Effectiveness of the XBB.1.5 COVID-19 vaccines
Living Evidence Synthesis #21
(Version 21.3: 25 June 2024)

Appendix 1a: Summary of Included Studies (new studies in blue)

Reference (author, year), with URL	Methods	Key findings	Implications	ROBINS-I
Anderson et al. (2024)[1]	National cohort study using different nationwide registries, leading to a source population of 6,958,082 adults. The study included 3,734,896 adults aged ≥65 years living in Denmark, Sweden or Finland from 1 October 2023 to 29 February 2024. Included adults had no prior hospital admission related to covid-19 and received ≥4 prior COVID-19 vaccine doses (of AZD1222, BNT162b2, or mRNA-1273 vaccines only [AZD1222 as part of the primary vaccination course only]). Relative VE (1-risk ratio) was calculated using the cumulative incidences of covid-19 hospital admission and death for 12 weeks after immunisation among recipients of an XBB.1.5-containing covid-19 mRNA vaccine and matched non-recipients. Time and setting: XBB sublineages and BA.2.86 sublineages were the prevailing variants.	**Relative VE (%) (95% CI) against COVID-19 related hospitalisations** (compared to individuals who received at least 4 prior doses of COVID-19 vaccines) *8 to 91 days since last dose:* • As a 5th dose: 64.6 (51.0-78.1) • As a 6th dose: 57.0 (41.6-72.4) • As a 7th dose: 44.4 (20.2-68.7) • ≥65 years: 60.6 (46.1-75.1) • 65-74 years: 58.3 (42.1-74.6) • ≥75 years: 62.0 (47.5-76.4) *8 to 28 days since last dose:* 65.2 (50.6-79.8) *29 to 49 days since last dose:* 63.4 (47.1-79.6) *50 to 70 days since last dose*: 35.6 (-15.9-87.0) *71 to 91 days since last dose*: 60.2 (45.3-75.0)	The XBB.1.5 variant adapted vaccine was associated with a reduced risk of hospitalisation and death due to COVID-19 among adults ≥65 years of age who received at least 4 prior COVID-19 vaccine doses. This effect was still present 12 weeks after the administration of the XBB.1.5 vaccine. These findings support XBB.1.5 recommendations for persons in this age group.	Serious

		21 to 91 days since last dose (Finland and Denmark only): 57.6 (29.8-85.5) **Relative VE (%) (95% CI) against COVID-19 related death** (compared to individuals who received at least 4 prior doses of COVID-19 vaccines) *8 to 91 days since last dose:* • As a 5th dose: 77.7 (67.5-87.9) • As a 6th dose: 76.9 (66.4-87.4) • As a 7th dose: 82.1 (68.8-95.5) • ≥65 years: 77.9 (69.2-86.7) • 65-74 years: 77.5 (65.6-89.5) • ≥75 years: 78.0 (69.3-86.8) *8 to 28 days since last dose:* 82.7 (79.2-86.2) *29 to 49 days since last dose:* 81.3 (67.1-95.4) *50 to 70 days since last dose*: 68.8 (39.9-93.8) *71 to 91 days since last dose*: 72.3 (60.8-83.8) *21 to 91 days since last dose:* 76.2 (64.2-88.2)		
Caffrey et al. (2024)[2]	Nationwide test-negative case control study using the US Veterans Affairs Healthcare system. The study included 113,174 acute respiratory infection (ARI) episodes in adults aged ≥18 years diagnosed in the	**Relative VE (95% CI) against COVID-19 related ED or UC visits** (compared to individuals who did not receive the XBB.1.5 variant adapted vaccines) *At least 14 days since last dose*	The BNT162b2 XBB.1.5 variant adapted vaccine was associated with a reduced risk of hospitalisation, ED/UC visits and outpatient visits due to COVID-19 among adults aged ≥ 18 years. This	Moderate

	hospital, emergency department, urgent care or outpatient setting during the study period (September 25, 2023, and January 31, 2024).
	
	Patients had to be tested for SARS-CoV-2 via nucleic acid amplification test (NAAT) or rapid antigen test (RAT) within 14 days prior through 3 days after the ARI encounter. Patients could contribute more than one ARI episode to the study if the episodes were more than 30 days apart and the encounter at the highest level of care (i.e., hospitalization > ED/UC visit > outpatient visit) was selected for inclusion.
	
	Adjusted odds ratios were calculated using a multivariate logistic regression model adjusting for (calendar week of ARI episode, age, sex, race, ethnicity, body mass index (BMI) categories, Charlson Comorbidity Index, receipt of influenza vaccine during the 2023-2024 season, receipt of pneumococcal vaccine in the past 5 years, encounters with the VA healthcare system in the year prior, smoking status, immunocompromised, and Census region, and prior documented SARS-CoV-2 infection. VE was calculated as 1 minus the corresponding adjusted OR (and 95% CI), multiplied by 100%.
	
	Time and setting: XBB sublineages and JN.1 sublineages were the prevailing variants.
		• ≥18 years: 39 (33-45)
		  ○ Immunocompromised: 34 (22-45)
		  ○ Immunocompetent: 42 (34-49)
		  ○ XBB and JN.1 sublineages: 43 (33-52)
		  ○ XBB sublineages: 50 (35-61)
		  ○ JN.1 sublineages: 33 (22-43)
		• 18 to <65 years: 48 (37-57)
		• ≥65 years: 35 (27-43)
		
		14 to 60 days since last dose
		  ○ XBB sublineages: 52 (37-63)
		  ○ JN.1 sublineages: 41 (23-54)
		
		61 to 133 days since last dose
		  ○ JN.1 sublineages: 30 (16-41)
		
		Relative VE (%) (95% CI) against COVID-19 related hospitalisations (compared to individuals who did not receive the XBB.1.5 variant adapted vaccines)
		
		At least 14 days since last dose
		• ≥18 years: 43 (34-51)
		  ○ Immunocompromised: 33 (16-47)
		  ○ Immunocompetent: 49 (38-58)
		  ○ XBB and JN.1 sublineages: 46 (32-58)
		  ○ XBB sublineages: 61 (44-73)
		  ○ JN.1 sublineages: 35 (20-48)
		• 18 to <65 years: 58 (33-73)
		• ≥65 years: 41 (32-50)
			protective effect seems less marked against the JN.1 sublineages than the XBB sublineages. The XBB.1.5 vaccine also provided some protection against hospitalisation, ED/UC visits and outpatient visits due to COVID-19 to immunocompromised individuals.	

		14 to 60 days since last dose ○ XBB sublineages: 62 (44-74) ○ JN.1 sublineages: 32 (3-52) *61 to 133 days since last dose* ○ JN.1 sublineages: 37 (19-51) **Relative VE (%) (95% CI) against COVID-19 related outpatient visits** (compared to individuals who did not receive the XBB.1.5 variant adapted vaccines) *At least 14 days since last dose* • ≥18 years: 27 (16-37) ○ Immunocompromised: 40 (19-55) ○ Immunocompetent: 22 (8-34) ○ XBB and JN.1 sublineages: 29 (9-44) ○ XBB sublineages: 51 (27-67) ○ JN.1 sublineages: 24 (5-39) • 18 to <65 years: 34 (14-50) • ≥65 years: 24 (9-36) *14 to 60 days since last dose* ○ XBB sublineages: 50 (25-66) ○ JN.1 sublineages: 31 (1-52) *61 to 133 days since last dose* ○ JN.1 sublineages: 20 (-4-38)		
DeCuir et al. (2024)[3]	A test-negative case-control study using VISION, a multisite, electronic health records (EHR)–based network including 369 EDs and UCs and 229 hospitals in eight states. During the study period (September 21,	**Relative VE (%) (95% CI) against COVID-19 related ED or UC visits** (compared to individuals who have not received the XBB.1.5 variant adapted vaccines) *7 to 119 days since last dose*	The XBB.1.5 variant adapted vaccine provides considerable protection against COVID related ED or UC visits and hospitalisations in adults aged ≥18 years. There was no observed difference between	Serious*

	2023–January 9, 2024) 166,328 immunocompetent adults aged ≥18 years were included either from ED/UC encounters or hospital admissions and were tested for SARS-CoV-2 during the 10 days preceding or up to 72 hours after a COVID-19–associated ED/UC encounter or hospital admission. Case-patients were excluded if they had received a positive influenza or respiratory syncytial virus molecular test result at the time of their COVID-like illness encounter. The IVY network was also used in this study but outcomes from this network were excluded due to having a critical risk of bias. Time and setting: XBB sublineages and JN.1 sublineages were the prevailing variants.	• ≥18 years: 47 (44-50) • 18 to <65 years: 50 (44-55) • ≥65 years: 45 (41-49) *7 to 59 days since last dose* • ≥18 years: 51 (47-54) • 18 to <65 years: 52 (45-58) • ≥65 years: 49 (44-54) *60 to 119 days since last dose* • ≥18 years: 39 (33-45) • 18 to <65 years: 45 (34-55) • ≥65 years: 37 (29-44) **Relative VE (%) (95% CI) against COVID-19 related hospitalisations** (compared to individuals who have not received the XBB.1.5 variant adapted vaccines) *7 to 119 days since last dose* • ≥18 years: 52 (47-57) • 18 to <65 years: 43 (20-59) • ≥65 years: 53 (47-58) *7 to 59 days since last dose* • ≥18 years: 53 (46-59) • 18 to <65 years: 42 (14-61) • ≥65 years: 54 (47-60) *60 to 119 days since last dose* • ≥18 years: 50 (40-59) • 18 to <65 years: 45 (-6-71) • ≥65 years: 50 (39-59)	age groups.	

Hansen et al. (2024)[4]	Cohort study using electronic health records and national administrative data. The study included 1,037,479 participants, individuals > 65 years old living in Denmark, capturing approximately 55% of all COVID-19 related hospitalisation during the study period (October 8 to October 26, 2023). All individuals included had received at least one booster. Hazard Ratio (HR) was estimated in a Cox proportional hazards regression model with calendar time as underlying time scale and adjustment for sex, 5-year age bands, residency region, and number of comorbidities (0, 1, 2, ≥3). Time and setting: Non-specific Omicron variant was the dominant variant (estimated 100%).	**HR against hospitalisation** Among adults aged > 65 years, those who have received the XBB.1.5 COVID-19 vaccine were much less likely to be hospitalised for COVID-19 compared with those who have not received the vaccine HR=0.239, 95% CI 0.152–0.377 after 7+ days since vaccination.	An XBB.1.5 vaccine was associated with a reduced risk of hospitalisation due to COVID-19 among adults > 65 years of age vaccinated with a booster dose. These findings support XBB.1.5 recommendations for persons in this age group	Serious
Huiberts et al. (2024)[5]	Prospective cohort study using data from the VAccine Study COvid-19 (VASCO), Dutch. The study included 23,895 participants; individuals aged 18 -85 years old; XBB.1.5 vaccine-eligible adults who had previously received at least one booster, during the study period (9 October 2023 and 9 January 2024). Relative vaccine effectiveness (VE) was calculated using Cox proportional hazard models with calendar time as time scale, XBB.1.5-vaccination as time-varying exposure and adjustment for age	**Relative VE (%) (95% CI) against positive test** (compared to individuals who have not received XBB.1.5 variant adapted vaccine, those who did) : *7 + days since last dose*: • 18-59 years: 41.3% (22.6-55.5) • 60-85 years: 50.3% (43.8-56.1) *1-6 weeks since last dose:* • 18-59 years: 40.2% (19.6-55.5) • 60-85 years: 52.1% (45.4-57.9) *7-12 weeks since last dose:* • 18-59 years: 46.7% (-5.7-73.1) • 60-85 years: 40.6% (25.7-52.4)	XBB.1.5 vaccination provides considerable protection against SARS-CoV-2 infection in the first 3 months after vaccination. Prior infection also provides some protection against new infection Recent prior infection also protects against new infection, but it should be kept in mind that experiencing a SARS-CoV-2 infection carries risks of severe illness, particularly among vulnerable groups, and post-COVID conditions.	Serious

	group, sex, education level, medical risk condition and infection history.	**Positive test with symptomatic infection:** *7+ days since last dose*: • 18-59 years; 34.7% (10.4-52.4) • 60-85 years; 55.0% (47.6-61.4) **Participants who received a bivalent mRNA booster in autumn 2022 COVID-19 vaccination campaign and XBB.1.5 variant adapted vaccine (compared to these without XBB.1.5 variant adapted vaccine)** *7+ days since last dose*: • 18-59 years; 44.6 (25.0-59.1) • 60-85 years; 51.4 (44.3-57.6) **Infection Status (compared to individuals who had no prior infection):** *No prior infection* *7+ days since last dose*: • 18-59 years; 11.7% (-60.9-51.6) • 60-85 years; 48.8% (36.4-58.8) *Infection ≥1 year ago* *7+ days since last dose*: • 18-59 years; 49.7% (22.8-67.2) • 60-85 years; 67.7% (61.2-73.1) *Infection <1 year ago* *7+ days since last dose*: • 18-59 years; 86.7% (68.9-94.3) • 60-85 years; 85.3% (80.6-88.9)	This underscores the importance of vaccination even for those who have previously been infected.	
Kirsebom et al. (2024)[6]	Test negative case-control study using England's national COVID-19 testing	**Relative VE (%) (95% CI) against COVID-19 related**	The XBB.1.5 variant adapted COVID-19 vaccine provided	Moderate

	data, UKHSA IIS (a national vaccine) and the Register and Secondary Uses Service (the national electronic database of hospital admissions). This study included 28,916 hospitalised adults aged 65 years and older admitted for having an acute respiratory illness (positive PCR tests from hospitalised individuals are cases and negative PCR tests from hospitalised individuals are the controls) during the study period (4th September 2023 to 21st January 2024). Multivariable logistic regression was used with the test result as the outcome, vaccination status as the primary exposure variable of interest and adjusted for week of test date, gender, age (five-year age bands), NHS region, IMD quintile, ethnicity and clinical risk group status (encoded as a categorial variable with a level for all conditions other than severe immunosuppression and a level for severe immunosuppression as described above. VE was calculated as 1-odds ratio and given as a percentage. Time and setting: JN.1 sublineages were the prevailing variants.	**hospitalisations** (compared to individuals who have not received the XBB.1.5 variant adapted vaccines) • 9 to 13 days since last dose: 37.4 (17.8-52.3) • 14 to 28 days since last dose: 54.8 (46.8-61.6) • 29 to 63 days since last dose: 48.3 (41.0-54.7) • 64 to 98 days since last dose: 42.2 (32.3-50.6)	a considerable level of protection against COVID related hospitalisations in adults aged ≥ 65 years. The effect was still present 98 days after the vaccination.	
Link-Gelles (2024)[7]	Test-negative case-control study using VISION, a multisite, electronic health records (EHR). For this study, only these sites contributed: HealthPartners (Minnesota and Wisconsin), Intermountain Health (Utah), Kaiser Permanente Northern California (California), Kaiser Permanente Northwest (Oregon and Washington),	**Relative VE (%) (95% CI) against COVID-19 related hospitalisations** (compared to individuals who have not received the XBB.1.5 variant adapted vaccines) • ≥7 days since last dose: 36 (25-46)	The XBB.1.5 variant adapted COVID-19 vaccine provided a considerable level of protection against COVID related hospitalisations in immunocompromised adults aged ≥ 18 years. The effect was still present 119 days after the vaccination.	Serious

	Regenstrief Institute (Indiana), and University of Colorado (Colorado). Throughout the study period (September 2023 to February 2024) the study included 14,586 hospitalizations among adults aged ≥18 years with immunocompromising conditions and who had COVID-19–like illness with SARS-CoV-2 molecular testing during the 10 days preceding admission or up to 72 hours after admission. Case-patients were persons who received a positive SARS-CoV-2 test result using a molecular test and received a negative or indeterminate or had an unknown test result for both respiratory syncytial virus and influenza. Control patients were those who received a negative SARS-CoV-2 test result using a molecular test and received a negative influenza test result or had an unknown influenza test result. Odds ratios (ORs) and 95% CIs were estimated using multivariable logistic regression comparing persons who received an updated COVID-19 vaccine dose with those who did not, VE was calculated as (1 − adjusted OR) × 100%. Time and setting: Omicron sublineages were the prevailing variants.	• 7 to 59 days since last dose: 38 (23-50) • 60 to 119 days since last dose: 34 (16-47)		
Link-Gelles (2024)[8]	A test-negative case-control study design was used to recruit all adults (18+) who had a test conducted at a participating	**Relative VE (%) (95% CI) against medically attended symptomatic COVID-19**	Updated monovalent COVID-19 XBB.1.5 vaccines provided 54% (95% CI = 46–	Serious

	CVS pharmacy or Walgreen between 21st of September 2023 and 14th of January 2024. Individuals were excluded if: 1) they had a self-reported immunocompromising condition; 2) received Novavax as the most recent dose and received <2 total COVID-19 vaccine doses; 3) received the Janssen COVID-19 vaccine after May 12, 2023; 4) received their most recent dose <7 days before testing or between September 1st and 12th (for those who received the XBB vaccine); 5) received their most recent dose <2 months before testing (for those who did not receive the XBB vaccine); 6) only reported month and year of the most recent vaccine dose rather than calendar date; 7) received a positive SARS-CoV-2 test result during the preceding 90 days. A total of 9,222 nucleic acid amplification test results were included in the study. The relative vaccine VE against symptomatic disease was calculated by comparing odds of receipt versus nonreceipt of the updated COVID-19 vaccine among case- and control patients. Time and setting: XBB subvariants and the JN.1 variant were dominant.	**infections compared to individuals who have not received XBB.1.5** *7+ days since receiving the XBB.1.5 variant adapted vaccine:* • ≥18 years: 54% (46-60) • 18-49 years: 57% (48-65) • ≥50 years: 46% (31-58) *7-59 days since receiving the XBB.1.5 variant adapted vaccine:* • ≥18 years: 58% (48-65) • 18-49 years: 64% (53-73) • ≥50 years: 45% (26-60) *59-119 days since receiving the XBB.1.5 variant adapted vaccine:* • ≥18 years: 49% (36-58) • 18-49 years: 48% (31-60) • ≥50 years: 47% (24-62)	60%) protection against SARS-CoV-2 infection caused by JN.1 and XBB-related lineages in persons recently vaccinated compared with those who did not receive the XBB.1.5 vaccine. The effectiveness of vaccination may decrease over time, especially against less severe disease.	
Skowronski (2024)[9]	A test-negative case-control study using the Canadian Sentinel Surveillance Network. A total of 2,176 individuals aged 12+ were recruited from community-based	**Relative VE (%) (95% CI) >14 days after receiving the XBB.1.5 vaccine against medically attended symptomatic laboratory confirmed COVID-19 infection compared to**	Monovalent XBB.1.5 vaccine provides comparable protection, reducing the risk of medically attended COVID-19 cases by about half overall. Notably, its	Serious

	sentinel practitioners in British Columbia, Ontario and Quebec. All individuals presented with an acute respiratory illness within 7 days of onset. The analysis included specimens collected between 29 October 2023 (week 44) and 13 January 2024 (week 2). VE was calculated as 1−OR × 100%. ORs compared test positivity between vaccinated and unvaccinated participants by logistic regression with covariate adjustment as specified. Time and setting: Most samples whose genetic lineage was tested belonged the JN.1 variant, followed by the HV.1, XBB subline ages and EG.5.1 variant.	**individuals who have not received XBB.1.5** • ≥12 years: 44 (14-63) • 12-64 years: 46 (2-70) • ≥65 years: 46 (-3-72) *Received their previous (non XBB vaccine) more than 12 weeks ago* • ≥12 years: 41 (13-60) *Received their previous (non XBB vaccine) more than 12 weeks ago* • ≥12 years: 47 (21-65) *Had a previous COVID-19 infection* • ≥12 years: 67 (28-85) *Excluding individuals who tested positive for influenza from the COVID-19 control group* • ≥12 years: 54 (31-70) *Had a previous COVID-19 infection and excluding individuals who tested positive for influenza from the COVID-19 control group* • ≥12 years: 72 (39-87)	effectiveness was even higher, reducing the risk by about two-thirds among individuals who were previously infected with COVID-19. This indicates that the vaccine may offer enhanced protection for individuals who have already had COVID-19.	
Tartof et al. (2023)[10]	A test-negative case-control study using the Kaiser Permanente Southern California records. All individuals aged 18+ included (n=24,007) have been diagnosed with an acute respiratory infection (ARI) and	**OR (95% CI) against hospitalisation:** After a median of 30 days (range: 14 - 73), individuals who received BNT162b2 XBB.1.5- adapted	XBB1.5-adapted vaccines provided significant additional protection against COVID-19 related hospitalization, ED or UC, and outpatient visits. These findings support XBB.1.5	Moderate

	tested for COVID-19 while being admitted to the hospital, visited the emergency department, visited the urgent care or had an in-person outpatient encounter during the study period (From October 10, 2023, through December 10, 2023). SARS-CoV-2 PCR tests among cases and controls were restricted to those administered ≤14 days prior to the initial ARI encounter through ≤3 days after the encounter. Patients could contribute ≥1 event to the study if events were >30 days apart. Adjusted odds ratios (OR) and 95% CI were estimated from multivariable logistic regression models that were adjusted for patient demographic and clinical characteristics. Time and setting: XBB sub lineages were the dominant variants.	vaccine *compared to individuals who did not receive the XBB.1.5 vaccine* ● 18+ years: 0.37 (0.2 to 0.67) ● 18 - 64 years: 0.32 (0.04 to 2.48) ● 65+ years: 0.37 (0.2 to 0.69) *Compared to individuals who received the BA.4/5-adapted bivalent vaccine but no, XBB.1.5-adapted vaccine.* ● 18+ years: 0.4 (0.21 to 0.75) ● 18 - 64 years: 0.35 (0.04 to 2.99) ● 65+ years: 0.39 (0.2 to 0.76) *Compared to individuals who received ≥3 doses of wild-type vaccine but no variant-adapted vaccines of any kind.* ● 18+ years: 0.36 (0.2 to 0.65) ● 18 - 64 years: 0.27 (0.03 to 2.14) ● 65+ years: 0.36 (0.19 to 0.68) *Compared to individuals who received ≥2 doses of wild-type vaccine but no variant-adapted vaccines of any kind.* ● 18+ years: 0.37 (0.2 to 0.67) ● 18 - 64 years: 0.3 (0.04 to 2.32) ● 65+ years: 0.37 (0.2 to 0.7) *Compared to individuals who were unvaccinated.* ● 18+ years: 0.32 (0.16 to 0.64) ● 18 - 64 years: 0.37 (0.04 to 3.22) ● 65+ years: 0.29 (0.14 to 0.61)	recommendations for broad age-based use of annually updated COVID-19 vaccines.	

		OR (95% CI) against COVID related emergency department/urgent care (ED or UC) visits After a median of 30 days (range: 14 - 73), individuals who received BNT162b2 XBB.1.5- adapted vaccine *compared to individuals who did not receive the XBB.1.5 vaccine* ● 18+ years: 0.42 (0.34 to 0. 53) ● 18 - 64 years: 0.36 (0.24 to 0.54) ● 65+ years: 0.45 (0.34 to 0.59) *Compared to individuals who received the BA.4/5-adapted bivalent vaccine but no XBB.1.5-adapted vaccine.* ● 18+ years: 0.43 (0.34 to 0.55) ● 18 - 64 years: 0.40 (0.26 to 0.62) ● 65+ years: 0.43 (0.31 to 0.58) *Compared to individuals who received ≥3 doses of wild-type vaccine but no variant-adapted vaccines of any kind.* ● 18+ years: 0.41(0.33 to 0.51) ● 18 - 64 years: 0.34 (0.23 to 0.51) ● 65+ years: 0.45 (0.34 to 0.6) *Compared to individuals who received ≥2 doses of wild-type vaccine but no variant-adapted vaccines of any kind.* ● 18+ years: 0.42 (0.33 to 0.52) ● 18 - 64 years: 0.35 (0.23 to 0.52) ● 65+ years: 0.46 (0.35 to 0.61)		

		Compared to individuals who were unvaccinated. ● 18+ years: 0.4 (0.31 to 0.52) ● 18 - 64 years: 0.37 (0.24 to 0.56) ● 65+ years: 0.33 (0.22 to 0.49) **OR (95% CI) against medically attended COVID infections** After a median of 30 days (range: 14 - 73), individuals who received BNT162b2 XBB.1.5- adapted vaccine *compared to individuals who did not receive the XBB.1.5 vaccine* ● 18+ years: 0.42 (0.27 - 0.66) ● 18 - 64 years: 0.68 (0.46 - 1.01) ● 65+ years: 0.32 (0.21 - 0.51) *Compared to individuals who received the BA.4/5-adapted bivalent vaccine but no XBB.1.5-adapted vaccine* ● 18+ years: 0.49 (0.35 to 0.68) ● 18 - 64 years: 0.78 (0.5 to 1.21) ● 65+ years: 0.29 (0.18 to 0.47) *Compared to individuals who received ≥3 doses of wild-type vaccine but no variant-adapted vaccines of any kind.* ● 18+ years: 0.44 (0.33 to 0.6) ● 18 - 64 years: 0.6 (0.4 to 0.9) ● 65+ years: 0.35 (0.22 to 0.55) *Compared to individuals who received ≥2 doses of wild-type vaccine but no variant-adapted vaccines of any kind.*		

		● 18+ years: 0.46 (0.34 to 0.62) ● 18 - 64 years: 0.65 (0.43 to 0.97) ● 65+ years: 0.33 (0.21 to 0.53) *Compared to those who were unvaccinated.* ● 18+ years: 0.57 (0.39 to 0.84) ● 18 - 64 years: 0.83 (0.52 to 1.33) 65+ years: 0.4 (0.18 to 0.87)		
UK Health Security Agency (2024)[11]	A test-negative case-control study design was used to recruit all individuals aged 65+ years in England from the national database who have had at least 2 days stay in the hospital and a respiratory code in the primary diagnostic field during the study period (4th September 2023 to 17th December 2023) All individuals included (n = 16,549) had previously received at least one booster. The relative VE of receiving a bivalent BA.1 booster vaccine in addition to at least 2 doses of a prior monovalent vaccine was used in the calculation Time and setting: Non-specific Omicron variant was the dominant variant (estimated 96%)	**Relative VE (%) (95% CI) against hospitalisation** Compared to those who did not receive the BNT162b2 XBB.1.5 vaccine, those who received BNT162b2 XBB.1.5. ● 9 to 13 days: 42.3% (95% CI, 20.5 to 58.2), ● 2 to 4 weeks: 55.4% (95% CI, 45 to 63.8), and ● 5 to 9 weeks: 50.9% (95% CI, 37.5 to 61.5)	Incremental effectiveness against hospitalisation for XBB.1.5 vaccines peaked at 55.4% after 2-4 weeks since vaccination. These findings show that VE against hospitalisation of XBB.1.5 did not meet WHO recommendations of VE against severe disease (≥ 90%, with the lower 95% CI ≥ 70%)	Moderate

*Hospitalisation data from the IVY database had a critical risk of bias and were excluded

ED: emergency department, HR: hazard ratio, OR: odds ratio, UC: urgent care, UK: United Kingdom

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Appendix 1b: Summary of studies excluded for critical risk of bias

Study ID	First author	Title	Reason for critical bias decision
09A-3	Antunes[1]	Early COVID-19 XBB.1.5 vaccine effectiveness against hospitalisation among adults targeted for vaccination, VEBIS hospital network, Europe, October 2023–January 2024	• Meeting serious risk of bias in 3 of 4 domains ○ Method for confirming vaccination - No data is provided on how vaccination information was captured, expect that the information needed to be collected from patient and entered into study database. ○ Accounting for prior infection – Not reported or analysed ○ Adjustments - Did not adjust for SES, ethnicity, race, occupation
13L-3	Lanièce Delaunay[2]	Effectiveness of COVID-19 vaccines administered in the 2023 autumnal campaigns in Europe: Results from the VEBIS primary care test-negative design study, September 2023–January 2024	• Meeting serious risk of bias in 3 of 4 domains ○ Method for confirming vaccination - No data is provided on how vaccination information was captured, expect that the information needed to be collected from patient and entered into study database. ○ Accounting for prior infection – Not reported or analysed ○ Adjustments - Did not adjust for SES, ethnicity, race, occupation
15M-3	Ma[3]	Effectiveness of Updated 2023–2024 (Monovalent XBB.1.5) COVID-19 Vaccination Against SARS-CoV-2 Omicron XBB and BA.2.86/JN.1 Lineage Hospitalization and a Comparison of Clinical Severity — IVY Network, 26 Hospitals, October 18, 2023– March 9, 2024	• Meeting serious risk of bias in 3 of 4 domains ○ Method for confirming vaccination - state registry data, hospital EMR, or self-report ○ Accounting for prior infection – Not reported or analysed ○ Adjustments - Did not adjust for SES or occupation
16M-3	Monge[4]	Effectiveness of XBB.1.5 Monovalent COVID-19 Vaccines During a Period of XBB.1.5 Dominance in EU/EEA Countries, October to November 2023: A VEBIS-HER Network Study	• Meeting serious risk of bias in 3 of 4 domains ○ Method for confirming vaccination - No data is provided on how vaccination information was captured, expect that the information needed to be collected from patient and entered into study database.

			○ Accounting for prior infection – Not reported or analysed ○ Adjustments - Did not adjust for SES, ethnicity, race, occupation
17N-3	Nham[5]	Effectiveness of COVID-19 XBB.1.5 monovalent mRNA vaccine in Korea: interim analysis	Downgraded for not adjusting or accounting for calendar time
02V-1	van Werkhoven[6]	Early COVID-19 vaccine effectiveness of XBB.1.5 vaccine against hospitalisation and admission to intensive care, the Netherlands, 9 October to 5 December 2023	• Meeting serious risk of bias in 3 of 4 domains. ○ Study design – serious bias in missing data ○ Assignment of COVID outcome – serious bias in missing data ○ Accounting for prior infection – not reported ○ Adjustments – Did not adjust for comorbidities, race/ethnicity, or SES

SES: socio-economic status

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2. Laniece Delaunay C, Melo A, Maurel M, Mazagatos C, Goerlitz L, O'Donnell J, et al. Effectiveness of COVID-19 vaccines administered in the 2023 autumnal campaigns in Europe: Results from the VEBIS primary care test-negative design study, September 2023-January 2024. Vaccine [Internet]. 2024; Available from: https://www.sciencedirect.com/science/journal/0264410X

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Appendix 2: VE against other COVID-19-related outcomes (e.g., outpatient visits) of the XBB.1.5 adapted COVID-19 vaccine compared to those who have not received the XBB.1.5 adapted COVID-19 vaccine

None

Appendix 3: Search strategy

Medline and Embase

Row #	Syntax
1	vaccination/ or vaccine/
2	"Vaccin*".mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kf, fx, dq, bt, nm, ox, px, rx, ui, sy, ux, mx]
3	1 or 2
4	("XBB.1.5" OR "XBB1.5").mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kf, fx, dq, bt, nm, ox, px, rx, ui, sy, ux, mx]
5	(effectiveness or efficacy or protection).mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kf, fx, dq, bt, nm, ox, px, rx, ui, sy, ux, mx]
6	4 AND 5
7	3 AND 6
8	remove duplicates from 7

NIH/iCite (except PubMed)

Syntax	Filters
vaccin* AND (effectiveness OR efficacy OR protection) AND ("XBB.1.5" OR "XBB1.5")	Look up in title and abstract

Appendix 4: Definitions and glossary

Full vaccine series: Receipt of one of the following COVID-19 vaccines authorised by Health Canada:
- Two doses of AstraZeneca/COVISHIELD (AZD1222/ChAdOx1, Vaxzevria), Moderna (mRNA-1273, Spikevax), Novavax, or Pfizer-BioNTech (BNT162b2, Comirnaty);
- One dose of Janssen (Johnson & Johnson: Ad26.COV2.S, Jcovden); or
- A combination of the above

Fully vaccinated: A person who is at least 14 days post having received one of the following vaccine schedules:
- the full series of a COVID-19 vaccine authorized by Health Canada (see above); or
- the full series of the above vaccines plus an additional dose in immunocompromised individuals

Additional dose: A person who has received:
- a full series of a COVID-19 vaccine authorised by Health Canada (see above) plus an additional dose of a COVID-19 vaccine authorised by Health Canada; or
- the full series of the above vaccines plus two additional doses in immunocompromised individuals

Confirmed infection: A person with confirmation of infection with SARS-CoV-2 documented by the detection of at least 1 specific gene target by a validated laboratory-based nucleic acid amplification test (NAAT) assay (e.g. real-time PCR or nucleic acid sequencing) performed at a community, hospital, or reference laboratory (the National Microbiology Laboratory or a provincial public health laboratory) (2).

Hospitalisation due to COVID-19: Inpatient admission to a hospital and/or ICU unit, associated with laboratory-confirmed SARS-CoV-2 infection.

ICU admission due to COVID-19: Inpatient admission to the ICU unit, associated with laboratory-confirmed SARS-CoV-2 infection.

Death due to COVID-19: Death resulting from a clinically compatible illness in a probable or confirmed COVID-19 case, with no presence of clear alternative causes unrelated to COVID-19 (e.g., trauma, poisoning, drug overdose).

Post-COVID-19 conditions: Occurs in individuals with a history of probable or confirmed SARS-CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis. Common symptoms include fatigue, shortness of breath, cognitive dysfunction but also others and generally have an impact on everyday functioning. Symptoms may be new onset following initial recovery from an acute COVID-19 episode or persist from the initial illness. Symptoms may also fluctuate or relapse over time.

Medically attended infection: This defines individuals who present to a medical professional with notable respiratory symptoms (also called acute respiratory infections [ARIs]), are then tested and found to have COVID-19.

MIS-C: Multisystem inflammatory syndrome in children is a post-viral inflammatory syndrome that temporally follows coronavirus disease 2019 (COVID-19). Symptoms may include fever, abdominal pain, vomiting, diarrhea, skin rash and other signs of inflammation. MIS-C occurs in children and adolescent 0-19 years of age with fever for three or more days AND two of the following:

1. Rash or bilateral non-purulent conjunctivitis or mucocutaneous inflammation signs (oral, hands or feet),
2. Hypotension or shock,
3. Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated troponin/N-terminal pro-brain natriuretic peptide (NT-proBNP),
4. Evidence of coagulopathy (by prothrombin time, partial thromboplastin time, elevated D-dimer),
5. Acute gastrointestinal problems (diarrhea, vomiting or abdominal pain) AND Elevated markers of inflammation such as C-reactive protein, erythrocyte sedimentation rate or procalcitonin AND no other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes AND Evidence of COVID-19

Variants of concern (VOC): A SARS-CoV-2 variant is considered a VOC in Canada based on a set of criteria including increased transmissibility or detrimental change in COVID-19 epidemiology, increased virulence, decreased effectiveness of vaccines, and so on. As of January 17, 2022, there is currently no VOCs.

Vaccine effectiveness (VE): A measure of how well a vaccine protects people from getting the outcome of interest in real-world practice (For example: VE of 92% against infection means that 92% of people will be protected from becoming infected with COVID and 8% of people will still be at risk of becoming infected with COVID). In the context of the current report, we have utilised the term vaccine effectiveness to cover all studies. However, we are aware that the studies that have been included range from efficacy through to effectiveness studies. We decided to use this terminology as it is consistent with how most evidence synthesis products describe these studies. To be consistent with this, in the French summary we have utilised the term efficacité, and it is noted that in French there is no distinction between the translations of efficacy and effectiveness.

Relative vaccine effectiveness: The term used to refer to the effectiveness of a vaccine when it is measured by comparing people who have received one vaccine type or regimen to those who received a different vaccine type or regimen.

AZ: AstraZeneca

CIs: Confidence Intervals

ED: emergency department

HCW: Healthcare workers

ICU: Intensive care unit

LTC: Long-term care

LTCF: Long-term care facility

MOD: Moderna

Obs: observational study

Omicron: variant of interest (XBB.1.5, EG.5, BA.2.86, JN.1)

OR: odds ratio

PF: Pfizer

RCT: Randomized controlled trial

RoB: Risk of Bias

UC: Urgent care

UK: United Kingdom

USA: United States of America

VOI: variant of interest

WHO: World Health Organization

Appendix 5: Critical appraisal process

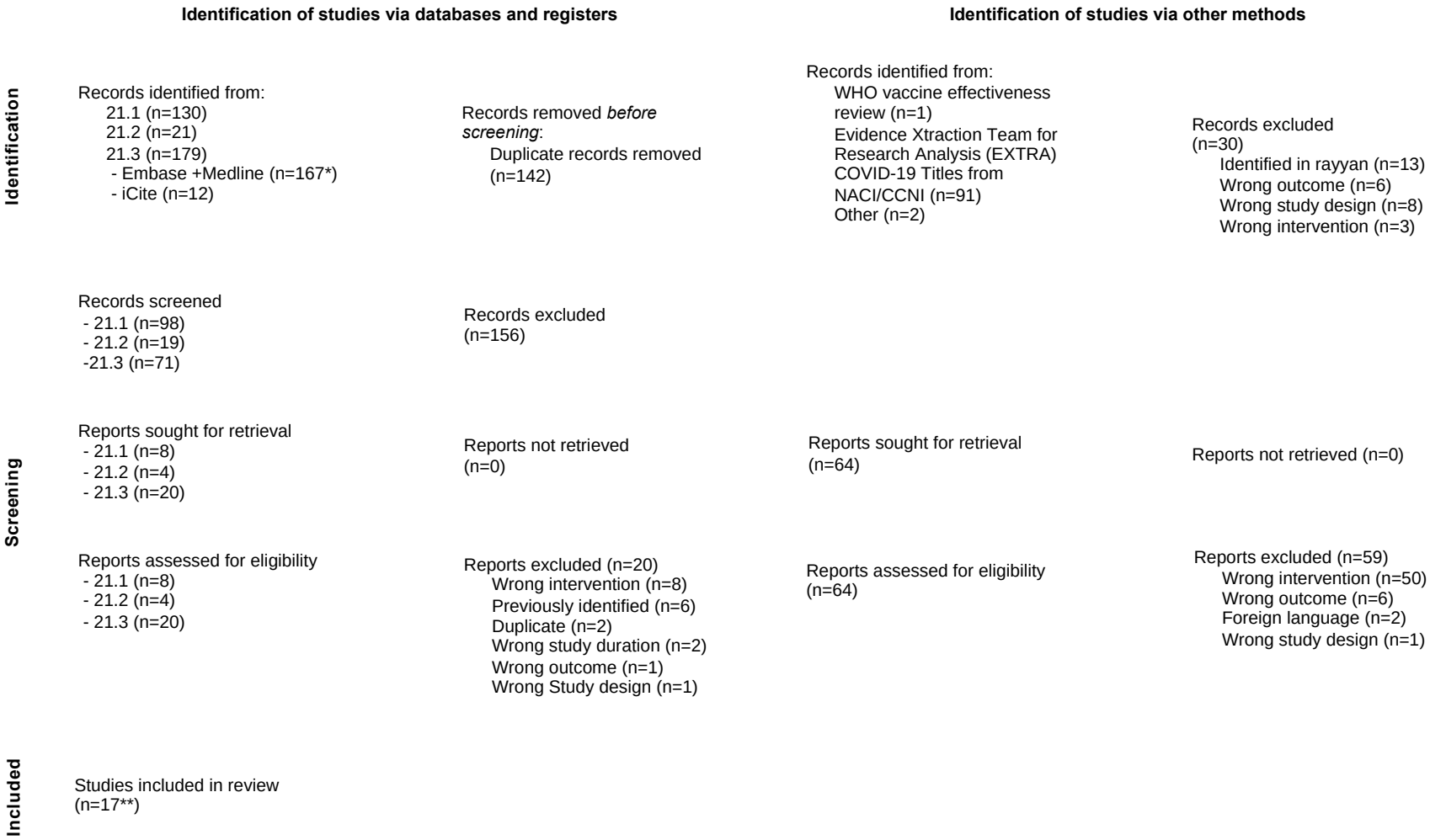
We appraised the quality of the individual studies using an adapted version of ROBINS-I. This tool classifies the Risk of Bias of a study as **Low, Moderate, Serious, Critical, or No Information**. *Low Risk of Bias indicates High Quality, and Critical Risk of Bias indicates Very Low (insufficient) Quality*. ROBINS-I appraises 7 bias domains and judges each study against an ideal reference randomised controlled trial. To improve the utility of ROBINS-I for assessing studies reporting vaccine effectiveness, we have focused on study characteristics that introduce bias as reported in the vaccine literature (see WHO. Evaluation of COVID-19 vaccine effectiveness. Interim Guidance. 17 March 2021). An overall judgement of "critical" is given when the study is judged to be at critical risk of bias in at least one domain or if three or more domains are judged to be "serious".

Appendix 6: Data-extraction template

Study details	
Source	First author of study and year of publication
Location	Country data was collected in
COI	If conflicts of interest were reported
Funding	public or industry
Study design	RCT/cohort/data-linkage/test-negative/case-control/other
Publication format	Peer-reviewed / pre-print / report
Population(s)	general public/HCW
Total (N)	Total study sample
Age	Description of age of the population
Female	number or %
Race/ethnicity	Description of the race/ethnicity of the population
Population (primary serie)	Details on primary serie received previously
Population (boosters)	Details on boosters received previously
Population (COVID-19 history)	Details on the COVID-19 history of the population
Definition of infections	How were COVID-19 infections defined
Definition of COVID hospitalisations	How were COVID-19 hospitalisations defined
Definition of COVID outpatient visits	How were COVID-19 outpatient visits defined
Definition of COVID emergency department visits	How were COVID-19 emergency department visits defined
Definition of COVID ICU admission	How were COVID-19 ICU admissions defined
Definition of post-COVID conditions	How were post-COVID-19 conditions defined
Definition of MIS-C	How was MIS-C defined
Definition of COVID deaths	How were COVID-19 deaths defined
Vaccines	Details of what vaccines were included in the study
Comparator	What comparison group was used to generate VE
Study calendar time	When was the study conducted

Outcomes	
Variant sub-group	Was a specific variant being studied (any, delta, or omicron)
Was VOC or VOI sequenced	Yes or no, only applicable if looking at a variant
Outcome	Cases, hospitalisations, ICU, deaths, post-COVID-conditions, or MIS-C
Specific vaccine	If individual vaccine data is reported
Vaccine class	mRNA, adenovirus, protein subunit, or mixed (reporting mRNA, adenovirus, and/or mixed doses)
Effect measure used	VE, RR, or other
Level of CIs	95% or 99%
Time window	Time since second dose administered
VE outcome	Reported point estimate
Lower CI	Reported lower CI
Upper CI	Reported upper CI
Adjustments	What variables were used to adjust for in analyses
Comments	

Appendix 7a: Flow chart of studies included in the current update:



*Includes a search strategy adjustment

**Six of these were excluded for having a critical risk of bias

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/

Appendix 7b. Summary of excluded studies during full text screening (new studies are in blue)

Author (year of publication)	Title	Reason for exclusion
Hansen et al. (2024)	Short-term effectiveness of the XBB.1.5 updated COVID-19 vaccine against hospitalisation in Denmark: a national cohort study	Previously identified
Huiberts et al. (2024)	Effectiveness of Omicron XBB.1.5 vaccine against SARS-CoV-2 Omicron XBB and JN.1 infection in a prospective cohort study in the Netherlands, October 2023 to January 2024	Duplicate
Huiberts et al. (2024)	Effectiveness of Omicron XBB.1.5 vaccine against SARS-CoV-2 Omicron XBB and JN.1 infection in a prospective cohort study in the Netherlands, October 2023 to January 2024	Previously identified
Huiberts et al. (2024)	Effectiveness of Omicron XBB.1.5 vaccine against infection with SARS-CoV-2 Omicron XBB and JN.1 variants, prospective cohort study, the Netherlands, October 2023 to January 2024	Previously identified
Kirsebom et al. (2023)	Long-term duration of protection of ancestral-strain monovalent vaccines and effectiveness of the bivalent BA.1 boosters against COVID-19 hospitalisation during a period of BA.5, BQ.1, CH.1.1. and XBB.1.5 circulation in England	Wrong intervention
Kirsebom et al. (2024)	Effectiveness of Autumn 2023 COVID-19 vaccination and residual protection of prior doses against hospitalisation in England, estimated using a test-negative case-control study	Duplicate
Kopel et al. (2024)	Effectiveness of the 2023-2024 Omicron XBB.1.5-containing mRNA COVID-19 vaccine (mRNA-1273.815) in preventing COVID-19-related hospitalizations and medical encounters among adults in the United States: An interim analysis	Wrong study duration
Lasrado et al. (2024)	Waning immunity and IgG4 responses following bivalent mRNA boosting	Wrong intervention
Levy et al. (2024)	XBB.1.5 mRNA COVID-19 Vaccination and Inpatient or Emergency Department Visits Among Adults Infected with SARS-CoV-2 JN.1 and XBB-Lineage Variants	Previously identified
Levy et al. (2024)	XBB.1.5 mRNA COVID-19 Vaccination and Inpatient or Emergency Department Visits Among Adults Infected with SARS-CoV-2 JN.1 and XBB-Lineage Variants	Wrong outcome
Lewnard et al (2023)	Increased vaccine sensitivity of an emerging SARS-CoV-2 variant	Wrong intervention
Lin et al. (2024)	Effectiveness of XBB.1.5 vaccines and antiviral drugs against severe outcomes of omicron infection in the USA	Wrong study duration

Lin et al. (2024)	Effectiveness of XBB.1.5 vaccines and antiviral drugs against severe outcomes of omicron infection in the USA	Previously identified
Lin et al (2023)	Effects of COVID-19 vaccination and previous SARS-CoV-2 infection on omicron infection and severe outcomes in children under 12 years of age in the USA:an observational cohort study	Wrong intervention
Link-Gelles et al (2023)	Early Estimates of Bivalent mRNA Booster Dose Vaccine Effectiveness in Preventing Symptomatic SARS-CoV-2 Infection Attributable to Omicron BA.5- and XBB/XBB.1.5-Related Sublineages Among Immunocompetent Adults - Increasing Community Access to Testing Program, United States, December 2022-January 2023	Wrong intervention
Machado et al. (2024)	Immune Evasion of SARS-CoV-2 Omicron Subvariants XBB.1.5, XBB.1.16 and EG.5.1 in a Cohort of Older Adults after ChAdOx1-S Vaccination and BA.4/5 Bivalent Booster	Wrong intervention
Mousten-Helms et al. (2024)	Relative vaccine protection, disease severity, and symptoms associated with the SARS-CoV-2 omicron subvariant BA.2.86 and descendant JN.1 in Denmark: a nationwide observational study	Wrong study design
Roa et al. (2024)	SCB-2019 protein vaccine as heterologous booster of neutralizing activity against SARS-CoV-2 Omicron variants after immunization with other COVID-19 vaccines	Wrong intervention
Sakr et al. (2024)	Booster doses of COVID-19 vaccine enhance neutralization efficiency against XBB.1.5	Wrong intervention
Skowronski et al. (2024)	2023/24 mid-season influenza and Omicron XBB.1.5 vaccine effectiveness estimates from the Canadian Sentinel Practitioner Surveillance Network (SPSN)	Previously identified

Appendix 7b. Summary of excluded studies during hand search (new studies are in blue)

Author (year of publication)	Title	Reason for exclusion
Allahgholipour et al. (2024)	COVID-19 vaccines breakthrough infection and adverse reactions in medical students: a nationwide survey in Iran	Wrong intervention
Altas et al. (2024)	Frequency of SARS-COV-2 infection and COVID-19 vaccine uptake and protection among Syrian refugees: COVID-19 Vaccine among Syrian Refugees	Wrong intervention
Alzubaidi et al. (2024)	Protective effect of COVID-19 vaccination against a SARS-CoV-2 reinfection in the Babil Province	Wrong outcome
Andersson et al. (2024)	Adverse Events After XBB.1.5-Containing COVID-19 mRNA Vaccines	Wrong outcome
Andersson et al. (2024)	Comparative effectiveness of the monovalent XBB.1.5-containing covid-19 mRNA vaccine across three Nordic countries	Included in rayyan
Andrews et al. (2024)	OpenSAFELY: Effectiveness of COVID-19 vaccination in children and adolescents	Wrong intervention
Ann Costa Clemens et al. (2024)	Interchangeability of different COVID-19 vaccine platforms as booster doses: A phase 3 study mimicking real-world practice	Wrong intervention
Baltu et al. (2024)	COVID-19 vaccination among adolescents and young adults with chronic kidney conditions: a single-center experience	Wrong outcome
Bejko et al. (2024)	High Vaccine Effectiveness Against Severe Covid-19 Outcomes During the Omicron Era in Luxembourg: A Nationwide Retrospective Cohort Study (December 2021-March 2023)	Wrong intervention
Bejko et al. (2024)	High vaccine effectiveness against severe COVID-19 outcomes and population preventable fraction during the Omicron era in Luxembourg: A nationwide retrospective risk factor analysis	Wrong intervention
Bytyci et al. (2024)	Immunocompromised individuals are at increased risk of COVID-19 breakthrough infection, hospitalization, and death in the post-vaccination era: A systematic review	Wrong study design
Cai et al. (2024)	Impact of COVID-19 vaccination status on hospitalization and disease severity: A descriptive study in Nagasaki Prefecture, Japan	Wrong intervention
Canaan et al. (2024)	Efficacy and safety of SARS-COV-2 vaccines in breast cancer patients : Egyptian experience	Wrong outcome
Cardemil et al. (2024)	Maternal COVID-19 Vaccination and Prevention of Symptomatic Infection in Infants	Wrong outcome

Chalkias et al. (2024)	Interim Report of the Reactogenicity and Immunogenicity of Severe Acute Respiratory Syndrome Coronavirus 2 XBB–Containing Vaccines	Wrong outcome
Chaudhary et al. (2024)	Breakthrough COVID-19 Infection Among the General Community, Frontline Workers, and Healthcare Workers During the Second and Third Wave in North India: A Longitudinal Study.	Wrong intervention
Chen et al. (2024)	Uptake, effectiveness and safety of COVID-19 vaccines in individuals at clinical risk due to immunosuppressive drug therapy or transplantation procedures: a population-based cohort study in England	Wrong intervention
Chirasuthat et al. (2024)	Immunogenicity, Effectiveness, and Safety of COVID-19 Vaccines among Patients with Immune-Mediated Dermatological Diseases: A Systematic Review and Meta-analysis	Wrong study design
Costiniuk et al. (2024)	Correlates of Breakthrough SARS-CoV-2 Infections in People with HIV: Results from the CIHR CTN 328 Study	Wrong intervention
Cotton et al. (2024)	The effect of SARS-COV-2 variant on non-respiratory features and mortality among vaccinated and non-fully vaccinated patients	Wrong intervention
Dal Negro et al. (2024)	mRNA vaccines protect from the lung microvasculature injury and the capillary blood volume loss occurring in SARS-CoV-2 paucisymptomatic infections	Wrong intervention
Dam et al. (2024)	COVID-19 outcome trends by vaccination status in Canada, December 2020–January 2022	Wrong intervention
De troyer et al. (2024)	Clinical effectiveness of coronavirus disease 2019 vaccination in patients with multiple sclerosis stratified by disease-modifying treatment	Wrong intervention
Deutschl et al. (2024)	Impact of Vaccination Status on Outcome of Patients With COVID-19 and Acute Ischemic Stroke Undergoing Mechanical Thrombectomy	Wrong intervention
Durier et al. (2024)	Incidence of COVID-19 mRNA vaccine symptomatic breakthrough infections during Omicron circulation in adults with or without infection prior to vaccination	Wrong intervention
Ehsan et al. (2024)	Prevalence of covid-19 breakthrough after vaccination and adverse effects of vaccines	Wrong intervention
Fernandez-Garcia et al. (2024)	Effectiveness and safety of COVID-19 vaccines on maternal and perinatal outcomes: a systematic review and meta-analysis	Wrong study design

Franklin et al. (2024)	COVID-19 Vaccination Coverage, and Rates of SARS-CoV-2 Infection and COVID-19–Associated Hospitalization Among Residents in Nursing Homes — National Healthcare Safety Network, United States, October 2023–February 2024	Wrong outcome
Garza-Silva et al. (2024)	Effectiveness of different booster vaccine combinations against SARS-CoV-2 during a six-month follow-up in Mexico and Argentina	Wrong intervention
Gayed et al. (2024)	Safety and Immunogenicity of the Monovalent Omicron XBB.1.5-Adapted BNT162b2 COVID-19 Vaccine in Individuals ≥12 Years Old: A Phase 2/3 Trial	Wrong outcome
Gazitt et al. (2024)	COVID-19 Vaccine Effectiveness among Patients with Psoriatic Disease: A Population-Based Study	Wrong intervention
Gim et al. (2024)	Vaccine Effectiveness Against Severe Acute Respiratory Syndrome Coronavirus 2 Reinfection by Type and Frequency of Vaccine: A Community-Based Case-Control Study	Wrong intervention
Guedalia et al. (2024)	Maternal hybrid immunity and risk of infant COVID-19 hospitalizations: national case-control study in Israel	Wrong intervention
Gutfreund et al. (2024)	The effectiveness of the COVID-19 vaccines in the prevention of post-COVID conditions in children and adolescents: a systematic literature review and meta-analysis	Wrong study design
Horvath et al. (2024)	Vaccine Effectiveness against GP-Attended Symptomatic COVID-19 and Hybrid Immunity among Adults in Hungary during the 2022–2023 Respiratory Season Dominated by Different SARS-CoV-2 Omicron Subvariants	Wrong intervention
Hu et al. (2024)	Evaluation of vaccine effectiveness of mRNA COVID-19 vaccines in children: a systematic review and meta-analysis	Wrong study design
Huang et al. (2024)	The Effectiveness of Vaccination on the COVID-19 Epidemic in California	Wrong intervention
Huiberts et al. (2024)	Effectiveness of Omicron XBB.1.5 vaccine against SARS-CoV-2 Omicron XBB and JN.1 infection in a prospective cohort study in the Netherlands, October 2023 to January 2024	Previously identified
Janzic et al. (2024)	Prospective Observational Study of COVID-19 Vaccination in Patients with Thoracic Malignancies: Adverse Events, Breakthrough Infections and Survival Outcomes	Wrong intervention

Jimenez-Sepulveda et al. (2024)	Effectiveness of mRNA booster doses in preventing infections and hospitalizations due to SARS-CoV-2 and its dominant variant over time in Valencian healthcare workers, Spain	Wrong intervention
Kastelewicz et al. (2024)	Incidence of SARS-CoV-2 infection among healthcare workers before and after COVID-19 vaccination in a tertiary paediatric hospital in Warsaw: A retrospective cohort study	Wrong intervention
Kavikondala et al. (2024)	Comparative Effectiveness of mRNA-1273 and BNT162b2 COVID-19 Vaccines Among Older Adults: Systematic Literature Review and Meta-Analysis Using the GRADE Framework	Wrong study design
Khater et al. (2024)	Effectiveness of COVID-19 vaccination among patients hospitalized from April 2020 to March 2021: A Retrospective cohort study	Wrong intervention
Kopel et al. (2024)	Effectiveness of the 2023-2024 Omicron XBB.1.5-containing mRNA COVID-19 vaccine (mRNA-1273.815) in preventing COVID-19-related hospitalizations and medical encounters among adults in the United States: An interim analysis	Included in rayyan
Lang et al. (2024)	COVID-19 Vaccine Effectiveness and Digital Pandemic Surveillance in Germany (eCOV Study): Web Application–Based Prospective Observational Cohort Study	Wrong intervention
Lanièce Delaunay et al. (2024)	Effectiveness of Covid-19 Vaccines Administered in the 2023 Autumnal Campaigns in Europe: Results from the Vebis Primary Care Test-Negative Design Study, September 2023–January 2024	Included in rayyan
Lanièce Delaunay et al. (2024)	Effectiveness of COVID-19 vaccines administered in the 2023 autumnal campaigns in Europe: Results from the VEBIS primary care test-negative design study, September 2023–January 2024	Included in rayyan
Lee et al. (2023)	Clinical and Economic impact of updated Fall 2023 COVID-19 vaccines in the Immunocompromised Population in Canada	Wrong study design (modelling study)
Levy et al. (2024)	XBB.1.5 mRNA COVID-19 Vaccination and Inpatient or Emergency Department Visits Among Adults Infected with SARS-CoV-2 JN.1 and XBB-Lineage Variants	Previously identified
Li et al. (2024)	Effectiveness and safety of immune response to SARS-CoV-2 vaccine in patients with chronic kidney disease and dialysis: A systematic review and meta-analysis	Wrong study design
Lin et al. (2024)	Impact of Booster Vaccination Interval on SARS-CoV-2 Infection, Hospitalization, and Death	Wrong intervention

Link-Gelles et al. (2024)	Interim Effectiveness of Updated 2023-2024 (Monovalent XBB.1.5) COVID-19 Vaccines Against COVID-19-Associated Hospitalization Among Adults Aged ≥18 Years with Immunocompromising Conditions - VISION Network, September 2023-February 2024	Included in rayyan
Lu et al. (2024)	Preliminary Report of Nationwide COVID-19 Vaccine Compensation in Taiwan	Wrong intervention
Lu et al. (2024)	The effect of COVID-19 vaccine to the Omicron variant in children and adolescents: a systematic review and meta-analysis	Wrong study design
Lu et al. (2024)	Real-world Effectiveness of mRNA COVID-19 Vaccines Among US Nursing Home Residents Aged ≥65 Years in the Pre-Delta and High Delta Periods	Wrong intervention
Ma et al. (2024)	Effectiveness of Updated 2023–2024 (Monovalent XBB.1.5) COVID-19 Vaccination Against SARS-CoV-2 Omicron XBB and BA.2.86/JN.1 Lineage Hospitalization and a Comparison of Clinical Severity — IVY Network, 26 Hospitals, October 18, 2023–March 9, 2024	Included in rayyan
Malden et al. (2024)	Post-COVID conditions following COVID-19 vaccination: a retrospective matched cohort study of patients with SARS-CoV-2 infection	Wrong intervention
Marziali et al. (2024)	Efficacy and safety of BNT162b2 mRNA vaccine in a cohort of 90 transfusion dependent thalassemia patients	Wrong intervention
McDonnell et al. (2024)	COVID-19 Vaccination in Patients with Inborn Errors of Immunity Reduces Hospitalization and Critical Care Needs Related to COVID-19: a USIDNET Report	Wrong intervention
Mimura et al. (2024)	Association between mRNA COVID-19 vaccine boosters and mortality in Japan: The VENUS study	Wrong intervention
Moller et al. (2024)	Effectiveness of Autumn 2023 COVID-19 vaccination and residual protection of prior doses against hospitalisation in England, estimated using a test-negative case-control study	Included in rayyan
Moor et al. (2024)	Sex differences in symptoms following the administration of BNT162b2 mRNA Covid-19 Vaccine in Children below 5 Years of age in Germany (CoVacU5): a retrospective cohort study	Wrong intervention
Moreno-Echevarria et al. (2024)	Incidence and risk factors of omicron variant SARS-CoV-2 breakthrough infection among vaccinated and boosted individuals	Wrong intervention

Mousten-Helms et al. (2024)	Relative vaccine protection, disease severity, and symptoms associated with the SARS-CoV-2 omicron subvariant BA.2.86 and descendant JN.1 in Denmark: a nationwide observational study	Included in rayyan
Nham et al. (2024)	Effectiveness of COVID-19 XBB.1.5 monovalent mRNA vaccine in Korea: interim analysis	Included in rayyan
Niessen et al. (2024)	Vaccine effectiveness against COVID-19 related hospital admission in the Netherlands by medical risk condition: A test-negative case-control study	Wrong intervention
Ogilvie et al. (2024)	Effectiveness of BNT162b2 COVID-19 primary series vaccination in children aged 5–17 years in the United States: a cohort study	Wrong intervention
Pastore et al. (2024)	Homologous or heterologous administration of mRNA or adenovirus-vectored vaccines show comparable immunogenicity and effectiveness against the SARS-CoV-2 omicron variant	Wrong intervention
Petrakis et al. (2024)	The prevalence of long COVID-19 syndrome in hospitalized patients with COVID-19 pneumonia.	Wrong outcome
Pool et al. (2024)	Effectiveness of ChAdOx1 nCoV-19 and BBIBP-CorV vaccines against COVID-19-associated hospitalisation and death in the Seychelles infected adult population	Wrong intervention
Rebertson et al. (2024)	Risk Factors for Long Covid in a United States Prospective Longitudinal Community-Based Cohort	Wrong intervention
Rover et al. (2024)	Association between Vaccination and Persistent Covid-19-Related Symptoms Among Patients with Mild Omicron Infection: A Prospective Cohort Study	Wrong intervention
Sadat et al. (2024)	Determination of COVID-19 Late Disorders as Possible Long-COVID and/or Vaccination Consequences	Wrong intervention
Shen et al. (2024)	Influence of vaccination on critical COVID-19 patients with acute respiratory failure: a retrospective cohort study	Wrong intervention
Shikami et al. (2024)	Effect of mRNA vaccines on preventing hospitalization in patients with new coronavirus infection during the predominance of the Alpha/Delta variant	Foreign language
Stalman et al. (2024)	Clinical and humoral responses after SARS-CoV-2 breakthrough infections in patients with immunosuppressants	Wrong intervention
Stankov et al. (2024)	Humoral and cellular immune responses following BNT162b2 XBB.1.5 vaccination	Previously identified

Su et al. (2024)	Safety and immunogenicity of heterologous boosting with a bivalent SARS-CoV-2 mRNA vaccine (XBB.1.5/BQ.1) in Chinese participants aged 18 years or more: A randomised, double-blinded, active-controlled phase 1 trial	Wrong outcome
Townsend et al. (2024)	Investigating incidence of and factors associated with SARS-CoV-2 infection over a nine-month period in a highly-vaccinated healthcare worker cohort	Wrong intervention
Turpin et al. (2024)	Risk factors for COVID-19 hospitalisation after booster vaccination during the Omicron period: A French nationwide cohort study	Wrong outcome
Uemura et al. (2024)	Duration of effectiveness of the COVID-19 vaccine in Japan: A retrospective cohort study using large- scale population-based registry data	Wrong intervention
Urquidi et al. (2024)	Vaccine effectiveness in reducing COVID-19-related hospitalization after a risk-age-based mass vaccination program in a Chilean municipality: A comparison of observational study designs	Wrong intervention
Van Werkhoven et al. (2023)	Early COVID-19 vaccine effectiveness of XBB.1.5 vaccine against hospitalization and ICU admission, the Netherlands, 9 October - 5 December 2023	Previously identified
Wu et al. (2024)	Protection of prior SARS-CoV-2 infection, COVID-19 boosters, and hybrid immunity against Omicron severe illness: A population-based cohort study of five million residents in Canada	Wrong intervention
Yamamoto et al. (2024)	Protection of Omicron bivalent vaccine, previous infection, and their induced neutralizing antibodies against symptomatic infection with Omicron XBB.1.16 and EG.5.1	Wrong outcome
Yang et al. (2024)	The impact of COVID vaccination on incidence of long COVID and healthcare resource utilisation in a primary care cohort in England, 2021-2022	Wrong intervention
Yildirim et al. (2024)	Impact of vaccination on ICU admissions of hospitalized COVID-19 patients in a country with a heterologous vaccine policy	Wrong intervention
Yumiya et al. (2024)	Effectiveness of COVID-19 mRNA vaccine in preventing infection against Omicron strain: Findings from the Hiroshima Prefecture COVID-19 version J-SPEED for PCR center	Wrong intervention
Zhang et al. (2024)	Analysis of cases of reinfection of past SARS-CoV-2 patients in Pudong New Area of Shanghai	Foreign language