SUPPLEMENTARY TABLE. Relative COVID-19 vaccine effectiveness* against laboratory-confirmed COVID-19–associated hospitalizations and critical illness† among adults aged ≥18 years who received a bivalent vaccine dose compared with adults aged ≥18 years who received monovalent doses only, by age group and immunocompromise status — seven states,§ September 2022–April 2023

Clinical status/Age group, yrs/Vaccine type received, interval since receipt of BV dose	Without documented immunocompromising conditions				With documented immunocompromising conditions			
	Total	Positive SARS-CoV-2 test result, no. (%)	Median interval since last dose, days (IQR)	Relative VE, % (95% CI)	Total	Positive SARS-CoV-2 test result, no. (%)	Median interval since last dose, days (IQR)	Relative VE, % (95% CI)
Hospitalization								
≥18								
MV only (Ref)	**37,269**	3,988 (10.7)	376 (270 to 505)	Ref	**11,140**	1,134 (10.2)	355 (237 to 474)	Ref
BV, 7–59 days earlier	**4,857**	327 (6.7)	34 (21 to 47)	51 (45 to 57)	**1,612**	143 (8.9)	33 (19 to 46)	25 (9 to 38)
BV, 60–119 days earlier	**5,191**	486 (9.4)	87 (73 to 103)	33 (25 to 39)	**1,829**	140 (7.6)	88 (74 to 104)	39 (26 to 49)
BV, 120–179 days earlier	**3,310**	315 (9.5)	144 (132 to 159)	6 (–7 to 18)	**1,244**	103 (8.3)	144 (131 to 159)	11 (–13 to 29)
18–64								
MV only (Ref)	**12,368**	821 (6.6)	403 (306 to 534)	Ref	**NA**	NA	NA	NA
BV, 7–59 days earlier	**959**	38 (4.0)	33 (21 to 45)	51 (31 to 65)	**NA**	NA	NA	NA
BV, 60–119 days earlier	**935**	66 (7.1)	86 (72 to 101)	9 (–19 to 30)	**NA**	NA	NA	NA
BV, 120–179 days earlier	**561**	31 (5.5)	143 (131 to 158)	3 (–43 to 35)	**NA**	NA	NA	NA
≥65								
MV only (Ref)	**24,901**	3,167 (12.7)	362 (245 to 484)	Ref	**NA**	NA	NA	NA
BV, 7–59 days earlier	**3,898**	289 (7.4)	35 (21 to 48)	52 (45 to 58)	**NA**	NA	NA	NA
BV, 60–119 days earlier	**4,256**	420 (9.9)	87 (73 to 103)	36 (28 to 43)	**NA**	NA	NA	NA
BV, 120–179 days earlier	**2,749**	284 (10.3)	145 (132 to 159)	8 (–7 to 20)	**NA**	NA	NA	NA
Critical illness**								
≥18								
MV only (Ref)	**33,925**	644 (1.9)	375 (269 to 505)	Ref	**10,263**	257 (2.5)	354 (235 to 474)	Ref
BV, 7–59 days earlier	**4,579**	49 (1.1)	34 (21 to 47)	54 (38 to 66)	**1,501**	32 (2.1)	33 (19 to 46)	28 (–6 to 51)
BV, 60–119 days earlier	**4,790**	85 (1.8)	86 (73 to 103)	20 (–2 to 37)	**1,725**	36 (2.1)	88 (74 to 104)	32 (1 to 54)
BV, 120–179 days earlier	**3,028**	33 (1.1)	144 (132 to 159)	27 (–7 to 50)	**1,155**	14 (1.2)	144 (131 to 159)	45 (2 to 69)

Abbreviation: BV = bivalent; MV = monovalent; NA = not applicable; Ref = referent group; VE = vaccine effectiveness.

* Relative VE was calculated as (1 − odds ratio) x 100%, estimated using a test-negative case-control design. A combined model was generated including patients who had received a bivalent mRNA booster at 7–59, 60–119, or 120–179 days before their index date compared to those who received only monovalent vaccination. Odds ratios and 95% confidence intervals were estimated using multivariable logistic regression adjusting for age, sex, race and ethnicity, geographic region, and calendar time (days since January 1, 2021). Age and calendar time were modeled as natural cubic splines. VE was modeled separately for those with and without immunocompromising conditions, by age group (18–64 and ≥65 years), and for each outcome (hospitalization and critical illness).

† Patients were considered to have critical illness if they were admitted to the intensive care unit or died. Death was identified at each individual site and was defined as a death while hospitalized or ≤28 days after admission.

§ California (September 13, 2022–April 21, 2023), Indiana (September 13, 2022–April 12, 2023), Minnesota and Wisconsin (September 13, 2022–April 21, 2023), Oregon and Washington (September 13, 2022–April 14, 2023), and Utah (September 13, 2022–April 21, 2023).

¶ These estimates are imprecise, which might be because of a relatively small number of persons in each level of vaccination or case status. This imprecision indicates the true VE could be substantially different than the point estimate shown in this table and estimates should therefore be interpreted with caution. Additional data accrual could increase precision and allow appropriate interpretation.

** For VE against critical illness, case-patients were persons admitted to an intensive care unit or who experienced death associated with COVID-19, and control patients were persons hospitalized without COVID-19.