Global update on COVID-19 vaccine effectiveness studies during Omicron

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Technical Consultation Meeting for the EM Regional COVID-19 Vaccine Effectiveness Studies
12–13 November 2023 | Cairo, Egypt

Global questions
on C-19 vaccine effectiveness (VE)

What is VE over time?

What is VE by vaccine?

What is VE against XBB?

525 VE studies across 50 countries as of Nov 2, 2023

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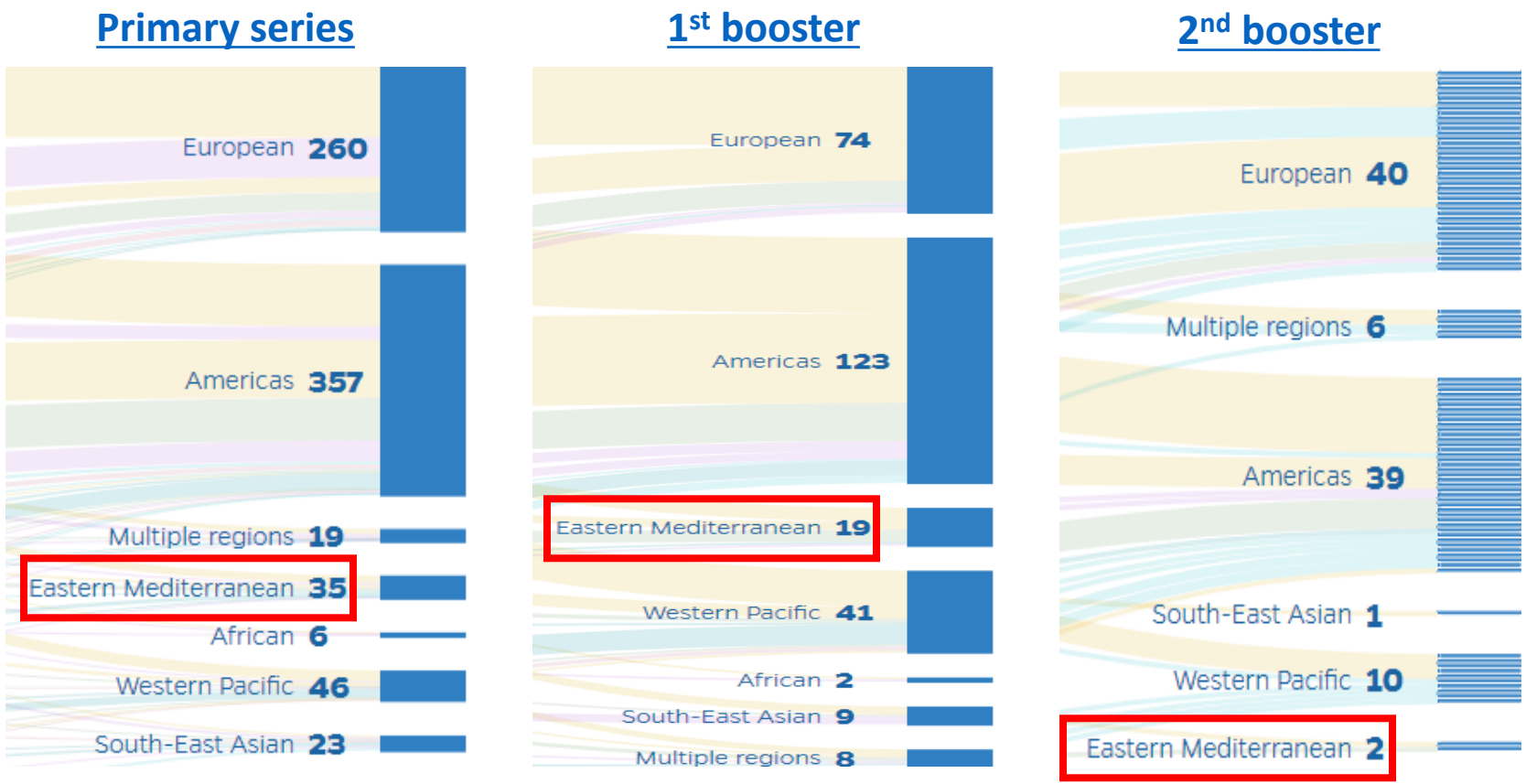

28 VE studies across Egypt, Iran, Kuwait, Lebanon, Morocco, Qatar, UAE

Effectiveness Studies | ViewHub (view-hub.org)

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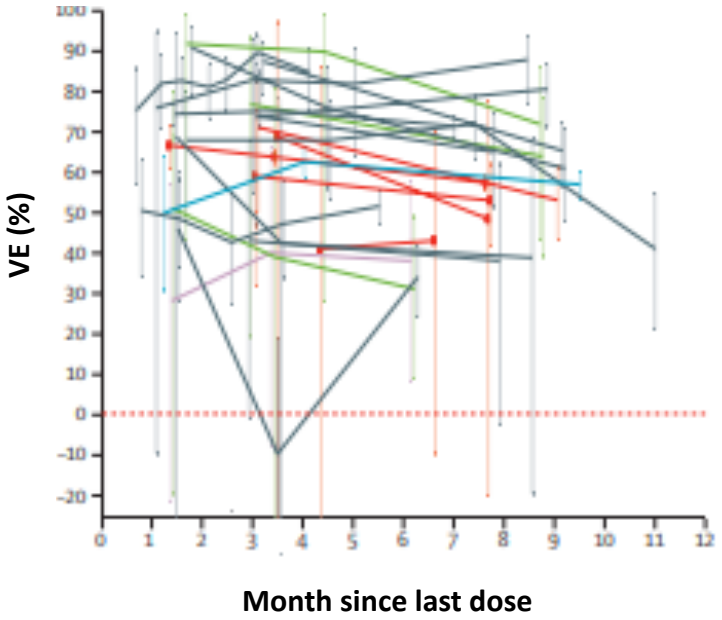
What is VE over time?

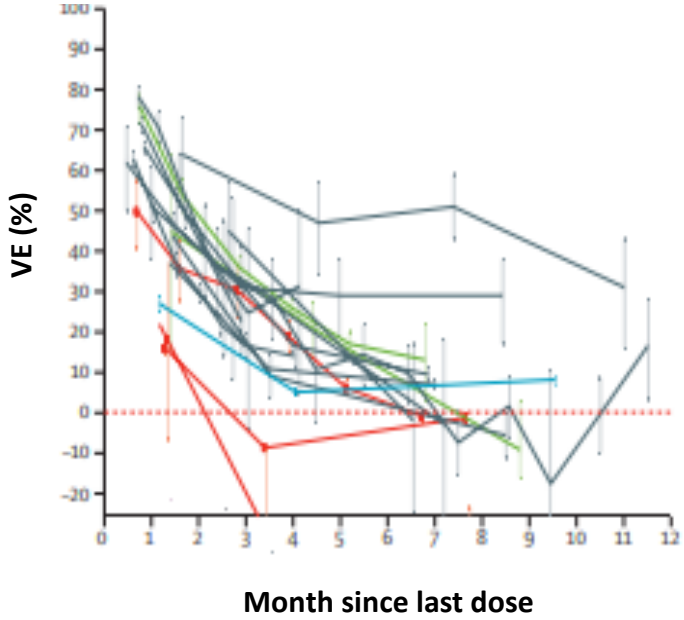
VE of ancestral monovalent primary series

Severe disease



Average decline in VE from 1-6 months
1·0 % point [–3·9 to 6·6]

Symptomatic disease



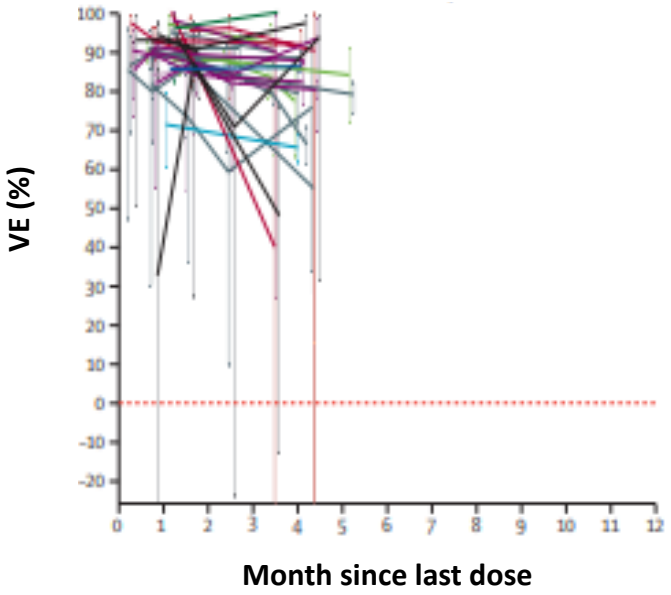
Average decline in VE from 1-6 months
47·6 % points [36·6 to 60·2]

- Vaxzevria (AstraZeneca; all doses)
- Vaxzevria plus mRNA-1273 (Moderna) booster
- Vaxzevria plus Comirnaty (Pfizer–BioNTech) booster
- Ad26.COV2-S (Janssen; all doses)
- mRNA-1273 (all doses)
- mRNA-1273 plus Comirnaty booster
- Comirnaty (all doses)
- Comirnaty plus mRNA-1273 booster
- CoronaVac (Sinovac Life Sciences; all doses)
- CoronaVac plus Comirnaty booster

Higdon et al, 2022, Lancet, meta-regression

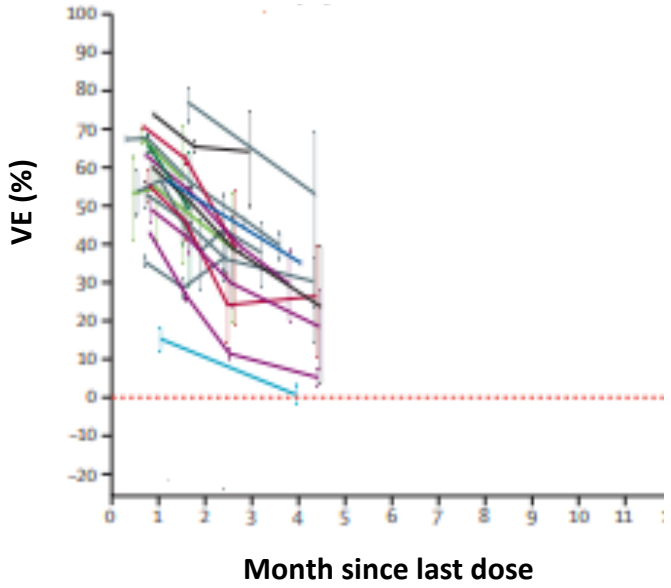
VE of ancestral monovalent 1st booster

Severe disease



Average decline in VE from 1-4 months
5·3 % point [2·4 to 8·7]

Symptomatic disease

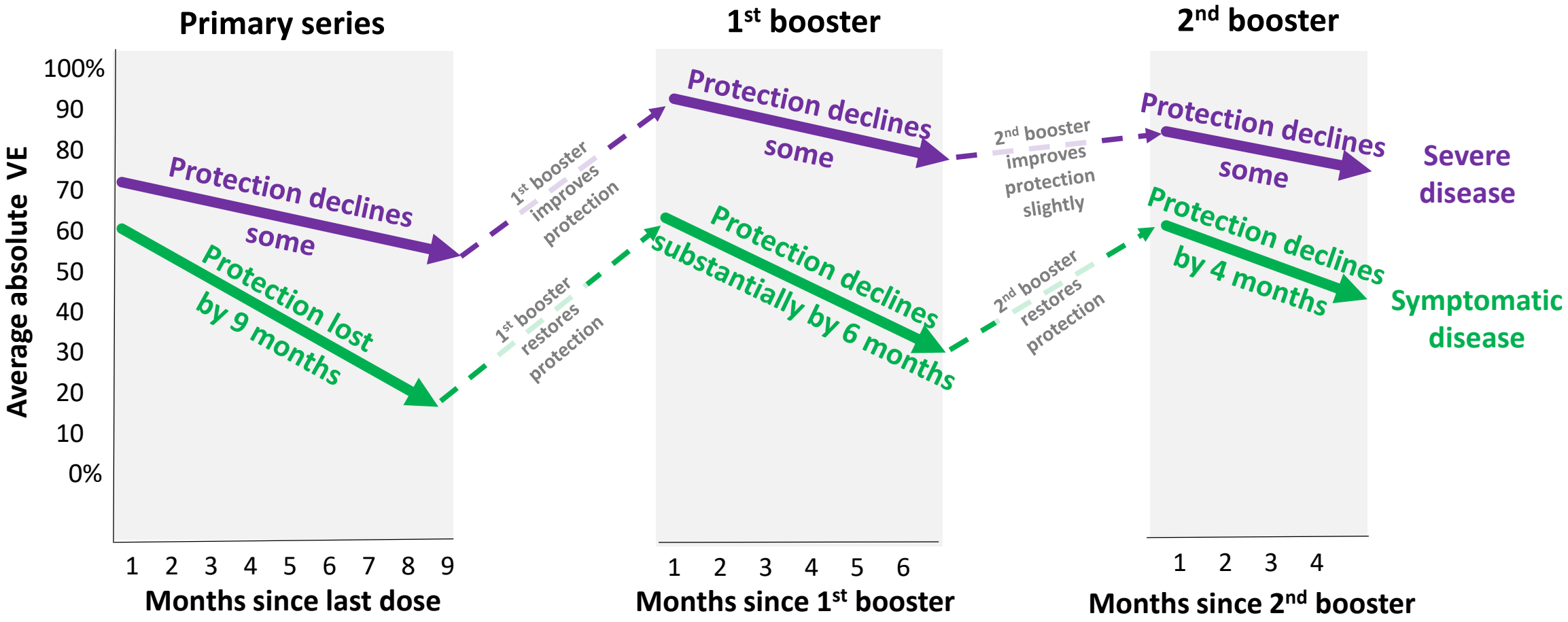


Average decline in VE from 1-4 months
24·3 % points [19·9 to 29·1]

- Vaxzevria (AstraZeneca; all doses)
- Vaxzevria plus mRNA-1273 (Moderna) booster
- Vaxzevria plus Comirnaty (Pfizer–BioNTech) booster
- Ad26.COV2-S (Janssen; all doses)
- mRNA-1273 (all doses)
- mRNA-1273 plus Comirnaty booster
- Comirnaty (all doses)
- Comirnaty plus mRNA-1273 booster
- CoronaVac (Sinovac Life Sciences; all doses)
- CoronaVac plus Comirnaty booster

Higdon et al, 2022, Lancet, meta-regression

VE of ancestral monovalent vaccines



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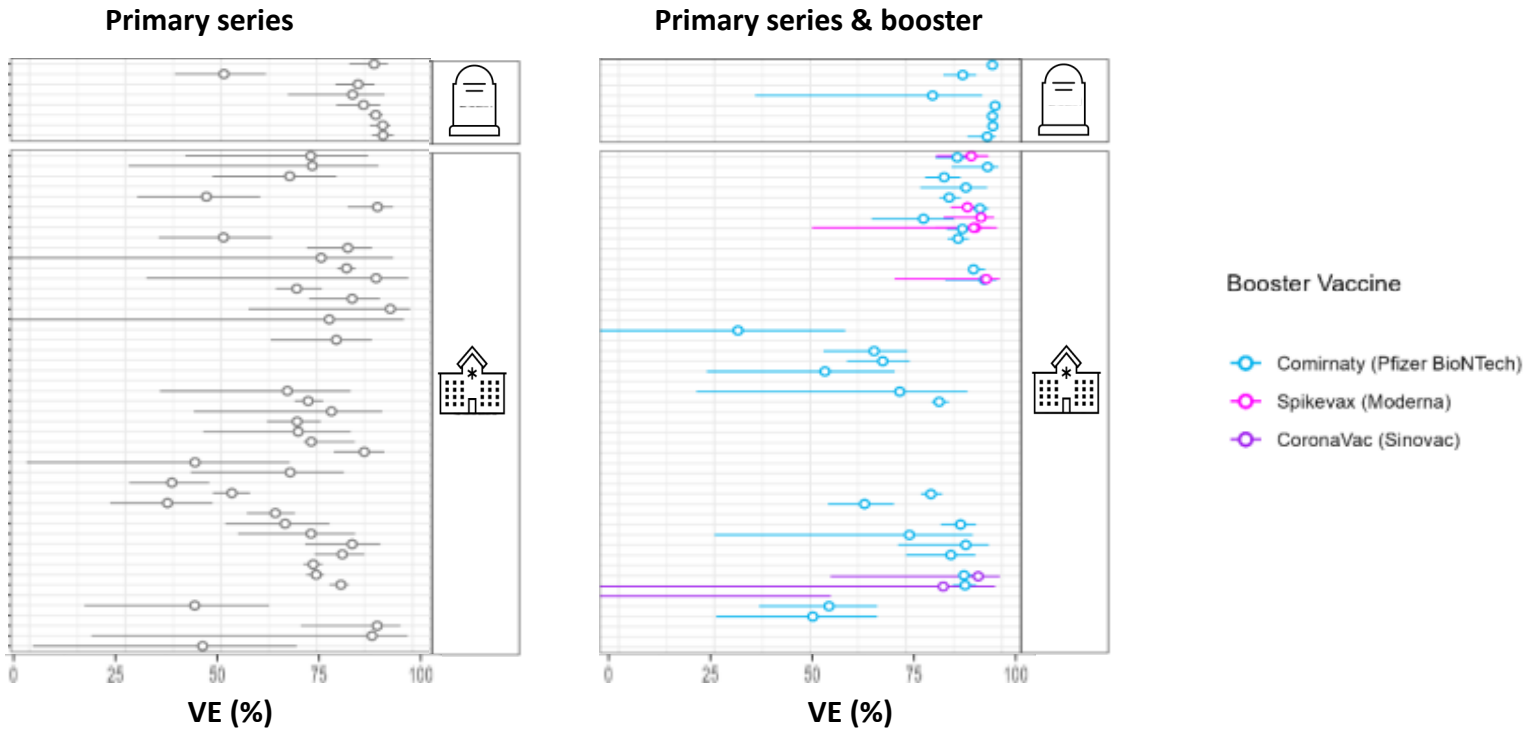
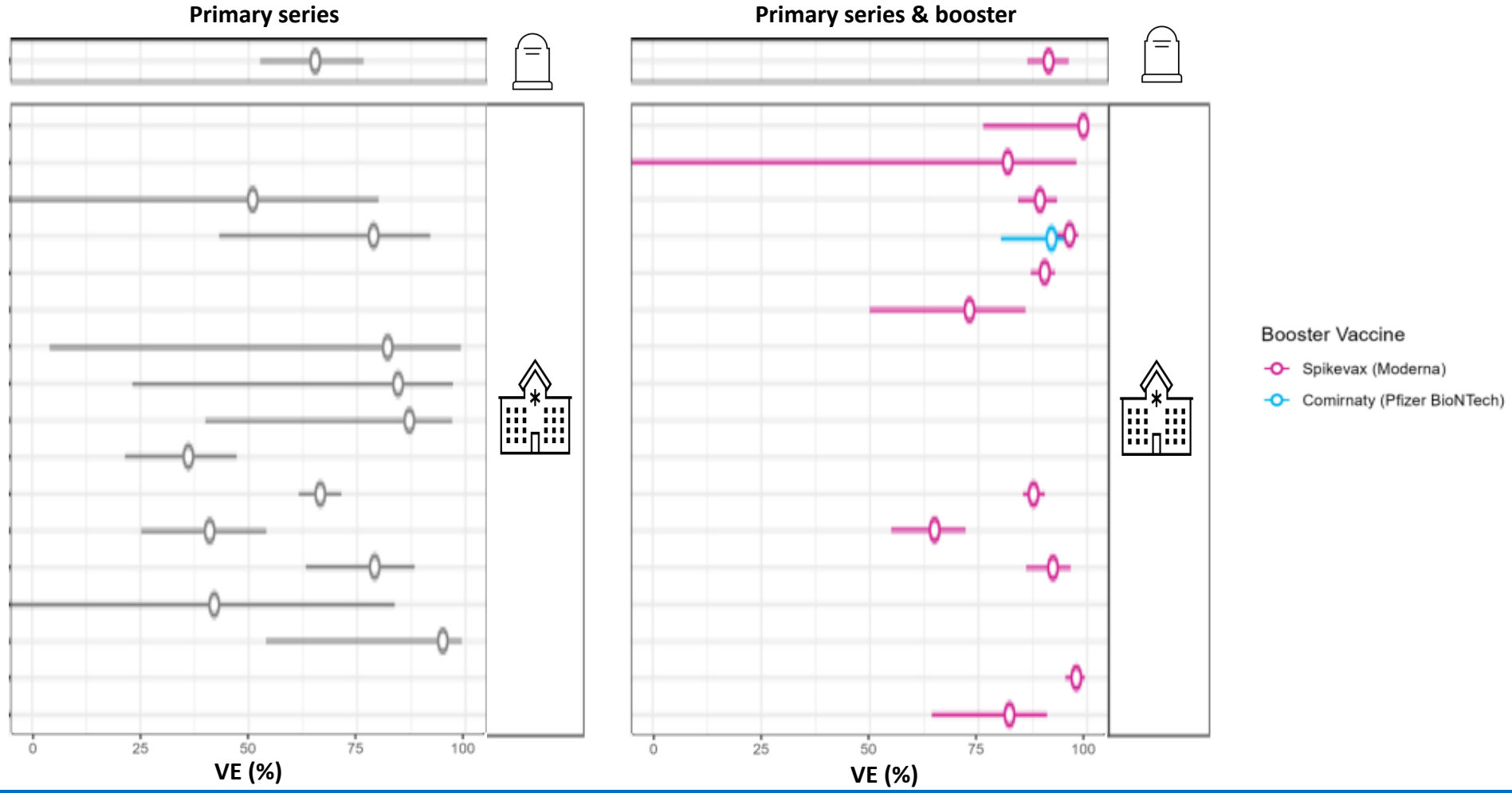
What is VE by vaccine?

VE against severe outcomes by mRNA primary series – Pfizer



COVID19 VE Studies_Forest Plots_Omicron.pdf (view-hub.org)

VE against severe outcomes by mRNA primary series – Moderna



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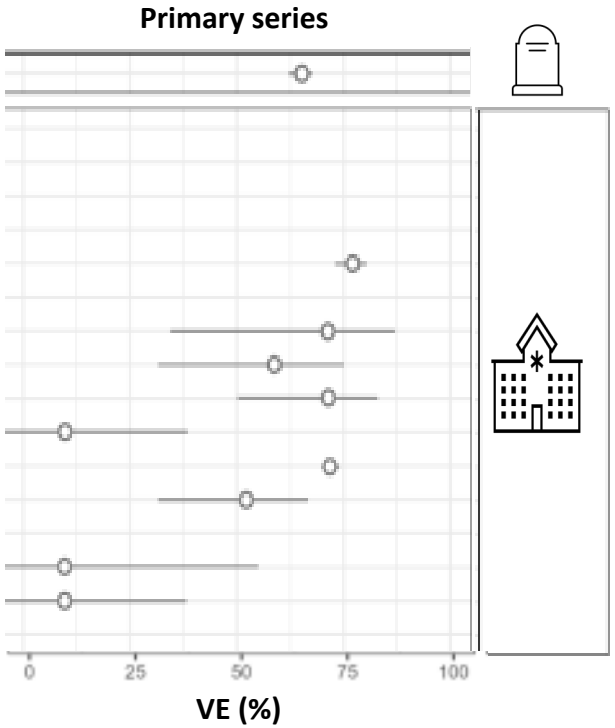
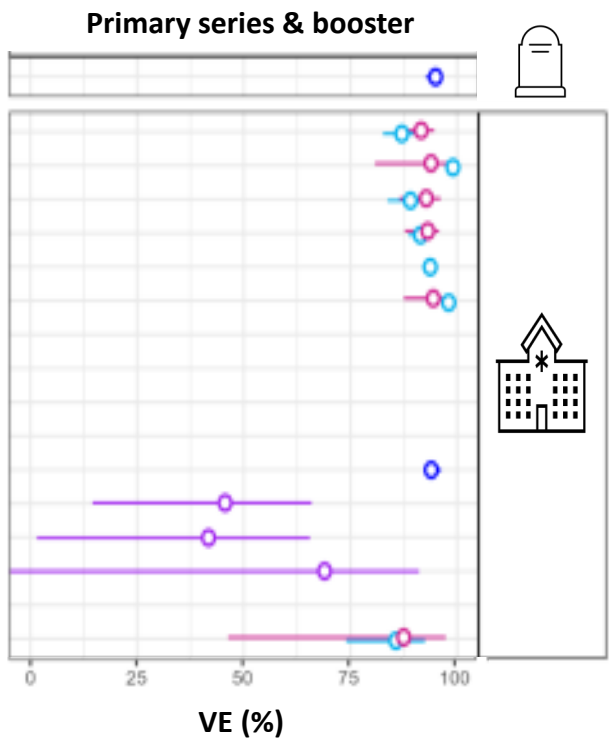
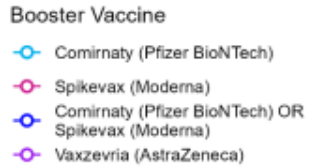
VE against severe outcomes by vector primary series – AstraZeneca & Sputnik

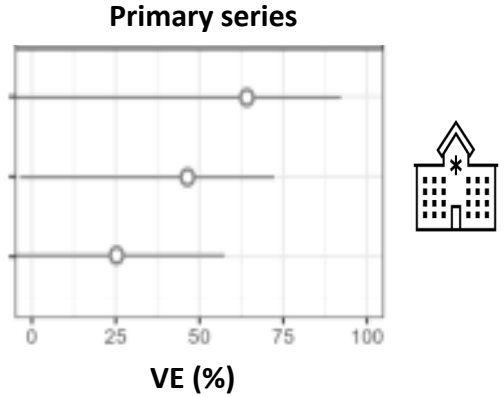
AstraZeneca







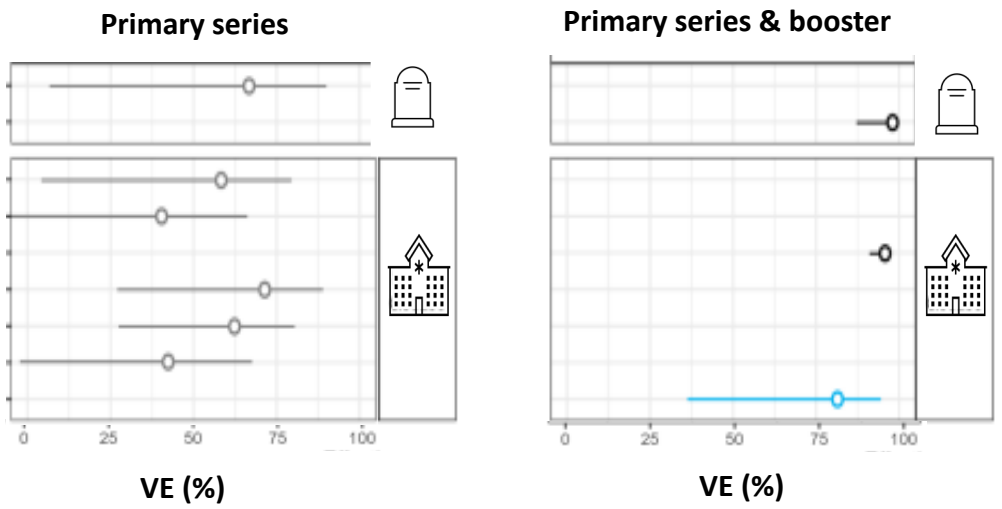
Sputnik



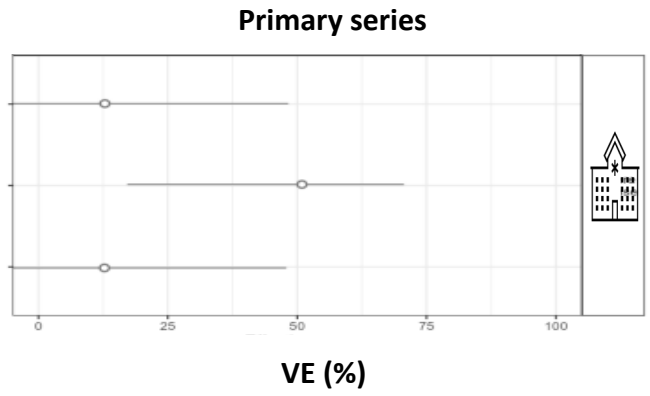
COVID19 VE Studies_Forest Plots_Omicron.pdf (view-hub.org)

VE against severe outcomes by inactivated primary series – Sinopharm & Bharat

Sinopharm

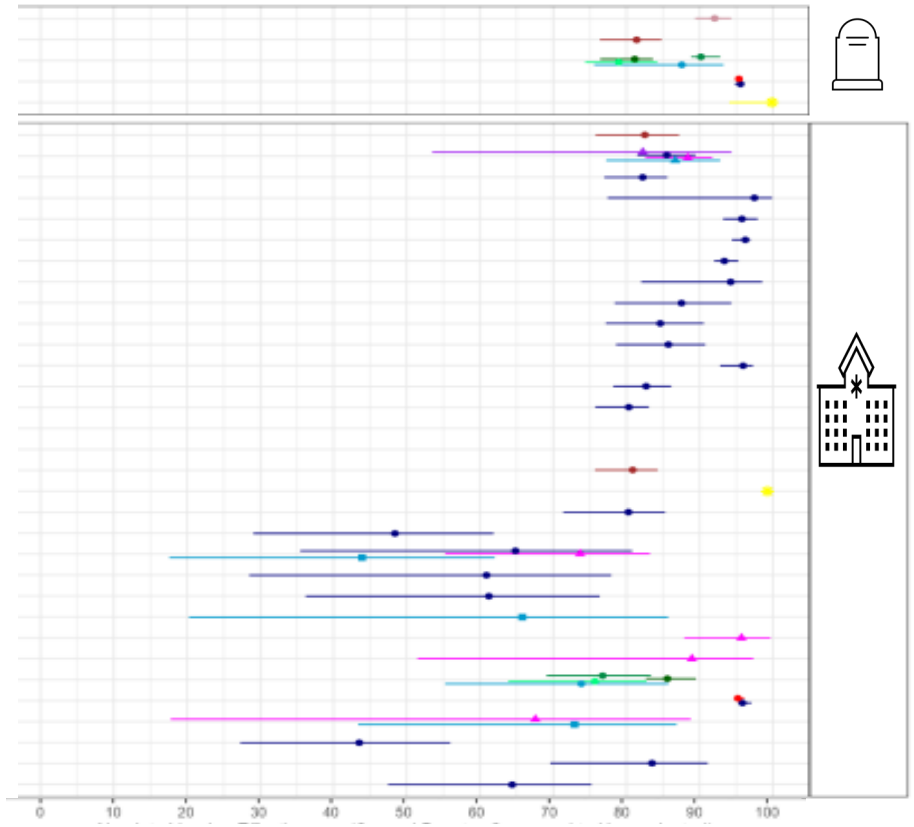


Bharat



COVID19 VE Studies_Forest Plots_Omicron.pdf (view-hub.org)

VE against severe disease by vaccine - 2nd booster



Primary series and first booster vaccine

- Comirnaty (Pfizer BioNTech)
- Spikevax (Moderna)
- any mRNA
- Comirnaty (Pfizer BioNTech) primary + Spikevax (Moderna) booster
- Comirnaty (Pfizer BioNTech) primary + any mRNA booster
- CoronaVac (Sinovac)
- CoronaVac (Sinovac) primary + any mRNA booster
- CoronaVac (Sinovac) primary + Comirnaty (Pfizer BioNTech) booster
- CoronaVac (Sinovac) primary + Vaxzevria (AstraZeneca) booster
- Any primary vaccine + any mRNA booster
- Vaxzevria (AstraZeneca) or any mRNA primary + any mRNA booster
- Vaxzevria (AstraZeneca) primary + any mRNA booster
- Vaxzevria (AstraZeneca) or any mRNA

Second Booster Dose Vaccine

- Vaxzevria (AstraZeneca) or any mRNA
- Comirnaty (Pfizer BioNTech)
- Spikevax (Moderna)
- any mRNA

COVID19 VE Studies_Forest Plots_Omicron.pdf (view-hub.org)

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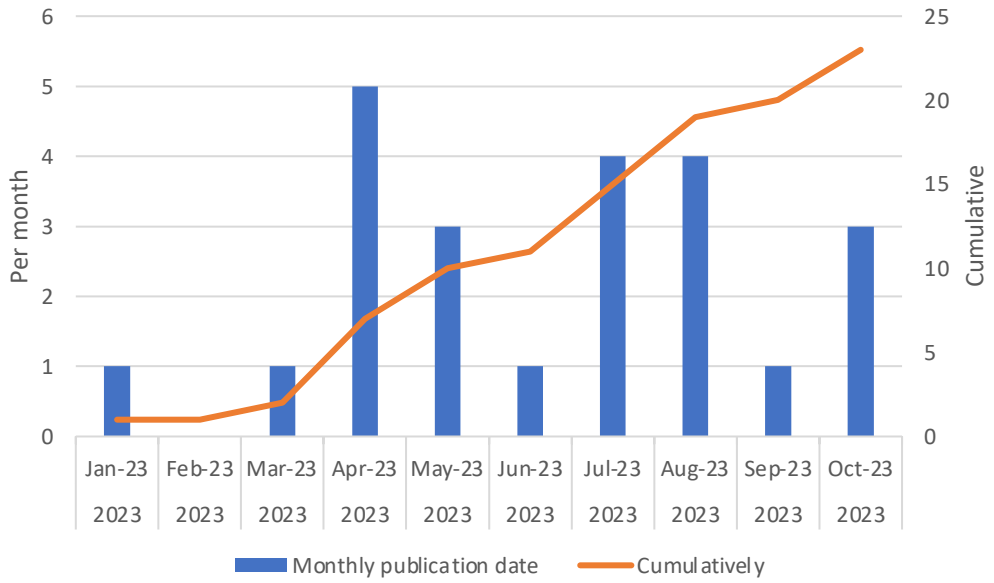
What is VE against XBB?

20 VE booster studies against XBB as of Oct 23

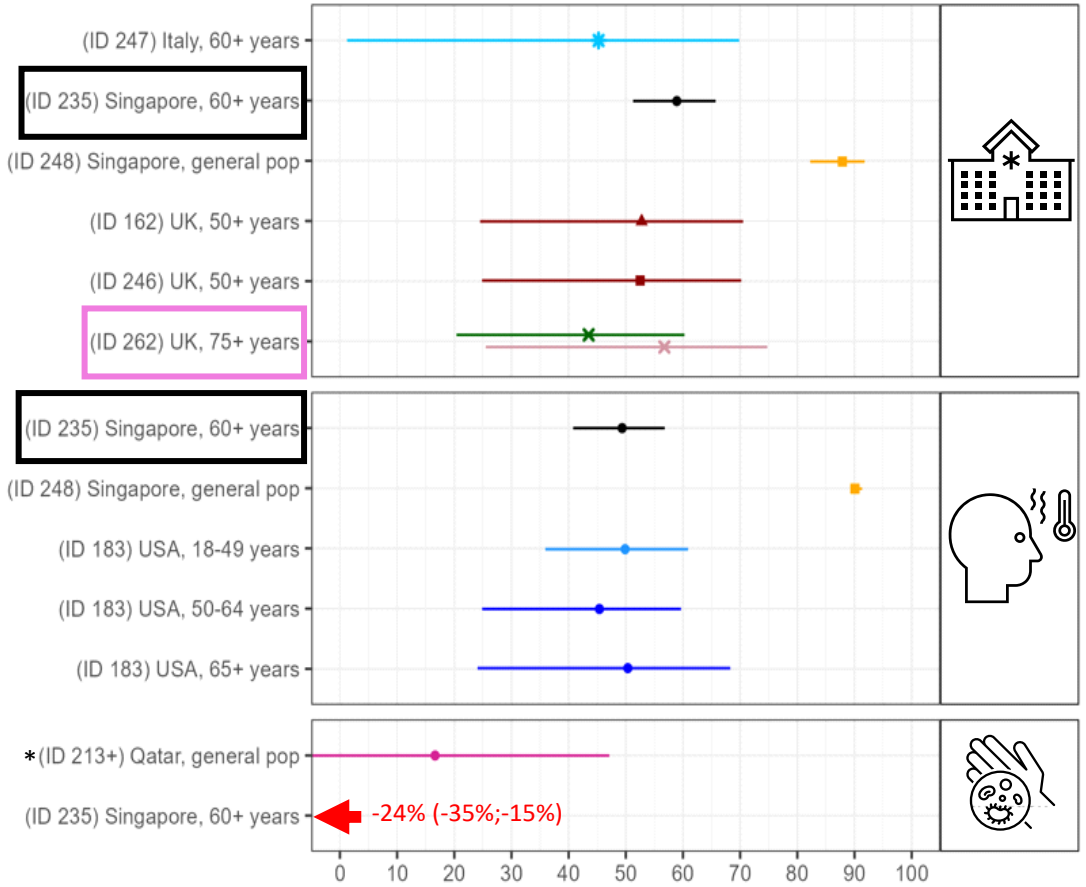


Only from high-income countries

Majority study mRNA vaccines

16 report relative VE estimates

Relative VE against XBB within 4 months after a 1st-5th booster

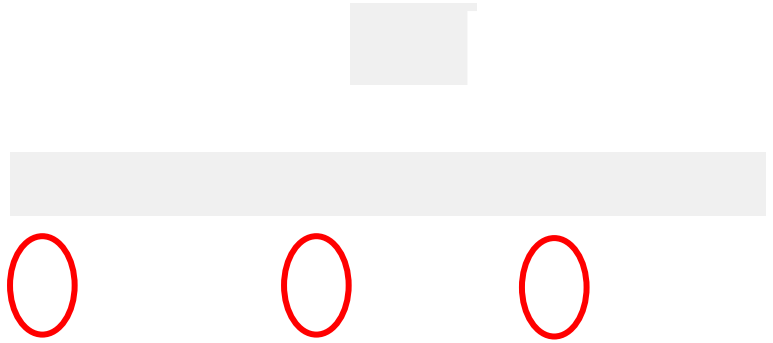


any monovalent mRNA (2nd booster)
any BA.4/BA.5 bivalent mRNA (2nd or 3rd booster)
any BA.4/BA.5 bivalent mRNA (1st or 2nd booster)
any BA.1 bivalent mRNA (1st-5th booster)
Moderna BA.1 bivalent or Pfizer BA.4/BA.5 bivalent mRNA (2nd booster)
Sanofi/GSK monovalent beta variant booster mRNA (1st-5th booster)
any BA.4/BA.5 bivalent mRNA (1st-3rd booster)
Moderna BA.1 bivalent mRNA (1st-3rd booster)
any BA.1 bivalent mRNA (1st-4th booster)

VE of a booster against severe disease by subvariant

Methods → Results

Population	Covid-19 vaccination status	Follow-up period	Covid-19 Outcome	Variant context
378,577 individuals aged 50+ years 	Bivalent BA.1 mRNA vaccine – 1st, 2nd 3rd, or 4th booster *VERSUS* ≥2 doses (ancestral monovalent mRNA boosters) at least 6 months prior	5th Dec 2022 to 2nd Apr 2023	Hospitalization	Omicron BQ.1, CH.1.1, XBB.1.5*



Boosters offer somewhat similar low-to-moderate additional protection against XBB.1.5/BQ.1/CH.1.1 but imprecision

*Whole genome sequencing

Kirsebom test-negative control, UK

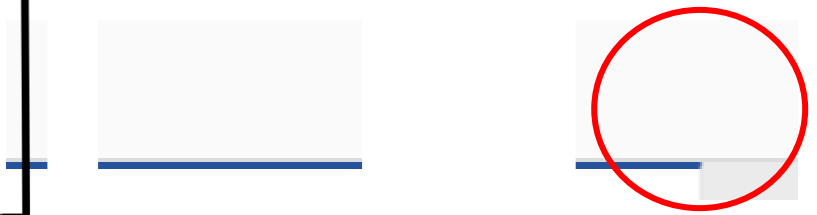
VE against severe disease over time

Methods → Results

Population	Covid-19 vaccination status	Follow-up period	Covid-19 Outcome	Variant context
N=66,141 immunocompetent adults >18 years with primary series +/- monovalent booster 	Bivalent booster (BA.4/BA.5) 1st-3rd (N=13,358/20%) *VERSUS* Unvaccinated (N=15,514/23%)	Sep 13, 2022 To Apr 21, 2023	Hospitalization with COVID-like illness & Intensive care unit admission/death with COVID-like illness	Omicron BA.4/5, XBB^

Hospitalization

Critical illness



Boosters' moderate protection wanes over a 6-month period and more so against hospitalization but XBB dominance only 30%

Link-Gelles test-negative control, USA

How can we assess VE against severe disease with reduced testing?

3 doses	0.46 (0.21, 1.00)
≥4 dose	0.30 (0.13, 0.70)

Boosters offer moderate protection against XBB cases progressing to hospitalization compared to being unvaccinated

Lewnard, case-only analysis, population aged 0-80 years, Spike-Gene-Target-Failure, mostly monovalent mRNA vaccines, Dec 1, 2022-Feb 23,2023, USA

Take away

What is VE over time?

«VE is consistently restored for a 1st and 2nd booster to the protection level of primary series, highest against severe disease, and waning slowest against severe disease »

What is VE by vaccine?

«mRNA vaccines offer high protection as primary series, 1st booster, and 2nd booster»

What is VE against XBB?

«Boosters offer moderate additional protection against XBB severe disease and symptomatic disease – may be somewhat similar to BQ.1/CH.1.1/BA.4-5 and wane**»**

Thank you

Melissa Higdon
Maria Knoll
Anurima Baidya
Karoline Walter

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