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Respiratory Medicine

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Tartof SY, Slezak JM, Puzniak L, et al. Durability of BNT162b2 vaccine against hospital and emergency department admissions due to the omicron and delta variants in a large health system in the USA: a test-negative case-control study. *Lancet Respir Med* 2022; published online April 22. [https://doi.org/10.1016/S2213-2600\(22\)00101-1](https://doi.org/10.1016/S2213-2600(22)00101-1).

Supplementary Table 1. Acute Respiratory Infection Codes and frequency in study population, Dec 1, 2021 to Feb 06, 2022

		Frequency
		N
A48.1	LEGIONNAIRES' DISEASE	6
B34.2	CORONAVIRUS INFECTION, UNSPECIFIED	6
B44.0	INVASIVE PULMONARY ASPERGILLOSIS	1
B97.29	OTH CORONAVIRUS AS THE CAUSE OF DISEASES CLASSD ELSWHR	5
J00	ACUTE NASOPHARYNGITIS (COMMON COLD)	8
J01.00	ACUTE MAXILLARY SINUSITIS, UNSPECIFIED	11
J01.10	ACUTE FRONTAL SINUSITIS, UNSPECIFIED	2
J01.20	ACUTE ETHMOIDAL SINUSITIS, UNSPECIFIED	1
J01.30	ACUTE SPHENOIDAL SINUSITIS, UNSPECIFIED	1
J01.40	ACUTE PANSINUSITIS, UNSPECIFIED	2
J01.80	OTHER ACUTE SINUSITIS	4
J01.90	ACUTE SINUSITIS, UNSPECIFIED	29
J02.0	STREPTOCOCCAL PHARYNGITIS	47
J02.8	ACUTE PHARYNGITIS DUE TO OTHER SPECIFIED ORGANISMS	34
J02.9	ACUTE PHARYNGITIS, UNSPECIFIED	892
J03.00	ACUTE STREPTOCOCCAL TONSILLITIS, UNSPECIFIED	3
J03.90	ACUTE TONSILLITIS, UNSPECIFIED	32
J04.0	ACUTE LARYNGITIS	13
J04.10	ACUTE TRACHEITIS WITHOUT OBSTRUCTION	1
J05.0	ACUTE OBSTRUCTIVE LARYNGITIS (CROUP)	53
J05.10	ACUTE EPIGLOTTITIS WITHOUT OBSTRUCTION	2
J06.0	ACUTE LARYNGOPHARYNGITIS	1
J06.9	ACUTE UPPER RESPIRATORY INFECTION, UNSPECIFIED	826
J09.X1	INFLUENZA DUE TO IDENT NOVEL INFLUENZA A VIRUS W PNEUMONIA	2
J09.X2	FLU DUE TO IDENT NOVEL INFLUENZA A VIRUS W OTH RESP MANIFEST	2
J10.00	FLU DUE TO OTH IDENT FLU VIRUS W UNSP TYPE OF PNEUMONIA	7
J10.01	FLU DUE TO OTH IDENT FLU VIRUS W SAME OTH IDENT FLU VIRUS PN	1
J10.08	INFLUENZA DUE TO OTH IDENT INFLUENZA VIRUS W OTH PNEUMONIA	5
J10.1	FLU DUE TO OTH IDENT INFLUENZA VIRUS W OTH RESP MANIFEST	79
J10.2	INFLUENZA DUE TO OTH IDENT INFLUENZA VIRUS W GI MANIFEST	1
J11.00	FLU DUE TO UNIDENTIFIED FLU VIRUS W UNSP TYPE OF PNEUMONIA	5
J11.08	FLU DUE TO UNIDENTIFIED FLU VIRUS W SPECIFIED PNEUMONIA	1
J11.1	FLU DUE TO UNIDENTIFIED INFLUENZA VIRUS W OTH RESP MANIFEST	186
J12.1	RESPIRATORY SYNCYTIAL VIRUS PNEUMONIA	17
J12.2	PARAINFLUENZA VIRUS PNEUMONIA	1
J12.3	HUMAN METAPNEUMOVIRUS PNEUMONIA	2
J12.81	PNEUMONIA DUE TO SARS-ASSOCIATED CORONAVIRUS	1
J12.82	PNEUMONIA DUE TO CORONAVIRUS DISEASE 2019	2,488

J12.89	OTHER VIRAL PNEUMONIA	28
J12.9	VIRAL PNEUMONIA, UNSPECIFIED	14
J13	PNEUMONIA DUE TO STREPTOCOCCUS PNEUMONIAE	10
J14	PNEUMONIA DUE TO HEMOPHILUS INFLUENZAE	2
J15.0	PNEUMONIA DUE TO KLEBSIELLA PNEUMONIAE	5
J15.1	PNEUMONIA DUE TO PSEUDOMONAS	9
J15.20	PNEUMONIA DUE TO STAPHYLOCOCCUS, UNSPECIFIED	1
J15.211	PNEUMONIA DUE TO METHICILLIN SUSCEP STAPH	7
J15.212	PNEUMONIA DUE TO METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS	2
J15.4	PNEUMONIA DUE TO OTHER STREPTOCOCCI	10
J15.5	PNEUMONIA DUE TO ESCHERICHIA COLI	2
J15.6	PNEUMONIA DUE TO OTHER AEROBIC GRAM-NEGATIVE BACTERIA	1
J15.7	PNEUMONIA DUE TO MYCOPLASMA PNEUMONIAE	1
J15.8	PNEUMONIA DUE TO OTHER SPECIFIED BACTERIA	3
J15.9	UNSPECIFIED BACTERIAL PNEUMONIA	75
J16.8	PNEUMONIA DUE TO OTHER SPECIFIED INFECTIOUS ORGANISMS	5
J18.0	BRONCHOPNEUMONIA, UNSPECIFIED ORGANISM	8
J18.1	LOBAR PNEUMONIA, UNSPECIFIED ORGANISM	47
J18.8	OTHER PNEUMONIA, UNSPECIFIED ORGANISM	17
J18.9	PNEUMONIA, UNSPECIFIED ORGANISM	925
J20.2	ACUTE BRONCHITIS DUE TO STREPTOCOCCUS	1
J20.5	ACUTE BRONCHITIS DUE TO RESPIRATORY SYNCYTIAL VIRUS	7
J20.6	ACUTE BRONCHITIS DUE TO RHINOVIRUS	3
J20.8	ACUTE BRONCHITIS DUE TO OTHER SPECIFIED ORGANISMS	163
J20.9	ACUTE BRONCHITIS, UNSPECIFIED	88
J22	UNSPECIFIED ACUTE LOWER RESPIRATORY INFECTION	11
J39.0	RETROPHARYNGEAL AND PARAPHARYNGEAL ABSCESS	4
J39.1	OTHER ABSCESS OF PHARYNX	1
J39.2	OTHER DISEASES OF PHARYNX	11
J39.8	OTHER SPECIFIED DISEASES OF UPPER RESPIRATORY TRACT	7
J80	ACUTE RESPIRATORY DISTRESS SYNDROME	131
J96.00	ACUTE RESPIRATORY FAILURE, UNSP W HYPOXIA OR HYPERCAPNIA	131
J96.01	ACUTE RESPIRATORY FAILURE WITH HYPOXIA	1,760
J96.02	ACUTE RESPIRATORY FAILURE WITH HYPERCAPNIA	45
J96.10	CHRONIC RESPIRATORY FAILURE, UNSP W HYPOXIA OR HYPERCAPNIA	83
J96.11	CHRONIC RESPIRATORY FAILURE WITH HYPOXIA	149
J96.12	CHRONIC RESPIRATORY FAILURE WITH HYPERCAPNIA	29
J96.20	ACUTE AND CHR RESP FAILURE, UNSP W HYPOXIA OR HYPERCAPNIA	12
J96.21	ACUTE AND CHRONIC RESPIRATORY FAILURE WITH HYPOXIA	203
J96.22	ACUTE AND CHRONIC RESPIRATORY FAILURE WITH HYPERCAPNIA	49

J96.90	RESPIRATORY FAILURE, UNSP, UNSP W HYPOXIA OR HYPERCAPNIA	52
J96.91	RESPIRATORY FAILURE, UNSPECIFIED WITH HYPOXIA	38
J96.92	RESPIRATORY FAILURE, UNSPECIFIED WITH HYPERCAPNIA	6
M35.81	MULTISYSTEM INFLAMATORY SYNDROME	3
M35.89	OTHER SPECIFIED SYSTEMIC INVOLVMENT OF CONNECTIVE TISSUE	1
R05.1	ACUTE COUGH	25
R05.3	CHRONIC COUGH	112
R05.4	COUGH SYNCOPE	6
R05.8	OTHER SPECIFIED COUGH	45
R05.9	COUGH, UNSPECIFIED	1,389
R09.2	RESPIRATORY ARREST	4
R50.9	FEVER, UNSPECIFIED	737
U07.1	COVID-19	10,342
All		21,598

Supplementary Table 2. Proportion of specimens identified as S-gene Target Failure on the ThermoFisher TaqPath COVID-19 Combo Kit, by date

Date	Total # of samples	S gene dropout (SGTF)	Total # of positive samples	% S gene dropout
12/1/2021	14516	12	706	1.7
12/2/2021	12864	17	634	2.68
12/3/2021	13583	23	1330	1.73
12/4/2021	13266	20	652	3.07
12/5/2021	9570	13	421	3.09
12/6/2021	4445	8	648	1.23
12/7/2021	12247	9	632	1.42
12/8/2021	14,664	16	590	2.7
12/9/2021	15,416	33	691	4.8
12/10/2021	13,160	38	581	6.5
12/11/2021	12,032	35	594	5.9
12/12/2021	9024	21	383	5.5
12/13/2021	7144	25	263	9.5
12/14/2021	13,536	114	746	15.3
12/15/2021	13,536	183	637	28.7
12/16/2021	14,664	351	895	39.2
12/17/2021	14,664	385	913	42.2
12/18/2021	14,288	501	1031	48.6
12/19/2021	11,656	444	844	52.6
12/20/2021	7777	428	674	63.5
12/21/2021	15,284	1218	1766	69.0
12/22/2021	19,033	1952	2407	81.1

12/23/2021	18,569	2017	2459	82.0
12/24/2021	22,619	2769	3301	83.9
12/25/2021	15,567	2226	2547	87.4
12/26/2021	17,212	2341	2674	87.6
12/27/2021	12,103	2498	2723	91.7
12/28/2021	17,158	4717	5098	92.5
12/29/2021	25,706	6679	7563	88.3
12/30/2021	29,277	8364	8808	95.0
12/31/2021	21,374	5885	6254	94.1
1/1/2022	28,990	8532	9059	94.2
1/2/2022	19,711	5184	5575	93.0
1/3/2022	33,158	8280	8881	93.2
1/4/2022	35,157	10,499	11,007	95.4
1/5/2022	33,088	10,903	11,830	92.2
1/6/2022	33,549	11,451	11,922	96.1
1/7/2022	35,018	11,991	12,466	96.2
1/8/2022	28,269	8838	9240	95.7
1/9/2022	36,071	12,290	12,645	97.2
1/10/2022	29,457	9452	9704	97.4
1/11/2022	42,888	13,176	13,542	97.3
1/12/2022	31297	9319	9579	97.29
1/13/2022	35933	11946	12208	97.85
1/14/2022	38704	14158	14424	98.16
1/15/2022	40259	13832	14100	98.1
1/16/2022	40570	13747	14051	97.84
1/17/2022	33631	10111	10350	97.69
1/18/2022	33385	11020	11202	98.38
1/19/2022	32169	10710	10930	97.99
1/20/2022	24122	7778	7901	98.44
1/21/2022	23180	6744	6916	97.51
1/22/2022	22790	6484	6635	97.72
1/23/2022	16574	3974	4019	98.88
1/24/2022	10614	2781	2808	99.04
1/25/2022	19123	4810	5327	90.29
1/26/2022	17903	4229	5227	80.91
1/27/2022	19424	4588	5118	89.64
1/28/2022	15003	3267	3296	99.12
1/29/2022	13940	2890	2918	99.04
1/30/2022	10688	2025	2066	98.02
1/31/2022	7256	1458	1470	99.18
2/1/2022	12943	2291	3186	71.91
2/2/2022	13806	2300	2337	98.42

Supplementary Tables 3a & 3b. Adjusted (3a) and unadjusted (3b) vaccine effectiveness of Pfizer mRNA COVID-19 vaccine BNT162b2 against hospital and emergency department among individuals with acute respiratory infection, Dec 1, 2021 through Feb 06, 2022

a) Adjusted Estimates

BNT162b2 effectiveness	Delta	Omicron
	<i>Vaccine effectiveness (95% confidence interval)</i>	
<i>Hospital admission</i>		
2 doses overall	76 (69- 82)	62 (53- 69)
2 doses <3 months ago	78 (55- 89)	68 (48- 80)
2 doses 3 to <6 months ago	87 (76- 93)	68 (53- 78)
2 doses 6 to <9 months ago	72 (60- 81)	72 (63- 79)
2 doses ≥9 months ago	73 (58- 83)	41 (21- 55)
3 doses overall	87 (81- 92)	82 (77- 87)
3 doses <3 months ago	89 (83- 93)	85 (80- 89)
3 doses ≥3 months ago	71 (40- 86)	55 (28- 71)
<i>Emergency department admission without admission to hospital</i>		
2 doses overall	61 (55- 66)	47 (40- 54)
2 doses <3 months ago	78 (69- 85)	64 (51- 73)
2 doses 3 to <6 months ago	59 (48- 68)	47 (34- 57)
2 doses 6 to <9 months ago	59 (51- 66)	51 (43- 59)
2 doses ≥9 months ago	57 (45- 66)	31 (16- 43)
3 doses overall	83 (79- 86)	75 (70- 79)
3 doses <3 months ago	84 (80- 87)	77 (72- 81)
3 doses ≥3 months ago	72 (58- 82)	53 (36- 66)

*adjusted for age, sex, race/ethnicity, BMI, Charlson comorbidity index, prior SARS-CoV-2 infection, prior influenza vaccination, prior pneumococcal vaccination

b.) Unadjusted Estimates

	Delta	Omicron
	<i>Crude Vaccine effectiveness (95% confidence interval)</i>	
<i>Hospital admission</i>		
2 doses overall	80 (75- 84)	65 (58- 71)
2 doses <3 m ago	81 (63- 90)	65 (45- 77)
2 doses 3 to 5 m ago	86 (75- 92)	67 (53- 77)
2 doses ≥6 m ago	75 (65- 81)	73 (65- 80)
2 doses ≥9 months ago	84 (76- 89)	56 (43- 66)
3 doses overall	92 (89- 94)	87 (84- 90)

3 doses <3 m ago	93 (90- 95)	89 (86- 92)
3 doses ≥3 m ago	86 (73- 93)	71 (56- 81)
<i>Emergency department admission without admission to hospital</i>		
2 doses overall	62 (56-66)	47 (40- 53)
2 doses <3 m ago	80 (71- 86)	67 (56- 75)
2 doses 3 to 5 m ago	60 (51- 68)	48 (36- 57)
2 doses ≥6 m ago	58 (50- 65)	51 (43- 58)
2 doses ≥9 months ago	61 (51- 68)	29 (15- 41)
<i>3 doses overall</i>		
3 doses <3 m ago	85 (82- 88)	72 (68- 76)
3 doses ≥3 m ago	86 (83- 89)	75 (71- 79)
3 doses ≥3 m ago	78 (67- 85)	51 (34- 64)

m = month. Individuals were considered vaccinated with two doses at least seven days after the second dose and vaccinated with three doses at least 14 days after the third dose.

Supplementary Tables 4a & 3b. Adjusted vaccine effectiveness of Pfizer mRNA COVID-19 vaccine BNT162b2 against hospital and emergency department admission among individuals 18-64 years (4a), and those 65 years and older (4b) with acute respiratory infection, Dec 1, 2021 through Feb 06, 2022

a.) 18 to 64 years

BNT162b2 effectiveness	Delta	Omicron
	<i>Vaccine effectiveness (95% confidence interval)</i>	
<i>Hospital admission</i>		
2 doses overall	78 (68- 85)	61 (48- 71)
2 doses <3 months ago	81 (55- 92)	60 (27- 78)
2 doses 3 to <6 months ago	90 (78- 95)	62 (40- 76)
2 doses 6 to <9 months ago	77 (64- 86)	69 (55- 79)
2 doses ≥9 months ago	47 (-3- 73)	27 (-25- 58)
<i>3 doses overall</i>		
3 doses <3 months ago	84 (72- 91)	76 (63- 85)
3 doses ≥3 months ago	83 (70- 91)	82 (69- 89)
3 doses ≥3 months ago	84 (36- 96)	38 (-35- 71)
<i>Emergency department admission without admission to hospital</i>		
2 doses overall	58 (51- 64)	45 (36- 52)
2 doses <3 months ago	76 (65- 84)	60 (45- 71)
2 doses 3 to <6 months ago	56 (43- 65)	44 (30- 55)
2 doses 6 to <9 months ago	57 (47- 64)	48 (38- 56)
2 doses ≥9 months ago	53 (39- 64)	26 (6- 42)

3 doses overall	80 (74- 85)	70 (63- 76)
3 doses <3 months ago	80 (74- 85)	71 (63- 77)
3 doses ≥3 months ago	77 (59- 87)	59 (35- 74)

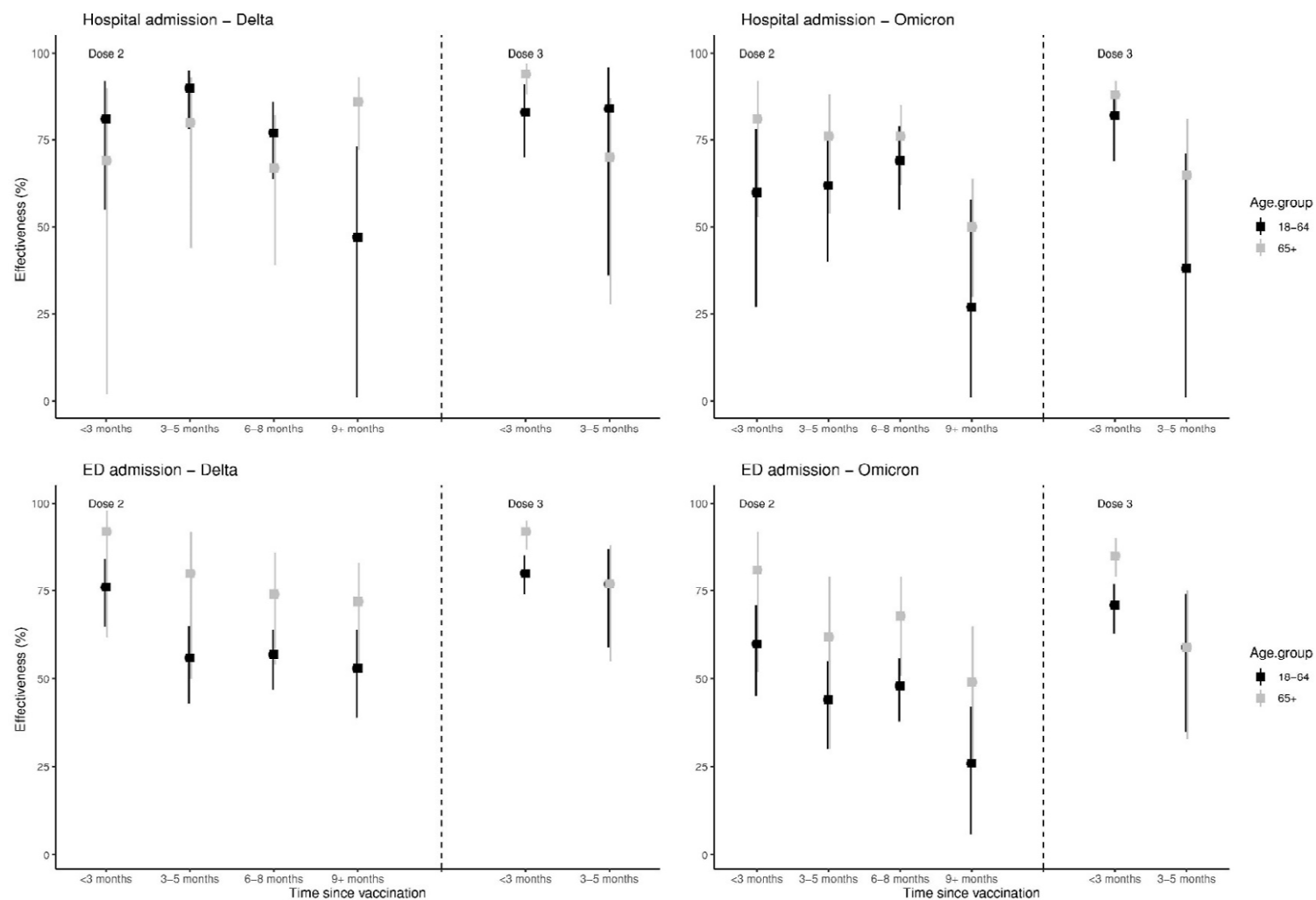
*adjusted for age, sex, race/ethnicity, BMI, Charlson comorbidity index, prior SARS-CoV-2 infection

b.) 65 years and older

BNT162b2 effectiveness	Delta	Omicron
	<i>Vaccine effectiveness (95% confidence interval)</i>	
<i>Hospital admission</i>		
2 doses overall	78 (65- 86)	64 (52- 73)
2 doses <3 months ago	69 (2- 90)	81 (53- 92)
2 doses 3 to <6 months ago	80 (44- 93)	76 (54- 88)
2 doses 6 to <9 months ago	67 (39- 82)	76 (62- 85)
2 doses ≥9 months ago	86 (72- 93)	50 (30- 64)
3 doses overall	91 (84- 95)	86 (79- 90)
3 doses <3 months ago	94 (88- 97)	88 (82- 92)
3 doses ≥3 months ago	70 (28- 87)	65 (37- 81)
<i>Emergency department admission without admission to hospital</i>		
2 doses overall	75 (62- 84)	59 (44- 70)
2 doses <3 months ago	92 (62- 98)	81 (52- 92)
2 doses 3 to <6 months ago	80 (50- 92)	62 (30- 79)
2 doses 6 to <9 months ago	74 (54- 86)	68 (51- 79)
2 doses ≥9 months ago	72 (54- 83)	49 (27- 65)
3 doses overall	90 (84- 94)	82 (75- 87)
3 doses <3 months ago	92 (87- 95)	85 (79- 90)
3 doses ≥3 months ago	77 (55- 88)	59 (33- 75)

*adjusted for age, sex, race/ethnicity, BMI, Charlson comorbidity index, prior SARS-CoV-2 infection

Supplementary Figure 1. Adjusted vaccine effectiveness of Pfizer mRNA COVID-19 vaccine BNT162b2 against hospital and emergency department admission among individuals 18-64 years and those 65 years and older with acute respiratory infection, Dec 1, 2021 through Feb 06, 2022



ED= emergency department, estimates adjusted for age, sex, race/ethnicity, BMI, Charlson comorbidity index, prior SARS-CoV-2 infection, prior influenza vaccination, prior pneumococcal vaccination