

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

Weekly Summary Tables

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1. Summary of Study Results for Post-Authorization COVID-19 Vaccine Effectiveness[#]

#	Reference (date)	Country	Design	Population	Dominant Variants (Alpha=B.1.1.7 Beta=B.131 Gamma=P.1 Delta=B.1617.2)	History of COVID	Vaccine Product	Outcome Measure	1 st Dose VE (95%CI)	Days post 1st dose	2nd Dose VE (95% CI)	Days post 2nd dose	Max Duration of follow up after fully vaccinated	
69	Lopez Bernal et al* (July 21, 2021)	UK	Test-negative case control	19,109 cases and 171,834 test negative controls among UK adults aged 16+	Alpha [^]	Excluded	BNT162b2	Symptomatic COVID-19	47.5 (41.6–52.8)	21+ (up to day before dose 2)	93.7 (91.6–95.3)	14+	~17 weeks	
							AZD1222	Symptomatic COVID-19	48.7 (45.2–51.9)		74.5 (68.4–79.4)			
							BNT162b2	Symptomatic COVID-19	35.6 (22.7–46.4)		88.0 (85.3–90.1)			
							AZD1222	Symptomatic COVID-19	30.0 (24.3–35.3)		67.0 (61.3–71.8)			
68	Butt et al* (July 20, 2021)	USA	Test-negative case control	54,360 propensity-matched pairs of veterans	Original and Alpha ^{††}	Excluded	BNT162b2 and mRNA-1273	Documented infection	85.0% (84.2–85.8)	0+	97.1(96.6–97.5)	7+	~6.5 weeks	
							BNT162b2	Documented infection	84.0% (82.7–85.1)		96.2(95.5–96.9)			
							mRNA-1273	Documented infection	85.7% (84.6–86.8)		98.2(97.5–98.6)			
67	Layan, Maylis et al (July 16,2021)	Israel	Prospective cohort	215 index cases and 687 household contacts from 210 Israeli households	Original and Alpha [†]	Included	BNT162b2	Documented infection among HHCs vaccinated and not isolated (relative to HHCs not vaccinated and not isolated)	—	—	81(60-93)	7+	~12 weeks	
66	Balicer et al (July 12,2021)	Israel	Prospective Cohort	21722 pregnant Israeli women	Original and Alpha [^]	Excluded	BNT162b2 and mRNA-1273	Documented infection	67(40-84)	14-20	96(89-100)	7-56	~18 weeks	
									71(33-94)					21-27
								Symptomatic COVID-19	66(32-86)					14-20
	Hospitalization	—	—	89(43-100)										
65	Butt et al (June 22,2021)	Qatar	Test-negative case control	1255 pregnant Qatar women	Alpha and Beta [^]	Excluded	BNT162b2 and mRNA-1273	Documented infection	40.3(0.0-80.4)	14+	67.7(30.5-86.9)	14+	~17 weeks	
64	Prunas et al (July 16, 2021)	Israel	Retrospective cohort	253,564 Israeli individuals from 65,264 households	Original and Alpha [†]	Unknown	BNT162b2	Documented infection	—	—	80.5(78.9-82.1)	10+		

				with at least 1 infected individual and at least 2 members									
63	Whitaker et al (July 9,2021)	UK	Prospective cohort	5,642,687 UK patients reporting to 718 English general practises	Original and Alpha ^v	Included	BNT162b2 AZD1222	Symptomatic COVID-19	48.6(27.9-63.3) 50.2(40.8-58.2)	28 to 90 days	93.3(85.8-96.8) 78.0(69.7-84.0)	14+	~20 weeks
62	John et al (July 13,2021)	USA	Retrospective cohort	40,074 patients with cirrhosis within Veterans Health Administration, propensity matched	Original and Alpha ^{††}	Excluded	BNT162b2 and mRNA-1273	Documented infection Hospitalization COVID-19 related death	64.8(10.9-86.1) 100.0(99.3-100.0) 100.0(99.3-100.0)	28+	78.6(25.5-93.8) 100.0(99-100) 100.0(99-100)	7+	~10 weeks
61	Bertollini et al (July 13, 2021)	Qatar	Prospective cohort	10,092 matched pairs of Qatari adults arriving at an international airport.	Original, Alpha and Beta [^]	Included	BNT162b2 and mRNA-1273	Documented infection	78(72-83)				~4 weeks
60	Goldshtein et al (July 12,2021)	Israel	Retrospective cohort	15060 pregnant Israeli women	Original and Alpha ⁿ	Excluded	BNT162b2	Documented infection	54(33-69) 78(57-89)	11-27 days 28+			~5 weeks
59	Chemaitelly et al* (July 9, 2021)	Qatar	Test-negative case-control	25,034 matched pairs of Qatari adults 52,442 matched pairs of Qatari adults 4,497 matched pairs of Qatari adults	Alpha [^] Beta [^] Alpha and Beta [^]	Unknown Unknown Unknown	mRNA-1273 mRNA-1273 mRNA-1273	Documented infection Documented infection Severe, critical or fatal disease Symptomatic infection	88.2(83.8-91.4) 68.2(64.3-71.7) 83.7(74.1-89.7) 66.0(60.6-70.7)	14+ days, prior to 2 nd dose	100.0% (CI omitted since there were no events among vaccinated persons) 96.0% (90.9-98.2) 89.5% (18.8-98.7) 98.6% (92.0-100.0)	14+	13 weeks

								Asymptomatic infection	47.3(37.6-55.5)		92.5% (84.8-96.9)			
			Retrospective cohort	Qatari adults (2520 vaccinated and 73,853 unvaccinated, antibody-negative controls)	Alpha^	Excluded	mRNA-1273	Documented infection	—		100.0% (82.5-100.)	14+	13 weeks	
					Beta^	Excluded	mRNA-1273	Documented infection	—		87.8% (73.4-95.5)			
					Variants of unknown status	Excluded	mRNA-1273	Documented infection	—		93.5% (76.6-99.2)			
58	Tenforde et al (July 8, 2021)	USA	Test-negative case-control	1210 hospitalized adults in the US	Original and Alpha^	Included	BNT162b2/mRNA-1273	Hospitalization	76.0(63.7-84.1)	14+	86.9% (80.4-91.2)	14+	~2 weeks	
							BNT162b2		—		84.3(74.6-90.3)			
							mRNA-1273		—		90.0(82.0-94.4)			
					Alpha^	Included	BNT162b2/mRNA-1273	—	92.8(83.0-96.9)					
57	Jara et al (July 7, 2021)	Chile	Prospective cohort	10,187,720 Chilean adults	Alpha and Gamma^	Excluded	CoronaVac	Documented infection	15.5(14.2-16.8)	14+ days, prior to dose 2	65.9(65.2-66.6)	14+	8 weeks	
								Hospitalization	37.4(34.9-39.9)		87.5(86.7-88.2)			
								ICU admission	44.7(40.8-48.3)		90.3(89.1-91.4)			
								Death	45.7(40.9-50.2)		86.3(84.5-87.9)			
56	Nasreen et al (July 3, 2021)	Canada	Test-negative Case Control	421073 community dwelling individuals	Non-VOC	Unknown	BNT162b2	Symptomatic infection	61 (54, 68)	14+ days	93 (88, 96)	7+	18 weeks	
								Hospitalization or death	68 (54,78)		96 (82, 99)			
								mRNA-1273	Symptomatic infection		54 (28, 70)			89 (65, 96)
									Hospitalization or death		57 (28, 75)			96 (70, 99)
							AZD1222	Symptomatic infection	67 (38, 82)		—			
							Alpha^	Unknown	BNT162b2		Symptomatic infection			66 (64, 68)
Hospitalization or death	80 (78, 82)	95 (92, 97)												

							mRNA-1273	Symptomatic infection	83 (80, 86)			92 (86, 96)		
								Hospitalization or death	79 (74, 83)			94 (89, 97)		
							AZD1222	Symptomatic infection	64 (60, 68)			—		
								Hospitalization or death	85 (81, 88)			—		
					Beta/Gamma [^]	Unknown	BNT162b2	Symptomatic infection	60 (52,67)			84 (69, 92)		
								Hospitalization or death	77 (69, 83)			95 (81, 99)		
							mRNA-1273	Symptomatic infection	77 (63, 86)			—		
								Hospitalization or death	89 (73, 95)			—		
							AZD1222	Symptomatic infection	48 (28, 63)			—		
								Hospitalization or death	83 (66, 92)			—		
					Delta [^]	Unknown	BNT162b2	Symptomatic infection	56 (45, 64)			87 (64, 95)		
								Hospitalization or death	78 (65, 86)			—		
							mRNA-1273	Symptomatic infection	72 (57, 82)			—		
								Hospitalization or death	96 (72, 99)			—		
							AZD1222	Symptomatic infection	67 (44, 80)			—		
								Hospitalization or death	88 (60, 96)			—		
55	Baum et al (June 28, 2021)	Finland	Prospective cohort	Two study cohorts: 901092 Finnish elderly aged 70 years and 774526 chronically ill aged 16-69 years	Original and Alpha [^]	Excluded	BNT162b2 & mRNA-1273	Documented infection	45 (36-53)	21+ days		75 (65-82)	7+	16 weeks
								Hospitalization	63 (49-74)			93 (70-98)		
							AZD1222	Documented infection	42 (32-50)			—		
								Hospitalization	62 (42-75)			—		
54	Saciuk et al (June 27, 2021)	Israel	Retrospective cohort	1.6 million members of Maccabi	Original and Alpha [†]	Excluded	BNT162b2	Documented infection	—			93.0 (92.6-93.4)	7+	14 weeks
								Hospitalization	—			93.4 (91.9-94.7)	7+	

				HealthCare HMO ≥16				Death	—		91.1 (86.5-94.1)	7+		
53	Pawlowski et al.* (Jun 17, 2021) [Update to Feb. 18, 2021 preprint]	USA – Mayo Clinic	Retrospective Cohort	68,266 – propensity matched on, zip, # of PCRs, demographics	Original & Alpha [¥]	excluded	BNT162b2	Documented Infection	61.0% (50.8-69.2)	≥14, prior to 2 nd dose	88.0% (84.2-91.0)	≥14	~17 weeks (120 days)	
								Hospitalization	—		88.3% (72.6-95.9)	≥14		
								ICU Admission	—		100.0% (18.7-100)	≥14		
								mRNA-1273	Documented Infection	66.6% (51.9-77.3)	≥14, prior to 2 nd dose	92.3% (82.4-97.3)		≥14
									Hospitalization	—		90.6% (76.5-97.1)		≥14
									ICU Admission	—		100.0% (17.9-100)		≥14
52	Young-Xu et al (July 14, 2021) [Update to Jun 22 preprint]	USA	Test negative case control	77014 veterans within Veterans Health Administration	Original and Alpha ^{††}	Excluded	BNT162b2 & mRNA-1273	Documented infection	58 (54-62)	7+ days up to dose 2	94 (92-95)	7+	~8 weeks	
								Hospitalization	40 (27-50)		89 (81-93)			
								Death	55 (21- 74)		98.5 (86.6-99.8)			
51	Mazagatos et al (June 17, 2021)*	Spain	Screening method	8379 Long-term care facility residents	Original and Alpha ^{††}	Included	BNT162b2 & mRNA-1273	Documented infection	50.5 (37.1-61.1)	>14	71.4 (55.7-81.5)	>7 for BNT162b2 >14 for mRNA-1273	~10 weeks	
								Asymptomatic infection	58.0 (41.7-69.7)		69.7 (47.7-82.5)			
								Hospitalization	53.0 (25.7-70.3)		88.4 (74.9-94.7)			
								Deaths	55.6 (26.6-73.2)		97.0 (91.7-98.9)			
50	Azamgarhi et al (June 17, 2021)* [Update to Azamgarhi et al below]	UK-London	Retrospective cohort	2235 HCWs working at one hospital	Original and Alpha [†]	Excluded	BNT162b2	Documented infection	70.0 (6.0-91.0)	>14	—			
49	Gupta et al (June 16, 2021)*	USA	Retrospective cohort	4028 HCWs in Boston, Massachusetts	Original and Alpha	Unknown	mRNA-1273	Documented infection	95.0 (86-98.2)	>14 days post dose 1 to 13 days post dose 2	—			
48	Stowe et al (June 14, 2021)	UK	TND Case-control	Patients seeking emergency care services with subsequent hospitalization	Alpha	included	BNT162b2	Hospitalization	83% (62-93)	21+ to <13 days post dose 2	95% (78-99)	14+	~20 weeks (but most much less)	
							AZD1222		76% (61-85)		86% (53-96)			
							BNT162b2		94% (46-99)		96 (86-99)			
							AZD1222		71% (51-83)		92% (75-97)			

47	Sheik et al (June 14, 2021)	Scotland	TND	Scottish population	Alpha	Unknown	BNT162b2	Documented infection	38 (29-45)	28+	92% (90–93)	14+	~20 weeks (but most much less)
						Unknown	AZD1222	Documented infection	37 (32-42)	28+	73% (66–78)	14+	
					Delta	Unknown	BNT162b2	Documented infection	30 (17-41)	28+	79% (75–82)	14+	
						Unknown	AZD1222	Documented infection	18 (9-25)	28+	60% (53–66)	14+	
46	Flacco, Maria et al* (June 10, 2021)	Italy	Retrospective cohort	245,226 individuals	Original and Alpha ^{††}	Unknown	BNT162b2	Documented infection	55(40-66)	14+ days	98(97-99)	14+	~14 weeks
								Hospitalization	—		99(96-100)	14+	
								Death	—		98(87-100)	14+	
								mRNA-1273	Documented infection	93(74-98)	14+ days	—	
	AZD1222	Documented infection	95(92-97)	21+ days	—								
45	Skowronski et al* (July 9, 2021) [Update to June 9 preprint]	Canada	TND	≥70 year olds living in community	Alpha	Included	BNT162b2 & mRNA-1273	Documented infection	67% (95% CI 57-75)	21+	—		~6 weeks
					Gamma				61% (95% CI 45-72)	21+			
					Non-VOC				72% (95% CI 58-81)	21+			
44	Emborg et al. (June 2, 2021) [Update of Houston-Melms below]	Denmark	Cohort	46,101 long-term care facility (LTCF) residents, 61,805 individuals 65 years and older living at home but requiring practical help and personal care (65PHC), 98,533 individuals ≥85 years of age (+85), 425,799 health-care workers (HCWs), and 231,858 individuals with comorbidities that predispose for	original & Alpha ^{†††}	excluded	BNT162b2	Documented infection	7 (-1-15)	>14	82 (79-84)	>7	10 weeks
								COVID-Hospitalization	35 (18-49)	>14	93 (89-96)	>7	
								COVID-Mortality	7 (-15-25)	>14	94 (90-96)	>7	

				severe COVID-19 disease (SCD)									
43	Thompson et al* [updated on June 30,2021]	USA	Cohort	3975 health care personnel, first responders, and other essential and frontline workers in 8 locations in US	Original	Excluded	BNT162b2	Documented infection	80 (60-90)	≥14 days post dose 1 to 13 days post dose 2	93 (78-98)	≥14	13 weeks
							mRNA-1273	Documented infection	83 (40-95)	≥14 days post dose 1 to 13 days post dose 2	82 (20-96)	≥14	
42	Salo et al (July 10, 2021) [Update to May 30 preprint]	Finland	Retrospective cohort	HCW and their unvaccinated spouses	Alpha††	Excluded	BNT162b2 & mRNA-1273	Documented infection in HCW	26.8% (7.5-42.1)	2 weeks	—		*10 weeks since dose 1
								Documented infection in HCW	69% (59.2-76.3)	10 weeks (combo of 1+2 dose recipients)	—		
41	Khan et al (May 31, 2021)	USA	Retrospective cohort	14,697 IBD patients in VA hospitals	Unknown	Included	BNT162b2 & mRNA-1273	Documented infection	-1% (-50-32)	14+	69% (44-83)	7+	14 weeks
								Hospitalization /death	9% (-114-61)	14+	49% (-36-81)	7+	
40	Martinez-Bas et al* (May 27, 2021)	Spain	Prospective Cohort	20,961 close contacts of confirmed cases	Alpha	Excluded	BNT162b2	Documented infection	21 (3-36%)	14+	65 (56-73)	14+	12 weeks
								Symptomatic infection	30 (10-45)	14+	82 (73-88)	14+	
								Hospitalization	65 (25-83)	14+	94 (60-99)	14+	
							AZD1222	Documented infection	44 (31-54)	14+	—		n/a
								Symptomatic infection	50 (37-61)	14+	—		
								Hospitalization	92 (46-99)	14+	—		
39	Chung et al (May 28, 2021)	Canada	Test negative design case control	Adults in Ontario 53,270 cases 270,763 controls	Alpha (31%) Beta+Gamma (3%)	excluded	BNT162b2	Symptomatic infection	59 (55-62)	14+	91 (88-93)	7+	15 weeks
								Hospitalization and Death	69 (59-77)	14+	96 (82-99)	0+	
							mRNA-1273	Symptomatic infection	72 (63-80)	14+	94 (86-97)	7+	
								Hospitalization and Death	73 (42-87)	14+	96 (74-100)	0+	
							BNT162b2 & mRNA-1273	Symptomatic infection	61 (56-66)	14+	90 (85-94)	7+	
								Hospitalization and Death	59 (39-73)	14+	94 (59-99)	0+	

					Beta or Gamma specifically		BNT162b2 & mRNA-1273	Symptomatic infection	43 (22-59)	14+	88 (61-96)	7+	
38	PHE (May 20, 2021)	UK	Test-negative case control	≥65 years	Alpha	excluded	BNT162b2	Symptomatic infection	54 (50-58)	28+	90 (82-95)	≥14	
							AZD1222	Symptomatic infection	53 (49-57)	28+	89 (78-94)	≥14	
37	Lopez-Bernal et al (May 20, 2021)	UK	Test-negative case control	63,839 (58,253 controls, 695 Delta, 4891 Alpha cases)	Alpha	excluded	BNT162b2	Symptomatic infection	49.2% (42.6-55)	21+ days post dose 1	93.4% (90.4-95.5)	≥14	
						Excluded	AZD1222	Symptomatic infection	51.4 (47.3-55.2)	21+ days post dose 1	66.1% (54.0-75.0)	≥14	
					Delta	Excluded	BNT162b2	Symptomatic infection	33.2 (8.3-51.4)	21+ days post dose 1	87.9 (78.2-93.2)	≥14	
						excluded	AZD1222	Symptomatic infection	32.9% (19.3-44.3)	21+ days post dose 1	59.8% (28.9-77.3)	≥14	
36	Ranzani et al. (updated Jul 21, 2021)	Brazil	Test-negative case control	7950 matched pairs among 70+ year olds in Sao Paulo	Gamma	Included	Coronavac	Symptomatic infection	10.5% (-4.4-23.3)	≥14	41.6% (26.9-53.3)	≥14	~10.5 weeks
								Hospitalization	18.5% (-1.0-34.2)		59.0 (44.2-69.8)		
								Death	31.6% (7.1-49.7)		71.4% (53.7-82.3)		
35	Ismail et al. (May 12, 2021)	UK	Screening method	13,907 ≥70	Alpha	included	AZD1222	Hospitalization in 70-79	84% (74-89%)	28+	—		
								Hospitalization in 80+	73% (60-81%)		—		
							BNT162b2	Hospitalization in 70-79	81% (73-87%)	28+	—		
								Hospitalization in 80+	81% (76-85%)		28+		
34	Pilishvili et al.* (May 14, 2021)	US	Test-negative case control	HCP at 33 U.S. sites across 25 U.S. states	Unknown	Excluded	BNT162b2 & mRNA-1273	Symptomatic infection	82% (74-87)	≥14 days after dose 1 to 6 days after dose 2	94% (87-97)	≥7	
33	Lopez-Bernal et al.* (May 13, 2021) [Update to Mar 1 preprint]	UK	Test-negative case control	156,930 UK population over age 70	Alpha [†]	Included	BNT162b2	Over 80 years: Symptomatic infection	—		79% (68-86)	≥7	
								Over 70 years: Symptomatic infection	61% (51-69)		28-34 days after dose 1 including some with dose 2		
							AZD1222	Over 70 years: Symptomatic infection	60% (41-73)	28-34 days after dose 1 including some with dose 2	—		
32	Angel et al.* (May 6, 2021)	Israel	Retrospective cohort	6710 HCWs at a single	Alpha ^{††}	Excluded	BNT162b2	Symptomatic	89% (83-94)	>7 days after dose 1 to 7	97% (94-99)	>7 days	

				tertiary care center in				Asymptomatic	36% (-51-69)	days after dose 2	86% (69-97)		
31	Abu-Raddad et al.* (May 5, 2021), with more granular 1 dose analysis here (July 8, 2021)	Qatar	Test-negative case-control	Qatari adults	Alpha & Beta^	Unknown	BNT162b2	CC Alpha documented infection	65.5% (58.2-71.5)	15-21 days	90% (86-92)	≥14	
								CC Alpha severe/fatal infection	72% (32-90)		100% (82-100)		
								CC Beta documented infection	46.5% (38.7-53.3)		75% (71-79)		
								CC Beta severe/fatal infection	56.5% (0-82.8)		100% (74-100)		
			Retrospective cohort	Qatari adults	Alpha & Beta^	Unknown	BNT162b2	Cohort documented infection Alpha	—	87% (82-91)			
								Cohort documented infection Beta	—	72% (66-77)			
30	Haas et al.* (May 5, 2021) [Update to Mar 24 preprint]	Israel	Retrospective cohort	Israeli population ≥16 years	Alpha^	Excluded	BNT162b2	Documented infection	—		95.3 % (94.9-95.7)	≥7 days	
								Asymptomatic infection			91.5% (90.7-92.2)		
								Symptomatic infection			97.0% (96.7-97.2)		
								Hospitalization			97.2% (96.8-97.5)		
								Severe/ critical hospitalization			97.5% (97.1-97.8)		
								Death			96.7% (96.0-97.3)		
29	Corchado-Garcia et al. (April 30, 2021)	USA	Retrospective cohort	24,145 patients in the Mayo Clinic Network	Original & Alpha [‡]	Excluded	Ad26.COV2.S	Documented infection	77% (30-95)	≥15 days	—		
28	Fabiani et al.* (Apr 29, 2021)	Italy	Retrospective cohort	9,878 HCWs	Unknown	Excluded	BNT162b2	Documented infection	84% (40-96)	14-21 days	95% (62-99)	≥7 days	
								Symptomatic infection	83% (15-97)		94% (51-99)		

27	Gras-Valenti et al.* (Apr 29, 2021)	Spain	Case-control	268 Spanish HCWs	Original & Alpha ^{xy}	Included	BNT162b2	Documented infection	53% (1-77)	>12 days	—		
26	Tenforde et al.* (Apr 28, 2021)	USA	Test-negative case-control	Hospitalized adults ≥65 years	Original and Alpha ^y	Unknown	BNT162b2 & mRNA-1273	Hospitalization	64% (28-82)	≥14 days after dose 1 to 14 days after dose 2	94% (49-99)	≥14 days	
25	Menni et al.* (Apr 27, 2021) [Update to Mar 4 preprint]	UK	Prospective cohort	Approximately 500,000 general population >16 years	original and Alpha ^f	Included	BNT162b2	Documented infection (self-reported)	58% (54-62)	12-20	—		
							AZD1222	Documented infection (self-reported)	60% (49-68)	12-20			
24	Goldberg et al. (Apr 24, 2021)	Israel	Prospective cohort	5,600,000+ individuals ≥16	Original and Alpha [^]	Included	BNT162b2	Documented infection	58% (57-59)	>14 days after dose 1 to <7 days after dose 2	93%(93-93)	≥7 days	
								Hospitalization	69% (68-71)		94%(94-95)		
								Severe disease	66%(63-69)		94%(94-95)		
								Death	63%(58-67)		94%(93-95)		
23	Pritchard et al.* (Jun 9, 2021) [Update to Apr 23 preprint]	UK	Prospective cohort	373,402 individuals ≥16	Alpha & Original [^]	Excluded	BNT162b2	Documented infection	66 (60-71)	≥21 days	80% (74-85)	≥0 days	
								Symptomatic disease	78 (72-83)		95 (91-98)		
							AZD1222	Documented infection	61% (54-68)		79% (65-88)		
								Symptomatic disease	71 (62-78)		92 (78-97)		
22	Vasileiou et al.* (Apr 23, 2021) [Update to Feb 21 preprint]	UK – Scotland	Prospective Cohort (Person-time)	Scotland population: 5.4 million	Original & Alpha ^f	Excluded	BNT162b2	Hospitalization	91% (85-94)	28-34 days	—		
							AZD1222	Hospitalization	88% (75-94)				
21	Hall et al.* (Apr 23, 2021) [Update to Feb 21 preprint]	UK – SIREN study	Prospective Cohort (Person-time)	23,324 healthcare workers	Alpha [^]	Excluded	BNT162b2	Documented infection	72% (58-86)	≥21	86% (76-97)	≥7	
20	Mason et al. (Apr 22, 2021)	UK - England	Case-control	170,226 80-83 year-olds	Alpha [^]	Excluded	BNT162b2	Documented infection ⁴	55% (40-66)	21-27	70% (55-80)	35-41	
								Hospitalization ⁴	50% (19-69)	21-27	75% (52-87)		

19	Bjork et al. (Apr 21, 2021)	Sweden	Retrospective cohort	805,741 Swedish adults aged 18-64 years	Original & Alpha [^]	Unknown	BNT162b2	Documented infection	42% (14-63)	≥14	86% (72-94)	≥7	
18	Gobierno de Chile (Apr 16, 2021)	Chile	Retrospective cohort	10,500,000 individuals >16 years under the national health fund	Original, Gamma, and Alpha ^{EE}	Unknown	CoronaVac	Symptomatic infection	16% (14-18)	≥14	67% (65-69)	≥14	
								Hospitalization	37% (32-39)	≥14	85% (83-87)	≥14	
								ICU admission	43% (37-43)	≥14	89% (85-92)	≥14	
								Death	40% (33-47)	≥14	80% (73-86)	≥14	
17	Glampson et al.* (Jul 15, 2021) [Update to Apr 10 preprint]	UK	Retrospective cohort	2 million adults ≥16 in Northwest London	Alpha [^]	Included	BNT162b2	Documented infection	78% (73-82)	22-28	—		
							AZD1222	Documented infection	74% (65-81)	22-28			
16	Andrejko et al.* (Jul 20, 2021) [update to May 25 preprint]	USA	Test-negative case control	1023 California adults ≥18 years	B.1.427/ B.1.429 & Alpha [^]	Excluded	BNT162b2 & mRNA-1273	Documented infection	66.9% (28.7--84.6%)	≥15	87.4% (77.2-93.1%)	≥15	~14 weeks
								Asymptomatic infection	—		68.3% (27.9-85.7%)	≥15	
								Symptomatic infection	—		91.3% (79.3-96.3)	≥15	
								Hospitalization	—		100%	≥15	
							BNT162b2	Documented infection	—		87.0% (68.6-94.6)	≥15	
							mRNA-1273	Documented infection	—		86.2% (68.4-93.9)	≥15	
15	Regev-Yochay et al.* (July 7,2021) [Update to April 9 preprint]	Israel	Prospective cohort	3578 HCWs in one Israeli health system	Alpha ^{II}	Included	BNT162b2	Asymptomatic infection	—		65% (45-79)	≥11	
								Asymptomatic infection presumed infectious (Ct<30)			70% (43-84)	≥11	
								Symptomatic infection			90% (84-94)	≥11	
								Symptomatic infection presumed infectious (CT<30)			88% (80-94)	≥11	

14	Cabezas et al. (Apr 9, 2021)	Spain	Prospective cohort	28,594 nursing home residents, 26,238 nursing home staff, and 61,951 healthcare workers in Catalan	original & Alpha ^{xy}	Excluded	BNT162b2	HCWs cohort: infection	43% (37-47)	0-14	95% (93-96)	0		
								SNF staff cohort: infection	40% (33-47)	0-14	88% (85-90)	0		
								SNF resident cohort: infection	47% (42-51)	0-14	92% (91-93)	0		
								SNF resident cohort: hospitalization	55% (44-64)	0-14	97% (95-98)	0		
								SNF resident cohort: death	50%(37-60)	0-14	98% (97-99)	0		
13	Bouton et al. (Mar 30, 2021)	USA – MA	Prospective Cohort	10,950 healthcare workers in Boston	Original [^]	included	BNT162b2 & mRNA-1273	Documented infection	82% (68-90) >14 days after dose 1 including some with dose 2 starting day 0					
12	Thompson et al.* (Mar 29, 2021)	USA	Prospective cohort	3,950 healthcare workers in eight US sites	Original ^y	excluded	BNT162b2 & mRNA1273	Documented infection	80% (59-90)	≥14	90% (68-97)	≥14		
11	Shrotri et al.* (Jun 23, 2021) [Update to Mar 26 preprint]	UK	Prospective cohort	10,412 care home residents aged ≥65 years from 310 LTCFs in England	Original and Alpha [^]	Stratified	BNT162b2	Documented infection	65% (29-83)	35-48	—			
							AZD1222	Documented infection	68% (34-85)	35-48				
10	Public Health England – March (Mar 17, 2021)	UK - England	Test Negative Case-Control	Adults in England over 70 years	Alpha [^]	?	BNT162b2	Symptomatic infection	58% (49-65)	≥28	—			
							AZD1222	Symptomatic infection	58% (38-72)	≥35				
			Retrospective Cohort	Adults in England over 80 years			Included	BNT162b2	Hospitalization ¹	42% (32-51)	≥14	—		
									Death ¹	54% (41-64)	≥14			
				AZD1222	Hospitalization ¹	35% (4-56)	14-21							
9	Yelin et al. (Mar 17, 2021)	Israel – Maccabi System	Retrospective Cohort	1.79 million enrollees, adults <90 years	Alpha [^]	excluded	BNT162b2	Documented infection	91% (89-93) ≥35 days after dose 1 most with dose 2					
								Symptomatic infection	99% (95-99) ≥35 days after dose 1 most with dose 2					
8	Britton et al.* (Mar 15, 2021)	USA – CT	Retrospective Cohort	463 residents of two skilled nursing facilities experiencing outbreaks	Original ^y	stratified	BNT162b2	Include Hx of COVID: Documented infection	63% (33-79) ≥14 days after dose 1 including some with dose 2 through day 7					
								Exclude Hx of COVID:	60% (30-77) ≥14 days after dose 1 including some with dose 2 through day 7					

								Documented infection				
7	Tande et al.* (Mar 11, 2021)	USA – Mayo Clinic	Retrospective Cohort	Asymptomatic screening of 39,156 patients: pre-surgical, pre-op PCR tests	original [‡]	included	BNT162b2 & mRNA-1273	Asymptomatic infection	79% (63-88) >10 days after dose 1, including some with dose 2	80% (56-91)	>0	
							BNT162b2	Asymptomatic infection	79% (62-89)	>10	80% (56-91)	>0
6	Azamgarhi et al. (Mar 9, 2021)	England--London	Retrospective cohort	2257 HCWs working at one hospital	Original and Alpha [‡]	Included	BNT162b2	Documented infection	80% (21-95)	≥14	—	
5	Mousten-Helms et al. (Mar 9, 2021)	Denmark	Retrospective Cohort	Long term care facilities in Denmark - 39,040 residents, 331,039 staff	original & Alpha ^{¶¶}	excluded	BNT162b2	LTCF Resident: Documented Infection	21% (-11-44)	>14	64% (14-84)	>7
								LTCF Staff: Documented Infection	17% (4-28)	>14	90% (82-95)	>7
4	Hyams et al.* (Jun 23, 2021) <i>[Update to Mar 3 preprint]</i>	UK – University of Bristol	Test Negative Case-Control	466 tests: ≥80 years hospitalized with respiratory symptoms	Alpha [‡]	included	BNT162b2	Hospitalization	79% (47-93)	>14	—	
							AZD1222	Hospitalization	80% (36-95)	>14		
3	Dagan et al.* (Feb. 24, 2021)	Israel – Clalit Health System	Retrospective Cohort	596,618 – matched on demographics, residence, clinical characteristics	original & Alpha [^]	excluded	BNT162b2	Documented infection	46% (40-51)	14-21	92% (88-95)	>7
								Symptomatic infection	57% (50-63)	14-21	94% (87-98)	>7
								Hospitalization	74% (56-86)	14-21	87% (55-100)	>7
								Severe disease	62% (39-80)	14-21	92% (75-100)	>7
2	Public Health England – Feb. (Feb. 22, 2021)	UK - England	Screening Method	43,294 cases, with England as source population	Alpha [^]	included	BNT162b2	Over 80 years: Symptomatic infection	57% (48-63)	>28	88% (84-90)	7
1	Amit et al.* (Feb 18, 2021)	Israel	Prospective Cohort	9,109 healthcare workers	original & Alpha [¶]	excluded	BNT162b2	Documented infection	75% (72-84) ≥15 days after dose 1 including some with dose 2 through day 7			
								Symptomatic infection	85% (71-92) ≥15 days after dose 1 including some with dose 2 through day 7			

Purple text indicates new or updated study.

Product Manufacturers: BNT162b2 (Pfizer), mRNA-1273 (Moderna), AZD1222 (Astra-Zeneca), Ad26.COV2.S (Janssen), Coronavac

[#]Includes studies published/posted up through Wednesday of current week.

Manuscripts with an asterisk (*) are peer-reviewed publications.

¹VE for individuals with PCR confirmed symptomatic disease progressing to hospitalization or death

²VE for household members of vaccinated HCWs vs household members of unvaccinated HCWs

[‡]Reference group is not unvaccinated—uses vaccinated group before day 12 or day 14 after dose 1 as a reference group

[^]Indicates predominant variant identified by study authors. If no ^ then variants identified through secondary source when possible. Please see additional footnotes.

[¶]The rise of SARS-CoV-2 variant Alpha in Israel intensifies the role of surveillance and vaccination in elderly | medRxiv

^y[CDC Says More Virulent British Strain Of Coronavirus Now Dominant In U.S. : Coronavirus Updates : NPR](#)

^z[Coronavirus \(COVID-19\) Infection Survey, UK - Office for National Statistics](#)

^{aa}[Denmark logs more contagious COVID variant in 45% of positive tests | Reuters](#)

^{bb}[COVID variant first detected in UK now dominant strain in Spain](#)

^{cc}[Reporte-circulacion-variantes-al-9.04.21-PUBLICADO-FINAL.pdf \(minsal.cl\)](#)

^{dd}Based on <https://outbreak.info/location-reports>

^{ee}<https://www.gov.uk/government/publications/covid-19-variants-genomically-confirmed-case-numbers/variants-distribution-of-cases-data>

1..1 Inclusion criteria for VE studies

Note: All VE studies now must meet these criteria to be in the VE table:

- Published or preprint studies (not press release, presentations, media)
- Needs confidence intervals around VE
- Needs to include persons with & without infection or disease and with and without vaccination (ie a proper comparison group)
- No case only studies (e.g., impact studies, risk of progression to severe disease (i.e. PHE).
- No modeled comparison group
- No comparison to historical cohort
- VE should be adjusted or state adjustment made no difference
- Outcomes must be lab confirmed, not syndromic
- Documented vaccination status needed
- VE for one vaccine or combined vaccines of same platform e.g. Pfizer + Moderna
- No significant bias that likely affects results
- Cannot include day 0-12 in unvaccinated definition
- Cannot compare to early post vaccination to calculate VE (e.g. day 0-12 vs day 12-21)

1..2 VE Studies that do not meet criteria are listed below in case of interest:

1. Hunter P and Brainard J. Estimating the effectiveness of the Pfizer COVID-19 BNT162b2 vaccine after a single dose. A reanalysis of a study of 'real-world' vaccination outcomes from Israel. *medRxiv*. Published online 2021:2021.02.01.21250957. doi: 10.1101/2021.02.01.21250957
2. Institut National de Santé Publique du Québec. Preliminary Data on Vaccine Effectiveness and Supplementary Opinion on the Strategy for Vaccination Against COVID-19 in Quebec in a Context of Shortage. Gouvernement du Québec. 2021:Publication No 3111. Available at: <https://www.inspq.qc.ca/sites/default/files/publications/3111-vaccine-effectiveness-strategy-vaccination-shortage-covid19.pdf>.
3. Weekes M, Jones NK, Rivett L, et al. Single-dose BNT162b2 vaccine protects against asymptomatic SARS-CoV-2 infection. *Authorea*. Published online Feb 24, 2021. doi: 10.22541/au.161420511.12987747/v1
4. Aran D. Estimating real-world COVID-19 vaccine effectiveness in Israel using aggregated counts. Published online Mar 4, 2021. Available at: https://github.com/dviraran/covid_analyses/blob/master/Aran_letter.pdf.

5. Shah ASV, Gribben C, Bishop J, et al. Effect of vaccination on transmission of COVID-19: an observational study in healthcare workers and their households. *medRxiv*. Published online 2021:2021.03.11.21253275. doi: 10.1101/2021.03.11.21253275
6. Monge S, Olmedo C, Alejos B, et al. Direct and indirect effectiveness of mRNA vaccination against SARS-CoV-2 infection in long-term care facilities in Spain. *medRxiv*. Published online 2021:2021.04.08.21255055 doi: 10.1101/2021.04.08.21255055
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12. Chodick G, Tene L, Rotem Ran S, et al. The Effectiveness of the Two-Dose BNT162b2 Vaccine: Analysis of Real-World Data. *Clin Infect Dis*. Published online May 17, 2021:2021;ciab438. doi: 10.1093/cid/ciab438
13. Lopez Bernal J, Andrews N, Gower C, et al. Effectiveness of BNT162b2 mRNA vaccine and ChAdOx1 adenovirus vector vaccine on mortality following COVID-19. *medRxiv*. Published online 2021:2021.05.14.21257600 doi: 10.1101/2021.05.14.21257218
14. Bianchi FB, Germinario CA, Migliore G, et al. BNT162b2 mRNA COVID-19 Vaccine Effectiveness in the Prevention of SARS-CoV-2 Infection: A Preliminary Report. *J Infect Dis*. Published online May 19, 2021:2021;jiab262. doi: 10.1093/infdis/jiab262
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18. Shrestha NK, Nowacki AS, Burke PC, Terpeluk P, Gordon SM. Effectiveness of mRNA COVID-19 Vaccines among Employees in an American Healthcare System. *medRxiv*. Published online 2021:2021.06.02.21258231. doi:10.1101/2021.06.02.21258231

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26. Malinis M, Cohen E, Azar MM. Effectiveness of SARS-CoV-2 vaccination in fully-vaccinated solid organ transplant recipients. *Am J Transplant*. Published online June 2021. doi:10.1111/ajt.16713
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2. Summary of Study Results for Post-Authorization COVID-19 Vaccine Effectiveness Against Transmission*

#	Reference (date)	Country	Design	Population	Dominant Variants (Alpha=B.1.1.7 Beta=B.1351 Gamma=P.1 Delta=B.1617.2)	History of COVID	Vaccine Product	Outcome Measure	1 st Dose VE (95%CI)	Days post 1st dose	2nd Dose VE (95% CI)	Days post 2nd dose	Max Duration of follow up after fully vaccinated
5	Layan, Gilboa et al (July 16, 2021)	Israel	Prospective cohort	215 index cases and 687 household contacts from 210 Israeli households	Original and Alpha [†]	Included	BNT162b2	Transmission to HHC by vaccinated vs. unvaccinated cases	—		78(30-94)	7+	~12 weeks
4	Prunas et al (July 16, 2021)	Israel	Retrospective cohort	253,564 Israeli individuals from 65,264 households with at least 1 infected individual and at least 2 members	Original and Alpha [†]	Unknown	BNT162b2	Infectiousness given Infection Transmission	—	—	41.3(9.5-73.0) 88.5(82.3-94.8)	10+	
3	Harris et al* (June 23, 2021) <i>[Update to Apr 28 preprint]</i>	UK	Retrospective cohort, case-control	970,128 household contacts of index case (unvaccinated, vaccinated with AZD1222 or BNT162b)	Alpha ^f	Unknown	AZD1222 BNT162b2	Documented infection	48(38-57) 46(38-53)	>21 days after dose 1, including some with dose 2	—		
2	Salo et al (July 10, 2021) <i>[Update to May 30 preprint]</i>	Finland	Retrospective cohort	HCW and their unvaccinated spouses	Alpha ^{††}	Excluded	BNT162b2 & mRNA-1273	Documented infection in HCW's unvaccinated spouses Documented infection in HCW's unvaccinated spouses	8.7 (-28.9-35.4) 42.9 (22.3-58.1)	2 weeks 10 weeks (combo of 1+2 dose recipients)	— —		*10 weeks since dose 1

1	Shah et al. (Mar 11, 2021)	UK - Scotland	Retrospective Cohort	144,525 healthcare workers (HCWs) and 194,362 household members	original & Alpha ^f	excluded	BNT162b2 & AZD1222	Household members of HCWs: Documented infection ²	30% (22- 37)	≥14	54% (30-70)	≥14	
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*Study results captured during literature search of vaccine effectiveness studies. Note this is not an exhaustive list of transmission studies.

3. Vaccine Impact: Summary of Ecologic Study Results for Post-Authorization COVID-19 Vaccine Products[#]

#	Reference (date)	Country	Design	Population	Dominant Variants	Vaccine Product	Descriptive Findings
36	Waldman et al* (July 21, 2021)	USA	Retrospective cohort	16,156 faculty, students, and staff at an academic medical center	Original and Alpha ††	BNT162b2 and mRNA-1273	This retrospective cohort study assessed the impact of vaccination on the incidence of SARS-CoV-2 infection, hospitalization, and mortality among faculty, students, and staff at the University of California Davis medical center. COVID-19 incidence decreased from 3.2% during the 8 weeks before vaccination began to 0.38% 4 weeks after the start of vaccination. A single dose of either vaccine reduced the hazard of testing positive by 48% (HR=0.52, CI 0.40-0.68) and the positivity rate for SARS-CoV-2 14+ days after the second dose was 0.04%. There were no hospitalizations or deaths among fully vaccinated (14+ days after dose 2) HCWs who tested positive.
35	Toniassoa et al (July 13, 2021)	Brazil	Cross-sectional	7523 HCWs in a hospital in Southern Brazil	Unknown	CoronaVac, AZD1222	This is a cross-sectional study conducted on 7523 vaccinated (both partial and full vaccination) Brazilian healthcare workers to detect the prevalence of COVID-19 diagnosis. The diagnosis of COVID-19 in the past reduced the prevalence of new infections by 68% (PR: 0.32 95% CI: 0.19 – 0.56). After the first dose, infection prevalence decreased by 7% every week (PR: 0.93 95% CI: 0.89 – 0.97) regardless of the type of vaccine. An important finding was that a previous diagnosis of COVID-19 over 45 days ago reduced prevalence by 71% (PR: 0.29 95% CI: 0.11 – 0.75) among those professionals.
34	Williams et al (July 8, 2021)	USA	Outbreak study	31 residents and 22 staff members working in a LTCF in the US	Gamma	BNT162b2 and mRNA-1273	This study was conducted in an outbreak setting in a long-term care facility where the predominant SARS-CoV-2 variant was determined as the P.1(Gamma variant). Vaccine effectiveness against SARS-CoV-2 infection was 52.5% (95%CI 26.9-69.1%) in residents and 66.2% (95%CI, 2.3-88.3%) in staff. VE against severe illness was 78.6% (95%CI 47.9-91.2) in residents. Assuming that all residents and staff of the home were exposed, the estimated VE against SARS-CoV-2 infection was 66.0% (95%CI 40.6-80.5%) in residents and 63.5% (95%CI 11.5-85.0%) in staff
33	Shacham et al (July 5, 2021)	USA	Ecologic	Residents of 115 counties and 2 cities in Missouri	Unknown	Unspecified (BNT162b2, mRNA-1273, Ad26.COVS.S available)	Ecologic study evaluating the relationship between the cumulative proportion of residents vaccinated and weekly incidence of COVID-19 by location in 115 counties and 2 cities in Missouri (total n=117 locations) from January 4 to June 26, 2021 (25 weeks). The relationship was found to likely be linear during the study period and was adjusted for other variables related to COVID-19 (population, proportion of nonwhite residents, median household income, proportion of residents in public-facing occupations). The final adjusted

							linear model showed the relationship was significant, with every percent increase in population vaccinated resulting in 3 fewer weekly COVID-19 cases (β -3.74, $p < 0.001$). Locations with higher proportions of nonwhite residents were also likely to experience lower weekly incidence of COVID-19 after adjusted for other variables (β -1.48, $p = 0.037$).
32	Greene, Sharon et al (July 5, 2021)	USA	Regression discontinuity	1,101,467 65-84-year-old NYC residents	Unknown	BNT162b2 and mRNA-1273	A regression discontinuity study comparing the rate of hospitalization and deaths among 65-84 year-old during an 8-week post-implementation phase of SARS-CoV-2 vaccines in New York City with the pre-implementation period, controlling for the epidemic trend among 45-64-year-olds, a group without concurrent age-based vaccine eligibility. It is observed that hospitalization rates among 65-84 year-olds during the post-implementation period had a statistically significant decrease as compared to the pre-implementation period with a RR of 0.85(95% CI 0.74-0.97). Similar decrease in death rates was observed during the post-implementation period but this finding was not statistically significant (RR 0.85, 95% CI: 0.66–1.10, $P = 0.22$).
31	Victoria et al (June 19, 2021)	Brazil	Ecologic	Brazilian population	Gamma	AZD1222 and CoronaVac	Calculated proportionate mortality of COVID-19 deaths at ages 70-79 and 80+ and COVID-19 age-specific mortality rates using Brazilian Ministry of Health data from January 3- May 15, 2021 in a setting of predominant Gamma variant transmission. The proportion of all COVID-19 deaths for ages 80+ years in weeks 1-6 was 25% which subsequently reduced to 12.4% in week 19 following the vaccination program. For individuals aged 70-79 years, the proportionate mortality showed a substantial decline in April-May. The mortality rate for persons aged 80+ reduced from 13.3 in January to 8.0 in week 19, and a gradual decline in the rate ratios was observed for ages 70-79 from 13.8 in week 1 to 5.0 in week 19.
30	Jacobson et al (June 17, 2021)	USA	Retrospective cohort	Healthcare workers	Alpha, Epsilon	BNT162b2 and mRNA-1273	A retrospective report of 660 SARS-Cov-2 cases detected by PCR test among HCW at a single-site medical center. Described proportions of cases and compared mutation prevalence among unvaccinated, early post-vaccinated (≤ 14 days after dose 1), partially vaccinated (> 14 days after dose 1 and ≤ 14 days after dose 2), and fully vaccinated (> 14 days after dose 2). 189 of 660 cases detected were post-vaccine SARS-CoV-2 cases (PVSC, defined as occurring in those who had received at least one dose of vaccine). 60.3% of the 189 PVSCs occurred early post-vaccination, 25.9% were among partially vaccinated individuals, and 13.8% were among those fully vaccinated. Incidence of the L452R mutation (presumed to indicate the Epsilon variant) did not vary by vaccination status.

29	Christie et al (June 7, 2021)	USA	Impact	US population	Unknown	Unspecified (BNT162b2, mRNA-1273	Calculated rates of COVID-19 cases, emergency department (ED) visits, hospital admissions, and deaths by age group during November 29–December 12, 2020 (pre-vaccine) and April 18–May 1, 2021. The rate ratios comparing the oldest age groups (≥ 70 years for hospital admissions; ≥ 65 years for other measures) with adults aged 18–49 years were 40%, 59%, 65%, and 66% lower, respectively, in the latter period
28	Guijarro et al (June 28, 2021) [Update to Jun 3 preprint]	Spain	Impact	HCW compared to community	Unknown	BNT162b2	Incidence rates of SARS-CoV-2 infection after the first dose of mRNA SARS-CoV-2 vaccine declined by 71% (Incidence Rate Ratio (IRR) 0.286 , 95% confidence interval (CI) 0.174-0.468) and by 97% (IRR 0.03 95% CI 0.013-0.068,) after the second dose as compared to the perivaccine time. SARS-CoV-2 incidence rates in the community (with a negligible vaccination rate) had a much lower decline: 2% (IRR 0.984; 95% CI 0.943-1.028) and 61% (IRR 0.390, 95% CI 0.375-0.406) for equivalent periods. Adjusting for the decline in the community, the reduction in the incident rates among HCW were 73% (IRR 0.272; 95% CI 0.164-0.451) after the first dose of the vaccine and 92 % (IRR 0.176, 95% CI 0.033-0.174;) after the second dose.
27	Sansone et al (May 13, 2021)	Italy	Impact	HCW	Alpha	BNT162b2	Community cases increased during the study period while cases in vaccinated HCWs only minimally increased and then stabilized.
26	White et al. (May 19, 2021)	USA	Impact	LTCF	Unknown	BNT162b2 and mRNA-1273	Evaluated an administrative database of a large LTCF company across USA. Evaluated 21,815 persons, . 80% Pfizer+20% Moderna; 60% 2 dose +24% 1 dose. Disease incidence goes down in vaccinated/unvaccinated.
25	Munitz et al (May 18, 2021)	Israel	Ecologic	Israeli Population	Alpha	BNT162b2	Evaluated the transmission dynamics of B.1.1.7(Alpha) variant and to study the impact of the national vaccination program on the general population and the elderly. The study analysed 292,268 RT-PCR samples collected from December 6,2020 to February 10,2021. In the first week of February, B.1.1.7 variant was the predominant variant identified in more than 90% of the positive tests. The B.1.1.7 variant was 1.45 more transmissible than the wild-type strain (95% confidence interval [CI]: 1.20–1.60). The effective reproduction number for B.1.1.7 was estimated to be 1.71 (95% CI: 1.59– 1.85) compared with 1.12 (95% CI: 1.10–1.15) observed for the wild-type. To evaluate the impact of preventive policies against the B.1.1.7 variant, the authors stratified the distribution of new COVID-19 cases in different age groups. It was observed that an increase in the incidence of the variant was noted in the 60+ years aged group through January 13,2021, following which the incidence plateaued and subsequently declined, which coincided with the rapid uptake of vaccine in this age group.

24	Domi et al (May 6, 2021)	USA	Impact	LTCF	unknown	BNT162b2	Evaluated data from 2501 nursing homes in the US in 17 states. Used zero-inflated negative binomial mixed effects regressions to model the associations of time since the vaccine clinic ending the week of December 27, 2020 (cohort 1), January 3, 2021 (cohort 2) or January 10, 2021 (cohort 3) controlling for county rate of COVID-19, bed size, urban location, racial and ethnic census, and level of registered nurses with resident cases and deaths of COVID-19 and staff cases of COVID-19. Resident and staff cases trended downward in all three cohorts following the vaccine clinics. Time following the first clinic at five and six weeks was consistently associated with fewer resident cases (IRR: 0.68 [95% CI: 0.54-0.84], IRR: 0.64 [95% CI: 0.48-0.86], respectively); resident deaths (IRR: 0.59 [95% CI: 0.45-0.77], IRR: 0.45 [95% CI: 0.31-0.65], respectively); and staff cases (IRR: 0.64 [95% CI: 0.56-0.73], IRR: 0.51 [95% CI: 0.42-0.62], respectively). Other factors associated with fewer resident and staff cases included facilities with less than 50 certified beds and high nurse staffing per resident day (>0.987). Contrary to prior research, higher Hispanic non-white resident census was associated with fewer resident cases (IRR: 0.42, 95% CI: 0.31-0.56) and deaths (IRR: 0.18, 95% CI: 0.12-0.27).
23	Haas et al. (May 13, 2021)	Israel	Impact	Israeli population	Alpha ^g	BNT162b2	Used national surveillance data from the first 112 days (Dec 20, 2020 – Apr 10, 2021) of Israel’s vaccination campaign to estimate averted burden of four outcomes: SARS-CoV-2 infections and COVID-19-related hospitalizations, severe or critical hospitalizations, and deaths. Estimated that Israel’s vaccination campaign averted 158,665 (95% CI: 115,899–201,431) SARS-CoV-2 infections, 24,597 (6,622–42,571) hospitalizations, 17,432 (3,065–31,799) severe and critical hospitalizations, and 5,533 (-1,146–12,213) deaths. Of these, 66% of hospitalizations and 91% of deaths averted were among those ≥65 years of age. 73% of SARS-CoV-2 infections and 79% of COVID-19-related hospitalizations and deaths averted stemmed from the protective effects in fully vaccinated persons.
22	Rana et al. (May 11, 2021)	Bangladesh	Cross-sectional	11 districts in Bangladesh	Unknown	AZD1222	Cross-sectional study in 11 districts in Bangladesh. Offered voluntary testing. A total of 6146 suspected samples were tested and 1752 were found positive for SARS-CoV-2. Of the positives, 200 individuals had received a first dose of AZ. Among the vaccinated cases, 165 (82.5%) did not require hospitalization and 177 (88.5%) did not have respiratory difficulties.
21	Garvey et al.* (Apr 28, 2021)	UK	ecologic	University Hospitals Birmingham (UHB) HCWs	Alpha ^f	BNT162b2	An occupational health database of all COVID-19 positive HCWs was interrogated against an informatics search of all vaccinated HCWs. A multivariate logistic regression model

							found that being vaccinated was associated with a decreased probability of testing positive ($p = 1.40 \times 10^{-10}$, odds ratio 2.35, 95% CI: 1.81-3.05). The model also found that the probability of testing positive decreases as the gap between vaccination and testing increases ($p = 0.00607$). A weighted cox regression demonstrated that vaccination was associated with a significantly lower hazard of testing positive during the time period in question ($p < 0.0001$). This model gave a generalized concordance probability of 0.24 (95% CI: 0.20, 0.28), meaning that a HCW who had been vaccinated had only a 24% probability of testing positive before an equivalent unvaccinated HCW.
20	Ackland et al. (Apr 22, 2021)	UK	ecologic	UK adults	Alpha [^]	BNT162b2, mRNA-1273, AZD1222	Used national data on cases and deaths to estimate CFR. Found that from the second half of January, the CFRs for older age groups show a marked decline. Since the fraction of the VOC has not decreased, this decline is likely to be the result of the rollout of vaccination.
19	Lillie et al.* (Apr 24, 2021)	UK	ecologic	Healthcare workers	Alpha [^]	BNT162b2	Symptomatic staff underwent routine testing together with routine (asymptomatic) Lateral Flow Device (LFD) testing of all clinical staff. Starting Jan 2021 827 (8.3%) of staff had received their first dose of vaccine, increasing to 8243 (82.5%) by the end of February. Cases of SARS-CoV-2 amongst staff reduced from 120 cases to 10 cases over the same period.
18	Rossman et al.* (Apr 19, 2021) <i>Update to Feb 9 preprint</i>	Israel	Impact	Israeli population	Alpha [^]	BNT162b2	Analysis of data from the Israeli Ministry of Health collected between 28 August 2020 and 24 February 2021. Compared: (1) individuals aged 60 years and older prioritized to receive the vaccine first versus younger age groups; (2) the January lockdown versus the September lockdown; and (3) early-vaccinated versus late-vaccinated cities. A larger and earlier decrease in COVID-19 cases and hospitalization was observed in individuals older than 60 years, followed by younger age groups, by the order of vaccination prioritization. This pattern was not observed in the previous lockdown and was more pronounced in early-vaccinated cities.
17	Mor et al. (Apr 16, 2021)	USA	Impact	80 nursing homes located across 21 states.	unknown	BNT162b2 & mRNA-1273	Matched pairs analysis of 280 nursing homes in 21 states owned and operated by the largest long-term care provider in the United States. Compared data from nursing homes that had their initial vaccine clinics between December 18, 2020 and January 2, 2021, versus between January 3, 2021 and January 18, 2021. Outcomes were incident SARS-CoV-2 infections per 100 at-risk residents per week and hospital transfers and/or deaths per 100 residents with confirmed SARS-CoV-2 infection per day, averaged over a week. Adjusted for facility infection rates in the fall. After 1 week,

							early vaccinated facilities had a predicted 2.5 fewer incident SARS-CoV-2 infections per 100 at-risk residents per week (95% CI: 1.2–4.0).
16	Faria et al. (Apr 15, 2021)	Brazil	Impact (model)	HCWs in Sao Paulo	Gamma [^]	CoronaVac	HCWs in Hospital das Clinicas received vaccine before the general population of Sao Paulo. Using a period before vaccination, a Poisson regression was fit to model expected COVID-19 cases among HCWs based on the number of cases in Sao Paulo. Study then compared the expected number of cases among HCWs after vaccination (based on the model) to the observed numbers of cases in HCWs. The estimated effectiveness 2 and 3 weeks after the 2nd dose was 50.7% and 51.8%, respectively, and increased over the next 2 weeks.
15	PHE (Apr 8, 2021)	UK	Impact	UK adults	Alpha [^]	BNT162b2 & mRNA-1273	Daily impact of vaccination on deaths was estimated based on vaccine effectiveness against mortality multiplied by vaccine coverage. Observed deaths were then divided by the impact to estimate the expected deaths in the absence of vaccination. By the end of March 2021, they estimated that 9,100 deaths were averted in individuals aged 80 years and older, 1,200 in individuals aged 70 to 79, and 100 in individuals aged 60 to 69 years giving a total of 10,400 deaths averted in individuals aged 60 years or older.
14	Jones et al. (Apr 8, 2021)	UK	Ecologic	Cambridge University healthcare workers	Alpha [^]	BNT162b2	Screened vaccinated and unvaccinated HCWs for two weeks then compared proportion of positive tests in unvaccinated vs. vaccinated groups. Found four-fold decrease in risk of asymptomatic SARS-Cov-2 infection among HCWs ≥12 days post-vaccination compared to unvaccinated HCWs.
13	Rivkees et al. (Apr 7, 2021)	US - FL	Ecologic	Florida population	original and Alpha [^]	BNT162b2 & mRNA-1273	Ecologic analysis of vaccinations in Florida. Through March 15, 2021, 4,338,099 individuals received COVID-19 vaccine, including 2,431,540 individuals who completed their vaccination series. Of all those vaccinated, 70% were 65 years of age and older, and 63% of those 65 years of age and older. Beginning February 1, 2021, the decline in the number of new cases per week became greater in those 65 years of age and older than those younger. By March 15, 2021, the number of new cases, hospitalizations, and deaths per day for those 65 years of age and older relative to mid-January, were 82%, 80%, and 92% lower respectively. In comparison, the number of new cases, hospitalizations, and deaths per day for those younger than 65 years of age were 70%, 60%, and 87% lower respectively. Reductions in rates in those 65 year of age and older, were thus greater than in those who were younger (p-value <0.01, Wilcoxon test).
12	Hollinghurst et al. (Mar 24, 2021)	UK—Wales	Cohort (but no control)	14,501 vaccinated older adult residents in a Wales care home	original and Alpha [^]	BNT162b2 & AZD1222	Observational data-linkage using electronic health records and administrative data. Developed a Cox proportional

							hazards models to estimate hazard ratios for the risk of testing positive for SARS-CoV-2 infection following vaccination. Outcome of interest was the time to a positive SARS-CoV-2 PCR test following vaccination. Kaplan-Meier curve and empirical cumulative distribution function suggest a susceptible period of vaccinated individuals up to 42 days, with approximately 40% of individuals having a positive PCR test within 7 days, 60% within 14-days, 85% within 21-days, 90% within 28-days, and over 95% within 35-days.
11	Milman et al. (Jun 11, 2021) [Update to Mar 23 preprint]	Israel	Ecologic	Maccabi Healthcare Services, 644,609 individuals in 177 communities	original & Alpha [†]	BNT162b2	Rates of vaccination in each community are highly correlated with a later decline in infections among a cohort of under 16 years old which are unvaccinated. These results provide observational evidence that vaccination not only protects individual vaccinees but also provides cross-protection to unvaccinated individuals in the community.
10	Keehner et al. (Mar 23, 2021)	US - CA	Ecologic	Healthcare workers in the UCLA and UCSD systems	original [‡]	BNT162b2 & mRNA-1273	Among the vaccinated health care workers, 379 people tested positive for SARS-CoV-2 at least 1 day after vaccination, and the majority (71%) of these persons tested positive within the first 2 weeks after the first dose.
9	Daniel et al. (Mar 23, 2021)	US - TX	Ecologic	Healthcare workers from the UTSW	original [‡]	BNT162b2 & mRNA-1273	After vaccination, they observed a greater than 90% decrease in the number of employees who are either in isolation or quarantine.
8	Benenson et al. (Mar 23, 2021)	Israel	Ecologic	Healthcare workers at Hadassah Hebrew University Medical Center	Alpha [^]	BNT162b2	Among vaccinated workers, the weekly incidence of COVID-19 since the first dose declined notably after the second week; the incidence of infection continued to decrease dramatically and then remained low after the fourth week.
7	Roghani (Mar 17, 2021)	US – TN	Ecologic	Residents of Tennessee	original [‡]	BNT162b2 & mRNA-1273	Between 12/17/20 and 3/3/21 found that the daily incidence among the entire population over 71 dropped from 0.1% to 0.01% of the age group (90% reduction) while for younger ages incidence dropped from 0.2% to 0.05% (75% reduction).
6	Puranik et al. (March 8, 2021)	US	Ecologic	87 million individuals from 580 counties in the United States	original [‡]	BNT162b2 & mRNA-1273	Compares the cumulative county-level vaccination rates with the corresponding COVID-19 incidence rates among 87 million individuals from 580 counties in the United States, including 12 million individuals who have received at least one vaccine dose. Found that cumulative county-level vaccination rate through March 1, 2021 is significantly associated with a concomitant decline in COVID-19, with stronger negative correlations in the Midwestern counties and Southern counties.
5	Rinott et al (March 8, 2021)	Israel	Ecologic	Persons needing ventilation	Original & alpha	BNT162b2	number of COVID-19 patients aged ≥70 years (who had the highest 2-dose vaccination coverage, 84.3%) requiring mechanical ventilation was compared with that of patients aged <50 years, who had the lowest 2-dose vaccination

							coverage (9.9%). Since implementation of the second dose of the vaccination campaign, the ratio of COVID-19 patients requiring mechanical ventilation aged ≥ 70 years to those aged < 50 years has declined 67%, from 5.8:1 during October–December 2020 to 1.9:1 in February 2021.
4	De-Leon et al. (Feb 8, 2021)	Israel	Ecologic Modeling	Israel population over 60 years old	original & Alpha [¶]	BNT162b2	Looked at whether the high vaccine coverage among individuals aged over 60 years old creates an observable change in disease dynamics using real and simulated data. Based on model, vaccine is at least 50% effective.
3	CHPE-LTC (Feb 10, 2021)	US - national	Ecologic	Residents of long term care facilities that received vaccine through the federal pharmacy partnership.	original [¥]	BNT162b2 & mRNA-1273	Three weeks after the first vaccine clinic the rates of new COVID-19 infection dropped more in the 797 SNFs that held vaccine clinic compared to those that did not in the same county (48% vs 21%, respectively).
2	Dunbar et al. (Feb 10, 2021)	US - VA	Ecologic	Healthcare workers in an academic hospital	original [¥]	BNT162b2 & mRNA-1273	After 60% of employees received the 1st vaccine dose, the HCW COVID-19 infection rate decreased by 50%. HCWs who were 14-28 days and > 28 days post-first vaccine dose were less likely COVID-19 infected than non-vaccine recipients.
1	Domi et al. (Feb 4, 2021)	US	Ecologic	LTCF residents and staff	original [¥]	BNT162b2 & mRNA-1273	Used CMS NMSN Public File data and Tiberius data and created an analytic cohort based on the schedule of the vaccination clinics taking place during the first week of the program (12/18/20 to 12/27/20). Created a comparison group, composed of facilities located in the same county that did not have a first vaccination clinic during that period. Found that COVID-19 cases decreased at a faster rate among both residents and staff associated with nursing homes that had completed their first clinic. Vaccinated nursing homes experienced a 48% decline in new resident cases three weeks after the first clinic, compared to a 21% decline among non-vaccinated nursing homes located in the same county. Similarly, new staff cases declined by 33% in vaccinated nursing homes compared to 18% in non-vaccinated facilities.

#Includes studies published/posted up through Wednesday of current week.

^Indicates predominant variant identified by study authors. If no ^ then variants identified through secondary source when possible. Please see additional footnotes.

¶[The rise of SARS-CoV-2 variant Alpha in Israel intensifies the role of surveillance and vaccination in elderly | medRxiv](#)

¥[CDC Says More Virulent British Strain Of Coronavirus Now Dominant In U.S. : Coronavirus Updates : NPR](#)

£[Coronavirus \(COVID-19\) Infection Survey, UK - Office for National Statistics](#)

##Based on <https://outbreak.info/location-reports>

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