Monitoring Vaccine Performance against SARS-CoV-2 Variants:

Impact and Value of Project

Updated March 2024

A collaboration between

International Vaccine Access Center,

Johns Hopkins Bloomberg School of Public Health

and

World Health Organization

and

Coalition for Epidemic Preparedness Innovations

Contents

1. Overview

This document highlights the impact and value of the *Monitoring Vaccine Performance against SARS-CoV-2 Variants Project*. This global systematic review of COVID-19 vaccine clinical effectiveness and neutralization capacity has directly informed and continues to inform decisions around COVID-19 vaccine policy over the course of the pandemic. Outputs from the project including summaries of the most current evidence for COVID-19 vaccines, a repository of high-quality studies, and other materials for use that are made available to the public every week to assist all policy makers in their decision-making.

The project has provided and continues to provide an important and valuable technical service to the World Health Organization, providing continued and immediate assistance in the following areas:

- Daily needs of the WHO: addressing urgent questions around vaccine performance as they arise
- Syntheses of the totality of the evidence around vaccine performance to address specific questions (e.g. duration of vaccine effectiveness, differences by age/population, vaccine product, variant/subvariant) to help inform and update recommendations
- Support for educating WHO regional offices and other global stakeholders on complex issues around vaccine performance
- Facilitating understanding of an evolving pandemic landscape and corresponding implications for vaccine policy
- Identifying gaps in knowledge to help focus needed resources where information is lacking

By making the project data readily available to the public, the project also conducts a valuable service to governments and other organizations and institutions around the world. Providing access to ongoing, up-to-date results from this high-quality systematic review on COVID-19 vaccine performance enables decision-makers around the globe to efficiently make timely decisions for their populations.

The sections below provide more details about the direct impact and reach of the project.

2. Purpose and Value of the Vaccine Effectiveness and Neutralization Systematic Reviews

Vaccine effectiveness (VE) studies provide valuable evidence on real world vaccine performance beyond what is known from clinical trials, such as performance against emerging variants, duration of protection, differences in VE by age or population, need and impact of booster doses, etc. But these observational studies have many differences between them in design and population or setting studied and are subject to bias. As a result, VE estimates have varied widely between them, including in the quality of evidence. Systematic reviews address these issues by:

1. Reviewing the quality of each individual study to evaluate the study for potential biases,
2. Identifying all available eligible evidence so that the full range of estimates can be considered including identifying any outliers, and
3. Characterizing, grouping and classifying the evidence so that the results and any heterogeneity can be better understood.

The team has been evaluating COVID-19 VE and neutralization studies globally since the introduction of the first COVID-19 vaccines, and is made up in **experts in epidemiology, vaccine evaluation, immunology, and surveillance so is highly experienced and skilled** at contextualizing new vaccine evidence as it emerges. From the project's inception, individuals at Johns Hopkins, the WHO and the CDC have reached out to their respective global contacts and audiences to ensure the review meets the global needs, and to hone the eligibility, inclusion, and synthesis methods to **ensure high quality, reliable and informative results**.

The review is **designed to respond quickly to demands for new information**, such as assessing changing VE over time (i.e., duration or protection), cellular immunity as well as antibody responses, benefits of subsequent vaccination among hybrid immune individuals, etc. and not just VE against new variants or for new vaccines. This project aims to monitor, track, and synthesize the global evidence on vaccine performance in the year ahead to continue to provide an evidence base for vaccine policy globally. Project data are **updated regularly and available online** to serve as a resource for the global scientific community.

The work has been judged to be of **high quality** by the global community of users, and as such is used by WHO to inform recommendations and guidelines for its member countries and, thus, have **widespread, global significance**.

WHO receives regular requests to share and summarize the results from IVAC's ongoing systematic literature review on COVID-19 vaccine effectiveness with internal and external audiences ranging from COVID-19 vaccine policy makers to COVID-19 vaccine program implementers.

3. Examples of How the Project's Work Has Been Used

- **WHO Strategic Advisory Group of Experts on Immunization (SAGE)** uses COVID-19 VE data to officially make policy recommendations. For example, the "WHO SAGE Roadmap for prioritizing use of Covid -19 vaccines" published on 30 March 2023, and updated on 10 November 2023 utilizes the IVAC review:

    "The evidence considered in this update, in particular Omicron-specific vaccine effectiveness studies, was identified through a living literature review up until 17 March 2023. All data can be accessed on the International Vaccine Access Center (IVAC)'s View-hub website (see: https://view-hub.org/vaccine/covid), including weekly literature tables, forest plots, neutralization plots, and methods used."

- **WHO SAGE COVID-19 Vaccines Working Group** uses COVID-19 VE data to prepare and update policy recommendations for SAGE
- **WHO Technical Advisory Group on COVID-19 Vaccine Composition (TAG-CO-VAC)** uses COVID-19 VE and neutralization data to review implications of emerging VOCs on the performance of current vaccines and to make vaccine composition. For example, the 18 May 2023 recommendation to move to an XBB-containing monovalent vaccine formulation.

- **Regional immunization advisors** use COVID-19 VE data updates to inform policy makers in regions about performance of vaccines in use in their regions.
- **The Director of Immunization, Vaccines and Biologicals (IVB) at WHO** uses COVID-19 VE data updates for internal and external communication (e.g., GAVI, COVAX, UNICEF, WHE)
- WHO shares VE data with **representatives from institutions around the world** who subscribe to receive the COVID-19 VE weekly summary tables (~350 recipients, see accompanying document on institutions receiving VE updates)
- WHO hosts a monthly meeting, *COVID -19 VE Stakeholder Forum*, to update **representatives from governmental agencies, pharmaceutical industry, regulators, academic institutions, regulators, funding agencies, and NGOs** on the status of and gaps in Covid-19 VE studies globally. The team at IVAC works closely with WHO in preparation for these meetings.

LMICs, in particular, rely heavily on WHO for guidance. Results from the project have been **shared with governments and organizations in 159 countries** either through weekly email updates or in the form of presentations.

Map. Countries receiving weekly emails of project data or attending presentations of the data (n=159 countries)
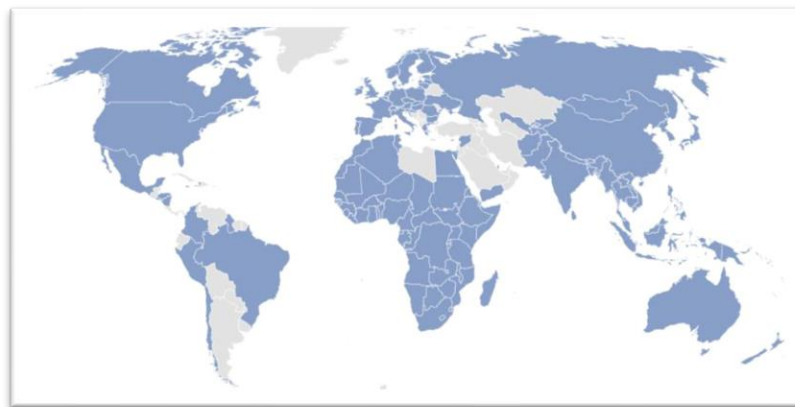
The project **produces visualizations of VE and neutralization data that has a broad readership**. Graphics illustrating meta-analyses of the systematic review are published in scientific literature (e.g. Higdon, et al.) but findings are also translated into more digestible graphics for more general audiences, such as this widely disseminated figure designed by our team:

Figure 1.   Waning protection from vaccines over time against Omicron
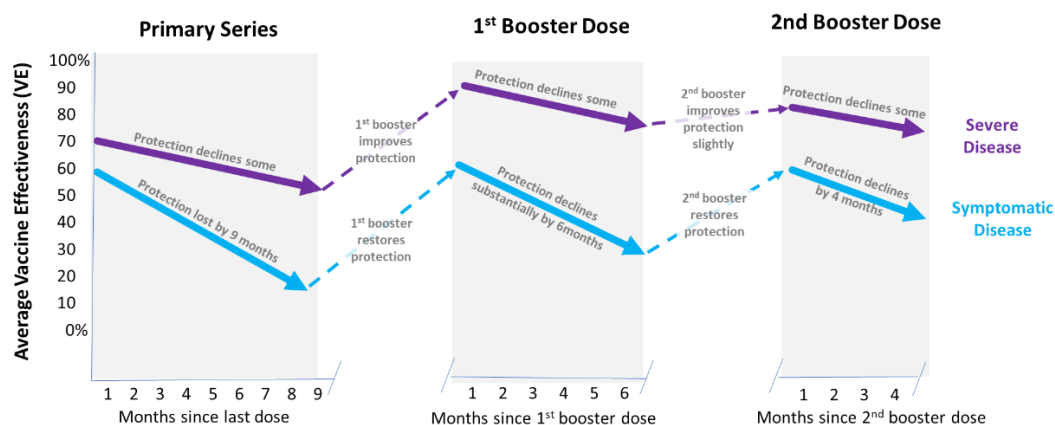
Project outputs are also included in widely disseminated materials by WHO, such as in their Weekly Epidemiological Update (https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports). The team has contributed to 52 issues of the Epidemiological Update (now distributed monthly) to date and continues to do so. Content and visuals have changed as needed to address new questions. Examples of these are shown below:

Figure 2. Vaccine Effectiveness of primary series and first booster vaccination against the Omicron variant of concern over time.
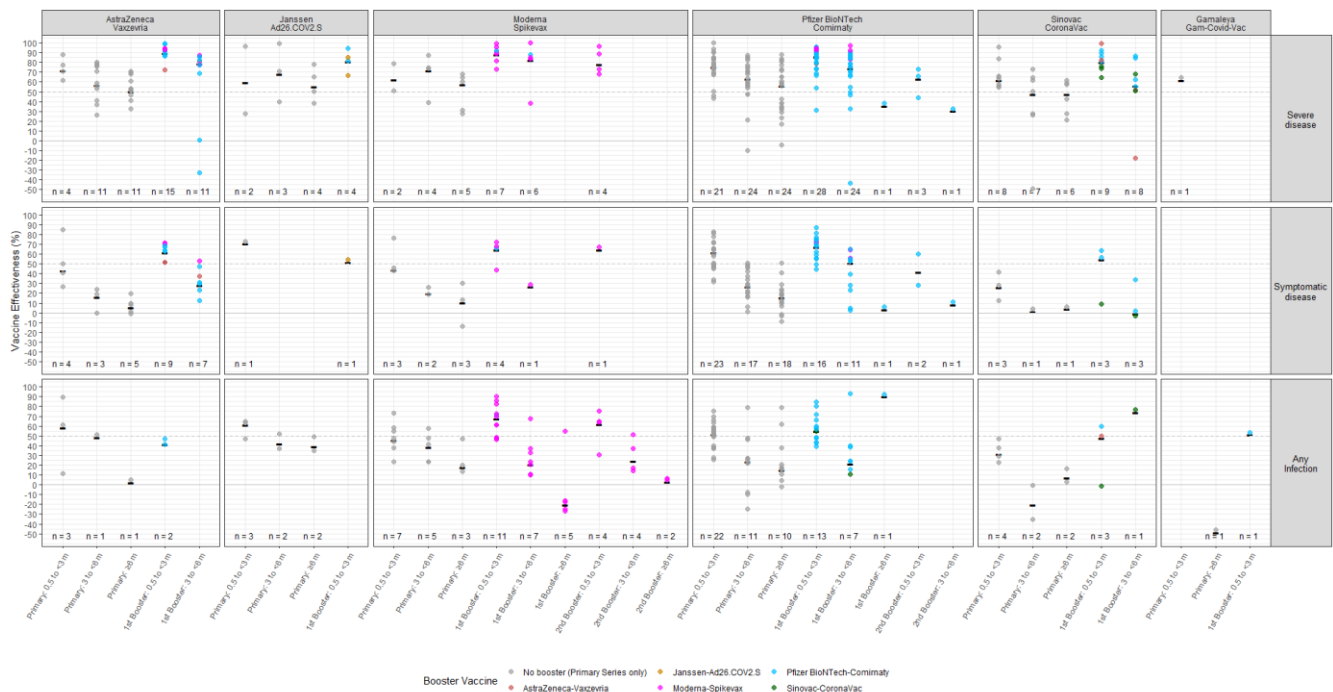
Current and future questions around COVID-19 vaccine performance: New questions around COVID-19 vaccine performance continue to arise. New Omicron subvariants continue to emerge. Monitoring VE, particularly against severe disease, is crucial to inform vaccine policy as well as vaccine composition. In addition, many new vaccines are in the pipeline and soon to be introduced by countries based on the results of immuno-bridging studies alone and new variants/sub-variants continue to emerge. Whether and when to update vaccines targeted to specific strains is another important question that relies on VE evidence. The project will continue to address important and evolving questions to help inform the evolution of vaccine policy recommendations globally.

Of note, the Standing Recommendations for COVID-19 issued by the Director-General of the World Health Organization (WHO) were updated on August 9, 2023. One of the recommendations is to "continue primary research and systematic reviews of research, including but not limited to the following topics: ….. Vaccination efficacy, effectiveness, duration and safety in groups defined by age, medical conditions and previous infection and vaccination with various products." The team is eager to continue to work with WHO and CEPI to further this effort.

4. Presentations

The team regularly presents project data and results at WHO meetings to inform decision making and to facilitate understanding around key epidemiological questions concerning COVID-19 vaccine effectiveness. Below is a list of project presentations given to date by the team:

Title of Presentation	Meeting	Date
SAGE and SAGE Working Group Meetings		
Duration of Protection in the Omicron Era	WHO SAGE Working Group Meeting	12 Jan 2023
Vaccine Effectiveness of Bivalent Vaccines (vs. Monovalent vaccines)	WHO SAGE Working Group Meeting	9 Feb 2023
Duration of primary, first, and second booster dose; duration by subvariant	WHO SAGE Meeting	21 Mar 2023
COVID-19 Vaccine Effectiveness against XBB	WHO SAGE Working Group Meeting	27 Jul 2023
Duration of vaccine effectiveness against severe outcomes in vulnerable groups	WHO SAGE Working Group Meeting	10 Aug 2023
Update on COVID-19 vaccine effectiveness against the Omicron subvariant XBB	WHO SAGE Meeting	28 Sep 2023
Vaccine effectiveness (VE) of bivalent/ancestral vaccines against XBB variants; VE of monovalent vaccines against XBB variants	WHO SAGE Working Group Meeting	15 Feb 2024
Update on COVID-19 vaccine effectiveness	WHO SAGE Working Group Meeting	12 Mar 2024
WHO Vaccine Effectiveness Methods Forum Meetings		
COVID-19 Vaccine Effectiveness: BA.1/BA.2 vs. BA.4/BA.5	WHO COVID-19 VE Forum	6 Dec 2022
Waning of Absolute vs. Relative Vaccine Effectiveness	WHO COVID-19 VE Forum	7 Feb 2023
COVID-19 Vaccine Effectiveness Against Progression to Severe Disease During Periods of Omicron Predominance	WHO COVID-19 VE Forum	5 Dec 2023
Negative Vaccine Effectiveness	WHO COVID-19 VE Forum	6 Mar 2024
Landscape analysis of COVID-19 vaccine immunogenicity after vaccine rollout: challenges and opportunities during a fast-moving pandemic	2023 Meeting of the Study Group Vaccines (Braunschweig, Germany)	13 Jan 2023
WHO Vaccine Effectiveness Stakeholder Meetings		
Overview of Vaccine Effectiveness Studies: Landscape and Gaps	WHO Vaccine Effectiveness Stakeholder Forum	20 Jun 2023
Negative Vaccine Effectiveness	WHO Vaccine Effectiveness Stakeholder Forum	23 Jan 2024
WHO Technical Advisory Group on COVID-19 Vaccine Composition (TAG-CO-VAC) Meetings		
Overview of immunogenicity data in recipients of variant-containing vaccines as compared to	WHO TAG-CO-VAC Meeting	16 Mar 2023

index-virus based vaccines, including Neutralizing antibody and T-cell responses		
Overview of published laboratory evidence of immune imprinting	WHO TAG-CO-VAC Meeting	16 Mar 2023
VE of bivalent vs. monovalent vaccines	WHO TAG-CO-VAC Meeting	16 Mar 2023
Vaccine Effectiveness of bivalent Covid-19 vaccines against new Omicron subvariants	WHO TAG-CO-VAC Meeting	11 May 2023
COVID-19 Vaccine Effectiveness against XBB	WHO TAG-CO-VAC Meeting	29 Aug 2023
Update on COVID-19 vaccine effectiveness (VE) against XBB	WHO TAG-CO-VAC Meeting	31 Oct 2023
Update on COVID-19 vaccine effectiveness against the Omicron subvariant XBB	WHO TAG-CO-VAC Meeting	04 Dec 2023
Other Meetings		
Overview of COVID vaccine effectiveness from Wuhan to Omicron	WHO AFRO & Bill & Melinda Gates Foundation COVID-19 Vaccine Effectiveness Network Convening, Cape Town, S Africa	27 Mar 2023
Studies on COVID-19 vaccine effectiveness during Omicron	WHO meeting of regional advisors	20 Apr 2023
COVID-19 Vaccine policy in a Changing World: Contributions of Vaccine Effectiveness Studies	IVAC Webinar sponsored by ADB	11 Jul 2023
COVID-19 Vaccine Effectiveness against XBB	WHO Department of Immunization, Vaccines, and Biologicals	28 Jul 2023
Duration of COVID-19 vaccine effectiveness against Omicron and its sub variants by dose: A systematic review	European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE)	22-24 Nov 2023
Evaluating the reliability of neutralizing antibody studies in assessing COVID-19 vaccine immunogenicity	2024 Meeting of The Study Group Vaccines, German Society of Immunology	15-17 Jan 2024
TBD (Timing of VE studies and strain selection for vaccines)	International Coalition of Medicines Regulatory Authorities (ICMRA) Meeting	26 Feb 2024

5. Institutions Benefiting from the Project

The vaccine effectiveness data compiled by IVAC and posted on VIEW-hub are requested by and shared with members of the following agencies:

Category	Agency
US government	National Security Council
	NIH
	US CDC
	US FDA
	State Departments of health
	US Military
	USAID

Category	Agency
	State Department
Non-US government	Australia MOH
	Canada MOH
	Chinese CDC
	China MOH
	Colombian MOH
	European Commission
	Federal Office of Public Health (Switzerland)
	Fiocruz (Brazil)
	Indonesia MOH
	Medical Research Council (South Africa)
	Mexico MOH
	NICD (South Africa)
	NIID (Japan)
	RIVM (Netherlands)
	RKI (Germany)
	UKHSA (UK)
	SSI (Denmark)
	Vietnam MOH
Industry	AstraZeneca
	Johnson & Johnson
	Sinopharm
	Novavax
Academic institutions in following countries:	Australia
	Brazil
	Canada
	Colombia
	Indonesia
	Jamaica
	Japan
	Germany
	Hong Kong
	Israel
	Portugal
	Qatar
	United Kingdom
	United States
Regulatory agencies	European Medicines Agency (EMA)
	U.S Food and Drug Administration (FDA)

Category	Agency
Nonprofit organizations	Bill & Melinda Gates Foundation (BMGF)
	Coalition for Epidemic Preparedness Innovations (CEPI)
	FHI-360
	Fred Hutchinson Cancer Research Center
	GAVI, The Vaccine Alliance (GAVI)
	Program for Appropriate Technology in Health (PATH)
	Taskforce for Global Health
	Whitman Walker Health
Consulting companies	EpiConcept
	P95
Other agencies	World Health Organization (SAGE, RITAGs, multiple departments, regions)
	Asian Development Bank

Additional details:

- UKHSA uses the data collected by IVAC, synthesizing the data with additional evidence to produce summary 'consensus estimates in their regular surveillance reports:

Consensus vaccine effectiveness estimates

Table 4. Consensus estimates of relative vaccine effectiveness against BA.4, BA.5, BQ.1 and CH1.1 Omicron for a booster dose of COVID-19 vaccine compared to 6+ months since the last dose (at least 2 doses)

Vaccine product of booster dose [Note 1]	Outcome	0 to 1 months	2 to 3 months	4 to 6 months	6+ months	Consensus narrative
Monovalent	All Infection [Note 2]	30% (20 to 40%)	20% (10 to 30%)	10% (0 to 20%)	0% (0 to 5%)	Post fourth dose estimates appear similar to post 3 dose estimates for the same time period, restoring VE to similar levels provided by the first booster dose (pre waning). VE estimates may differ depending on whether individuals have had a prior infection. Some studies suggest VE estimates may be slightly higher against Omicron BA.1/BA.2 compared to Omicron BA.4/BA.5.
Monovalent	Symptomatic [Note 2]	40% (30 to 50%)	40% (30 to 50%)	10% (0 to 20%)	Insufficient data	Post fourth dose estimates appear similar to post 3 dose estimates for the same time period, restoring VE to similar levels provided by the first booster dose (pre waning). VE estimates may differ depending on whether individuals have had a prior infection.
Monovalent	Hospitalisation	60% (55 to 65%)	40% (30 to 50%)	20% (15 to 25%)	0% (0 to 5%)	These estimates are based on UKHSA test negative case control using SUS data on hospitalisations in age 75+ with 2+ days stay and respiratory coded. Note: As absolute VE had waned to about 70% at 6+ months post dose 3, a relative VE of 50% would increase this back to an absolute VE of 85% compared to unvaccinated. Some studies suggest VE estimates against hospitalisation are similar for BA.2 versus BA.4/BA.5.
Monovalent	Mortality	Insufficient data	Insufficient data	Insufficient data	Insufficient data	
Bivalent	All Infection [Note 2]	30% (20 to 40%)	20% (10 to 30%)	10% (0 to 20%)	0% (0 to 5%)	Estimates for the BA.1/BA.2 bivalent booster are not too different from what is being seen with BA.4/BA.5 bivalent boosters.
Bivalent	Symptomatic [Note 2]	40% (30 to 50%)	40% (30 to 50%)	10% (0 to 20%)	Insufficient data	
Bivalent	Hospitalisation	55% (40 to 65%)	50% (40 to 65%)	Insufficient data	Insufficient data	Estimates for the BA.1/BA.2 bivalent booster are not too different from what is being seen with BA.4/BA.5 bivalent boosters. There is some evidence that VE against hospitalisation is slightly lower against CH1.1 compared to BA.4/BA.5.
Bivalent	Mortality	70% (65 to 80%)	70% (65 to 80%)	Insufficient data	Insufficient data	Current evidence based on age 65+.

The table presents estimates of VE compared to 6+ months since last dose (at least 2 doses) (estimates agreed by the vaccine expert panel).
Note 1. Refers to either Pfizer or Moderna.
Note 2. Estimates were not stratified according to monovalent or bivalent.

High confidence	Evidence from multiple studies which is consistent and comprehensive.
Medium confidence	Evidence is emerging from a limited number of studies or with a moderate level of uncertainty.
Low confidence	Little evidence is available, and results are inconclusive.

- ACIP has used the data in presentations during meetings to determine vaccine policy.
- The Vietnam MOH and China MOH summarize the data in correspondences for their respective governments.
- US National Security Council uses the data to brief the White House.

- WHO technical advisory group on vaccine composition and other expert groups at WHO have used the neutralization data (*presentations by team given in March 2023, topics included bivalent vs. monovalent vaccines and immune imprinting*)

6. Publications

In progress

1. Duration of Effectiveness of COVID-19 primary series, first booster, and second dose vaccination by Omicron subvariant, age group, and platform.

2. Description and review of a tool to evaluate the reliability of studies assessing neutralizing antibody responses of post-vaccination sera.

3. Informing the pandemic response: The role of the World Health Organization's COVID-19 Weekly Epidemiological (led by WHO, soon to be submitted to Lancet Infectious Diseases)

Published

4. Jacobsen H, Sitaras I, Katzmarzyk M, Cobos Jiménez V, Naughton R, Higdon MM, Knoll MD. Waning of post-vaccination neutralizing antibody responses against SARS-CoV-2, a systematic literature review and meta-analysis. medRxiv. Epub 2023 Aug 8. doi: https://doi.org/10.1101/2023.08.08.23293864. (*preprint*, *submitted to NPJ vaccines*)

5. Feikin DR, Higdon MM, Andrews N, Collie S, Deloria Knoll M, Kwong JC, Link-Gelles R, Pilishvili T, Patel MK. Assessing COVID-19 vaccine effectiveness against Omicron subvariants: Report from a meeting of the World Health Organization. Vaccine. 2023 Mar 31;41(14):2329-2338. doi: 10.1016/j.vaccine.2023.02.020. Epub 2023 Feb 9.

6. Sitaras I, Jacobsen H, Higdon MM, Dowling WE, Bar-Zeev N, Deloria Knoll M. Systematic review of primary and booster COVID-19 sera neutralizing ability against SARS-CoV-2 omicron variant. NPJ Vaccines. 2022 Nov 15;7(1):147. doi: 10.1038/s41541-022-00565-y.

7. Bobrovitz N, Ware H, Ma X, Li Z, Hosseini R, Cao C, Selemon A, Whelan M, Premji Z, Issa H, Cheng B, Abu Raddad LJ, Buckeridge DL, Van Kerkhove MD, Piechotta V, Higdon MM, Wilder-Smith A, Bergeri I, Feikin DR, Arora RK, Patel MK, Subissi L. Protective effectiveness of previous SARS-CoV-2 infection and hybrid immunity against the omicron variant and severe disease: a systematic review and meta-regression. Lancet Infect Dis. 2023 May;23(5):556-567. doi: 10.1016/S1473-3099(22)00801-5. Epub 2023 Jan 18.

8. Jacobsen H, Katzmarzyk M, Higdon MM, Jiménez VC, Sitaras I, Bar-Zeev N, Knoll MD. Post-Vaccination Neutralization Responses to Omicron Sub-Variants. Vaccines (Basel). 2022 Oct 20;10(10):1757. doi: 10.3390/vaccines10101757.

9. Higdon MM, Baidya A, Walter KK, Patel MK, Issa H, Espié E, Feikin DR, Knoll MD. Duration of effectiveness of vaccination against COVID-19 caused by the omicron variant. Lancet Infect Dis. 2022 Aug;22(8):1114-1116. doi: 10.1016/S1473-3099(22)00409-1. Epub 2022 Jun 22.

10. Jacobsen H, Cobos Jiménez V, Sitaras I, Bar-Zeev N, Čičin-Šain L, Higdon MM, Deloria-Knoll M. Post-vaccination T cell immunity to omicron. Front Immunol. 2022 Jul 26;13:944713. doi: 10.3389/fimmu.2022.944713.

11. Feikin DR, Abu-Raddad LJ, Andrews N, Davies MA, Higdon MM, Orenstein WA, Patel MK. Assessing vaccine effectiveness against severe COVID-19 disease caused by omicron variant. Report from a meeting of the World Health Organization. Vaccine. 2022 Jun 9;40(26):3516-3527. doi: 10.1016/j.vaccine.2022.04.069. Epub 2022 May 2.

12. Jacobsen H, Sitaras I, Jurgensmeyer M, Mulders MN, Goldblatt D, Feikin DR, Bar-Zeev N, Higdon MM, Knoll MD. Assessing the Reliability of SARS-CoV-2 Neutralization Studies That Use Post-Vaccination Sera. Vaccines (Basel). 2022 May 26;10(6):850. doi: 10.3390/vaccines10060850.

13. Higdon MM, Wahl B, Jones CB, Rosen JG, Truelove SA, Baidya A, Nande AA, ShamaeiZadeh PA, Walter KK, Feikin DR, Patel MK, Deloria Knoll M, Hill AL. A Systematic Review of Coronavirus Disease 2019 Vaccine Efficacy and Effectiveness Against Severe Acute Respiratory Syndrome Coronavirus 2 Infection and Disease. Open Forum Infect Dis. 2022 Apr 18;9(6):ofac138. doi: 10.1093/ofid/ofac138.

14. Feikin DR, Higdon MM, Abu-Raddad LJ, Andrews N, Araos R, Goldberg Y, Groome MJ, Huppert A, O'Brien KL, Smith PG, Wilder-Smith A, Zeger S, Deloria Knoll M, Patel MK. Duration of effectiveness of vaccines against SARS-CoV-2 infection and COVID-19 disease: results of a systematic review and meta-regression. Lancet. 2022 Mar 5;399(10328):924-944. doi: 10.1016/S0140-6736(22)00152-0. Epub 2022 Feb 23.

Publications by other groups leveraging the project's literature reviews

1. Understanding the time-driven shifts of vaccine effectiveness against any and severe COVID-19 before and after the surge of Omicron variants within 2.5 years of vaccination: a meta-regression

    Petráš M, Janovská D, Lomozová D, et al. Int J Infect Dis. 2024 Feb 26:106986.

2. Predicting COVID-19 booster immunogenicity against future SARSCoV-2 variants and the benefits of vaccine updates

    Cromer D, Reynaldi A, Hie A, et al. *medRxiv*. Epub 2024 Feb 9. Int J Infect Dis. 2024 Feb 26:106986. doi: 10.1016/j.ijid.2024.106986

    We searched the **VIEW-hub ongoing systematic review database** for papers reporting neutralising antibody titres against COVID-19 after vaccination with a COVID-19 variant-immunogen and indexed prior to 15 August 2023. This search identified 399 studies for screening.

3. [Capacity-building for conducting COVID-19 vaccine effectiveness studies to enhance evidence-informed vaccination policymaking in the Eastern Mediterranean Region](#)

   Kheirandish M, Karimian Z, Fahmy K, Rashidian A, Hajjeh R. East Mediterr Health J. 2023 Jul 31;29(7):562-569.

4. [Capacity-building for conducting COVID-19 vaccine effectiveness studies to enhance evidence-informed vaccination policymaking in the Eastern Mediterranean Region](#)

   Kheirandish M, Karimian Z, Fahmy K, Rashidian A, Hajjeh R. East Mediterr Health J. 2023 Jul 31;29(7):562-569.

5. [Severity in Vaccinated and Unvaccinated Patients during the Delta and Omicron Wave of the Pandemic in a Romanian Tertiary Infectious Diseases Hospital](#)

   Briciu V, Topan A, Calin M, Dobrota R, Leucuta DC, Lupse M. Comparison of COVID-19. Healthcare (Basel). 2023 Jan 28;11(3):373.

6. [Cost-effectiveness of the second COVID-19 booster vaccination in the United States](#)

   Li R, Lu P, Fairley CK, et al. *medRxiv*. Epub 2023 Jan 12.

   To estimate the real-world booster VE for Omicron infection and severe progression, we relied on the existing scientific literature reporting real population incidence and vaccination status data from an ongoing systematic review conducted by **The International Vaccine Access Center.**

7. [Expert review of global real-world data on COVID-19 vaccine booster effectiveness and safety during the omicron-dominant phase of the pandemic.](#)

   Solante R, Alvarez-Moreno C, Burhan E, et al. Expert Rev Vaccines. 2023 Jan-Dec;22(1):1-16. Epub 2022 Nov 11.

   Using the publicly available **IVAC VIEW-hub** platform, we reviewed 52 studies on vaccine effectiveness (VE) after booster vaccinations.

8. [Absolute and Relative Vaccine Effectiveness of Primary and Booster Series of COVID-19 Vaccines (mRNA and Adenovirus Vector) Against COVID-19 Hospitalizations in the United States, December 2021–April 2022](#)

   Lewis NM, Murray N, Adams K, et al. Open Forum Infect Dis. 2022 Dec 31;10(1):ofac698.

   To contextualize the results of the current study and the scenario analysis, we used the **International Vaccine Access Center** database [19] to identify extant studies using rVE to compare COVID-19 vaccine regimens.

9. [Effectiveness of Pfizer-BioNTech COVID-19 vaccine as evidence for policy action: A rapid systematic review and meta-analysis of non-randomized studies](#)

   Wallace M, Collins JP, Moline H, et al. PLoS One. 2022 Dec 6;17(12):e0278624

   To expedite the process of identifying relevant literature, we identified observational studies through an ongoing systematic review conducted by the **International Vaccine Access Center and the World Health Organization (IVAC/WHO)**.

10. Expert review on global real-world vaccine effectiveness against SARS-CoV-2.

    Chuenkitmongkol S, Solante R, Burhan E, et al. Expert Rev Vaccines. 2022 Sep;21(9):1255-1268. Epub 2022 Jun 30.

    We reviewed 79 studies in the **International Vaccine Access Center (IVAC) VIEW-hub** platform on vaccine effectiveness (VE) after primary immunizations with two-dose schedules. …

11. Grading of Recommendations, Assessment, Development, and Evaluation (GRADE): Moderna COVID-19 Vaccine for Children Aged 6–11 Years

    Advisory Committee on Immunization Practices (ACIP), Centers for Disease Control and Prevention, July 28, 2022

    We identified relevant observational studies through an ongoing systematic review conducted by the **International Vaccine Access Center (IVAC) and the World Health Organization (WHO**).

12. Grading of Recommendations, Assessment, Development, and Evaluation (GRADE): Pfizer-BioNTech COVID-19 Vaccine for Children Aged 6 Months–4 Years

    Advisory Committee on Immunization Practices (ACIP), Centers for Disease Control and Prevention, June 27, 2022

    We identified relevant observational studies through an ongoing systematic review conducted by the **International Vaccine Access Center (IVAC) and the World Health Organization (WHO)**.

13. COVID-19 booster vaccination in the United States.

    Li R, Liu H, Fairley CK, et al. Int J Infect Dis. 2022 Jun;119:87-94. Epub 2022 Mar 22.

    We collected information on the vaccine efficacy of BNT162b2 for SARS-CoV-2 (Delta variant) infection in older adults aged ≥65 years on the basis of an ongoing systematic review conducted by the **International Vaccine Access Center** (IVAC 2021).

14. Grading of Recommendations, Assessment, Development, and Evaluation (GRADE): Moderna COVID-19 Vaccine

    Advisory Committee on Immunization Practices (ACIP), Centers for Disease Control and Prevention, March 15, 2022

    We identified relevant observational studies through an ongoing systematic review conducted by the **International Vaccine Access Center (IVAC) and the World Health Organization (WHO)**

15. Grading of Recommendations, Assessment, Development, and Evaluation (GRADE): Pfizer-BioNTech COVID-19 Vaccine

    Advisory Committee on Immunization Practices (ACIP), Centers for Disease Control and Prevention, September 20, 2021

    We identified relevant observational studies through an ongoing systematic review conducted by the **International Vaccine Access Center (IVAC) and the World Health Organization (WHO)**