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Supplemental information

Real-time analysis of a mass vaccination effort confirms the safety of FDA-authorized mRNA COVID-19 vaccines

Reid McMurry, Patrick Lenehan, Samir Awasthi, Eli Silvert, Arjun Puranik, Colin Pawlowski, A.J. Venkatakrishnan, Praveen Anand, Vineet Agarwal, John C. O'Horo, Gregory J. Gores, Amy W. Williams, Andrew D. Badley, John Halamka, Abinash Virk, Melanie D. Swift, Katie Carlson, Deeksha Doddahonnaiah, Anna Metzger, Nikhil Kayal, Gabi Berner, Eshwan Ramudu, Corinne Carpenter, Tyler Wagner, Ajit Rajasekharan, and Venky Soundararajan

Supplemental Figures

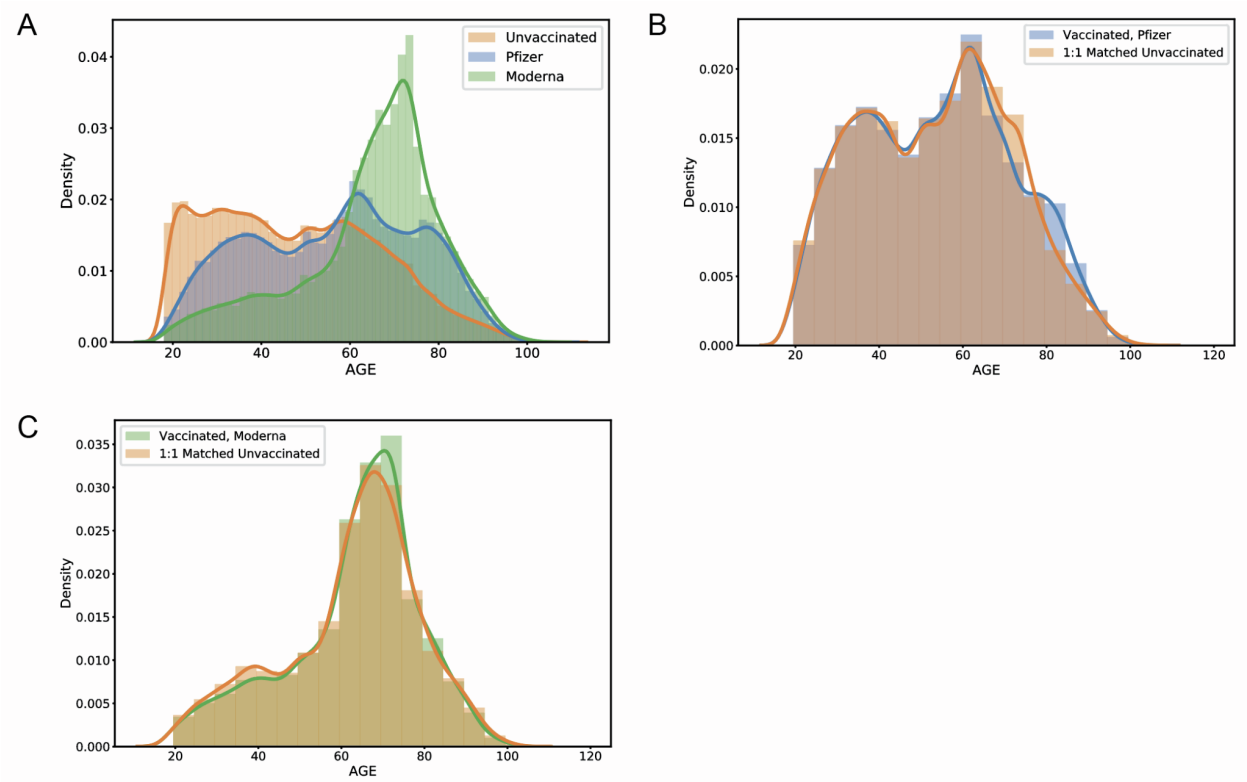

Figure S1. Age distributions for vaccinated and unvaccinated cohorts before and after propensity matching, related to STAR Methods. (A) Distribution of ages for vaccinated individuals and unvaccinated individuals before 1:1 matching. (B) Distribution of ages for individuals vaccinated with BNT162b2 and 1:1 matched unvaccinated individuals. (C) Distribution of ages for individuals vaccinated with mRNA-1273 and 1:1 matched unvaccinated individuals. These matched cohorts were used to assess the safety of each vaccine.

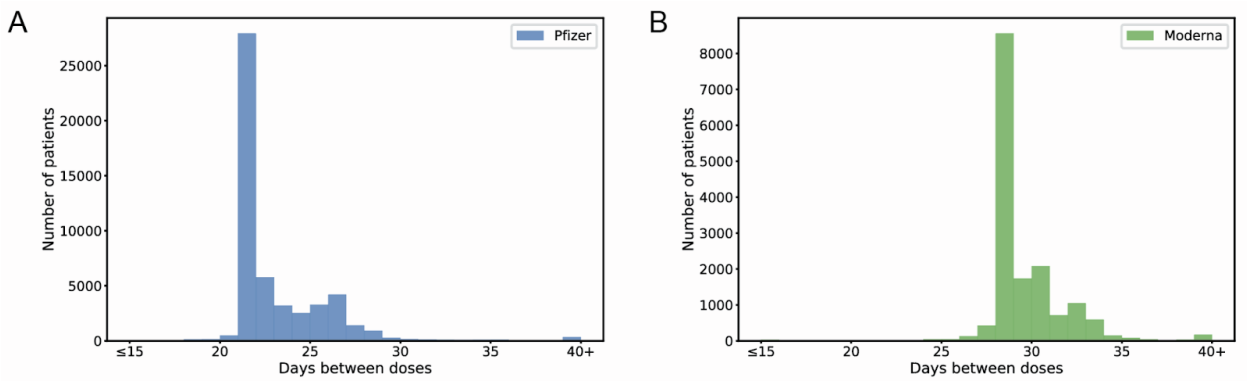

Figure S2. Distribution of time between first and second vaccine doses for all individuals receiving two doses of BNT162b2 or mRNA-1273, related to STAR Methods. (A) Distribution of time between doses for individuals receiving BNT162b2. It is recommended that the second dose is administered 21 days following the first. (B) Distribution of time between doses for individuals receiving mRNA-1273. It is recommended that the second dose is administered 28 days following the first. Consistent with these recommendations, the median and mode of time between doses among the analyzed individuals in the Mayo Clinic health system are 21 and 28 days for BNT162b2 and mRNA-1273, respectively.

Supplemental Tables

Table S1. Demographic and clinical characteristics of individuals vaccinated with BNT162b2 and their 1:1 propensity-matched unvaccinated cohorts, related to STAR Methods. Covariates for matching include: (1) demographics (age, sex, race, ethnicity), (2) number of prior SARS-CoV-2 PCR tests before December 1, 2020, (3) number of influenza tests between February 1 and December 1, 2020, (4) residential location (zip code), and (5) long term care facility status. Note that sex, zip code, and long term care status are matched exactly between the two cohorts, so the proportion of individuals with each feature in these categories are identical. Highly balanced covariates with Standardized Mean Difference (SMD) < 0.1 are indicated with ***.

Clinical covariate	**BNT162b2 vaccinated cohort**	**1:1 Propensity-matched unvaccinated cohort**	**Standardized Mean Difference (SMD)**
Total number of individuals	51,795	51,795	
Age, mean (SD)	53.83 (18.32)	53.5 (18.02)	0.02***
Age groups in years			
- 18-24	2,419 (4.7%)	2,526 (4.9%)	0.01***
- 25-34	7,576 (14.6%)	7,550 (14.6%)	0.00***
- 35-44	8,367 (16.2%)	8,503 (16.4%)	0.01***
- 45-54	7,901 (15.3%)	7,764 (15.0%)	0.01***
- 55-64	10,546 (20.4%)	10,303 (19.9%)	0.01***
- 65-74	7,404 (14.3%)	8,929 (17.2%)	0.08***
- 75+	7,582 (14.6%)	6,220 (12.0%)	0.08***
Sex			
- Female	31,099 (60.0%)	31,099 (60.0%)	0.00***
- Male	20,695 (40.0%)	20,695 (40.0%)	0.00***
- Unknown	1 (0.0%)	1 (0.0%)	0.00***
Race			
- Asian	1,568 (3.0%)	1,602 (3.1%)	0.00***
- Black / African American	1,156 (2.2%)	1,519 (2.9%)	0.04***
- Native American	127 (0.2%)	126 (0.2%)	0.00***
- White / Caucasian	47,270 (91.3%)	46,853 (90.5%)	0.03***
- Other	1,185 (2.3%)	1,253 (2.4%)	0.01***
- Unknown	489 (0.9%)	442 (0.9%)	0.01***
Ethnicity			
- Hispanic or Latino	1,676 (3.2%)	1,462 (2.8%)	0.02***
- Not Hispanic or Latino	48,941 (94.5%)	49,304 (95.2%)	0.03***
- Unknown	1,178 (2.3%)	1,029 (2.0%)	0.02***
Mean number of prior PCR tests			
- Feb 1 - May 30, 2020	0.2282 (0.5282)	0.2152 (0.5171)	0.02***
- Jun 1 - Aug 31, 2020	0.4562 (0.7652)	0.4547 (0.7775)	0.00***
- Sep 1 - Nov 30, 2020	0.6488 (0.8929)	0.6585 (0.8835)	0.01***
Mean number of prior influenza tests			
- Feb 1 - May 30, 2020	0.2122 (0.7284)	0.2324 (0.772)	0.03***
- Jun 1 - Aug 31, 2020	0.01658 (0.2355)	0.0219 (0.2695)	0.02***
- Sep 1 - Nov 30, 2020	0.04334 (0.3588)	0.04864 (0.3759)	0.01***

State			
- Arizona	3,572 (6.9%)	3,572 (6.9%)	0.00***
- Florida	5,834 (11.3%)	5,834 (11.3%)	0.00***
- Iowa	133 (0.3%)	133 (0.3%)	0.00***
- Minnesota	30,021 (58.0%)	30,021 (58.0%)	0.00***
- Wisconsin	12,235 (23.6%)	12,235 (23.6%)	0.00***
Long term care resident	67 (0.1%)	67 (0.1%)	0.00***

Table S2. Demographic and clinical characteristics of individuals vaccinated with mRNA-1273 and their 1:1 propensity-matched unvaccinated cohorts, related to STAR Methods. Covariates for matching include: (1) demographics (age, sex, race, ethnicity), (2) number of prior SARS-CoV-2 PCR tests before December 1, 2020, (3) number of influenza tests between February 1 and December 1, 2020, (4) residential location (zip code), and (5) long term care facility status. Note that sex, zip code, and long term care status are matched exactly between the two cohorts, so the proportion of individuals with each feature in these categories are identical. Highly balanced covariates with Standardized Mean Difference (SMD) < 0.1 are indicated with ***.

Clinical covariate	**mRNA-1273 vaccinated cohort**	**1:1 Propensity-matched unvaccinated cohort**	**Standardized Mean Difference (SMD)**
Total number of individuals	16,471	16,471	
Age, mean (SD)	63 (16.14)	62.23 (16.72)	0.05***
Age groups in years			
- 18-24	375 (2.3%)	388 (2.4%)	0.01***
- 25-34	926 (5.6%)	1,074 (6.5%)	0.04***
- 35-44	1,285 (7.8%)	1,484 (9.0%)	0.04***
- 45-54	1,598 (9.7%)	1,601 (9.7%)	0.00***
- 55-64	3,402 (20.7%)	3,436 (20.9%)	0.01***
- 65-74	5,598 (34.0%)	5,121 (31.1%)	0.06***
- 75+	3,287 (20.0%)	3,367 (20.4%)	0.01***
Sex			
- Female	8,758 (53.2%)	8,758 (53.2%)	0.00***
- Male	7,713 (46.8%)	7,713 (46.8%)	0.00***
- Unknown	0 (0.0%)	0 (0.0%)	N/A
Race			
- Asian	378 (2.3%)	463 (2.8%)	0.03***
- Black / African American	530 (3.2%)	437 (2.7%)	0.03***
- Native American	44 (0.3%)	30 (0.2%)	0.02***
- White / Caucasian	15,088 (91.6%)	15,141 (91.9%)	0.01***
- Other	273 (1.7%)	278 (1.7%)	0.00***
- Unknown	158 (1.0%)	122 (0.7%)	0.02***
Ethnicity			
- Hispanic or Latino	522 (3.2%)	408 (2.5%)	0.04***
- Not Hispanic or Latino	15,583 (94.6%)	15,834 (96.1%)	0.07***
- Unknown	366 (2.2%)	229 (1.4%)	0.06***
Mean number of prior PCR tests			
- Feb 1 - May 30, 2020	0.2189 (0.5214)	0.2168 (0.5282)	0.00***
- Jun 1 - Aug 31, 2020	0.5114 (0.8292)	0.4902 (0.8364)	0.03***
- Sep 1 - Nov 30, 2020	0.5724 (0.8154)	0.6195 (0.9051)	0.05***
Mean number of prior influenza tests			
- Feb 1 - May 30, 2020	0.266 (0.85)	0.2498 (0.8491)	0.02***
- Jun 1 - Aug 31, 2020	0.03967 (0.3932)	0.03291 (0.4238)	0.02***
- Sep 1 - Nov 30, 2020	0.08333 (0.5536)	0.08354 (0.5692)	0.02***

State			
- Arizona	1,896 (11.5%)	1,896 (11.5%)	0.00***
- Florida	5,453 (33.1%)	5,453 (33.1%)	0.00***
- Iowa	64 (0.4%)	64 (0.4%)	0.00***
- Minnesota	6,299 (38.2%)	6,299 (38.2%)	0.00***
- Wisconsin	2,759 (16.8%)	2,759 (16.8%)	0.00***
Long term care resident	50 (0.3%)	50 (0.3%)	0.00***

Table S3. Number of individuals contributing Emergency Department (ED) notes in the vaccinated and unvaccinated cohorts ($n_{BNT162b2}$ = 51,795 each; $n_{mRNA-1273}$ = 16,471 each) during the 1, 7, 14, and 21 days after the first actual or assigned vaccination date, related to Table 1. Percentages shown are obtained by dividing the number of individuals with at least one ED note by the total number of individuals in the cohort and multiplying by 100. To assess the magnitude and significance of difference between the percentages of patients with ED notes, the odds ratio (OR) and corresponding 95% CI are shown. With the null hypothesis that the OR falls between 0.91 and 1.1, a difference was considered significant if the upper bound of the 95% CI was less than 0.91 or the lower bound of the 95% CI was greater than 1.1.

Vaccine	**Time Interval After First Actual or Assigned Dose**	**Vaccinated Cohort** Individuals with ED Visits (% of Cohort)	**Unvaccinated Cohort** Individuals with ED Visits (% of Cohort)	**Odds Ratio** (95% CI)
BNT162b2 *51,795 individuals*	**1 Day**	106 (0.2%)	189 (0.36%)	0.56 (0.44 - 0.71)
	7 Days	567 (1.09%)	752 (1.45%)	0.75 (0.67 - 0.84)
	14 Days	1024 (1.98%)	1376 (2.66%)	0.74 (0.68 - 0.8)
	21 Days	1465 (2.83%)	1983 (3.83%)	0.73 (0.68 - 0.78)
mRNA-1273 *16,471 individuals*	**1 Day**	50 (0.3%)	50 (0.3%)	1 (0.66 - 1.51)
	7 Days	238 (1.44%)	219 (1.33%)	1.09 (0.9 - 1.31)
	14 Days	464 (2.82%)	406 (2.46%)	1.15 (1 - 1.32)
	21 Days	693 (4.21%)	628 (3.81%)	1.11 (0.99 - 1.24)

Table S4. Number of individuals contributing Emergency Department (ED) notes in the vaccinated and unvaccinated cohorts ($n_{BNT162b2}$ = 39,058 each; $n_{mRNA-1273}$ = 11,851 each) during the 1, 7, 14, and 21 days after the second actual or assigned vaccination date, related to Table 2. Percentages shown are obtained by dividing the number of individuals with at least one ED note by the total number of individuals in the cohort and multiplying by 100. To assess the magnitude and significance of difference between the percentages of patients with ED notes, the odds ratio (OR) and corresponding 95% CI are shown. With the null hypothesis that the OR falls between 0.91 and 1.1, a difference was considered significant if the upper bound of the 95% CI was less than 0.91 or the lower bound of the 95% CI was greater than 1.1.

Vaccine	**Time Interval After Second Actual or Assigned Dose**	**Vaccinated Cohort** Individuals with ED Visits (% of Cohort)	**Unvaccinated Cohort** Individuals with ED Visits (% of Cohort)	**Odds Ratio** (95% CI)
BNT162b2 *39,058 individuals*	**1 Day**	85 (0.22%)	161 (0.41%)	0.53 (0.4 - 0.69)
	7 Days	396 (1.01%)	521 (1.33%)	0.76 (0.66 - 0.87)
	14 Days	757 (1.94%)	911 (2.33%)	0.83 (0.75 - 0.91)
	21 Days	1028 (2.63%)	1297 (3.32%)	0.79 (0.72 - 0.86)
mRNA-1273 *11,851 individuals*	**1 Day**	43 (0.36%)	43 (0.36%)	1 (0.64 - 1.56)
	7 Days	191 (1.61%)	168 (1.42%)	1.14 (0.92 - 1.41)
	14 Days	320 (2.7%)	308 (2.6%)	1.04 (0.88 - 1.22)
	21 Days	439 (3.7%)	396 (3.34%)	1.11 (0.97 - 1.28)

Table S5. Number of Emergency Department (ED) notes contributed by vaccinated and unvaccinated individuals ($n_{BNT162b2}$ = 51,795 each; $n_{mRNA-1273}$ = 16,471 each) during the 1, 7, 14, and 21 days after the first actual or assigned vaccination date, related to Table 1. The percentages shown were obtained by dividing the number of ED notes by the total number of clinical notes for the cohort in the given time interval (not shown) and multiplying by 100. To assess the magnitude and significance of difference between the percentages of ED notes, the odds ratio (OR) and corresponding 95% CI are shown. With the null hypothesis that the OR falls between 0.91 and 1.1, a difference was considered significant if the upper bound of the 95% CI was less than 0.91 or the lower bound of the 95% CI was greater than 1.1.

Vaccine	**Time Interval After First Actual or Assigned Dose**	**Vaccinated Cohort** Number of ED Notes (% of All Notes)	**Unvaccinated Cohort** Number of ED Notes (% of All Notes)	**Odds Ratio** (95% CI)
BNT162b2 *51,795 individuals*	**1 Day**	128 (2.36%)	250 (3.3%)	0.71 (0.57 - 0.88)
	7 Days	735 (3.54%)	1002 (3.75%)	0.94 (0.85 - 1.04)
	14 Days	1344 (3.24%)	1846 (3.71%)	0.87 (0.81 - 0.93)
	21 Days	1900 (3.08%)	2744 (3.76%)	0.81 (0.77 - 0.86)
mRNA-1273 *16,471 individuals*	**1 Day**	60 (3.05%)	62 (2.29%)	1.34 (0.92 - 1.96)
	7 Days	287 (3.25%)	283 (2.74%)	1.19 (1.01 - 1.42)
	14 Days	600 (3.2%)	541 (2.82%)	1.14 (1.01 - 1.28)
	21 Days	904 (3.1%)	837 (2.97%)	1.05 (0.95 - 1.15)

Table S6. Number of Emergency Department (ED) notes contributed by vaccinated and unvaccinated individuals ($n_{BNT162b2}$ = 39,058 each; $n_{mRNA-1273}$ = 11,851 each) during the 1, 7, 14, and 21 days after the second actual or assigned vaccination date, related to Table 2.
The percentages shown were obtained by dividing the number of ED notes by the total number of clinical notes for the cohort in the given time interval (not shown) and multiplying by 100. To assess the magnitude and significance of difference between the percentages of ED notes, the odds ratio (OR) and corresponding 95% CI are shown. With the null hypothesis that the OR falls between 0.91 and 1.1, a difference was considered significant if the upper bound of the 95% CI was less than 0.91 or the lower bound of the 95% CI was greater than 1.1.

Vaccine	**Time Interval After Second Actual or Assigned Dose**	**Vaccinated Cohort** Number of ED Notes (% of All Notes)	**Unvaccinated Cohort** Number of ED Notes (% of All Notes)	**Odds Ratio** (95% CI)
BNT162b2 *39,058 individuals*	**1 Day**	100 (2.54%)	194 (3.52%)	0.71 (0.55 - 0.92)
	7 Days	496 (3.3%)	671 (3.59%)	0.92 (0.81 - 1.03)
	14 Days	963 (3.22%)	1190 (3.5%)	0.92 (0.84 - 1)
	21 Days	1332 (3.01%)	1731 (3.57%)	0.84 (0.78 - 0.9)
mRNA-1273 *11,851 individuals*	**1 Day**	50 (3.16%)	52 (2.7%)	1.18 (0.78 - 1.78)
	7 Days	232 (3.22%)	204 (2.81%)	1.15 (0.95 - 1.4)
	14 Days	397 (2.78%)	393 (2.96%)	0.94 (0.81 - 1.08)
	21 Days	560 (2.72%)	505 (2.73%)	1 (0.88 - 1.13)

Table S7. Incidence rates of adverse effects in the 14 days following the date of the first BNT162b2 or mRNA-1273 dose, related to Figure 3A. For each adverse effect, incidence rates were calculated for the vaccinated and propensity matched unvaccinated cohorts as the number of positive cases divided by the total number of at-risk person days during this time period. Individuals were considered at risk for developing an adverse effect from their actual or assigned date of first vaccination until they experienced the event, died, or reached the end of the 14-day study period, or until four days prior to a positive SARS-CoV-2 test. For example, we see that 849 cases of fatigue were recorded in the BNT162b2 vaccinated cohort over a total of 715,390 person-days, corresponding to an incidence rate of 1.2 cases per 1000 person-days. N/A, not applicable; inf, infinity.

Vaccine	**Adverse effect**	**Vaccinated Incidence Rate** Cases / Person-Days *[Cases Per 1000 Person-Days]*	**Unvaccinated Incidence Rate** Cases/Person-Days *[Cases Per 1000 Person-Days]*	**Incidence Rate Ratio** (95% CI)
BNT162b2 (n = 51,795 each)	Anaphylaxis	16 / 721,797 [0.022]	25 / 716,676 [0.035]	0.64 (0.32, 1.2)
	Arthralgia	698 / 716,595 [0.97]	473 / 713,187 [0.66]	1.5 (1.3, 1.7)
	Chills	134 / 720,984 [0.19]	175 / 715,564 [0.24]	0.76 (0.6, 0.96)
	CVST	1 / 721,940 [0.0014]	3 / 716,857 [0.0042]	0.33 (0.0063, 4.1)
	Diarrhea	361 / 719,310 [0.5]	527 / 712,832 [0.74]	0.68 (0.59, 0.78)
	Erythema	539 / 717,966 [0.75]	513 / 713,076 [0.72]	1 (0.92, 1.2)
	Facial paralysis	10 / 721,894 [0.014]	20 / 716,717 [0.028]	0.5 (0.21, 1.1)
	Fatigue	849 / 715,390 [1.2]	1133 / 708,159 [1.6]	0.74 (0.68, 0.81)
	Fever	261 / 720,157 [0.36]	297 / 714,572 [0.42]	0.87 (0.74, 1)
	Headache	995 / 714,571 [1.4]	1078 / 708,785 [1.5]	0.92 (0.84, 1)
	Local pain	8 / 721,890 [0.011]	1 / 716,873 [0.0014]	7.9 (1.1, 350)
	Local swelling	4 / 721,911 [0.0055]	0 / 716,886 [0]	inf (0.66, inf)
	Lymphadenopathy	241 / 720,256 [0.33]	250 / 715,014 [0.35]	0.96 (0.8, 1.1)
	Myalgia	693 / 716,553 [0.97]	532 / 712,824 [0.75]	1.3 (1.2, 1.5)
	Nausea	678 / 717,130 [0.95]	885 / 710,220 [1.2]	0.76 (0.69, 0.84)
	Soreness	218 / 720,204 [0.3]	149 / 715,736 [0.21]	1.5 (1.2, 1.8)
	Vomiting	274 / 720,015 [0.38]	497 / 713,228 [0.7]	0.55 (0.47, 0.63)
mRNA-1273 (n = 16,471 each)	Anaphylaxis	2 / 229,651 [0.0087]	11 / 228,602 [0.048]	0.18 (0.019, 0.83)
	Arthralgia	361 / 226,983 [1.6]	223 / 227,116 [0.98]	1.6 (1.4, 1.9)
	Chills	56 / 229,293 [0.24]	46 / 228,329 [0.2]	1.2 (0.81, 1.8)
	CVST	0 / 229,669 [0]	1 / 228,683 [0.0044]	0 (0, 39)
	Diarrhea	161 / 228,507 [0.7]	224 / 227,045 [0.99]	0.71 (0.58, 0.88)

	Erythema	257 / 227,814 [1.1]	195 / 227,303 [0.86]	1.3 (1.1, 1.6)
	Facial paralysis	2 / 229,664 [0.0087]	5 / 228,662 [0.022]	0.4 (0.038, 2.4)
	Fatigue	456 / 226,290 [2]	481 / 225,043 [2.1]	0.94 (0.83, 1.1)
	Fever	123 / 228,802 [0.54]	130 / 227,692 [0.57]	0.94 (0.73, 1.2)
	Headache	351 / 227,156 [1.5]	358 / 226,095 [1.6]	0.98 (0.84, 1.1)
	Local pain	6 / 229,625 [0.026]	1 / 228,690 [0.0044]	6 (0.72, 270)
	Local swelling	0 / 229,669 [0]	0 / 228,691 [0]	N/A
	Lymphadenopathy	142 / 228,640 [0.62]	116 / 227,881 [0.51]	1.2 (0.95, 1.6)
	Myalgia	356 / 227,194 [1.6]	219 / 227,077 [0.96]	1.6 (1.4, 1.9)
	Nausea	303 / 227,522 [1.3]	334 / 226,234 [1.5]	0.9 (0.77, 1.1)
	Soreness	86 / 229,063 [0.38]	59 / 228,254 [0.26]	1.5 (1, 2.1)
	Vomiting	154 / 228,652 [0.67]	190 / 227,390 [0.84]	0.81 (0.65, 1)

Table S8. Incidence rates of adverse effects in the 14 days following the date of the second BNT162b2 or mRNA-1273 dose, related to Figure 3A. For each adverse effect, incidence rates were calculated for the vaccinated and propensity matched unvaccinated cohorts as the number of positive cases divided by the total number of at-risk person days during this time period. Individuals were considered at risk for developing an adverse effect from their actual or assigned date of first vaccination until they experienced the event, died, or reached the end of the 14-day study period, or until four days prior to a positive SARS-CoV-2 test. For example, we see that 619 cases of fatigue were recorded in the BNT162b2 vaccinated cohort over a total of 541,561 person-days, corresponding to an incidence rate of 1.1 cases per 1000 person-days. N/A, not applicable; inf, infinity.

Vaccine	**Adverse effect**	**Vaccinated Incidence Rate** Cases / Person-Days *[Cases Per 1000 Person-Days]*	**Unvaccinated Incidence Rate** Cases / Person-Days *[Cases Per 1000 Person-Days]*	**Incidence Rate Ratio** (95% CI)
BNT162b2 (n = 39,058 each)	Anaphylaxis	5 / 546,187 [0.0092]	23 / 528,677 [0.044]	0.21 (0.062, 0.57)
	Arthralgia	508 / 542,294 [0.94]	343 / 526,159 [0.65]	1.4 (1.3, 1.7)
	Chills	119 / 545,288 [0.22]	123 / 527,940 [0.23]	0.94 (0.72, 1.2)
	CVST	0 / 546,223 [0]	1 / 528,868 [0.0019]	0 (0, 38)
	Diarrhea	259 / 544,344 [0.48]	390 / 525,891 [0.74]	0.64 (0.55, 0.75)
	Erythema	441 / 542,758 [0.81]	374 / 525,957 [0.71]	1.1 (0.99, 1.3)
	Facial paralysis	7 / 546,166 [0.013]	11 / 528,780 [0.021]	0.62 (0.2, 1.7)
	Fatigue	619 / 541,561 [1.1]	788 / 522,771 [1.5]	0.76 (0.68, 0.84)
	Fever	182 / 545,043 [0.33]	222 / 527,022 [0.42]	0.79 (0.65, 0.97)
	Headache	700 / 540,865 [1.3]	738 / 523,104 [1.4]	0.92 (0.83, 1)
	Local pain	4 / 546,191 [0.0073]	0 / 528,875 [0]	inf (0.64, inf)
	Local swelling	0 / 546,223 [0]	2 / 528,867 [0.0038]	0 (0, 5.2)
	Lymphadenopathy	198 / 544,761 [0.36]	187 / 527,398 [0.35]	1 (0.84, 1.3)
	Myalgia	553 / 541,905 [1]	372 / 525,880 [0.71]	1.4 (1.3, 1.6)
	Nausea	472 / 542,820 [0.87]	659 / 523,701 [1.3]	0.69 (0.61, 0.78)
	Soreness	159 / 544,936 [0.29]	104 / 528,119 [0.2]	1.5 (1.1, 1.9)
	Vomiting	199 / 544,875 [0.37]	379 / 525,893 [0.72]	0.51 (0.42, 0.6)
mRNA-1273 (n = 11,851 each)	Anaphylaxis	1 / 165,856 [0.006]	9 / 160,479 [0.056]	0.11 (0.0025, 0.78)
	Arthralgia	287 / 163,803 [1.8]	135 / 159,537 [0.85]	2.1 (1.7, 2.6)
	Chills	47 / 165,462 [0.28]	47 / 160,219 [0.29]	0.97 (0.63, 1.5)
	CVST	0 / 165,870 [0]	0 / 160,544 [0]	N/A

	Diarrhea	97 / 165,143 [0.59]	156 / 159,369 [0.98]	0.6 (0.46, 0.78)
	Erythema	186 / 164,434 [1.1]	136 / 159,503 [0.85]	1.3 (1.1, 1.7)
	Facial paralysis	2 / 165,857 [0.012]	8 / 160,478 [0.05]	0.24 (0.025, 1.2)
	Fatigue	343 / 163,393 [2.1]	332 / 158,089 [2.1]	1 (0.86, 1.2)
	Fever	91 / 165,178 [0.55]	91 / 159,887 [0.57]	0.97 (0.72, 1.3)
	Headache	241 / 164,176 [1.5]	212 / 158,908 [1.3]	1.1 (0.91, 1.3)
	Local pain	1 / 165,862 [0.006]	0 / 160,544 [0]	inf (0.025, inf)
	Local swelling	0 / 165,870 [0]	0 / 160,544 [0]	N/A
	Lymphadenopathy	96 / 165,148 [0.58]	85 / 159,941 [0.53]	1.1 (0.81, 1.5)
	Myalgia	278 / 163,735 [1.7]	142 / 159,508 [0.89]	1.9 (1.6, 2.4)
	Nausea	191 / 164,349 [1.2]	232 / 158,783 [1.5]	0.8 (0.65, 0.97)
	Soreness	62 / 165,436 [0.37]	39 / 160,247 [0.24]	1.5 (1, 2.4)
	Vomiting	94 / 165,178 [0.57]	131 / 159,618 [0.82]	0.69 (0.53, 0.91)

Table S9. Incidence rates of adverse effects in the 21 days following the date of the first BNT162b2 or mRNA-1273 dose, related to Figure 3B. For each adverse effect, incidence rates were calculated for the vaccinated and propensity matched unvaccinated cohorts as the number of positive cases divided by the total number of at-risk person days during this time period. Individuals were considered at risk for developing an adverse effect from their actual or assigned date of first vaccination until they experienced the event, died, or reached the end of the 21-day study period, or until four days prior to a positive SARS-CoV-2 test. For example, we see that 1206 cases of fatigue were recorded in the BNT162b2 vaccinated cohort over a total of 1,068,371 person-days, corresponding to an incidence rate of 1.1 cases per 1000 person-days. N/A, not applicable; inf, infinity.

Vaccine	**Adverse effect**	**Vaccinated Incidence Rate** Cases / Person-Days *[Cases Per 1000 Person-Days]*	**Unvaccinated Incidence Rate** Cases / Person-Days *[Cases Per 1000 Person-Days]*	**Incidence Rate Ratio** (95% CI)
BNT162b2 (n = 51,795 each)	Anaphylaxis	20 / 1,081,462 [0.018]	30 / 1,072,090 [0.028]	0.66 (0.36, 1.2)
	Arthralgia	960 / 1,070,571 [0.9]	641 / 1,064,992 [0.6]	1.5 (1.3, 1.6)
	Chills	193 / 1,079,694 [0.18]	247 / 1,069,711 [0.23]	0.77 (0.64, 0.94)
	CVST	1 / 1,081,728 [0.00092]	3 / 1,072,441 [0.0028]	0.33 (0.0063, 4.1)
	Diarrhea	515 / 1,076,282 [0.48]	710 / 1,064,493 [0.67]	0.72 (0.64, 0.8)
	Erythema	777 / 1,073,197 [0.72]	728 / 1,064,480 [0.68]	1.1 (0.96, 1.2)
	Facial paralysis	14 / 1,081,605 [0.013]	35 / 1,072,115 [0.033]	0.4 (0.2, 0.76)
	Fatigue	1206 / 1,068,371 [1.1]	1550 / 1,055,120 [1.5]	0.77 (0.71, 0.83)
	Fever	386 / 1,077,782 [0.36]	428 / 1,067,886 [0.4]	0.89 (0.78, 1)
	Headache	1406 / 1,066,337 [1.3]	1471 / 1,055,958 [1.4]	0.95 (0.88, 1)
	Local pain	9 / 1,081,623 [0.0083]	1 / 1,072,471 [0.00093]	8.9 (1.2, 390)
	Local swelling	5 / 1,081,677 [0.0046]	0 / 1,072,491 [0]	inf (0.91, inf)
	Lymphadenopathy	340 / 1,078,111 [0.32]	353 / 1,068,738 [0.33]	0.95 (0.82, 1.1)
	Myalgia	1005 / 1,070,435 [0.94]	726 / 1,064,138 [0.68]	1.4 (1.2, 1.5)
	Nausea	955 / 1,071,432 [0.89]	1252 / 1,058,848 [1.2]	0.75 (0.69, 0.82)
	Soreness	291 / 1,078,260 [0.27]	217 / 1,070,100 [0.2]	1.3 (1.1, 1.6)
	Vomiting	405 / 1,077,503 [0.38]	689 / 1,065,057 [0.65]	0.58 (0.51, 0.66)
mRNA-1273 (n = 16,471 each)	Anaphylaxis	3 / 344,161 [0.0087]	15 / 342,090 [0.044]	0.2 (0.037, 0.7)
	Arthralgia	532 / 338,398 [1.6]	328 / 338,846 [0.97]	1.6 (1.4, 1.9)
	Chills	85 / 343,329 [0.25]	75 / 341,473 [0.22]	1.1 (0.82, 1.6)

	CVST	0 / 344,197 [0]	1 / 342,256 [0.0029]	0 (0, 39)
	Diarrhea	228 / 341,748 [0.67]	304 / 338,990 [0.9]	0.74 (0.62, 0.89)
	Erythema	359 / 340,280 [1.1]	276 / 339,289 [0.81]	1.3 (1.1, 1.5)
	Facial paralysis	2 / 344,178 [0.0058]	10 / 342,197 [0.029]	0.2 (0.021, 0.93)
	Fatigue	648 / 337,172 [1.9]	684 / 334,725 [2]	0.94 (0.84, 1)
	Fever	178 / 342,315 [0.52]	184 / 340,344 [0.54]	0.96 (0.78, 1.2)
	Headache	511 / 338,725 [1.5]	506 / 336,848 [1.5]	1 (0.89, 1.1)
	Local pain	8 / 344,105 [0.023]	2 / 342,260 [0.0058]	4 (0.79, 38)
	Local swelling	0 / 344,197 [0]	0 / 342,271 [0]	N/A
	Lymphadenopathy	206 / 342,033 [0.6]	167 / 340,591 [0.49]	1.2 (1, 1.5)
	Myalgia	508 / 338,773 [1.5]	310 / 338,864 [0.91]	1.6 (1.4, 1.9)
	Nausea	461 / 339,614 [1.4]	450 / 337,308 [1.3]	1 (0.89, 1.2)
	Soreness	119 / 342,885 [0.35]	85 / 341,320 [0.25]	1.4 (1, 1.9)
	Vomiting	229 / 341,881 [0.67]	265 / 339,533 [0.78]	0.86 (0.72, 1)

Table S10. Incidence rates of adverse effects in the 21 days following the date of the second BNT162b2 or mRNA-1273 dose, related to Figure 3B. For each adverse effect, incidence rates were calculated for the vaccinated and propensity matched unvaccinated cohorts as the number of positive cases divided by the total number of at-risk person days during this time period. Individuals were considered at risk for developing an adverse effect from their actual or assigned date of first vaccination until they experienced the event, died, or reached the end of the 21-day study period, or until four days prior to a positive SARS-CoV-2 test. For example, we see that 876 cases of fatigue were recorded in the BNT162b2 vaccinated cohort over a total of 809,424 person-days, corresponding to an incidence rate of 1.1 cases per 1000 person-days. N/A, not applicable; inf, infinity.

Vaccine	**Adverse effect**	**Vaccinated Incidence Rate** Cases / Person-Days *[Cases Per 1000 Person-Days]*	**Unvaccinated Incidence Rate** Cases / Person-Days *[Cases Per 1000 Person-Days]*	**Incidence Rate Ratio** (95% CI)
BNT162b2 (n = 39,058 each)	Anaphylaxis	7 / 819,112 [0.0085]	28 / 793,121 [0.035]	0.24 (0.089, 0.57)
	Arthralgia	724 / 810,980 [0.89]	441 / 788,048 [0.56]	1.6 (1.4, 1.8)
	Chills	151 / 817,291 [0.18]	185 / 791,471 [0.23]	0.79 (0.63, 0.99)
	CVST	0 / 819,195 [0]	1 / 793,439 [0.0013]	0 (0, 38)
	Diarrhea	357 / 815,230 [0.44]	519 / 787,601 [0.66]	0.66 (0.58, 0.76)
	Erythema	646 / 811,854 [0.8]	522 / 787,621 [0.66]	1.2 (1.1, 1.3)
	Facial paralysis	8 / 819,084 [0.0098]	20 / 793,248 [0.025]	0.39 (0.15, 0.92)
	Fatigue	876 / 809,424 [1.1]	1089 / 781,165 [1.4]	0.78 (0.71, 0.85)
	Fever	247 / 816,558 [0.3]	306 / 789,917 [0.39]	0.78 (0.66, 0.93)
	Headache	930 / 808,359 [1.2]	1024 / 781,805 [1.3]	0.88 (0.8, 0.96)
	Local pain	4 / 819,135 [0.0049]	1 / 793,452 [0.0013]	3.9 (0.38, 190)
	Local swelling	1 / 819,190 [0.0012]	2 / 793,431 [0.0025]	0.48 (0.0082, 9.3)
	Lymphadenopathy	270 / 816,106 [0.33]	251 / 790,552 [0.32]	1 (0.87, 1.2)
	Myalgia	742 / 810,422 [0.92]	496 / 787,476 [0.63]	1.5 (1.3, 1.6)
	Nausea	656 / 811,917 [0.81]	871 / 783,439 [1.1]	0.73 (0.66, 0.81)
	Soreness	215 / 816,617 [0.26]	148 / 791,802 [0.19]	1.4 (1.1, 1.7)
	Vomiting	288 / 816,148 [0.35]	511 / 787,587 [0.65]	0.54 (0.47, 0.63)
mRNA-1273 (n = 11,851 each)	Anaphylaxis	2 / 248,751 [0.008]	10 / 240,935 [0.042]	0.19 (0.021, 0.91)
	Arthralgia	407 / 244,300 [1.7]	192 / 238,949 [0.8]	2.1 (1.7, 2.5)
	Chills	68 / 247,995 [0.27]	62 / 240,371 [0.26]	1.1 (0.74, 1.5)

	CVST	0 / 248,773 [0]	0 / 241,065 [0]	N/A
	Diarrhea	141 / 247,286 [0.57]	208 / 238,702 [0.87]	0.65 (0.52, 0.81)
	Erythema	249 / 245,850 [1]	177 / 238,991 [0.74]	1.4 (1.1, 1.7)
	Facial paralysis	2 / 248,760 [0.008]	10 / 240,944 [0.042]	0.19 (0.021, 0.91)
	Fatigue	447 / 243,764 [1.8]	439 / 236,165 [1.9]	0.99 (0.86, 1.1)
	Fever	143 / 247,308 [0.58]	112 / 239,775 [0.47]	1.2 (0.96, 1.6)
	Headache	345 / 245,067 [1.4]	284 / 237,788 [1.2]	1.2 (1, 1.4)
	Local pain	3 / 248,746 [0.012]	0 / 241,065 [0]	inf (0.4, inf)
	Local swelling	0 / 248,773 [0]	0 / 241,065 [0]	N/A
	Lymphadenopathy	133 / 247,290 [0.54]	109 / 239,806 [0.45]	1.2 (0.91, 1.5)
	Myalgia	376 / 244,445 [1.5]	191 / 238,863 [0.8]	1.9 (1.6, 2.3)
	Nausea	281 / 245,763 [1.1]	294 / 237,547 [1.2]	0.92 (0.78, 1.1)
	Soreness	76 / 247,875 [0.31]	46 / 240,477 [0.19]	1.6 (1.1, 2.4)
	Vomiting	135 / 247,341 [0.55]	164 / 239,199 [0.69]	0.8 (0.63, 1)

Table S11. Number of individuals contributing at-risk person days to the analyses of adverse effect incidence rates after each dose, related to Figures 2-3 and Tables 3-4. The number of individuals contributing at-risk person days is lower than the total number of individuals who received each vaccine (BNT162b2: $n_{\text{At least 1 Dose}}$ = 51,795 and $n_{\text{2 Doses}}$ = 39,058; mRNA-1273: $n_{\text{At least 1 Dose}}$ = 16,471 and $n_{\text{2 Doses}}$ = 11,851), and the number of vaccinated and unvaccinated individuals is slightly different for each comparison. This is true because at-risk person days were defined as the number of days from the start of the time period to the day on which the individual experienced the adverse effect or died, or four days prior to testing positive for SARS-CoV-2. Thus, if an individual tested positive for SARS-CoV-2 four or fewer days after the first dose, they contribute no at-risk time for the post-first dose analyses. Similarly, if an individual tested positive for SARS-CoV-2 before the second dose or within four days after it, they contribute no at-risk time for the post-second dose analyses.

Vaccine	Number of doses	Vaccinated Cohort	Unvaccinated Cohort
BNT162b2	**At least 1**	51,732	51,573
	2	39,045	38,255
mRNA-1273	**At least 1**	16,455	16,423
	2	11,849	11,645