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Methods

Table S1. Definitions of COVID-19 cases

Clinical severity	Definition
Mild	Patients with mild clinical symptoms, and no pneumonia manifestation in imaging.
Moderate	Patients with fever, respiratory symptoms, and pneumonia manifestation in imaging.
Severe	The adult patients meet any of the following: a. respiratory distress, breathing rate ≥30 beats/min; or b. the oxygen saturation ≤93% at a rest state; or c. PaO2/FiO2 ≤300mmHg (1mmHg = 0.133kPa); or d. patients with >50% lesions progression within 24~48 hours. The child patients meet any of the following: a. high fever that lasts more than 3 days; or b. respiratory distress (breathing rate ≥60 beats/min in children under 2 months old; ≥50 beats/min in children aged 2-12 months old; ≥40 beats/min in children aged 1-5 years old; ≥30 beats/min in children over 5 years old); or c. the oxygen saturation ≤93% at a rest state; or d. assisted breathing (flaring of nose wings, three-concave sign); or e. lethargy, convulsions; or f. children with feeding difficulty or refuse to be feed and with dehydration.
Critical	Patients meet any of the following: a. respiratory failure occurs and mechanical ventilation is required; or b. shock occurs; or c. complicated with other organ failures that requires monitoring and treatment in ICU.

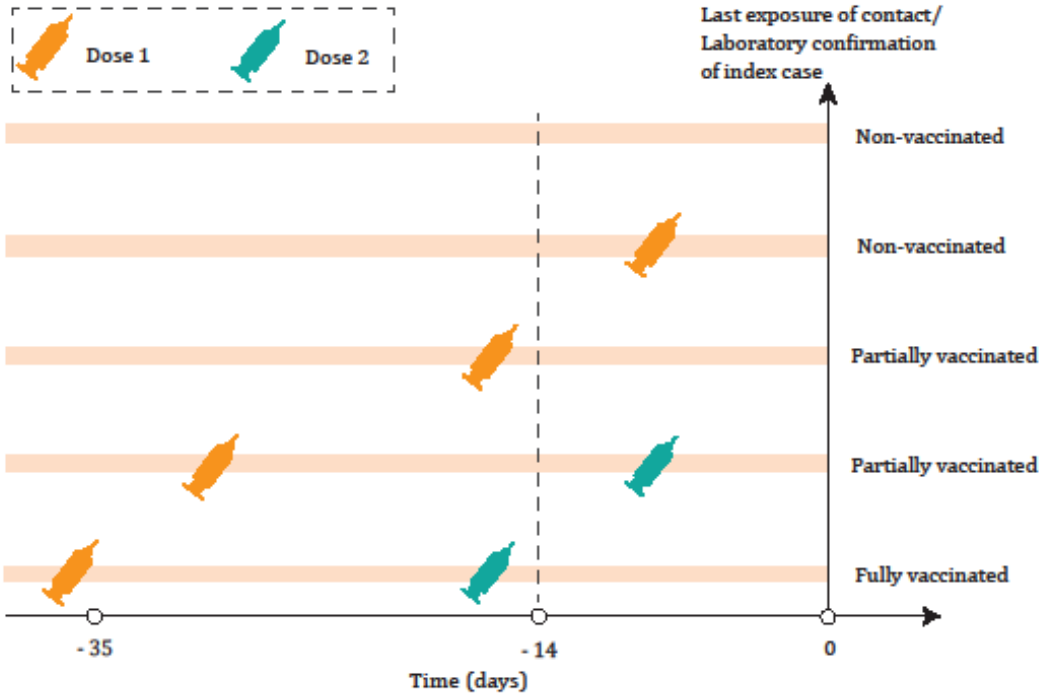

Figure S1. The definition of vaccination status of close contacts and index cases

Sensitive analyses

Mixed-effect logistic regression models were used to estimate the effectiveness of inactivated vaccines and cluster index was introduced in the model as random effect. To evaluate robustness of the model, we randomly selected one index case for close contacts with multiple exposures, which was repeated for 1000 times. Here we listed results for 5 samplings.

Table S2. Adjusted effectiveness of inactivated vaccines in preventing different COVID-19 outcomes, according to vaccination status, by randomly selecting different index case of close contacts with multiple exposure.

Outcome and vaccination status	Model 1	Model 2	Model 3	Model 4	Model 5
SARS-CoV-2 infection					
Non-vaccinated	Ref	Ref	Ref	Ref	Ref
Partially vaccinated	-0.9 (-119, 53.5)	-30 (-180.5, 39.8)	-18.9 (-160.3, 45.7)	-15.2 (-148.4, 46.6)	-25.9 (-172.7, 41.9)
Fully vaccinated	47.8 (-6.1, 74.3)	43 (-16.8, 72.2)	45.8 (-12.3, 73.9)	46 (-10.7, 73.6)	43.6 (-16.1, 72.6)
Symptomatic COVID-19					
Non-vaccinated	Ref	Ref	Ref	Ref	Ref
Partially vaccinated	-5.3 (-131, 52)	-16.6 (-155.8, 46.8)	-26.4 (-172.6, 41.4)	-2 (-119.9, 52.7)	-20.5 (-159.9, 44.1)
Fully vaccinated	50.1 (-1.5, 75.4)	51.7 (1.6, 76.3)	50.3 (-1.9, 75.7)	52.2 (3.8, 76.3)	49.8 (-3.3, 75.6)
Mild COVID-19					
Non-vaccinated	Ref	Ref	Ref	Ref	Ref
Partially vaccinated	7.8 (-254.7, 76.1)	34.1 (-173.8, 84.1)	5.2 (-265.2, 75.4)	-4.1 (-278.6, 71.4)	35.9 (-151, 83.6)
Fully vaccinated	17.4 (-136.9, 71.2)	29.4 (-92.5, 74.1)	24.5 (-117.9, 73.9)	17.3 (-127.3, 69.9)	32.3 (-78.1, 74.3)
Moderate to severe COVID-19					
Non-vaccinated	Ref	Ref	Ref	Ref	Ref
Partially vaccinated	-40 (-277.2, 48)	-31.9 (-255, 51)	-26.7 (-240.9, 52.9)	-47.3 (-284.3, 43.5)	-32.2 (-253.3, 50.5)
Fully vaccinated	64.7 (0.4, 87.5)	68.7 (9.2, 89.2)	68 (7.4, 88.9)	63.6 (-0.7, 86.8)	67.3 (6.2, 88.6)

Subgroup analyses

Table S3. Logistic regression of factors associated with COVID-19-related outcomes.

Factor	SARS-CoV-2 infection			Symptomatic COVID-19			Mild COVID-19			Moderate to severe COVID-19		
	SAR (a/n)	RR (95% CI)	P value	SAR (a/n)	RR (95% CI)	P value	SAR (a/n)	RR (95% CI)	P value	SAR (a/n)	RR (95% CI)	P value
Intercept		0.22 (0.07, 0.71)	0.01		0.29 (0.1, 0.85)	0.02		0.11 (0.02, 0.51)	0		0.1 (0.02, 0.5)	0
Aged 18-29	7/385	Ref		7/385	Ref		4/382	Ref		3/381	Ref	
Aged 30-39	17/536	1.83 (0.71, 4.69)	0.21	15/534	1.75 (0.68, 4.5)	0.25	9/528	1.69 (0.49, 5.9)	0.41	6/525	1.53 (0.35, 6.58)	0.57
Aged 40-49	10/342	1.4 (0.49, 4.03)	0.53	10/342	1.6 (0.58, 4.45)	0.37	5/337	1.44 (0.36, 5.79)	0.6	5/337	1.74 (0.38, 8.01)	0.48
Aged 50-59	11/288	1.66 (0.58, 4.78)	0.35	11/288	1.81 (0.65, 5.07)	0.26	3/280	0.97 (0.2, 4.75)	0.97	8/285	2.99 (0.69, 12.84)	0.14
Aged 60-69	9/90	1.87 (0.57, 6.11)	0.3	7/88	1.77 (0.55, 5.72)	0.34	1/82	0.59 (0.06, 6.03)	0.66	6/87	2.68 (0.56, 12.9)	0.22
Aged ≥70	1/44	0.28 (0.02, 3.17)	0.3	1/44	0.33 (0.04, 3.08)	0.33	0/43	NA	0.86	1/44	0.68 (0.05, 8.64)	0.77
Male	25/690	Ref		24/689	Ref		12/677	Ref		12/677	Ref	
Female	30/995	1.26 (0.69, 2.31)	0.45	27/992	1.22 (0.66, 2.26)	0.53	10/975	0.87 (0.35, 2.14)	0.76	17/982	1.83 (0.77, 4.32)	0.17
Household contact	21/125	Ref		21/122	Ref		7/112	Ref		14/114	Ref	
Non-household contact	34/1560	0.12 (0.06, 0.25)	0	30/1559	0.1 (0.05, 0.19)	0	15/1540	0.11 (0.04, 0.32)	0	15/1545	0.08 (0.03, 0.21)	0
Non-vaccinated contact	24/561	Ref		22/559	Ref		8/545	Ref		13/550	Ref	
Partially vaccinated contact	13/289	1.04 (0.48, 2.28)	0.92	12/288	0.95 (0.44, 2.08)	0.9	4/280	0.9 (0.25, 3.24)	0.87	9/285	1.31 (0.49, 3.49)	0.59
Fully vaccinated contact	18/835	0.52 (0.26, 1.07)	0.08	17/834	0.45 (0.22, 0.92)	0.03	10/827	0.74 (0.27, 2.03)	0.56	7/824	0.32 (0.11, 0.91)	0.03
Non-vaccinated index case	31/479	Ref		27/476	Ref		13/455	Ref		13/462	Ref	
Partially vaccinated index case	8/369	0.29 (0.11, 0.74)	0.01	9/369	0.43 (0.19, 0.99)	0.05	5/369	0.7 (0.2, 2.42)	0.58	4/368	0.28 (0.07, 1.07)	0.06
Fully vaccinated index case	16/837	0.35 (0.16, 0.79)	0.01	15/836	0.4 (0.19, 0.83)	0.01	4/828	0.29 (0.07, 1.1)	0.07	12/829	0.44 (0.16, 1.23)	0.12

Table S4. Effectiveness of inactivated vaccines in preventing different COVID-19 outcomes by age group.

Outcomes	Vaccination status	18-59 years			60 years and over		
		SAR (%, a/n)	Unadjusted VE (95% CI)	Adjusted VE (95% CI)	SAR (%, a/n)	Unadjusted VE (95% CI)	Adjusted VE (95% CI)
SARS-CoV-2 infection	Non-vaccinated	3.4 (16/472)	-	-	9 (8/89)	-	-
	Partially vaccinated	4.1 (11/266)	-22 (-159, 42.5)	-7.6 (-149.7, 53.7)	8.7 (2/23)	3.3 (-325, 78)	-42 (-2540, 92.4)
	Fully vaccinated	2.2 (18/813)	34.7 (-26.9, 66.4)	44.3 (-15.9, 73.2)	0 (0/22)	-	-
Symptomatic COVID-19	Non-vaccinated	3.2 (15/471)	-	-	6.9 (6/87)	-	-
	Partially vaccinated	4.1 (11/266)	-29.8 (-178.6, 39.5)	-1.8 (-138.5, 56.6)	8.7 (2/23)	-26.1 (-484, 72.8)	-25.3 (-2105.6, 92.9)
	Fully vaccinated	2.1 (17/812)	34.3 (-30.4, 66.9)	46.2 (-12.1, 74.2)	0 (0/22)	-	-
Mild COVID-19	Non-vaccinated	1.7 (8/464)	-	-	1.2 (1/82)	-	-
	Partially vaccinated	1.2 (3/258)	32.6 (-152, 82)	2.3 (-263.1, 73.7)	0 (0/21)	-	-
	Fully vaccinated	1.2 (10/805)	28 (-81.3, 71.4)	15.2 (-138.1, 69.8)	0 (0/22)	-	-
Moderate to severe COVID-19	Non-vaccinated	1.7 (8/464)	-	-	5.8 (5/86)	-	-
	Partially vaccinated	2.7 (7/262)	-55 (-322.5, 43.2)	-36.8 (-321.7, 55.6)	8.7 (2/23)	-49.6 (-621.8, 69)	-6036.9 (-Inf, 86.2)
	Fully vaccinated	0.9 (7/802)	49.4 (-38.7, 81.5)	61.0 (-16.1, 86.9)	0 (0/22)	-	-

Table S5. Effectiveness of inactivated vaccines in preventing different COVID-19 outcomes by gender.

Outcome	Vaccination status	Male			Female		
		SAR (%, a/n)	Unadjusted VE (95% CI)	Adjusted VE (95% CI)	SAR (%, a/n)	Unadjusted VE (95% CI)	Adjusted VE (95% CI)
SARS-CoV-2 infection	Non-vaccinated	3.9 (10/256)	-	-	4.3 (13/304)	-	-
	Partially vaccinated	4.8 (7/146)	-22.7 (-215.6, 52.3)	11.6 (-174.3, 71.5)	4.9 (7/144)	-13.7 (-178.8, 53.7)	-13 (-235.8, 62)
	Fully vaccinated	2.8 (8/288)	28.9 (-77.4, 71.5)	30.8 (-94.1, 75.3)	1.8 (10/547)	57.2 (3.7, 81)	61.6 (0.4, 85.2)
Symptomatic COVID-19	Non-vaccinated	3.5 (9/255)	-	-	4 (12/303)	-	-
	Partially vaccinated	4.8 (7/146)	-35.8 (-257.1, 48.3)	3.4 (-202.5, 69.1)	4.2 (6/143)	-5.9 (-176.6, 59.4)	-14.2 (-230.5, 60.6)
	Fully vaccinated	2.8 (8/288)	21.3 (-100.9, 69.2)	24.4 (-116.3, 73.6)	1.6 (9/546)	58.4 (2.3, 82.3)	65.3 (11.3, 86.4)
Mild COVID-19	Non-vaccinated	2 (5/251)	-	-	1 (3/294)	-	-
	Partially vaccinated	1.4 (2/141)	28.8 (-262.3, 86)	32.7 (-380.3, 90.6)	1.4 (2/139)	-41 (-734.3, 76.2)	-47.6 (-915.7, 78.5)
	Fully vaccinated	1.8 (5/285)	11.9 (-200.7, 74.2)	14.5 (-279.6, 80.8)	0.9 (5/542)	9.6 (-275.6, 78.2)	27.9 (-237.7, 84.6)
Moderate to severe COVID-19	Non-vaccinated	1.6 (4/250)	-	-	3 (9/300)	-	-
	Partially vaccinated	3.5 (5/144)	-117 (-695.3, 40.8)	-118.2 (-947, 54.5)	2.8 (4/141)	5.4 (-201.9, 70.4)	-5.6 (-297.1, 71.9)
	Fully vaccinated	1.1 (3/283)	33.7 (-193.2, 85)	20.4 (-348.5, 85.9)	0.7 (4/541)	75.4 (20.6, 92.3)	76.5 (14.0, 93.6)

Table S6. Effectiveness of inactivated vaccines in preventing different COVID-19 outcomes among the fully vaccinated group by vaccine manufacturer.

Outcome and vaccine manufacturer	SAR (%, a/n)	Unadjusted VE (95% CI)	Adjusted VE (95% CI)
SARS-CoV-2 infection			
Non-vaccinated	4.3 (24/561)	-	-
BBIBP-CorV/WBIBP-CorV	1.8 (5/277)	57.8 (-9.4, 83.7)	64.7 (-3.9, 88)
CoronaVac	1.3 (5/377)	69 (19.5, 88.1)	69.3 (9.5, 89.6)
Symptomatic COVID-19			
Non-vaccinated	1.4 (4/276)	-	-
BBIBP-CorV/WBIBP-CorV	1.3 (5/377)	63.2 (-5.8,87.2)	68.8 (1.2, 90.1)
CoronaVac	4.4 (8/181)	66.3 (11.8,87.1)	64.7 (-1.5, 87.8)
Mild COVID-19			
Non-vaccinated	1.6 (9/546)	-	-
BBIBP-CorV/WBIBP-CorV	0.7 (2/274)	55.7 (-103.5, 90.4)	66.4 (-70.5, 93.4)
CoronaVac	0.8 (3/375)	51.5 (-78.1, 86.8)	50.9 (-101.3, 88)
Moderate to severe COVID-19			
Non-vaccinated	2.4 (13/550)	-	-
BBIBP-CorV/WBIBP-CorV	0.7 (2/274)	69.1 (-35.9, 93)	69.3 (-50, 93.7)
CoronaVac	0.5 (2/374)	77.4 (0.3, 94.9)	73.9 (-25.6, 94.6)

Table S7. Effectiveness of inactivated vaccines in preventing different COVID-19 outcomes by time duration of vaccination.

Outcome and vaccination time	SAR (%, a/n)	Unadjusted VE (95% CI)	Adjusted VE (95% CI)
SARS-CoV-2 infection			
Non-vaccinated	4.3 (24/561)	-	-
Fully vaccinated			
14-90 days	2.2 (15/693)	49.4 (4.5, 73.2)	52.3 (-2.9, 77.9)
>90 days	2.1 (3/142)	50.6 (-61.7, 84.9)	46.6 (-107.3, 86.2)
Symptomatic COVID-19			
Non-vaccinated	3.9 (22/559)	-	-
Fully vaccinated			
14-90 days	2 (14/692)	48.6 (0.5, 73.5)	54.5 (1.5, 79)
>90 days	2.1 (3/142)	46.3 (-76.8, 83.7)	47.8 (-102.6, 86.6)
Mild COVID-19 case			
Non-vaccinated	1.6 (9/546)	-	-
Fully vaccinated			
14-90 days	1.2 (8/686)	29.3 (-82.2, 72.5)	37.8 (-72.4, 77.6)
>90 days	1.4 (2/141)	13.9 (-293.8, 81.2)	21.8 (-301.9, 84.8)
Moderate to severe COVID-19			
Non-vaccinated	2.4 (13/550)	-	-
Fully vaccinated			
14-90 days	0.9 (6/684)	62.9 (3, 85.8)	68.6 (-4.7, 90.6)
>90 days	0.7 (1/140)	69.8 (-129.1, 96)	73 (-167.7, 97.3)