Results of COVID-19 Vaccine Effectiveness Studies: An Ongoing Systematic Review

Forest Plots: Vaccine Effectiveness against Delta and Omicron Variants of Concern

Updated May 12, 2022

Prepared by:
International Vaccine Access Center,
Johns Hopkins Bloomberg School of Public Health
and
World Health Organization
and
Coalition for Epidemic Preparedness Innovations

For comments or questions, please contact: Melissa Higdon at mhigdon@jhu.edu.
TABLE OF CONTENTS

Methods for Inclusion in Forest Plots ................................................................. 3
Abbreviations ........................................................................................................ 4
Delta ....................................................................................................................... 5
Forest Plots by Vaccine .......................................................................................... 5
  Ad26.COV2.S (Janssen) ..................................................................................... 5
  AZD1222 (AstraZeneca) .................................................................................... 6
  BBIBP-CorV2 (Beijing CNBG) ........................................................................... 7
  BBV152 (Bharat) ............................................................................................. 7
  CoronaVac (Sinovac) ......................................................................................... 8
  BNT162b2 (Pfizer) ............................................................................................ 9
  mRNA-1273 (Moderna) .................................................................................... 10
Heterologous schedules ......................................................................................... 11
Forest Plots by Population of Special Interest ......................................................... 12
  Older Adults ..................................................................................................... 12
  Healthcare Workers ......................................................................................... 12
  Children ........................................................................................................... 12
  Immunocompromised ....................................................................................... 12
Duration of Vaccine Effectiveness against Delta ................................................. 13
Omicron .................................................................................................................. 14
Forest Plots by Vaccine .......................................................................................... 14
  Ad26.COV2.S (Janssen) ..................................................................................... 14
  AZD1222 (AstraZeneca) .................................................................................... 14
  CoronaVac (Sinovac) ......................................................................................... 15
  BNT162b2 (Pfizer) ............................................................................................ 16
  mRNA-1273 (Moderna) .................................................................................... 17
Second booster vaccination ................................................................................... 18
Forest Plots by Population of Special Interest ......................................................... 19
  Older Adults ..................................................................................................... 19
  Healthcare Workers ......................................................................................... 19
  Children ........................................................................................................... 19
  Immunocompromised ....................................................................................... 19
Duration of Vaccine Effectiveness against Omicron ............................................. 20
METHODS FOR INCLUSION IN FOREST PLOTS

Vaccine Effectiveness (VE) estimates included in these plots are from an ongoing systematic review of COVID-19 vaccine effectiveness studies. Due to the predominance of the Delta variant across the globe, the plots in this document are restricted to studies conducted during a period when the Delta variant was the dominant circulating variant. Previous versions of the plots (prior to November 18, 2021) showed results from all studies, regardless of dominant variant, and the latest version of those plots (November 11, 2021) are available on the VIEW-hub resources page (https://view-hub.org/resources). Complete details on the method of the systematic review as well as a summary table of results can also be found on the VIEW-hub Resources Page:

- “COVID-19 Vaccine Effectiveness and Impact Studies Review Methods”
- “COVID-19 Vaccine Effectiveness Results Summary Table”

The VE estimates included in the plots are a subset of the estimates abstracted from the systematic literature review. A single study can include many VE estimates. In an effort to not overrepresent the amount of evidence that exists for each vaccine, the following criteria are used to determine which VE estimates are displayed in the forest plots located on the VIEW-hub resources page (https://view-hub.org/resources). There are some instances when more than one estimate from a study will be displayed in the same plot (e.g. a study includes VE estimates from two distinct populations). Reference numbers are included for each VE estimate displayed so users can identify when a study is represented more than once within a plot. More information on each reference can be found in the weekly literature review summary table located on VIEW-HUB (https://view-hub.org/resources).

- Complete vaccination is defined as ≥7 days post final dose; partial vaccination is defined as ≥14 days post first dose of a 2-dose vaccine.
- If a study reports results for the same outcome for both combined and individual vaccines, only individual vaccine VE estimates are displayed. This criterion only applies to studies evaluating VE of BNT162b2 (Pfizer) and mRNA-1273 (Moderna) vaccines.
- If a study reports results from 2 different evaluation designs (e.g. test-negative design and cohort design) on the same population, VE estimates from the primary analysis only are displayed.
- If a study reports VE estimates for the same disease outcome for different populations, the general population VE estimate is displayed when available. If a general population estimate is not available, the VE from each population is displayed (exception is when there are estimates for similar age groups in which case the more stable VE estimate will be displayed).
- If a study reports VE estimates on more than one ‘severe’ disease outcome (e.g. ‘severe disease’, ‘hospitalization’, and ‘ICU admission’), the more inclusive disease outcome including a larger population is displayed. These different types of severe outcomes are labeled as ‘severe disease’ in the plots, however it is important to keep in mind that the definition of severe disease varies and may explain some differences in VE estimates for severe disease outcomes.
- If a study reports VE estimates for different time intervals from the final dose, those from the earlier time intervals are plotted in an effort to remove the effect of possible waning of immunity. Studies that report only VE estimates that include a follow-up time that extends beyond 4 months post final dose are indicated with a ‘+’. Studies that report only VE estimates that are restricted to time intervals beyond 4 months are indicated with a ‘*’.
ABBREVIATIONS

asym = asymptomatic
HCW = healthcare workers
HHC = household contacts
LTCF = long-term care facility
pop = population
SNF = skilled nursing facility
DELTA VARIANT OF CONCERN

BY VACCINE

Ad26 CoV2.S (Janssen) Primary Series Vaccine Effectiveness, Delta Variant
(ref no) country, population

- South Africa, HCW
- Czech Republic, general pop
- Hungary, 18-64 years
- Hungary, 65-100 years
- South Africa, HCW
- USA, military personnel
- USA, general pop
- USA, general pop
- EU, 30-59 years
- USA, military personnel
- Czech Republic, general pop
- Hungary, 18-64 years
- Hungary, 65-100 years
- Spain, Contacts of index cases
- USA, military personnel
- USA, general pop
- USA, general pop
- USA, military personnel

Effectiveness

Death
Severe disease
Symptomatic disease
Any infection
Asympt.

booster_vaccine

Ad26 CoV2.S (Janssen)

Ad5-nCoV (Cansino) Primary Series Vaccine Effectiveness, Delta Variant
(ref no) country, population

- China, close contacts

Effectiveness

Severe disease
Symptomatic disease
Vaxzevria (AstraZeneca) Primary Series + Booster Dose Vaccine Effectiveness, Delta Variant

(ref no) country, population

Vaxzevria primary series

Vaxzevria primary series + booster

Death

Severe disease

Symptomatic disease

Any Infection

booster_vaccine
- Comirnaty (Pfizer BioNTech)
- Spikevax (Moderna)
- BBIBP-CorV (Beijing CNBG)

Infective frailty estimates that include a follow-up time extending beyond 4 months post final dose.
Indicates estimates that include a follow-up time extending beyond 4 months post final dose.
Indicates estimates that include a follow-up time extending beyond 4 months post final dose.
+ Indicates estimates that include a follow-up time extending beyond 4 months post final dose.
Indicates estimates that include a follow-up time extending beyond 4 months post final dose.

Heterologous AZD1222 (AstraZeneca) 1st dose plus mRNA-1273 (Moderna) 2nd dose Vaccine Effectiveness
(ref no) country, population

(115) Sweden, general pop

(103+) Spain, Contacts of index cases

Heterologous AZD1222 (AstraZeneca) 1st dose plus BNT162b2 (Pfizer) 2nd dose Vaccine Effectiveness
(ref no) country, population

(115) Sweden, general pop

(176) Thailand, general pop

Heterologous CoronaVac (SINovac) 1st dose plus AZD1222 (AstraZeneca) 2nd dose Vaccine Effectiveness
(ref no) country, population

(114) Canada (BC), general pop

(112) Sweden, general pop

(114) Canada (BC), general pop

(119) Finland, HCW

Heterologous mRNA Vaccine Effectiveness
(ref no) country, population

(114) Canada (BC), general pop

(114) Canada (BC), general pop

Effectiveness

Symptomatic disease

Severe disease

Symptomatic disease

Any infection

Any infection

Any infection
OMICRON VARIANT OF CONCERN

BY VACCINE

Ad26 CoV2.S (Janssen) Primary Series + Booster Vaccine Effectiveness, Omicron Variant

Vaxzevria (AstraZeneca) Primary Series + Booster Dose Vaccine Effectiveness, Omicron Variant

*Indicates estimates that include a follow-up time extending beyond 4 months post final dose.*
+ Indicates estimates that include a follow-up time extending beyond 4 months post final dose.
+ Indicates estimates that include a follow-up time extending beyond 4 months post final dose.
† Indicates estimates that include a follow-up time extending beyond 4 months post final dose.
SECOND BOOSTER DOSE VACCINE EFFECTIVENESS AGAINST OMICRON

+ Indicates estimates that that include a follow-up time extending beyond 4 months post final dose.
BY STUDY POPULATION OF SPECIAL INTEREST

Primary Series Vaccine Effectiveness Among Older Adults/Skilled Nursing Facility Residents, Omicron

(Ref no) country, population

Severe disease

Effectiveness

Vaccine ◯ Vaxzevria (AstraZeneca) ◇ Comirnaty (Pfizer/BioNTech) ◇ Spikevax (Moderna)

indicates follow-up period extending beyond 6 months.

Primary Series Vaccine Effectiveness Among Healthcare Workers, Omicron

(Ref no) country, population

Any infection

Effectiveness

Vaccine ◯ AstraZeneca COVID-19 Vaccine ◇ Comirnaty (Pfizer/BioNTech) ◇ Spikevax (Moderna)

Primary Series Vaccine Effectiveness Among Children, Omicron

(Ref no) country, population

Death

Severe disease

Symptomatic disease

Effectiveness

Vaccine ◯ BNT162b2 (Pfizer/BioNTech) ◇ Spikevax (Moderna) ◇ Comirnaty (Pfizer/BioNTech)

Primary Series Vaccine Effectiveness Among Immunocompromised Persons, Omicron

(Ref no) country, population

Any infection

Effectiveness

Vaccine ◯ Comirnaty (Pfizer/BioNTech) ◇ Spikevax (AstraZeneca)
DURATION OF VACCINE EFFECTIVENESS AGAINST OMICRON

[Graph showing the duration of vaccine effectiveness against Omicron for primary series and booster doses, with different vaccines indicated by colors.]

Primary Series Vaccine
- AstraZeneca-Vaxzevria
- Janssen-Ad26.COV2.S
- Moderna-Spikevax
- Pfizer BioNTech-Comirnaty
- Sinovac-Coronavac

Booster Vaccine
- No booster (Primary Series only)
- Janssen-Ad26.COV2.S
- Moderna-Spikevax
- Pfizer BioNTech-Comirnaty

*Reference group for booster VE is fully vaccinated with two doses.