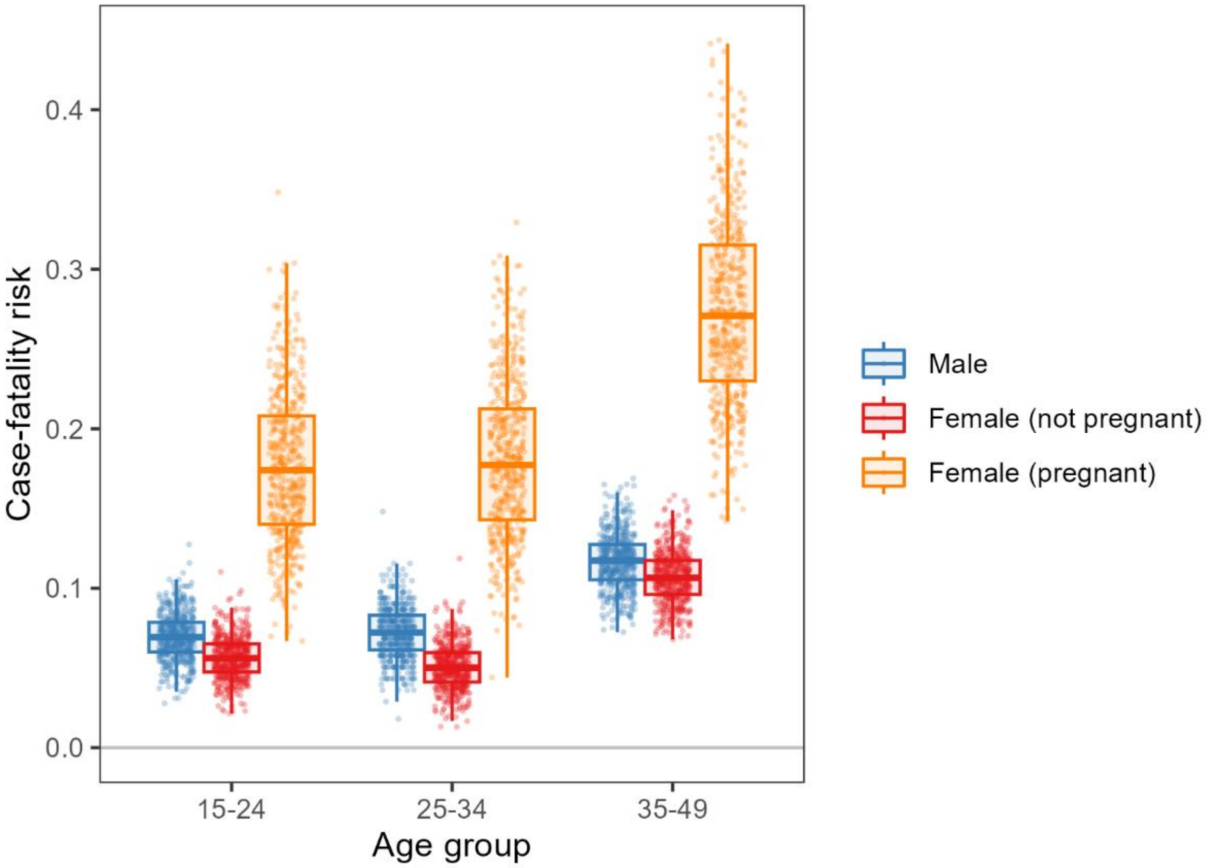


Figure S8. The estimated proportion of hospitalised cases that result in death in men and women, after adjustment to account for increased odds of mortality in pregnant women relative to non-pregnant women, but maintaining equal overall risk in men and women of the same age group. Each point is a draw (n=500) from bootstrapped cases and deaths reported in the LASCOPE study.[14] Boxplot whiskers extend to the most extreme value no further than 1.5 × IQR from the nearest hinge.

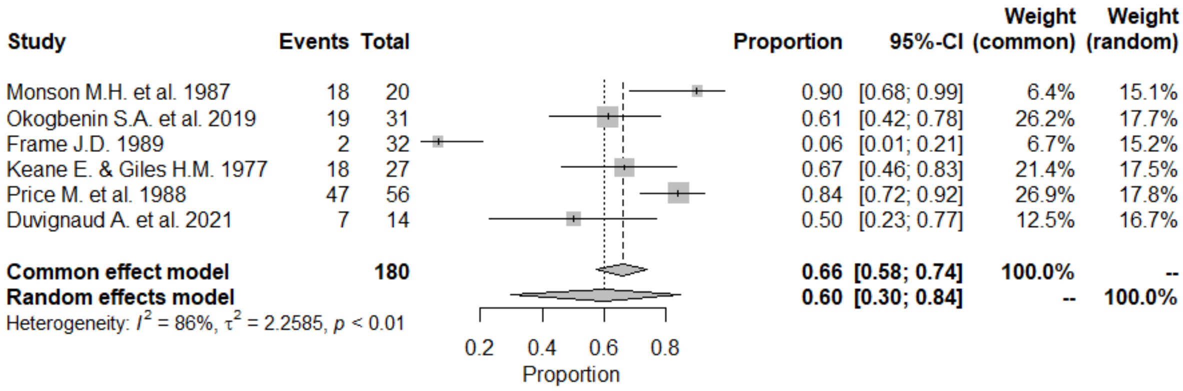
Table S3. Final age- and sex-stratified risks of Lassa fever. For symptom risk, stratification by age is only considered in sensitivity analysis; while the relative difference in risk across age groups is assumed, these values nonetheless recapitulate the population-wide estimate from Smith et al. (2024).[1] For case-fatality risk, which applies to hospitalised cases, we distinguish between non-pregnant female (F) and pregnant female (P), and the age group <2 includes only those aged 1 month to 23 months, as neonatal mortality risk is estimated separately.

Parameter (unit) ***Symbol***	**Sex**	**Age group**	**Mean (95% UI)**	**Source**
Infection-symptom risk (%) $\mathbb{P}_a(symptoms \vert infection)$	/	/	19.3 (10.2, 32.7)	[1]
		<2	7.5 (3.9, 12.9)	Assumed*
		2-14	14.9 (7.8, 25.9)	
		15-24	22.4 (11.7, 38.8)	
		25-34	29.9 (15.7, 51.7)	
		35-49	37.3 (19.6, 64.7)	
		50+	44.8 (23.5, 77.6)	
Infection-hospitalisation risk (%) $\mathbb{P}_{s,a}(hospital \vert infection)$	M	<2	0.12 (0.07, 0.20)	Estimated
		2-14	0.24 (0.16, 0.34)	
		15-24	0.89 (0.60, 1.22)	
		25-34	2.46 (1.64, 3.39)	
		35-49	3.44 (2.28, 4.67)	
		50+	5.16 (3.46, 7.10)	
	F	<2	0.12 (0.06, 0.18)	
		2-14	0.26 (0.17, 0.35)	
		15-24	0.93 (0.63, 1.32)	
		25-34	2.15 (1.47, 2.93)	
		35-49	2.50 (1.69, 3.38)	
		50+	3.43 (2.25, 4.85)	
Case-fatality risk (%) $\mathbb{P}_{s,a}(death \vert hospital)$	M	<2*	6.1 (0.0, 17.3)	Estimated
		2-14	2.2 (0.0, 5.5)	
		15-24	7.0 (4.1, 9.9)	
		25-34	7.1 (4.3, 10.5)	
		35-49	11.7 (8.4, 15.2)	
		50+	25.9 (18.4, 33.6)	
	F	<2*	6.1 (0.0, 17.3)	
		2-14	2.2 (0.0, 5.5)	
		15-24	5.6 (3.2, 8.4)	
		25-34	5.1 (2.5, 7.7)	
		35-49	10.7 (7.7, 14.1)	
		50+	25.9 (18.4, 33.6)	
	P	<2*	/	
		2-14	6.1 (0.0, 15.3)	
		15-24	17.6 (9.6, 27.6)	
		25-34	18.0 (9.7, 28.6)	
		35-49	27.4 (17.3, 39.8)	
		50+	/	

The meta-analyses of Kayem *et al.* quantifying risks of Lassa fever-associated foetal loss and neonatal loss were updated to include data from LASCOPE. The initial full-population results from LASCOPE reported 14 documented pregnancy outcomes, among which there were 6 spontaneous miscarriages and 1 intrauterine death.[14] In the follow-up paediatric study, among 7 neonatal cases of Lassa fever there were 3 deaths.[17] It was implicitly assumed that these neonatal cases were associated with maternal Lassa fever, though maternal infection history/status was not reported. The other included studies are described in Kayem *et al.*[18]

Proportional meta-analyses implementing the Freeman-Tukey double arcsine transformation were conducted, as this method is well suited to binomial data with extreme proportions. A random effects model was used to calculate a weighted summary estimate and the 95% CI for the proportion of hospitalised maternal Lassa fever cases resulting in foetal loss (**Figure S9**) or neonatal death (**Figure S10**).

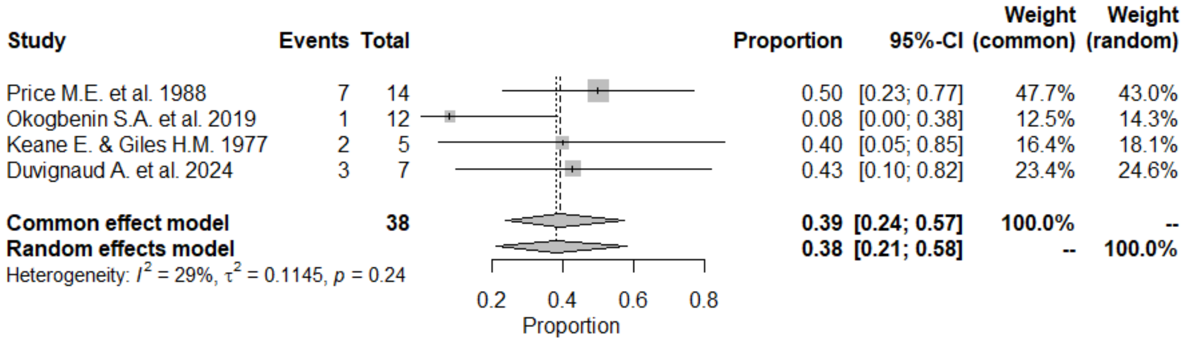
To estimate the proportion of foetal losses among hospitalised pregnant Lassa fever patients that are attributable to Lassa fever and not other causes, random draws of the baseline risk of stillbirth in West Africa estimated in 2019 were subtracted from weighted summary estimates from the random effects meta-analysis,[19] for a final risk estimate of 58.0% (95% UI: 28.4%, 80.9%). To estimate the proportion of neonatal deaths among pregnant Lassa fever patients that are attributable to Lassa fever and not other causes, random draws of the baseline risk of neonatal death estimated in Nigeria in 2020 were subtracted from weighted summary estimates from the random effects meta-analysis,[20] for a final risk estimate of 33.1% (95% UI: 15.8%, 52.3%).



Study	Events	Total	Proportion	95%-CI	Weight (common)	Weight (random)
Monson M.H. et al. 1987	18	20	0.90	[0.68; 0.99]	6.4%	15.1%
Okogbenin S.A. et al. 2019	19	31	0.61	[0.42; 0.78]	26.2%	17.7%
Frame J.D. 1989	2	32	0.06	[0.01; 0.21]	6.7%	15.2%
Keane E. & Giles H.M. 1977	18	27	0.67	[0.46; 0.83]	21.4%	17.5%
Price M. et al. 1988	47	56	0.84	[0.72; 0.92]	26.9%	17.8%
Duvignaud A. et al. 2021	7	14	0.50	[0.23; 0.77]	12.5%	16.7%
Common effect model		**180**	**0.66**	**[0.58; 0.74]**	**100.0%**	**--**
Random effects model			**0.60**	**[0.30; 0.84]**	**--**	**100.0%**

Heterogeneity: $I^2 = 86\%$, $\tau^2 = 2.2585$, $p < 0.01$

Figure S9. Proportional meta-analysis of studies reporting foetal loss from Lassa fever in pregnancy. I^2, Higgins statistics; τ^2, tau squared; p, p-value associated with Cochran's Q for heterogeneity; Events, number of foetal losses; Total, number of foetuses included in the analysis.



Study	Events	Total	Proportion	95%-CI	Weight (common)	Weight (random)
Price M.E. et al. 1988	7	14	0.50	[0.23; 0.77]	47.7%	43.0%
Okogbenin S.A. et al. 2019	1	12	0.08	[0.00; 0.38]	12.5%	14.3%
Keane E. & Giles H.M. 1977	2	5	0.40	[0.05; 0.85]	16.4%	18.1%
Duvignaud A. et al. 2024	3	7	0.43	[0.10; 0.82]	23.4%	24.6%
Common effect model		**38**	**0.39**	**[0.24; 0.57]**	**100.0%**	**--**
Random effects model			**0.38**	**[0.21; 0.58]**	**--**	**100.0%**

Heterogeneity: $I^2 = 29\%$, $\tau^2 = 0.1145$, $p = 0.24$

Figure S10. Proportional meta-analysis of studies reporting neonatal death following maternal Lassa fever. I^2, Higgins statistics; τ^2, tau squared; p, p-value associated with Cochran's Q for heterogeneity; Events, number of neonatal deaths; Total, number of neonates included in the analysis.

Neither neonatal deaths nor foetal losses were counted as Lassa fever cases or hospitalisations, as neonatal deaths attributed to maternal Lassa fever do not necessarily result from infection (all live births in the LASCOPE data were tested and found to be Lassa fever negative).[14] Further, no additional care costs were included due to many neonatal deaths occurring within a few hours of birth and many not presenting to hospital.[21,22]

1e. *Lassa fever-induced sensorineural hearing loss*

To characterise Lassa fever-induced sensorineural hearing loss (SNHL), 3 relevant systematic literature reviews were consulted and 20 unique research articles describing hearing loss subsequent to Lassa fever were identified.[23-25] Most of these were case reports or retrospective observational studies. One case-control study by Ficenec *et al.* (2020) quantified risk of hearing loss in Lassa fever survivors (17%) relative to community-matched controls (1%) but did not conduct follow-up or provide individual patient-level audiometry data.[26] Only one study, a prospective audiometric evaluation conducted by Cummins *et al.* (1990) in Sierra Leone, provides detailed individual patient-level audiometry data at baseline and 1-year follow-up, allowing for quantification of Lassa fever-induced SNHL risk, duration and disability.[27] They reported SNHL in 14 (29%) of 48 confirmed Lassa fever cases and in 0 of 20 febrile controls, found no obvious association between recovery and severity of the initial hearing deficit, and observed a high pooled prevalence (17.6%) among local villagers and healthcare workers known to be LASV seropositive. These findings suggest that post-acute SNHL is not limited to severe cases or strongly associated with age, so SNHL risk was applied to anyone surviving symptomatic disease, but in sensitivity analysis SNHL risk was limited only to those surviving hospitalisation.

Although some Lassa fever survivors develop lifelong hearing loss, many recover over the months and years following their infection.[23] To quantify the average duration of SNHL, mean auditory threshold (MAT) estimates were extracted for all patients in both ears at baseline and at 1-year follow-up. Three patients lacking follow-up data were excluded, and only data from each patient's better ear at both time points were carried forward for analysis (**Figure S11 panel A**), as the Global Burden of Disease (GBD) study on hearing loss defines hearing loss according to the quietest sound an individual can hear in their better ear (GBD Hearing Loss Collaborators, 2021).[28] These patients were bootstrap resampled 10,000 times and, for each sample, mean MAT in decibels (dB) was calculated at baseline, M, and at follow-up, m, at t=1 year. Assuming an exponential decay in deafness severity (MAT), the MAT decay rate, d, was calculated from,

$$m = M\, e^{-d \cdot t}$$

solving for d in each sample:

$$d = -\frac{\log\left(\frac{m}{M}\right)}{(t - t_0)}$$

resulting in a distribution of 10,000 exponential decay curves corresponding to each bootstrapped sample of patient audiometry data (**Figure S11, Panel B**).

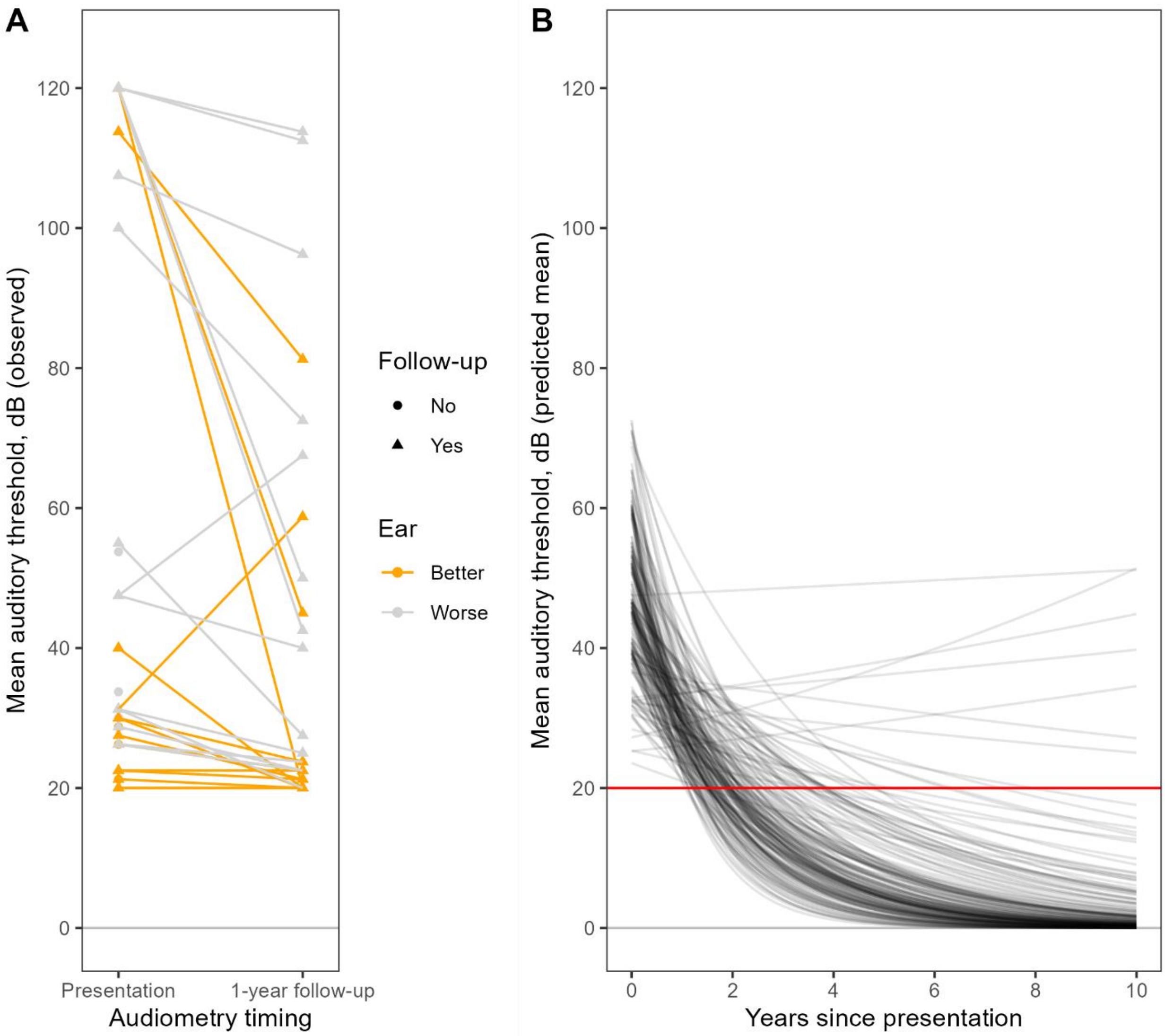


Figure S11. **Resolution of Lassa fever-induced hearing loss.** (**A**) Patient audiometry data from Cummins et al. (1990),[27] highlighting in gold the data carried forward in analysis: measures of MAT in dB at presentation and 1-year follow-up in patients' better ear at each time point (not necessarily the same ear in the case of asymmetric improvement in bilateral SNHL). (**B**) Modelled average trajectories of SNHL recovery over time, estimated by fitting bootstrap resampled audiometry data to exponential decay curves. The red horizontal line indicates the threshold at which patients are defined as having any deafness according to the GBD study on hearing loss.

Mean SNHL duration was estimated by calculating when each decay curve crossed 20 dB, which in the GBD study is the minimum threshold at which patients are classified as having normal hearing and hence no hearing-related disability:

$$dur^{SNHL} = -\frac{\log\left(\frac{20}{M}\right)}{d}$$

This resulted in a final distribution of SNHL durations with a mean of 2.1 years (**Figure S12**).

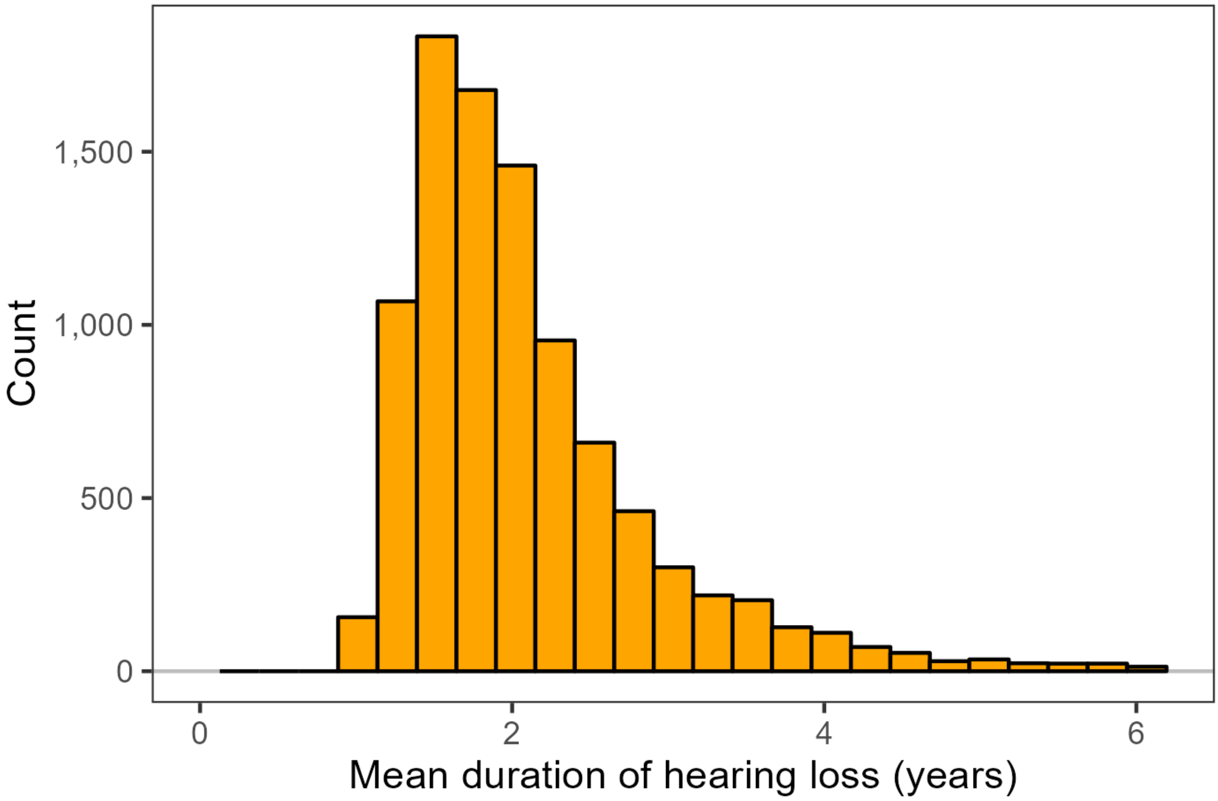


Figure S12. **Hearing loss duration.** Histogram showing the 95% probability distribution (trimmed at 2.5% and 97.5%) of the mean duration of Lassa fever-induced SNHL, estimated from bootstrap resampled audiometry data.

To quantify disability associated with SNHL, mean MAT measures were taken at baseline from the bootstrapped sample and the severity of average hearing loss was classified according to GBD definitions (mild, 20 dB ≤ MAT < 35 dB; moderate, 35 dB ≤ MAT < 50 dB; moderately severe, 50 dB ≤ MAT < 65 dB; severe, 65 dB ≤ MAT < 80 dB; profound, 80 dB ≤ MAT < 95 dB; and complete, MAT ≥ 95 dB).[28] Based on these classifications, for each baseline MAT value, a disability weight associated with the corresponding level of hearing loss severity was stochastically drawn, ranging from a mean of 0.021 in mild hearing loss with ringing to 0.316 given complete hearing loss with ringing and assuming normally distributed confidence intervals. The GBD study also reports estimates of hearing loss disability weights without ringing.[28] However, since Lassa fever-induced SNHL is commonly associated with tinnitus, and since tinnitus is itself a common sequela of Lassa fever even in the absence of SNHL,[25,26] disability weights associated with ringing were selected.

The binning of disability estimates according to severity categories results in stepwise increases in hearing loss-associated disability with increasing baseline MAT. To generate a more plausible distribution, these data were fitted to a Gamma-distributed generalised additive model (GAM) with a log link function and a smooth term with k=3 basis dimensions (**Figure S13 panel A**). Finally, using the distribution of bootstrap resampled mean MAT from Cummins *et al.* (1990) at baseline as input data, this GAM was used to generate a final distribution of disability values associated with Lassa fever-induced SNHL (**Figure S13 panel B**).

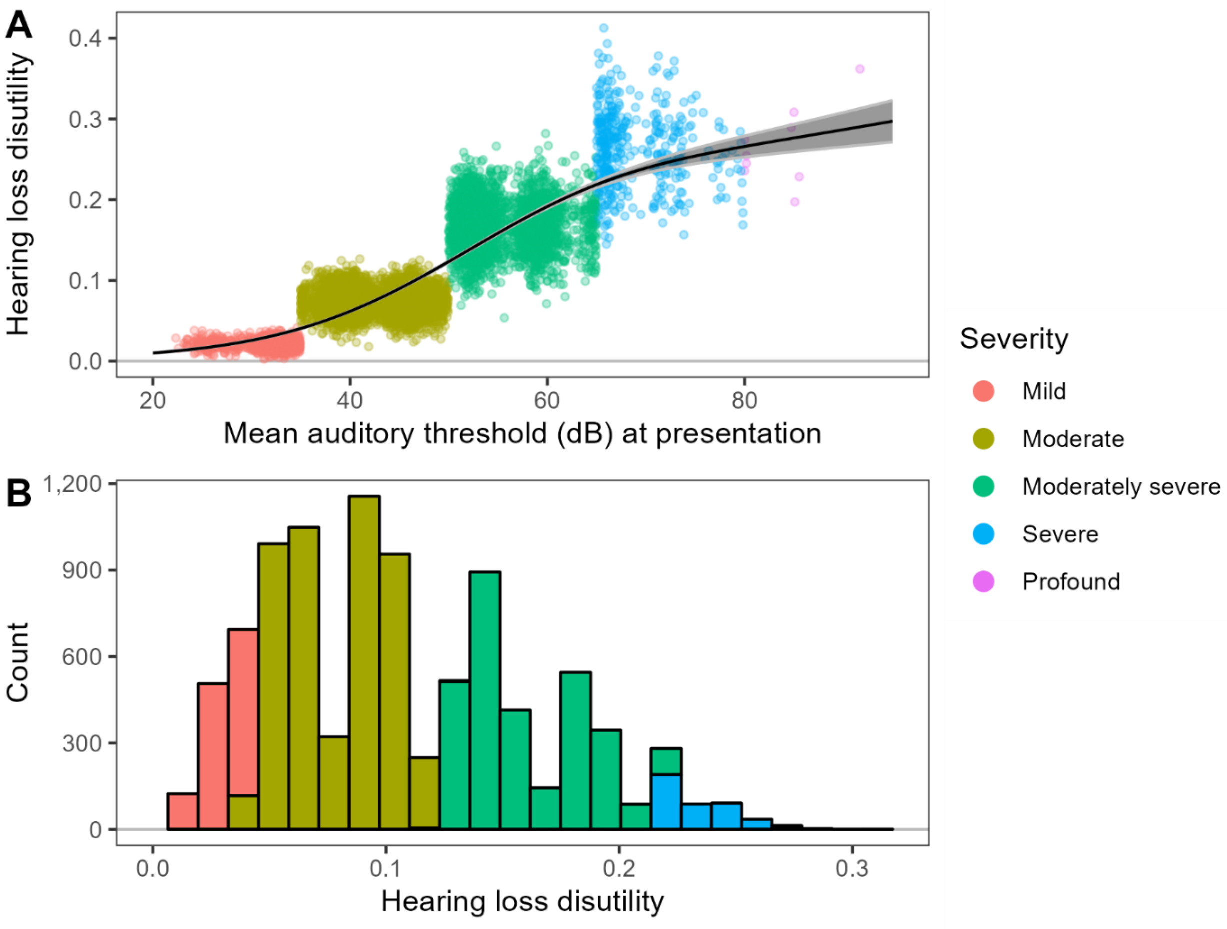


Figure S13. Hearing loss disability. (**A**) Disability associated with sensorineural hearing loss (SNHL), simulated from estimates of disability weights for hearing loss with ringing from the Global Burden of Disease (GBD) study on hearing loss (2021) corresponding to mean auditory threshold (MAT) values specific to Lassa fever-induced SNHL. Each point is a value drawn randomly as a function of the MAT in decibels (dB) at baseline from audiometry measurements in patients followed-up in a prospective cohort study of Lassa fever-induced SNHL by Cummins et al. (1990),[27] and subsequently binned according to the corresponding severity category defined in GBD (2021).[28] The smoothed curve shows the mean fit (line) and 95% confidence interval (shading) of a generalised additive model fit to these data. (**B**) Histogram of the final distribution of disability predicted by the GAM as a function of the bootstrapped sample of baseline MAT values from Cummins et al. (1990).

1f. Vaccination Campaigns

Vaccination campaigns were included in the model to estimate the projected health-economic benefits of administering a hypothetical single-dose Lassa fever vaccine preventively to different population groups in endemic areas of West Africa. Vaccination campaigns included in the model were conducted only in areas classified as endemic (≥5 Lassa fever cases reported annually) following WHO's 2024 Lassa fever risk map.[5] Therefore, vaccine doses were administered to populations in 19 areas spread across Nigeria (14), Liberia (3), Guinea (1) and Sierra Leone (1). Any area not classified as endemic (<5 cases reported annually) did not receive any vaccine doses. Within each area, vaccination campaigns were designed to target 75% of the entire population aged ≥2 years ("untargeted vaccination") or 75% of one of four target groups defined based on age and sex ("risk-targeted vaccination"). The four target groups considered were children aged 2 to 14 years, women of childbearing age (WCBA) aged 15 to 49 years, all adolescents and adults aged 15 to 49 years, and older adults aged ≥50 years. The 75% total coverage target was based on targets for other mass vaccination campaigns and a previously published Lassa fever vaccine demand forecast.[29-31]

The 3-year campaign was intended to reduce the annual demand after introduction by spreading the campaign over multiple years (**Table S4**). The total demand for each target age group assumed 10% wastage per year and accounted for the changing size of each group over time (per population projections). Any campaign in Nigeria requires significantly more doses than those operated in the other endemic countries, due to its much more populous endemic areas (**Table S5**). These demand numbers are driven by target coverage, target population and wastage and are therefore not constrained by supply. The final number of vaccine doses administered under each vaccination campaign was assumed to be equal to vaccine demand.

Table S4. Total vaccine demand for target groups in endemic areas grouped by year. The demand figures assume 75% population coverage achieved over a 3-year campaign, a 1-dose schedule and 10% wastage, and account for projected population change over the vaccination period. WCBA = women of childbearing age; M = million.

Target group (age in years)	2025	2026	2027	Total
Children (2-14)	8.34 M	8.40 M	8.46 M	25.20 M
WCBA (15-49)	5.86 M	6.02 M	6.19 M	18.06 M
Adolescents & adults (15-49)	11.90 M	12.23 M	12.58 M	36.70 M
Older adults (50+)	2.51 M	2.59 M	2.68 M	7.78 M
All (2+)	22.7 M	23.23 M	23.72 M	69.68 M

Table S5. Total vaccine demand for target age groups in endemic areas grouped by country. The target group "all" refers to untargeted vaccination to all individuals aged 2+. The demand figures assume 75% coverage achieved over a 3-year campaign, a 1-dose schedule and 10% wastage, and account for projected population change over the vaccination period. WCBA = women of childbearing age; K = thousand; M = million.

Target group (age in years)	**Guinea**	**Liberia**	**Nigeria**	**Sierra Leone**	**Total**
Children (2-14)	601 K	411 K	23.7 M	513 K	25.2 M
WCBA (15-49)	436 K	312 K	16.9 M	414 K	18.1 M
Adolescents & adults (15-49)	868 K	625 K	34.4 M	831 K	36.7 M
Older adults (50+)	184 K	140 K	7.27 M	184 K	7.78 M
All (2+)	1.65 M	1.18 M	65.3 M	1.53 M	69.7 M

To simulate vaccination cohorts, immunisation was implemented using an algorithm that accounts for aging, such that the age groups in which outcomes are prevented represent individuals' ages when those outcomes would have occurred, and not necessarily their age when vaccine was received. The age-specific benefits of targeted vaccination thus depend not only on the burden of disease in the targeted group and the vaccine's efficacy against disease, but also on how much time has passed since vaccine administration. The acquisition and loss of immunity through time when targeting different age groups is visualised in **Figure S14** under base case assumptions and in **Figure S15** for the sensitivity analysis assuming five- instead of ten-years of vaccine-induced immunity.

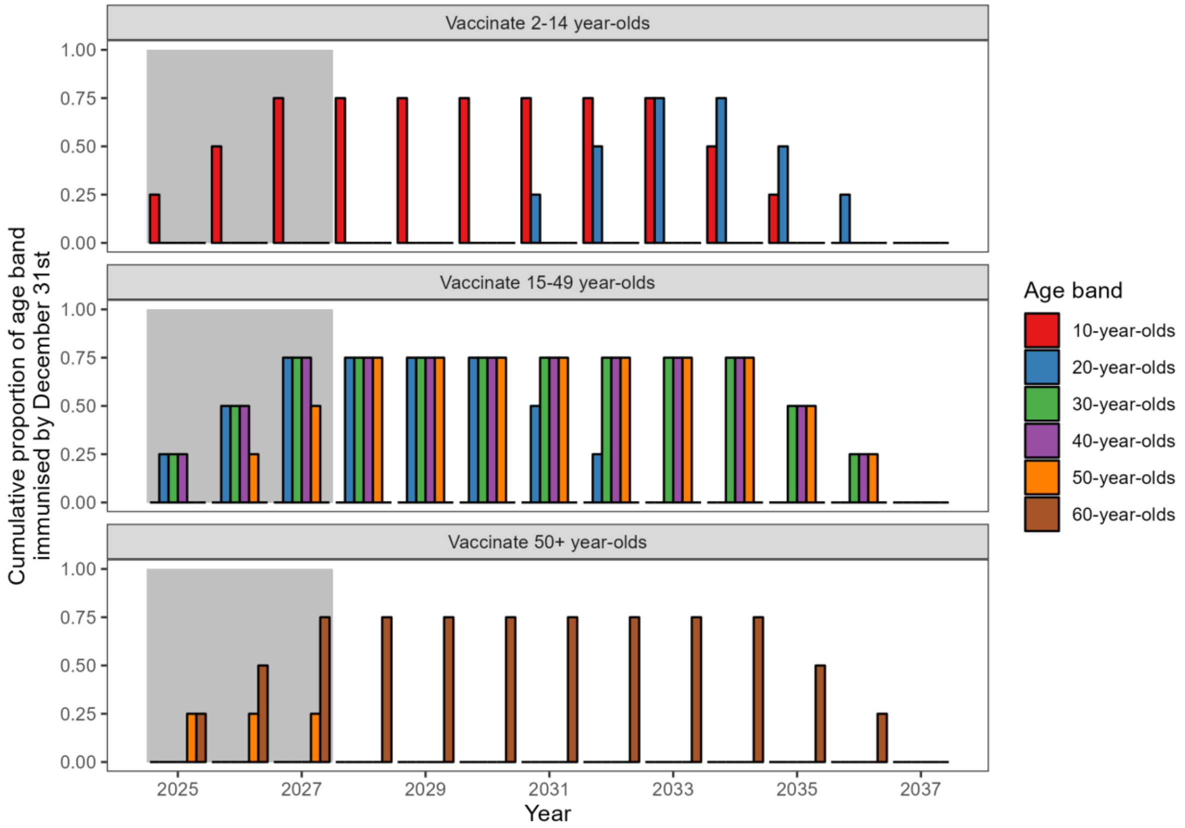


Figure S14. Levels of vaccine-induced immunity at year's end (31st December) across selected one-year age bands (colours) for different vaccine population target groups (panels), in the base case analysis assuming

10 years of vaccine-induced immunity. Changes in the proportion immunised after the end of the vaccine programme (grey shaded area) reflect vaccinated individuals aging into older age groups, and eventual immune waning ten years after vaccine administration. These immunisation proportions therefore demonstrate potential immunogenicity due to prior vaccine exposure and do not account for imperfect vaccine efficacy or natural immunity (e.g. through prior LASV infection).

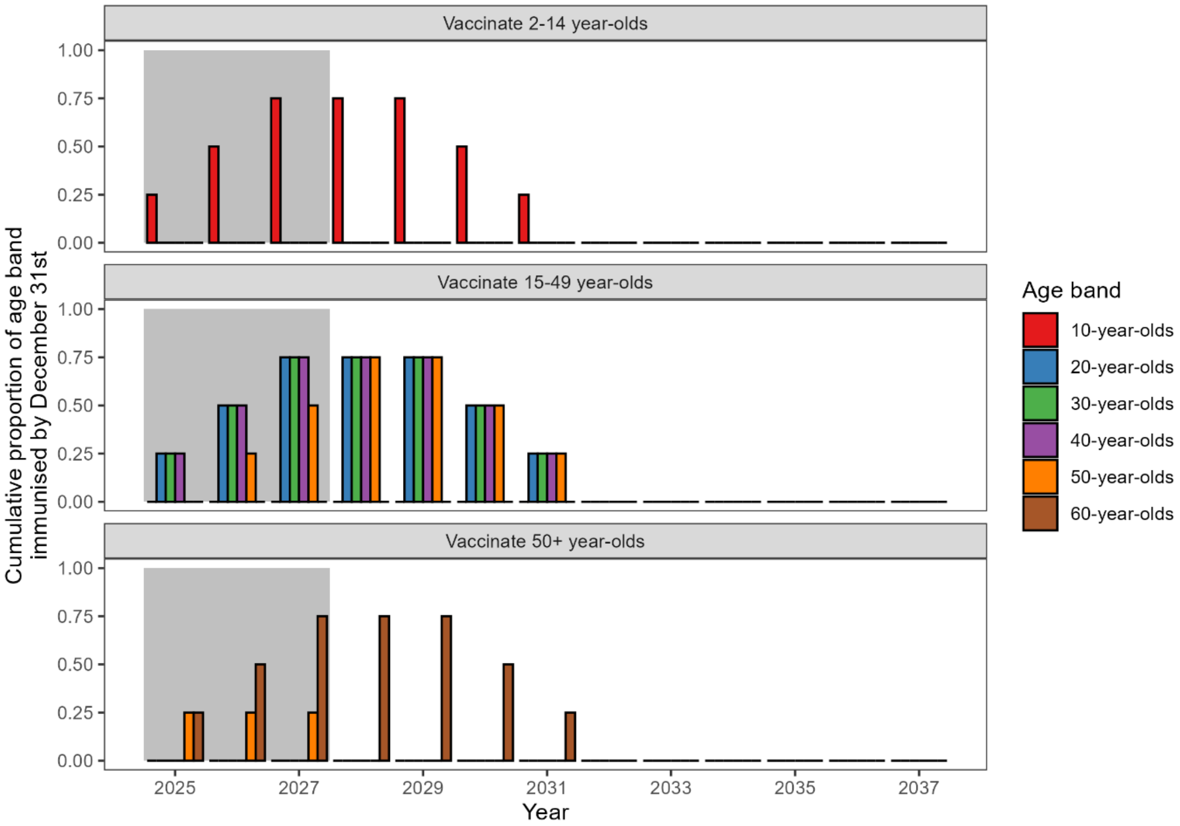


Figure S15. Levels of vaccine-induced immunity at year's end (31st December) across selected one-year age bands (colours) for different vaccine population target groups (panels), in a sensitivity analysis assuming 5 years of vaccine-induced immunity. Changes in the proportion immunised after the end of the vaccine programme (grey shaded area) reflect vaccinated individuals aging into older age groups, and eventual immune waning five years after vaccine administration. These immunisation proportions therefore demonstrate potential immunogenicity due to prior vaccine exposure and do not account for imperfect vaccine efficacy or natural immunity (e.g. through prior LASV infection).

1g. Other health state parameters

Other health state input parameters in the model remain unchanged since previous publication, including the probability of seeking outpatient care for moderate symptoms, as well as the durations and disability weights of various health states. See Smith *et al*. (2024) for details on derivation of these parameters.[1] **Table S6** lists all health state input parameters not stratified by age and sex.

Table S6. Model input parameters not varied by age or sex. The mean and 95% uncertainty interval were calculated from the final vector of 500 stochastic draws for each parameter used as inputs in Monte Carlo simulation. No unit is provided for disability weights, which represent decrements of health-related quality of life on a scale from 0 (death) to 1 (perfect health). CI = confidence interval.

Parameter (unit) ***Symbol***	**Mean** **[95% CI]**	**Distribution [parameters]**	**Source**
Health state probabilities			
Probability of foetal loss in pregnant women hospitalised with Lassa fever (%) $\mathbb{P}(FL \mid hospital)$	60.3 [30.8, 83.3]	Beta [α=6.913, β=4.533]	Estimated
Probability of all-cause foetal loss (%) $\mathbb{P}(FL \mid all\ cause)$	2.28 [1.98, 2.77]	Log-normal [μ_{log}=-3.78, σ_{log}=0.086]	[19]
Probability of neonatal death in pregnant women hospitalised with Lassa fever (%) $\mathbb{P}(NND \mid hospital)$	38.1 [21.8, 58.3]	Beta [α=9.89, β=16.08]	Estimated
Probability of all-cause neonatal death (%) $\mathbb{P}(NND \mid all\ cause)$	4.97 [4.45, 5.51]	Log-normal [μ_{log}=-3.00, σ_{log}=0.055]	[20]
Probability of developing SNHL during Lassa fever convalescence (%) $\mathbb{P}(SNHL \mid discharged)$	28.0 [16.3, 42.9]	Binomial, [n=49, p=0.286]	[27]
Probability of seeking outpatient care for moderate symptoms (%) $\mathbb{P}(outpatient \mid mild)$	59.7 [54.5, 65.3]	Normal, [μ=0.598, σ=0.028]	[32]
Probability of outpatient care costs being reimbursed by government (%) $\mathbb{P}(gvt \mid outpatient)$	48.8 [43.7, 54.5]	Normal, [μ=0.489, σ=0.028]	[32]
Health state durations			
Duration of moderate symptoms (days) dur^{mild}	3.53 [3.29, 3.78]	Normal, [μ=3.53, σ=0.123]	[33]
Duration of severe symptoms prior to hospital (days) $dur^{severe}_{pre-hospital}$	9.33 [8.95, 9.73]	Normal, [μ=9.33, σ=0.197]	[14]
Hospital length of stay for survivors (days) $dur^{severe}_{hospital_{survived}}$	12.00 [11.66, 12.35]	Normal, [μ=12, σ=0.175]	[14]
Hospital length of stay for fatalities (days) $dur^{severe}_{hospital_{died}}$	3.32 [2.42, 4.29]	Normal, [μ=3.33, σ=0.475]	[14]
Duration of Lassa fever-induced SNHL (years) dur^{SNHL}	2.10 [1.07, 6.07]	Non-parametric	Estimated
Health state disability weights			
Disability due to moderate symptoms dw^{mild}	0.0508 [0.0304, 0.0725]	Normal [μ=0.051, σ=0.011]	[34]
Disability due to severe symptoms dw^{severe}	0.337 [0.219, 0.429]	Non-parametric	[1]
Disability due to Lassa fever-induced SNHL dw^{SNHL}	0.104 [0.032, 0.215]	Non-parametric	Estimated

1h. Economic parameters

This study builds on a previous health-economic analysis (see Smith *et al.* for details).[1] No additional analysis plan specific to this study was developed. All economic parameters included in our model were estimated previously, but were reviewed and updated to 2023 value here using most recent available economic data.[1] These updated parameters are summarised in **Table S7**. The 2023 World Bank GDP deflator was used to update country-specific outpatient and inpatient treatment costs, including the proportion of costs paid out-of-pocket (OOP) by patients or their families, based on modelled estimates of all-cause outpatient costs and data from an inpatient Lassa fever costing study in Nigeria in 2016.[35-37] These estimates of OOP healthcare expenditure informed updated estimates of the probability of OOP healthcare expenditure resulting in: (i) catastrophic healthcare expenditure (CHE), i.e. healthcare expenditure exceeding 10% of annual income; and (ii) impoverishing healthcare expenditure (IHE), estimated using updated country-specific poverty lines from 2017 (USD$3.40 in Guinea, USD$3.24 in Sierra Leone, USD$3.13 in Liberia and USD$2.52 in Nigeria).[38] Finally, 2023 World Bank estimates of per-capita GDP were used to update country-specific estimates of (i) willingness-to-pay per DALY from Ochalek *et al.*, and (ii) the value of a statistical life.[36,39-41]

Table S7. Economic model input parameters. All parameters were estimated previously in Smith et al. (2024) and were updated here to values reflecting International dollars in 2023 (I$ 2023).

Parameter (Unit) ***Symbol***	**Guinea**	**Liberia**	**Nigeria**	**Sierra Leone**
Outpatient unit cost (I$ 2023) $Unit_c^{outpatient}$	6.11	15.88	23.21	9.77
Inpatient unit cost, reimbursed (I$ 2023) $Unit_c^{inpatient,gvt}$	1,723	2,114	1,414	1,751
Inpatient unit cost, paid OOP (I$ 2023) $Unit_c^{inpatient,OOP}$	725	334	1,034	697
Probability of CHE (%) $\mathbb{P}_c(catastrophic \vert hospital)$	99.3	94.9	99.9	98.3
Probability of IHE (%) $\mathbb{P}_c(impoverishing \vert hospital)$	55.6	44.0	59.8	41.5
Willingness-to-pay per DALY (I$ 2023) m_c	449	168	178	91
Value of statistical life (I$ 2023) vsl_c	138,544	39,266	273,485	55,070

APPENDIX 2: OUTCOME CALCULATIONS

2a. Disease states

The total number of cases of symptomatic infection in each year y, area d, 1-year age band a and sex s (including males, non-pregnant females and pregnant females) is calculated as,

$$N_{y,d,s,a}^{symptoms} = L_{y,d,s,a} \cdot \mathbb{P}_a(symptoms|infection)$$

Severe Lassa fever is defined as symptomatic disease that is severe enough to result in hospitalisation, quantified using age- and sex-specific IHR estimates, such that

$$N_{y,d,s,a}^{hospital} = N_{y,d,s,a}^{severe} = L_{y,d,s,a} \cdot \mathbb{P}_{s,a}(hospital|infection)$$

The number of cases of moderate symptomatic disease is therefore,

$$N_{y,d,s,a}^{moderate} = N_{y,d,s,a}^{symptoms} - N_{y,d,s,a}^{severe}$$

and the number of outpatient healthcare visits resulting from moderate disease is

$$N_{y,d,s,a}^{outpatient} = N_{y,d,s,a}^{moderate} \cdot \mathbb{P}(outpatient|moderate)$$

among which a proportion are in government-run facilities,

$$N_{y,d,s,a}^{outpatient,gvt} = N_{y,d,s,a}^{outpatient} \cdot \mathbb{P}(gvt|outpatient)$$

Among hospitalised cases, the number of deaths is calculated using age- and sex-adjusted CFRs,

$$N_{y,d,s,a}^{death} = N_{y,d,s,a}^{hospital} \cdot \mathbb{P}_{s,a}(death|hospital)$$

and, among pregnant women (s=P), the number of foetal losses due to Lassa fever is calculated as

$$N_{y,d,s=P,a}^{FL} = N_{y,d,s=P,a}^{hospital} \cdot \big(\mathbb{P}(FL|hospital) - \mathbb{P}(FL|all\ cause)\big)$$

and the number of neonatal deaths due to Lassa fever as

$$N_{y,d,s=P,a}^{NND} = N_{y,d,s=P,a}^{hospital} \cdot \big(\mathbb{P}(NND|hospital) - \mathbb{P}(NND|all\ cause)\big)$$

where neonatal deaths and foetal losses were attributed to the youngest age (a = 0), with equal proportions male and female, for appropriate calculation of DALYs. Foetal loss is presented as a distinct outcome separate from deaths, but the total number of deaths is presented as including both direct Lassa fever deaths and neonatal deaths following maternal Lassa fever,

$$N_{y,d,s,a}^{deathTotal} = N_{y,d,s,a}^{death} + N_{y,d,s,a}^{NND}$$

Finally, among survivors, the number that develop SNHL during convalescence was calculated,

$$N_{y,d,s,a}^{SNHL} = N_{y,d,s,a}^{moderate} \cdot \mathbb{P}(SNHL|moderate) + \big(N_{y,d,s,a}^{hospital} - N_{y,d,s,a}^{death}\big) \cdot \mathbb{P}(SNHL|discharged)$$

where in the base case it is assumed that

$$\mathbb{P}(SNHL|moderate) = \mathbb{P}(SNHL|discharged)$$

and in sensitivity analysis it is assumed that

$$\mathbb{P}(SNHL|moderate) = 0$$

2b. Disability-adjusted life years

As in Smith *et al.* (2024),[1] disability-adjusted life years (DALYs) were calculated as the sum of years lived with disability (YLDs) and years of life lost (YLLs). YLLs due to moderate symptomatic disease were calculated as the disability weight associated with fever multiplied by its cumulative duration,

$$YLD^{mild} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} N_{y,d,s,a}^{moderate} \cdot dw^{moderate} \cdot \frac{dur^{moderate}}{365}$$

YLDs due to severe symptomatic disease were calculated as the disability weight associated with hospitalised Lassa fever multiplied by its cumulative duration, accounting for different illness durations among those who die and those who survive,

$$YLD^{severe} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} \left(\left(N_{y,d,s,a}^{hospital} - N_{y,d,s,a}^{death}\right) \cdot dw^{severe} \cdot \frac{dur_{pre-hospital}^{severe} + dur_{hospital_{survived}}^{severe}}{365} + N_{y,d,s,a}^{death} \cdot dw^{severe} \cdot \frac{dur_{pre-hospital}^{severe} + dur_{hospital_{died}}^{severe}}{365} \right)$$

YLDs due to SNHL were calculated using estimates of the average disability associated with Lassa fever-induced hearing loss multiplied by estimates of its average cumulative duration,

$$YLD^{SNHL} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} N_{y,d,s,a}^{SNHL} \cdot dw^{SNHL} \cdot dur^{SNHL}$$

YLLs were calculated using each deceased individual's average remaining life expectancy. For a death occurring at age a, annual national projections of age- and sex-specific remaining life expectancy from 2024 WHO Population Prospects, $x_{y,c,s,a}$, were used to account for changing life expectancy over the study horizon,[6]

$$YLL^{Total} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} N_{y,d,s,a}^{deathTotal} \cdot x_{y,c,s,a}$$

The same holds for YLLs due to foetal loss, although this outcome was only included in sensitivity analysis,

$$YLL^{FL} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} N_{y,d,s,a}^{FL} \cdot x_{y,c,s,a}$$

The total number of DALYs due to Lassa fever is therefore,

$$DALY = YLD^{moderate} + YLD^{severe} + YLD^{SNHL} + YLL^{Total} + YLL^{FL}$$

2c. Treatment costs

As with all monetary costs, outpatient care costs among patients with moderate symptomatic disease were calculated using a discounting rate, r, applied in discrete time to future costs to estimate their present value in 2025, i.e. at the start of the study time horizon,

$$Cost_{r}^{outpatient,gvt} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} \frac{N_{y,d,s,a}^{outpatient,gvt} \cdot Unit_{c}^{outpatient}}{(1+r)^{y-2025}}$$

$$Cost_{r}^{outpatient,OOP} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} \frac{\left(N_{y,d,s,a}^{outpatient} - N_{y,d,s,a}^{outpatient,gvt}\right) \cdot Unit_{c}^{outpatient}}{(1+r)^{y-2025}}$$

$$Cost_{r}^{outpatient} = Cost_{r}^{outpatient,gvt} + Cost_{r}^{outpatient,OOP}$$

And inpatient costs for patients hospitalised with Lassa fever were calculated as,

$$Cost_{r}^{hospital,gvt} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} \frac{N_{y,d,s,a}^{hospital} \cdot Unit_{c}^{inpatient,gvt}}{(1+r)^{y-2025}}$$

$$Cost_{r}^{hospital,OOP} = \sum_{y}\sum_{d}\sum_{s}\sum_{a} \frac{N_{y,d,s,a}^{hospital} \cdot Unit_{c}^{inpatient,OOP}}{(1+r)^{y-2025}}$$

$$Cost_{r}^{hospital} = Cost_{r}^{hospital,gvt} + Cost_{r}^{hospital,OOP}$$

Total Lassa fever healthcare costs are therefore,

$$Cost_r^{care} = Cost_r^{outpatient} + Cost_r^{hospital}$$

Related to the cost of hospitalisation costs paid OOP, the number of instances of Lassa fever hospitalisation costs resulting in CHE or IHE were calculated,

$$N^{catastrophic} = \sum_y \sum_d \sum_s \sum_a N_{y,d,s,a}^{hospital} \cdot \mathbb{P}(catastrophic|hospital)$$

$$N^{impoverishing} = \sum_y \sum_d \sum_s \sum_a N_{y,d,s,a}^{hospital} \cdot \mathbb{P}(impoverishing|hospital)$$

Outpatient costs did not contribute to catastrophic or impoverishing expenditure, under the assumption that the probability of attending a government-run facility is associated with having less ability to pay OOP for medical expenses.

2d. Monetised DALYs

When monetising DALYs, it is necessary to discount future years of life lost or lived with disability. Following Larson,[42] YLLs were calculated assuming continuous time discounting at rate r as,

$$YLL_{r,y,d} = \sum_s \sum_a N_{y,d,s,a}^{death} \frac{1 - e^{-r \cdot x_{y,d,s,a}}}{r} + \left(N_{y,d,s,a}^{NND} + N_{y,d,s,a}^{FL}\right) \frac{1 - e^{-r \cdot x_{y,d,s,a=0}}}{r}$$

where (monetised) DALYs due to foetal losses were only included in sensitivity analysis. Half-cycle correction was not applied due to the majority of Lassa fever hospitalisations occurring in January and February of each year.

Similarly, YLDs due to Lassa fever-induced SNHL of average duration dur^{SNHL} years were calculated as,

$$YLD_{r,y,d}^{SNHL} = \sum_s \sum_a N_{y,d,s,a}^{SNHL} \frac{1 - e^{-r \cdot dur^{SNHL}}}{r}$$

It was necessary to truncate SNHL duration in 1 of 500 (0.2%) Monte Carlo simulations in which $x_{y,d,s,a} > dur^{SNHL}$ in those aged 80+.

In turn, monetised DALYs for Lassa fever cases occurring in year y were calculated using country-specific willingness-to-pay thresholds, m_c, as

$$MDALY_r = \sum_y \sum_d \frac{YLD_{r,y,d}^{moderate} + YLD_{r,y,d}^{severe} + YLD_{r,y,d}^{SNHL} + YLL_{r,y,d}}{(1+r)^{y-2025}} \cdot m_c$$

2e. Productivity losses

To estimate future years of potential productive life lost (YPPLL) due to Lassa fever, most recent age group- and sex-specific estimates of the proportion of the population participating in the labour force in each country, $lfp_{c,a,s}$, compiled by the International Labour Organisation (ILO) were used,[43]

$$YPPLL_{r,y,d}^{moderate} = \sum_s \sum_a N_{y,d,s,a}^{moderate} \cdot dur^{moderate} \cdot \frac{lpf_{c,s,a}}{365}$$

$$\begin{aligned} YPPLL_{r,y,d}^{severe} = \sum_s \sum_a & \left(N_{y,d,s,a}^{hospital} - N_{y,d,s,a}^{death}\right) \cdot \left(dur_{pre-hospital}^{severe} + dur_{hospital_{survived}}^{severe}\right) \cdot \frac{lpf_{c,s,a}}{365} + N_{y,d,s,a}^{death} \\ & \cdot \left(dur_{pre-hospital}^{severe} + dur_{hospital_{died}}^{severe}\right) \cdot \frac{lpf_{c,s,a}}{365} \end{aligned}$$

For YPPLL associated with death and disability, discrete time discounting was applied over future years of lost productivity because of variable $lfp_{c,a,s}$ over individuals' remaining years of life (death) or years of life lived with disability (SNHL),

$$YPPLL^{death}_{r,y,d} = \sum_{s}\sum_{a} N^{death}_{y,d,s,a} \cdot \left(\sum_{i=0}^{\lfloor x_{y,d,s,a} \rfloor - 1} \frac{lpf_{c,s,a+i}}{(1+r)^{i}} \right) + \frac{\vartheta^{death}_{y,d,s,a} \cdot lpf_{c,s,a+\lfloor x_{y,d,s,a} \rfloor}}{(1+r)^{\lfloor x_{y,d,s,a} \rfloor}}$$

$$YPPLL^{SNHL}_{r,y,d} = \sum_{s}\sum_{a} N^{SNHL}_{y,d,s,a} \cdot \left(\sum_{i=0}^{\lfloor dur^{SNHL} \rfloor - 1} \frac{lpf_{c,s,a+i} \cdot (1 - pl^{SNHL})}{(1+r)^{i}} \right) + \frac{\vartheta^{SNHL} \cdot lpf_{c,s,a+\lfloor dur^{SNHL} \rfloor} \cdot (1 - pl^{SNHL})}{(1+r)^{\lfloor dur^{SNHL} \rfloor}}$$

where non-integer durations of remaining life expectancy and SNHL are given by

$$x_{y,d,s,a} \equiv \vartheta^{death}_{y,d,s,a} \left(\mathrm{mod}\ x_{y,d,s,a}\right)$$

and

$$dur^{SNHL} \equiv \vartheta^{SNHL} \left(\mathrm{mod}\ dur^{SNHL}\right)$$

The calculation for $YPPLL^{SNHL}$ includes pl^{SNHL}, a proportional reduction in labour force participation due to SNHL. Estimates specific to Lassa fever could not be found, but a 2017 WHO report has highlighted the global costs of unaddressed hearing loss, including lost economic productivity among those with hearing loss due to isolation, communication difficulties, stigma and other factors (WHO, 2017a).[44] Although this report highlights that information on productivity losses related to hearing loss remains scarcely available even in high-income settings, the authors highlighted a conservative estimate that there is an 18% gap in employment rates between working-age people not classified as disabled relative to working-age disabled people reporting hearing loss as their main health problem. This estimate of 18% has also been used in a study estimating the global costs of hearing loss.[45] It was therefore assumed that $pl^{SNHL} = 0.18$ among those experiencing SNHL for the duration of their disability.

Total productivity losses were then calculated by summing annual national YPPLL multiplied by per-capita gross national income (GNI) and discounting annually,

$$PL_{r} = \sum_{y}\sum_{d} \frac{YPPLL^{moderate}_{r,y,d} + YPPLL^{severe}_{r,y,d} + YPPLL^{death}_{r,y,d} + YPPLL^{SNHL}_{r,y,d}}{(1+r)^{y-2025}} \cdot GNI_{c}$$

Based on these calculations, age- and sex-stratified per-person productivity losses due to death ($YPPLL^{death}$) vary across included countries (**Figure S16**), over time (**Figure S17**) and depending on the discount rate assumed (**Figure S18**). Per-person productivity losses due to SNHL ($YPPLL^{SNHL}$) also vary based on these factors, as well as on draws of the average duration of SNHL in Monte Carlo simulation (**Figure S19**).

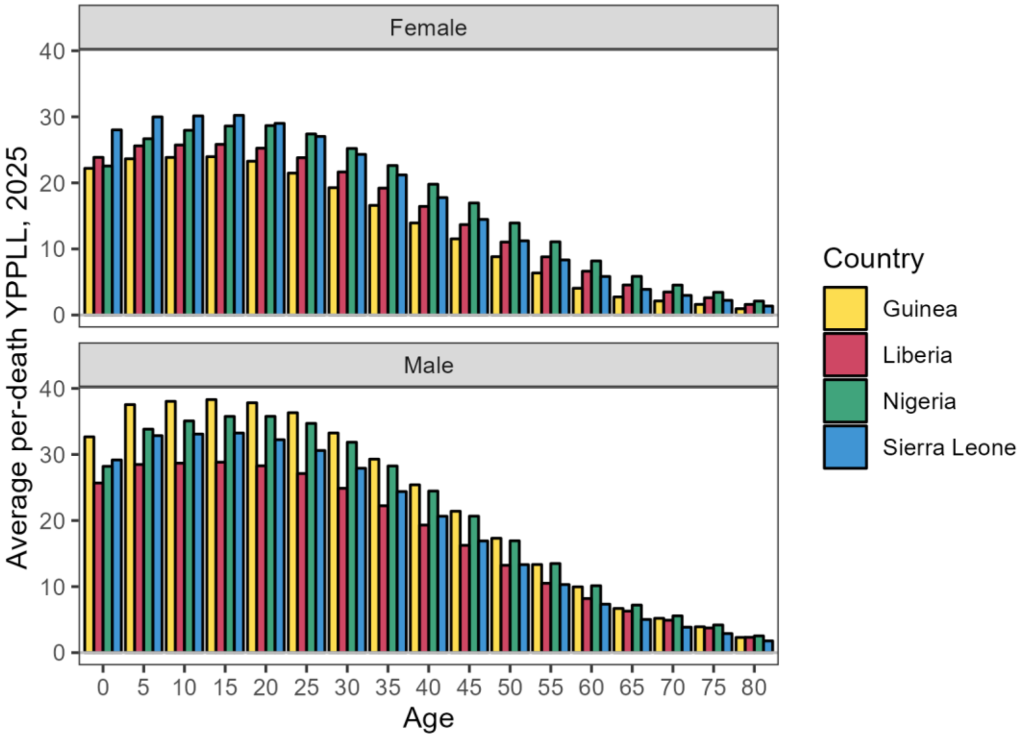


Figure S16. The average YPPLL per Lassa fever death across countries (colours), stratified by sex (panels) and age (x-axis), showing a selection one-year age bands from 0 to 80+ years by increments of 5 years and assuming no discounting of future YPPLL (r=0%).

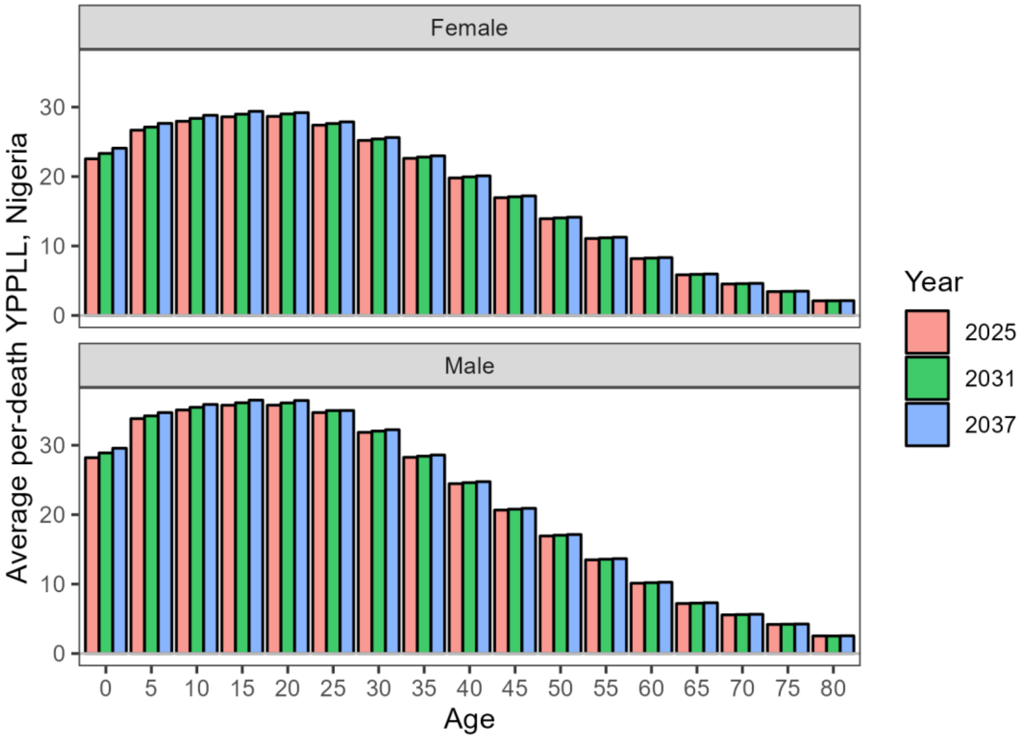


Figure S17. The average YPPLL per Lassa fever death across a selection of 3 years from the beginning, middle and end of the modelled time horizon (colours), stratified by sex (panels) and age (x-axis), showing

a selection of one-year age bands from 0 to 80+ years by increments of 5 years and assuming no discounting of future YPPLL (r=0%).

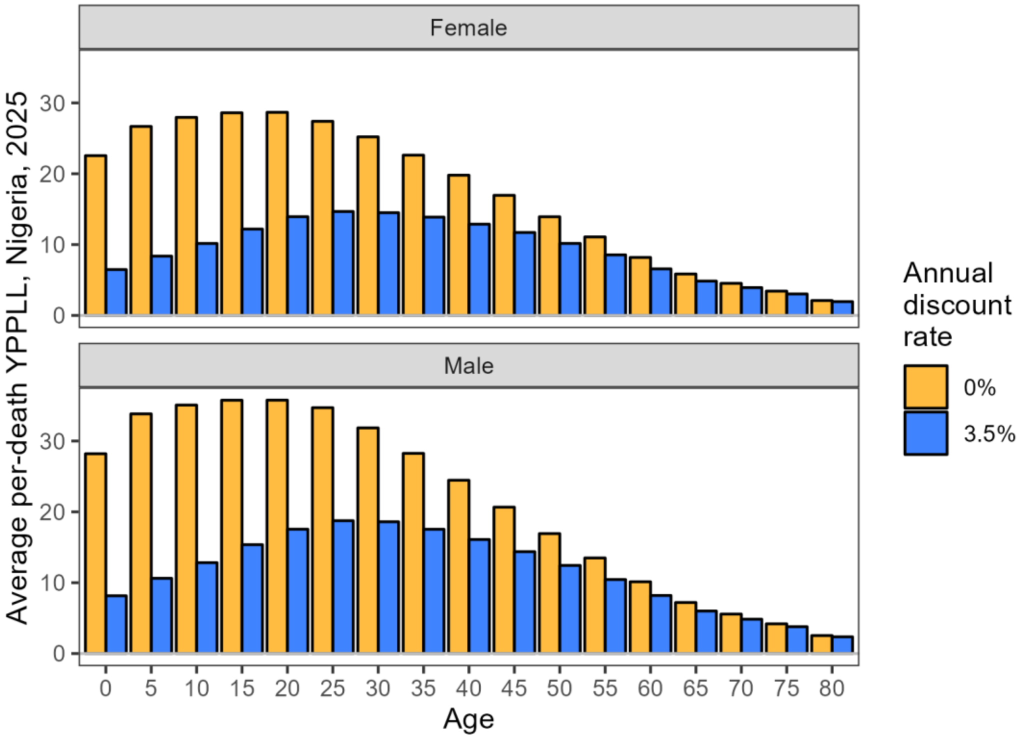


Figure S18. The average YPPLL per Lassa fever death with and without discounting of future life-years (colours), stratified by sex (panels) and age (x-axis), showing a selection of one-year age bands from 0 to 80+ years by increments of 5 years.

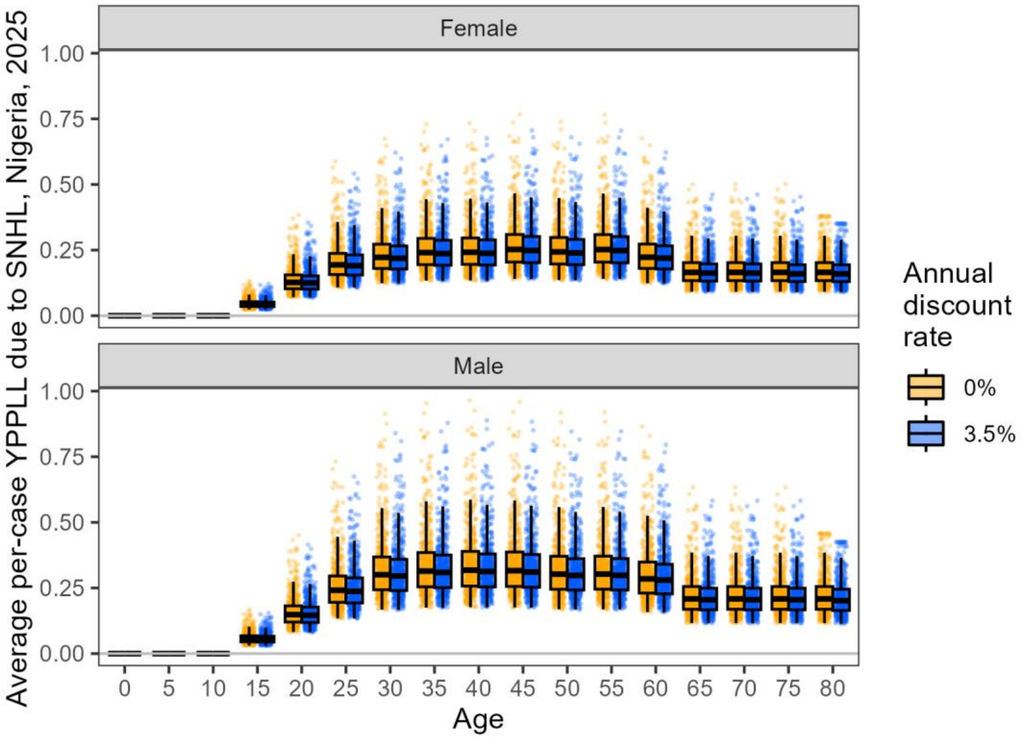


Figure S19. The average YPPLL per case of Lassa fever-induced SNHL with and without discounting of future life-years (colours), stratified by sex (panels) and age (x-axis), showing a selection of one-year age

bands from 0 to 80+ years by increments of 5 years. Each point (n=500) corresponds to a stochastic draw of SNHL duration used in Monte Carlo simulation. Boxplot whiskers extend to the most extreme value no further than 1.5 × IQR from the nearest hinge.

2f. Societal costs

The economic burden of disease from a societal perspective includes both direct costs of disease (e.g. healthcare costs), as well as indirect costs (e.g. productivity losses) and intangible costs (e.g. reduced quality of life). Societal costs of Lassa fever were therefore calculated as the sum of these costs,

$$SC_r = Cost_r^{care} + MDALY_r + PL_r$$

2g. Value of statistical life-years

In addition to calculating the monetised value of life lost using a value of statistical life (VSL) approach, as in Smith *et al.* (2024),[1] the monetised value of life-years lost was also calculated using a value of statistical life-years (VSLY) approach. Following the Reference Case Guidelines for Benefit-Cost Analysis in Global Health and Development,[40] VSLY divides VSL by the age that is one half of a given population's undiscounted life expectancy at birth, $x_{y,c,s,a=0}$, and multiplies this estimated average value per life-year across the estimated total years of life lost (excluding foetal loss),

$$VSLY = \sum_y \sum_d \sum_s \sum_a \frac{YLL_{y,d,s,a}^{Total} \cdot vsl_c}{x_{y,d,s,a=0}/2}$$

VSLY thus places greater value on deaths among younger people, who have more years left to live and hence greater total (monetised) life-years.

2h. Incremental cost-effectiveness ratios, net monetary benefit and threshold vaccine costs

The incremental cost-effectiveness ratio (ICER) of vaccine campaign *g* relative to an alternative strategy *j* along the efficiency frontier was calculated as the total additional economic cost (incremental difference in the sum of vaccine programme costs, healthcare costs and productivity losses) required to avert one additional DALY, accounting for discounting of future life-years and future costs. Given total vaccine programme costs, $Cost^{programme}$, that depends on $Unit^{dose}$, a hypothetical cost per vaccine dose, and $v_{g,y}$, the number of vaccine doses allocated in year *y* when targeting risk group *g*, including wasted doses (10%) and discounting future doses at rate *r*,

$$Cost_{g,r}^{programme} = Unit^{dose} \cdot \sum_y \frac{v_{g,y}}{(1+r)^{y-2025}}$$

it follows that

$$ICER_{g,r} = \frac{\Delta Cost_{g,r}^{programme} + \Delta Cost_{g,r}^{care} + \Delta PL_{g,r}}{\Delta DALY_{g,r}}$$

where ICERs were calculated using mean PSA results in an incremental frontier analysis, whereby strategies were ordered by mean effectiveness (DALYs averted), strictly or extendedly dominated strategies were excluded, and each remaining strategy was compared relative to the next least effective, non-dominated strategy.

For each campaign, net monetary benefit was calculated considering the difference between vaccine programme costs and societal costs averted due to vaccination. Given a change in societal costs,

$$\Delta SC_{g,r} = SC_{no\ vaccine,r} - SC_{g,r}$$

the net monetary benefit of vaccine campaign *g* is

$$NMB_{g,r} = \Delta SC_{g,r} - Cost_{g,r}^{programme}$$

The threshold vaccine cost (TVC) is the price per vaccine dose at which the benefit-to-cost ratio of vaccination exceeds 1. This was calculated as the total economic benefit of vaccination, b**,** divided by the number of vaccine doses administered, including wasted doses and discounting as above,

$$TVC_{g,r}^{b} = \frac{\Delta b_{g,r}}{\sum_y \frac{v_{g,y}}{(1+r)^{y-2025}}}$$

TVCs were calculated separately for each of *b* in *SC* (base case analysis) and *VSLY* (sensitivity analysis).

Finally, cost-effectiveness acceptability curves were generated by solving, for each simulation, which vaccination strategy yielded the greatest net monetary benefit given a willingness-to-pay threshold $m_{ceac} \in$ {I$0, I$50,000} per discounted DALY averted. In this calculation, m_{ceac} therefore replaces the country-specific willingness-to-pay thresholds m_c used in calculation of monetised DALYs. At each value of m_{ceac}, the probability of each vaccination campaign being most cost-effective was calculated as the proportion of simulations in which that campaign yielded the greatest net monetary benefit.

APPENDIX 3: GATHER AND CHEERS CHECKLISTS

Table S8. Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) checklist.[46]

Item	Checklist item	Reporting
Objectives and funding		
1	Define the indicator(s), populations (including age, sex, and geographic entities), and time period(s) for which estimates were made.	Methods [*Model outcomes*]
2	List the funding sources for the work.	Methods [*Role of the funder*]
Data inputs		
For all data inputs from multiple sources that are synthesized as part of the study:		
3	Describe how the data were identified and how the data were accessed.	Methods [*Model overview*]; Supplementary appendix 1
4	Specify the inclusion and exclusion criteria. Identify all ad-hoc exclusions.	Supplementary appendix 1
5	Provide information on all included data sources and their main characteristics. For each data source used, report reference information or contact name/institution, population represented, data collection method, year(s) of data collection, sex and age range, diagnostic criteria or measurement method, and sample size, as relevant.	Tables S1 through S6; Supplementary appendix 1
6	Identify and describe any categories of input data that have potentially important biases (e.g., based on characteristics listed in item 5).	Supplementary appendix 1; Discussion
For data inputs that contribute to the analysis but were not synthesized as part of the study:		
7	Describe and give sources for any other data inputs.	Tables S6 and S7
For all data inputs:		
8	Provide all data inputs in a file format from which data can be efficiently extracted (e.g., a spreadsheet rather than a PDF), including all relevant meta-data listed in item 5. For any data inputs that cannot be shared because of ethical or legal reasons, such as third-party ownership, provide a contact name or the name of the institution that retains the right to the data.	Methods [*Code and data sharing*]
Data analysis		
9	Provide a conceptual overview of the data analysis method. A diagram may be helpful.	Figure S1
10	Provide a detailed description of all steps of the analysis, including mathematical formulae. This description should cover, as relevant, data cleaning, data pre-processing, data adjustments and weighting of data sources, and mathematical or statistical model(s).	Supplementary appendix 2
11	Describe how candidate models were evaluated and how the final model(s) were selected.	Methods [*Simulation and statistical reporting*]; Supplementary appendix 1
12	Provide the results of an evaluation of model performance, if done, as well as the results of any relevant sensitivity analysis.	Methods [*Simulation and statistical reporting*]; Figure S51
13	Describe methods for calculating uncertainty of the estimates. State which sources of uncertainty were, and were not, accounted for in the uncertainty analysis.	Methods [*Simulation and statistical reporting*]
14	State how analytic or statistical source code used to generate estimates can be accessed.	Methods [*Code and data sharing*]
Results and Discussion		
15	Provide published estimates in a file format from which data can be efficiently extracted.	Results tables
16	Report a quantitative measure of the uncertainty of the estimates (e.g. uncertainty intervals).	Reported throughout
17	Interpret results in light of existing evidence. If updating a previous set of estimates, describe the reasons for changes in estimates.	Discussion

18	Discuss limitations of the estimates. Include a discussion of any modelling assumptions or data limitations that affect interpretation of the estimates.	Discussion

Table S9. Guidelines for Consolidated Health Economic Evaluation Reporting Standards (CHEERS) 2022 checklist.[47]

	Item	**Guidance for Reporting**	**Reported in section**
TITLE			
Title	**1**	Identify the study as an economic evaluation and specify the interventions being compared.	Title
ABSTRACT			
Abstract	**2**	Provide a structured summary that highlights context, key methods, results and alternative analyses.	Abstract
INTRODUCTION			
Background and objectives	**3**	Give the context for the study, the study question and its practical relevance for decision making in policy or practice.	Introduction
METHODS			
Health economic analysis plan	**4**	Indicate whether a health economic analysis plan was developed and where available.	Supplementary appendix section 1h
Study population	**5**	Describe characteristics of the study population (such as age range, demographics, socioeconomic, or clinical characteristics).	Methods section *Model overview*; Supplementary appendix sections 1a, 1b
Setting and location	**6**	Provide relevant contextual information that may influence findings.	Methods section *Setting and demography*; Supplementary appendix section 1b
Comparators	**7**	Describe the interventions or strategies being compared and why chosen.	Methods section *Health-economic evaluation*
Perspective	**8**	State the perspective(s) adopted by the study and why chosen.	Methods section *Health-economic evaluation*
Time horizon	**9**	State the time horizon for the study and why appropriate.	Methods sections *Setting and demography*, *Vaccine characteristics*
Discount rate	**10**	Report the discount rate(s) and reason chosen.	Methods section *Health-economic evaluation*
Selection of outcomes	**11**	Describe what outcomes were used as the measure(s) of benefit(s) and harm(s).	Methods section *Model outcomes*
Measurement of outcomes	**12**	Describe how outcomes used to capture benefit(s) and harm(s) were measured.	Supplementary appendix sections 1 and 2
Valuation of outcomes	**13**	Describe the population and methods used to measure and value outcomes.	Supplementary appendix sections 1 and 2
Measurement and valuation of resources and costs	**14**	Describe how costs were valued.	Methods section *Health-economic evaluation*; Supplementary appendix section 1h
Currency, price date, and conversion	**15**	Report the dates of the estimated resource quantities and unit costs, plus the currency and year of conversion.	Supplementary appendix section 1h
Rationale and description of model	**16**	If modelling is used, describe in detail and why used. Report if the model is publicly available and where it can be accessed.	Methods section *Code and data sharing*; Supplementary appendix section 1
Analytics and assumptions	**17**	Describe any methods for analysing or statistically transforming data, any extrapolation methods, and approaches for validating any model used.	Supplementary appendix sections 1 and 2
Characterizing heterogeneity	**18**	Describe any methods used for estimating how the results of the study vary for sub-groups.	Methods sections *Projecting infections through time* and *Disease Risk*; Supplementary appendix section 1
Characterizing distributional effects	**19**	Describe how impacts are distributed across different individuals or adjustments made to reflect priority populations.	Supplementary appendix section 1h
Characterizing uncertainty	**20**	Describe methods to characterize any sources of uncertainty in the analysis.	Supplementary appendix section 1
Approach to engagement with patients and others affected by the study	**21**	Describe any approaches to engage patients or service recipients, the general public, communities, or stakeholders (e.g., clinicians or payers) in the design of the study.	Methods section *Ethics and inclusion*
RESULTS			
Study parameters	**22**	Report all analytic inputs (e.g., values, ranges, references) including uncertainty or distributional assumptions.	Supplementary appendix Tables S1, S2, S3, S4, S5, S6, S7
Summary of main results	**23**	Report the mean values for the main categories of costs and outcomes of interest and summarise them in the most appropriate overall measure.	Throughout results
Effect of uncertainty	**24**	Describe how uncertainty about analytic judgments, inputs, or projections affect findings. Report the effect of choice of discount rate and time horizon, if applicable.	Throughout results; Sensitivity analyses concerning discount rate (0%) and time horizon of vaccine impact (5 years); partial rank correlation coefficients

Effect of engagement with patients and others affected by the study	**25**	Report on any difference patient/service recipient, general public, community, or stakeholder involvement made to the approach or findings of the study	None
DISCUSSION			
Study findings, limitations, generalizability, and current knowledge	**26**	Report key findings, limitations, ethical or equity considerations not captured, and how these could impact patients, policy, or practice.	Throughout discussion
OTHER RELEVANT INFORMATION			
Source of funding	**27**	Describe how the study was funded and any role of the funder in the identification, design, conduct, and reporting of the analysis	Methods section *Role of the funder*
Conflicts of interest	**28**	Report authors conflicts of interest according to journal or International Committee of Medical Journal Editors requirements.	Article section *Declaration of interest*

APPENDIX 4: SUPPLEMENTARY RESULTS

4a. Projected Lassa fever burden in the absence of vaccination

Table S10. Projected mean (95% uncertainty interval) cumulative burden of Lassa fever health outcomes from 2025 to 2037 in the absence of vaccination, stratified by age group under base case assumptions. Hearing loss refers to sensorineural hearing loss, DALY = disability-adjusted life-year.

Age group	LASV infection	Symptomatic cases	Hospitalisation	Hearing loss	Death	Foetal loss	DALYs
Cumulative totals							
<2	1.10 M (942 K, 1.27 M)	212 K (115 K, 363 K)	1.31 K (835, 1.95 K)	60.7 K (25.7 K, 118 K)	995 (402, 1.71 K)	1.60 K (710, 2.56 K)	69.7 K (30.2 K, 122 K)
2-14	4.00 M (3.76 M, 4.24 M)	770 K (410 K, 1.29 M)	10.0 K (6.72 K, 13.5 K)	221 K (93.6 K, 434 K)	223 (0, 559)	0 (0, 0)	60.4 K (15.6 K, 157 K)
15-24	1.76 M (1.60 M, 1.91 M)	339 K (175 K, 577 K)	16.0 K (10.6 K, 21.9 K)	96.9 K (40.2 K, 188 K)	1.12 K (594, 1.94 K)	0 (0, 0)	72.8 K (35.6 K, 132 K)
25-34	850 K (761 K, 935 K)	164 K (85.5 K, 281 K)	19.6 K (13.1 K, 26.4 K)	46.6 K (19.9 K, 92.1 K)	1.40 K (729, 2.36 K)	0 (0, 0)	64.0 K (32.6 K, 108 K)
35-49	639 K (576 K, 702 K)	123 K (63.5 K, 212 K)	19.0 K (12.9 K, 26.3 K)	34.7 K (14.4 K, 67.9 K)	2.22 K (1.35 K, 3.39 K)	0 (0, 0)	72.3 K (43.0 K, 111 K)
50+	336 K (301 K, 369 K)	64.7 K (33.6 K, 111 K)	14.3 K (9.71 K, 19.7 K)	17.5 K (7.08 K, 35.1 K)	3.71 K (2.22 K, 5.53 K)	0 (0, 0)	61.7 K (37.0 K, 91.9 K)
All	8.68 M (8.19 M, 9.15 M)	1.67 M (884 K, 2.86 M)	80.3 K (54.2 K, 108 K)	477 K (204 K, 933 K)	9.66 K (6.22 K, 14.2 K)	1.60 K (710, 2.56 K)	401 K (228 K, 672 K)
Cumulative totals per 100,000 person-years							
<2	1.54 K (1.32 K, 1.77 K)	296 (161, 507)	1.83 (1.17, 2.72)	84.9 (35.9, 165)	1.39 (0.56, 2.39)	2.24 (0.99, 3.57)	97.4 (42.2, 170)
2-14	968 (911, 1.03 K)	186 (99.3, 313)	2.43 (1.63, 3.28)	53.5 (22.7, 105)	0.05 (0, 0.14)	0 (0, 0)	14.6 (3.77, 38.1)
15-24	641 (584, 696)	123 (63.6, 210)	5.84 (3.87, 7.99)	35.3 (14.7, 68.6)	0.41 (0.22, 0.70)	0 (0, 0)	26.5 (13.0, 47.9)
25-34	425 (381, 468)	82.0 (42.8, 141)	9.78 (6.54, 13.2)	23.3 (9.96, 46.1)	0.70 (0.36, 1.18)	0 (0, 0)	32.0 (16.3, 53.9)
35-49	348 (313, 382)	67.0 (34.5, 115)	10.3 (7.01, 14.3)	18.9 (7.81, 36.9)	1.21 (0.73, 1.84)	0 (0, 0)	39.3 (23.4, 60.4)
50+	232 (207, 255)	44.7 (23.2, 76.3)	9.90 (6.70, 13.6)	12.1 (4.89, 24.2)	2.56 (1.53, 3.82)	0 (0, 0)	42.6 (25.5, 63.4)
All	674 (636, 711)	130 (68.6, 222)	6.23 (4.21, 8.42)	37.1 (15.8, 72.4)	0.75 (0.48, 1.10)	0.12 (0.06, 0.20)	31.1 (17.7, 52.2)

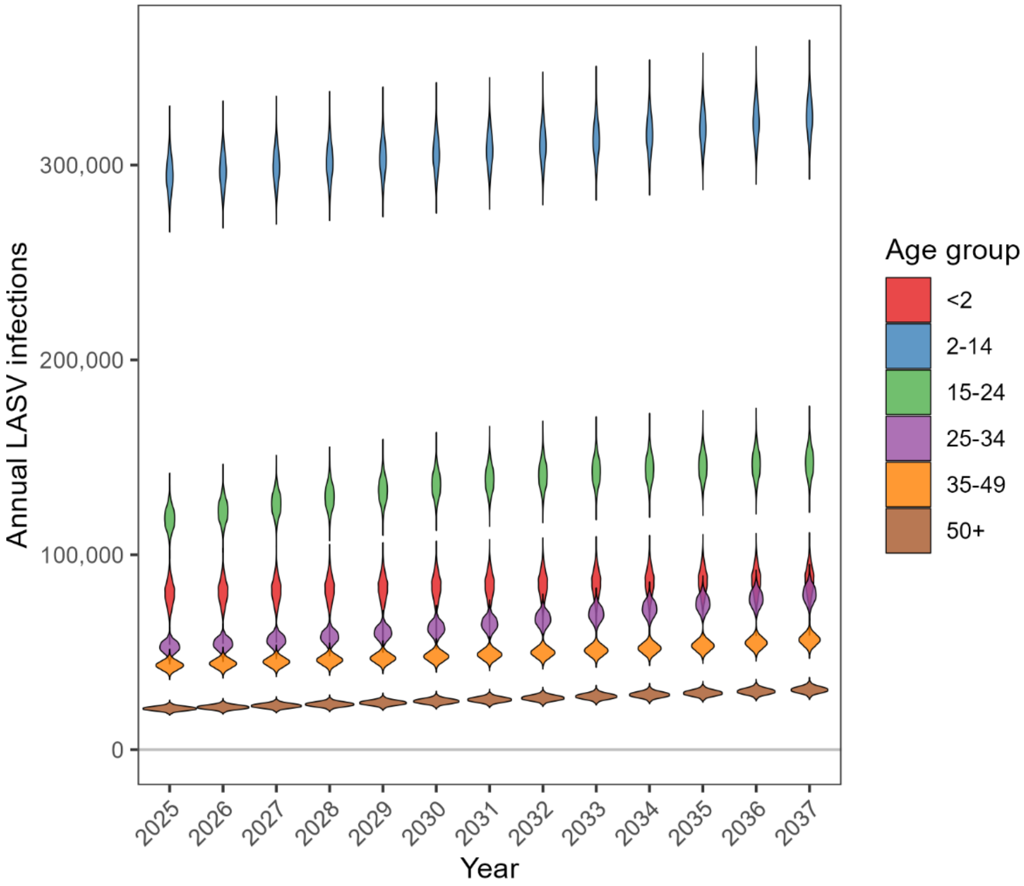


Figure S20. Density distributions (violins) of 500 Monte Carlo draws of the projected annual number of human LASV infections occurring in each age group, summed across all 19 areas.

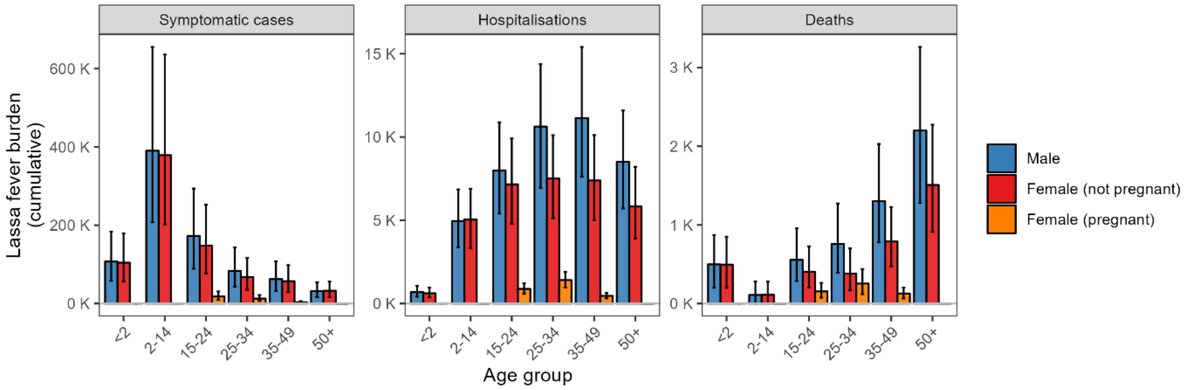


Figure S21. Cumulative Lassa fever cases, hospitalisations and deaths from 2025-2037, stratified by age group, sex and pregnancy status upon outcome onset under base case assumptions. Bar heights represent means. Error bars represent 95% uncertainty intervals.

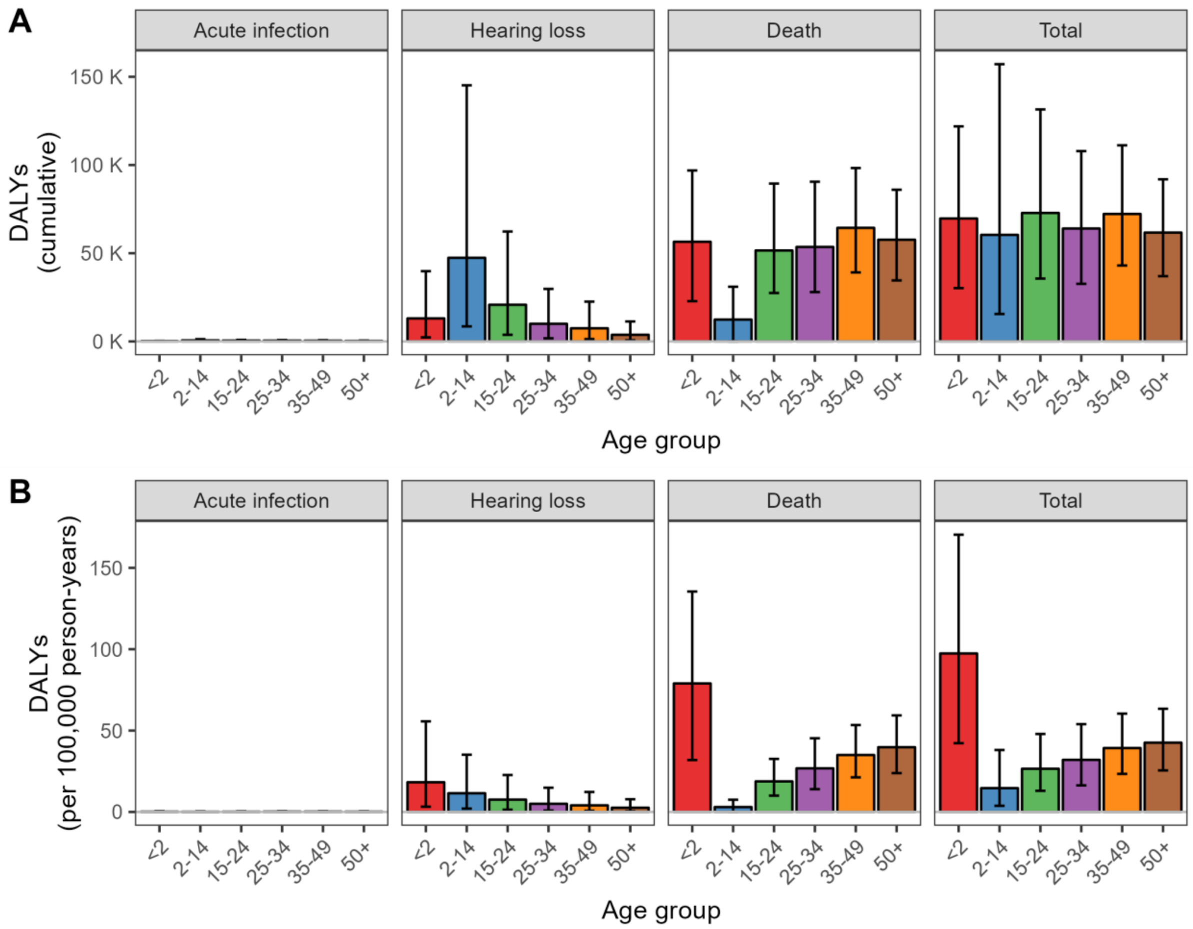


Figure S22. Cumulative DALYs due to Lassa fever from 2025-2037, including DALYs due to acute infection (including both moderate disease and severe disease), DALYs due to sensorineural hearing loss and DALYs due to death under base case assumptions. (**A**) Cumulative totals, stratified by the age of the individual when the infection occurs. (**B**) Cumulative totals per 100,000 person-years, stratified by the age of the individual when the infection occurs. Bar heights represent means. Error bars represent 95% uncertainty intervals. DALY = disability-adjusted life-year.

Table S11. Projected mean (95% uncertainty interval) cumulative total societal costs of Lassa fever from 2025 to 2037 in the absence of vaccination, disaggregated by types of cost, and comparing estimates with (left; base case assumptions) and without (right; sensitivity analysis) discounting of future costs and life-years. DALYs do not include DALYs due to foetal loss. DALY = disability-adjusted life-year, K = thousand, M = million, B = billion.

	Discounted at 3.5%/year	Not discounted
Healthcare costs (I$ 2023)		
Outpatient (reimbursed)	3.44 M (575 K, 8.89 M)	4.22 M (706 K, 10.9 M)
Outpatient (out-of-pocket)	14.2 M (7.21 M, 23.9 M)	17.4 M (8.84 M, 29.4 M)
Inpatient (reimbursed)	65.7 M (44.4 M, 88.8 M)	81.0 M (54.7 M, 109 M)
Inpatient (out-of-pocket)	93.6 M (63.2 M, 126 M)	115 M (77.9 M, 156 M)
Total	177 M (116 M, 247 M)	218 M (143 M, 305 M)
Productivity losses (I$ 2023)		
Moderate disease	14.1 M (6.41 M, 26.2 M)	17.5 M (7.91 M, 32.3 M)
Severe disease	11.6 M (7.55 M, 16.4 M)	14.4 M (9.33 M, 20.3 M)
Hearing loss	178 M (53.8 M, 433 M)	226 M (67.2 M, 556 M)
Death	502 M (306 M, 767 M)	1.02 B (615 M, 1.58 B)
Total	706 M (402 M, 1.14 B)	1.28 B (736 M, 1.99 B)
Monetised DALYs (I$ 2023)		
Moderate disease	126 K (33.9 K, 313 K)	155 K (41.5 K, 385 K)
Severe disease	225 K (126 K, 360 K)	278 K (155 K, 444 K)
Hearing loss	14.6 M (2.69 M, 43.9 M)	18.7 M (3.39 M, 56.5 M)
Death	24.9 M (15.5 M, 36.6 M)	54.1 M (33.3 M, 79.2 M)
Total	39.9 M (21.9 M, 74.2 M)	73.3 M (41.5 M, 123 M)

4b. Vaccine impact

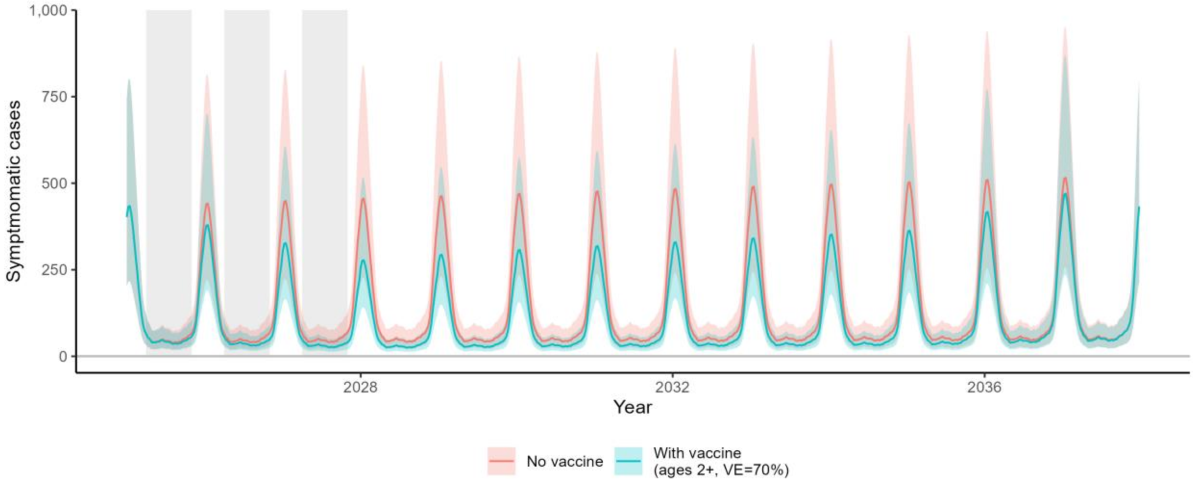


Figure S23. Total weekly symptomatic Lassa fever cases in an exemplar area (Edo, Nigeria) from 1 January 2025 to 31 December 2037, with (blue) and without (red) an untargeted 3-year vaccination campaign (i.e. vaccinating the whole population aged 2+) and assuming 70% vaccine efficacy against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). Curved lines represent means, shading represents 95% uncertainty intervals, and grey vertical bars represent periods of vaccine distribution. VE = vaccine efficacy.

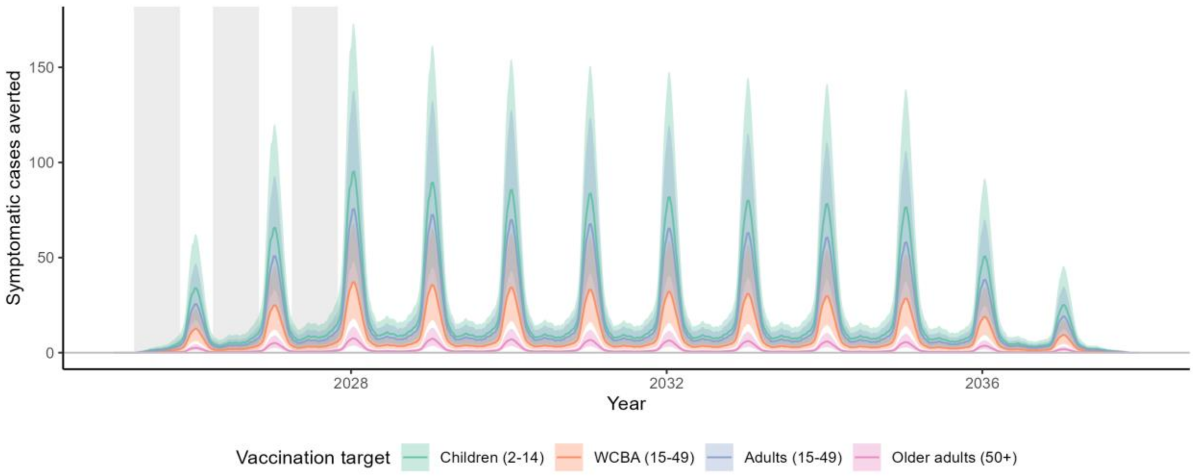


Figure S24. Total weekly symptomatic Lassa fever cases averted by a 3-year vaccination campaign in an exemplar area (Edo, Nigeria) from 1 January 2025 to 31 December 2037, varying the group targeted by vaccination (colours) and assuming 70% vaccine efficacy against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). Curved lines represent means, shading represents 95% uncertainty intervals, and grey vertical bars represent periods of vaccine distribution. The target group “adults” includes adolescents and adults. WCBA = women of childbearing age.

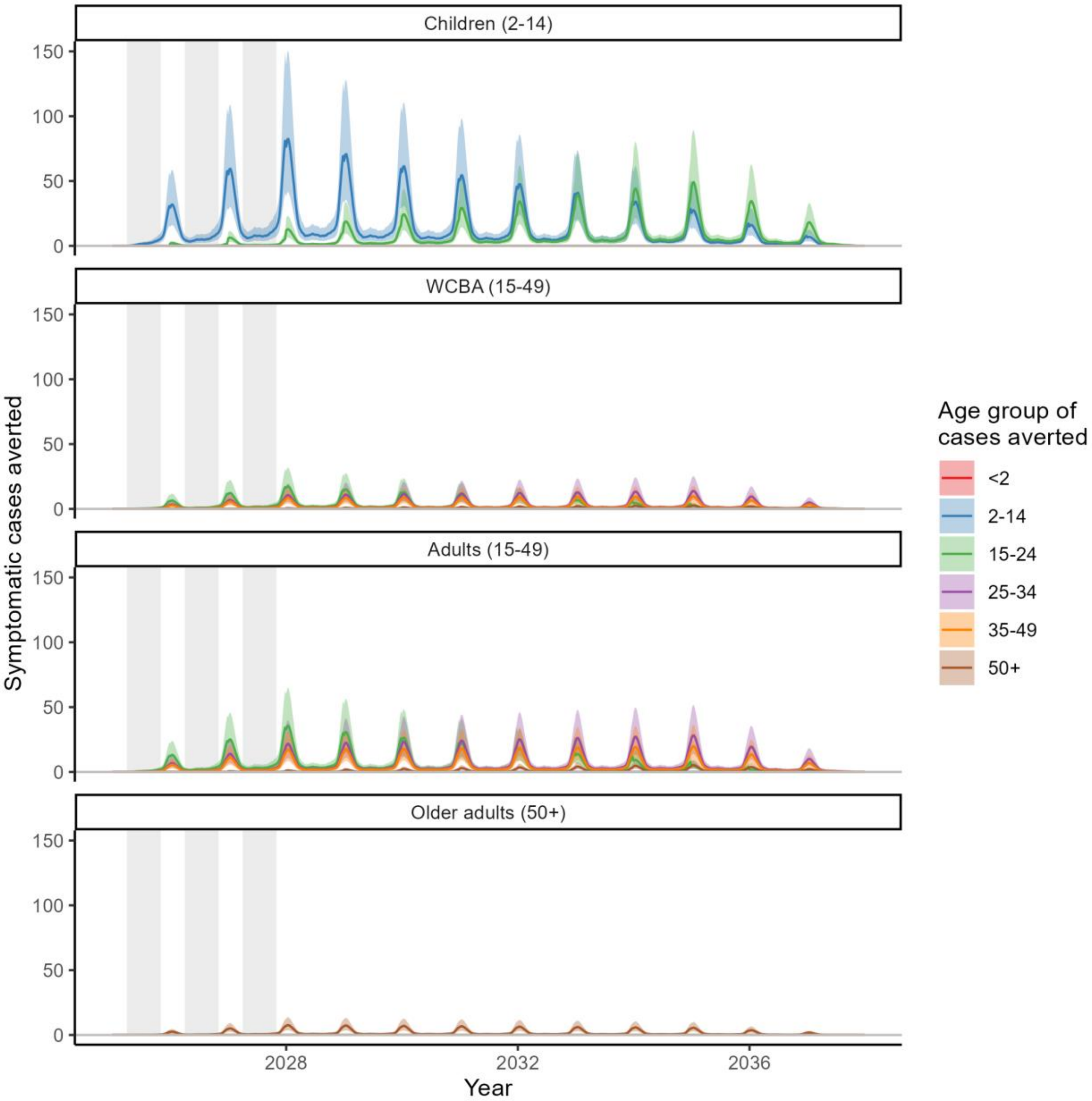


Figure S25. Weekly symptomatic Lassa fever cases in different age groups (colours) that are averted by vaccination in an exemplar area (Edo, Nigeria) from 1 January 2025 to 31 December 2037, varying the group targeted by vaccination (panels) and assuming 70% vaccine efficacy against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). Curved lines represent means, shading represents 95% uncertainty intervals, and grey vertical bars represent periods of vaccine distribution. The target group “adults” includes adolescents and adults.

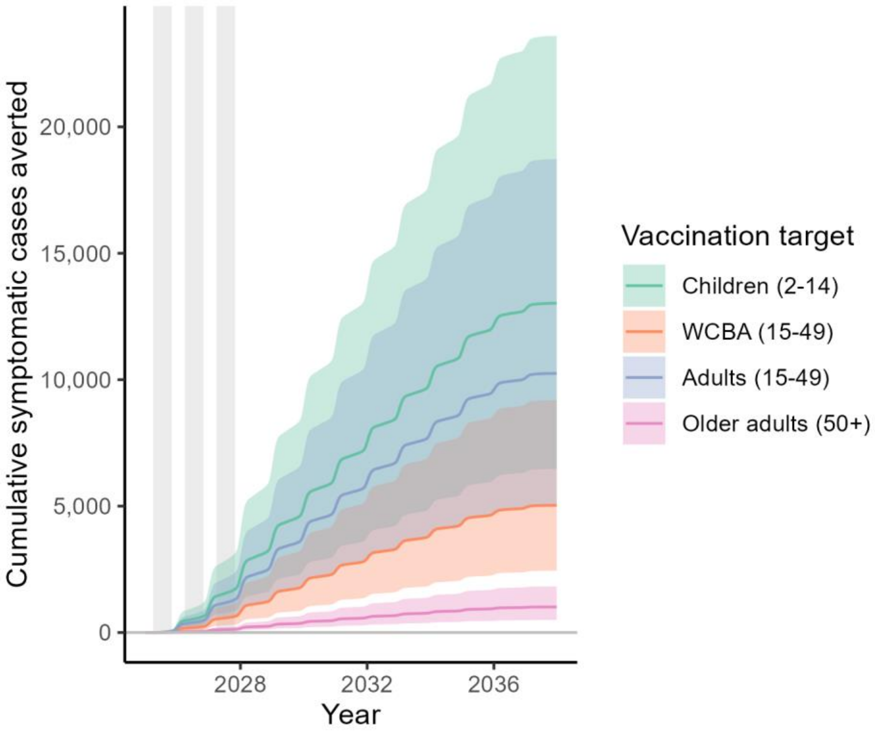


Figure S26. The weekly total cumulative number of symptomatic Lassa fever cases averted due to vaccination in one exemplar area (Edo, Nigeria) from 1 January 2025 to 31 December 2037 when targeting different groups for vaccination (colours). Grey vertical bars indicate periods of Lassa vaccine distribution. Curved lines and shaded areas represent means and 95% uncertainty intervals, respectively, for a vaccine 70% effective against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). The target group "adults" includes adolescents and adults. WCBA = women of childbearing age.

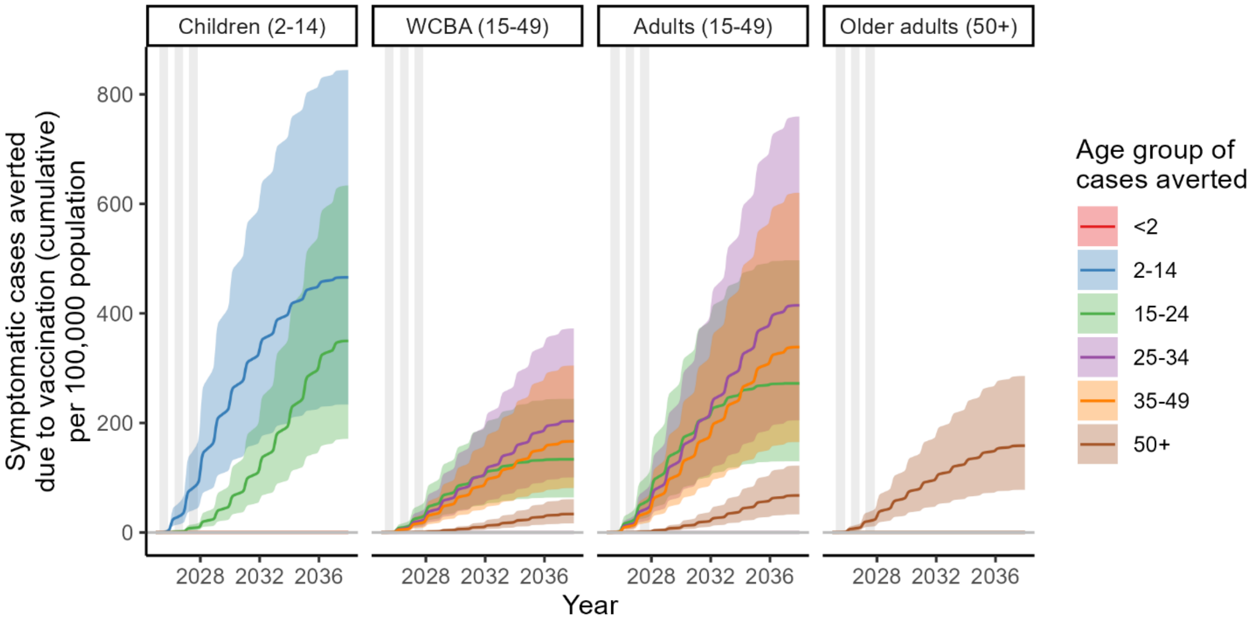


Figure S27. Evolution of age-specific vaccine impacts per capita through time. The weekly total cumulative number of symptomatic Lassa fever cases per 100,000 population in different age groups (colours) averted due to vaccination in one exemplar area (Edo, Nigeria) from 1 January 2025 to 31 December 2037. Grey vertical bars indicate periods of Lassa vaccine distribution and panels compare results when targeting different groups for vaccination. Thick lines and shaded areas represent means and 95% uncertainty intervals, respectively, for a 1-dose vaccine 70% effective against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). The target group "Adults" includes adolescents and adults. WCBA = women of childbearing age.

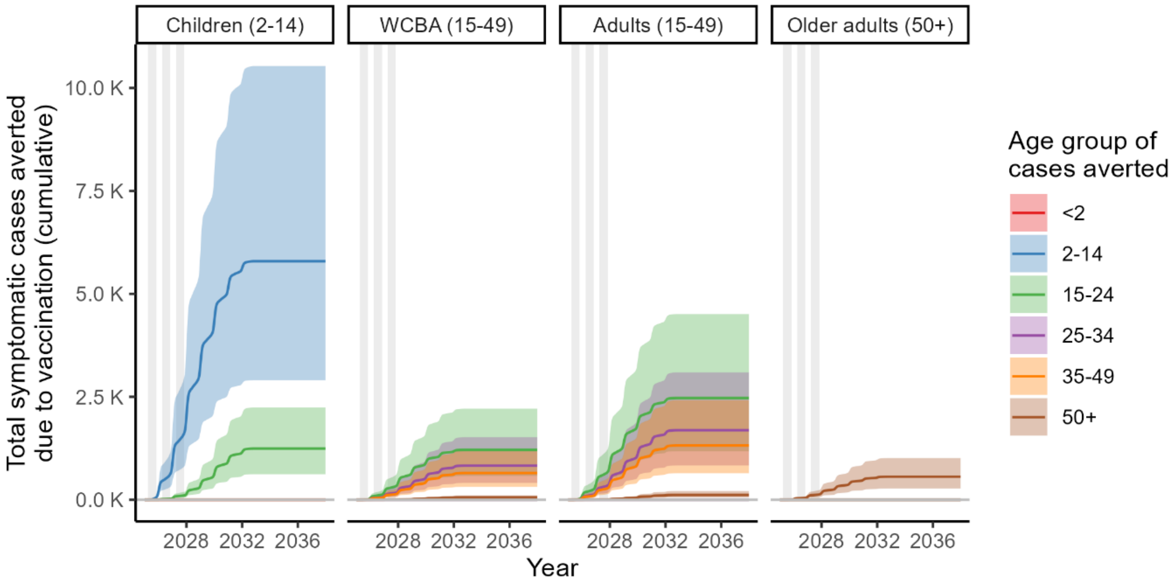


Figure S28. Evolution of age-specific vaccine impacts through time, in the sensitivity analysis assuming a duration of 5 years of vaccine-induced immunity. The weekly total cumulative number of symptomatic Lassa fever cases in different age groups (colours) averted due to vaccination in one exemplar area (Edo, Nigeria) from 1 January 2025 to 31 December 2037. Grey vertical bars indicate periods of Lassa vaccine distribution and panels compare results when targeting different groups for vaccination. Thick lines and shaded areas represent means and 95% uncertainty intervals, respectively, for a 1-dose vaccine 70% effective against all symptomatic disease. The target group "Adults" includes adolescents and adults. WCBA = women of childbearing age.

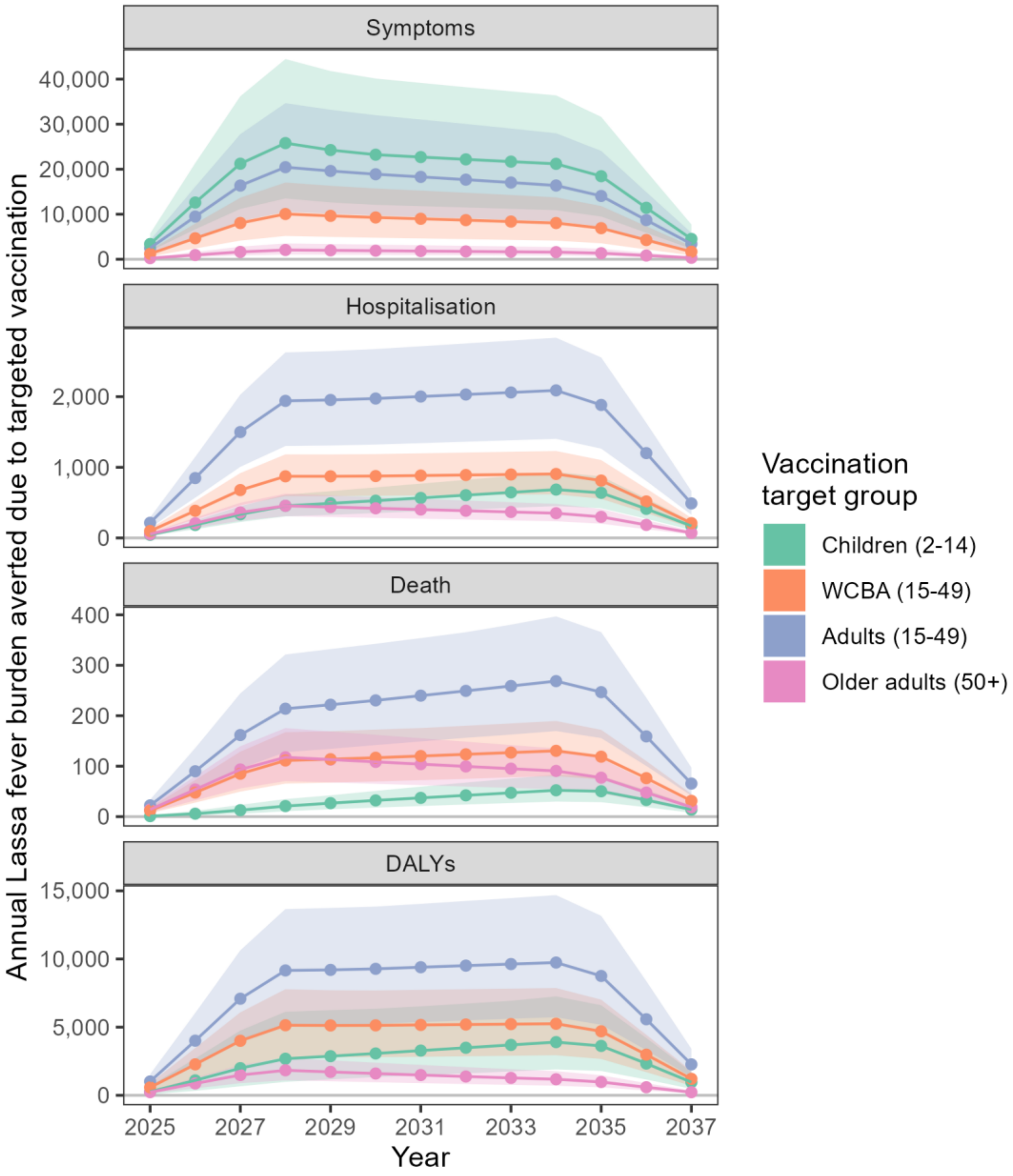


Figure S29. Change through time in annual projections of the total number of Lassa fever cases, hospitalisations, deaths and DALYs averted when vaccinating different target groups (colours). These numbers represent total outcomes averted each year summed across all 19 areas when assuming 70% vaccine efficacy against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). Lines represent means, shading represents 95% uncertainty intervals. The target group "Adults" includes adolescents and adults. WCBA = women of childbearing age.

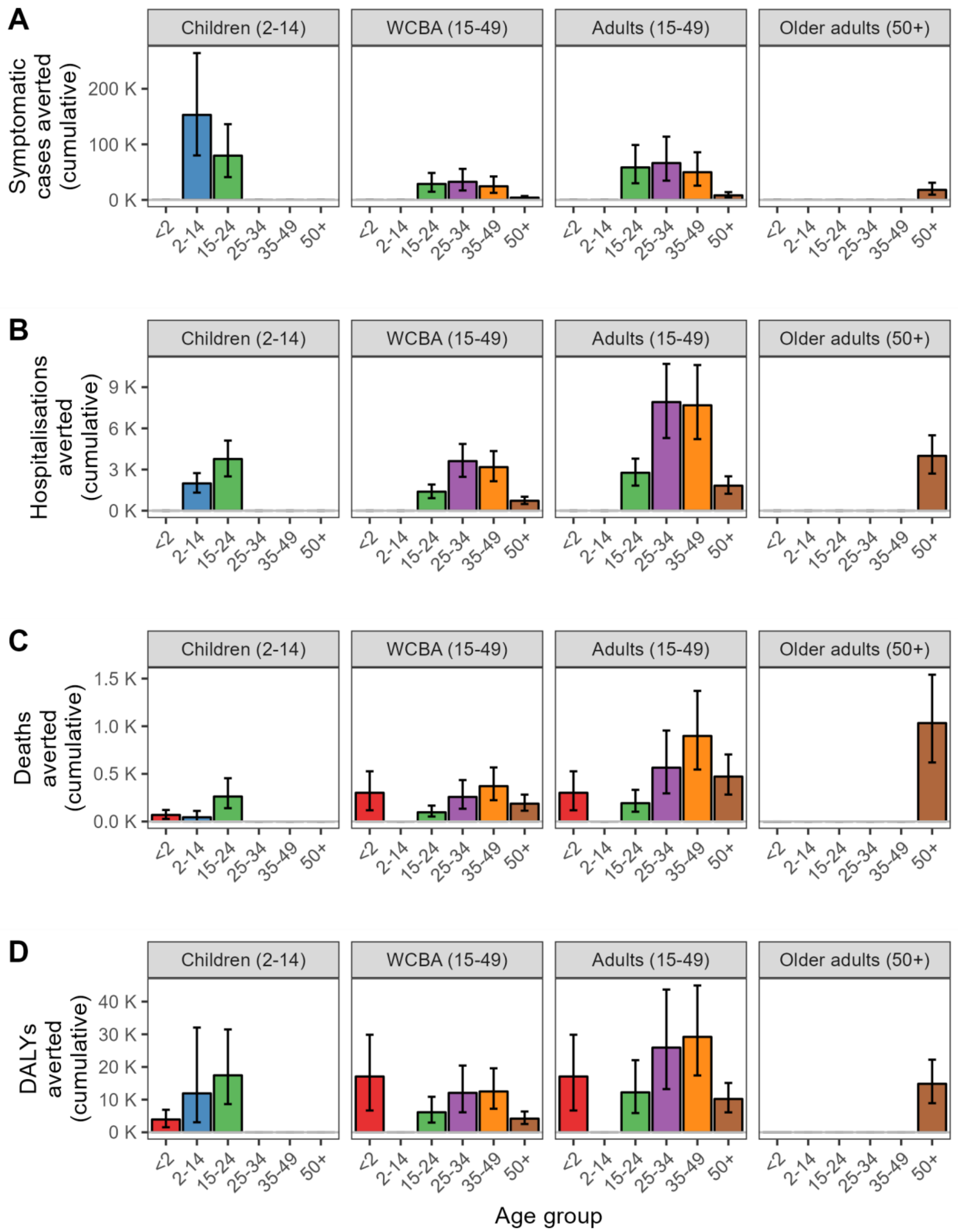


Figure S30. Age distributions of cumulative Lassa fever health outcomes averted due to targeted Lassa vaccination for a vaccine having 70% efficacy against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). Cumulative symptomatic Lassa fever cases (**A**), hospitalisations (**B**), deaths (**C**) and DALYs (**D**) averted from 2025-2037 when vaccinating different target groups (panels), where results are stratified by the age groups in which the outcomes are averted (x-axis, colours). DALYs do not include foetal loss DALYs. Bar heights represent means. Error bars represent 95% uncertainty intervals. The target group "Adults" includes adolescents and adults. DALY = disability-adjusted life-year, WCBA = women of childbearing age.

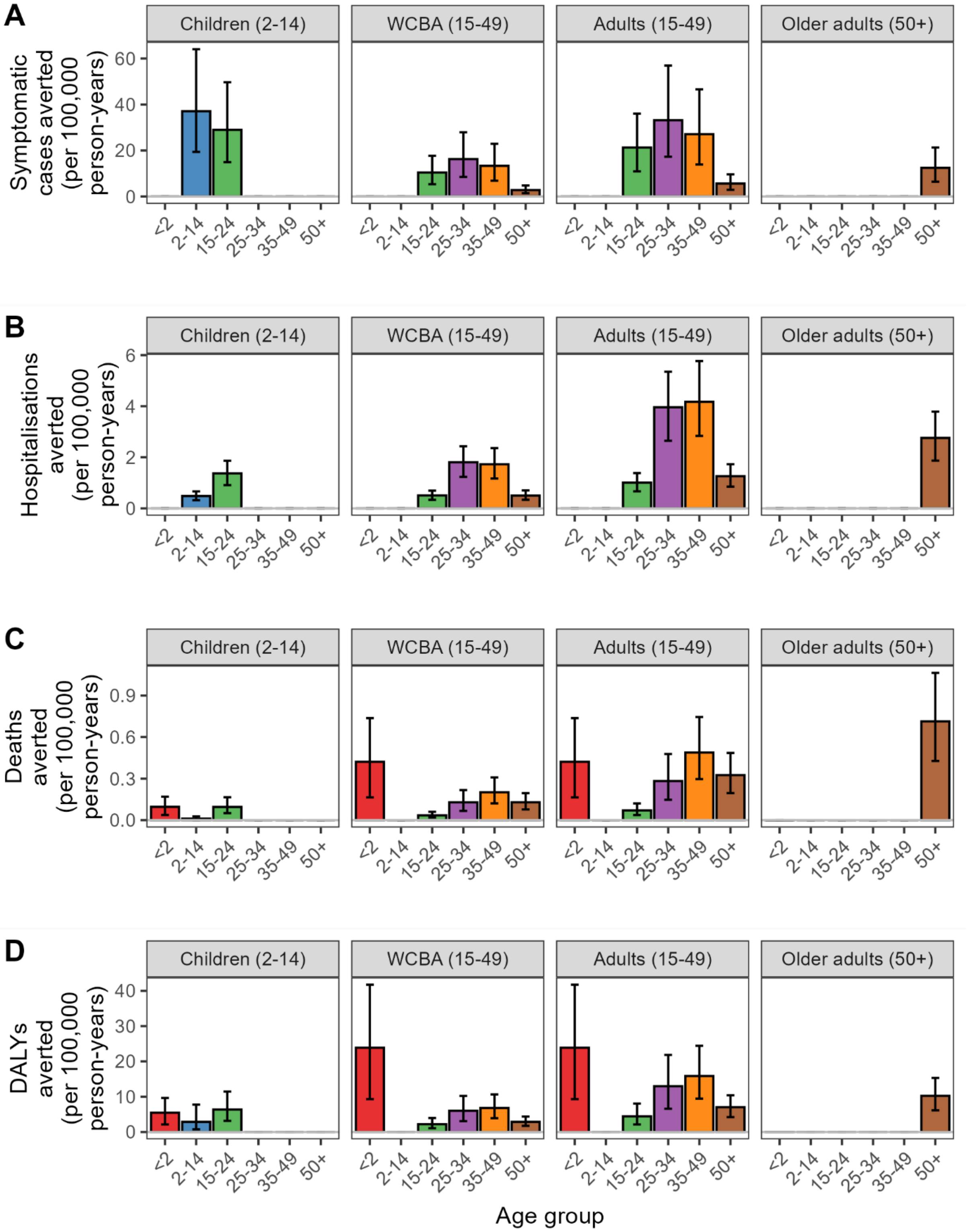


Figure S31. Age distributions of cumulative Lassa fever health outcomes averted per 100,000 person-years due to targeted Lassa vaccination for a vaccine having 70% efficacy against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). Cumulative symptomatic Lassa fever cases (A), hospitalisations (B), deaths (C) and DALYs (D) averted per 100,000 person-years from 2025-2037 when vaccinating different target groups (panels), where results are stratified by the age groups in which the outcomes are averted (x-axis, colours). DALYs do not include foetal loss DALYs. Bar heights represent means. Error bars represent 95% uncertainty intervals. The target group "Adults" includes adolescents and adults. DALY = disability-adjusted life-year, WCBA = women of childbearing age.

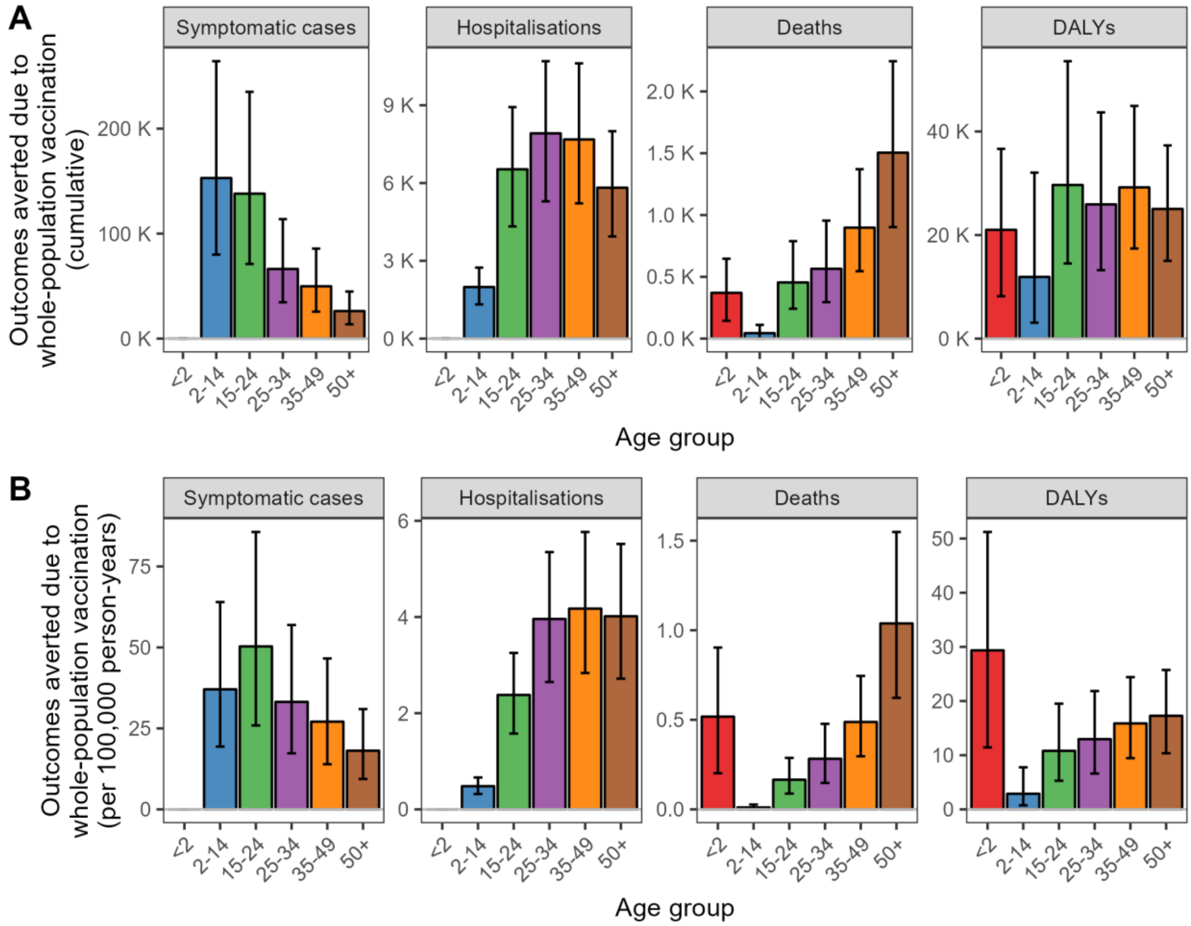


Figure S32. Age distributions of cumulative Lassa fever health outcomes averted due to untargeted whole-population vaccination (all individuals aged 2+) with a 1-dose Lassa fever vaccine having 70% efficacy against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). (**A**) Impact: cumulative total health outcomes averted due to vaccination summed across all 19 areas from 2025 through to 2037. (**B**) Efficiency: cumulative total health outcomes averted per 100,000 doses of vaccine administered. DALYs exclude DALYs due to foetal loss. Bar heights represent means. Error bars represent 95% uncertainty intervals. The target group "Adults" includes adolescents and adults. WCBA, women of childbearing age.

Table S12. Projected mean (95% uncertainty interval) cumulative total Lassa fever health outcomes averted due to Lassa vaccination from 2025 to 2037, depending on the group targeted for vaccination and the vaccine's efficacy against moderate and severe disease. These projections correspond to base case assumptions. DALY = disability-adjusted life-year, WCBA = women of childbearing age.

Outcome averted	Vaccine target group	Vaccine efficacy				
		50% moderate, 50% severe	50% moderate, 70% severe	70% moderate, 70% severe	70% moderate, 90% severe	90% moderate, 90% severe
Symptomatic Lassa fever	Children (2-14)	166 K (86.1 K, 287 K)	168 K (87.2 K, 289 K)	233 K (121 K, 401 K)	234 K (122 K, 404 K)	299 K (155 K, 516 K)
	WCBA (15-49)	64.2 K (33.0 K, 109 K)	66.7 K (34.7 K, 112 K)	89.8 K (46.2 K, 153 K)	92.4 K (47.9 K, 156 K)	115 K (59.4 K, 196 K)
	Adolescents & adults (15-49)	131 K (67.2 K, 222 K)	136 K (71.1 K, 230 K)	183 K (94.1 K, 310 K)	189 K (98.0 K, 318 K)	235 K (121 K, 399 K)
	Older adults (50+)	12.9 K (6.69 K, 22.0 K)	14 K (7.49 K, 23.6 K)	18.1 K (9.36 K, 30.9 K)	19.2 K (10.2 K, 32.4 K)	23.2 K (12.0 K, 39.7 K)
	All (2+)	310 K (160 K, 531 K)	318 K (166 K, 543 K)	433 K (224 K, 743 K)	442 K (230 K, 756 K)	557 K (288 K, 956 K)
Hospitalisation	Children (2-14)	4.11 K (2.74 K, 5.57 K)	5.76 K (3.83 K, 7.80 K)	5.76 K (3.83 K, 7.80 K)	7.4 K (4.92 K, 10.0 K)	7.4 K (4.92 K, 10.0 K)
	WCBA (15-49)	6.36 K (4.34 K, 8.63 K)	8.90 K (6.07 K, 12.1 K)	8.90 K (6.07 K, 12.1 K)	11.4 K (7.81 K, 15.5 K)	11.4 K (7.81 K, 15.5 K)
	Adolescents & adults (15-49)	14.4 K (9.67 K, 19.5 K)	20.2 K (13.5 K, 27.4 K)	20.2 K (13.5 K, 27.4 K)	26.0 K (17.4 K, 35.2 K)	26.0 K (17.4 K, 35.2 K)
	Older adults (50+)	2.85 K (1.93 K, 3.92 K)	4.00 K (2.71 K, 5.49 K)	4.00 K (2.71 K, 5.49 K)	5.14 K (3.48 K, 7.06 K)	5.14 K (3.48 K, 7.06 K)
	All (2+)	21.4 K (14.4 K, 28.9 K)	29.9 K (20.2 K, 40.4 K)	29.9 K (20.2 K, 40.4 K)	38.5 K (25.9 K, 51.9 K)	38.5 K (25.9 K, 51.9 K)
Sensorineural hearing loss	Children (2-14)	47.6 K (20.1 K, 91.2 K)	48.0 K (20.3 K, 91.9 K)	66.6 K (28.1 K, 128 K)	67.1 K (28.4 K, 128 K)	85.7 K (36.2 K, 164 K)
	WCBA (15-49)	18.2 K (7.62 K, 36.3 K)	18.9 K (7.98 K, 37.3 K)	25.5 K (10.7 K, 50.8 K)	26.2 K (11.0 K, 51.8 K)	32.8 K (13.7 K, 65.4 K)
	Adolescents & adults (15-49)	37.0 K (15.5 K, 73.8 K)	38.5 K (16.3 K, 76.0 K)	51.8 K (21.7 K, 103 K)	53.3 K (22.5 K, 105 K)	66.6 K (27.9 K, 133 K)
	Older adults (50+)	3.49 K (1.41 K, 7.00 K)	3.73 K (1.54 K, 7.37 K)	4.89 K (1.98 K, 9.80 K)	5.13 K (2.10 K, 10.2 K)	6.28 K (2.54 K, 12.6 K)
	All (2+)	88.1 K (37.2 K, 172 K)	90.3 K (38.3 K, 175 K)	123 K (52.0 K, 241 K)	126 K (53.2 K, 244 K)	159 K (66.9 K, 310 K)
Death	Children (2-14)	268 (152, 427)	375 (212, 598)	375 (212, 598)	483 (273, 769)	483 (273, 769)
	WCBA (15-49)	867 (523, 1.27 K)	1.21 K (732, 1.77 K)	1.21 K (732, 1.77 K)	1.56 K (941, 2.28 K)	1.56 K (941, 2.28 K)
	Adolescents & adults (15-49)	1.73 K (1.08 K, 2.56 K)	2.43 K (1.51 K, 3.58 K)	2.43 K (1.51 K, 3.58 K)	3.12 K (1.94 K, 4.60 K)	3.12 K (1.94 K, 4.60 K)
	Older adults (50+)	738 (443, 1.10 K)	1.03 K (620, 1.54 K)	1.03 K (620, 1.54 K)	1.33 K (797, 1.98 K)	1.33 K (797, 1.98 K)
	All (2+)	2.74 K (1.75 K, 4.07 K)	3.84 K (2.46 K, 5.69 K)	3.84 K (2.46 K, 5.69 K)	4.93 K (3.16 K, 7.32 K)	4.93 K (3.16 K, 7.32 K)
Foetal loss	Children (2-14)	86.1 (38.5, 138)	121 (53.9, 193)	121 (53.9, 193)	155 (69.3, 249)	155 (69.3, 249)
	WCBA (15-49)	378 (168, 604)	529 (236, 845)	529 (236, 845)	680 (303, 1.09 K)	680 (303, 1.09 K)
	Adolescents & adults (15-49)	378 (168, 604)	529 (236, 845)	529 (236, 845)	680 (303, 1.09 K)	680 (303, 1.09 K)
	Older adults (50+)	0.21 (0.10, 0.34)	0.30 (0.13, 0.47)	0.30 (0.13, 0.47)	0.38 (0.17, 0.60)	0.38 (0.17, 0.60)
	All (2+)	464 (206, 740)	650 (288, 1.04 K)	650 (288, 1.04 K)	835 (370, 1.33 K)	835 (370, 1.33 K)

Outcome averted	Vaccine target group	Vaccine efficacy				
		50% moderate, 50% severe	50% moderate, 70% severe	70% moderate, 70% severe	70% moderate, 90% severe	90% moderate, 90% severe
DALYs	Children (2-14)	23.8 K (10.6 K, 47.5 K)	29.2 K (14.1 K, 54.3 K)	33.3 K (14.8 K, 66.5 K)	38.8 K (18.3 K, 73.1 K)	42.8 K (19.1 K, 85.6 K)
	WCBA (15-49)	37.1 K (20.3 K, 55.7 K)	50.5 K (28.1 K, 75.8 K)	52 K (28.5 K, 77.9 K)	65.4 K (36.2 K, 97.9 K)	66.8 K (36.6 K, 100 K)
	Adolescents & adults (15-49)	67.6 K (38.7 K, 101 K)	91.7 K (53.1 K, 138 K)	94.6 K (54.2 K, 141 K)	119 K (68.5 K, 179 K)	122 K (69.7 K, 182 K)
	Older adults (50+)	10.6 K (6.37 K, 15.9 K)	14.6 K (8.77 K, 21.7 K)	14.9 K (8.92 K, 22.2 K)	18.8 K (11.3 K, 28 K)	19.1 K (11.5 K, 28.6 K)
	All (2+)	102 K (58.5 K, 162 K)	136 K (78 K, 203 K)	143 K (81.8 K, 227 K)	176 K (101 K, 268 K)	184 K (105 K, 292 K)

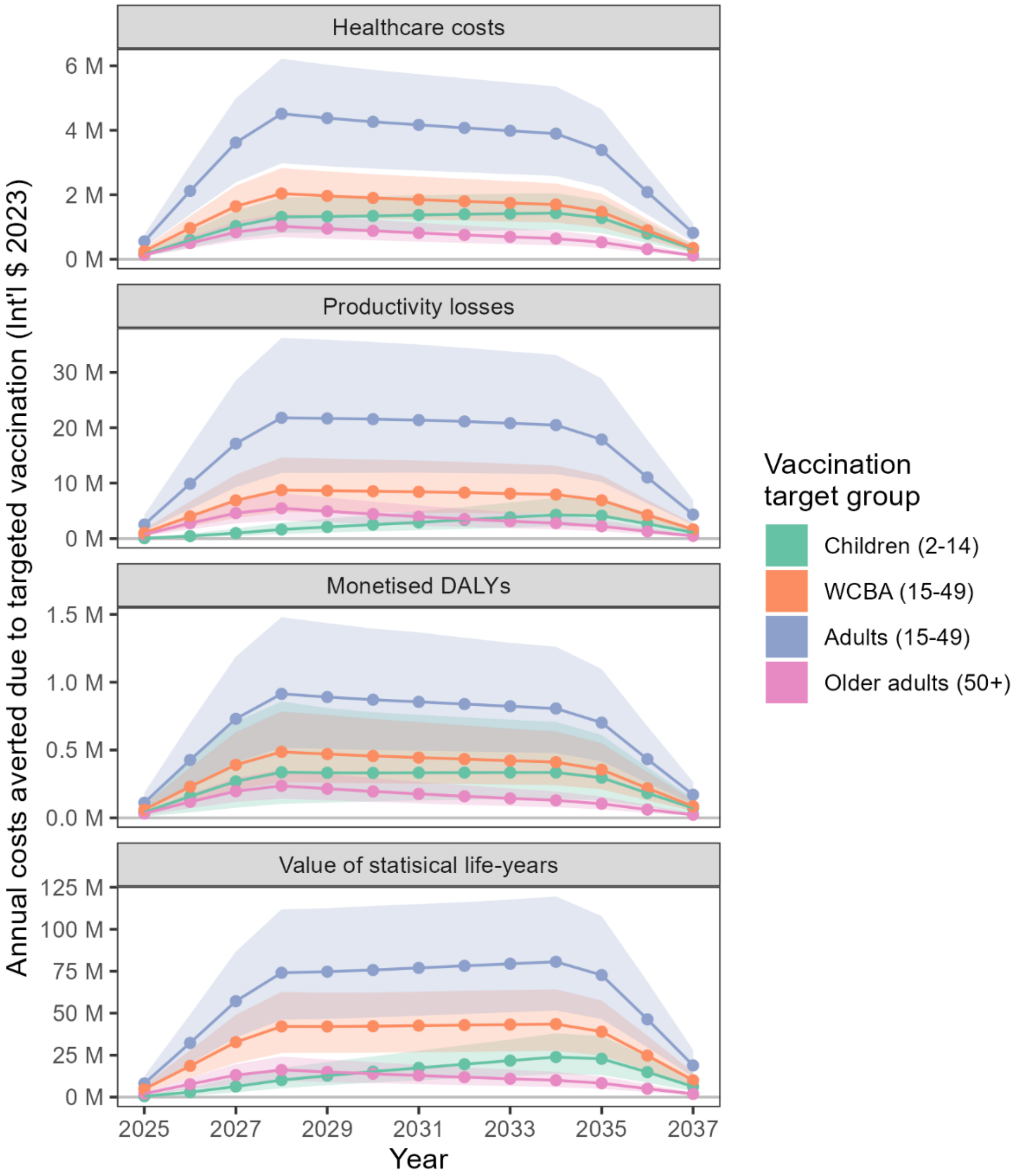


Figure S33. Change through time in annual projections of monetary costs averted (panels) when vaccinating different target groups (colours). These numbers represent total costs averted each year combined across all 19 areas when assuming 70% vaccine efficacy against all symptomatic disease and an immunological response lasting 10 years (base case assumptions). Monetised DALYs do not include foetal loss DALYs. Future costs and life-years are discounted at 3.5%. Lines represent means, shading represents 95% uncertainty intervals. The target group "Adults" includes adolescents and adults. DALY = disability-adjusted life-year, WCBA = women of childbearing age.

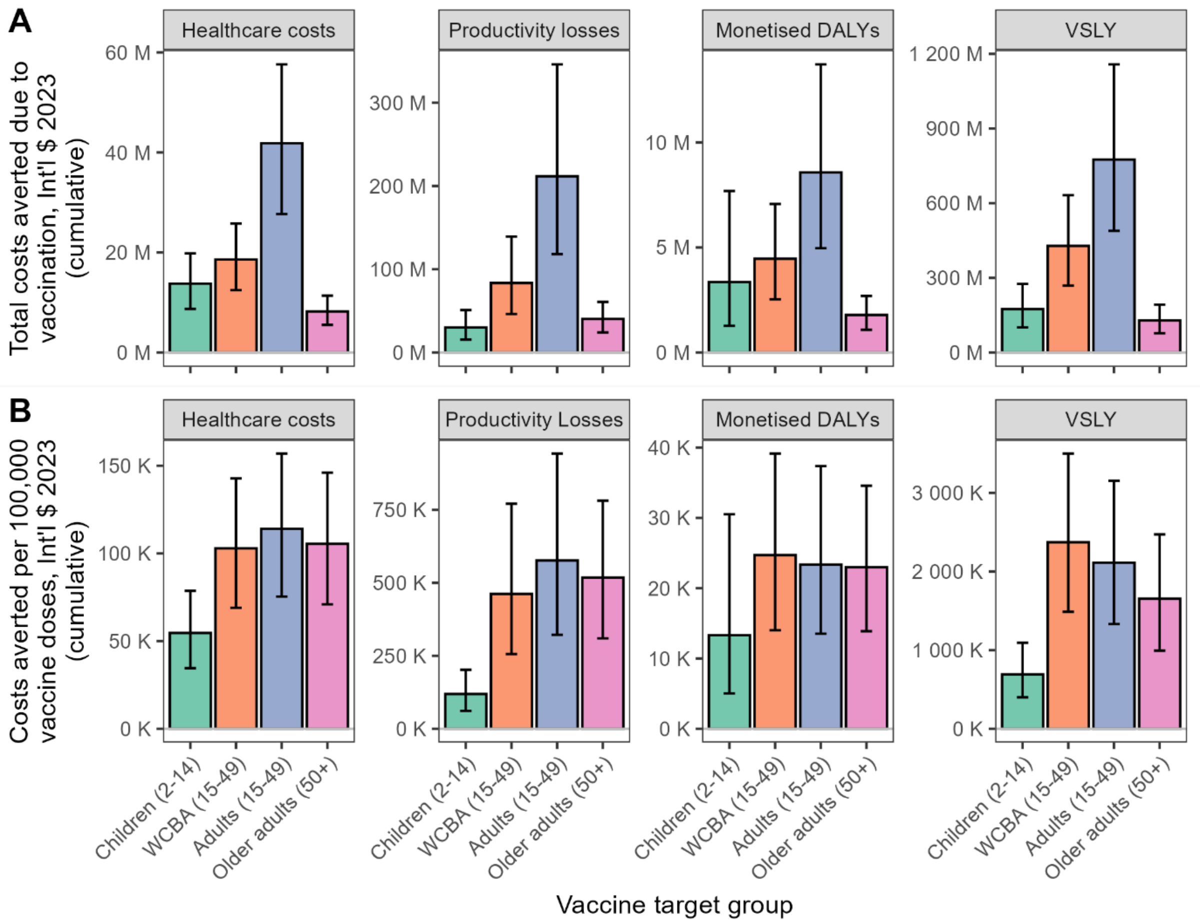


Figure S34. Comparing the cumulative economic impacts and efficiencies of targeting different risk groups for vaccination with a 1-dose Lassa fever vaccine having 70% efficacy against both mild and severe symptomatic disease and an immunological response lasting 10 years (base case assumptions). (**A**) Impact: cumulative total economic costs averted due to vaccination across all 19 areas from 2025 through to 2037. (**B**) Efficiency: cumulative total economic costs averted per 100,000 doses of vaccine administered. Monetised DALYs do not include foetal loss DALYs. Future costs and life-years are discounted at 3.5%. Bar heights represent means. Error bars represent 95% uncertainty intervals. The target group "Adults" includes adolescents and adults. WCBA = women of childbearing age.

Table S13. Projected mean (95% uncertainty interval) cumulative total economic costs averted due to Lassa vaccination from 2025 to 2037, depending on the group targeted for vaccination and the vaccine's efficacy against moderate and severe disease. These projections correspond to base case assumptions. DALY = disability-adjusted life-year, VSLY = value of statistical life-years, WCBA = women of childbearing age, I$ = International dollar, K = thousand, M = million, B = billion.

Costs averted	Vaccine target group	Vaccine efficacy				
		50% moderate, 50% severe	**50% moderate, 70% severe**	**70% moderate, 70% severe**	**70% moderate, 90% severe**	**90% moderate, 90% severe**
Healthcare costs (I$ 2023)	Children (2-14)	9.84 M (6.22 M, 14.2 M)	13.0 M (8.36 M, 18.5 M)	13.8 M (8.71 M, 19.8 M)	17.0 M (10.9 M, 24.2 M)	17.7 M (11.2 M, 25.5 M)
	WCBA (15-49)	13.3 M (8.9 M, 18.4 M)	18.3 M (12.3 M, 25.3 M)	18.6 M (12.5 M, 25.8 M)	23.6 M (15.9 M, 32.7 M)	23.9 M (16.0 M, 33.2 M)
	Adolescents & adults (15-49)	29.9 M (19.8 M, 41.1 M)	41.3 M (27.4 M, 56.6 M)	41.8 M (27.7 M, 57.6 M)	53.3 M (35.3 M, 73.1 M)	53.8 M (35.6 M, 74.1 M)
	Older adults (50+)	5.86 M (3.95 M, 8.12 M)	8.16 M (5.50 M, 11.3 M)	8.21 M (5.52 M, 11.4 M)	10.5 M (7.08 M, 14.5 M)	10.6 M (7.10 M, 14.6 M)
	All (2+)	45.6 M (30.1 M, 63.4 M)	62.5 M (41.5 M, 86.3 M)	63.8 M (42.1 M, 88.8 M)	80.8 M (53.5 M, 112 M)	82.1 M (54.1 M, 114 M)
Productivity losses (I$ 2023)	Children (2-14)	21.5 M (11.1 M, 36.4 M)	27.5 M (14.5 M, 45.6 M)	30.1 M (15.5 M, 51.0 M)	36.1 M (18.9 M, 60.3 M)	38.7 M (19.9 M, 65.5 M)
	WCBA (15-49)	59.6 M (33.0 M, 99.5 M)	76.5 M (43.7 M, 123 M)	83.5 M (46.2 M, 139 M)	100 M (56.8 M, 163 M)	107 M (59.4 M, 179 M)
	Adolescents & adults (15-49)	151 M (84.4 M, 247 M)	196 M (113 M, 307 M)	212 M (118 M, 346 M)	256 M (147 M, 406 M)	272 M (152 M, 445 M)
	Older adults (50+)	28.8 M (17.2 M, 43.4 M)	38.8 M (23.5 M, 57.4 M)	40.3 M (24.1 M, 60.8 M)	50.3 M (30.3 M, 74.6 M)	51.8 M (31.0 M, 78.2 M)
	All (2+)	201 M (115 M, 327 M)	262 M (152 M, 408 M)	282 M (160 M, 458 M)	343 M (198 M, 542 M)	363 M (206 M, 589 M)
Monetised DALYs (I$ 2023)	Children (2-14)	2.40 M (907 K, 5.49 M)	2.77 M (1.13 M, 6.00 M)	3.35 M (1.27 M, 7.69 M)	3.73 M (1.49 M, 8.20 M)	4.31 M (1.63 M, 9.89 M)
	WCBA (15-49)	3.19 M (1.81 M, 5.05 M)	4.26 M (2.41 M, 6.55 M)	4.46 M (2.53 M, 7.07 M)	5.53 M (3.14 M, 8.51 M)	5.74 M (3.26 M, 9.09 M)
	Adolescents & adults (15-49)	6.12 M (3.55 M, 9.80 M)	8.16 M (4.70 M, 12.5 M)	8.57 M (4.96 M, 13.7 M)	10.6 M (6.12 M, 16.4 M)	11.0 M (6.38 M, 17.6 M)
	Older adults (50+)	1.28 M (772 K, 1.92 M)	1.75 M (1.06 M, 2.61 M)	1.79 M (1.08 M, 2.69 M)	2.26 M (1.36 M, 3.37 M)	2.30 M (1.39 M, 3.46 M)
	All (2+)	9.80 M (5.63 M, 16.9 M)	12.7 M (7.40 M, 20.3 M)	13.7 M (7.88 M, 23.6 M)	16.6 M (9.67 M, 27.0 M)	17.6 M (10.1 M, 30.4 M)
VSLY losses (I$ 2023)	Children (2-14)	125 M (72.1 M, 197 M)	174 M (101 M, 276 M)	174 M (101 M, 276 M)	224 M (130 M, 355 M)	224 M (130 M, 355 M)
	WCBA (15-49)	306 M (192 M, 452 M)	428 M (269 M, 632 M)	428 M (269 M, 632 M)	551 M (346 M, 813 M)	551 M (346 M, 813 M)
	Adolescents & adults (15-49)	554 M (349 M, 827 M)	775 M (489 M, 1.16 B)	775 M (489 M, 1.16 B)	997 M (629 M, 1.49 B)	997 M (629 M, 1.49 B)
	Older adults (50+)	92.0 M (55.3 M, 137 M)	129 M (77.4 M, 192 M)	129 M (77.4 M, 192 M)	166 M (99.5 M, 247 M)	166 M (99.5 M, 247 M)
	All (2+)	770 M (494 M, 1.14 B)	1.08 B (692 M, 1.59 B)	1.08 B (692 M, 1.59 B)	1.39 B (889 M, 2.05 B)	1.39 B (889 M, 2.05 B)

Table S14. Projected mean (95% uncertainty interval) cumulative total healthcare costs averted due to Lassa vaccination from 2025 to 2037, depending on the group targeted for vaccination and the vaccine's efficacy against disease. These projections correspond to base case assumptions. WCBA = women of childbearing age, I$ = International dollar, K = thousand, M = million.

Costs averted	Vaccine target group	Vaccine efficacy				
		50% moderate, 50% severe	**50% moderate, 70% severe**	**70% moderate, 70% severe**	**70% moderate, 90% severe**	**90% moderate, 90% severe**
Outpatient healthcare costs, reimbursed (I$ 2023)	Children (2-14)	1.46 M (731 K, 2.43 M)	1.46 M (731 K, 2.43 M)	2.04 M (1.02 M, 3.41 M)	2.04 M (1.02 M, 3.41 M)	2.62 M (1.32 M, 4.38 M)
	WCBA (15-49)	519 K (256 K, 886 K)	519 K (256 K, 886 K)	727 K (358 K, 1.24 M)	727 K (358 K, 1.24 M)	935 K (461 K, 1.59 M)
	Adolescents & adults (15-49)	1.04 M (513 K, 1.78 M)	1.04 M (513 K, 1.78 M)	1.46 M (718 K, 2.50 M)	1.46 M (718 K, 2.50 M)	1.88 M (924 K, 3.21 M)
	Older adults (50+)	90.2 K (40.9 K, 159 K)	90.2 K (40.9 K, 159 K)	126 K (57.3 K, 223 K)	126 K (57.3 K, 223 K)	162 K (73.7 K, 286 K)
	All (2+)	2.59 M (1.29 M, 4.37 M)	2.59 M (1.29 M, 4.37 M)	3.63 M (1.80 M, 6.12 M)	3.63 M (1.80 M, 6.12 M)	4.67 M (2.32 M, 7.87 M)
Outpatient healthcare costs, out-of-pocket (I$ 2023)	Children (2-14)	353 K (58.9 K, 938 K)	353 K (58.9 K, 938 K)	494 K (82.5 K, 1.31 M)	494 K (82.5 K, 1.31 M)	636 K (106 K, 1.69 M)
	WCBA (15-49)	126 K (21.1 K, 341 K)	126 K (21.1 K, 341 K)	177 K (29.5 K, 478 K)	177 K (29.5 K, 478 K)	227 K (37.9 K, 614 K)
	Adolescents & adults (15-49)	254 K (42.3 K, 688 K)	254 K (42.3 K, 688 K)	356 K (59.2 K, 963 K)	356 K (59.2 K, 963 K)	458 K (76.1 K, 1.24 M)
	Older adults (50+)	22.1 K (3.36 K, 58.7 K)	22.1 K (3.36 K, 58.7 K)	30.9 K (4.71 K, 82.2 K)	30.9 K (4.71 K, 82.2 K)	39.7 K (6.06 K, 106 K)
	All (2+)	629 K (105 K, 1.69 M)	629 K (105 K, 1.69 M)	881 K (147 K, 2.37 M)	881 K (147 K, 2.37 M)	1.13 M (189 K, 3.04 M)
Inpatient healthcare costs, reimbursed (I$ 2023)	Children (2-14)	4.71 M (3.14 M, 6.38 M)	6.60 M (4.40 M, 8.94 M)	6.60 M (4.40 M, 8.94 M)	8.48 M (5.65 M, 11.5 M)	8.48 M (5.65 M, 11.5 M)
	WCBA (15-49)	7.43 M (5.06 M, 10.1 M)	10.4 M (7.09 M, 14.1 M)	10.4 M (7.09 M, 14.1 M)	13.4 M (9.12 M, 18.1 M)	13.4 M (9.12 M, 18.1 M)
	Adolescents & adults (15-49)	16.8 M (11.3 M, 22.8 M)	23.5 M (15.8 M, 31.9 M)	23.5 M (15.8 M, 31.9 M)	30.3 M (20.3 M, 41.0 M)	30.3 M (20.3 M, 41.0 M)
	Older adults (50+)	3.38 M (2.29 M, 4.65 M)	4.74 M (3.21 M, 6.51 M)	4.74 M (3.21 M, 6.51 M)	6.09 M (4.12 M, 8.37 M)	6.09 M (4.12 M, 8.37 M)
	All (2+)	24.9 M (16.8 M, 33.6 M)	34.9 M (23.5 M, 47.1 M)	34.9 M (23.5 M, 47.1 M)	44.8 M (30.2 M, 60.5 M)	44.8 M (30.2 M, 60.5 M)
Inpatient healthcare costs, out-of-pocket (I$ 2023)	Children (2-14)	3.31 M (2.21 M, 4.49 M)	4.64 M (3.09 M, 6.28 M)	4.64 M (3.09 M, 6.28 M)	5.96 M (3.98 M, 8.08 M)	5.96 M (3.98 M, 8.08 M)
	WCBA (15-49)	5.20 M (3.55 M, 7.08 M)	7.28 M (4.97 M, 9.91 M)	7.28 M (4.97 M, 9.91 M)	9.37 M (6.39 M, 12.7 M)	9.37 M (6.39 M, 12.7 M)
	Adolescents & adults (15-49)	11.8 M (7.91 M, 16.0 M)	16.5 M (11.1 M, 22.4 M)	16.5 M (11.1 M, 22.4 M)	21.2 M (14.2 M, 28.7 M)	21.2 M (14.2 M, 28.7 M)
	Older adults (50+)	2.37 M (1.60 M, 3.26 M)	3.32 M (2.24 M, 4.56 M)	3.32 M (2.24 M, 4.56 M)	4.26 M (2.89 M, 5.86 M)	4.26 M (2.89 M, 5.86 M)
	All (2+)	17.5 M (11.8 M, 23.6 M)	24.5 M (16.5 M, 33.0 M)	24.5 M (16.5 M, 33.0 M)	31.4 M (21.2 M, 42.4 M)	31.4 M (21.2 M, 42.4 M)

Table S15. **Projected mean (95% uncertainty interval) cumulative total productivity losses averted due to Lassa vaccination from 2025 to 2037, depending on the group targeted for vaccination and the vaccine's efficacy against disease.** These projections correspond to base case assumptions. WCBA = women of childbearing age, I$ = International dollar, K = thousand, M = million, B = billion.

Costs averted	**Vaccine target group**	**Vaccine efficacy**				
		50% moderate, 50% severe	**50% moderate, 70% severe**	**70% moderate, 70% severe**	**70% moderate, 90% severe**	**90% moderate, 90% severe**
Productivity lost due to moderate disease (I$ 2023)	Children (2-14)	478 K (224 K, 869 K)	478 K (224 K, 869 K)	669 K (314 K, 1.22 M)	669 K (314 K, 1.22 M)	861 K (403 K, 1.56 M)
	WCBA (15-49)	1.44 M (661 K, 2.68 M)	1.44 M (661 K, 2.68 M)	2.02 M (925 K, 3.75 M)	2.02 M (925 K, 3.75 M)	2.60 M (1.19 M, 4.82 M)
	Adolescents & adults (15-49)	3.28 M (1.49 M, 6.11 M)	3.28 M (1.49 M, 6.11 M)	4.59 M (2.09 M, 8.55 M)	4.59 M (2.09 M, 8.55 M)	5.91 M (2.68 M, 11.0 M)
	Older adults (50+)	319 K (138 K, 611 K)	319 K (138 K, 611 K)	447 K (193 K, 855 K)	447 K (193 K, 855 K)	575 K (248 K, 1.10 M)
	All (2+)	4.08 M (1.85 M, 7.55 M)	4.08 M (1.85 M, 7.55 M)	5.71 M (2.59 M, 10.6 M)	5.71 M (2.59 M, 10.6 M)	7.34 M (3.33 M, 13.6 M)
Productivity lost due to severe disease (I$ 2023)	Children (2-14)	138 K (87.7 K, 195 K)	193 K (123 K, 273 K)	193 K (123 K, 273 K)	249 K (158 K, 351 K)	249 K (158 K, 351 K)
	WCBA (15-49)	1.02 M (669 K, 1.44 M)	1.43 M (936 K, 2.01 M)	1.43 M (936 K, 2.01 M)	1.83 M (1.20 M, 2.58 M)	1.83 M (1.20 M, 2.58 M)
	Adolescents & adults (15-49)	2.72 M (1.76 M, 3.81 M)	3.80 M (2.46 M, 5.34 M)	3.80 M (2.46 M, 5.34 M)	4.89 M (3.17 M, 6.87 M)	4.89 M (3.17 M, 6.87 M)
	Older adults (50+)	502 K (323 K, 729 K)	703 K (452 K, 1.02 M)	703 K (452 K, 1.02 M)	904 K (581 K, 1.31 M)	904 K (581 K, 1.31 M)
	All (2+)	3.36 M (2.18 M, 4.74 M)	4.70 M (3.05 M, 6.63 M)	4.70 M (3.05 M, 6.63 M)	6.04 M (3.92 M, 8.52 M)	6.04 M (3.92 M, 8.52 M)
Productivity lost due to hearing loss (I$ 2023)	Children (2-14)	6.25 M (1.68 M, 17.0 M)	6.35 M (1.72 M, 17.3 M)	8.75 M (2.35 M, 23.9 M)	8.85 M (2.39 M, 24.1 M)	11.2 M (3.03 M, 30.7 M)
	WCBA (15-49)	17.7 M (5.43 M, 42.6 M)	18.4 M (5.69 M, 44.2 M)	24.8 M (7.60 M, 59.6 M)	25.5 M (7.86 M, 61.2 M)	31.9 M (9.77 M, 76.7 M)
	Adolescents & adults (15-49)	41.0 M (12.5 M, 98.5 M)	42.8 M (13.2 M, 103 M)	57.4 M (17.6 M, 138 M)	59.2 M (18.2 M, 142 M)	73.7 M (22.6 M, 177 M)
	Older adults (50+)	4.17 M (1.27 M, 9.89 M)	4.47 M (1.38 M, 10.4 M)	5.83 M (1.78 M, 13.8 M)	6.13 M (1.89 M, 14.4 M)	7.50 M (2.29 M, 17.8 M)
	All (2+)	51.4 M (15.5 M, 125 M)	53.6 M (16.4 M, 130 M)	71.9 M (21.7 M, 175 M)	74.2 M (22.6 M, 180 M)	92.5 M (27.9 M, 225 M)
Productivity lost due to death (I$ 2023)	Children (2-14)	14.6 M (7.68 M, 24.6 M)	20.5 M (10.8 M, 34.4 M)	20.5 M (10.8 M, 34.4 M)	26.3 M (13.8 M, 44.3 M)	26.3 M (13.8 M, 44.3 M)
	WCBA (15-49)	39.4 M (23.1 M, 61.0 M)	55.2 M (32.3 M, 85.5 M)	55.2 M (32.3 M, 85.5 M)	71.0 M (41.5 M, 110 M)	71.0 M (41.5 M, 110 M)
	Adolescents & adults (15-49)	104 M (61.8 M, 162 M)	146 M (86.6 M, 227 M)	146 M (86.6 M, 227 M)	188 M (111 M, 291 M)	188 M (111 M, 291 M)
	Older adults (50+)	23.8 M (14.2 M, 35.5 M)	33.3 M (19.9 M, 49.7 M)	33.3 M (19.9 M, 49.7 M)	42.9 M (25.6 M, 63.9 M)	42.9 M (25.6 M, 63.9 M)
	All (2+)	143 M (87.0 M, 218 M)	200 M (122 M, 305 M)	200 M (122 M, 305 M)	257 M (157 M, 392 M)	257 M (157 M, 392 M)

4c. Vaccine cost-effectiveness

Table S16. Estimated mean ICERs under base case assumptions. ICERs were calculated using expected values from the probabilistic sensitivity analysis by ordering strategies by expected DALYs averted and, after removing strict and extended dominance, comparing each remaining strategy with the immediately preceding (less effective) non-dominated alternative along the efficient frontier. ICERs were calculated as the incremental cost (combined vaccine programme costs and averted healthcare costs and productivity losses) divided by the incremental DALYs, under a range of hypothetical vaccine programme costs per dose of vaccine administered. Incremental DALYs and costs are not calculated for dominated strategies. ICER = incremental cost-effectiveness ratio, DALY = disability-adjusted life-year, WCBA = women of childbearing age I$ = International dollar. See **Table S7** for country-specific willingness-to-pay thresholds.

Cost per vaccine dose (I$ 2023)	Vaccine target group	DALYs averted*	Total cost* (I$ 2023)	Incremental DALYs averted**	Incremental cost (I$ 2023)**	ICER***
$2/dose	Older adults (50+)	11,834	-33,492,014	/	/	Dominated
	Children (2-14)	22,792	4,867,589	/	/	Dominated
	WCBA (15-49)	30,110	-67,145,817	/	/	Dominated
	Adolescents & adults (15-49)	58,001	-182,566,502	/	/	Dominated
	All (2+)	92,627	-211,190,927	92,627	-211,190,927	Dominant
$5/dose	Older adults (50+)	11,834	-10,943,097	/	/	Dominated
	Children (2-14)	22,792	77,923,595	/	/	Dominated
	WCBA (15-49)	30,110	-14,805,069	/	/	Dominated
	Adolescents & adults (15-49)	58,001	-76,204,186	58,001	-76,204,186	Dominant¤
	All (2+)	92,627	-9,223,688	34,626	66,980,498	1,934
$10/dose	Older adults (50+)	11,834	26,638,432	11,834	26,638,432	2,251
	Children (2-14)	22,792	199,683,605	/	/	Dominated
	WCBA (15-49)	30,110	72,429,512	18,276	45,791,080	2,506
	Adolescents & adults (15-49)	58,001	101,066,340	27,891	28,636,828	1,027
	All (2+)	92,627	327,388,377	34,626	226,322,037	6,536
$20/dose	Older adults (50+)	11,834	101,801,489	11,834	101,801,489	8,602
	Children (2-14)	22,792	443,203,624	/	/	Dominated
	WCBA (15-49)	30,110	246,898,674	18,276	145,097,185	7,939
	Adolescents & adults (15-49)	58,001	455,607,393	27,891	208,708,719	7,483
	All (2+)	92,627	1,000,612,506	34,626	545,005,113	15,740
$50/dose	Older adults (50+)	11,834	327,290,661	11,834	327,290,661	27,657
	Children (2-14)	22,792	1,173,763,683	/	/	Dominated
	WCBA (15-49)	30,110	770,306,158	18,276	443,015,497	24,240
	Adolescents & adults (15-49)	58,001	1,519,230,550	27,891	748,924,392	26,852
	All (2+)	92,627	3,020,284,894	34,626	1,501,054,344	43,350

** relative to do-nothing alternative (no vaccination)*

*** relative to previous non-dominated strategy*

**** incremental cost per incremental DALY averted*

¤ dominant in pairwise comparison with do-nothing alternative (no vaccination)

Table S17. Estimated mean ICERs for the sensitivity analysis with reduced vaccine efficacy (50% against both moderate and severe disease). ICERs were calculated using expected values from the probabilistic sensitivity analysis by ordering strategies by expected DALYs averted and, after removing strict and extended dominance, comparing each remaining strategy with the immediately preceding (less effective) non-dominated alternative along the efficient frontier. ICERs were calculated as the incremental cost (combined vaccine programme costs and averted healthcare costs and productivity losses) divided by the incremental DALYs, under a range of hypothetical vaccine programme costs per dose of vaccine administered. Incremental DALYs and costs are not calculated for dominated strategies. ICER = incremental cost-effectiveness ratio, DALY = disability-adjusted life-year, WCBA = women of childbearing age I$ = International dollar. See **Table S7** for country-specific willingness-to-pay thresholds.

Cost per vaccine dose (I$ 2023)	Vaccine target group	DALYs averted*	Total cost* (I$ 2023)	Incremental DALYs averted**	Incremental cost (I$ 2023)**	ICER***
$2/dose	Older adults (50+)	8,453	-19,627,835	/	/	Dominated
	Children (2-14)	16,280	17,392,279	/	/	Dominated
	WCBA (15-49)	21,507	-37,991,632	/	/	Dominated
	Adolescents & adults (15-49)	41,429	-110,145,155	/	/	Dominated
	All (2+)	66,162	-112,380,712	66,162	-112,380,712	Dominant
$5/dose	Older adults (50+)	8,453	2,921,082	/	/	Dominated
	Children (2-14)	16,280	90,448,285	/	/	Dominated
	WCBA (15-49)	21,507	14,349,117	/	/	Dominated
	Adolescents & adults (15-49)	41,429	-3,782,840	41,429	-3,782,840	Dominant¤
	All (2+)	66,162	89,586,527	24,733	93,369,367	3,775
$10/dose	Older adults (50+)	8,453	40,502,611	8,453	40,502,611	4,792
	Children (2-14)	16,280	212,208,295	/	/	Dominated
	WCBA (15-49)	21,507	101,583,698	13,054	61,081,087	4,679
	Adolescents & adults (15-49)	41,429	173,487,686	19,922	71,903,988	3,609
	All (2+)	66,162	426,198,592	24,733	252,710,906	10,218
$20/dose	Older adults (50+)	8,453	115,665,668	8,453	115,665,668	13,683
	Children (2-14)	16,280	455,728,314			Dominated
	WCBA (15-49)	21,507	276,052,859	13,054	160,387,191	12,286
	Adolescents & adults (15-49)	41,429	528,028,739	19,922	251,975,880	12,648
	All (2+)	66,162	1,099,422,721	24,733	571,393,982	23,102
$50/dose	Older adults (50+)	8,453	341,154,840	8,453	341,154,840	40,359
	Children (2-14)	16,280	1,186,288,373	/	/	Dominated
	WCBA (15-49)	21,507	799,460,344	13,054	458,305,504	35,108
	Adolescents & adults (15-49)	41,429	1,591,651,896	19,922	792,191,552	39,765
	All (2+)	66,162	3,119,095,109	24,733	1,527,443,213	61,757

** relative to do-nothing alternative (no vaccination)*

*** relative to previous non-dominated strategy*

**** incremental cost per incremental DALY averted*

¤ *dominant in pairwise comparison with do-nothing alternative (no vaccination)*

Table S18. Estimated mean ICERs for the sensitivity analysis with increased vaccine efficacy (90% against both moderate and severe disease). ICERs were calculated using expected values from the probabilistic sensitivity analysis by ordering strategies by expected DALYs averted and, after removing strict and extended dominance, comparing each remaining strategy with the immediately preceding (less effective) non-dominated alternative along the efficient frontier. ICERs were calculated as the incremental cost (combined vaccine programme costs and averted healthcare costs and productivity losses) divided by the incremental DALYs, under a range of hypothetical vaccine programme costs per dose of vaccine administered. Incremental DALYs and costs are not calculated for dominated strategies. ICER = incremental cost-effectiveness ratio, DALY = disability-adjusted life-year, WCBA = women of childbearing age I$ = International dollar. See **Table S7** for country-specific willingness-to-pay thresholds.

Cost per vaccine dose (I$ 2023)	Vaccine target group	DALYs averted*	Total cost* (I$ 2023)	Incremental DALYs averted**	Incremental cost (I$ 2023)**	ICER***
$2/dose	Older adults (50+)	15,215	-47,356,193	/	/	Dominated
	Children (2-14)	29,303	-7,657,101	/	/	Dominated
	WCBA (15-49)	38,713	-96,300,003	/	/	Dominated
	Adolescents & adults (15-49)	74,573	-254,987,848	/	/	Dominated
	All (2+)	119,091	-310,001,142	119,091	-310,001,142	Dominant
$5/dose	Older adults (50+)	15,215	-24,807,275	/	/	Dominated
	Children (2-14)	29,303	65,398,905	/	/	Dominated
	WCBA (15-49)	38,713	-43,959,254	/	/	Dominated
	Adolescents & adults (15-49)	74,573	-148,625,533	74,573	-148,625,533	Dominant¤
	All (2+)	119,091	-108,033,903	44,518	40,591,630	912
$10/dose	Older adults (50+)	15,215	12,774,253	15,215	12,774,253	840
	Children (2-14)	29,303	187,158,915	/	/	Dominated
	WCBA (15-49)	38,713	43,275,326	/	/	Dominated
	Adolescents & adults (15-49)	74,573	28,644,994	59,358	15,870,741	267
	All (2+)	119,091	228,578,162	44,518	199,933,168	4,491
$20/dose	Older adults (50+)	15,215	87,937,311	15,215	87,937,311	5,780
	Children (2-14)	29,303	430,678,934	/	/	Dominated
	WCBA (15-49)	38,713	217,744,488	23,498	129,807,177	5,524
	Adolescents & adults (15-49)	74,573	383,186,046	35,860	165,441,558	4,614
	All (2+)	119,091	901,802,291	44,518	518,616,245	11,650
$50/dose	Older adults (50+)	15,215	313,426,482	15,215	313,426,482	20,600
	Children (2-14)	29,303	1,161,238,993	/	/	Dominated
	WCBA (15-49)	38,713	741,151,973	23,498	427,725,491	18,203
	Adolescents & adults (15-49)	74,573	1,446,809,204	35,860	705,657,231	19,678
	All (2+)	119,091	2,921,474,679	44,518	1,474,665,475	33,125

** relative to do-nothing alternative (no vaccination)*

*** relative to previous non-dominated strategy*

**** incremental cost per incremental DALY averted*

¤ dominant in pairwise comparison with do-nothing alternative (no vaccination)

Table S19. Estimated mean ICERs for the sensitivity analysis including foetal loss DALYs. ICERs were calculated using expected values from the probabilistic sensitivity analysis by ordering strategies by expected DALYs averted and, after removing strict and extended dominance, comparing each remaining strategy with the immediately preceding (less effective) non-dominated alternative along the efficient frontier. ICERs were calculated as the incremental cost (combined vaccine programme costs and averted healthcare costs and productivity losses) divided by the incremental DALYs, under a range of hypothetical vaccine programme costs per dose of vaccine administered. Incremental DALYs and costs are not calculated for dominated strategies. ICER = incremental cost-effectiveness ratio, DALY = disability-adjusted life-year, WCBA = women of childbearing age I$ = International dollar. See **Table S7** for country-specific willingness-to-pay thresholds.

Cost per vaccine dose (I$ 2023)	Vaccine target group	DALYs averted*	Total cost* (I$ 2023)	Incremental DALYs averted**	Incremental cost (I$ 2023)**	ICER***
$2/dose	Older adults (50+)	11,841	-33,492,014	/	/	Dominated
	Children (2-14)	25,765	4,867,589	/	/	Dominated
	WCBA (15-49)	43,137	-67,145,817	/	/	Dominated
	Adolescents & adults (15-49)	71,028	-182,566,502	/	/	Dominated
	All (2+)	108,634	-211,190,927	108,634	-211,190,927	Dominant
$5/dose	Older adults (50+)	11,841	-10,943,097	/	/	Dominated
	Children (2-14)	25,765	77,923,595	/	/	Dominated
	WCBA (15-49)	43,137	-14,805,069	/	/	Dominated
	Adolescents & adults (15-49)	71,028	-76,204,186	71,028	-76,204,186	Dominant¤
	All (2+)	108,634	-9,223,688	37,606	66,980,498	1,781
$10/dose	Older adults (50+)	11,841	26,638,432	11,841	26,638,432	2,250
	Children (2-14)	25,765	199,683,605	/	/	Dominated
	WCBA (15-49)	43,137	72,429,512	31,296	45,791,080	1,463
	Adolescents & adults (15-49)	71,028	101,066,340	27,891	28,636,828	1,027
	All (2+)	108,634	327,388,377	37,606	226,322,037	6,018
$20/dose	Older adults (50+)	11,841	101,801,489	11,841	101,801,489	8,597
	Children (2-14)	25,765	443,203,624	/	/	Dominated
	WCBA (15-49)	43,137	246,898,674	31,296	145,097,185	4,636
	Adolescents & adults (15-49)	71,028	455,607,393	27,891	208,708,719	7,483
	All (2+)	108,634	1,000,612,506	37,606	545,005,113	14,493
$50/dose	Older adults (50+)	11,841	327,290,661	11,841	327,290,661	27,640
	Children (2-14)	25,765	1,173,763,683	/	/	Dominated
	WCBA (15-49)	43,137	770,306,158	31,296	443,015,497	14,156
	Adolescents & adults (15-49)	71,028	1,519,230,550	27,891	748,924,392	26,852
	All (2+)	108,634	3,020,284,894	37,606	1,501,054,344	39,915

** relative to do-nothing alternative (no vaccination)*

*** relative to previous non-dominated strategy*

**** incremental cost per incremental DALY averted*

¤ dominant in pairwise comparison with do-nothing alternative (no vaccination)

Table S20. Estimated mean ICERs for the sensitivity analysis in which only survivors of severe disease are assumed to be at risk of developing post-acute SNHL. ICERs were calculated using expected values from the probabilistic sensitivity analysis by ordering strategies by expected DALYs averted and, after removing strict and extended dominance, comparing each remaining strategy with the immediately preceding (less effective) non-dominated alternative along the efficient frontier. ICERs were calculated as the incremental cost (combined vaccine programme costs and averted healthcare costs and productivity losses) divided by the incremental DALYs, under a range of hypothetical vaccine programme costs per dose of vaccine administered. Incremental DALYs and costs are not calculated for dominated strategies. ICER = incremental cost-effectiveness ratio, DALY = disability-adjusted life-year, WCBA = women of childbearing age I$ = International dollar. See **Table S7** for country-specific willingness-to-pay thresholds.

Cost per vaccine dose (I$ 2023)	Vaccine target group	DALYs averted*	Total cost* (I$ 2023)	Incremental DALYs averted**	Incremental cost (I$ 2023)**	ICER***
$2/dose	Children (2-14)	9,388	13,249,818	/	/	Dominated
	Older adults (50+)	11,004	-28,701,989	/	/	Dominated
	WCBA (15-49)	25,331	-44,776,092	/	/	Dominated
	Adolescents & adults (15-49)	48,398	-131,700,267	/	/	Dominated
	All (2+)	68,789	-147,152,439	68,789	-147,152,439	Dominant
$5/dose	Children (2-14)	9,388	86,305,823	/	/	Dominated
	Older adults (50+)	11,004	-6,153,072	/	/	Dominated
	WCBA (15-49)	25,331	7,564,657	/	/	Dominated
	Adolescents & adults (15-49)	48,398	-25,337,951	48,398	-25,337,951	Dominant¤
	All (2+)	68,789	54,814,800	20,391	80,152,751	3,931
$10/dose	Children (2-14)	9,388	208,065,833	/	/	Dominated
	Older adults (50+)	11,004	31,428,457	11,004	31,428,457	2,856
	WCBA (15-49)	25,331	94,799,238	14,327	63,370,781	4,423
	Adolescents & adults (15-49)	48,398	151,932,575	23,067	57,133,337	2,477
	All (2+)	68,789	391,426,865	20,391	239,494,290	11,745
$20/dose	Children (2-14)	9,388	451,585,853	/	/	Dominated
	Older adults (50+)	11,004	106,591,514	11,004	106,591,514	9687
	WCBA (15-49)	25,331	269,268,399	14,327	162,676,885	11,355
	Adolescents & adults (15-49)	48,398	506,473,627	23,067	237,205,228	10,283
	All (2+)	68,789	1,064,650,994	20,391	558,177,367	27,374
$50/dose	Children (2-14)	9,388	1,182,145,911	/	/	Dominated
	Older adults (50+)	11,004	332,080,686	11,004	332,080,686	30,178
	WCBA (15-49)	25,331	792,675,884	14,327	460,595,198	32,149
	Adolescents & adults (15-49)	48,398	1,570,096,785	23,067	777,420,901	33,703
	All (2+)	68,789	3,084,323,382	20,391	1,514,226,597	74,260

** relative to do-nothing alternative (no vaccination)*

*** relative to previous non-dominated strategy*

**** incremental cost per incremental DALY averted*

¤ dominant in pairwise comparison with do-nothing alternative (no vaccination)

Table S21. Estimated mean ICERs for the sensitivity analysis in which the risk of infected people developing moderate symptoms increases with age. ICERs were calculated using expected values from the probabilistic sensitivity analysis by ordering strategies by expected DALYs averted and, after removing strict and extended dominance, comparing each remaining strategy with the immediately preceding (less effective) non-dominated alternative along the efficient frontier. ICERs were calculated as the incremental cost (combined vaccine programme costs and averted healthcare costs and productivity losses) divided by the incremental DALYs, under a range of hypothetical vaccine programme costs per dose of vaccine administered. Incremental DALYs and costs are not calculated for dominated strategies. ICER = incremental cost-effectiveness ratio, DALY = disability-adjusted life-year, WCBA = women of childbearing age I$ = International dollar. See **Table S7** for country-specific willingness-to-pay thresholds.

Cost per vaccine dose (I$ 2023)	Vaccine target group	DALYs averted*	Total cost* (I$ 2023)	Incremental DALYs averted**	Incremental cost (I$ 2023)**	ICER***
$2/dose	Older adults (50+)	13,257	-42,708,781	/	/	Dominated
	Children (2-14)	21,495	3,848,053	/	/	Dominated
	WCBA (15-49)	33,137	-85,461,264	/	/	Dominated
	Adolescents & adults (15-49)	64,153	-225,020,392	/	/	Dominated
	All (2+)	98,905	-263,881,120	98,905	-263,881,120	Dominant
$5/dose	Older adults (50+)	13,257	-20,159,863	/	/	Dominated
	Children (2-14)	21,495	76,904,059	/	/	Dominated
	WCBA (15-49)	33,137	-33,120,515	/	/	Dominated
	Adolescents & adults (15-49)	64,153	-118,658,077	64,153	-118,658,077	Dominant¤
	All (2+)	98,905	-61,913,881	34,752	56,744,196	1,633
$10/dose	Older adults (50+)	13,257	17,421,665	13,257	17,421,665	1,314
	Children (2-14)	21,495	198,664,069	/	/	Dominated
	WCBA (15-49)	33,137	54,114,065	19,880	36,692,400	1,846
	Adolescents & adults (15-49)	64,153	58,612,450	31,016	4,498,385	145
	All (2+)	98,905	274,698,184	34,752	216,085,734	6,218
$20/dose	Older adults (50+)	13,257	92,584,723	13,257	92,584,723	6,984
	Children (2-14)	21,495	442,184,088	/	/	Dominated
	WCBA (15-49)	33,137	228,583,227	19,880	135,998,504	6,841
	Adolescents & adults (15-49)	64,153	413,153,502	31,016	184,570,275	5,951
	All (2+)	98,905	947,922,313	34,752	534,768,811	15,388
$50/dose	Older adults (50+)	13,257	318,073,894	13,257	318,073,894	23,993
	Children (2-14)	21,495	1,172,744,147	/	/	Dominated
	WCBA (15-49)	33,137	751,990,712	19,880	433,916,818	21,827
	Adolescents & adults (15-49)	64,153	1,476,776,659	31,016	724,785,947	23,368
	All (2+)	98,905	2,967,594,701	34,752	1,490,818,042	42,899

** relative to do-nothing alternative (no vaccination)*

*** relative to previous non-dominated strategy*

**** incremental cost per incremental DALY averted*

¤ dominant in pairwise comparison with do-nothing alternative (no vaccination)

Table S22. Estimated mean ICERs for the sensitivity analysis in which future costs and life-years are not discounted (r=0%). ICERs were calculated using expected values from the probabilistic sensitivity analysis by ordering strategies by expected DALYs averted and, after removing strict and extended dominance, comparing each remaining strategy with the immediately preceding (less effective) non-dominated alternative along the efficient frontier. ICERs were calculated as the incremental cost (combined vaccine programme costs and averted healthcare costs and productivity losses) divided by the incremental DALYs, under a range of hypothetical vaccine programme costs per dose of vaccine administered. Incremental DALYs and costs are not calculated for dominated strategies. ICER = incremental cost-effectiveness ratio, DALY = disability-adjusted life-year, WCBA = women of childbearing age I$ = International dollar. See **Table S7** for country-specific willingness-to-pay thresholds.

Cost per vaccine dose (I$ 2023)	Vaccine target group	DALYs averted*	Total cost* (I$ 2023)	Incremental DALYs averted**	Incremental cost (I$ 2023)**	ICER***
$2/dose	Older adults (50+)	14,853	-52,561,968	/	/	Dominated
	Children (2-14)	33,271	-39,335,004	/	/	Dominated
	WCBA (15-49)	51,961	-134,389,239	/	/	Dominated
	Adolescents & adults (15-49)	94,627	-353,099,266	/	/	Dominated
	All (2+)	142,751	-444,996,237	142,751	-444,996,237	Dominant
$5/dose	Older adults (50+)	14,853	-29,215,605	/	/	Dominated
	Children (2-14)	33,271	36,261,179	/	/	Dominated
	WCBA (15-49)	51,961	-80,203,909	/	/	Dominated
	Adolescents & adults (15-49)	94,627	-242,987,335	94,627	-242,987,335	Dominant¤
	All (2+)	142,751	-235,941,761	48,124	7,045,574	146
$10/dose	Older adults (50+)	14,853	9,694,999	/	/	Dominated
	Children (2-14)	33,271	162,254,817	/	/	Dominated
	WCBA (15-49)	51,961	10,104,973	/	/	Dominated
	Adolescents & adults (15-49)	94,627	-59,467,450	94,627	-59,467,450	Dominant¤
	All (2+)	142,751	112,482,366	48,124	171,949,816	3,573
$20/dose	Older adults (50+)	14,853	87,516,208	14,853	87,516,208	5,892
	Children (2-14)	33,271	414,242,092	/	/	Dominated
	WCBA (15-49)	51,961	190,722,739	37,108	103,206,531	2,781
	Adolescents & adults (15-49)	94,627	307,572,320	42,666	116,849,581	2,739
	All (2+)	142,751	809,330,620	48,124	501,758,300	10,426
$50/dose	Older adults (50+)	14,853	320,979,835	14,853	320,979,835	21,610
	Children (2-14)	33,271	1,170,203,918	/	/	Dominated
	WCBA (15-49)	51,961	732,576,036	37,108	411,596,201	11,092
	Adolescents & adults (15-49)	94,627	1,408,691,629	42,666	676,115,593	15,847
	All (2+)	142,751	2,899,875,383	48,124	1,491,183,754	30,986

** relative to do-nothing alternative (no vaccination)*

*** relative to previous non-dominated strategy*

**** incremental cost per incremental DALY averted*

¤ dominant in pairwise comparison with do-nothing alternative (no vaccination)

Table S23. Estimated mean ICERs for the sensitivity analysis considering a five- instead of ten-year duration of vaccine-induced immunity. ICERs were calculated using expected values from the probabilistic sensitivity analysis by ordering strategies by expected DALYs averted and, after removing strict and extended dominance, comparing each remaining strategy with the immediately preceding (less effective) non-dominated alternative along the efficient frontier. ICERs were calculated as the incremental cost (combined vaccine programme costs and averted healthcare costs and productivity losses) divided by the incremental DALYs, under a range of hypothetical vaccine programme costs per dose of vaccine administered. Incremental DALYs and costs are not calculated for dominated strategies. ICER = incremental cost-effectiveness ratio, DALY = disability-adjusted life-year, WCBA = women of childbearing age I$ = International dollar. See **Table S7** for country-specific willingness-to-pay thresholds.

Cost per vaccine dose (I$ 2023)	Vaccine target group	DALYs averted*	Total cost* (I$ 2023)	Incremental DALYs averted**	Incremental cost (I$ 2023)**	ICER***
$2/dose	Older adults (50+)	6,878	-15,477,863	/	/	Dominated
	Children (2-14)	10,274	32,636,089	/	/	Dominated
	WCBA (15-49)	14,741	-18,240,541	/	/	Dominated
	Adolescents & adults (15-49)	27,869	-59,307,801	27,869	-59,307,801	Dominant
	All (2+)	45,021	-42,149,575	17,152	17,158,226	1,000
$5/dose	Older adults (50+)	6,878	7,071,054	6,878	7,071,054	1,028
	Children (2-14)	10,274	105,692,095	/	/	Dominated
	WCBA (15-49)	14,741	34,100,208	7,863	27,029,154	3,438
	Adolescents & adults (15-49)	27,869	47,054,515	13,128	12,954,307	987
	All (2+)	45,021	159,817,664	17,152	112,763,149	6,574
$10/dose	Older adults (50+)	6,878	44,652,583	6,878	44,652,583	6,492
	Children (2-14)	10,274	227,452,105	/	/	Dominated
	WCBA (15-49)	14,741	121,334,788	7,863	76,682,205	9,752
	Adolescents & adults (15-49)	27,869	224,325,041	13,128	102,990,253	7,845
	All (2+)	45,021	496,429,729	17,152	272,104,688	15,864
$20/dose	Older adults (50+)	6,878	119,815,640	6,878	119,815,640	17,420
	Children (2-14)	10,274	470,972,124	/	/	Dominated
	WCBA (15-49)	14,741	295,803,950	7,863	175,988,310	22,382
	Adolescents & adults (15-49)	27,869	578,866,093	13,128	283,062,143	21,562
	All (2+)	45,021	1,169,653,858	17,152	590,787,765	34,444
$50/dose	Older adults (50+)	6,878	345,304,812	6,878	345,304,812	50,204
	Children (2-14)	10,274	1,201,532,183	/	/	Dominated
	WCBA (15-49)	14,741	819,211,435	7,863	473,906,623	60,270
	Adolescents & adults (15-49)	27,869	1,642,489,251	13,128	823,277,816	62,712
	All (2+)	45,021	3,189,326,246	17,152	1,546,836,995	90,184

** relative to do-nothing alternative (no vaccination)*

*** relative to previous non-dominated strategy*

**** incremental cost per incremental DALY averted*

Table S24. Estimated mean (95% uncertainty interval) net monetary benefit (International dollars I$ 2023), calculated by subtracting total vaccine programme costs (under a range of hypothetical costs per dose of vaccine administered) from the total societal costs averted due to vaccination (sum of healthcare costs, productivity losses and monetised DALYs). This table compares results from the base case analysis against various sensitivity analyses. DALY = disability-adjusted life-year, WCBA = women of childbearing age, SNHL = sensorineural hearing loss, SA = sensitivity analysis.

Analysis	Vaccine target group	Cost per vaccine dose (I$ 2023)				
		I$2/dose	I$5/dose	I$10/dose	I$20/dose	I$50/dose
Base case	Children (2-14)	-1.51 M (-22.0 M, 26.8 M)	-74.6 M (-95.0 M, -46.2 M)	-196 M (-217 M, -168 M)	-440 M (-460 M, -412 M)	-1.17 B (-1.19 B, -1.14 B)
	WCBA (15-49)	71.6 M (27.2 M, 135 M)	19.3 M (-25.2 M, 82.6 M)	-68.0 M (-112 M, -4.59 M)	-242 M (-287 M, -179 M)	-766 M (-810 M, -702 M)
	Adolescents & adults (15-49)	191 M (82.7 M, 340 M)	84.8 M (-23.7 M, 234 M)	-92.5 M (-201 M, 56.5 M)	-447 M (-555 M, -298 M)	-1.51 B (-1.62 B, -1.36 B)
	Older adults (50+)	35.3 M (16.3 M, 59.0 M)	12.7 M (-6.23 M, 36.5 M)	-24.8 M (-43.8 M, -1.10 M)	-100 M (-119 M, -76.3 M)	-326 M (-344 M, -302 M)
	All (2+)	225 M (79.7 M, 419 M)	22.9 M (-122 M, 217 M)	-314 M (-459 M, -119 M)	-987 M (-1.13 B, -792 M)	-3.01 B (-3.15 B, -2.81 B)
Reduced vaccine efficacy (VE=50% against all disease)	Children (2-14)	-15.0 M (-29.6 M, 5.25 M)	-88.1 M (-103 M, -67.8 M)	-210 M (-224 M, -190 M)	-453 M (-468 M, -433 M)	-1.18 B (-1.20 B, -1.16 B)
	WCBA (15-49)	41.2 M (9.44 M, 86.4 M)	-11.2 M (-42.9 M, 34.1 M)	-98.4 M (-130 M, -53.1 M)	-273 M (-305 M, -228 M)	-796 M (-828 M, -751 M)
	Adolescents & adults (15-49)	116 M (38.8 M, 223 M)	9.91 M (-67.5 M, 116 M)	-167 M (-245 M, -61.0 M)	-522 M (-599 M, -415 M)	-1.59 B (-1.66 B, -1.48 B)
	Older adults (50+)	20.9 M (7.36 M, 37.9 M)	-1.64 M (-15.2 M, 15.3 M)	-39.2 M (-52.8 M, -22.3 M)	-114 M (-128 M, -97.4 M)	-340 M (-353 M, -323 M)
	All (2+)	122 M (18.4 M, 261 M)	-79.8 M (-184 M, 59.2 M)	-416 M (-520 M, -277 M)	-1.09 B (-1.19 B, -951 M)	-3.11 B (-3.21 B, -2.97 B)
Increased vaccine efficacy (VE=90% against all disease)	Children (2-14)	12.0 M (-14.4 M, 48.4 M)	-61.1 M (-87.4 M, -24.6 M)	-183 M (-209 M, -146 M)	-426 M (-453 M, -390 M)	-1.16 B (-1.18 B, -1.12 B)
	WCBA (15-49)	102 M (44.9 M, 184 M)	49.7 M (-7.43 M, 131 M)	-37.5 M (-94.7 M, 43.9 M)	-212 M (-269 M, -131 M)	-735 M (-793 M, -654 M)
	Adolescents & adults (15-49)	266 M (127 M, 458 M)	160 M (20.2 M, 351 M)	-17.6 M (-157 M, 174 M)	-372 M (-512 M, -181 M)	-1.44 B (-1.58 B, -1.24 B)
	Older adults (50+)	49.7 M (25.3 M, 80.2 M)	27.1 M (2.73 M, 57.6 M)	-10.5 M (-34.9 M, 20.1 M)	-85.6 M (-110 M, -55.1 M)	-311 M (-336 M, -281 M)
	All (2+)	328 M (141 M, 578 M)	126 M (-61.1 M, 376 M)	-211 M (-398 M, 39.2 M)	-884 M (-1.07 B, -634 M)	-2.90 B (-3.09 B, -2.65 B)
Include DALYs due to foetal loss	Children (2-14)	-1.09 M (-21.7 M, 27.3 M)	-74.1 M (-94.8 M, -45.8 M)	-196 M (-217 M, -168 M)	-439 M (-460 M, -411 M)	-1.17 B (-1.19 B, -1.14 B)
	WCBA (15-49)	73.5 M (28.9 M, 137 M)	21.2 M (-23.4 M, 84.9 M)	-66.0 M (-111 M, -2.36 M)	-240 M (-285 M, -177 M)	-764 M (-809 M, -700 M)
	Adolescents & adults (15-49)	193 M (84.2 M, 342 M)	86.7 M (-22.2 M, 236 M)	-90.6 M (-199 M, 58.7 M)	-445 M (-554 M, -296 M)	-1.51 B (-1.62 B, -1.36 B)
	Older adults (50+)	35.3 M (16.3 M, 59.0 M)	12.7 M (-6.23 M, 36.5 M)	-24.8 M (-43.8 M, -1.10 M)	-100 M (-119 M, -76.3 M)	-326 M (-344 M, -302 M)
	All (2+)	227 M (81.4 M, 423 M)	25.3 M (-121 M, 221 M)	-311 M (-457 M, -116 M)	-985 M (-1.13 B, -789 M)	-3.00 B (-3.15 B, -2.81 B)
Limit SNHL only to survivors of severe disease	Children (2-14)	-11.9 M (-26.7 M, 7.41 M)	-85.0 M (-99.7 M, -65.6 M)	-207 M (-221 M, -187 M)	-450 M (-465 M, -431 M)	-1.18 B (-1.20 B, -1.16 B)
	WCBA (15-49)	48.5 M (16.9 M, 89.2 M)	-3.82 M (-35.4 M, 36.8 M)	-91.1 M (-123 M, -50.4 M)	-266 M (-297 M, -225 M)	-789 M (-821 M, -748 M)
	Adolescents & adults (15-49)	139 M (60.5 M, 246 M)	32.5 M (-45.9 M, 139 M)	-145 M (-223 M, -38.0 M)	-499 M (-578 M, -393 M)	-1.56 B (-1.64 B, -1.46 B)
	Older adults (50+)	30.4 M (13.3 M, 49.8 M)	7.82 M (-9.29 M, 27.3 M)	-29.8 M (-46.9 M, -10.3 M)	-105 M (-122 M, -85.5 M)	-330 M (-348 M, -311 M)
	All (2+)	157 M (52.8 M, 299 M)	-44.7 M (-149 M, 97.5 M)	-381 M (-486 M, -239 M)	-1.05 B (-1.16 B, -912 M)	-3.07 B (-3.18 B, -2.93 B)
	Children (2-14)	-705 K (-21.7 M, 28.3 M)	-73.8 M (-94.7 M, -44.7 M)	-196 M (-216 M, -166 M)	-439 M (-460 M, -410 M)	-1.17 B (-1.19 B, -1.14 B)
	WCBA (15-49)	90.4 M (34.7 M, 172 M)	38.0 M (-17.6 M, 120 M)	-49.2 M (-105 M, 32.7 M)	-224 M (-279 M, -142 M)	-747 M (-803 M, -665 M)

Analysis	**Vaccine target group**	**Cost per vaccine dose (I$ 2023)**				
		I$2/dose	**I$5/dose**	**I$10/dose**	**I$20/dose**	**I$50/dose**
Assume moderate symptom risk increases with age	Adolescents & adults (15-49)	234 M (100 M, 432 M)	128 M (-6.28 M, 326 M)	-49.1 M (-184 M, 148 M)	-404 M (-538 M, -206 M)	-1.47 B (-1.60 B, -1.27 B)
	Older adults (50+)	44.7 M (20.4 M, 78.5 M)	22.2 M (-2.16 M, 56.0 M)	-15.4 M (-39.7 M, 18.4 M)	-90.6 M (-115 M, -56.8 M)	-316 M (-340 M, -282 M)
	All (2+)	279 M (101 M, 541 M)	76.5 M (-101 M, 340 M)	-260 M (-438 M, 2.90 M)	-933 M (-1.11 B, -670 M)	-2.95 B (-3.13 B, -2.69 B)
No discounting of future costs or life-years (*r*=0)	Children (2-14)	45.4 M (4.18 M, 102 M)	-30.2 M (-71.4 M, 26.8 M)	-156 M (-197 M, -99.2 M)	-408 M (-449 M, -351 M)	-1.16 B (-1.21 B, -1.11 B)
	WCBA (15-49)	144 M (69.6 M, 239 M)	89.7 M (15.4 M, 185 M)	-604 K (-74.9 M, 94.6 M)	-181 M (-256 M, -86.1 M)	-723 M (-797 M, -628 M)
	Adolescents & adults (15-49)	370 M (187 M, 606 M)	260 M (77.3 M, 496 M)	76.8 M (-106 M, 312 M)	-290 M (-473 M, -54.9 M)	-1.39 B (-1.57 B, -1.16 B)
	Older adults (50+)	55.3 M (28.3 M, 88.4 M)	31.9 M (4.95 M, 65.1 M)	-6.98 M (-34.0 M, 26.1 M)	-84.8 M (-112 M, -51.7 M)	-318 M (-345 M, -285 M)
	All (2+)	471 M (222 M, 789 M)	262 M (13.2 M, 580 M)	-86.4 M (-335 M, 231 M)	-783 M (-1.03 B, -466 M)	-2.87 B (-3.12 B, -2.56 B)
Assume 5-year duration of vaccine-induced immunity	Children (2-14)	-31.0 M (-38.5 M, -20.9 M)	-104 M (-112 M, -93.9 M)	-226 M (-233 M, -216 M)	-469 M (-477 M, -459 M)	-1.20 B (-1.21 B, -1.19 B)
	WCBA (15-49)	20.6 M (-2.48 M, 51.2 M)	-31.7 M (-54.8 M, -1.14 M)	-119 M (-142 M, -88.4 M)	-293 M (-317 M, -263 M)	-817 M (-840 M, -786 M)
	Adolescents & adults (15-49)	63.8 M (8.01 M, 135 M)	-42.6 M (-98.4 M, 28.4 M)	-220 M (-276 M, -149 M)	-574 M (-630 M, -503 M)	-1.64 B (-1.69 B, -1.57 B)
	Older adults (50+)	16.6 M (4.46 M, 31.5 M)	-5.96 M (-18.1 M, 8.96 M)	-43.5 M (-55.7 M, -28.6 M)	-119 M (-131 M, -104 M)	-344 M (-356 M, -329 M)
	All (2+)	49.4 M (-24.8 M, 140 M)	-153 M (-227 M, -62.4 M)	-489 M (-563 M, -399 M)	-1.16 B (-1.24 B, -1.07 B)	-3.18 B (-3.26 B, -3.09 B)

Table S25. Estimated mean (95% uncertainty interval) threshold vaccine costs (International dollars I$ 2023), calculated by dividing the cumulative total societal costs averted due to vaccination (the sum of healthcare costs, productivity losses and monetised DALYs averted) by the number of doses administered to different target groups. This table compares results from the base case analysis against various sensitivity analyses. DALY = disability-adjusted life-year, VSLY = value of statistical life-years, WCBA = women of childbearing age, SNHL = sensorineural hearing loss.

Analysis	Vaccine target group	Vaccine efficacy				
		50% moderate, 50% severe	50% moderate, 70% severe	70% moderate, 70% severe	70% moderate, 90% severe	90% moderate, 90% severe
Base case analysis	Children (2-14)	1.38 (0.78, 2.22)	1.78 (1.03, 2.83)	1.94 (1.10, 3.10)	2.33 (1.35, 3.73)	2.49 (1.41, 3.99)
	WCBA (15-49)	4.36 (2.54, 6.96)	5.68 (3.38, 8.65)	6.10 (3.56, 9.74)	7.42 (4.40, 11.4)	7.85 (4.57, 12.5)
	Adolescents & adults (15-49)	5.28 (3.09, 8.28)	6.92 (4.09, 10.5)	7.39 (4.33, 11.6)	9.03 (5.33, 13.7)	9.5 (5.57, 14.9)
	Older adults (50+)	4.78 (2.98, 7.04)	6.48 (4.04, 9.44)	6.69 (4.17, 9.85)	8.40 (5.24, 12.3)	8.61 (5.36, 12.7)
	All (2+)	3.81 (2.27, 5.88)	5.01 (3.04, 7.55)	5.34 (3.18, 8.23)	6.54 (3.95, 9.90)	6.87 (4.09, 10.6)
Include DALYs due to foetal loss	Children (2-14)	1.40 (0.79, 2.23)	1.80 (1.05, 2.85)	1.96 (1.11, 3.12)	2.35 (1.37, 3.76)	2.51 (1.43, 4.01)
	WCBA (15-49)	4.44 (2.61, 7.05)	5.79 (3.48, 8.77)	6.22 (3.66, 9.86)	7.57 (4.53, 11.6)	7.99 (4.70, 12.7)
	Adolescents & adults (15-49)	5.32 (3.13, 8.33)	6.97 (4.14, 10.5)	7.45 (4.38, 11.7)	9.10 (5.39, 13.8)	9.57 (5.63, 15.0)
	Older adults (50+)	4.78 (2.98, 7.04)	6.48 (4.04, 9.44)	6.69 (4.17, 9.85)	8.40 (5.24, 12.3)	8.61 (5.36, 12.7)
	All (2+)	3.84 (2.29, 5.91)	5.05 (3.06, 7.59)	5.38 (3.21, 8.28)	6.58 (3.97, 9.94)	6.91 (4.13, 10.6)
Limit SNHL only to survivors of severe disease	Children (2-14)	1.08 (0.65, 1.65)	1.47 (0.89, 2.26)	1.51 (0.91, 2.30)	1.90 (1.15, 2.92)	1.94 (1.16, 2.96)
	WCBA (15-49)	3.42 (2.12, 5.08)	4.73 (2.94, 7.03)	4.78 (2.97, 7.11)	6.10 (3.79, 9.06)	6.15 (3.82, 9.14)
	Adolescents & adults (15-49)	4.23 (2.65, 6.38)	5.86 (3.67, 8.82)	5.92 (3.71, 8.93)	7.55 (4.73, 11.4)	7.61 (4.76, 11.5)
	Older adults (50+)	4.31 (2.69, 6.16)	6.02 (3.75, 8.59)	6.04 (3.76, 8.63)	7.74 (4.83, 11.1)	7.77 (4.84, 11.1)
	All (2+)	3.10 (1.99, 4.61)	4.29 (2.76, 6.37)	4.34 (2.78, 6.45)	5.53 (3.55, 8.22)	5.58 (3.58, 8.29)
Assume moderate symptom risk increases with age	Children (2-14)	1.41 (0.79, 2.26)	1.80 (1.05, 2.88)	1.97 (1.11, 3.16)	2.36 (1.37, 3.78)	2.53 (1.43, 4.07)
	WCBA (15-49)	5.13 (2.85, 8.48)	6.45 (3.71, 10.4)	7.18 (3.99, 11.9)	8.50 (4.85, 13.8)	9.23 (5.13, 15.3)
	Adolescents & adults (15-49)	6.15 (3.44, 10.1)	7.79 (4.51, 12.4)	8.61 (4.82, 14.2)	10.3 (5.89, 16.5)	11.1 (6.20, 18.2)
	Older adults (50+)	5.68 (3.37, 8.89)	7.38 (4.55, 11.2)	7.95 (4.71, 12.4)	9.65 (5.90, 14.8)	10.2 (6.06, 16.0)
	All (2+)	4.38 (2.50, 7.17)	5.58 (3.29, 8.78)	6.14 (3.5, 10.0)	7.33 (4.28, 11.7)	7.89 (4.50, 12.9)
No discounting of future costs or life-years (*r*=0)	Children (2-14)	2.72 (1.55, 4.33)	3.60 (2.06, 5.74)	3.80 (2.17, 6.06)	4.69 (2.68, 7.50)	4.89 (2.78, 7.80)
	WCBA (15-49)	7.12 (4.18, 10.9)	9.45 (5.64, 14.3)	9.97 (5.85, 15.2)	12.3 (7.32, 18.6)	12.8 (7.53, 19.6)
	Adolescents & adults (15-49)	8.64 (5.08, 13.2)	11.5 (6.87, 17.6)	12.1 (7.11, 18.5)	15.0 (8.9, 22.9)	15.5 (9.14, 23.8)
	Older adults (50+)	6.50 (4.03, 9.54)	8.85 (5.47, 12.8)	9.10 (5.64, 13.4)	11.5 (7.08, 16.6)	11.7 (7.25, 17.2)
	All (2+)	6.26 (3.71, 9.51)	8.36 (5.03, 12.5)	8.76 (5.19, 13.3)	10.9 (6.52, 16.4)	11.3 (6.67, 17.1)
Use VSLY instead of societal costs to calculate threshold vaccine costs	Children (2-14)	5.12 (2.96, 8.09)	7.16 (4.14, 11.3)	7.16 (4.14, 11.3)	9.21 (5.33, 14.6)	9.21 (5.33, 14.6)
	WCBA (15-49)	17.5 (11.0, 25.9)	24.6 (15.4, 36.2)	24.6 (15.4, 36.2)	31.6 (19.8, 46.6)	31.6 (19.8, 46.6)
	Adolescents & adults (15-49)	15.6 (9.85, 23.3)	21.9 (13.8, 32.7)	21.9 (13.8, 32.7)	28.1 (17.7, 42.0)	28.1 (17.7, 42.0)
	Older adults (50+)	12.2 (7.35, 18.3)	17.1 (10.3, 25.6)	17.1 (10.3, 25.6)	22.0 (13.2, 32.9)	22.0 (13.2, 32.9)
	All (2+)	11.4 (7.34, 16.9)	16.0 (10.3, 23.7)	16.0 (10.3, 23.7)	20.6 (13.2, 30.4)	20.6 (13.2, 30.4)

Analysis	Vaccine target group	Vaccine efficacy				
		50% moderate, 50% severe	50% moderate, 70% severe	70% moderate, 70% severe	70% moderate, 90% severe	90% moderate, 90% severe
Assume 5-year duration of vaccine-induced immunity	Children (2-14)	0.52 (0.30, 0.82)	0.67 (0.40, 1.03)	0.73 (0.42, 1.14)	0.88 (0.52, 1.36)	0.94 (0.54, 1.47)
	WCBA (15-49)	2.27 (1.33, 3.52)	2.95 (1.75, 4.50)	3.18 (1.86, 4.93)	3.86 (2.29, 5.89)	4.09 (2.39, 6.34)
	Adolescents & adults (15-49)	2.71 (1.59, 4.14)	3.55 (2.11, 5.40)	3.80 (2.23, 5.80)	4.63 (2.74, 7.04)	4.88 (2.86, 7.46)
	Older adults (50+)	3.01 (1.85, 4.42)	4.08 (2.52, 5.95)	4.21 (2.59, 6.19)	5.28 (3.26, 7.72)	5.41 (3.33, 7.96)
	All (2+)	1.95 (1.17, 2.91)	2.57 (1.55, 3.79)	2.73 (1.63, 4.07)	3.35 (2.01, 4.96)	3.51 (2.10, 5.24)

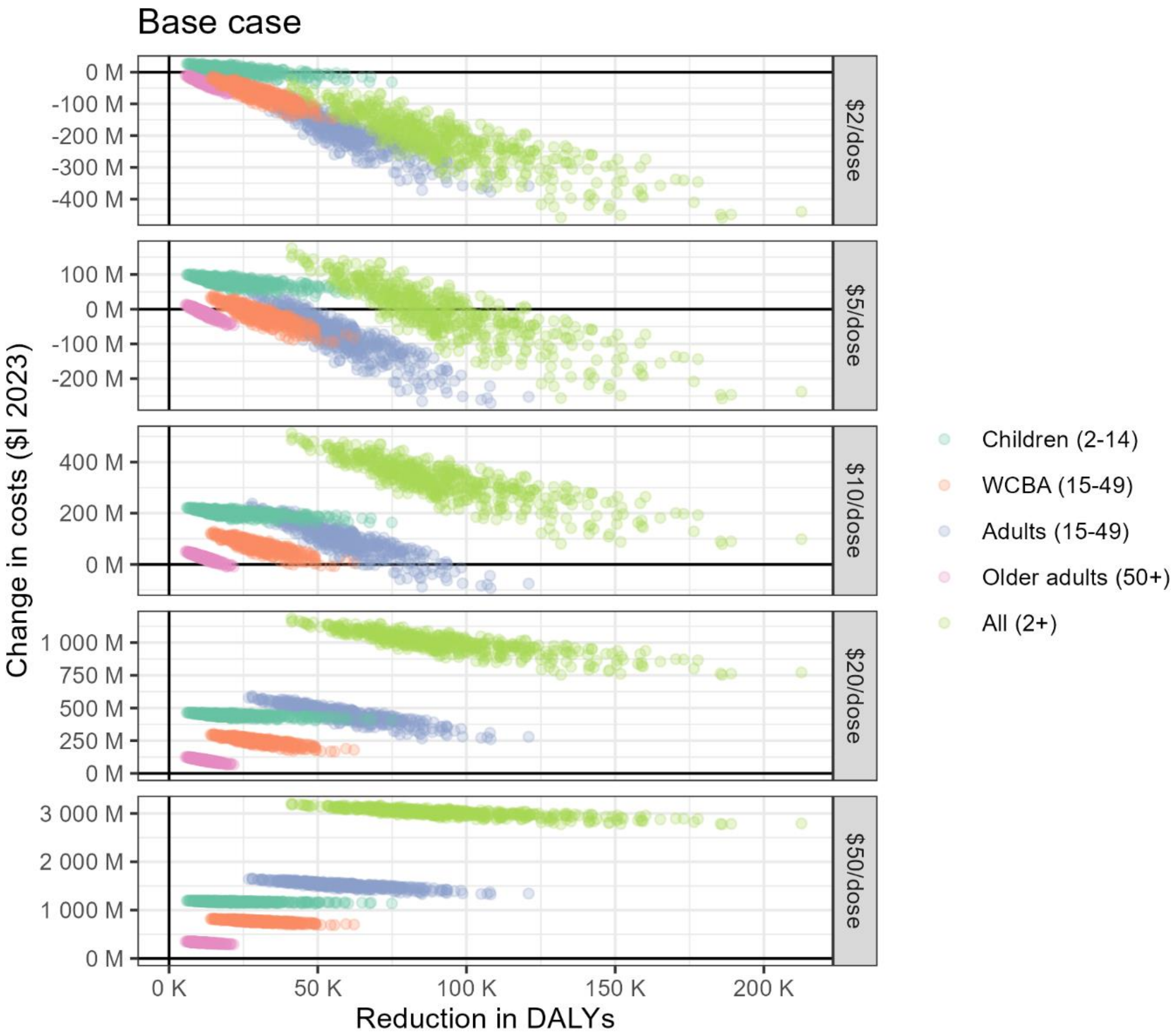


Figure S35. Cost-effectiveness planes under base case assumptions. This figure shows change in costs (y-axis) and benefits (x-axis) due to vaccination relative to a do-nothing alternative. Costs are calculated as the sum of vaccine programme costs and change in healthcare costs and productivity losses. Each point represents one of 500 Monte Carlo simulations, colours represent each of the five considered vaccination campaigns, and panels correspond to hypothetical vaccine programme costs per dose of vaccine administered. The target group "Adults" includes adolescents and adults. K = thousand, M = million, $I = International dollar, DALY = disability-adjusted life year, WCBA = women of childbearing age.

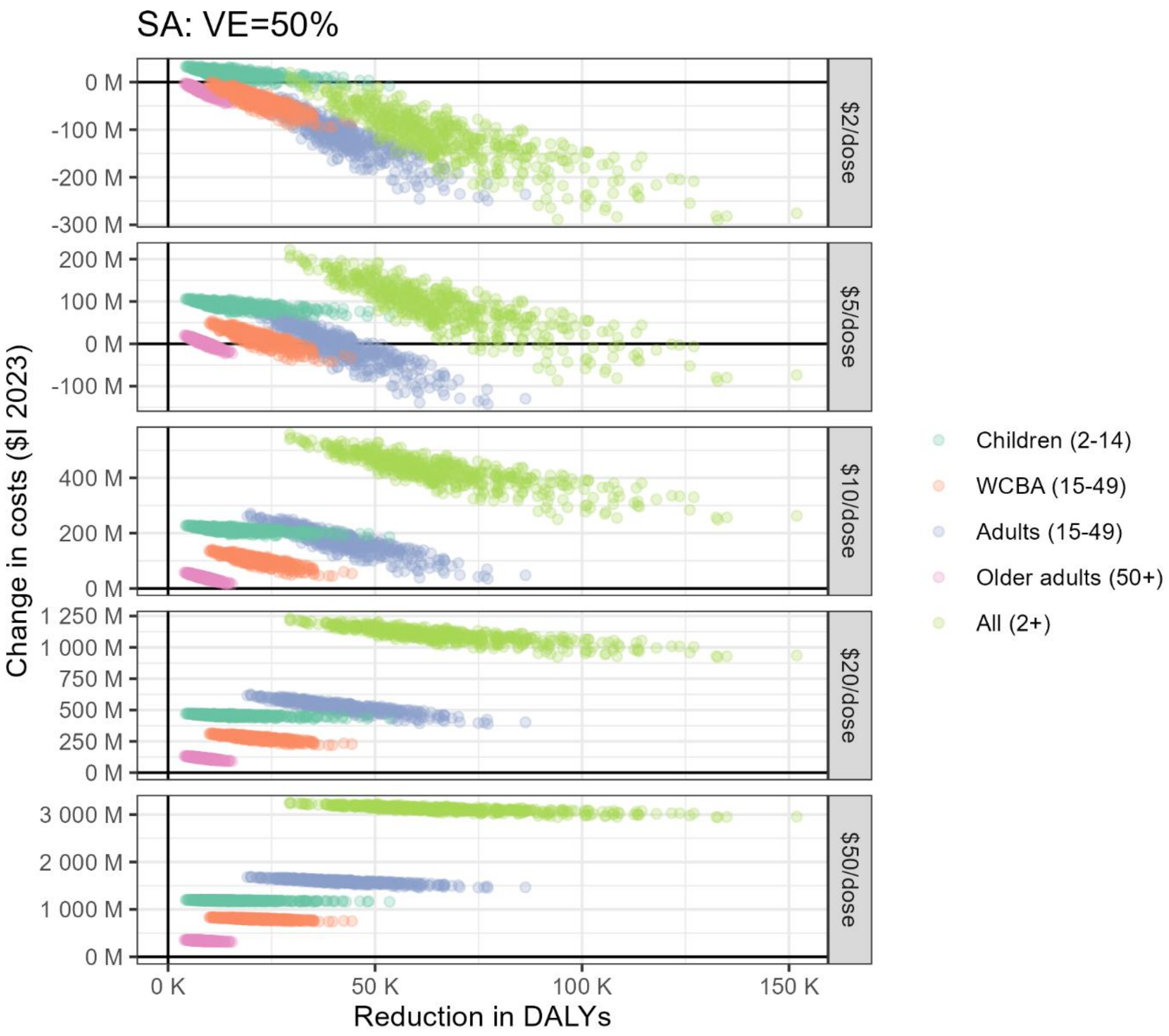


Figure S36. Cost-effectiveness planes for the sensitivity analysis with reduced vaccine efficacy (50% against both moderate and severe disease). This figure shows change in costs (y-axis) and benefits (x-axis) due to vaccination relative to a do-nothing alternative. Costs are calculated as the sum of vaccine programme costs and change in healthcare costs and productivity losses. Each point represents one of 500 Monte Carlo simulations, colours represent each of the five considered vaccination campaigns, and panels correspond to hypothetical vaccine programme costs per dose of vaccine administered. The target group "Adults" includes adolescents and adults. K = thousand, M = million, $I = International dollar, DALY = disability-adjusted life year, WCBA = women of childbearing age.

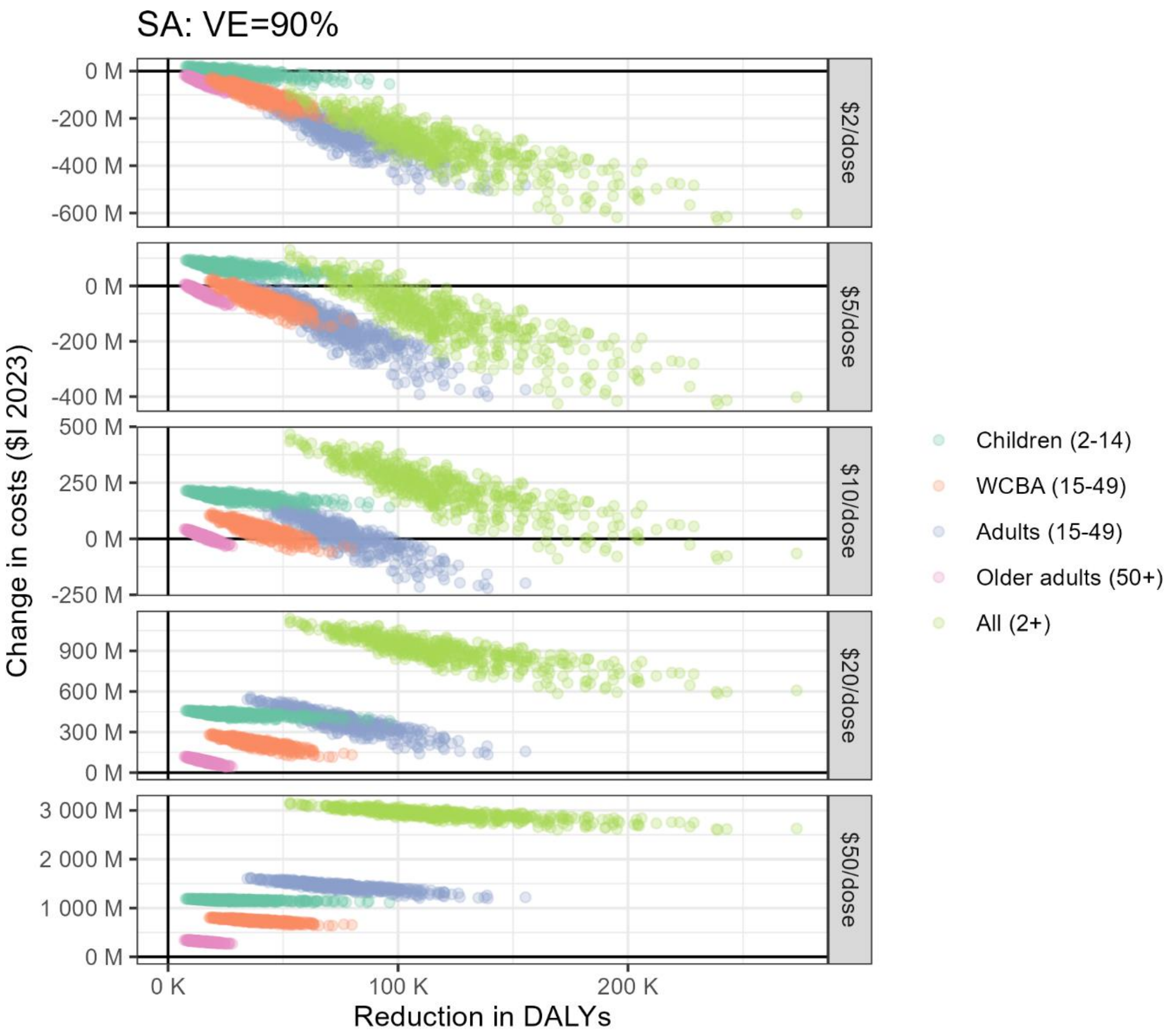


Figure S37. Cost-effectiveness planes for the sensitivity analysis with increased vaccine efficacy (90% against both moderate and severe disease). This figures shows change in costs (y-axis) and benefits (x-axis) due to vaccination relative to a do-nothing alternative. Costs are calculated as the sum of vaccine programme costs and change in healthcare costs and productivity losses. Each point represents one of 500 Monte Carlo simulations, colours represent each of the five considered vaccination campaigns, and panels correspond to hypothetical vaccine programme costs per dose of vaccine administered. The target group "Adults" includes adolescents and adults. K = thousand, M = million, $I = International dollar, DALY = disability-adjusted life year, WCBA = women of childbearing age.

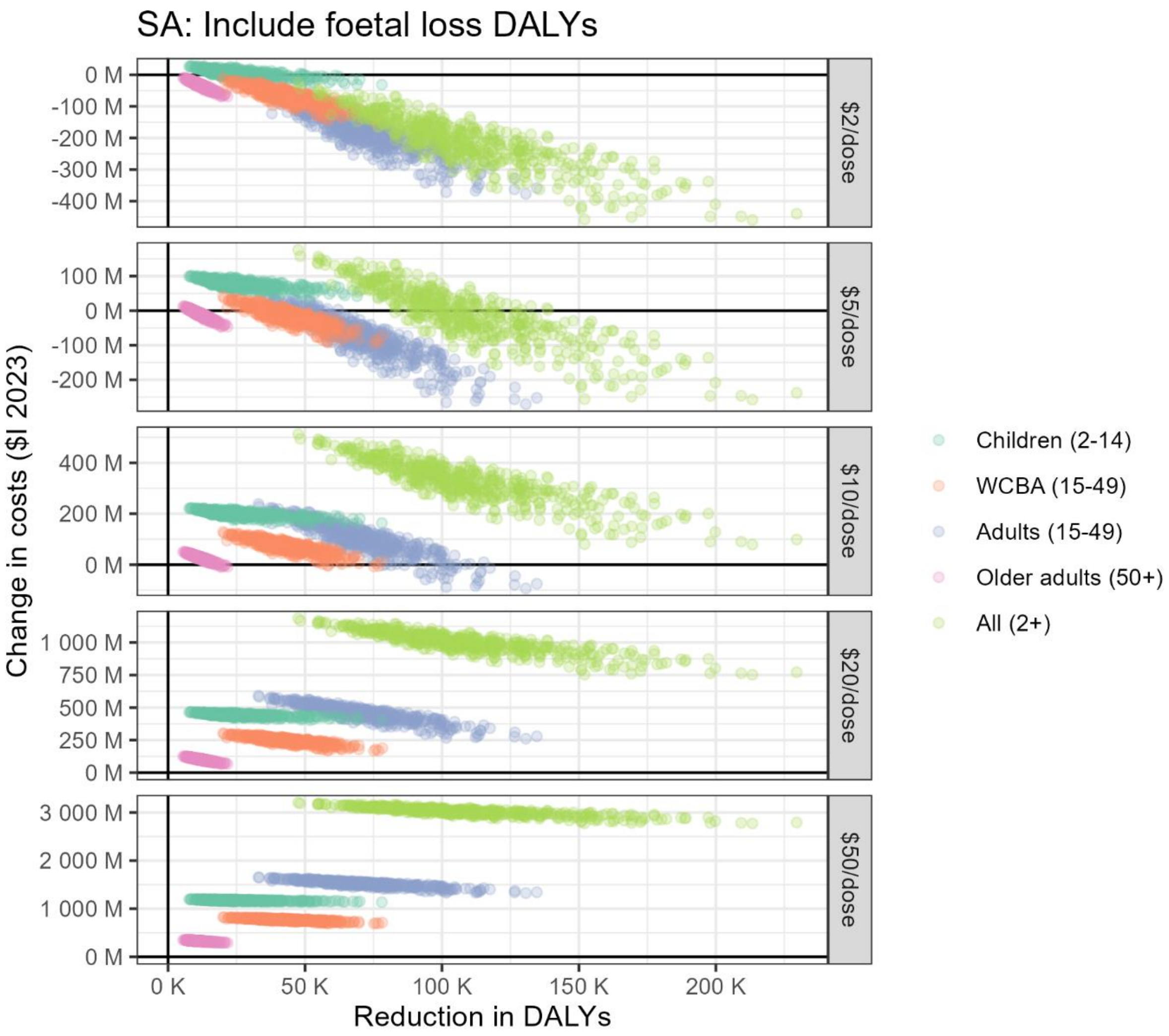


Figure S38. Cost-effectiveness planes for the sensitivity analysis including foetal loss DALYs. This figure shows change in costs (y-axis) and benefits (x-axis) due to vaccination relative to a do-nothing alternative. Costs are calculated as the sum of vaccine programme costs and change in healthcare costs and productivity losses. Each point represents one of 500 Monte Carlo simulations, colours represent each of the five considered vaccination campaigns, and panels correspond to hypothetical vaccine programme costs per dose of vaccine administered. The target group "Adults" includes adolescents and adults. K = thousand, M = million, $I = International dollar, DALY = disability-adjusted life year, WCBA = women of childbearing age.

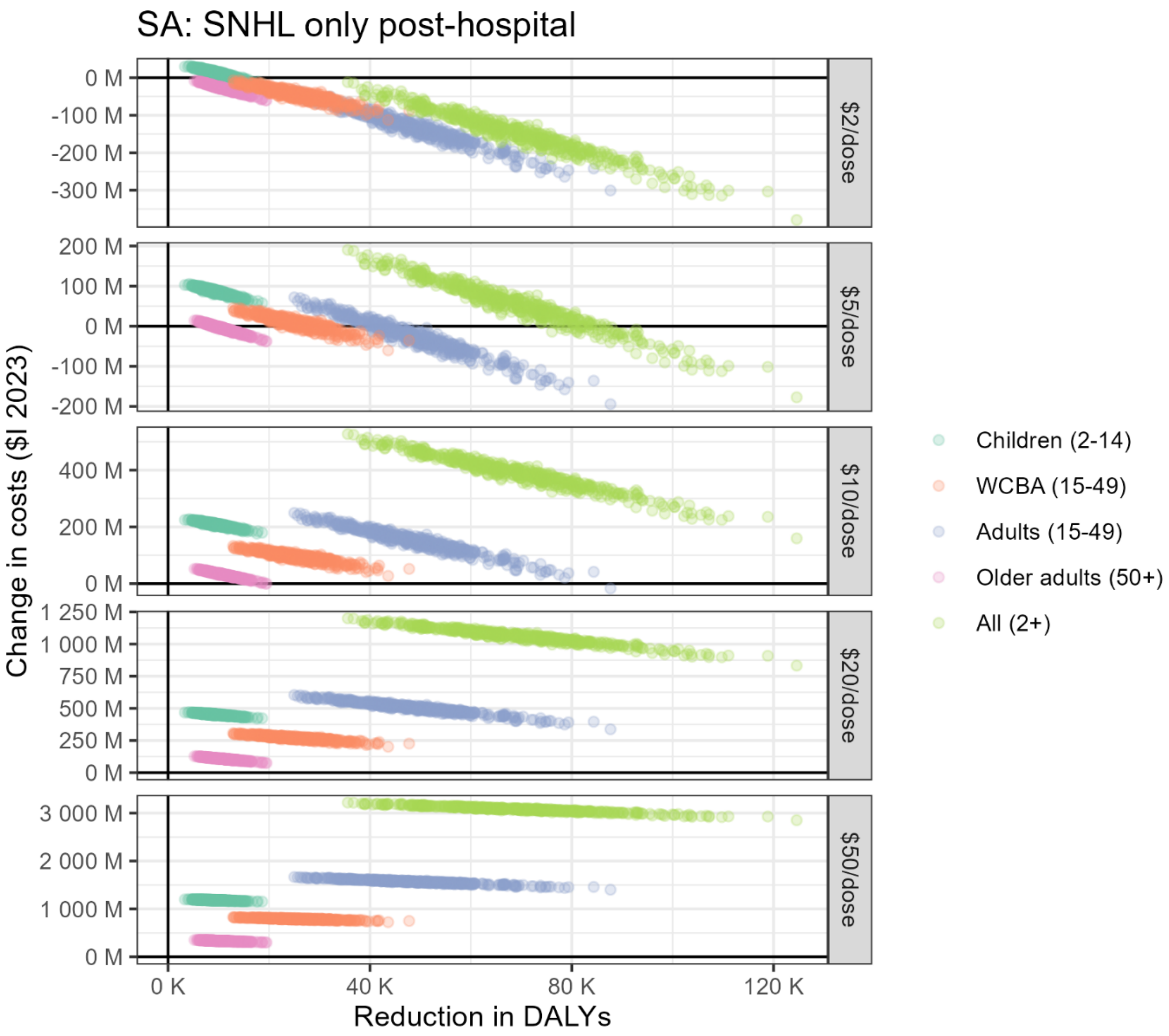


Figure S39. Cost-effectiveness planes for the sensitivity analysis in which only survivors of severe disease are assumed to be at risk of developing post-acute SNHL. This figure shows change in costs (y-axis) and benefits (x-axis) due to vaccination relative to a do-nothing alternative. Costs are calculated as the sum of vaccine programme costs and change in healthcare costs and productivity losses. Each point represents one of 500 Monte Carlo simulations, colours represent each of the five considered vaccination campaigns, and panels correspond to hypothetical vaccine programme costs per dose of vaccine administered. The target group "Adults" includes adolescents and adults. K = thousand, M = million, $I = International dollar, DALY = disability-adjusted life year, WCBA = women of childbearing age.

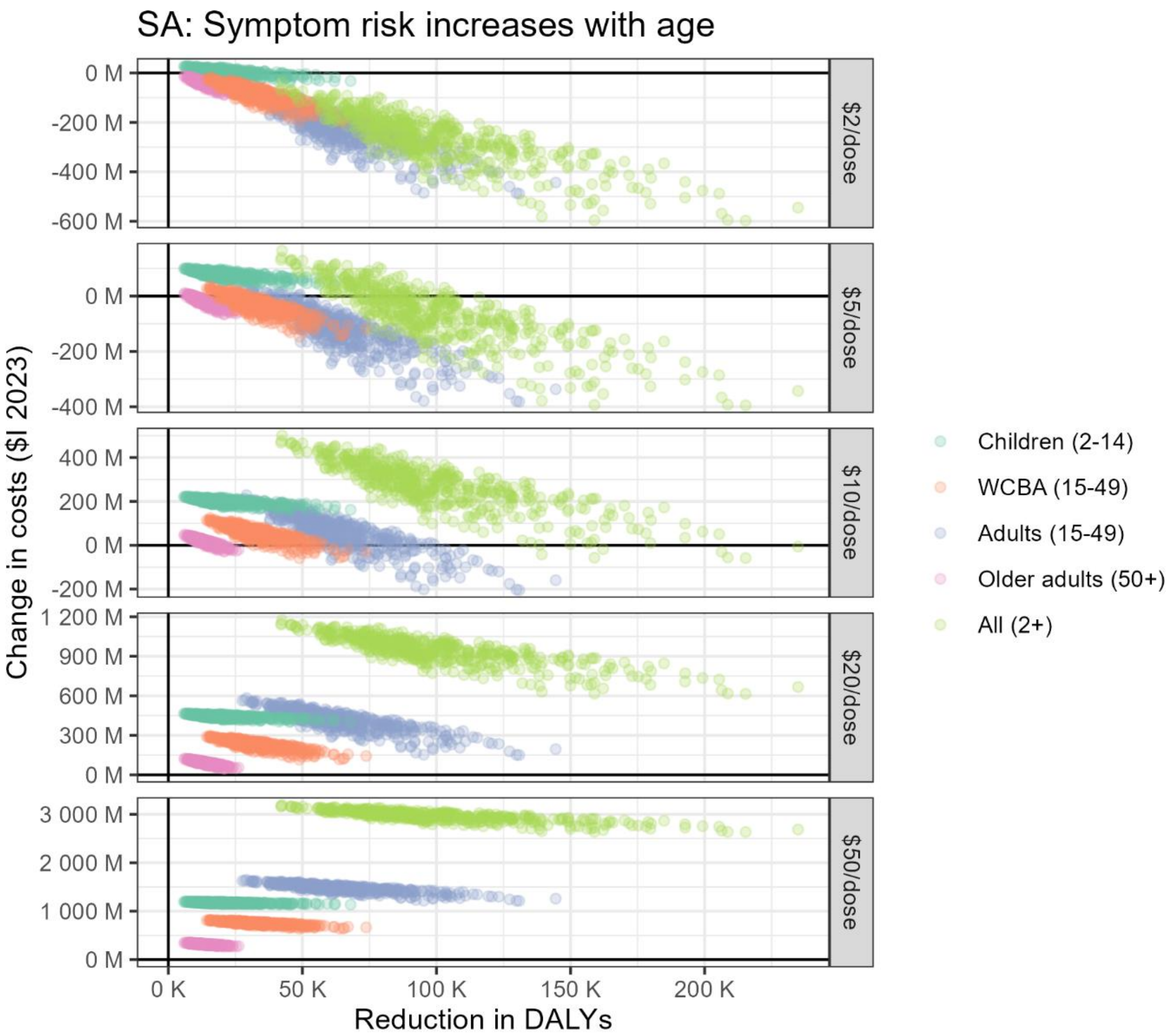


Figure S40. Cost-effectiveness planes for the sensitivity analysis in which the risk of infected people developing moderate symptoms increases with age. This figure shows change in costs (y-axis) and benefits (x-axis) due to vaccination relative to a do-nothing alternative. Costs are calculated as the sum of vaccine programme costs and change in healthcare costs and productivity losses. Each point represents one of 500 Monte Carlo simulations, colours represent each of the five considered vaccination campaigns, and panels correspond to hypothetical vaccine programme costs per dose of vaccine administered. The target group "Adults" includes adolescents and adults. K = thousand, M = million, $I = International dollar, DALY = disability-adjusted life year, WCBA = women of childbearing age.

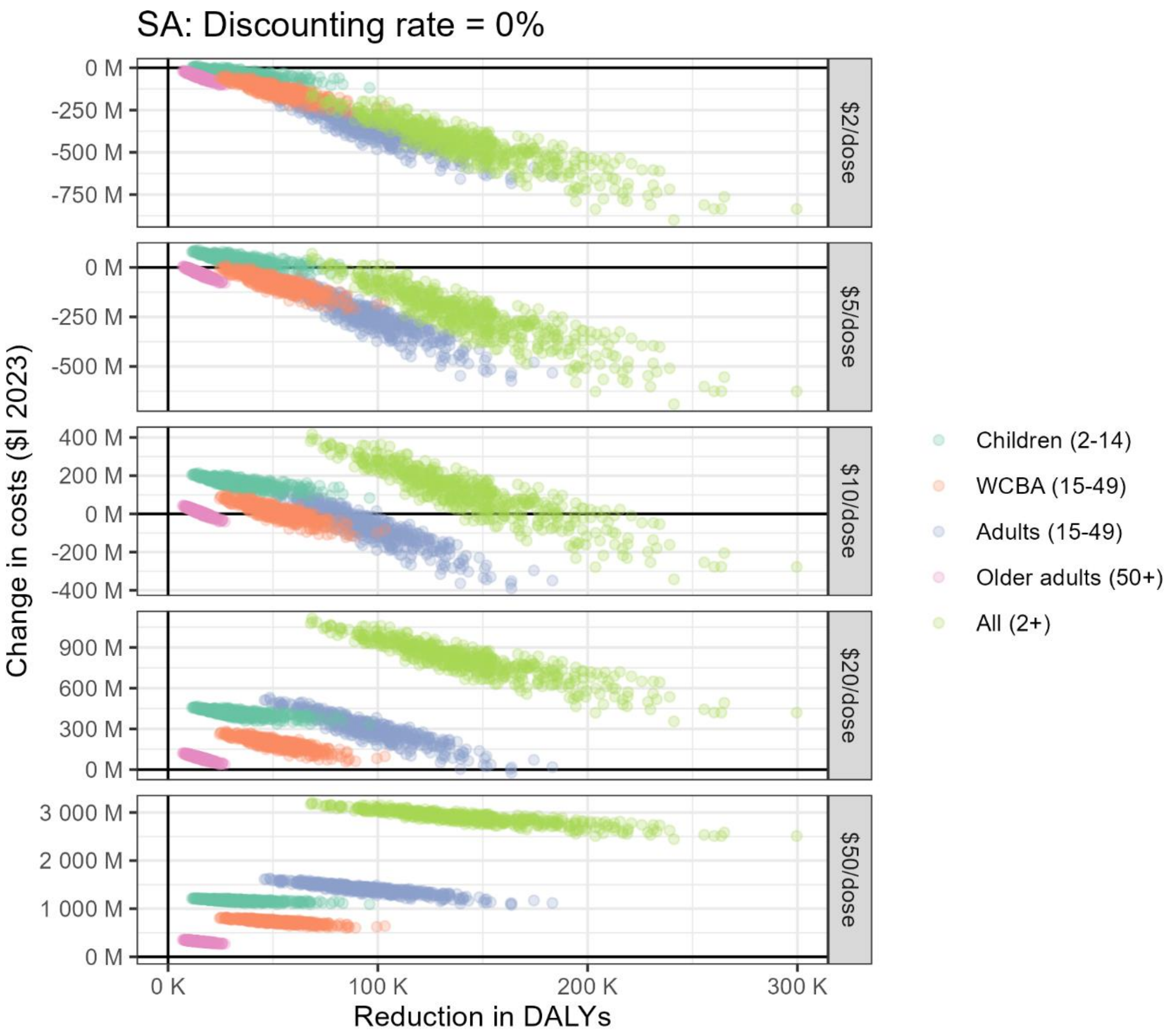


Figure S41. Cost-effectiveness planes for the sensitivity analysis in which future costs and life-years are not discounted (r=0%). This figure shows change in costs (y-axis) and benefits (x-axis) due to vaccination relative to a do-nothing alternative. Costs are calculated as the sum of vaccine programme costs and change in healthcare costs and productivity losses. Each point represents one of 500 Monte Carlo simulations, colours represent each of the five considered vaccination campaigns, and panels correspond to hypothetical vaccine programme costs per dose of vaccine administered. The target group "Adults" includes adolescents and adults. K = thousand, M = million, $I = International dollar, DALY = disability-adjusted life year, WCBA = women of childbearing age.

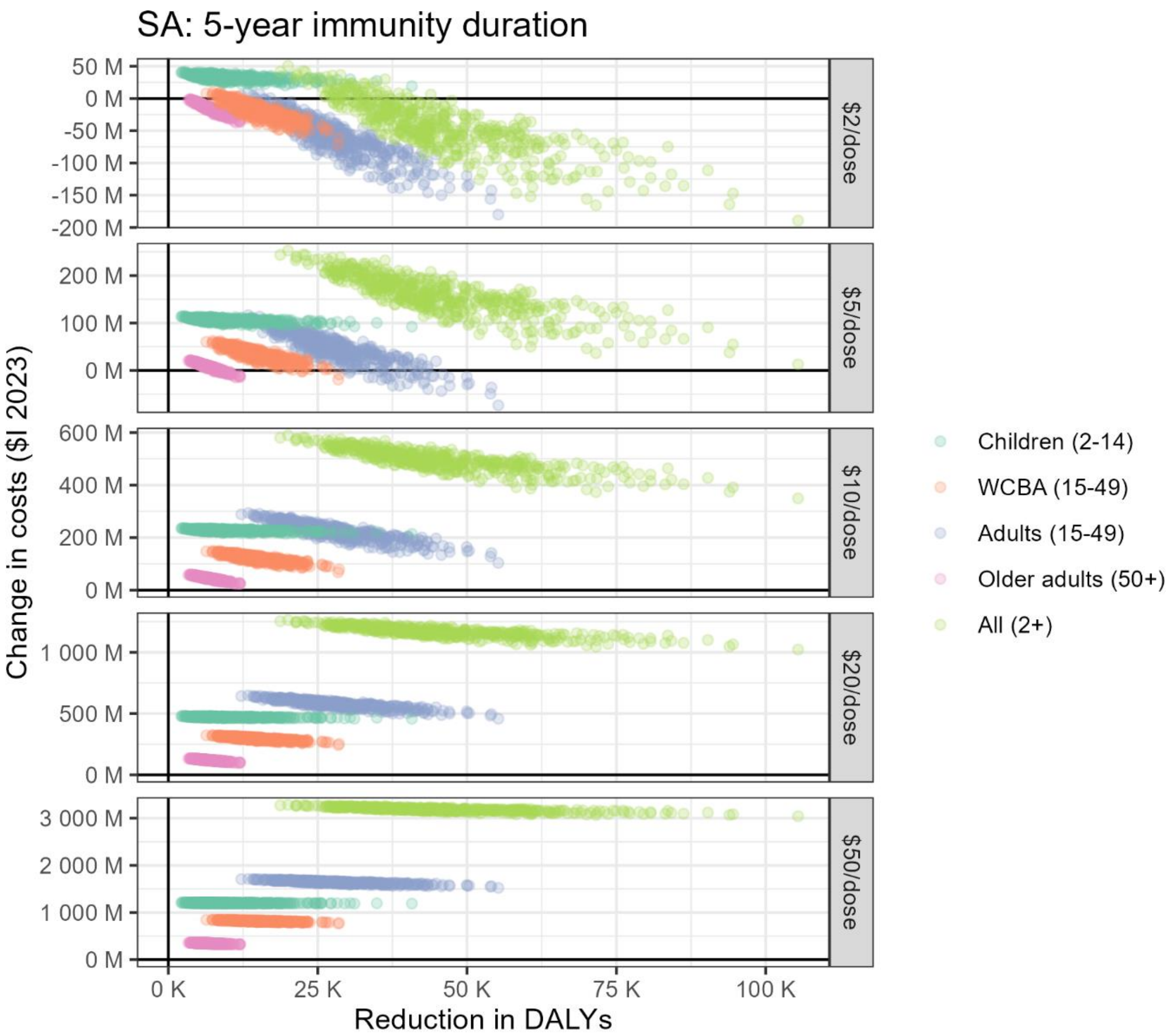


Figure S42. Cost-effectiveness planes for the sensitivity analysis considering a five- instead of ten-year duration of vaccine-induced immunity. This figure shows change in costs (y-axis) and benefits (x-axis) due to vaccination relative to a do-nothing alternative. Costs are calculated as the sum of vaccine programme costs and change in healthcare costs and productivity losses. Each point represents one of 500 Monte Carlo simulations, colours represent each of the five considered vaccination campaigns, and panels correspond to hypothetical vaccine programme costs per dose of vaccine administered. The target group "Adults" includes adolescents and adults. K = thousand, M = million, $I = International dollar, DALY = disability-adjusted life year, WCBA = women of childbearing age.

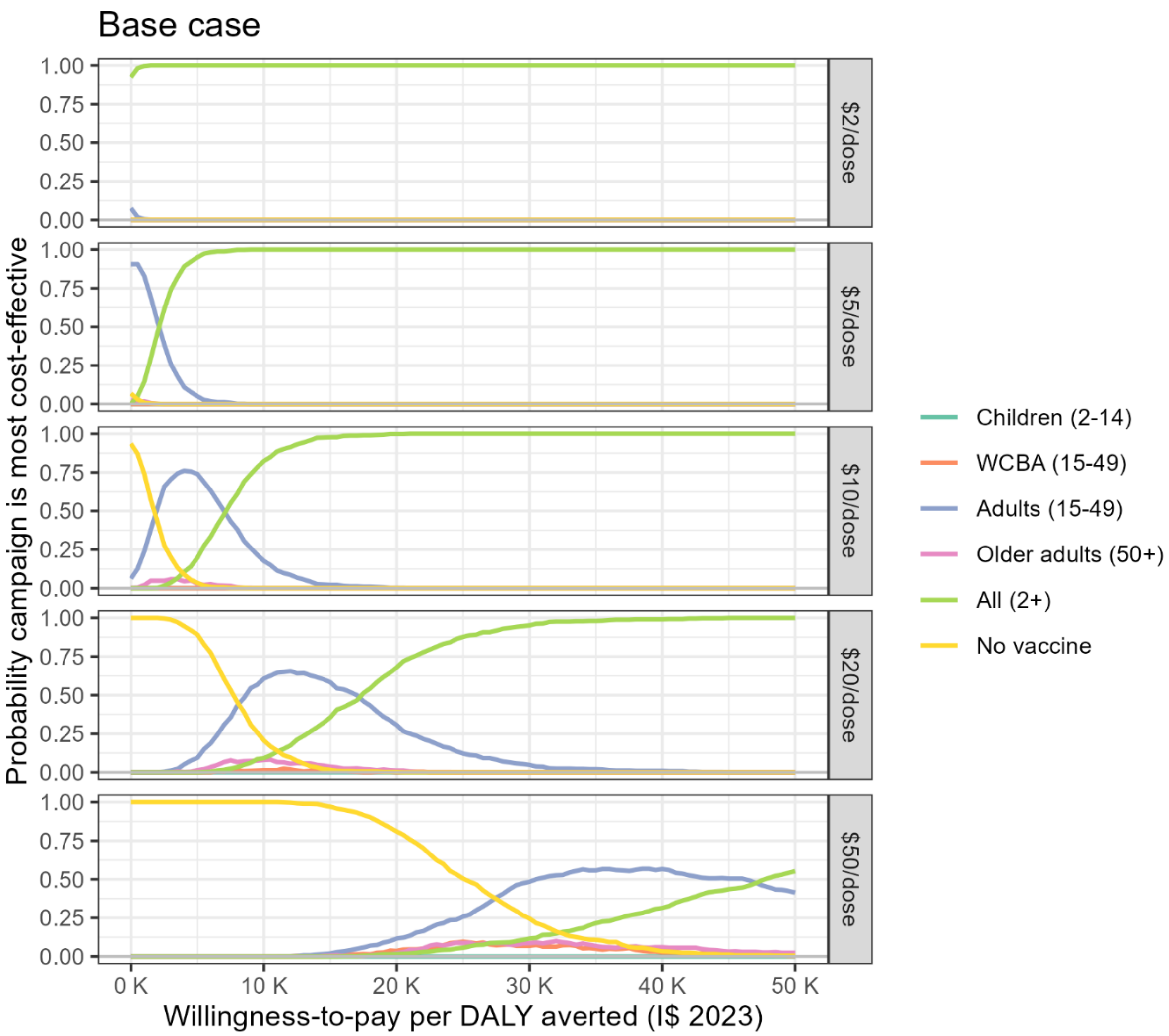


Figure S43. Cost-effectiveness acceptability curves under base case assumptions. This figure shows the probability of each vaccination campaign (coloured lines) being the most cost-effective campaign, as depending on the willingness-to-pay per DALY averted (x-axis) and an assumed hypothetical cost per dose of vaccine (panels). The target group "Adults" includes adolescents and adults. K = thousand, I$ = International dollar, WCBA = women of childbearing age.

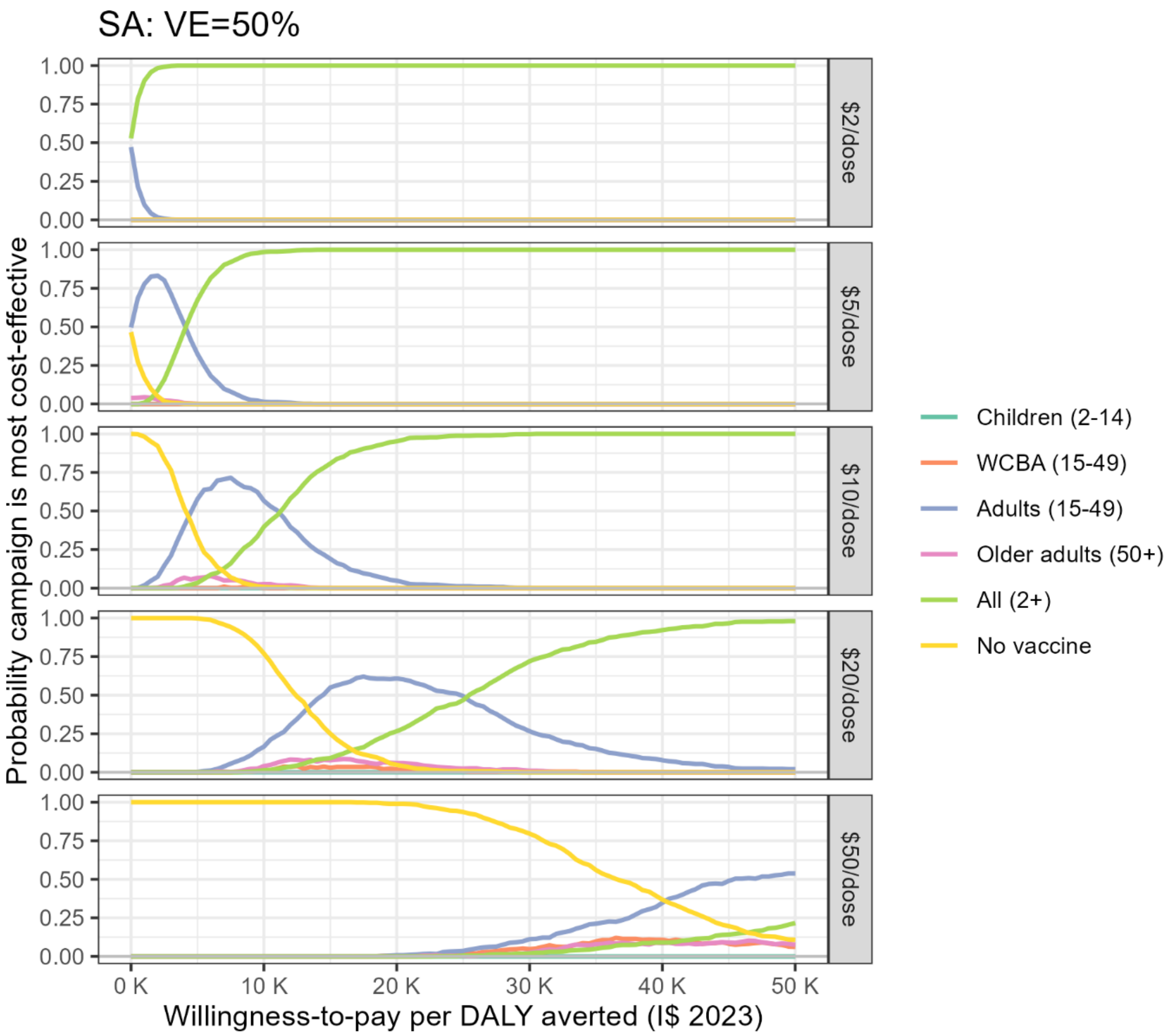


Figure S44. Cost-effectiveness acceptability curves for the sensitivity analysis with reduced vaccine efficacy (50% against both moderate and severe disease). This figure shows the probability of each vaccination campaign (coloured lines) being the most cost-effective campaign, as depending on the willingness-to-pay per DALY averted (x-axis) and an assumed hypothetical cost per dose of vaccine (panels). The target group “Adults” includes adolescents and adults. K = thousand, I$ = International dollar, SA = sensitivity analysis, WCBA = women of childbearing age.

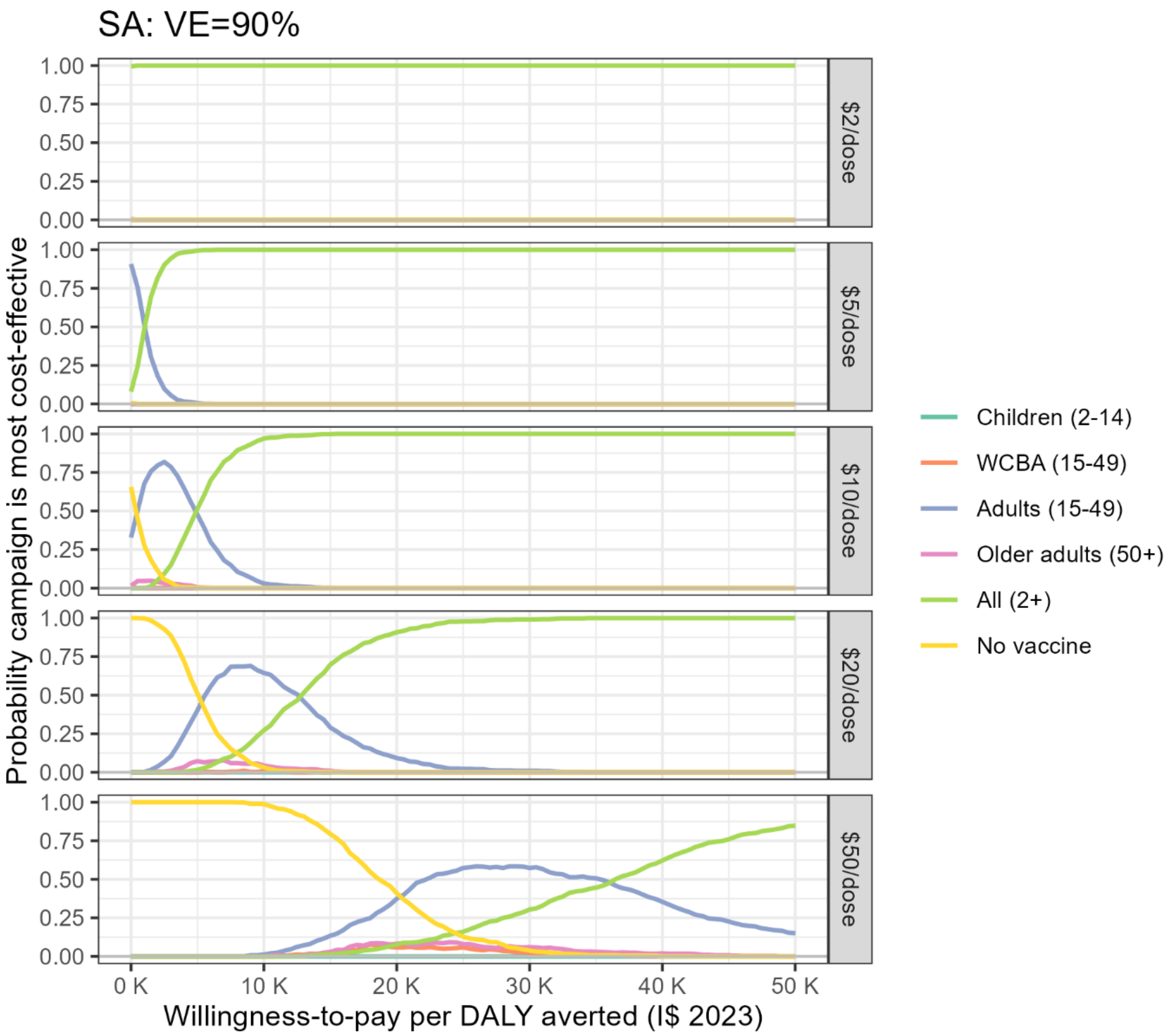


Figure S45. Cost-effectiveness acceptability curves for the sensitivity analysis with increased vaccine efficacy (90% against both moderate and severe disease). This figure shows the probability of each vaccination campaign (coloured lines) being the most cost-effective campaign, as depending on the willingness-to-pay per DALY averted (x-axis) and an assumed hypothetical cost per dose of vaccine (panels). The target group "Adults" includes adolescents and adults. K = thousand, I$ = International dollar, SA = sensitivity analysis, WCBA = women of childbearing age.

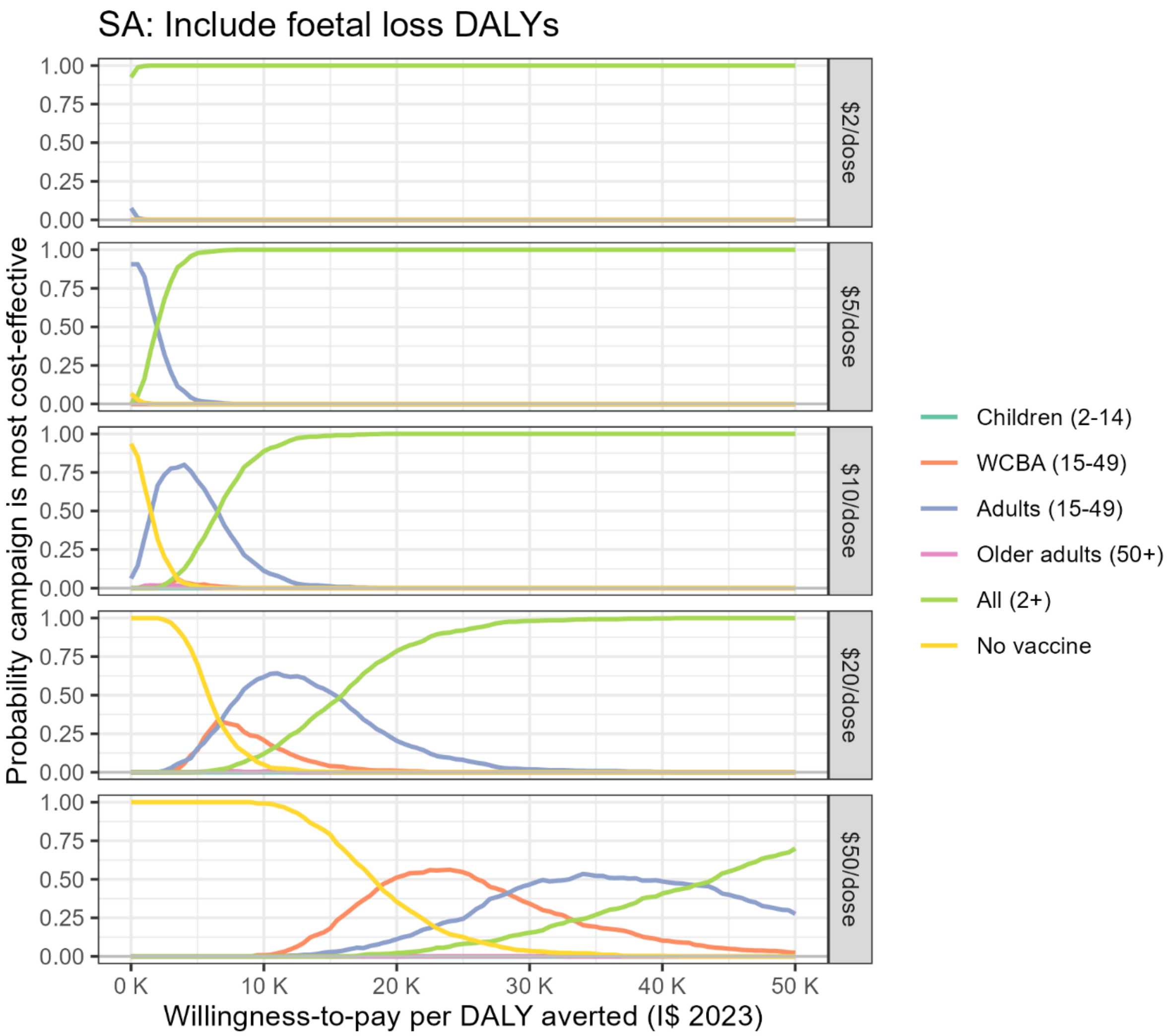


Figure S46. Cost-effectiveness acceptability curves for the sensitivity analysis including foetal loss DALYs. This figure shows the probability of each vaccination campaign (coloured lines) being the most cost-effective campaign, as depending on the willingness-to-pay per DALY averted (x-axis) and an assumed hypothetical cost per dose of vaccine (panels). The target group "Adults" includes adolescents and adults. K = thousand, I$ = International dollar, SA = sensitivity analysis, WCBA = women of childbearing age.

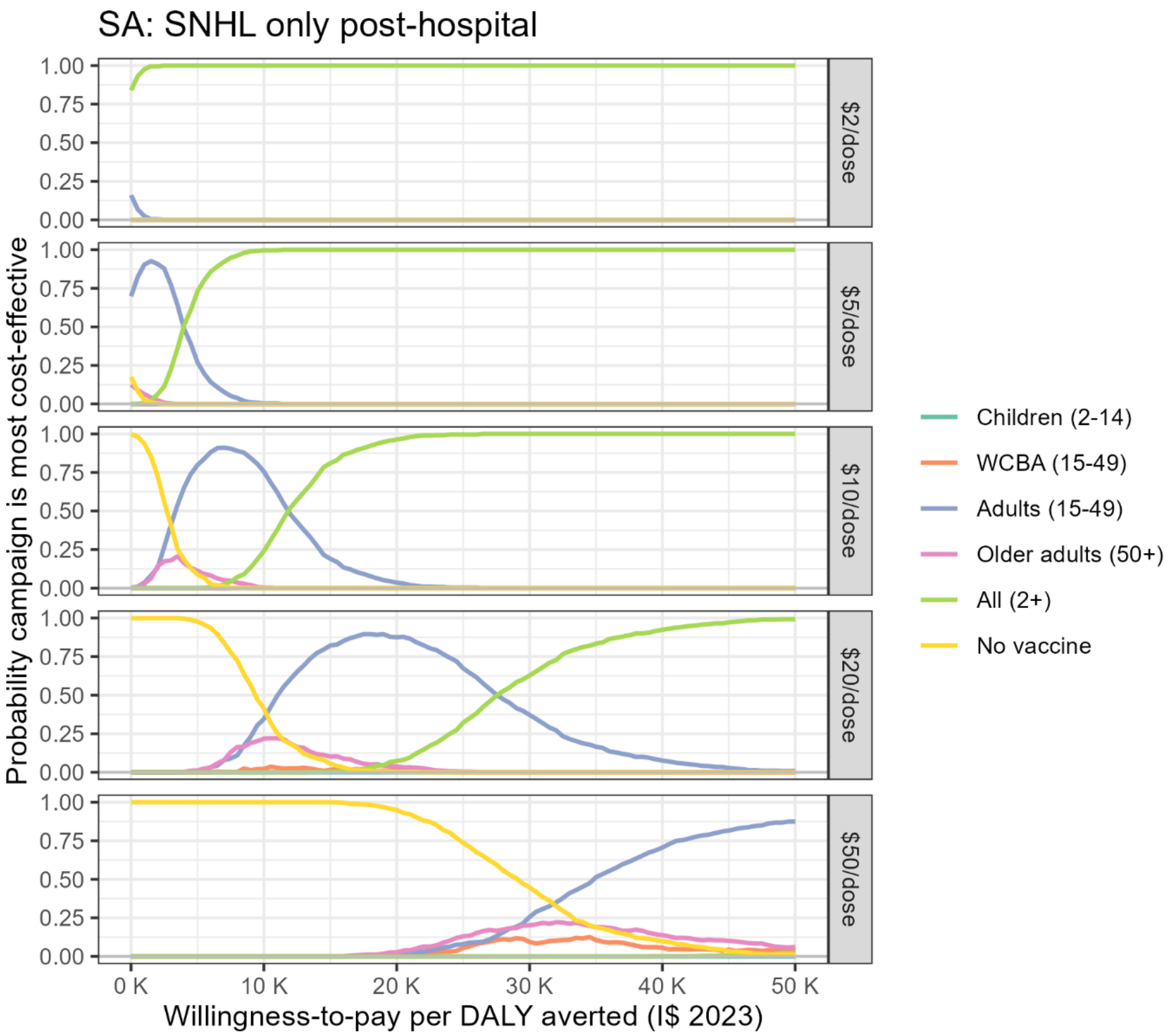


Figure S47. Cost-effectiveness acceptability curves for the sensitivity analysis in which only survivors of severe disease are assumed to be at risk of developing post-acute SNHL. This figure shows the probability of each vaccination campaign (coloured lines) being the most cost-effective campaign, as depending on the willingness-to-pay per DALY averted (x-axis) and an assumed hypothetical cost per dose of vaccine (panels). The target group “Adults” includes adolescents and adults. K = thousand, I$ = International dollar, SA = sensitivity analysis, SNHL = sensorineural hearing loss, WCBA = women of childbearing age.

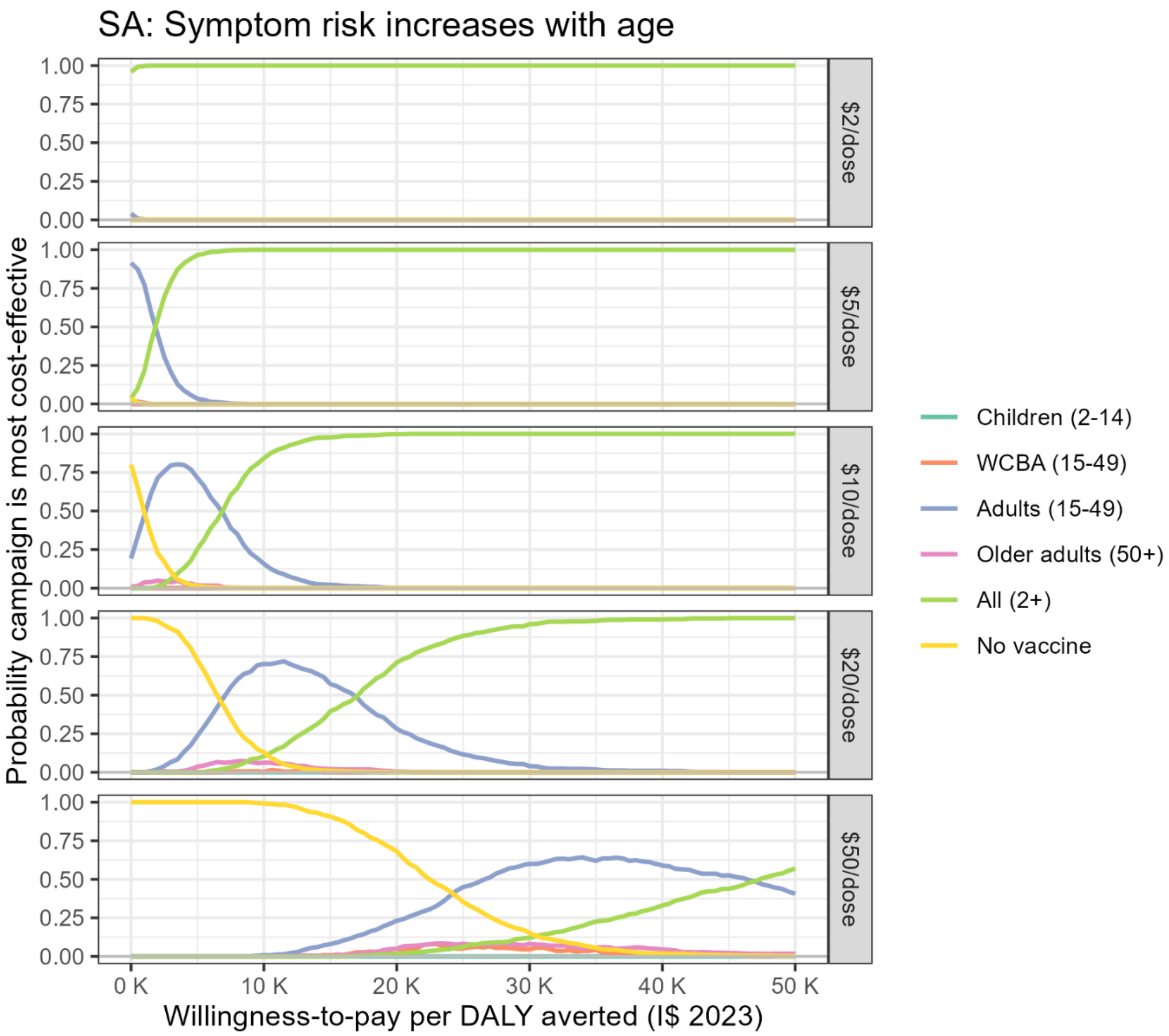


Figure S48. Cost-effectiveness acceptability curves for the sensitivity analysis in which the risk of infected people developing moderate symptoms increases with age. This figure shows the probability of each vaccination campaign (coloured lines) being the most cost-effective campaign, as depending on the willingness-to-pay per DALY averted (x-axis) and an assumed hypothetical cost per dose of vaccine (panels). The target group "Adults" includes adolescents and adults. K = thousand, I$ = International dollar, SA = sensitivity analysis, WCBA = women of childbearing age.

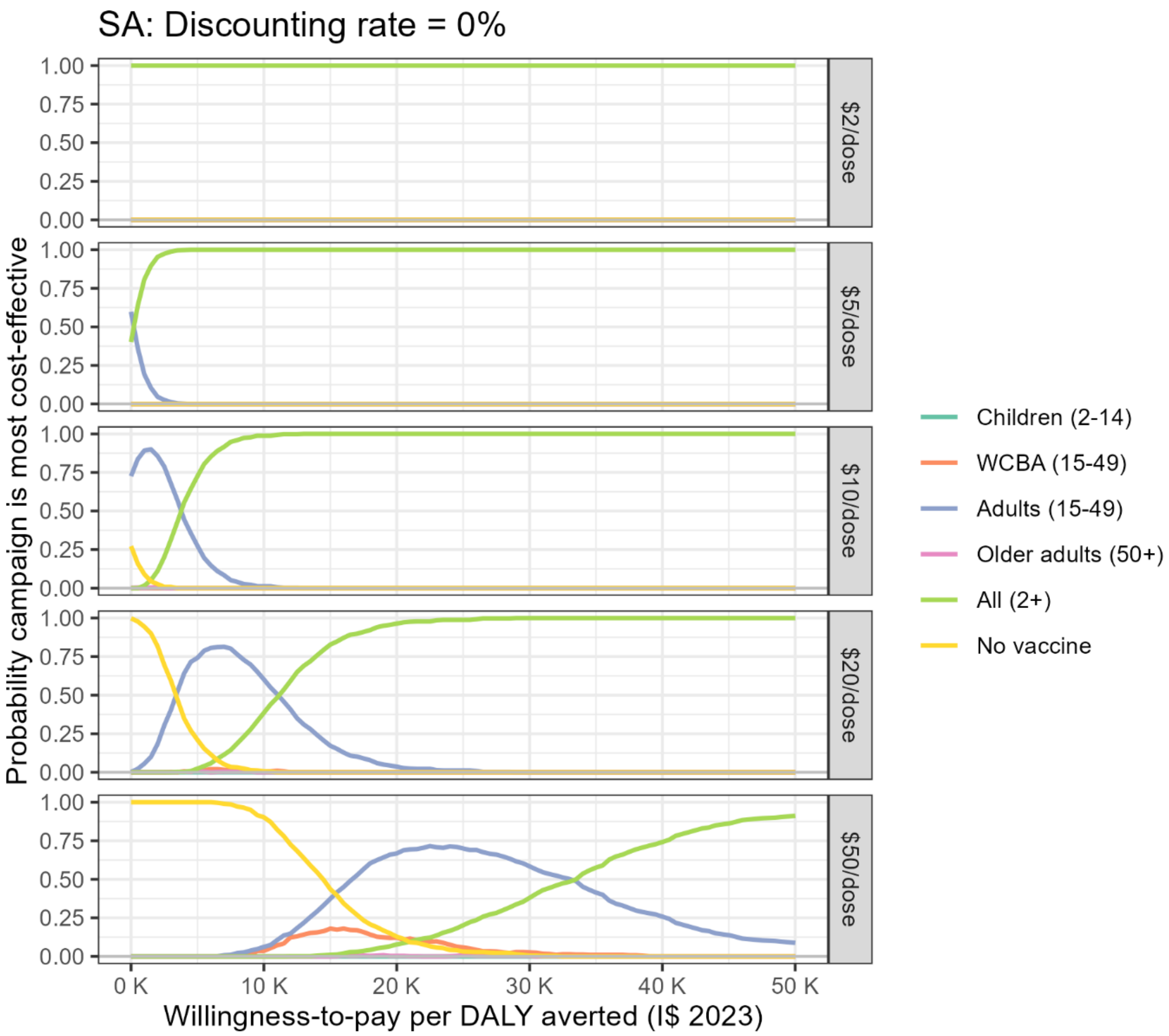


Figure S49. Cost-effectiveness acceptability curves for the sensitivity analysis in which future costs and life-years are not discounted (r=0%). This figure shows the probability of each vaccination campaign (coloured lines) being the most cost-effective campaign, as depending on the willingness-to-pay per DALY averted (x-axis) and an assumed hypothetical cost per dose of vaccine (panels). The target group "Adults" includes adolescents and adults. K = thousand, I$ = International dollar, SA = sensitivity analysis, WCBA = women of childbearing age.

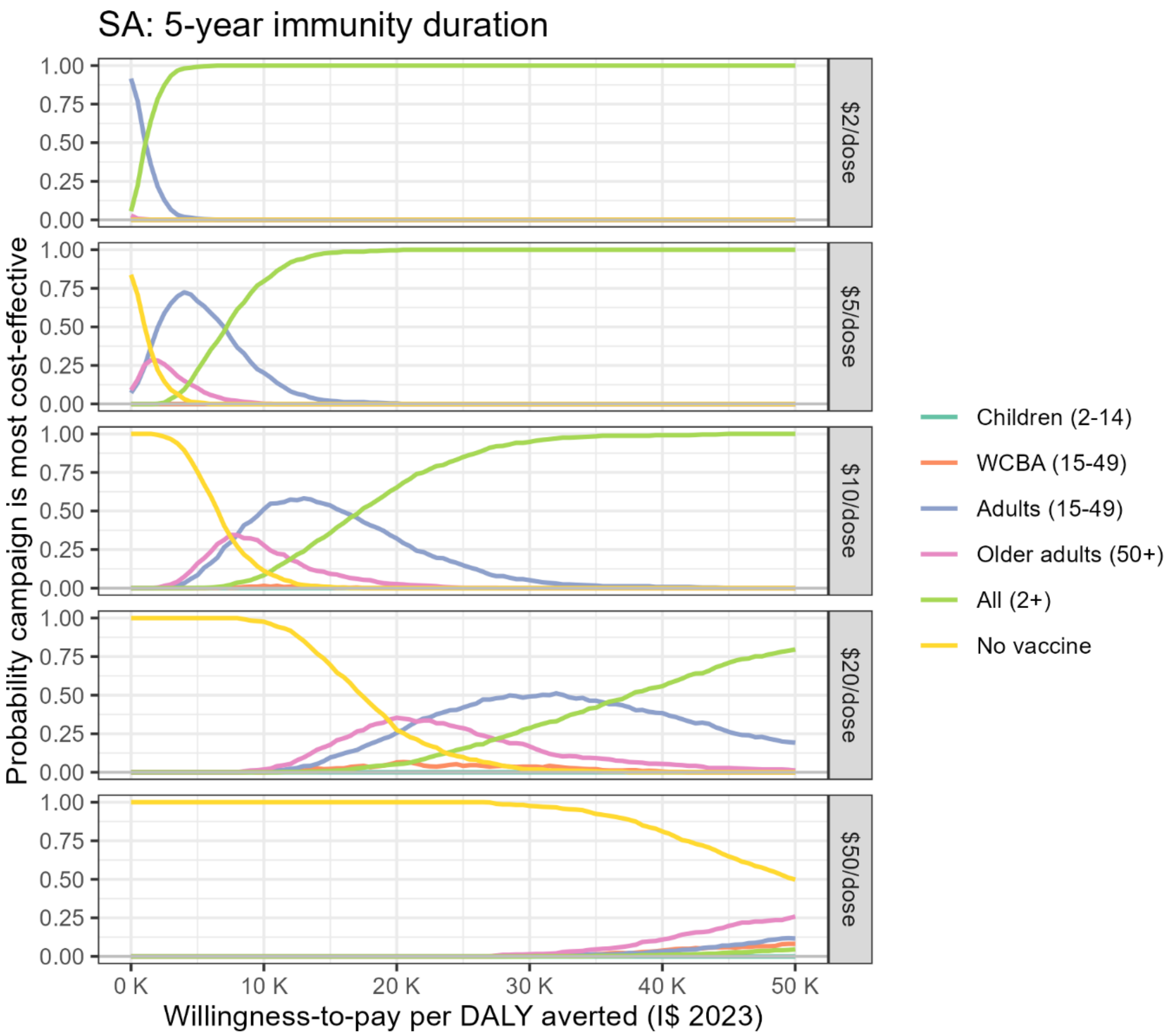


Figure S50. Cost-effectiveness acceptability curves for the sensitivity analysis considering a five- instead of ten-year duration of vaccine-induced immunity. This figure shows the probability of each vaccination campaign (coloured lines) being the most cost-effective campaign, as depending on the willingness-to-pay per DALY averted (x-axis) and an assumed hypothetical cost per dose of vaccine (panels). The target group "Adults" includes adolescents and adults. K = thousand, I$ = International dollar, SA = sensitivity analysis, WCBA = women of childbearing age.

4d. Partial rank correlation coefficients

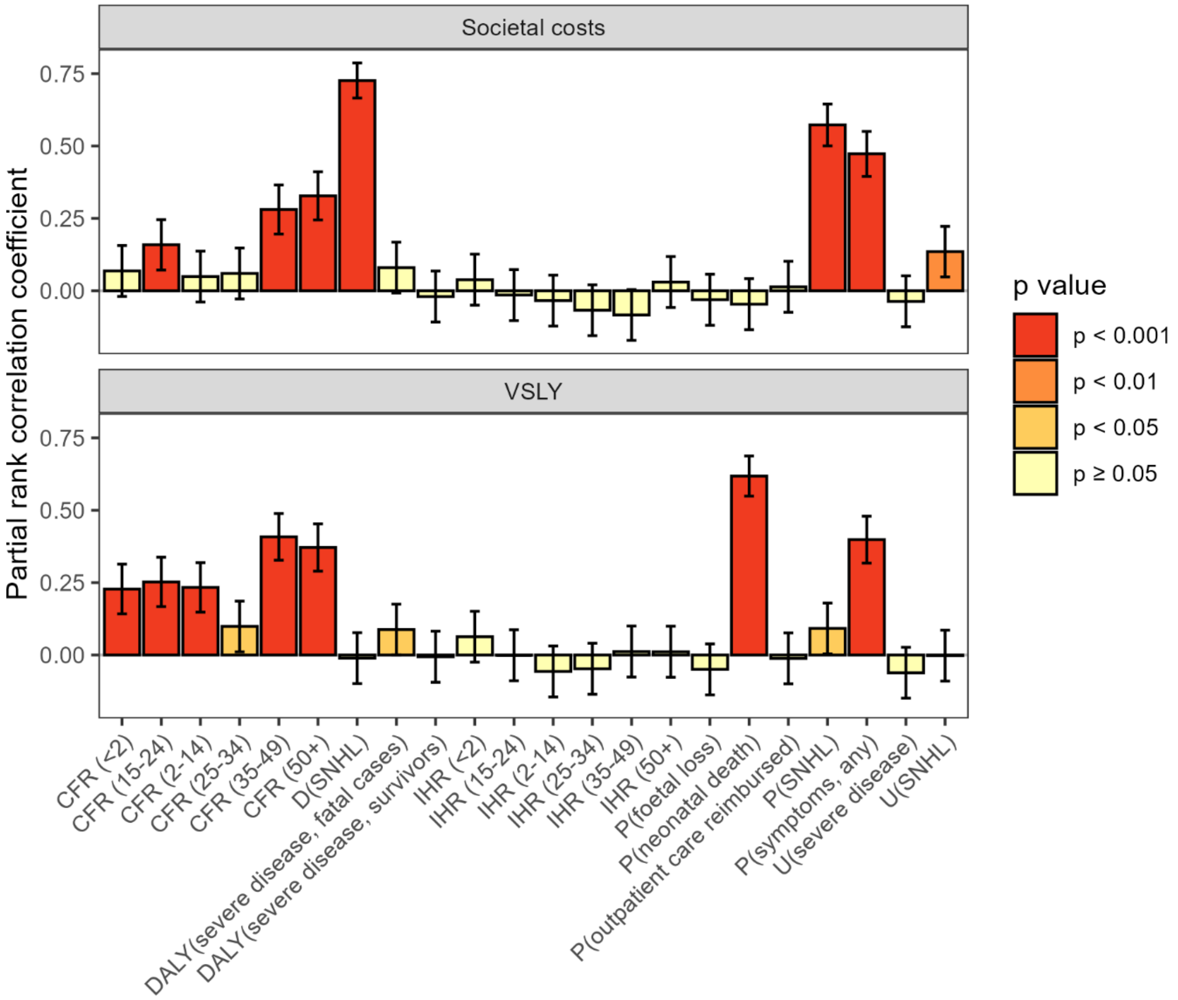


Figure S51. Partial rank correlation coefficients between model input parameters (x-axis) and two estimates of the cumulative total economic burden of Lassa fever in the absence of vaccination: societal costs (top panel) and VSLY (bottom panel). From left to right, input parameters varied along the x-axis include age-specific CFRs, the duration of SNHL, average DALYs per case for severe disease (the product of health state duration and corresponding disability), age-specific IHRs, probabilities of health state outcomes and health state disability weight estimates. The following input parameters were removed due to extreme multicollinearity and/or negligible variance: the durations of fever (moderate symptoms), severe symptoms prior to hospitalisation and hospitalisation among survivors; disability weight for fever; per-case DALYs due to fever; and the probability of seeking any outpatient care. Although IHRs vary slightly between sexes, only male IHRs were included to reduce dimensionality. CFR = case-fatality risk, SNHL = sensorineural hearing loss, DALY = disability-adjusted life-year, IHR = infection-hospitalisation risk.

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