Global C-19 Vaccination Strategy – SAGE Extraordinary meeting

June 29, 2021

Tania Cernuschi
Kate O'Brien
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World Health Organization

June 29, 2021

Global C-19 Vaccination Strategy SAGE Extraordinary meeting

Objectives

Critical appraisal from SAGE will be sought for:

- The **Conceptual Goal Framework**, built along health and socio-economic dimensions, and the identification of the **levels of scientific uncertainty** associated with the different steps in the framework
- The **Goal Synthesis** based on scenario analysis as a means to inform a global strategy
- The lay out of the **three potential options for a Global Strategy for 2021-2022**

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Global C-19 Vaccination Strategy SAGE Extraordinary meeting

Agenda

1. Context and proposed goal framework – Kate O’Brien (10’)

2. Health impact and uncertainties – Sarah Pallas (10’)

3.Goal synthesis and feasibility assessment – Tania Cernuschi (10’)

4. Options for an updated global strategy – Kate O’Brien (10’)

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Over one year since the start of the pandemic, we have a renewed need for collective action

Pandemic status in 2021

- Epidemiology is dynamic and uneven
- Death toll continues to increase
- High transmission is leading to the emergence of new variants of concern
- We now have the tools to end the acute phase of the pandemic, with several vaccines authorized and available in increasing quantities

Rationale for Updated Goals and Strategy

- **Ambitious vaccination coverage targets are being set**, however the preconditions, benefits, risks, and resources needed are not explicit
- **Uncoordinated approach** is further exacerbating inequities, and consequent impacts on virus and disease
- Major financial, donor, and political institutions are making **investment decisions** and require strategic global guidance
- Manufacturers need enhanced clarity on required **supply**

> “ ”
>
> ***“We need to work together. (…) To end the pandemic everywhere, we need a global vaccination plan***” **–** UN Secretary General Antonio Guterres

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1. https://iccwbo.org/media-wall/news-speeches/study-shows-vaccine-nationalism-could-cost-rich-countries-us4-5-trillion/

Updating the Global Vaccination Strategy

① **Inform the decisions countries are making regarding their vaccination goals and targets for 2022 and beyond**

② **Promote an equitable** approach to **COVID-19 vaccination globally**, as part of the broader pandemic control strategy

③ **Update global vaccination goals for 2022**, based on specific changes in the global context and in light of key uncertainties

④ **Inform global policymaking and access efforts**, investment decisions by financial and donor institutions, R&D groups and vaccine manufacturers as well as country planning and programmatic work

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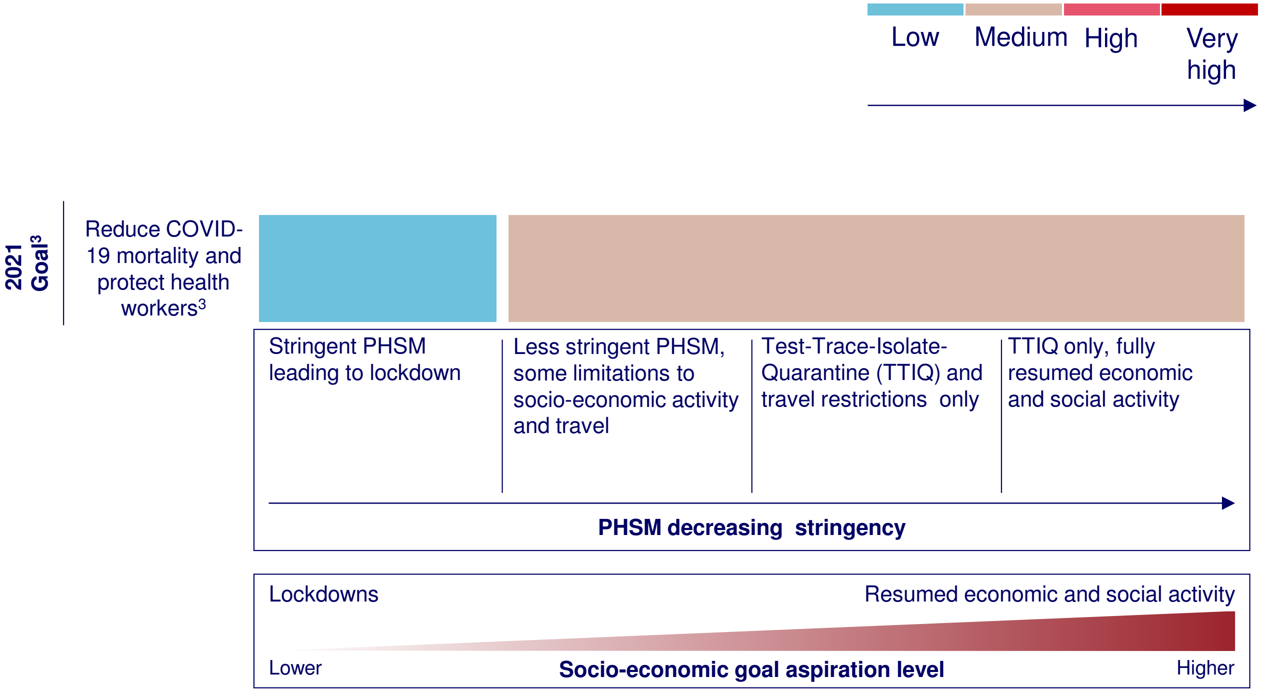
Conceptual goal framework: Socio-economic goals and vaccination

2022 goals development[1]

Priority group vaccination targets defined according to SAGE Roadmap



Low | Medium | High | Very high

2021 Goal[3]

Reduce COVID-19 mortality and protect health workers[3]

Stringent PHSM leading to lockdown	Less stringent PHSM, some limitations to socio-economic activity and travel	Test-Trace-Isolate-Quarantine (TTIQ) and travel restrictions only	TTIQ only, fully resumed economic and social activity

PHSM decreasing stringency

Lockdowns — Resumed economic and social activity

Lower — **Socio-economic goal aspiration level** — Higher

Countries are setting health and socio-economic goals of increasing aspiration across a continuum

To reach these goals, and hence sustainably lift PHSM, **different levels of vaccination ambition are necessary to avoid death and suffering**

For instance, to reduce C-19 mortality and protecting health workers, **countries need to increase their vaccination targets,** if lifting PHSM

As they increase their vaccination targets, countries can **follow the SAGE Roadmap to prioritize populations**

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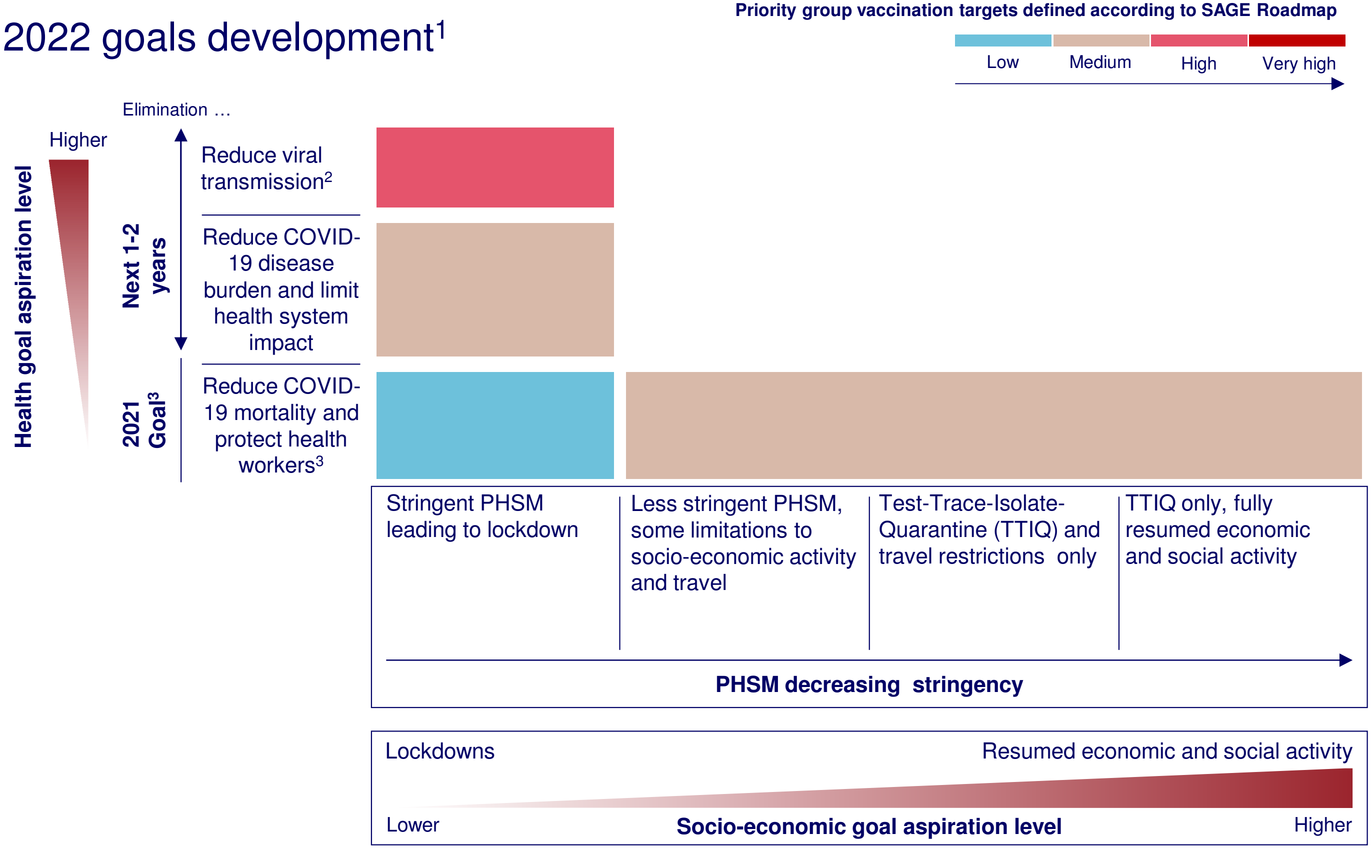
1. Indicative framework as other countries have achieved same goals with different combinations (e.g., China); 3. Maps to SPRP 2021 strategic goals of "Protecting the vulnerable" and "Reducing mortality and Morbidity from all causes"

Conceptual goal framework: Health dimension

2022 goals development[1]



Priority group vaccination targets defined according to SAGE Roadmap

Low | Medium | High | Very high

Health goal aspiration level

Higher

Elimination …

Next 1-2 years

Reduce viral transmission[2]

Reduce COVID-19 disease burden and limit health system impact

2021 Goal[3]

Reduce COVID-19 mortality and protect health workers[3]

Stringent PHSM leading to lockdown

Less stringent PHSM, some limitations to socio-economic activity and travel

Test-Trace-Isolate-Quarantine (TTIQ) and travel restrictions only

TTIQ only, fully resumed economic and social activity

PHSM decreasing stringency

Lockdowns

Resumed economic and social activity

Lower

Socio-economic goal aspiration level

Higher

Similarly, for each level of PHSM, **countries may also wish to increase their health goal aspiration level**, from mortality reduction and health system protection to reducing viral transmission, for instance to reduce emergence and transmission of VoCs

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1. Indicative framework as other countries have achieved same goals with different combinations (e.g., China); 2. Maps to SPRP 2021 "Suppress transmission" strategic goal; 3. Maps to SPRP 2021 strategic goals of “Protecting the vulnerable” and “Reducing mortality and Morbidity from all causes”

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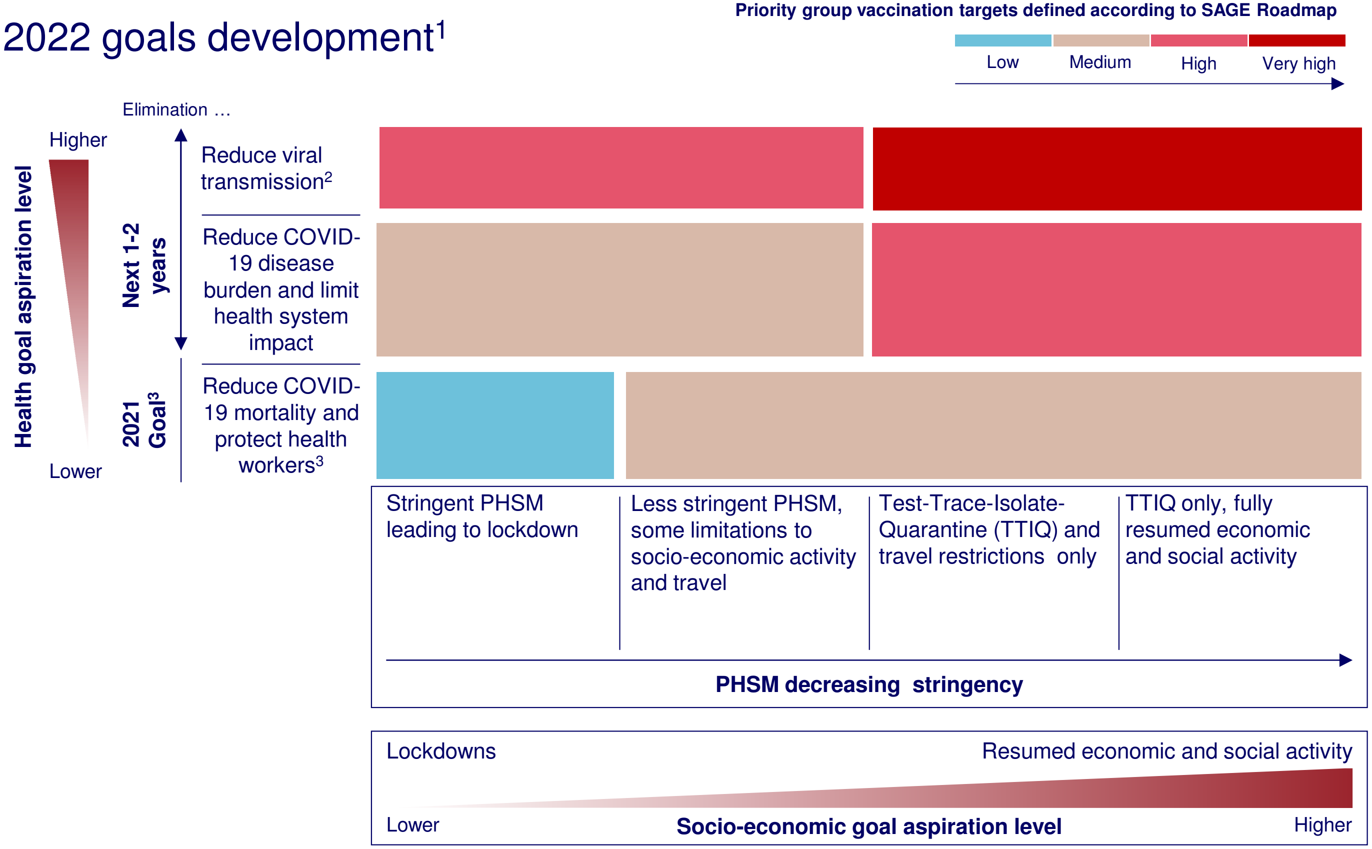
Conceptual goal framework

2022 goals development[1]



Priority group vaccination targets defined according to SAGE Roadmap

🟦 Low · 🟫 Medium · 🟥 High · 🟥 Very high

Elimination …

Higher

Health goal aspiration level

Lower

Next 1-2 years	Reduce viral transmission[2]	High	High	Very high	Very high
Next 1-2 years	Reduce COVID-19 disease burden and limit health system impact	Medium	Medium	High	High
2021 Goal[3]	Reduce COVID-19 mortality and protect health workers[3]	Low	Medium	Medium	Medium
		Stringent PHSM leading to lockdown	Less stringent PHSM, some limitations to socio-economic activity and travel	Test-Trace-Isolate-Quarantine (TTIQ) and travel restrictions only	TTIQ only, fully resumed economic and social activity

PHSM decreasing stringency

Lockdowns

Resumed economic and social activity

Lower

Socio-economic goal aspiration level

Higher

Goals (global and countries) to be revisited as the pandemic unfolds and new epi data/information becomes available

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1. Indicative framework as other countries have achieved same goals with different combinations (e.g., China); 2. Maps to SPRP 2021 "Suppress transmission" strategic goal; 3. Maps to SPRP 2021 strategic goals of “Protecting the vulnerable” and “Reducing mortality and Morbidity from all causes”

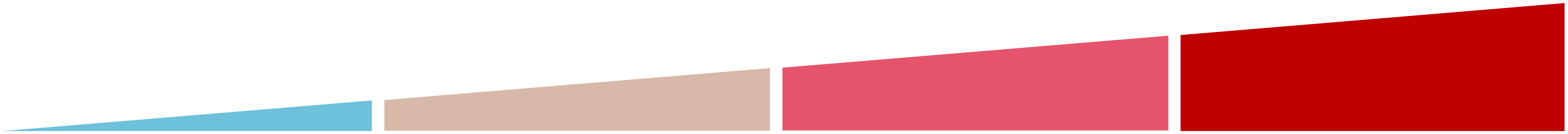
The framework is intended to help countries **move away from setting coverage targets as goal in themselves and rather defining explicit health and socio-economic goals** and working towards equitable outcomes for all, both within and amongst countries.

The framework is <u>not meant to endorse</u> any specific combination of goals and vaccination targets, but rather lay out all the possible options for individual countries and the international community as a whole.

The framework focuses on vaccination, however must be considered within the broader **Strategic Preparedness Response Plan**

Simplifications adopted for the conceptual framework and analytics

Within their chosen vaccination ambition, countries are encouraged to prioritize priority populations leveraging the SAGE Roadmap



Low=Older adults and high-risk groups

Medium=All adults

High=Adults + adolescents

Very high=Include children

For simplification, we are considering age-descending prioritization in this work

Age is most consistent risk factor for severe disease and death across countries and hence chosen as simplifying assumption; age-descending strategy consistent with SAGE Prioritization Roadmap

Expanding coverage down to children is a necessary implication of reduced transmission goal, or socioeconomic reopening goal

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Rationale for age cutoffs for global strategy analyses: short answers

Goal	Vaccination ambition	Age cut-off adapted for analysis	Short answer
Reduce mortality	Low=Older adults and high-risk groups	50+	• Substantially **greater mortality risk above 50 years** • Lower "older adult" 50+ threshold will (i) capture most adults with **comorbidities** and (ii) be more **appropriate cross-country** accounting for IFR variability 65+ (e.g., care homes in HICs) and younger demographic structure in LMICs/LICs
Reduce disease burden and limit health system impact	Medium=All adults	30+	• Hospitalization data from a few HIC settings show **higher risk and number of hospitalizations for those 30+**
Reduce viral transmission	High=Adults + adolescents	12+	• **Direct benefit in reducing symptomatic cases, long COVID, and MIS-C** • **10-29 years have some of highest pre-pandemic contact rates** • 12+ cutoff **based on vaccines** with current/anticipated adolescent indications based on clinical trial ages • **Separates decision to vaccinate adolescents vs. younger children**
Reduce viral transmission while lifting PHSM	Very high=Include children	0+	• **Lifting PHSM increases Rt** • With higher Rt, it is necessary to vaccinate a larger share of the total population to achieve viral transmission reduction • **Implies expansion to children, especially in LMICs/LICs** with younger demographic structures

Global C-19 Vax Strategy SAGE Extraordinary meeting

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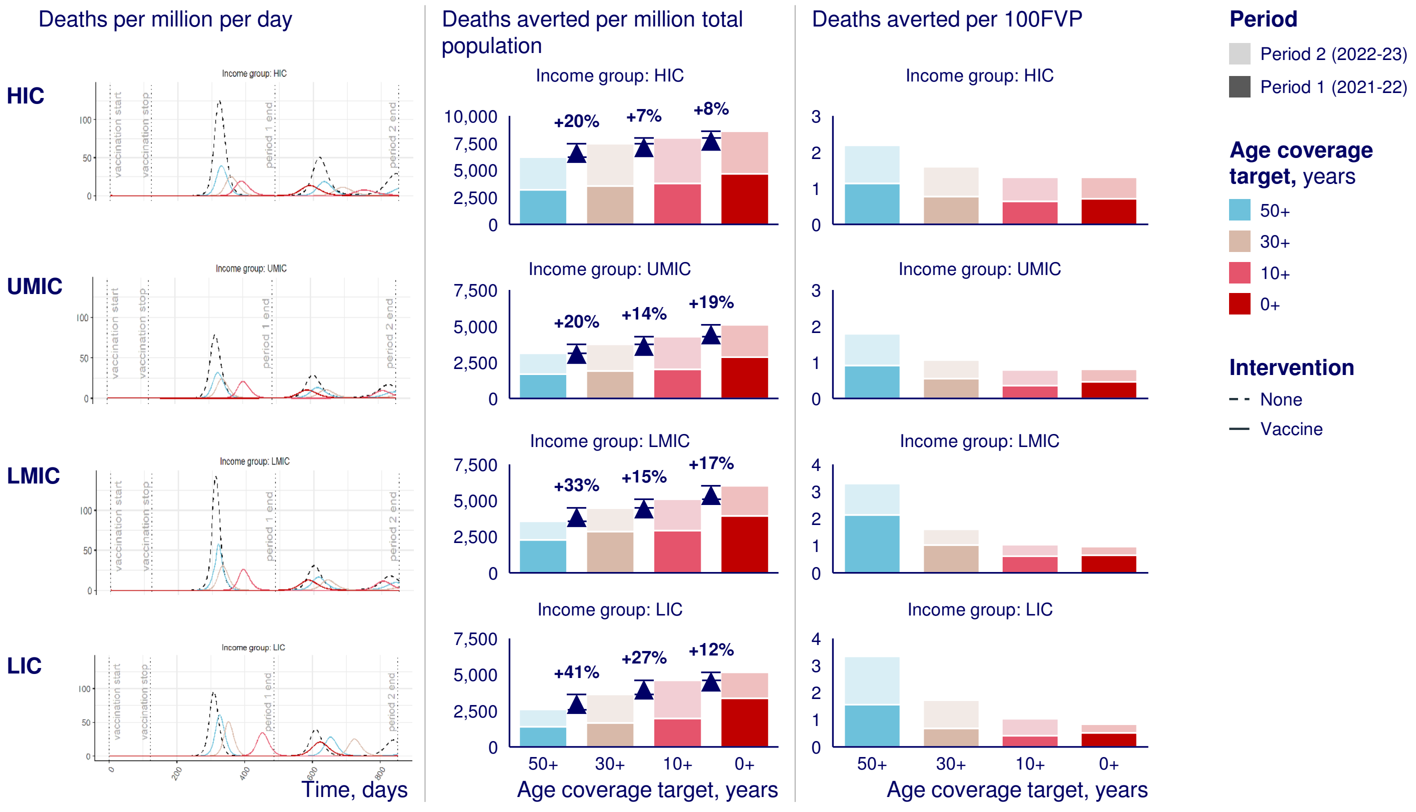
Incremental benefit of vaccination across the health dimension

Target population vaccinated over 4 months with PHSM in place (Rt=1.2), gradually lifted thereafter (Rt=3.5)

Vaccine efficacy 63% vs infection; 80% vs severe disease; 45% vs transmission

Trajectories with and without vaccine | **Deaths averted per population** | **Deaths averted per 100 FVP**



Source: Imperial College London, MRC Centre for Global Infectious Disease Analysis, Alexandra Hogan, Peter Winskill, Oliver Watson, Azra Ghani

Incremental health benefits with increasing vaccination targets to younger ages (assuming vaccine effective against infection, transmission)

Distribution of incremental benefits reflects demographics (older populations in HICs, younger populations in LICs), contact patterns, and health system strength across countries

Demonstrates efficiency of targeting the oldest age groups in terms of deaths and hospitalisations averted

Even a vaccine with “sub-optimal” efficacy can have substantial public health impact

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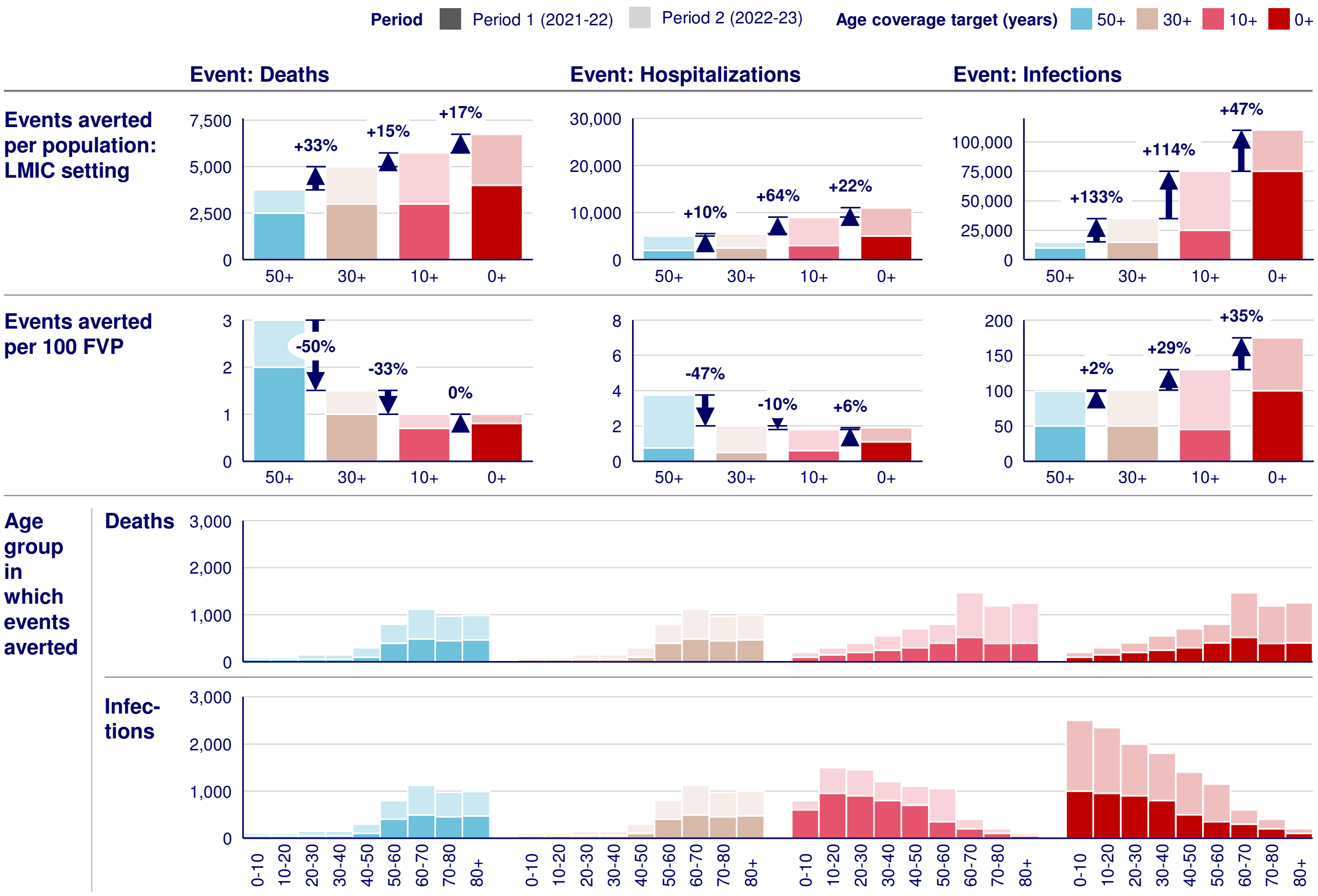
Modelled impact of coverage targets by age: LMIC setting



Vaccinating those <30 years old is an **efficient strategy mainly towards the goal of reducing viral transmission**

Vaccinating younger cohorts provides some indirect protection to avert deaths and hospitalisations in older age cohorts, but efficiency depends on vaccine characteristics

Default scenario shown assumes same infectiousness of <10 years and that health system constraints increase IFR in LMICs/LICs when health system is overwhelmed

Source: Imperial College London, MRC Centre for Global Infectious Disease Analysis, Alexandra Hogan, Peter Winskill, Oliver Watson, Azra Ghani

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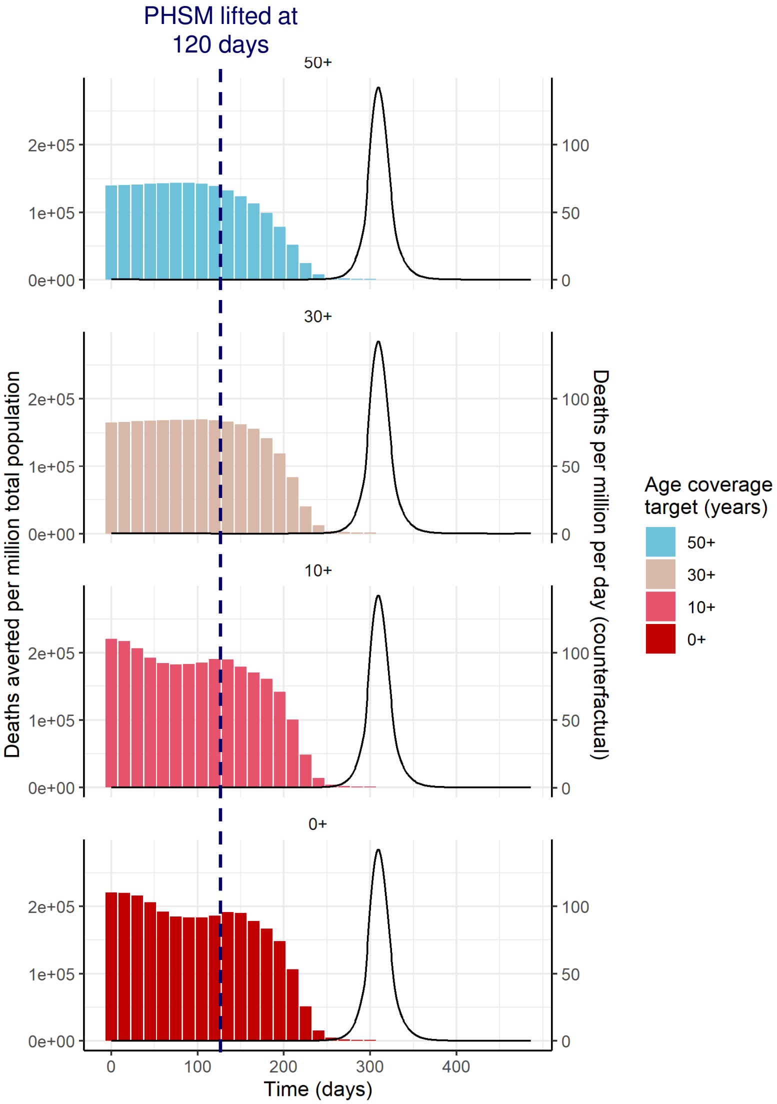
Timing of vaccination relative to lifting PHSM: LMIC example

- Coloured bars show the total deaths averted if vaccination **begins** at that time point
- Each coloured bar represents an increment of around 2 weeks
- The black line shows the counterfactual epidemic
- Only one epidemic wave shown – there would be additional impact on subsequent waves



Source: Imperial College London, MRC Centre for Global Infectious Disease Analysis, Alexandra Hogan, Peter Winskill, Oliver Watson, Azra Ghani

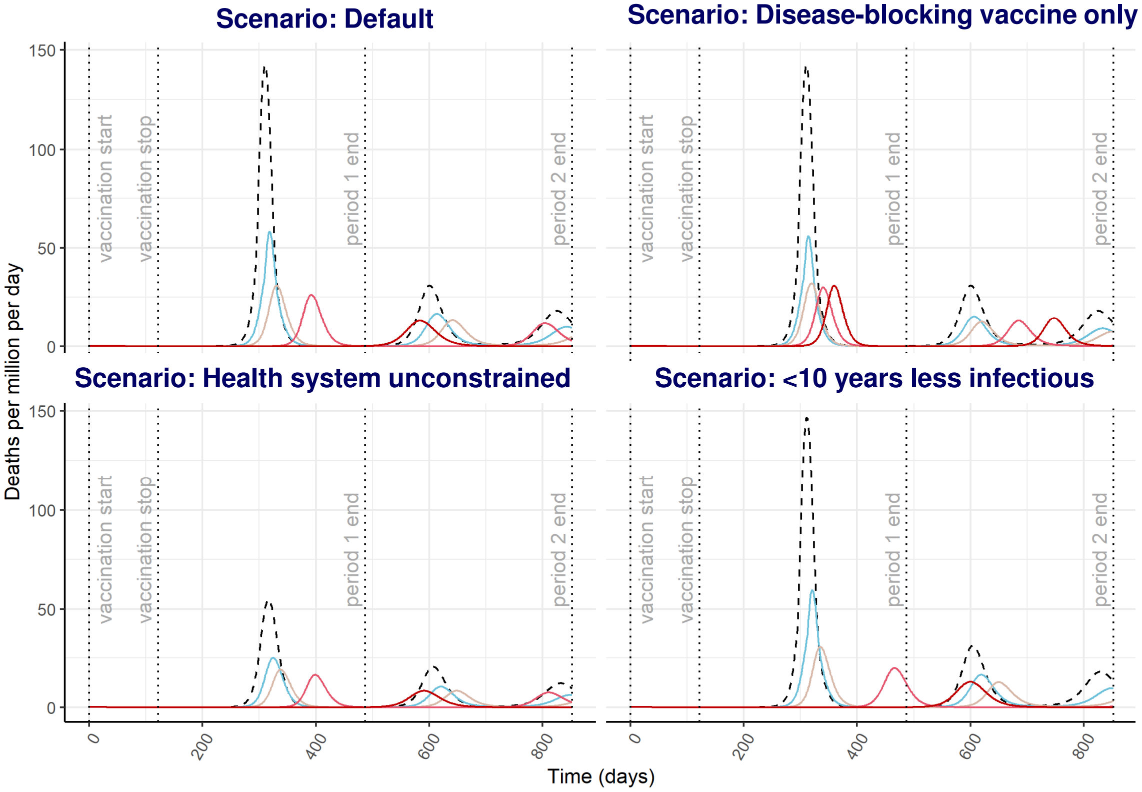
Prioritization of vaccination, along with an **integrated strategy of PHSM use during vaccine rollout,** important **to optimize impact** across multiple health dimensions

Rapid vaccination rollout important to minimize economic costs of PHSM

Vaccination needs to happen well in advance of surges to maximize vaccination impact (limited impact of surge response vaccination due to lag in detection and response times)

Still some longer-term benefit to vaccinating "past the peak" for protection against future waves/ waning

Sensitivity analyses: Strategy implications qualitatively similar (LMIC setting example)

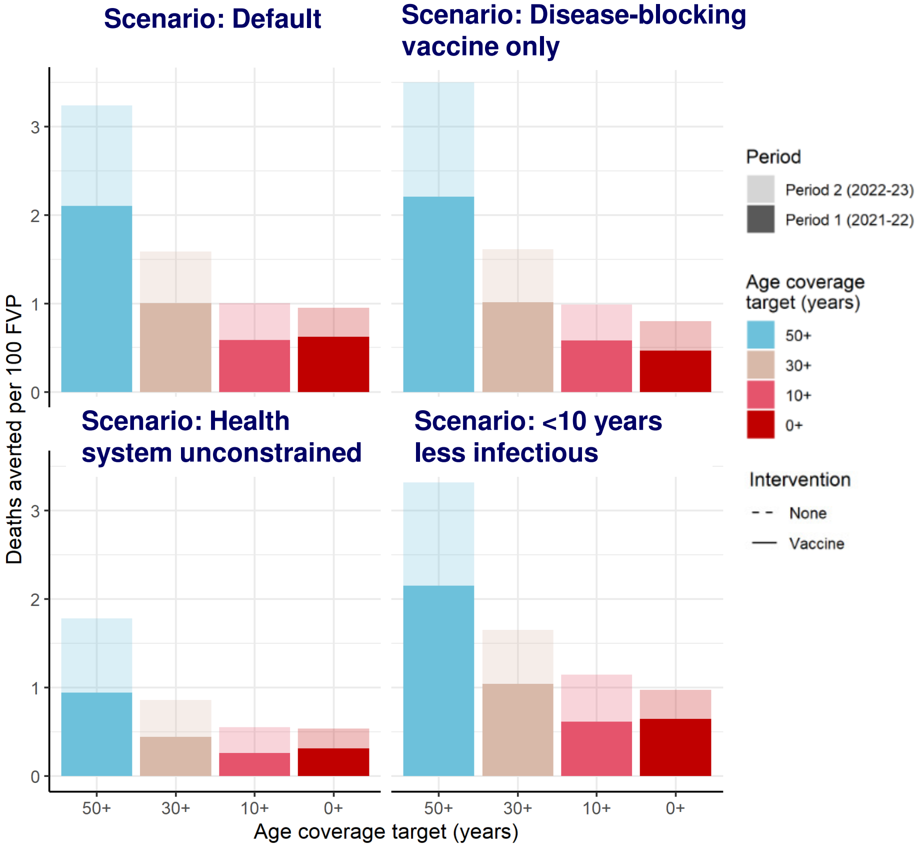


Scenario: Default

Scenario: Disease-blocking vaccine only

Scenario: Health system unconstrained

Scenario: <10 years less infectious



Scenario: Default

Scenario: Disease-blocking vaccine only

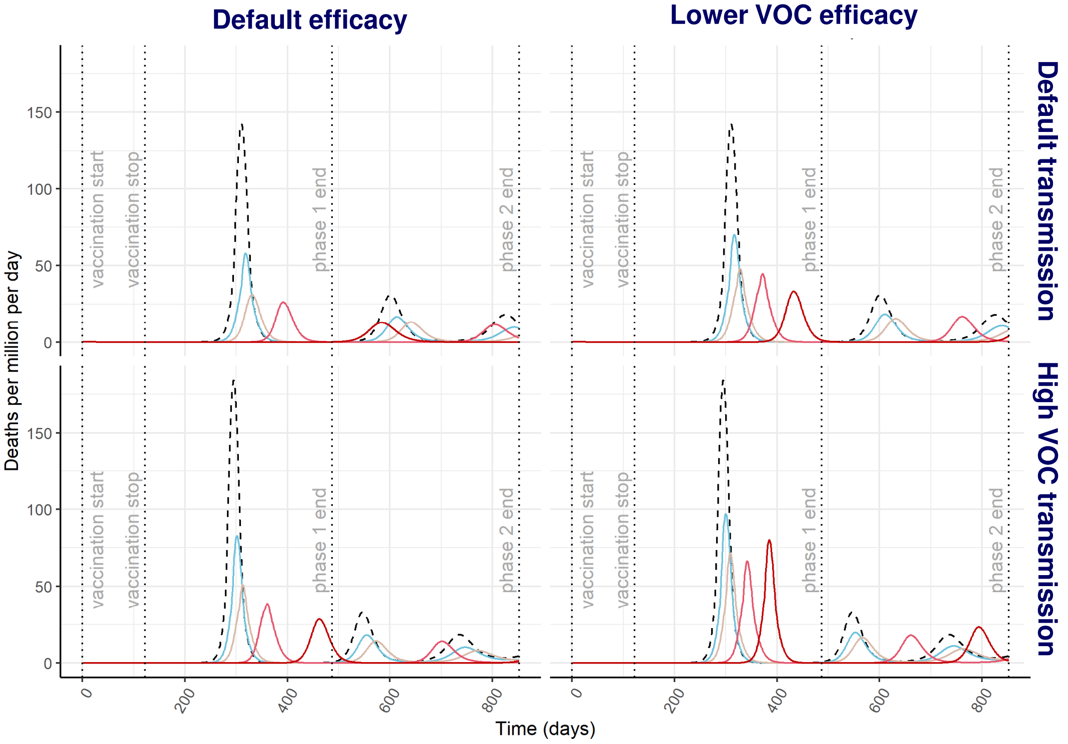
Scenario: Health system unconstrained

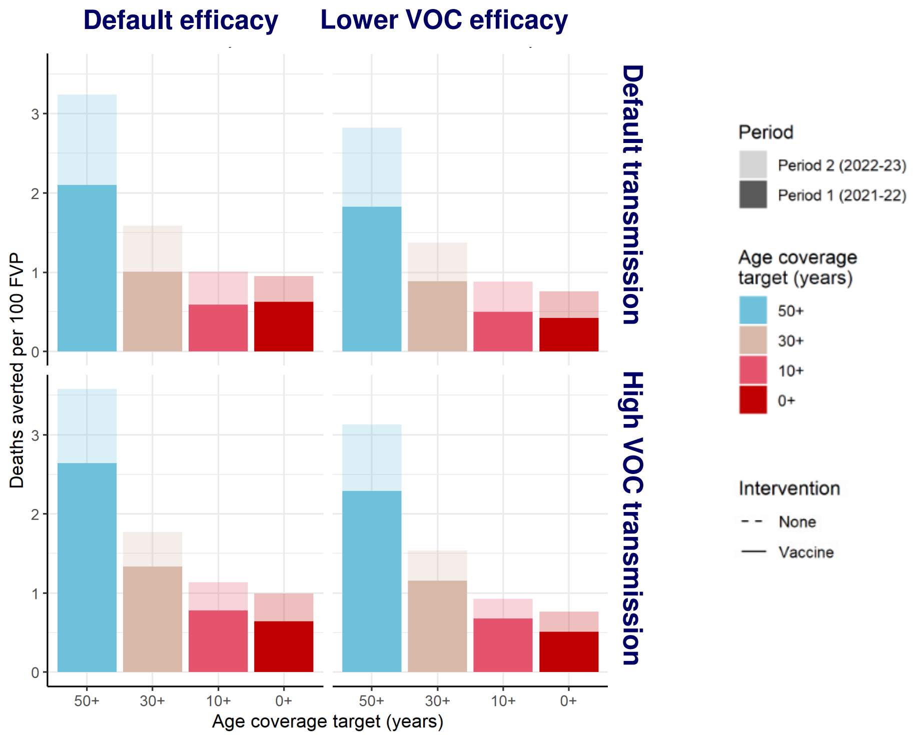
Scenario: <10 years less infectious

Consider changes in timing of epidemic peaks relative to period over which impacts measured

Source: Imperial College London, MRC Centre for Global Infectious Disease Analysis, Alexandra Hogan, Peter Winskill, Oliver Watson, Azra Ghani

Sensitivity analysis: Potential impacts of VOCs (LMIC setting example)





Default: Vaccine efficacy 63% vs infection; 80% vs severe disease; 45% vs transmission; Rt=3.5
VOC: Vaccine efficacy 40% vs infection; 60% vs severe disease; 33% vs transmission; Rt=4.5

Source: Imperial College London, MRC Centre for Global Infectious Disease Analysis, Alexandra Hogan, Peter Winskill, Oliver Watson, Azra Ghani

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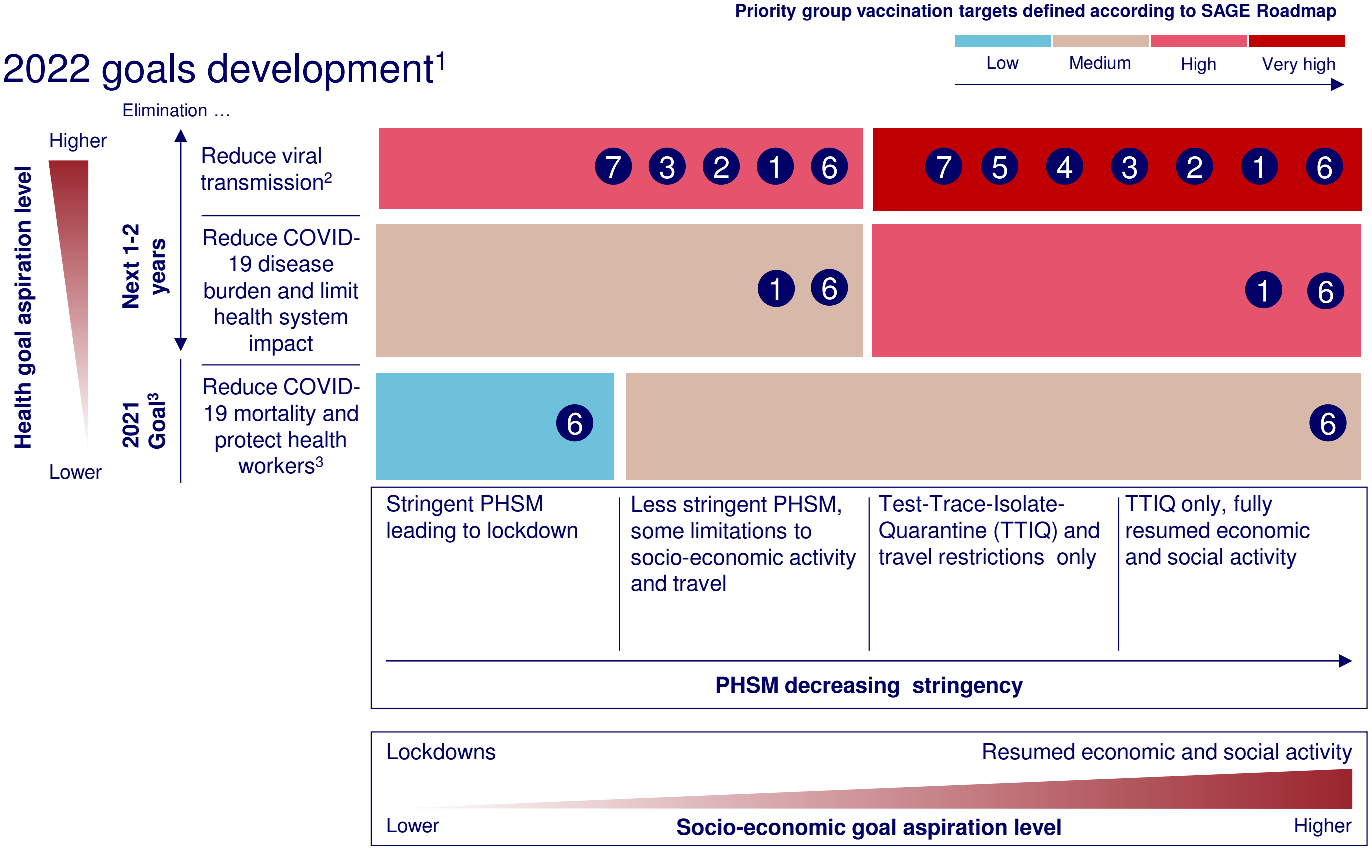
Key uncertainties tied to the conceptual framework

2022 goals development[1]



Priority group vaccination targets defined according to SAGE Roadmap

Low | Medium | High | Very high

Elimination …

Health goal aspiration level: Higher – Lower

Next 1-2 years

2021 Goal[3]

	Stringent PHSM leading to lockdown	Less stringent PHSM, some limitations to socio-economic activity and travel	Test-Trace-Isolate-Quarantine (TTIQ) and travel restrictions only	TTIQ only, fully resumed economic and social activity
Reduce viral transmission[2]	❼ ❸ ❷ ❶ ❻		❼ ❺ ❹ ❸ ❷ ❶ ❻	
Reduce COVID-19 disease burden and limit health system impact	❶ ❻		❶ ❻	
Reduce COVID-19 mortality and protect health workers[3]	❻	❻		

PHSM decreasing stringency

Lockdowns – Resumed economic and social activity

Lower – **Socio-economic goal aspiration level** – Higher

Goals (global and countries) to be revisited as the pandemic unfolds and new epi data/information becomes available

- ❶ **Clinical impact of infection and disease (e.g., long COVID)**
- ❷ **Emergence of VoC**
- ❸ **Vaccine performance in reducing transmission**
- ❹ **Safety/efficacy under 12 years**
- ❺ **Endemic disease circulation**
- ❻ **Duration of protection (dealt with through the scenarios)**
- ❼ **% of population to reduce viral transmission**

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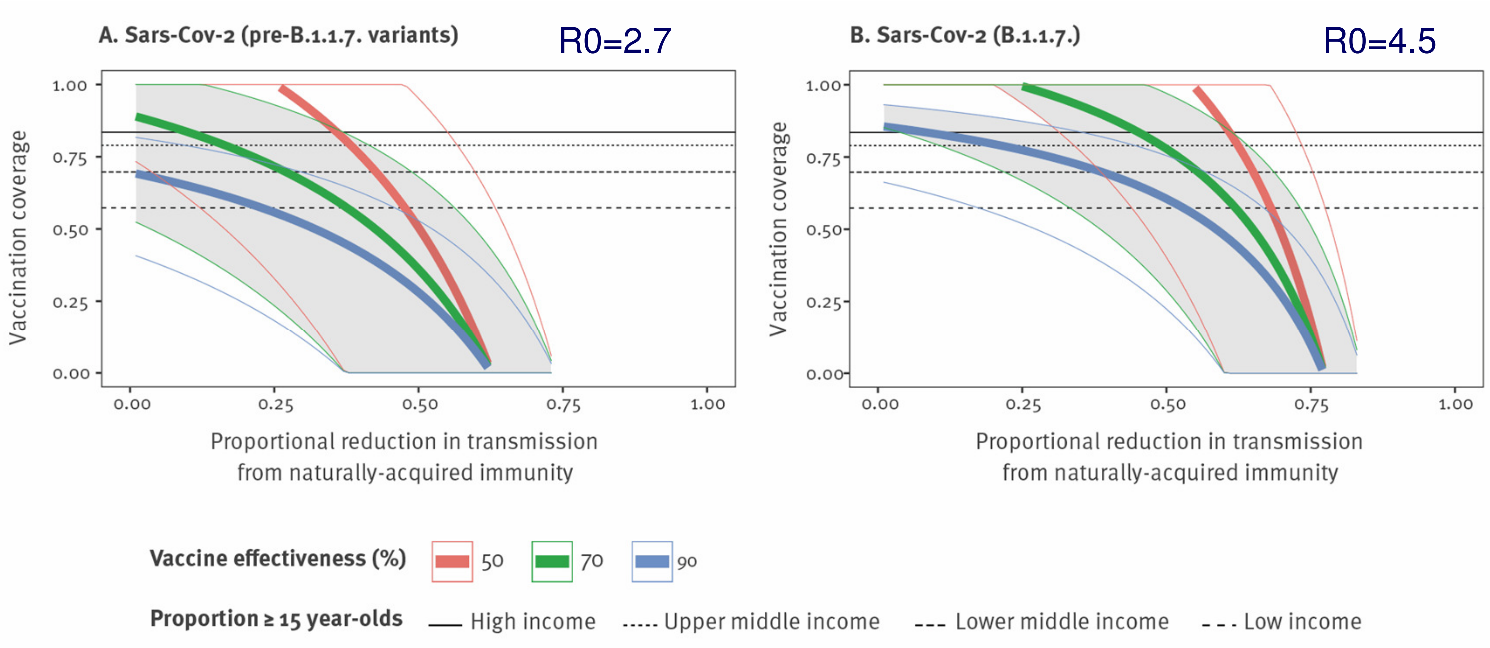
Uncertainty about transmission reduction



- Curves show estimated vaccination coverage required to reach herd immunity threshold for different levels of vaccine effectiveness and naturally-acquired immunity

Source: Figure 2. Hodgson David, Flasche Stefan, Jit Mark, Kucharski Adam J, CMMID COVID-19 Working Group. Euro Surveill. 2021;26(20):pii=2100428. https://doi.org/10.2807/1560-7917.ES.2021.26.20.2100428

- **More transmissible VOCs make vaccination-induced "herd immunity threshold" harder to achieve**
- "Herd immunity threshold" **harder to achieve in younger demographic settings** without (i) high proportion of naturally acquired immunity, or (ii) vaccination of younger cohorts
- Uncertainties:
  - **Vaccine effectiveness against infection and transmission across VOCs**
  - Duration of protection
  - Relevance of theoretical "herd immunity threshold" as policy/ programmatic guide

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Goal-synthesis

- Ⓐ Identify countries' vaccination ambition relative to the framework and progress to date
- Ⓑ Identify barriers on the trajectory towards different goals
- Ⓒ Perform incremental benefit analysis for moving to higher ambition goals
- Ⓓ Calibrate expectations with respect to global goals

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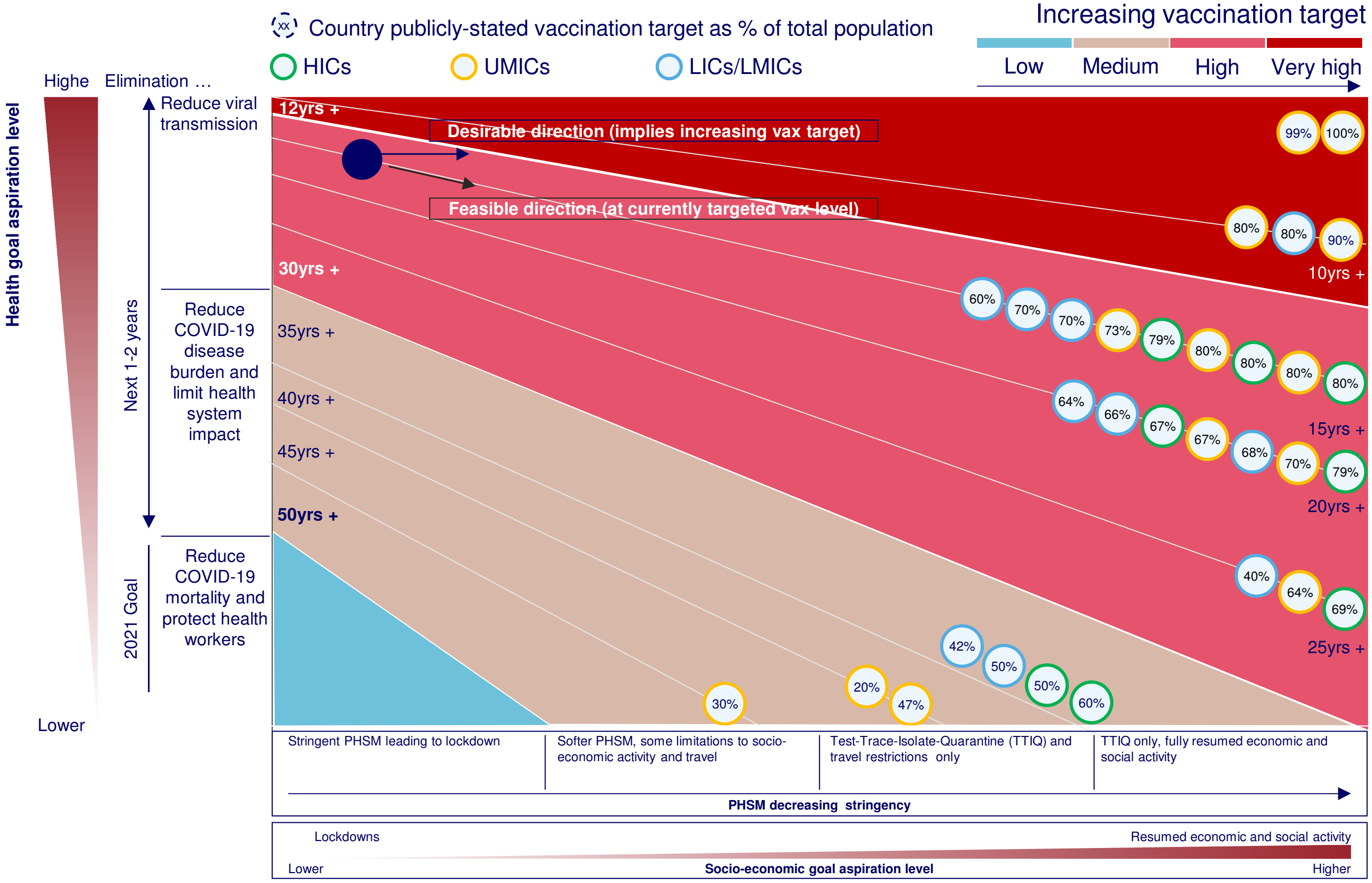
A. Current country targets mapped against the goal framework



Countries have been setting goals beyond 20% total pop: **goals are clustered between 50-75%** of total population range

These translate into very different target ages, with LICs and LMICs having high ambition and targeting youth

Most countries are probably targeting **resumed socio-economic activity while reducing disease burden, but possibly with lack of clarity on how to achieve these**

The framework shows how **countries' desire to lift PHSM may be constrained by their vaccination target**

Higher income countries are advancing at much faster pace towards goals

B. Three scenarios for global dose requirements

Dose schedule scenario	Primary series	Booster
‘No booster scenario’	Two-dose course primary vaccination for HICs and UMICs and one-dose course primary vaccination for LMICs/LICs*	No booster
‘High-risk booster scenario’	Two-dose course primary vaccination for all countries	Annual one-dose booster for those 50+ years only. Booster every two years for other populations
‘Yearly booster scenario’	Two-dose course primary vaccination for all countries	Annual one-dose booster for all target populations

WHO currently recommends a two-dose course for all vaccines except for J&J, which requires only one dose. Eventual booster needs have not yet been established

*Low resource requirement scenario requested by African Union for exploratory purposes.

Disclaimer: *It is important to specify that* ***scenarios*** *used in the analysis were designed to explore possible trajectories and the resilience of the proposed strategy to different types of uncertainty. They* ***do not constitute forecasts by WHO*** *or any participating partners as to the likely trajectory of the pandemic nor of any anticipated vaccine performance, regulatory or policy decisions.* ***Neither do these scenarios represent any judgement by WHO or participating partners about their relative desirability****.*

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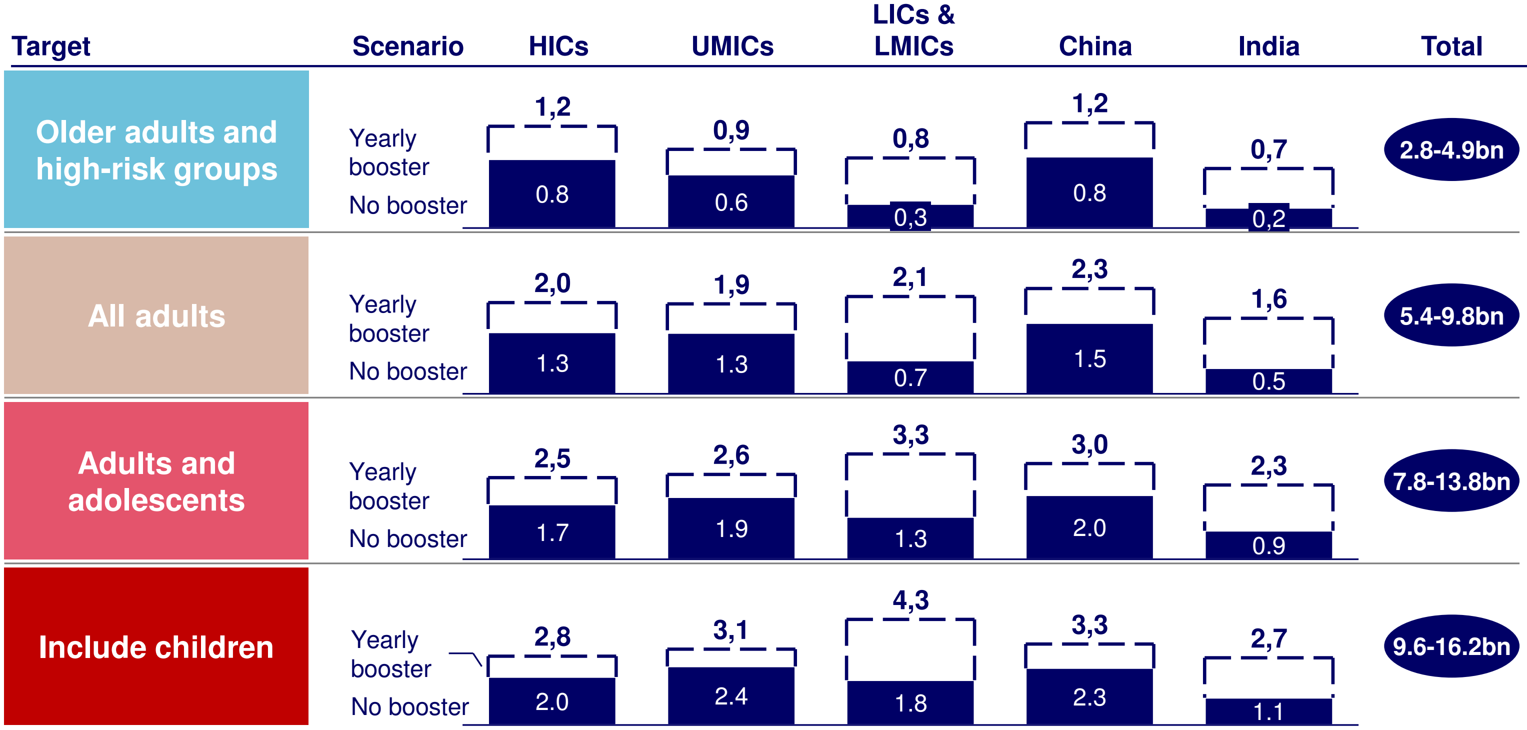
B. Global programmatic dose requirements per goal and scenario

Aggregate global dose requirement for 2021 and 2022 (bn doses)



Target	Scenario	HICs	UMICs	LICs & LMICs	China	India	Total
Older adults and high-risk groups	Yearly booster	1,2	0,9	0,8	1,2	0,7	2.8-4.9bn
	No booster	0.8	0.6	0,3	0.8	0,2	
All adults	Yearly booster	2,0	1,9	2,1	2,3	1,6	5.4-9.8bn
	No booster	1.3	1.3	0.7	1.5	0.5	
Adults and adolescents	Yearly booster	2,5	2,6	3,3	3,0	2,3	7.8-13.8bn
	No booster	1.7	1.9	1.3	2.0	0.9	
Include children	Yearly booster	2,8	3,1	4,3	3,3	2,7	9.6-16.2bn
	No booster	2.0	2.4	1.8	2.3	1.1	

Demand considerations

There is a **large variance** in programmatic dose requirement **across goals and scenarios**

As expected **dose requirement is increasing with level of goal ambition and boosters**

Considerable drop in dose requirements in year 3 in all scenarios. In no-booster scenario, requirements approach annual birth cohort size with important considerations on likelihood of market investments

Requirements range from 2.8 to 16.2 bn doses

Source: COVAX Global Market Assessment

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B. Potential supply - dose requirement for low supply scenario for 2021 and 2022

Incorporating key distribution assumptions based on manufacturing capacity, existing deals, and dose sharing

🟩 excess supply >20% of demand 🟨 excess supply between 10-15% of demand 🟥 excess supply <10% of demand

Scenario	HICs	UMICs	LICs/ LMICs	China	India	Total	Target
Yearly/high-risk booster – 50+ yrs	🟩	🟩	🟩	🟩	🟩	🟩	Older adults
No boooster – 50+ yrs	🟩	🟩	🟩	🟩	🟩	🟩	
Yearly booster – 30+ yrs	🟩	🟨	🟩	🟩	🟩	🟩	All adults
High-risk booster – 30+ yrs	🟩	🟩	🟩	🟩	🟩	🟩	
No booster – 30+ yrs	🟩	🟩	🟩	🟩	🟩	🟩	
Yearly booster – 12+ yrs	🟩	🟥	🟥	🟥	🟥	🟥	Adults & adolescents
High-risk booster – 12+ yrs	🟩	🟥	🟥	🟩	🟥	🟩	
No booster – 12+ yrs	🟩	🟨	🟩	🟩	🟩	🟩	
Yearly booster – 0+ yrs	🟩	🟥	🟥	🟥	🟥	🟥	Include children
High-risk booster – 0+ yrs	🟩	🟥	🟥	🟨	🟥	🟥	
No booster – 0+ yrs	🟩	🟥	🟩	🟩	🟩	🟩	

Supply considerations

Potential production ranges from **6.5 to 9 bn doses in 2021 and 9 to 17 in 2022**

No supply constraints for the 'older adults + high-risk' and 'all adults' goals

For the more ambitious goals of 'adults and adolescents' and 'include children', all countries except for HICs face supply constraints in at least one scenario.

There is ~**1.5-4.5 bn** of currently **unreserved manufacturing capacity** that could be further secured to address gaps

Global supply may be adequate over the course of the 2021-2022 biennium, but it will require (i) important redistribution in the next months as it builds up and **(ii) clear market signaling for 2022** to sustain the manufacturing capacity expansion (iii) **active management** to balance demand and supply

Assumes 2 year programmatic dose requirements are needed by end of 2022, likely over-estimating gaps in supply. 'No booster scenario' assumes 1 dose for LICs and LMICs.
Source: COVAX Global Market Assessment

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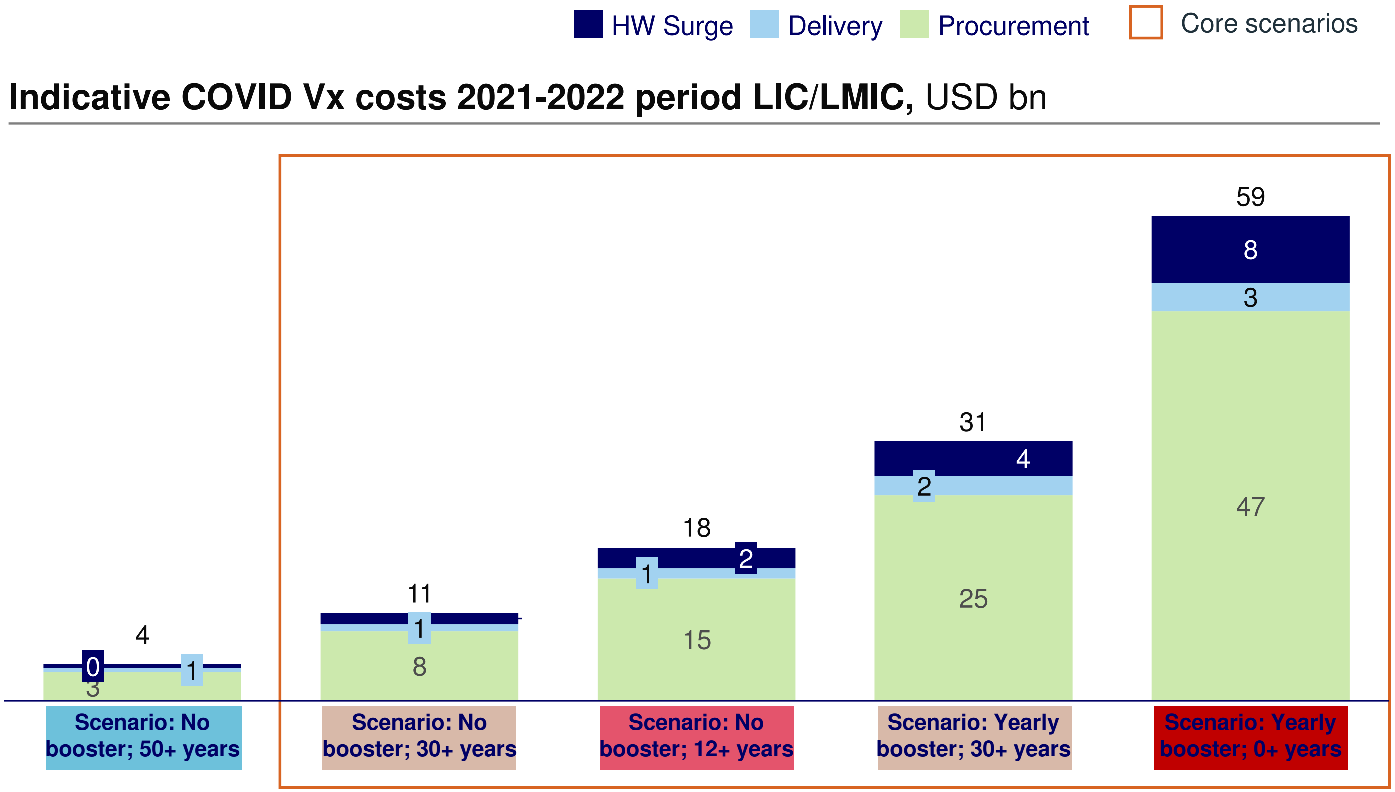
B. Indicative cost to reach different vaccination targets in LICs and LMICs over a two-year period



Indicative COVID Vx costs 2021-2022 period LIC/LMIC, USD bn

Currently assumes following ***costs per dose****: **6.7 USD for procurement, 0.5 to ~1 USD for delivery costs**, decreasing with increasing number of doses, thanks to economies of scale; **~0.9 to ~1.2 USD for HW surge costs**, increasing with the number of doses supplied*

Given the wide range of dose requirement scenarios, there is a similarly wide range of costs up to ~60 USD bn in 2021-22

Primary course and booster scenarios are an **important driver of cost** difference and have long term implications

Delivery and HW costs will represent ~**1/4 of overall cost**

These costs are only indicative and are under discussion at COVAX CR&D Task Team

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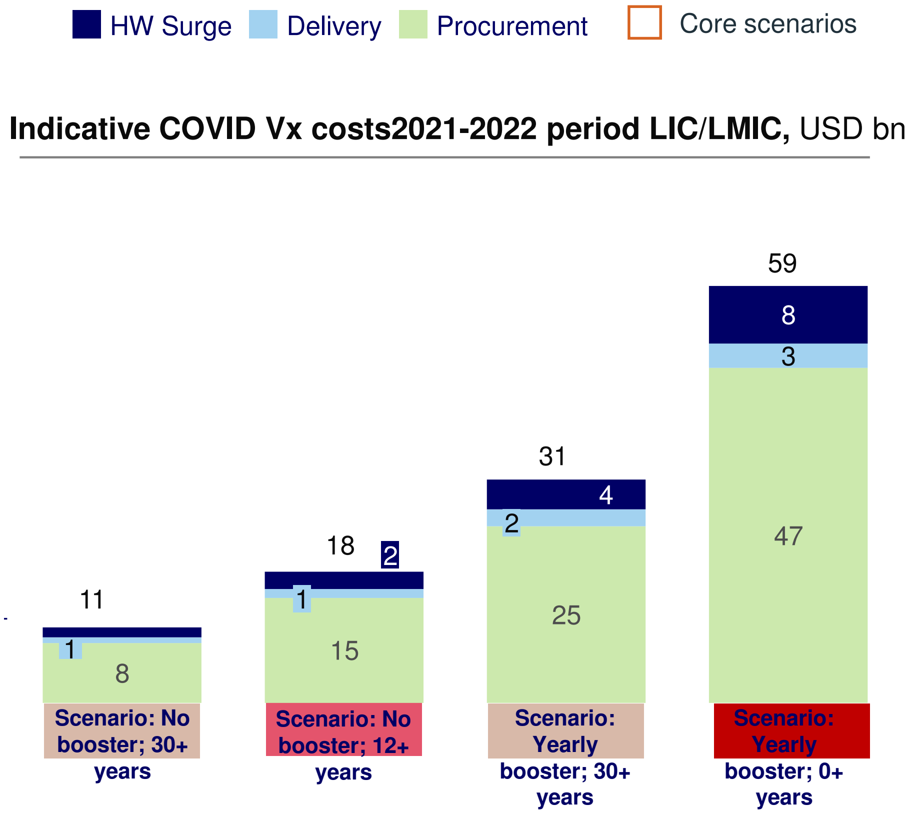
B. Important investments have already been made towards ambition vaccination targets



Indicative COVID Vx costs2021-2022 period LIC/LMIC, USD bn

Source: COVAX Country Readiness and Delivery Task Team on global delivery costs for COVID-19 vaccine

Categories of investments

- **Dose donation**
- **Multilateral Development Banks**
- **Sunk cost on deals**
- **COVAX 2021**

Important investments have already been made to date by COVAX, MDBs, earmarking for bilateral and regional deals, commitments to dose donation

The commitments already place LICs and LMICs on a **good trajectory towards achievement of ambitious** targets (12+ and 30+)

Additional funds are available from MDBs and more ODA could be mobilized, as well as return on investments from immunization

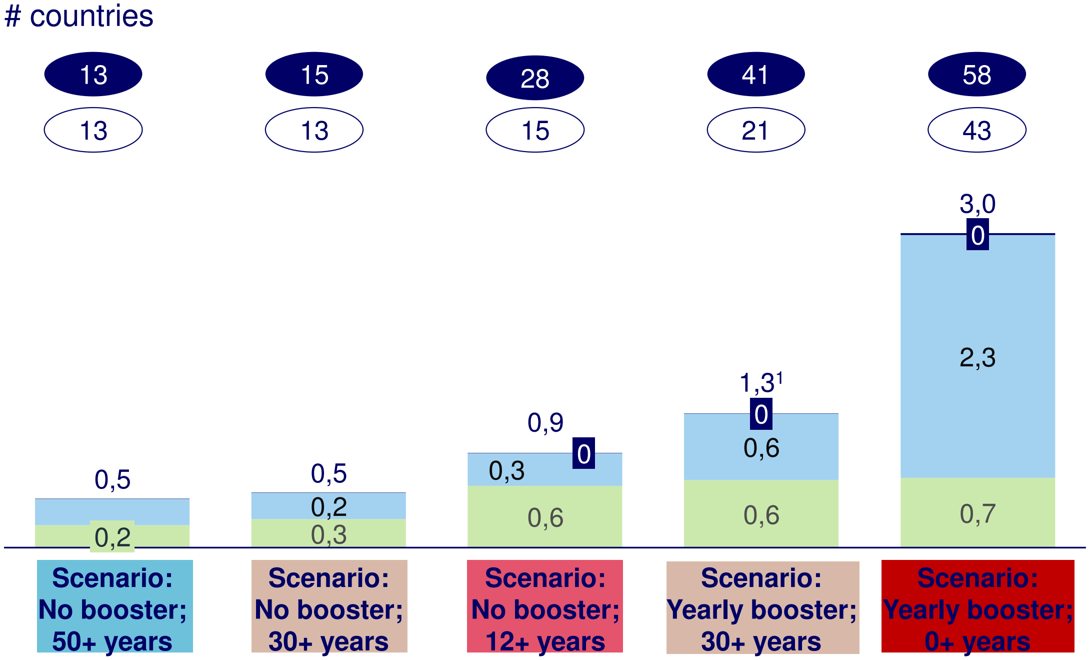
B. Number of countries and population with potential financial & system challenges by scenario

■ UMIC ■ LMIC ■ LIC

countries meeting at lest one of three criteria ● XX

countries meeting at lest one of the HW or DTP3 criteria ○ XX

Population, Bn



Indicators used to identify countries

1) the cost of vaccinating x% of the population is over 1% of 2021-2022 General Government Expenditure* for countries where expected government revenue per person vaccinated is less than the cost per person vaccinated

AND/OR

2) the extra HW for vaccinating the target population is larger than 10% of existing HW in countries where the number of physicians/1000 pop is lower than 0.2.

AND/OR

3) countries are not able to reach DTP3 coverage above 60%**

*(IMF WEO April 2021 data)

** (WUENIC estimates extracted from WIISE, June 2021) (assumed applicable to 30yrs and 0yrs goals)

C. Incremental benefits and trade-offs of ambitious vaccination target in LICs and LMICs

National considerations

Benefit

- **Biggest incremental health benefit of moving to younger age strata** as a result of demographics, mixing patterns and health system constraints
- **Incremental economic benefits** in the form of GDP losses averted i**f vaccination rollout is rapid**, allowing earlier lifting of economically costly PHSM[1]

Risk

- **Inefficient use of scarce resources** poses risk to sustainability of immunization outcomes and new investments across many other diseases of considerable burden
- **Risk of increase in cases and IFR**

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1. Ferranna, Cadarette, Bloom (2021) Harvard School of Public Health

Global considerations

Lower/slower vaccination roll out in L(M)ICs could result in limited control over VOC and lead to economic losses (due to trade, financial and consumption patterns) globally

"Vaccinating 40% globally by end 2021 and 60% by first half of 2021 translates into **$9 trillion benefits** by 2025, with over **40% of this gain going to advanced economies**"

"Our estimates suggest that up to **53%** of the global economic costs of the pandemic in 2021 [**$1.5-9trillion**] **are borne by the advanced economies** even if they achieve universal vaccination in their own countries"

Global C-19 Vax Strategy SAGE Extraordinary meeting

Agenda

1. Context and proposed goal framework – Kate O'Brien (10')

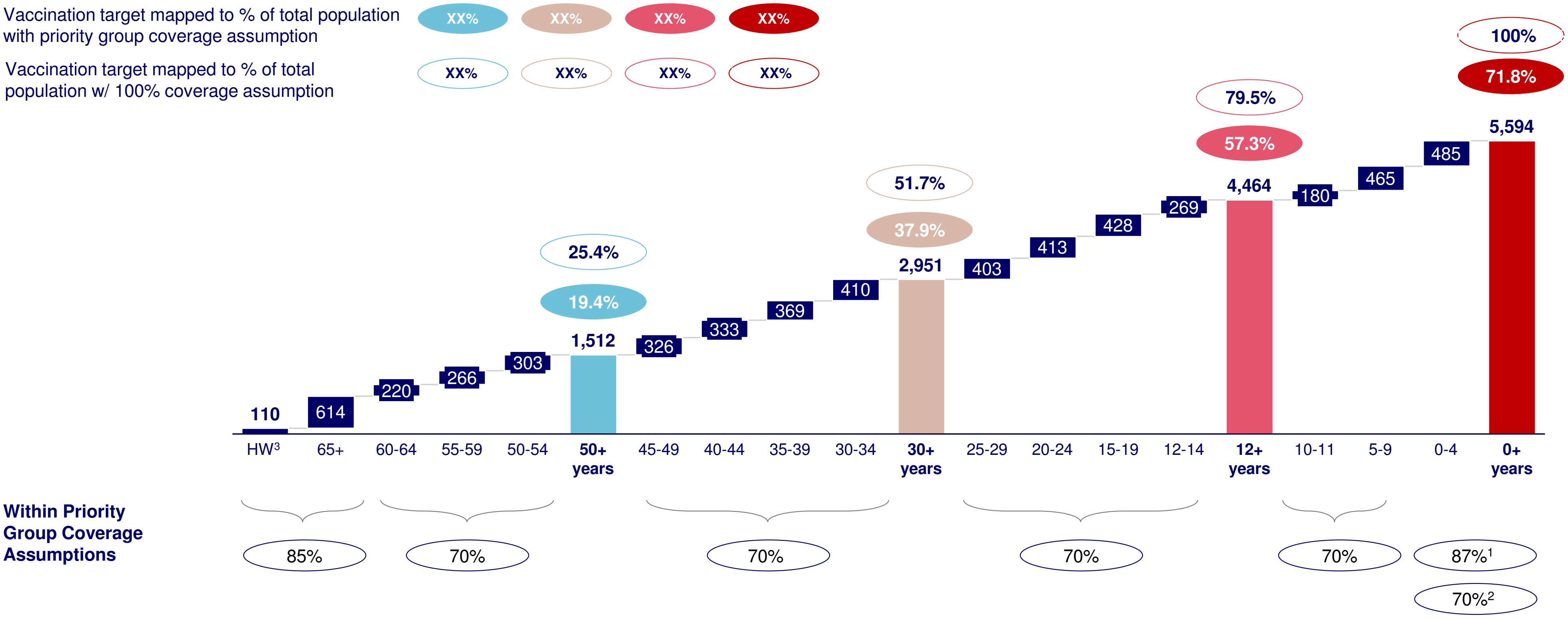
2. Health impact and uncertainties – Sarah Pallas (10')

3.Goal synthesis and feasibility assessment – Tania Cernuschi (10')

4. Options for an updated global strategy – Kate O'Brien (10')

D. Countries and public health agencies have been setting immunization targets as share of total population

Priority Group Population by Age Strata, *mn*

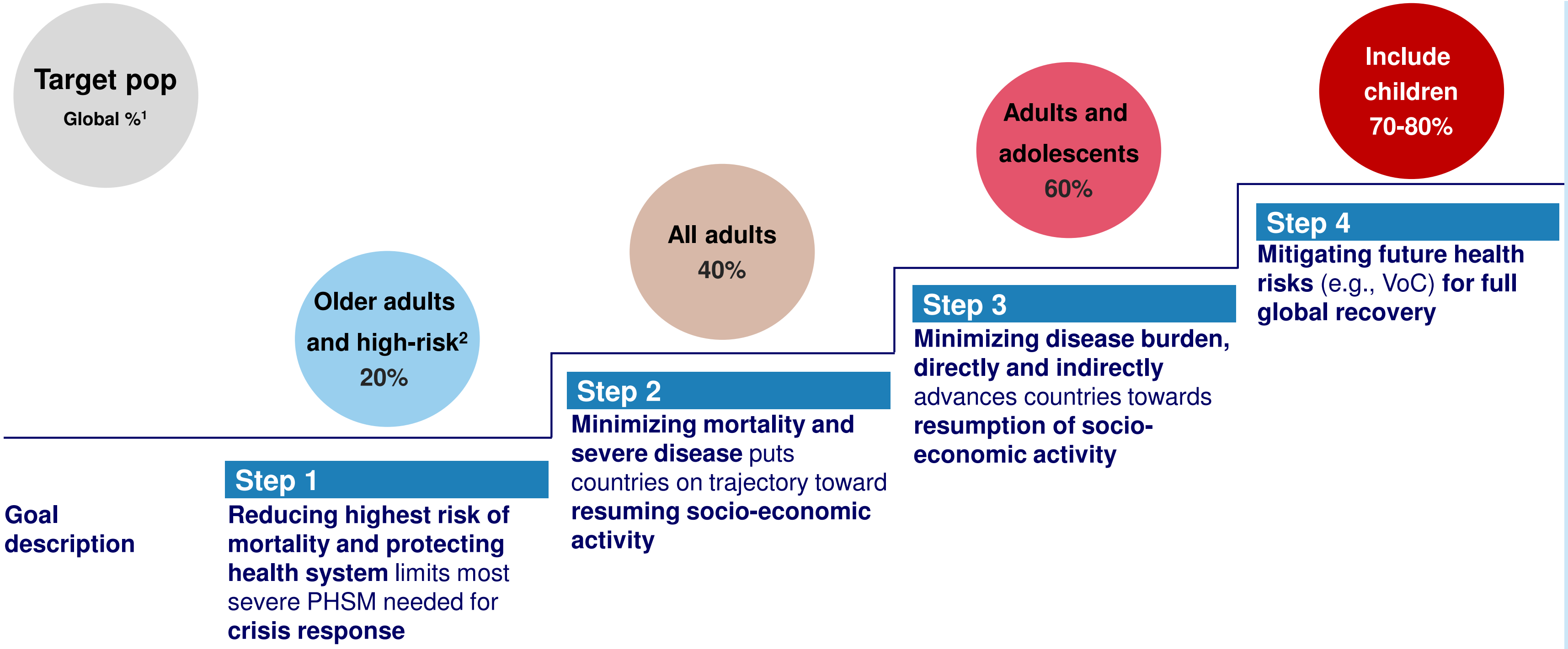


1. HICs; 2. UMICs and L(M)ICs
3. Explicitly calculated and subsequently subtracted from their corresponding age group to avoid double-counting

Source: UN population estimates, https://population.un.org/wpp/

June 29, 2021

D. Step-wise approach along the trajectory of potential global goals



Target pop
Global %[1]

Older adults and high-risk[2]
20%

All adults
40%

Adults and adolescents
60%

Include children
70-80%

Goal description

Step 1
Reducing highest risk of mortality and protecting health system limits most severe PHSM needed for **crisis response**

Step 2
Minimizing mortality and severe disease puts countries on trajectory toward **resuming socio-economic activity**

Step 3
Minimizing disease burden, directly and indirectly advances countries towards **resumption of socio-economic activity**

Step 4
Mitigating future health risks (e.g., VoC) **for full global recovery**

The path to full global recovery advances through several goals in a step wise approach

---

1. The % population targets include coverage assumptions within the prioritized population: HCW and 65yrs+: 85% coverage, 5-65yrs: 70% coverage, 0-4yrs: coverage ranging from 70% to 87%
2. Including all HW

D. Step-wise approach along the trajectory of potential global goals

Target pop
Global %[1] (range[2])

Goal description

Older adults and high-risk[3]
20% (8%-31%)

Step 1

Reducing highest risk of mortality and protecting health system limits most severe PHSM needed for **crisis response**

All adults
40% (22%-50%)

Step 2

Minimizing mortality and severe disease puts countries on trajectory toward **resuming socio-economic activity**

Adults and adolescents
60% (47%-64%)

Step 3

Minimizing disease burden, directly and indirectly advances countries towards **resumption of socio-economic activity**

Include children
70-80%

Step 4

Mitigating future health risks (e.g., VoC) **for full global recovery**

The path to full global recovery advances through several goals in a step wise approach

Country specific targets need to **account for local circumstances**, including demographic and priority populations distribution

---

1. The % population targets include coverage assumptions within the prioritized population: HCW and 65yrs+: 85% coverage, 5-65yrs: 70% coverage, 0-4yrs: coverage ranging from 70% to 87%
2. Including all HW

June 29, 2021

D. Step-wise approach along the trajectory of potential global goals

Target pop
Global %[1] (range[2])

Considerations

Older adults and high-risk[3]
20% (8%-31%)

Step 1

✓

Already established global goal

Unfinished agenda well underway

Feasible in all countries

All adults
40% (22%-50%)

Step 2

✓

Required to resume socio-economic activity

Clear political will to move in this direction, important sunk investments

Could be feasible for majority of countries with external support for L(M)ICs at low dose requirement (1 or 2 dose no booster)

Adults and adolescents
60% (47%-64%)

Step 3

?

Target already implemented in some UMICs and HICs

Unknowns around benefits of vaccinating adolescents

Requires substantially greater financial and programme investment to achieve and requires important trade-offs at high dose requirement (2 dose + boosters)

Include children
70-80%

Step 4

?

Unknown impact of VoC (vaccine performance, pace of resurgence)

Unknown trades off of natural versus vaccine induced immunity

Inadequate understanding of mild disease, vx safety evidence

Requires substantially greater financial and programme investment to achieve and requires important trade offs particularly at high dose requirement

The path to full global recovery advances through several goals in a step wise approach from reducing highest risk of mortality and protecting health systems limiting most sever PHSM needed for crisis response to mitigating future health risks for full global recovery

Country specific targets need to **account for local circumstances**, including demographic and priority populations distribution

Vaccination targets should be driven by considerations on:

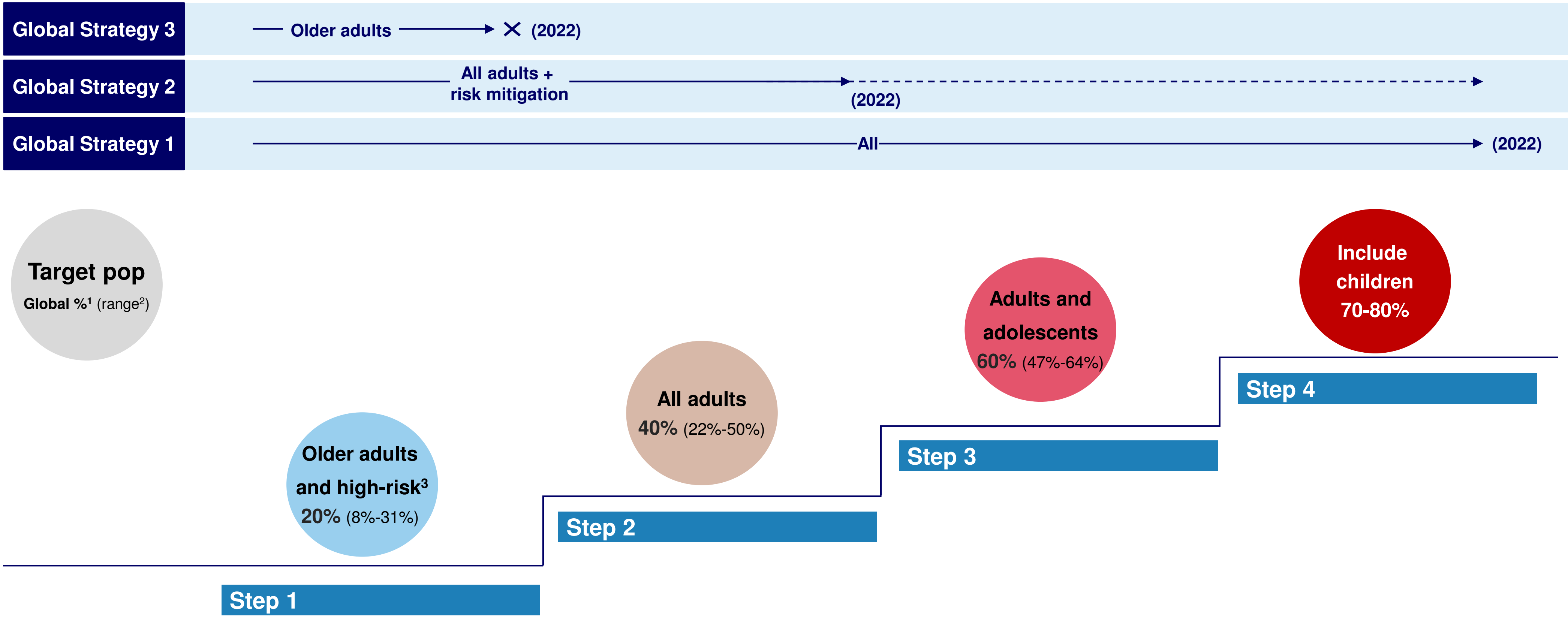
- Incremental benefits
- Feasibility
- Future risks

---

1. The % population targets include coverage assumptions within the prioritized population: HCW and 65yrs+: 85% coverage, 5-65yrs: 70% coverage, 0-4yrs: coverage ranging from 70% to 87%
2. Range refers to the % population in the age strata across HIC, UMIC, LMIC and LIC
3. Including all HW

June 29, 2021

Options for a Global Strategy for 2021-2022



Global Strategy 3 — Older adults → ✕ (2022)

Global Strategy 2 — All adults + risk mitigation → (2022) - - - →

Global Strategy 1 — All → (2022)

Target pop
Global %[1] (range[2])

Step 1 — **Older adults and high-risk**[3] **20%** (8%-31%)

Step 2 — **All adults** **40%** (22%-50%)

Step 3 — **Adults and adolescents** **60%** (47%-64%)

Step 4 — **Include children** **70-80%**

---

1. The % population targets include coverage assumptions within the prioritized population: HCW and 65yrs+: 85% coverage, 5-65yrs: 70% coverage, 0-4yrs: coverage ranging from 70% to 87%
2. Range refers to the % population in the age strata across HIC, UMIC, LMIC and LIC
3. Including all HW

Key features of the three potential global strategies

	Global Strategy 3: ***Older adult global vaccination***	Global Strategy 2: ***All adult global vaccination with risk mitigation***	Global Strategy 1: ***Universal global vaccination***
Goals	• **Reduce highest risk of mortality and protecting health systems limiting most sever PHSM needed for crisis response**	• **Aim to reduce disease burden and putting countries on trajectory toward resuming socio-economic activity**	• **Aim to mitigate future health risks for full global recovery**
Age	• Focus only on **highest risk groups and older adults where incremental benefits are most certain**	• Prioritise highest risk groups where incremental benefits are highest, and **encourage and support countries to all adult populations**	• **Prioritize older adults and highest risk groups**, but encourage and support all countries to **quickly move to include children vaccination**
Alignment with political context	• Reinforce and build on the **current unfinished agenda** • **Encourage all countries to await for further evidence** on need/desirability of further ambitions	• Leverage clear political will and already ongoing in investments, and could be **feasible for majority of countries** with external support	• Leverage **recent ambitious calls for actions and establish equitable opportunities**
Requirements and resource-handling	• Ensure **efficient and effective use of scarce resources** for more feasible and impactful targets • Risk **leaving us unprepared in potential need for more ambitious vaccination targets** as more data and knowledge is collected on scientific uncertainties.	• **Promote efficient use of resources in face of many scientific uncertainties** on feasibility and desirability of adolescent and children vaccination • Call for **important at-risk investments in vaccine supply and systems** to ensure readiness to implement future steps once scientific uncertainty is cleared	• **May require massive investments**, including of external technical support, to support externally drive, campaign-type approach to timely immunization in context of high scientific uncertainty • Proposes **concomitant investment in other immunization activities** and primary care

Acknowledgements

Members of the Global COVID-19 Vaccination Task Team: Simon Allan, Sunil Kumar Bahl, Mathieu Boniol, Tania Cernuschi, Peter Cowley, Emily Dansereau, Siddhartha Sankar Datta, Isabel de la Mata, Ulla Griffiths, Shanelle Hall, Quamrul Hasan, Joachim Hombach, Hannah Kettler, Olivier Le Polain, Chris Lewis, Richard Mihigo, Nicaise Ndembi, Canice Nolan, Kate O'Brien, Saad Omer, Ahmed Ogwell Ouma, Sarah Pallas, Cuauhtemoc Ruiz-Matus, Yoshihiro Takashima, Nathalie Van de Maele, Charlotte Watts, Yin Zundong

Contributing panels and working groups (in no specific order): Global COVID-19 Vaccination Ad-hoc Strategy Group, COVAX global market assessment working group, SAGE Working Group on COVID-19 Vaccines, Imperial College London (MRC Centre for Global Infectious Disease Analysis, WHO Collaborating Centre for Infectious Disease Modelling), Harvard School of Public Health (Value of Vaccination Research Network Secretariat), Country Readiness and Delivery Task Team for Global Delivery Costs, COVAX Workstream Convenors and RSSE

June 29, 2021

Global C-19 Vaccination Strategy SAGE Extraordinary meeting

Objectives

Critical appraisal from SAGE will be sought for:

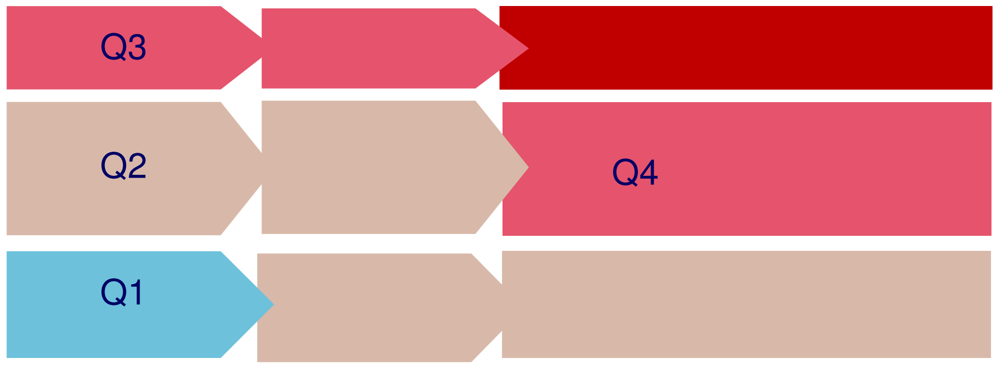
- The **Conceptual Goal Framework**, built along health and socio-economic dimensions, and the identification of the **levels of scientific uncertainty** associated with the different steps in the framework

- The **Goal Synthesis** based on scenario analysis as a means to inform a global strategy

- The lay out of the **three potential options for a Global Strategy for 2021-2022**

Appendix: Conceptual goal framework

Rationale for age cutoffs for global strategy analyses



Reduce viral transmission

Reduce COVID-19 disease burden and limit health system impact

Reduce COVID-19 mortality and protect health workers

Stringent PHSM leading to lockdown

Less stringent PHSM, some limitations to socio-economic activity and travel

Test, trace, isolate, quarantine (TTIQ) and travel restrictions only

TTIQ only, fully resumed economic and social activity

Increasing Rt in absence of vaccination

Goal framework key assumption: countries' primary objective is to "return to normal" (move along horizontal axis) while mitigating health losses

No country aims to stay at "stringent PHSM" forever.

Modeling finding:
Maintaining NPIs during vaccination rollout minimizes health losses

Implication:
Vaccination at each stage of PHSM is preparatory for next stage of lifting PHSM

Age groups vary in their population coverage across income groups

Total Pop Proportion (%) accounted for by Health Goal & Country Income Group

(low socioeconomic goal/high PHSM example)

GOAL	HIC	UMIC	LMIC	LIC	Average across income groups	Global Total
Older adults and high-risk groups	31%	23%	14%	8%	19%	19%
All adults	50%	43%	32%	22%	37%	38%
Adults and adolescents	64%	60%	54%	47%	56%	57%
Include children	74%	72%	71%	71%	72%	72%

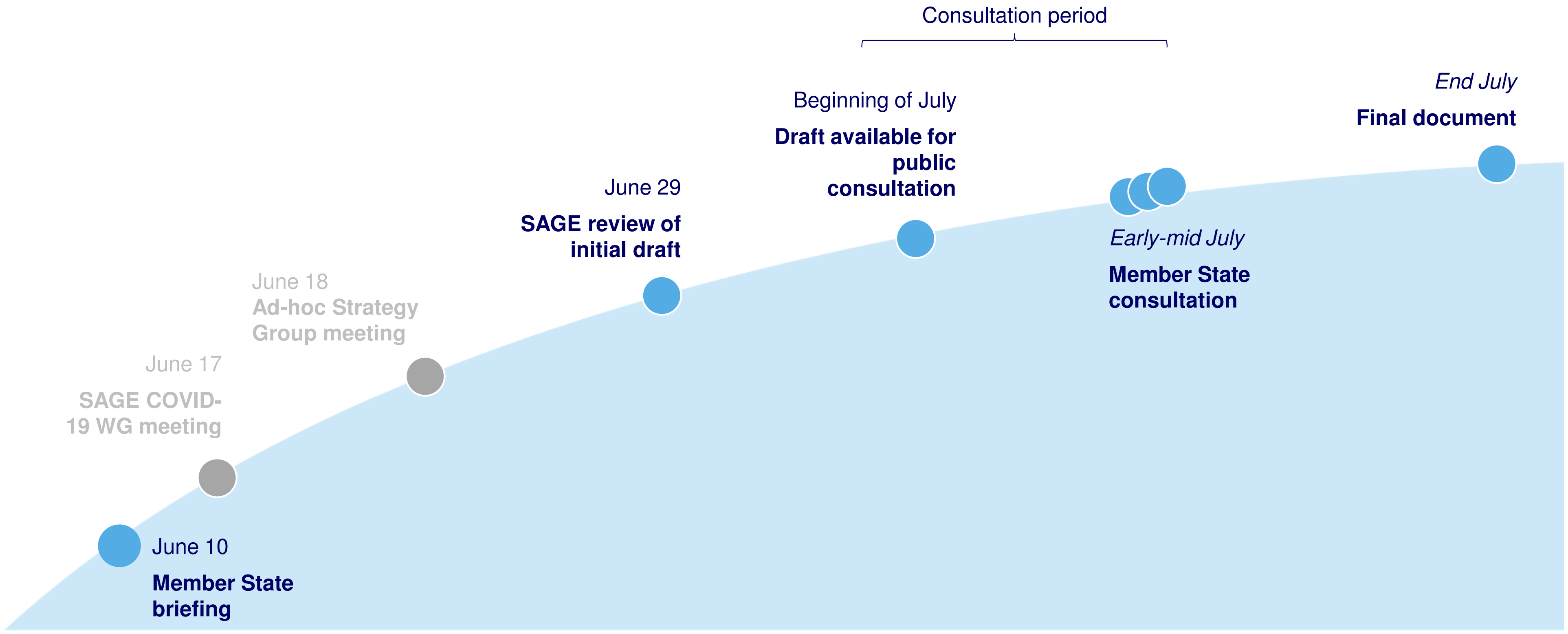
- For the first two goals, HICs/UMICs would require higher % total population coverage than LMICs/LICs due to their older demographic structure

Add coverage assumptions we have used that get us to this shares

Appendix: Health impact modelling

June 29, 2021

Timeline to complete Global vaccination work – including consultations



June 10

Member State briefing

June 17

SAGE COVID-19 WG meeting

June 18

Ad-hoc Strategy Group meeting

June 29

SAGE review of initial draft

Consultation period

Beginning of July

Draft available for public consultation

Early-mid July

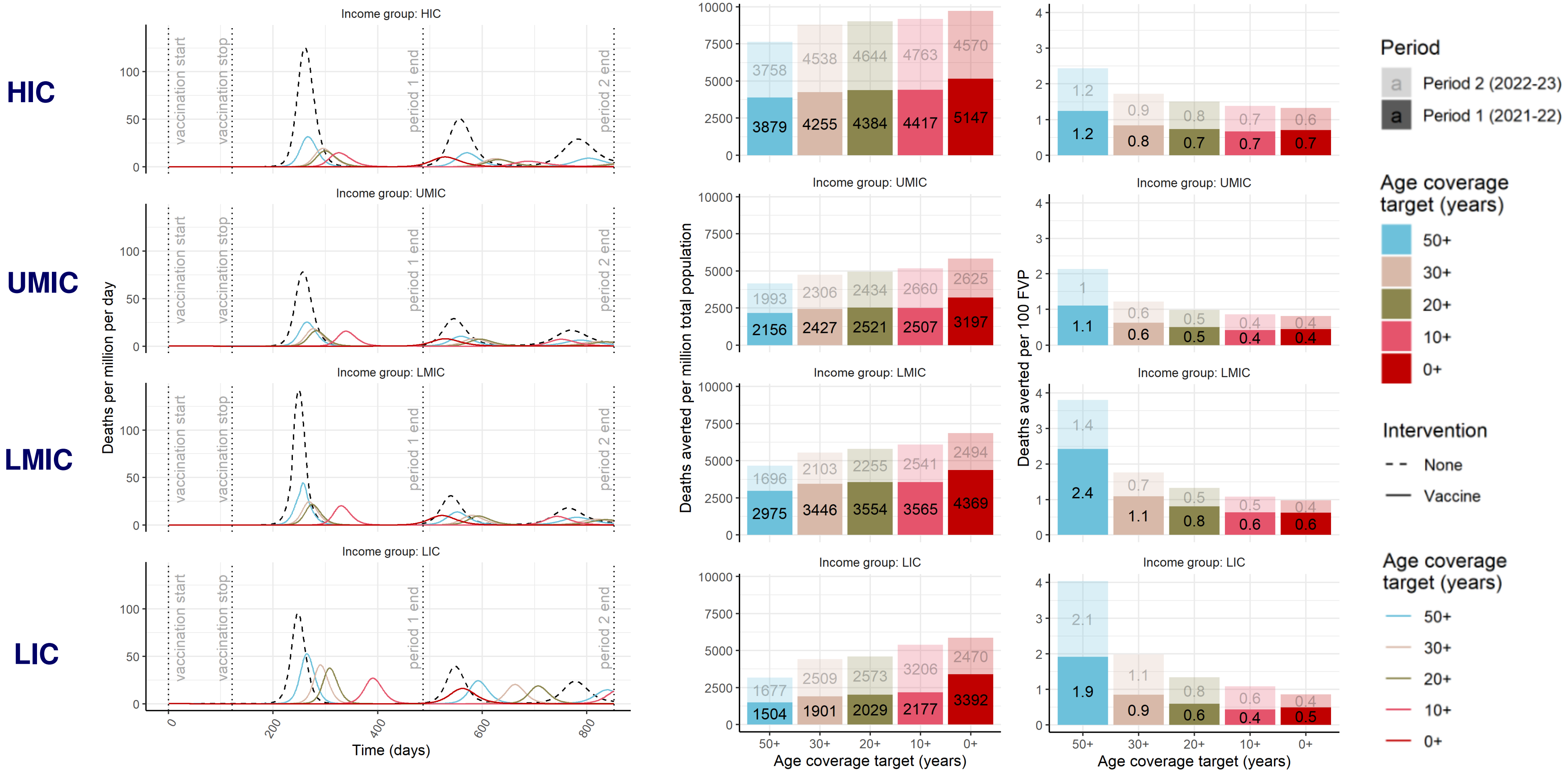
Member State consultation

End July

Final document

Modelled impact of coverage targets by age, across income settings (incl. 20+)

Trajectories with and without vaccine **Deaths averted per population** **Deaths averted per 100 FVP**



Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Events averted per million population

Deaths averted

Hospitalisations averted

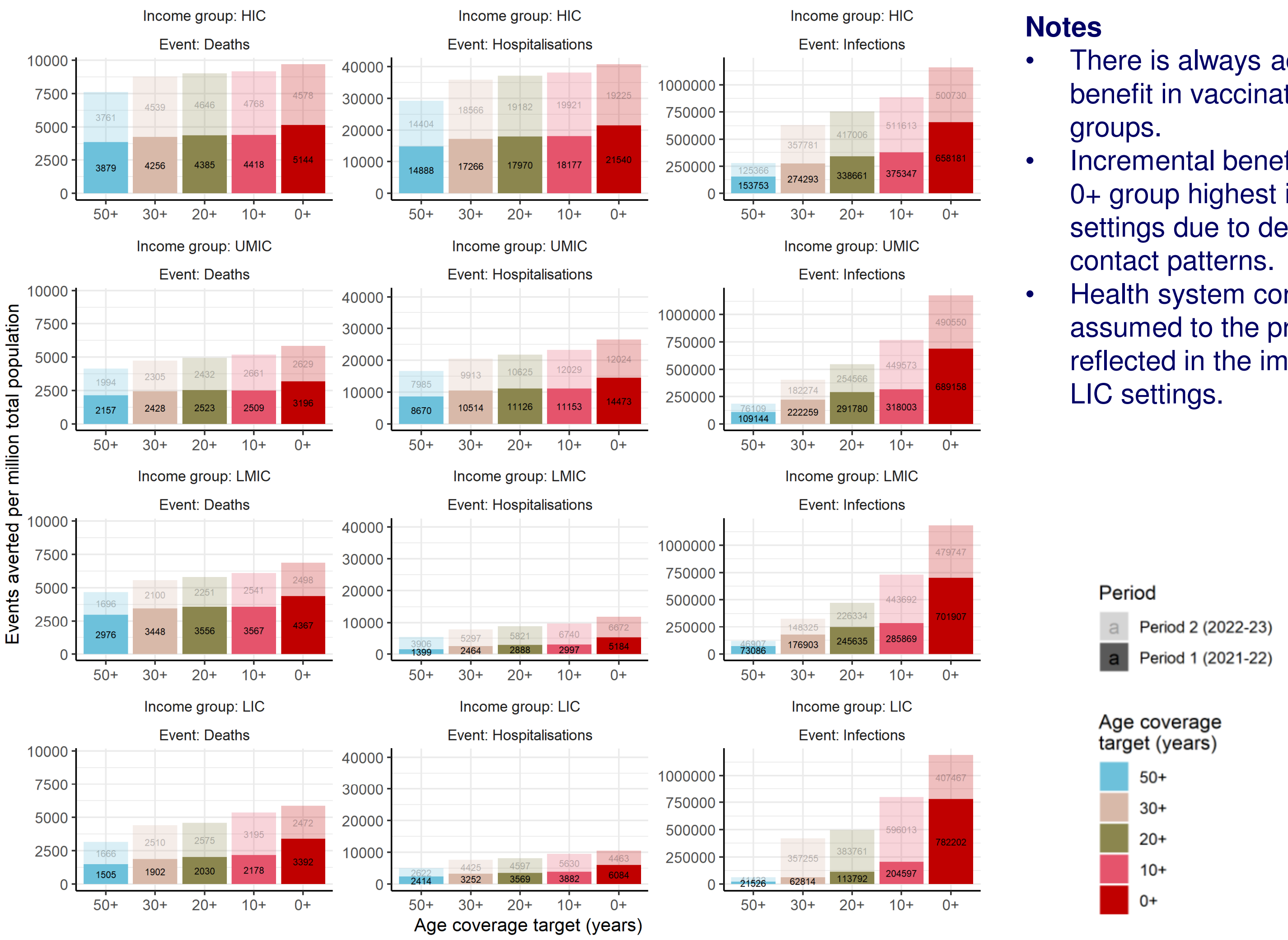
Infections averted

HIC

UMIC

LMIC

LIC

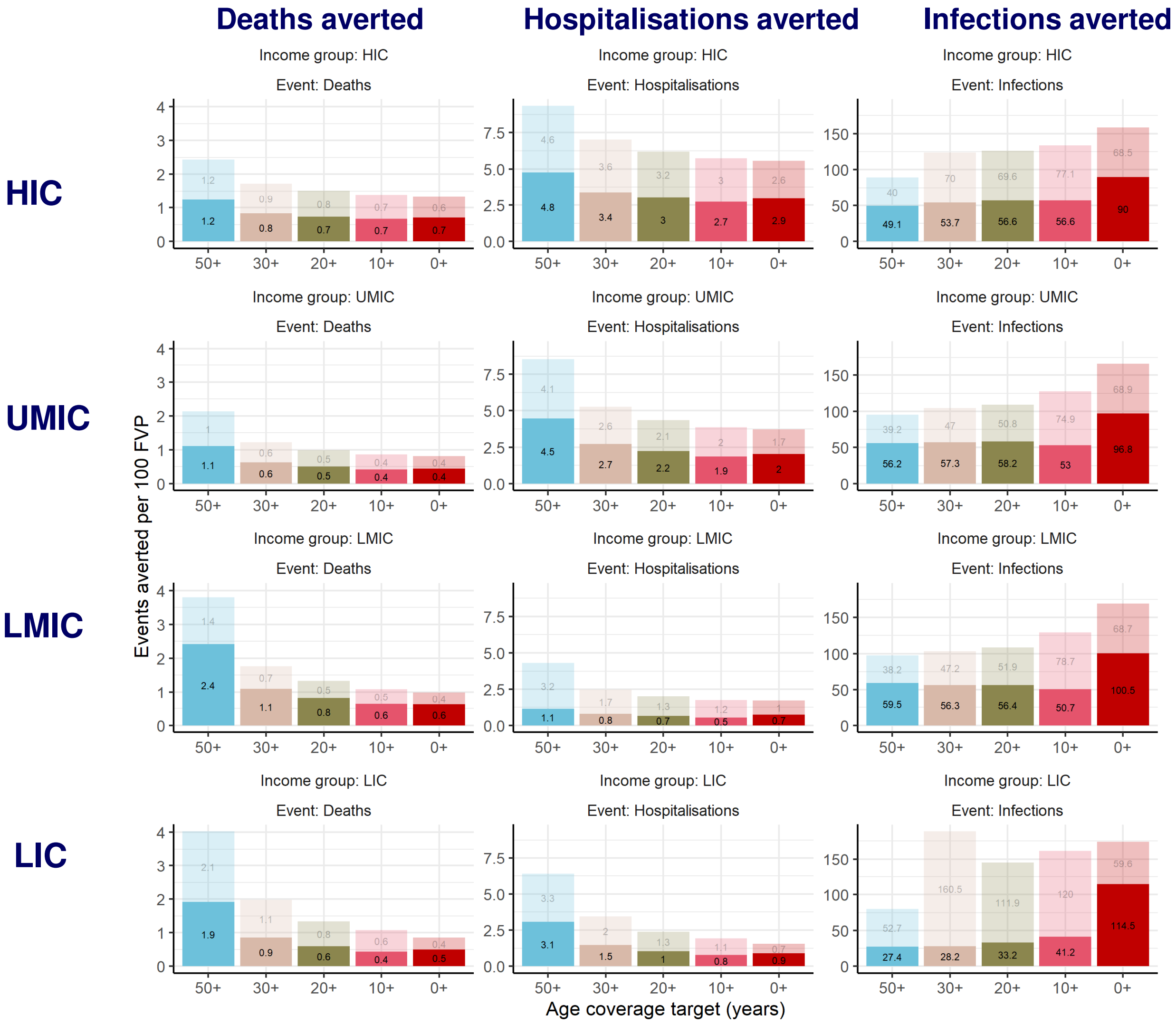


Notes

- There is always additional health benefit in vaccinating additional age groups.
- Incremental benefit of vaccinating 0+ group highest in lower-income settings due to demography and contact patterns.
- Health system constraints are assumed to the present, which is reflected in the impact in LMIC and LIC settings.

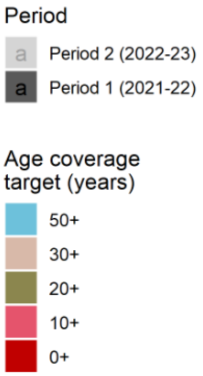
Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Events averted per 100 FVP



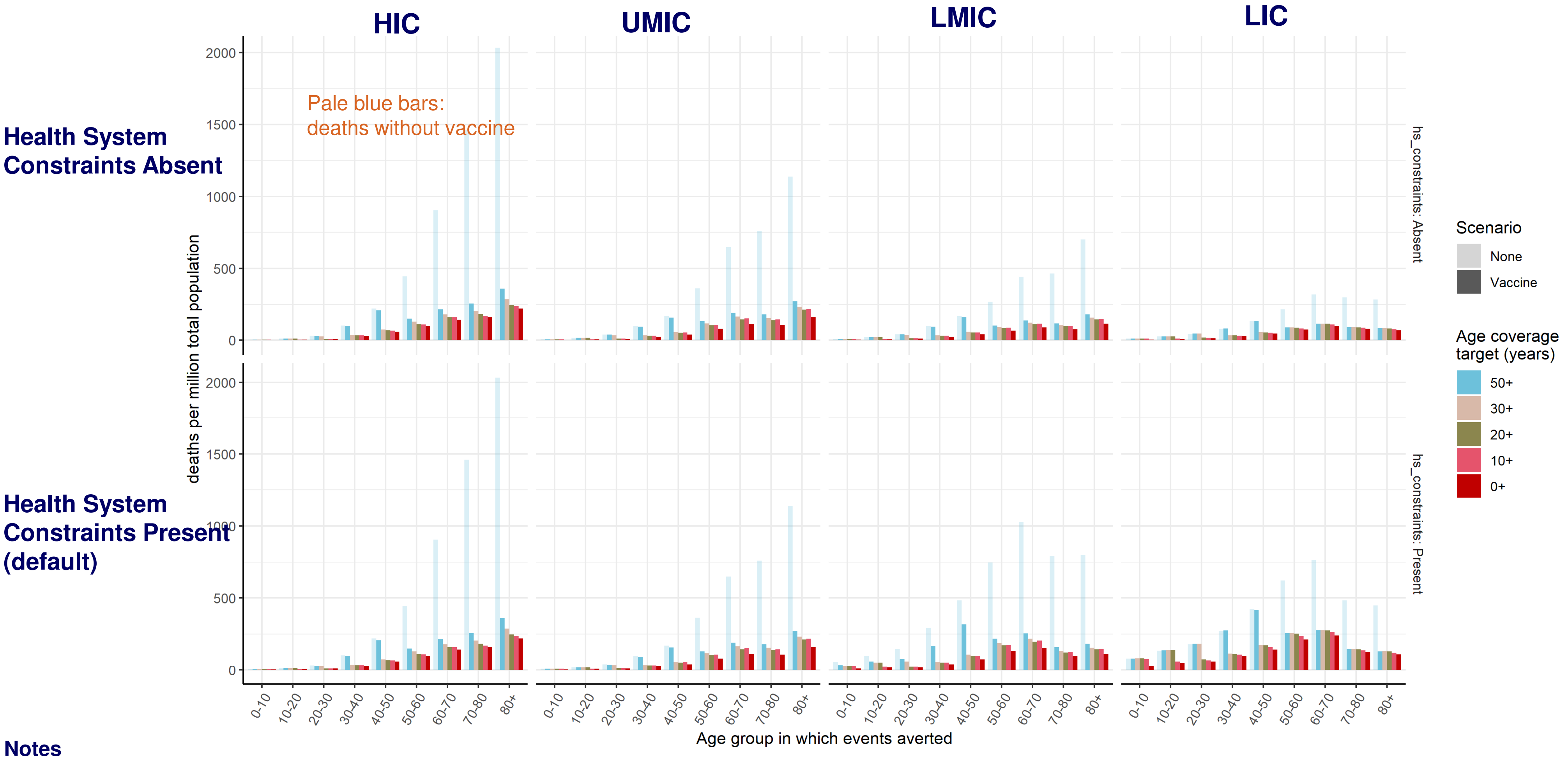
Notes

- Demonstrates efficiency in terms of deaths and hospitalisations averted of targeting the oldest age groups.
- Benefit of averting infections shown in vaccinating youngest age groups – particularly in LMIC and UMIC settings



Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Interpreting drivers of impact across income settings: deaths with and without vaccine, by age group



Health System Constraints Absent

Health System Constraints Present (default)

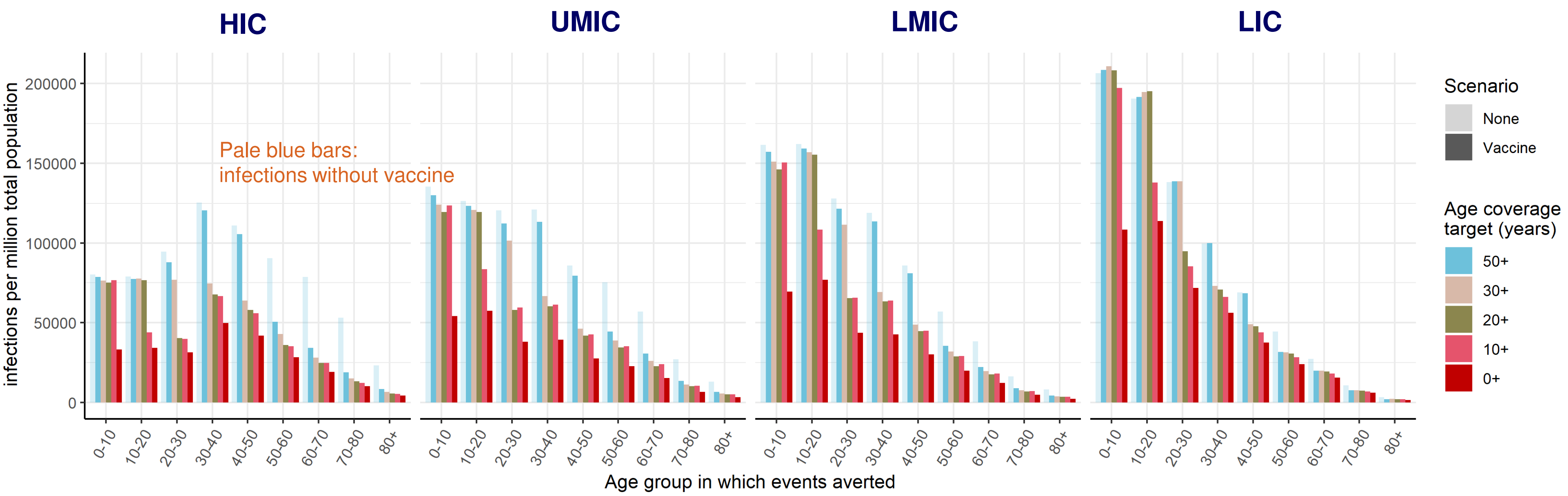
Pale blue bars: deaths without vaccine

Notes

- Time period selected such that each bar represents one epidemic wave for comparability
- Top row shows **health constraints absent**: deaths in younger ages in LMICs and LICs are being driven by assumption about health system constraints

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Interpreting drivers of impact across income settings: infections with and without vaccine, by age group



Pale blue bars: infections without vaccine

Notes

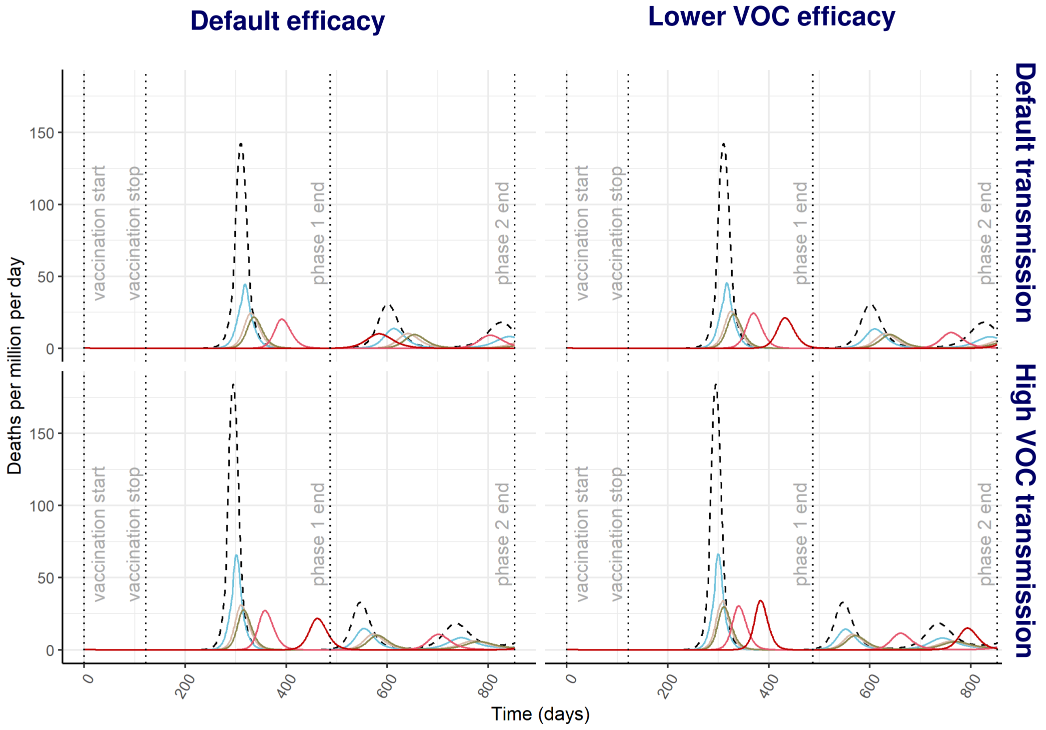
- Time period selected such that each bar represents one epidemic wave for comparability

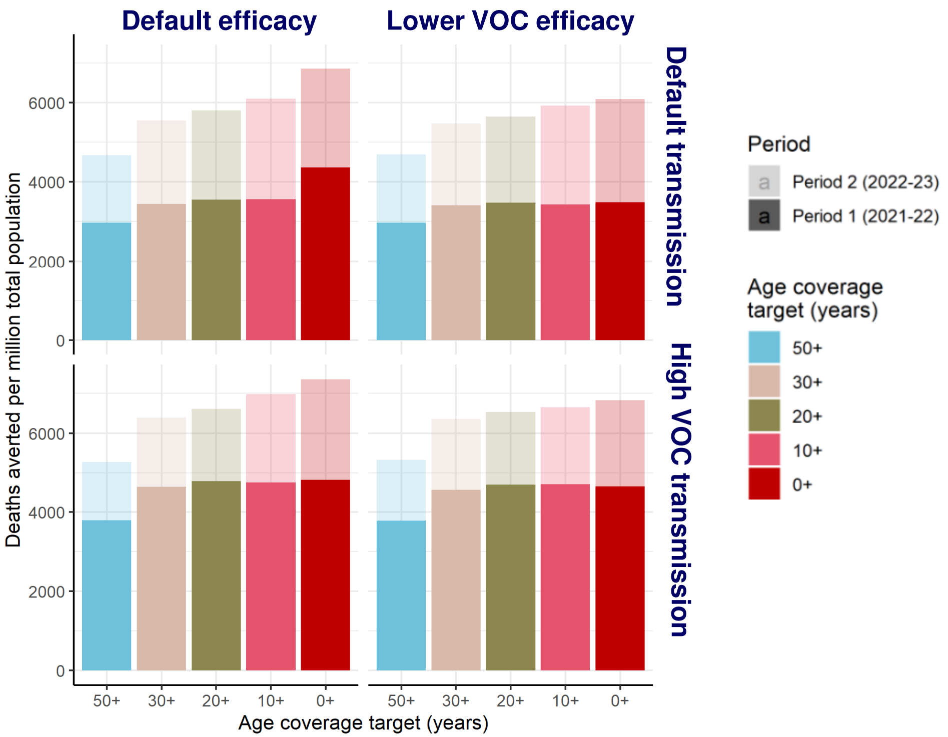
Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

“Matrix” of VOC impact – conceptualised as impact on transmission and impact on vaccine efficacy

LMIC setting shown

- Important to consider timing of epidemic peaks and window over which impact is measure (makes it hard to compare)



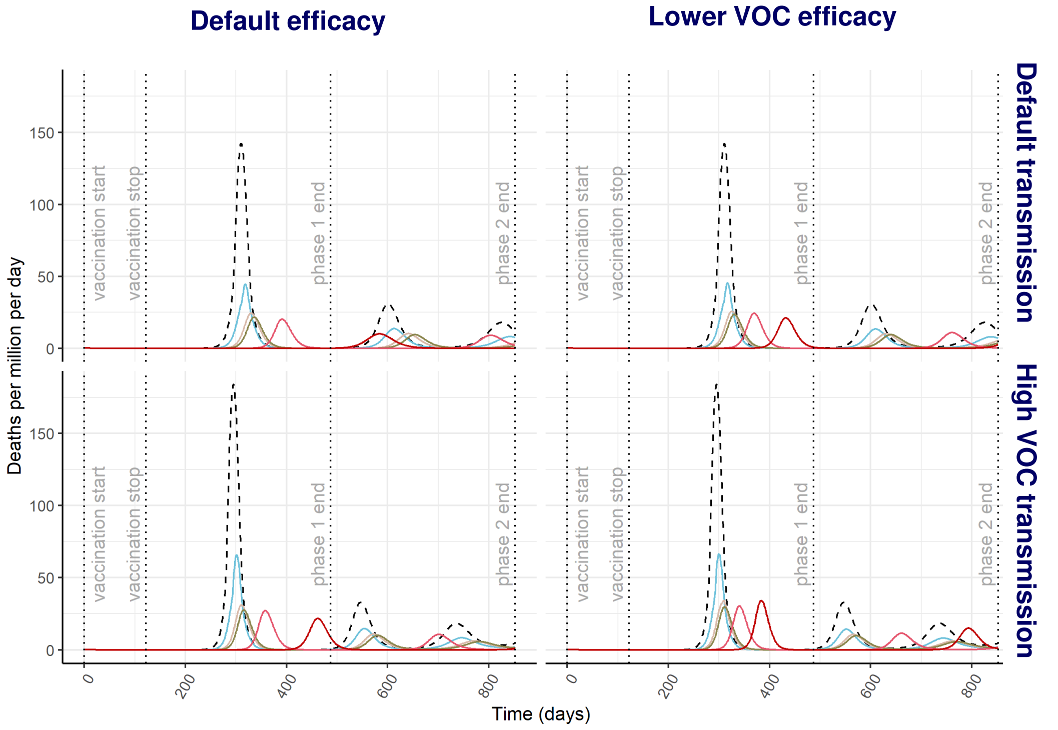


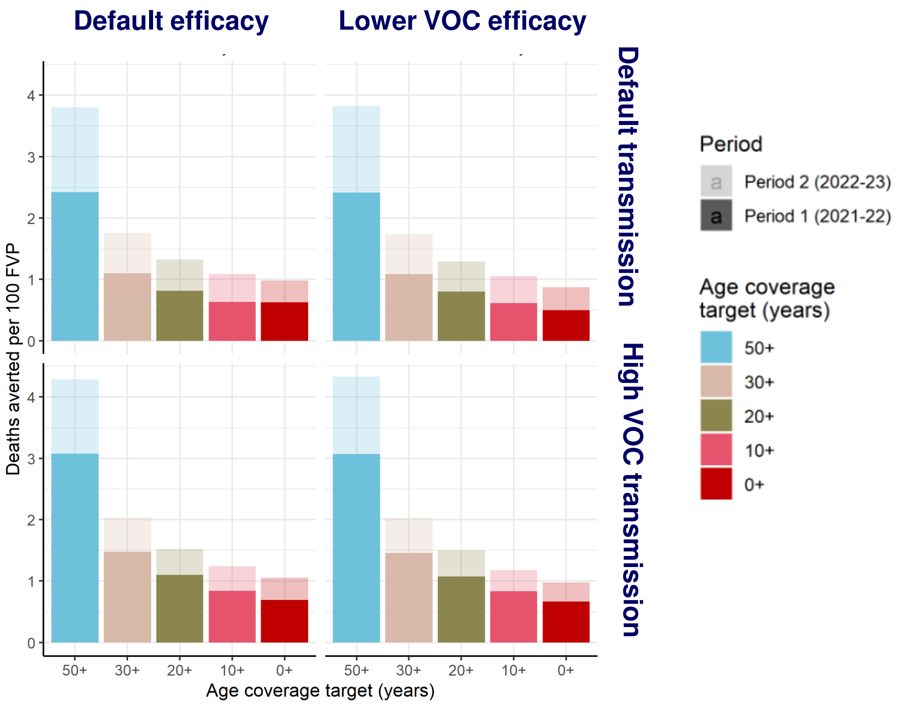
Default: Vaccine efficacy 63% vs infection; 90% vs severe disease; 45% vs transmission; Rt=3.5
VOC: Vaccine efficacy 40% vs infection; 90% vs severe disease; 33% vs transmission; Rt=4.5

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

“Matrix” of VOC impact – conceptualised as impact on transmission and impact on vaccine efficacy

- Important to consider timing of epidemic peaks and window over which impact is measure (makes it hard to compare)

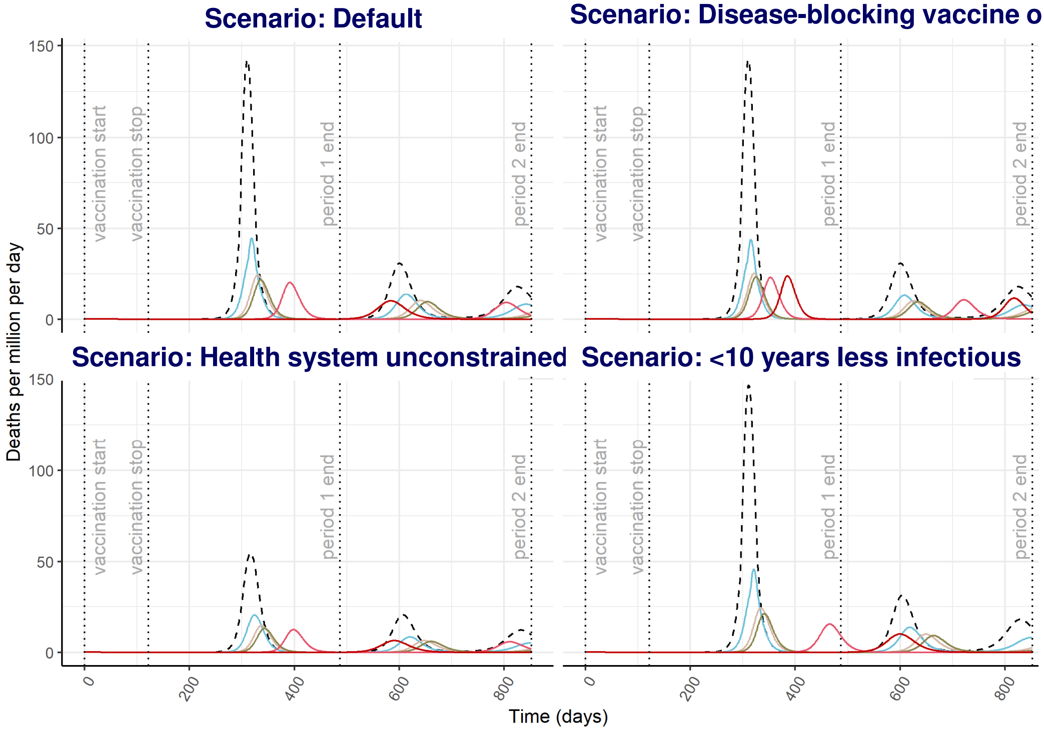


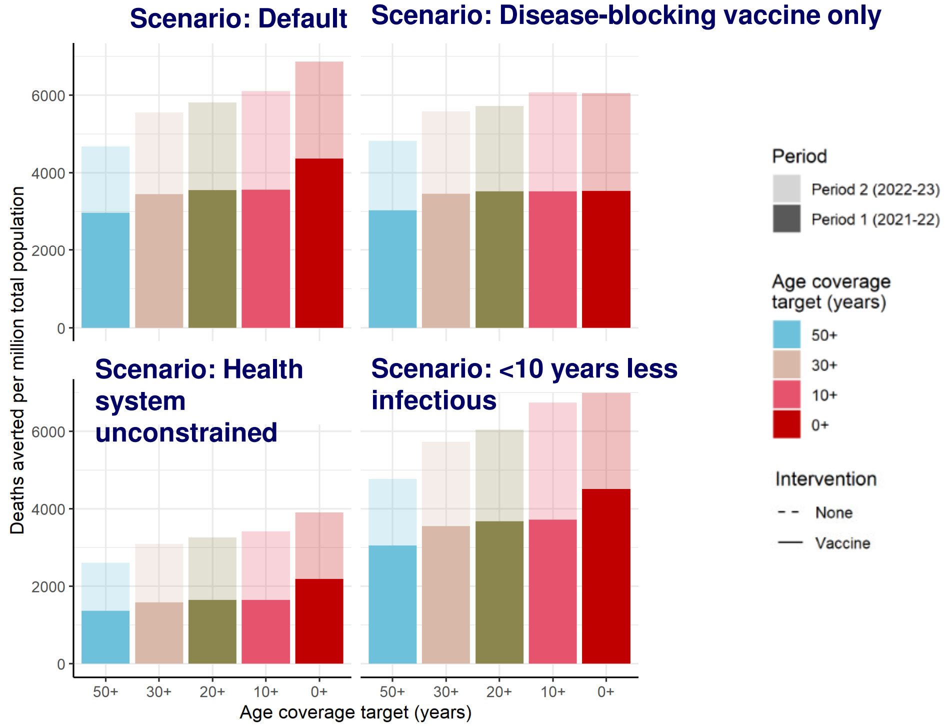


Default: Vaccine efficacy 63% vs infection; 90% vs severe disease; 45% vs transmission; Rt=3.5
VOC: Vaccine efficacy 40% vs infection; 90% vs severe disease; 33% vs transmission; Rt=4.5

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Sensitivity analyses (shown for LMIC setting with 20+): Deaths averted per million population

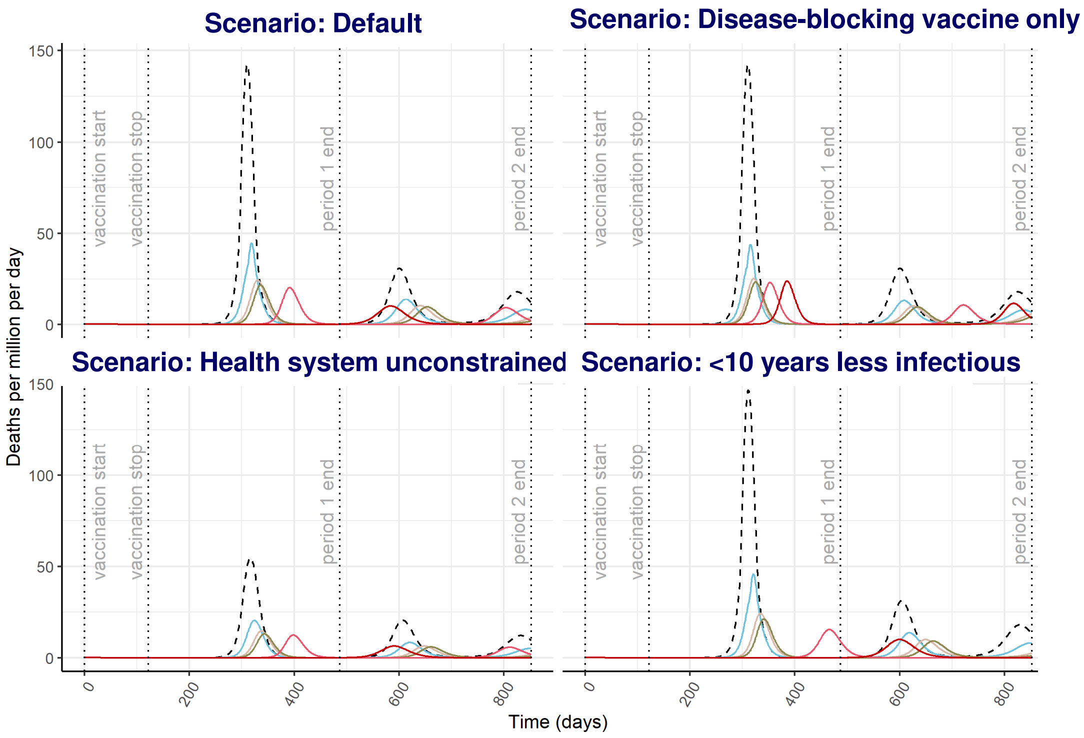


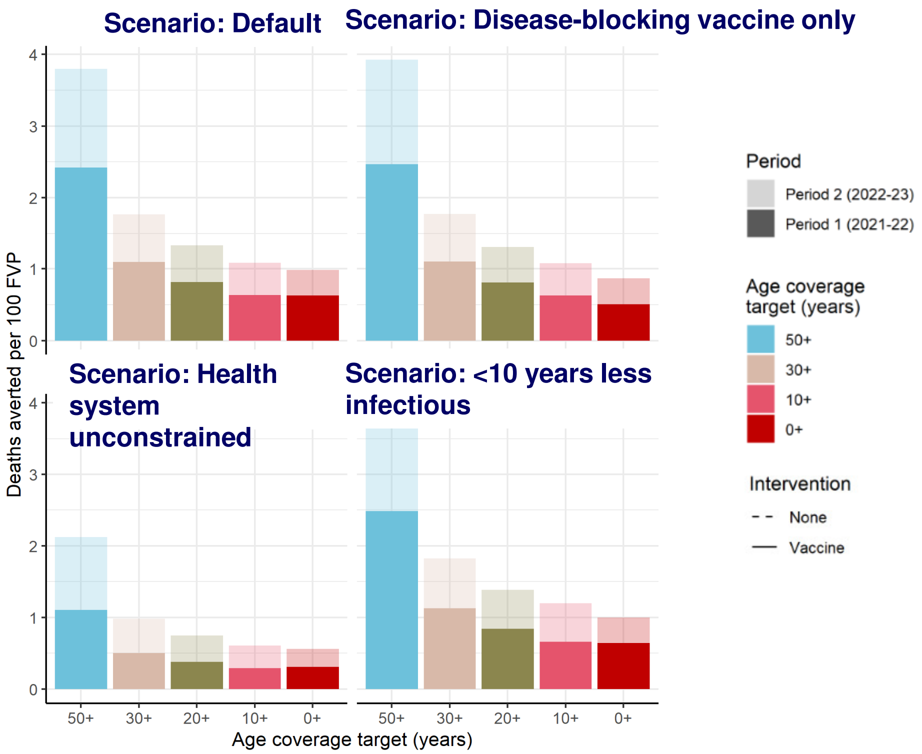


- Timing of epidemic peaks shifts with different assumptions
- Vaccine that is disease-blocking only (with some reduction in infectiousness for breakthrough infections): few lives saved vaccinating individuals <30 years; slightly higher deaths averted 50+ which is artefact of earlier epidemic and waning immunity
- If no constraints on health system, then fewer deaths to avert but similar pattern of incremental gains
- If <10 years less infectious, smaller overall incremental impact of vaccinating <10 years.

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

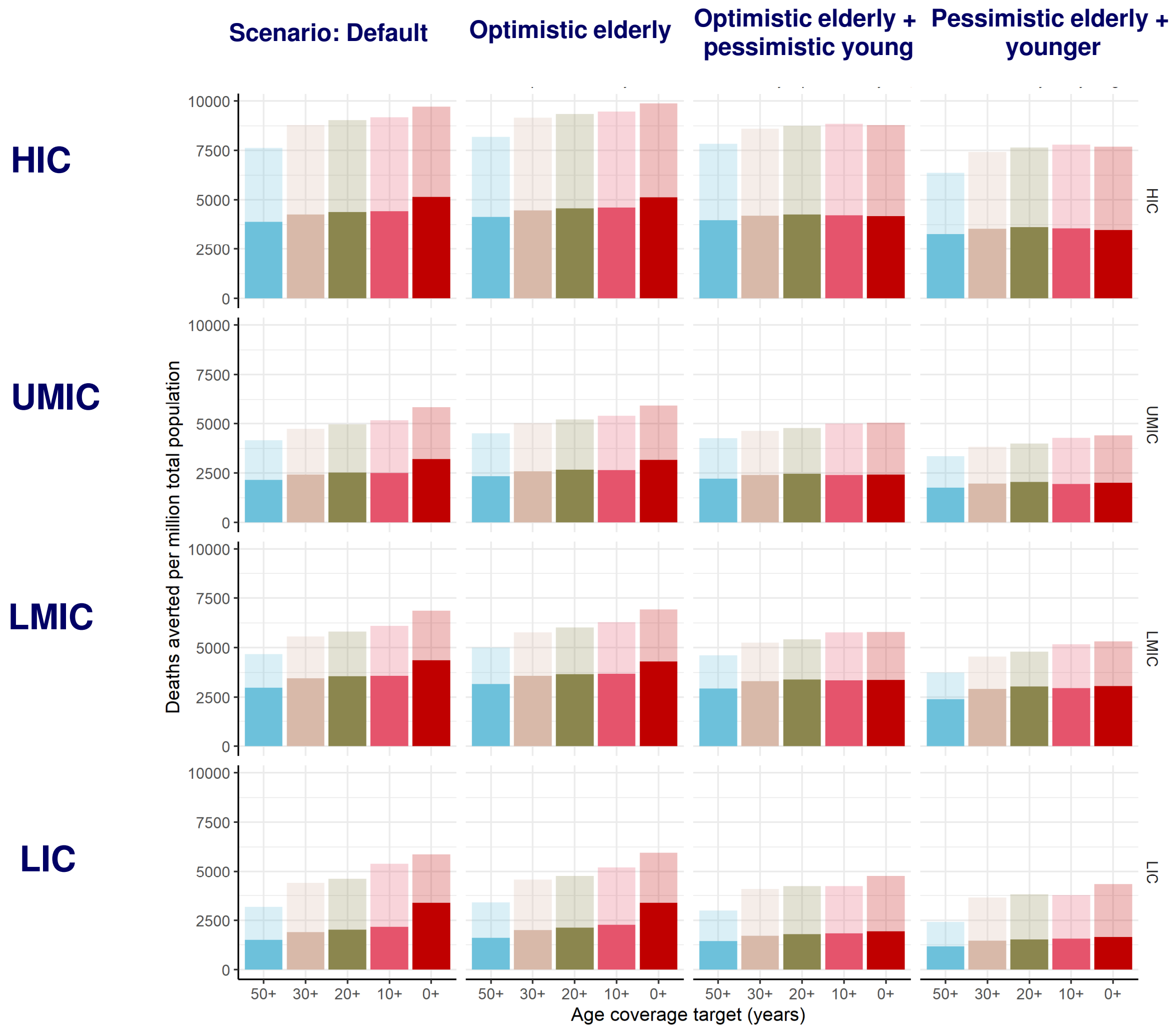
Sensitivity analyses (shown for LMIC setting with 20+): Deaths averted per 100 FVP





Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Sensitivity to assumptions about take-up within age groups: **deaths averted**



Notes

- Demonstrates importance of maintaining high take-up in the most at-risk populations

Period

- ▢ Period 2 (2022-23)
- ■ Period 1 (2021-22)

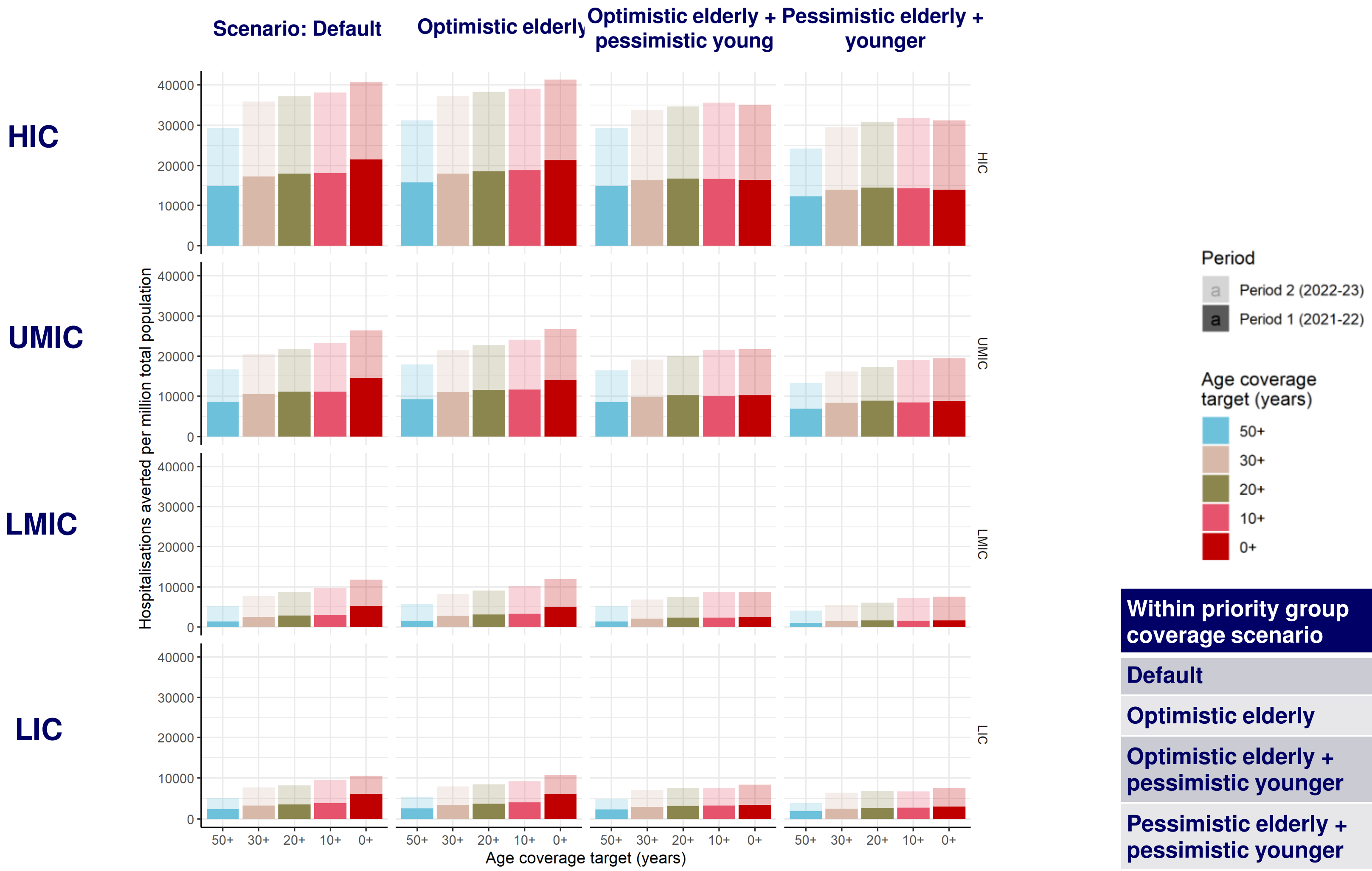
Age coverage target (years)

- 🟦 50+
- 🟫 30+
- 🟫 20+
- 🟥 10+
- 🟥 0+

Within priority group coverage scenario	65+ years	<65 years
Default	85%	70%
Optimistic elderly	95%	70%
Optimistic elderly + pessimistic younger	95%	50%
Pessimistic elderly + pessimistic younger	70%	50%

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

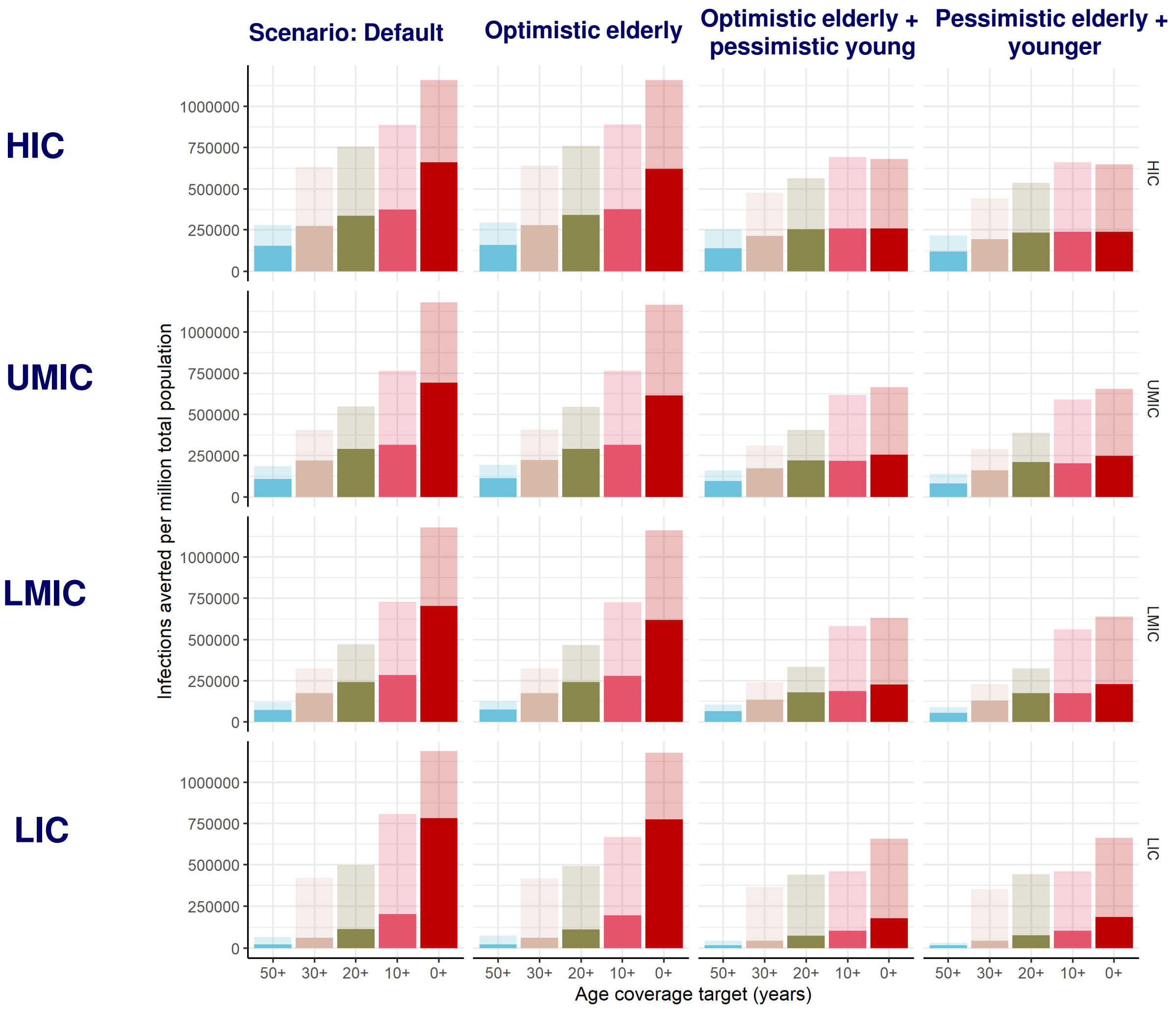
Sensitivity to assumptions about take-up within age groups: **hospitalisations averted**



Within priority group coverage scenario	**65+ years**	**<65 years**
Default	85%	70%
Optimistic elderly	95%	70%
Optimistic elderly + pessimistic younger	95%	50%
Pessimistic elderly + pessimistic younger	70%	50%

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

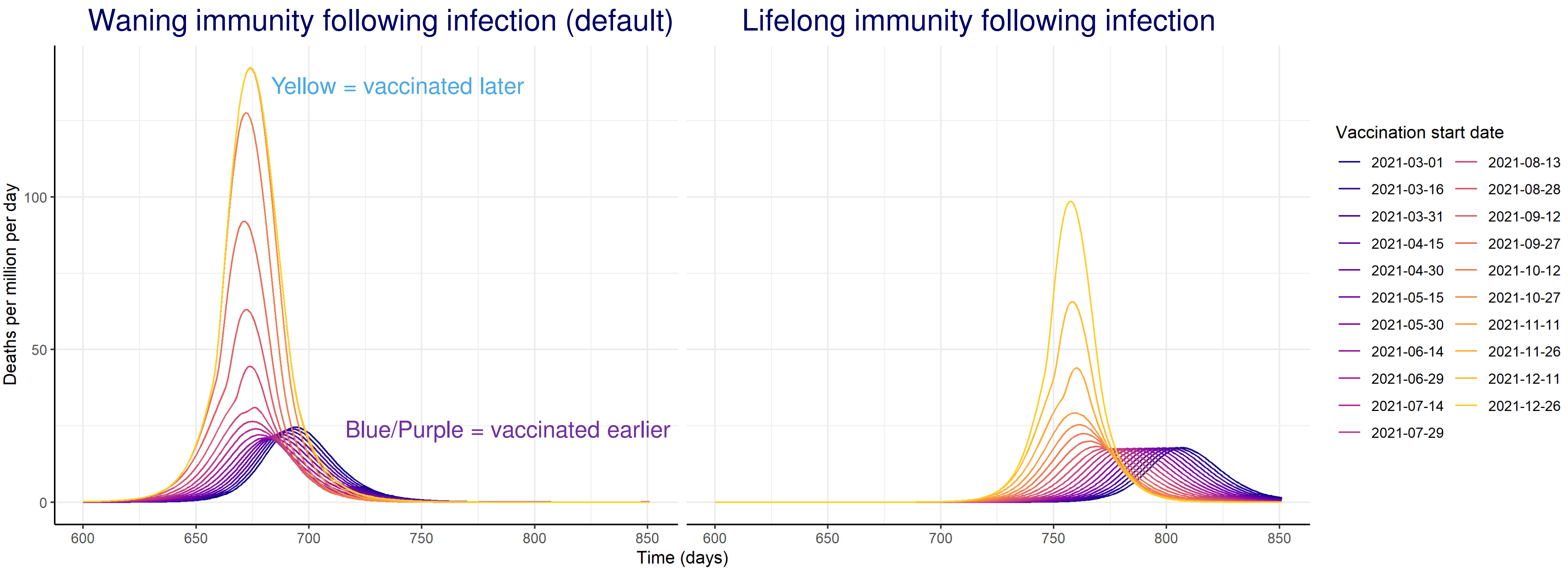
Sensitivity to assumptions about take-up within age groups: **infections averted**



Within priority group coverage scenario	65+ years	<65 years
Default	85%	70%
Optimistic elderly	95%	70%
Optimistic elderly + pessimistic younger	95%	50%
Pessimistic elderly + pessimistic younger	70%	50%

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

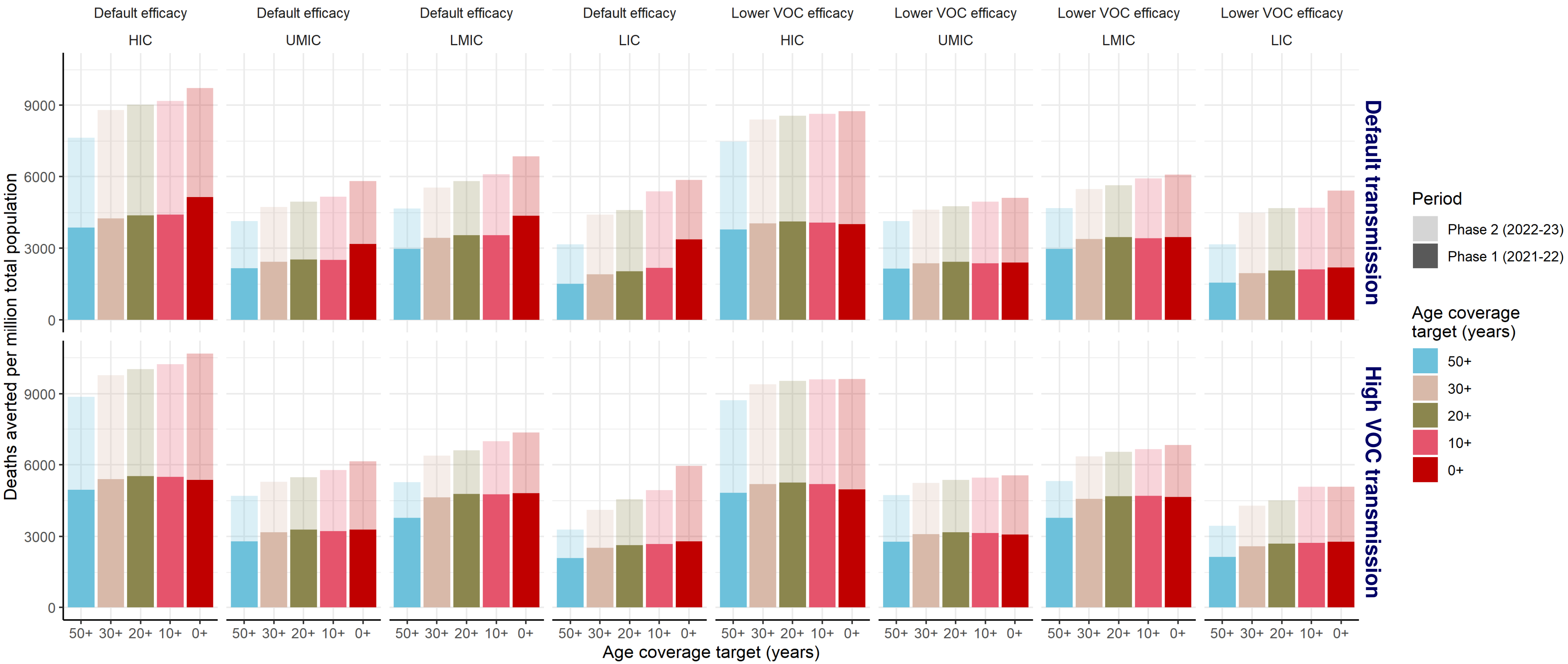
Timing of window of vaccination relative to epidemic peak



Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

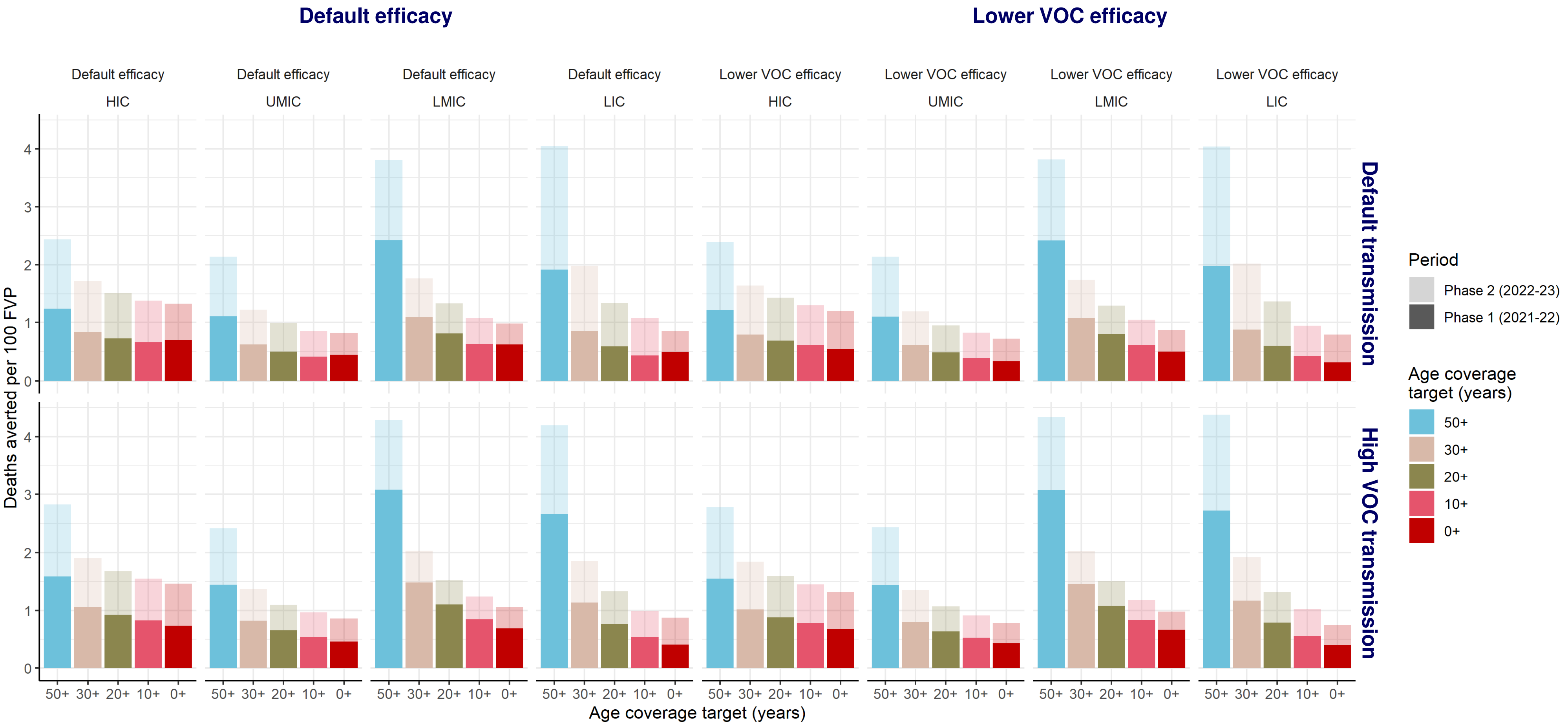
“Matrix” of VOC impact – conceptualised as impact on transmission and impact on vaccine efficacy

Default efficacy **Lower VOC efficacy**



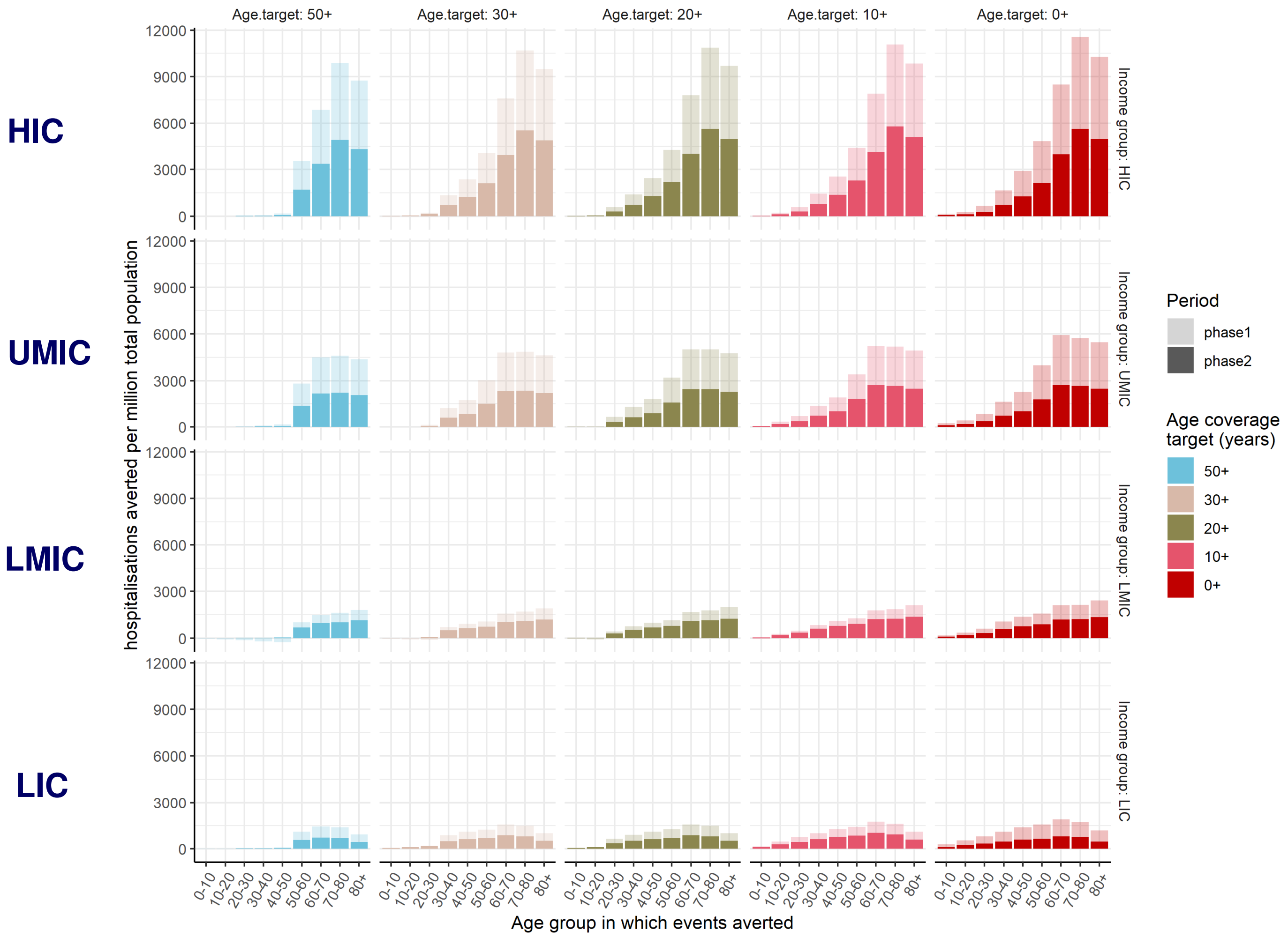
Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

“Matrix” of VOC impact – conceptualised as impact on transmission and impact on vaccine efficacy



Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Age groups in which hospitalisations averted for each age coverage targeting strategy



Notes

Deaths and hospitalisations primarily averted in oldest age groups (where largest severe disease and mortality observed)

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

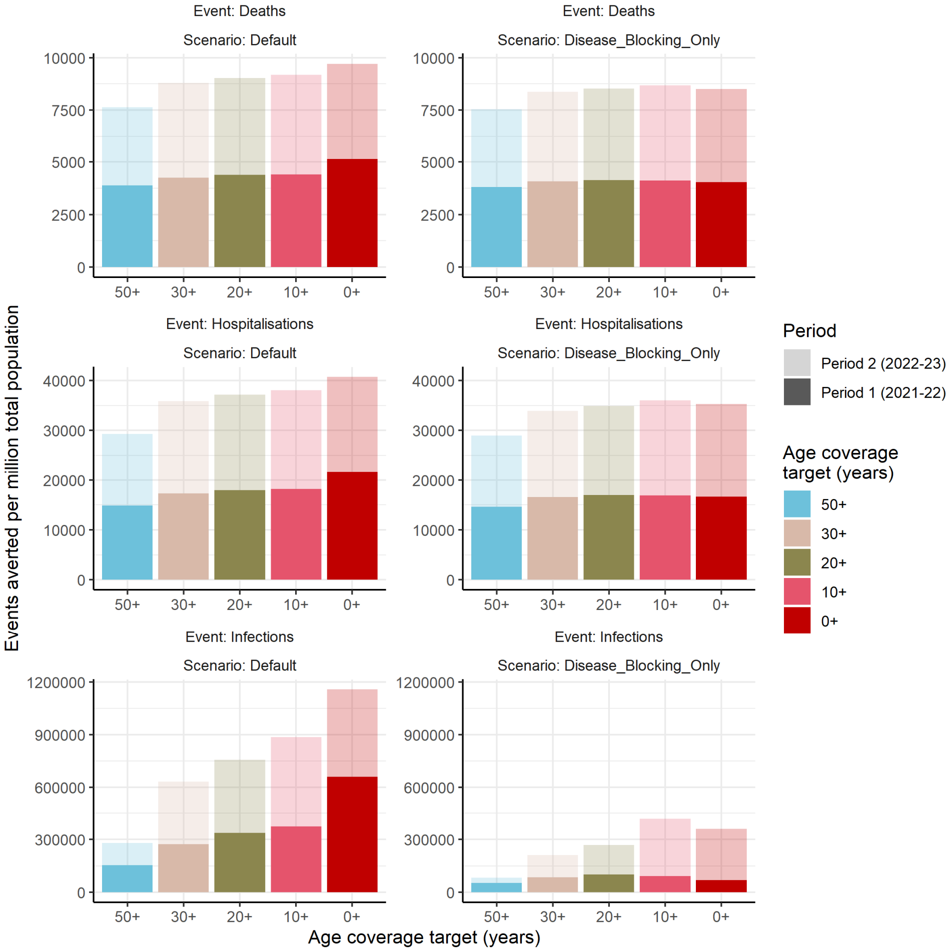
Sensitivity analyses (shown for **HIC** setting): Disease blocking vaccine only

Scenario: Default **Scenario: Disease-blocking vaccine only**

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



Note some impact on infections due to assumption that vaccinated infections are less infectious

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

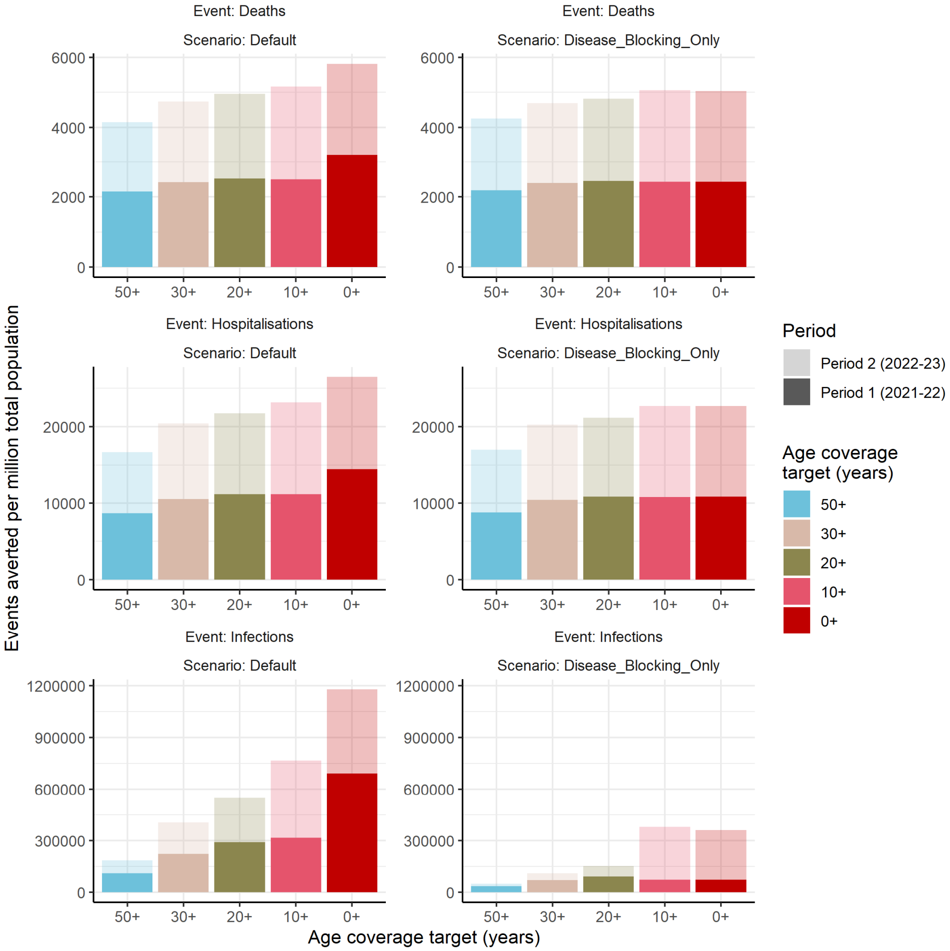
Sensitivity analyses (shown for **UMIC** setting): Disease blocking vaccine only

Scenario: Default **Scenario: Disease-blocking vaccine only**

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



Note some impact on infections due to assumption that vaccinated infections are less infectious

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

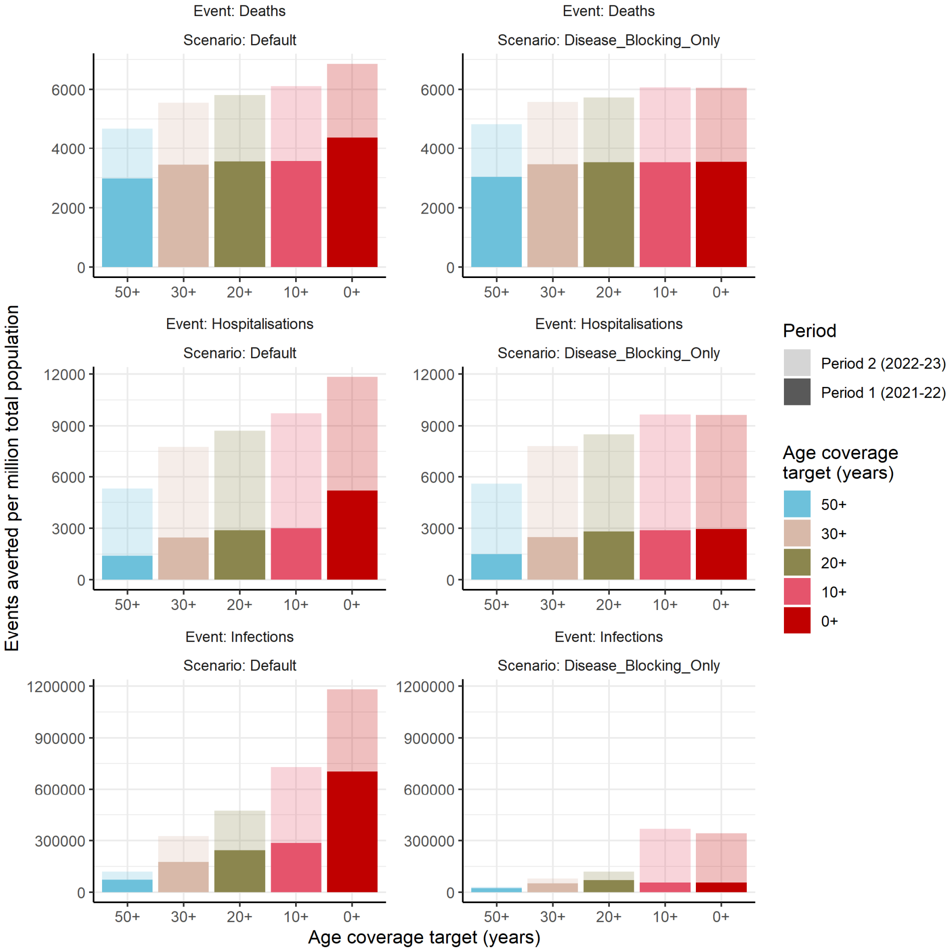
Sensitivity analyses (shown for **LMIC** setting): Disease blocking vaccine only

Scenario: Default **Scenario: Disease-blocking vaccine only**

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



Note some impact on infections due to assumption that vaccinated infections are less infectious

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

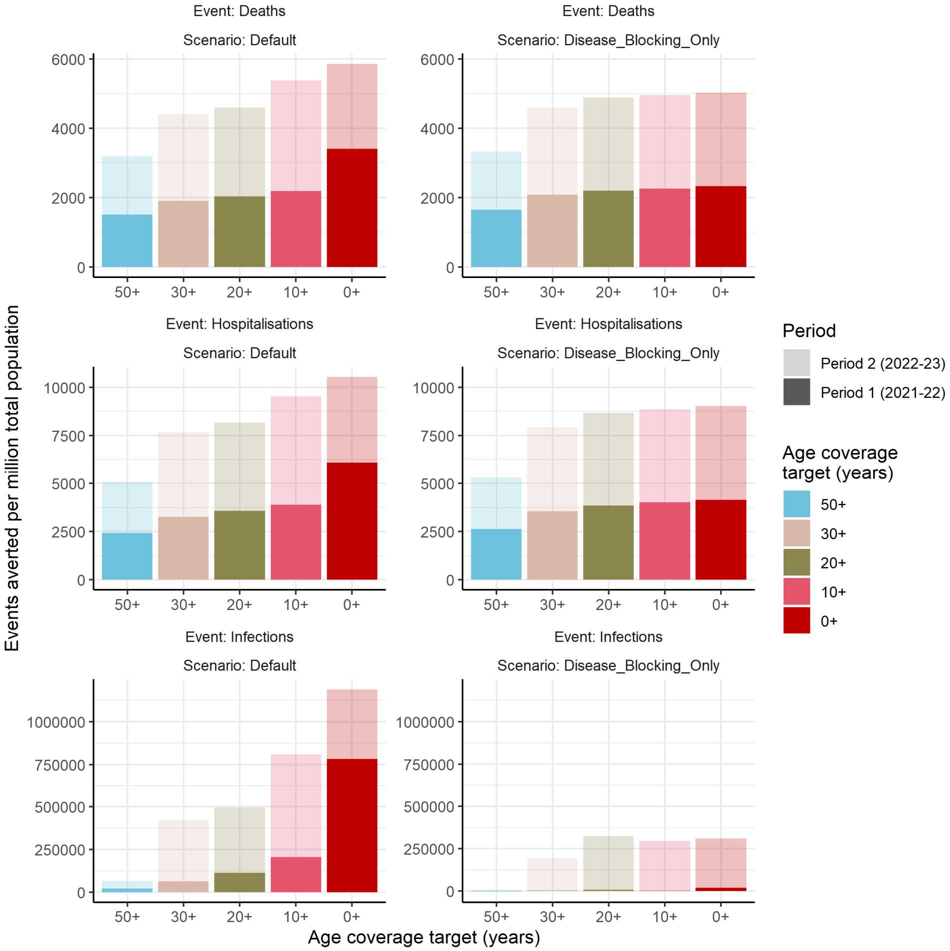
Sensitivity analyses (shown for **LIC** setting): Disease blocking vaccine only

Scenario: Default **Scenario: Disease-blocking vaccine only**

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



Note some impact on infections due to assumption that vaccinated infections are less infectious

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

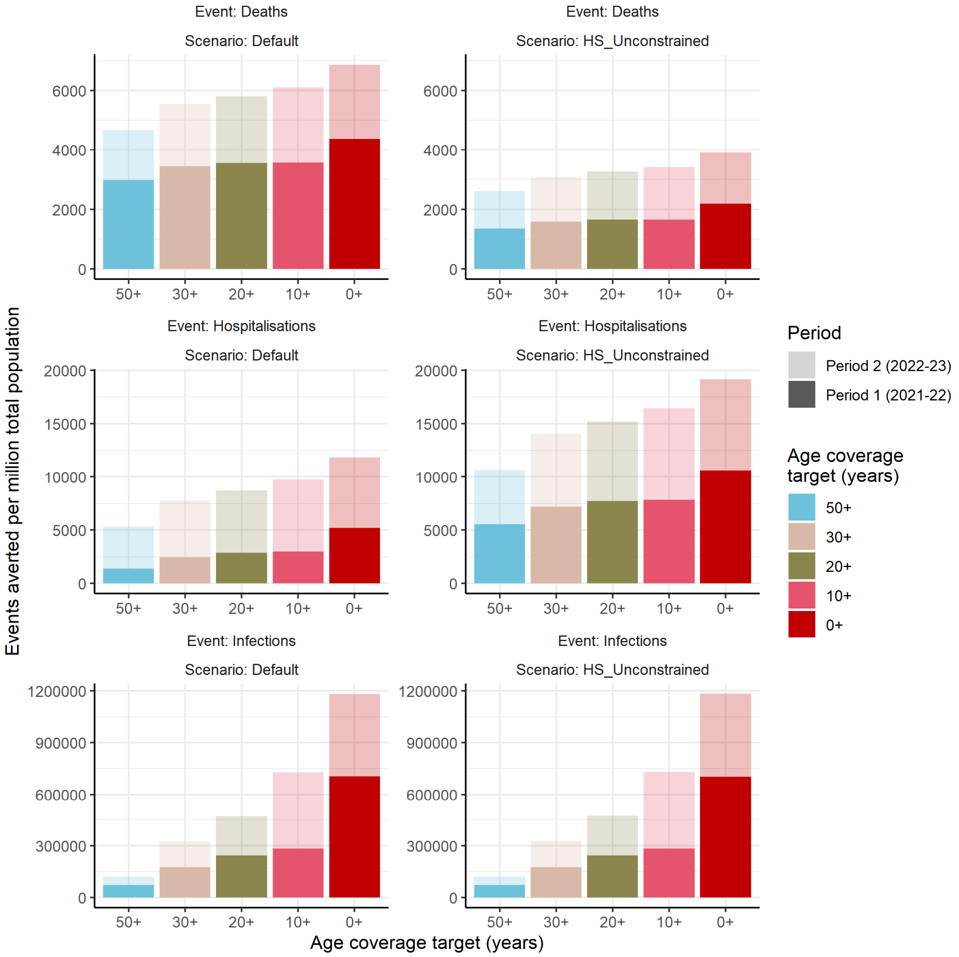
Sensitivity analyses (shown for **LMIC** setting): Health Systems Unconstrained

Scenario: Default **Scenario: Health systems unconstrained**

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



Note: impact on infections does not change, but greater impact in hospitalisations, therefore fewer deaths to avert

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

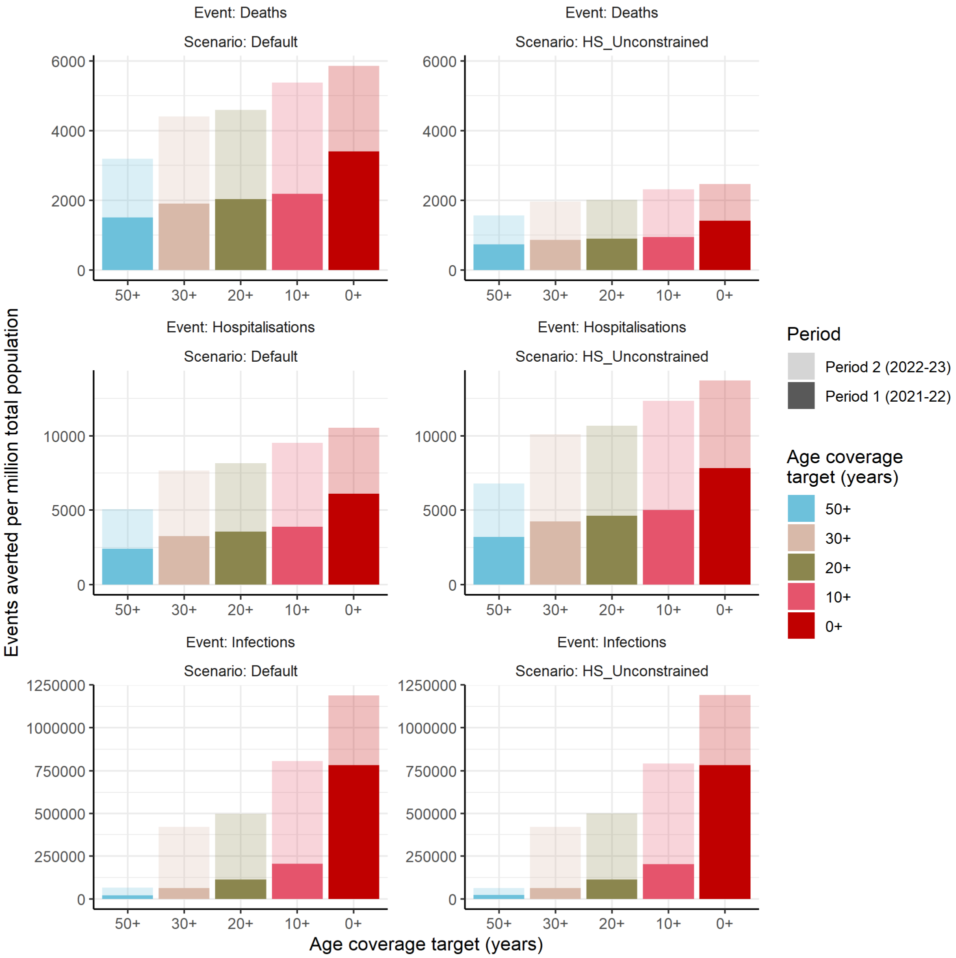
Sensitivity analyses (shown for **LIC** setting): Health Systems Unconstrained

Scenario: Default **Scenario: Health systems unconstrained**

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



Note: impact on infections does not change, but greater impact in hospitalisations, therefore fewer deaths to avert

Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

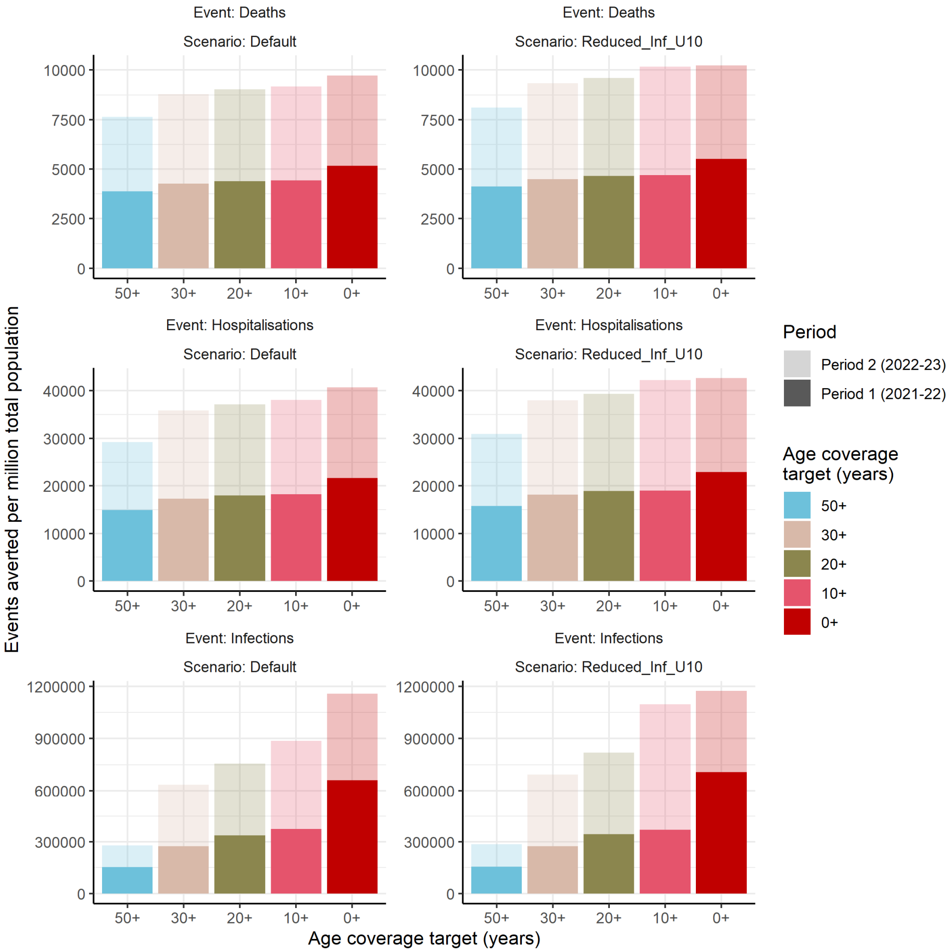
Sensitivity analyses (shown for **HIC** setting): Reduced infectiousness in <10 years

Scenario: Default **Scenario: Reduced infectiousness <10 years**

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



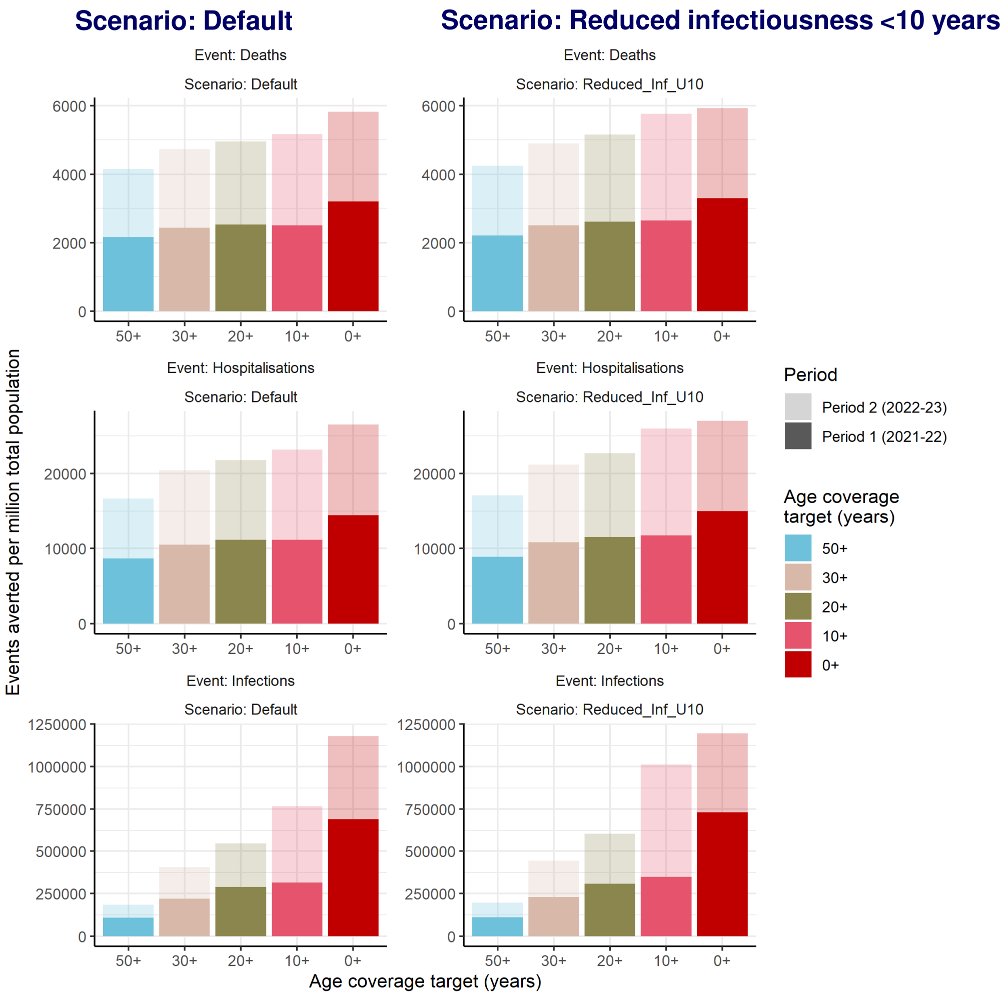
Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Sensitivity analyses (shown for **UMIC** setting): Reduced infectiousness in <10 years

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Sensitivity analyses (shown for **LMIC** setting): Reduced infectiousness in <10 years

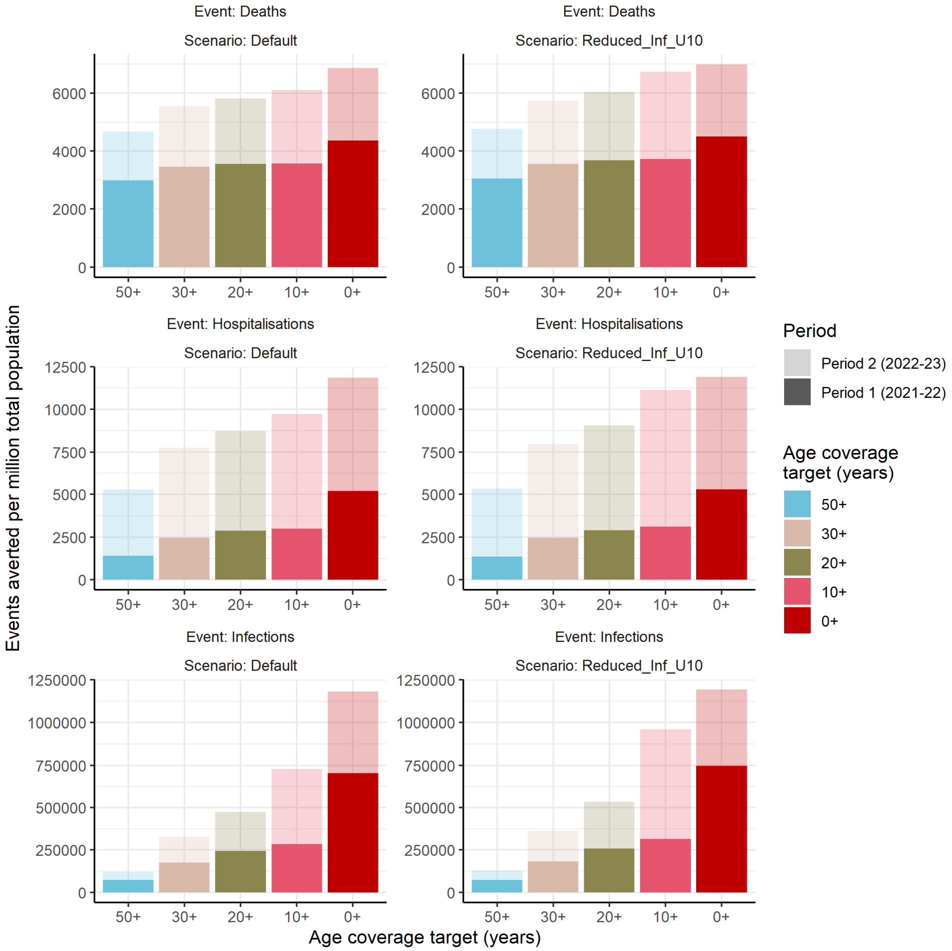
Scenario: Default

Scenario: Reduced infectiousness <10 years

Deaths averted per million population

Hospitalisations averted per million population

Infections averted per million population



Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

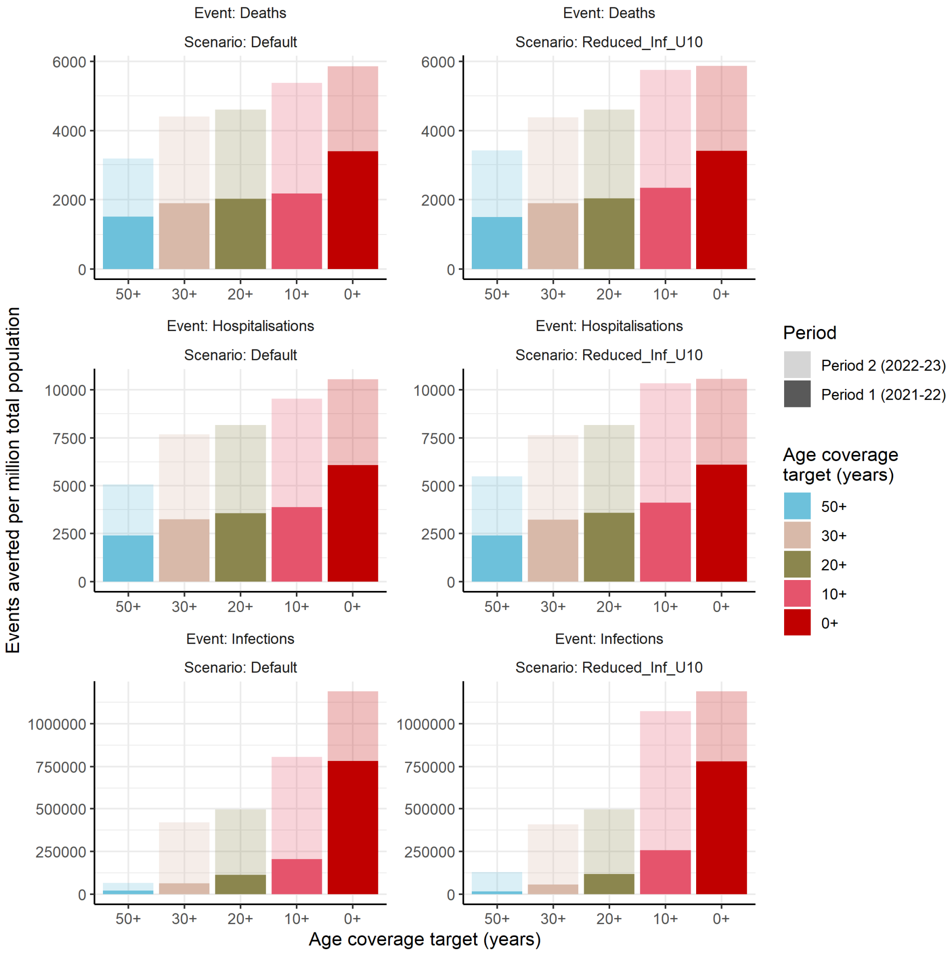
Sensitivity analyses (shown for **LIC** setting): Reduced infectiousness in <10 years

Scenario: Default **Scenario: Reduced infectiousness <10 years**

Deaths averted per million population

Hospitalisations averted per million population

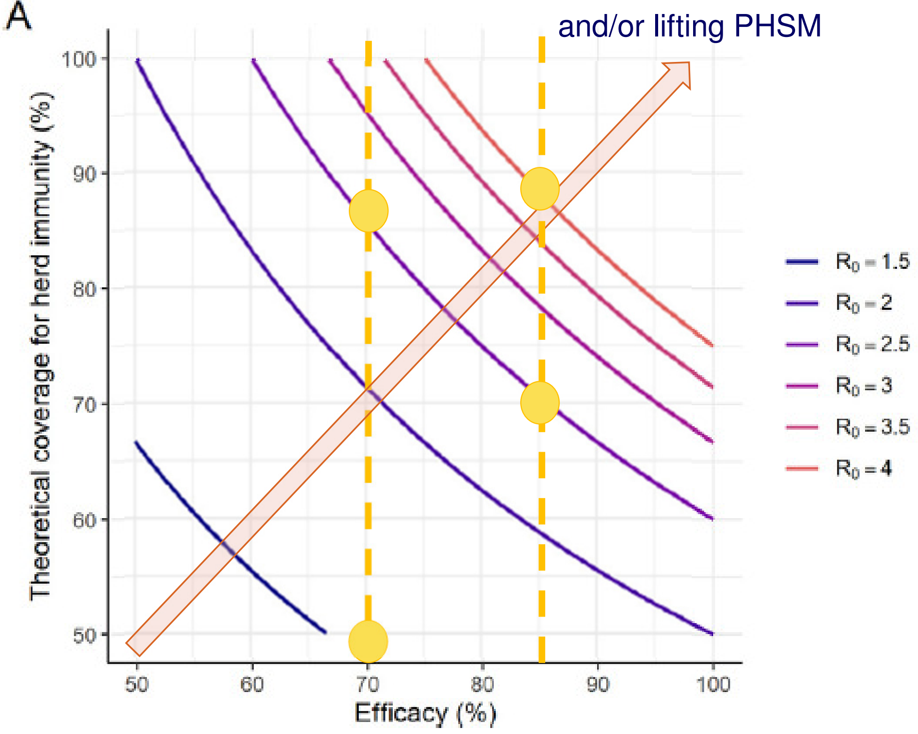
Infections averted per million population



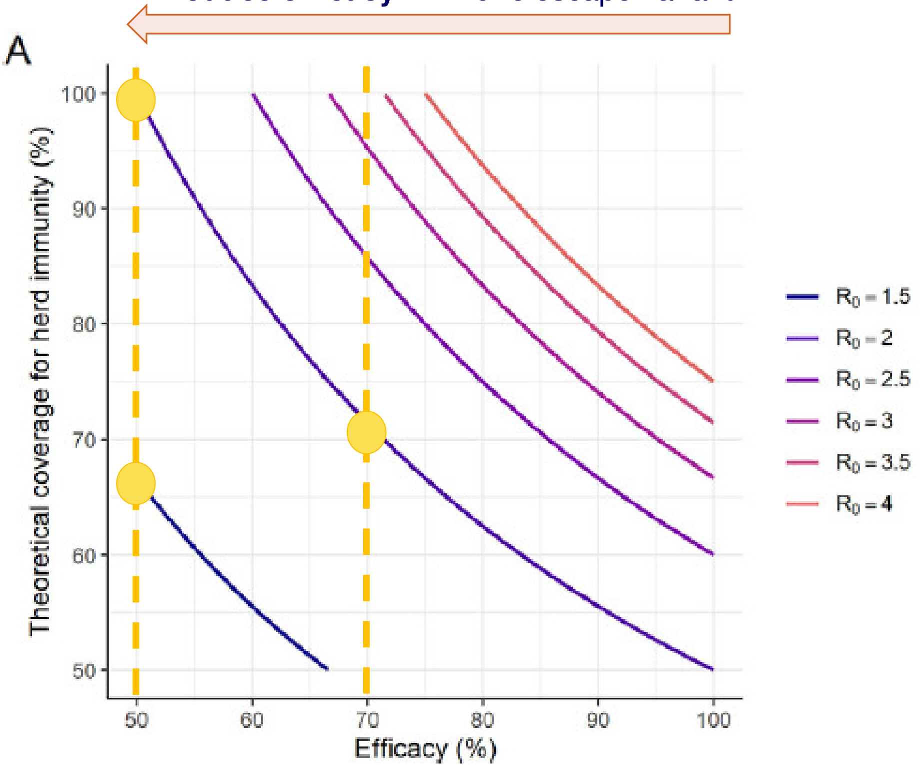
Source: Hogan, Winskill, Watson, Ghani, 2021, Imperial College London

Coverage and efficacy tradeoffs in context of variants

Increase R: More transmissible variant and/or lifting PHSM



Reduce efficacy: Immune escape variant

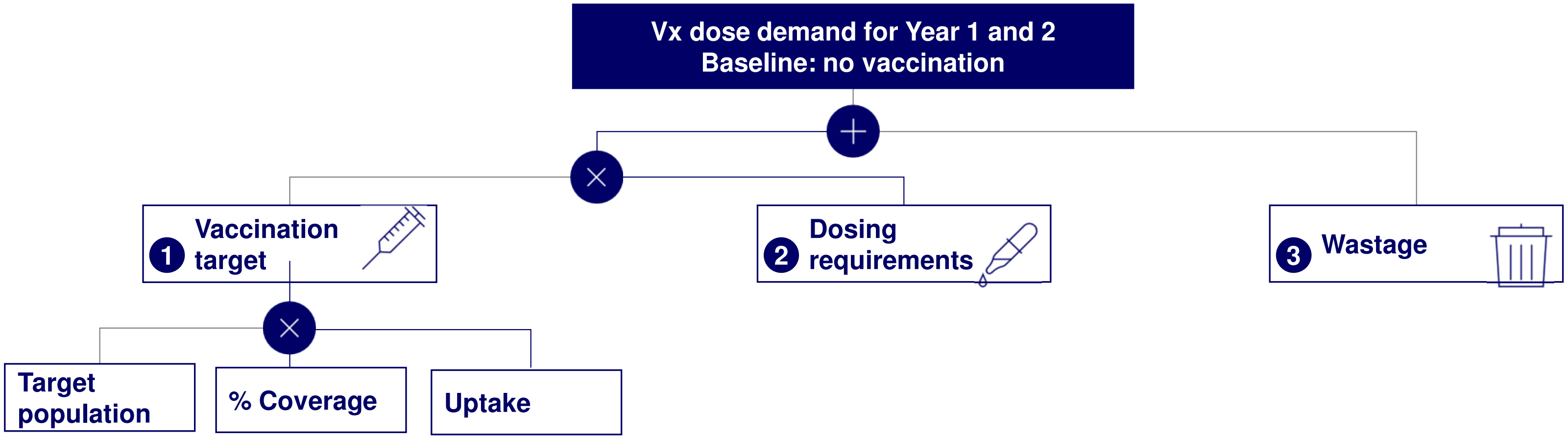


Hogan et al. (2021) Vaccine. https://doi.org/10.1016/j.vaccine.2021.04.002

Appendix: Dose requirements

Dose requirement is calculated as a function of the vaccination target and is subject to epidemiological scenarios

Methodology



Vx dose demand for Year 1 and 2
Baseline: no vaccination

1 **Vaccination target**

2 **Dosing requirements**

3 **Wastage**

Target population

% Coverage

Uptake

Assumptions & sources

Target population (TP):

- Older adults and high-risk groups: 50yrs old+
- All adults: 30yrs old+
- Adults and adolescents: 12yrs old+
- Include children: 0yrs old+

Descending age order is applied within each goal. 2021-2022 birth cohort used

Coverage: age dependent (85% 65yrs+; 70% 5-65yrs; 70% - 87% 0-5yrs based on historical performance)

Uptake: time to reach assumed coverage: based on country groupings*

Three scenarios:

- **'No booster':** Two-dose course primary vaccination for HICs and UMICs and one-dose course primary vaccination for LMICs/LICs
- **'High-risk booster':** Two-dose course primary vaccination for all countries. Annual boosters for high-risk groups*, every 2 years for general population
- **'Yearly booster':** Two-dose course primary vaccination for all countries. Annual booster for all

Number of doses that are purchased but not used

Based on predominant 10-dose vial size and delivery mechanism (campaigns): 10%

---

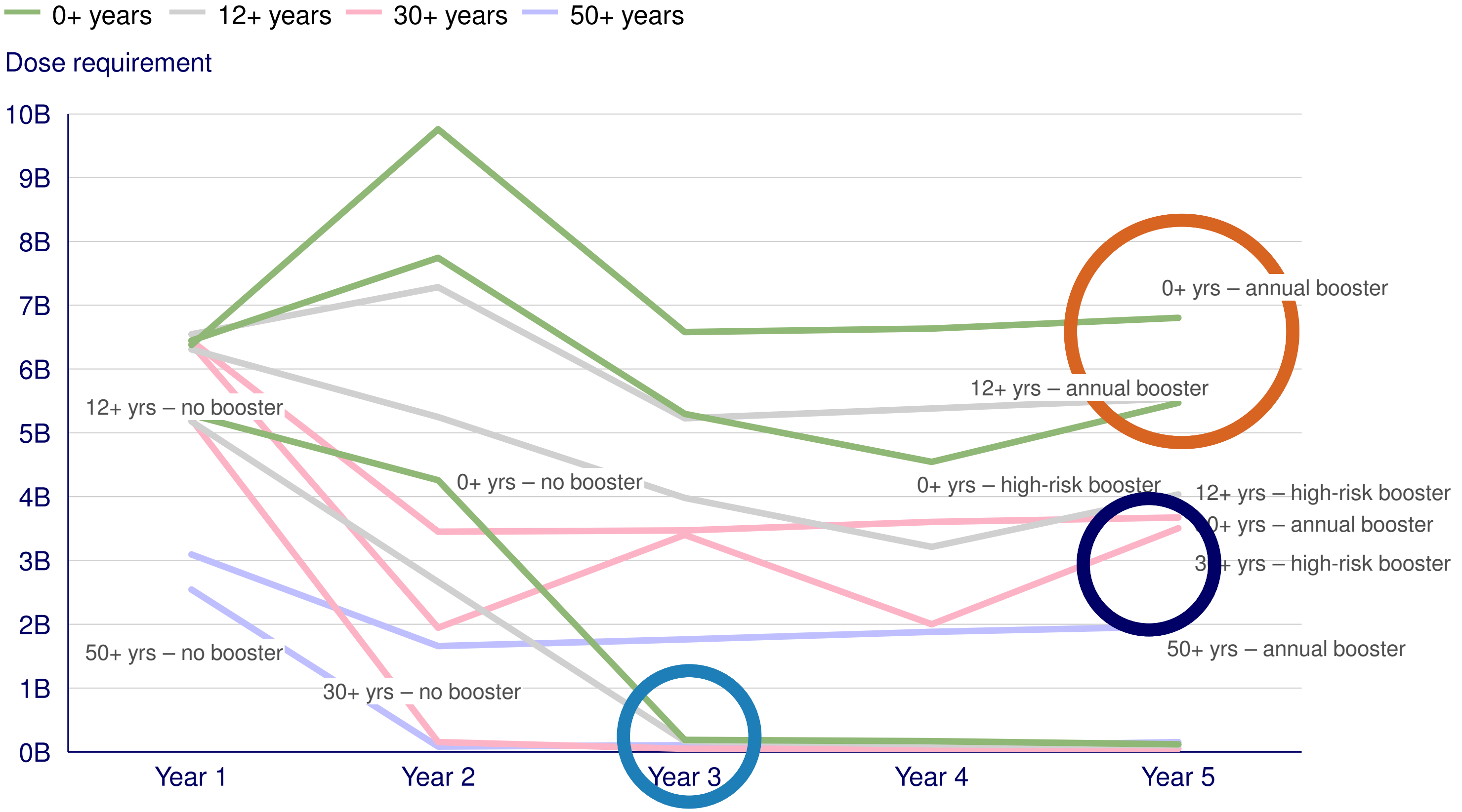
* Uptake country groupings take into account cold chain capacity, health system strength, campaign experience, country readiness, healthcare workforce, health expenditure, financing constraints, and population size. Expressed as max % share of pop reachable per month

** High risk groups assumed at 20% of total population in any given country

Last updated: June 17, 2021

B. Dose requirement per scenario per year

The average annual dose requirement per scenario over a 5-year period ranges from 0.6 billion doses to 7.2 billion doses



The 0+ yrs and 12+ yrs annual booster scenarios
have the highest annual dose requirement

The high-risk booster scenarios
have the most volatility from year to year

In the no-booster scenarios, dose requirement approach 0 in Year 3

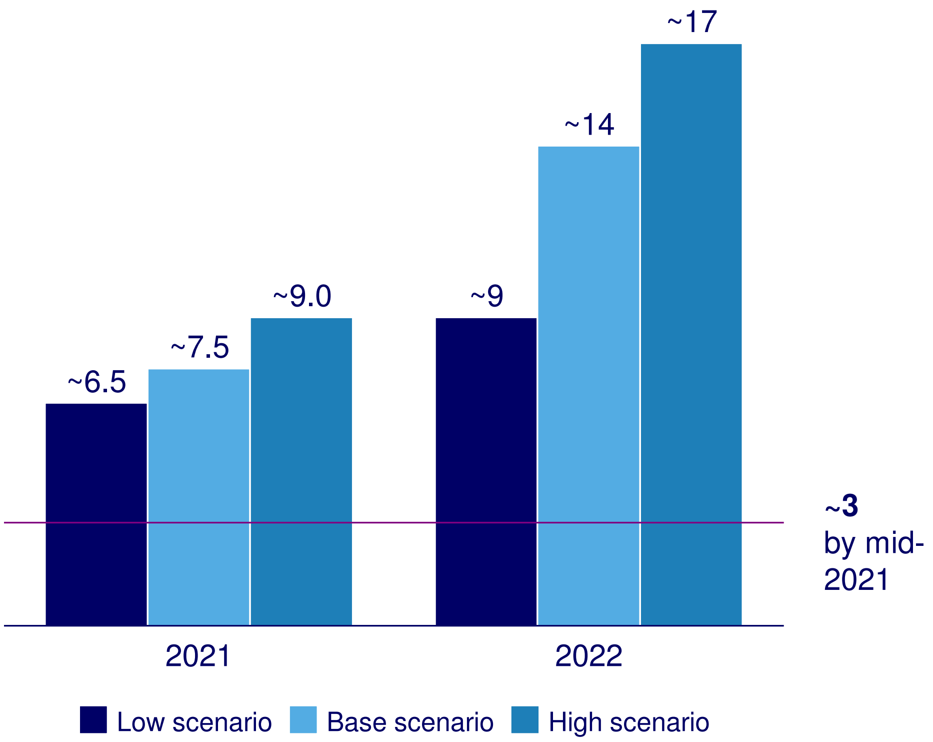
Source: Global production model and demand forecast, COVID-19 market assessment working group (WHO, CEPI, Gavi, UNICEF, BMGF)

Appendix: Supply

June 29, 2021

B. Three supply scenarios

Production estimates[1] in billion doses of Covid-19 vaccines per annum



Source: Global Market Assessment (CEPI, GAVI, PAHO RF, UNICEF, WHO)

Global vaccine supply forecasts depend on a set of parameters that are hard to accurately predict; three supply forecast scenarios (low, base, high) **must be taken with great caution**

Multiple different technology platforms:

- **2021:** production divided between **mRNA, Non-Replicating Viral Vector, and Inactivated Vaccines with about a 1/3, 1/3, 1/4 split in the base scenario**
- **2022:** potential entry of Protein Subunit Vaccines with about a 1/3 from mRNA and 1/5 to Viral Vector, Inactivated and Protein Subunit split in the base scenario

Key factors with largest variance across the three scenarios:

- The probability of technical and regulatory success
- The manufacturing risk, technology transfer experience, and scale-up curve
- The availability of raw materials and manufacturing inputs
- The timing of regulatory approval and actual production ramp-up

Throughout the 2021-2022 period, countries’ ability to secure the supply they need for their vaccine programs is linked not only to supply availability, but also factors that drive **distribution**

World Health Organization

Appendix: Incremental benefit analysis and funding

C. Incremental benefit analysis for moving to higher ambition goals

Example LIC scenario of deaths vs. GDP losses under different vaccination and PHSM strategy combinations implemented over 2021-2022

	Vaccination target achieved by end-2021			Vaccination target achieved by end-2022		
Vaccination strategy	**Deaths (over 1000 days)[a]**	**GDP loss (over 1000 days)[b]**	**Incremental GDP loss per life saved[c]**	**Deaths (over 1000 days)[a]**	**GDP loss (over 1000 days)[b]**	**Incremental GDP loss per life saved[c]**
No vaccination, no PHSM	73,102	$12M		73102	$12M	
50+	42,524	$65M	$1,727	42387	$163M	$4,903
30+	31,640	$152M	$7,986	31370	$424M	$23,668
12+	588	$299M	$4,723	89	$880M	$14,587
0+	22	$462M	$287,925	51	$1,304M	$11,150,277
Alternative counterfactual: No vaccination, PHSM in place throughout*	29,105	**$2,385M**		29105	**$2,385M**	

- **Vaccination strategy:** age descending, vaccination rollout is at a constant rate required to achieve the target coverage. Vaccine product assumed to be 70% effective at reducing the risk of infection.
- PHSM are lifted at the completion of vaccination of each age group. Simulation run over 1000 days, assuming Rt=1.2 at beginning of vaccination campaign with PHSM in place until the vaccination target is reached, with social contact patterns then increased to approximate level of Rt=1.8 when PHSM are lifted
- Gross Domestic Product (GDP) loss over 1000 days in US dollars calculated compared to a no-pandemic counterfactual GDP scenario.

Source: Harvard School of Public Health

A strategy relying only on PHSM to control COVID-19 much more costly than a carefully constructed strategy that involves both vaccination and PHSM

Both health and economic benefit from **faster vaccination**

Only short-term economic impacts from supply side shock captured; **conservative estimates of the economic benefits** of vaccination over the short-term because they do not capture demand shocks, changes in government revenue, international trade losses, and long-term GDP impacts

June 29, 2021

C. Incremental benefits and trade-offs – LICs and LMICs

High, very high vaccination ambition

Benefit

National - Biggest incremental benefit of moving to younger age strata as a result of demographics, mixing patterns and health system constraints

National – Incremental economic benefits in the from of GDP loss aversion provided timely vaccination[1]

International - $9 trillion benefits by 2025, with over 40% of this gain going to advanced economies (IMF, ICC)

Risk

National - Sustainability of immunization outcomes across many other diseases of considerable burden

National - Risk to other health-related investments

Low, mid vaccination ambition

Benefit

National - Most efficient vaccination strategy

National - Focus limited health system resources on achievable target with largest incremental benefit

Risk

National - Negative health outcomes if increase in cases and IFR

National - Negative economic impact due to consumption, trade, capital flows consequences

International - *N*egative impact on control of VoC, economic recovery

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1. LMIC example; Ferranna, Cadarette, Bloom (2021) Harvard School of Public Health

C. Mapping of key funding sources

In low-cost scenarios, ODA and dose sharing could possibly be main sources of funding for **lower income settings**; for higher cost scenarios, MDBs and, ultimately, countries' budget would be an important contributor

Funding source	Considerations	Supporting evidence
MDB	**Repayment needs, constraints and uncertainty on demand and supply, sanctions and process delays**	So far **$ ~8 bn committed in MDB lending for vaccine procurement and delivery against $ ~24 bn announced** envelope
ODA	Considerable funding already raised, but need represents an important share of current ODA	**So far, ~$9 bn committed to COVAX for 2021**
HICs budgets	Potential source of funding since **economic returns of vaccination accrue to** all countries	Reduced mortality and morbidity from SARS-Cov2 + economic **return of $9 trillion across all countries** and of ~$1tn for HICs[1] *(IMF report)*
Dose donation	Important source that could be unlocked **if countries decided to share their excess supply**	**Corresponds to >1bn doses**

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[1] https://blogs.imf.org/2021/05/21/a-proposal-to-end-the-covid-19-pandemic/

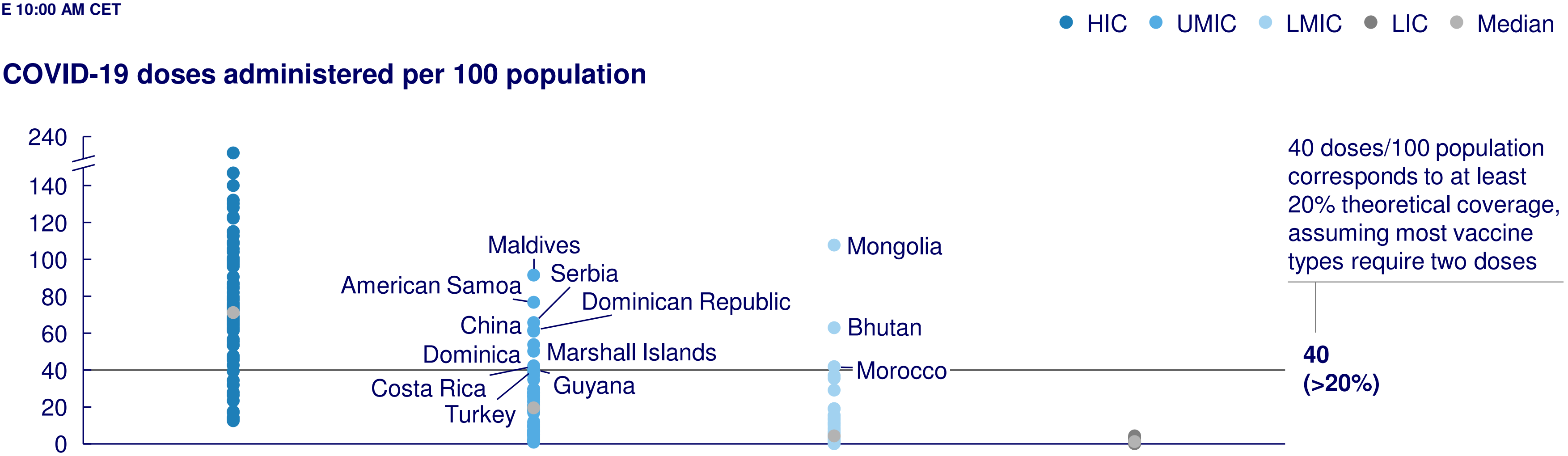
Appendix: Country goals

June 29, 2021

A. Mongolia, Bhutan and Morocco are the only LMIC/LIC that have achieved theoretical coverage of >20%[1]

DATA AS OF 24 JUNE 10:00 AM CET

Cumulative COVID-19 doses administered per 100 population



40 doses/100 population corresponds to at least 20% theoretical coverage, assuming most vaccine types require two doses

Income group	**HIC**	**UMIC**	**LMIC**	**LIC**
Population, millions	1,206	2,945	2,954	686
Population in economies above 40 d/100, millions and %	981 81.3%	1,580 53.7%	41 1.4%	0 0.0%
Economies above 40 d/100, # and % of total	65 78.3%	10 17.9%	3 6.0%	0 0.0%

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1. As defined by 40 doses administered per 100 population (at least 20% theoretical coverage, assuming most vaccine types require two doses)

SOURCE: WHO COVID-19 Dashboard using the list of economies by the World Bank

Appendix: Key actions

What are key enablers to reach global goals? Key areas for action

> ***Worldwide access to vaccines offers the best hope for stopping the coronavirus pandemic***
>
> – Heads of World Bank Group and International Monetary Fund Joint Statement to the G7, June 3 2021

1. Anticipate excess vaccine supplies, particularly in the coming months and redistribution of surplus doses from higher to lower income settings as soon as possible, while urgently evaluate *dose stretching and dose optimization strategies* to expand effective supply

2. Take steps to enable countries to reach desired targets by supporting free cross-border flows of raw materials and finished vaccines, while ensuring full and global recognition of WHO EUL'd products

3. Send early, strong and clear signals about demand to secure manufacturing capacity scale up

4. Governments and vaccine manufacturers to invest in diversifying vaccine productions and prioritize the scale up of vaccine production in the long term, providing increased access for developing countries

5. Greater transparency on vaccine contracts, options and agreements as well as doses delivered and needed: in these challenging circumstances, information means access

Source: Call to Action on COVID Vaccine Access for Developing Countries by Heads of World Bank Group and International Monetary Fund

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