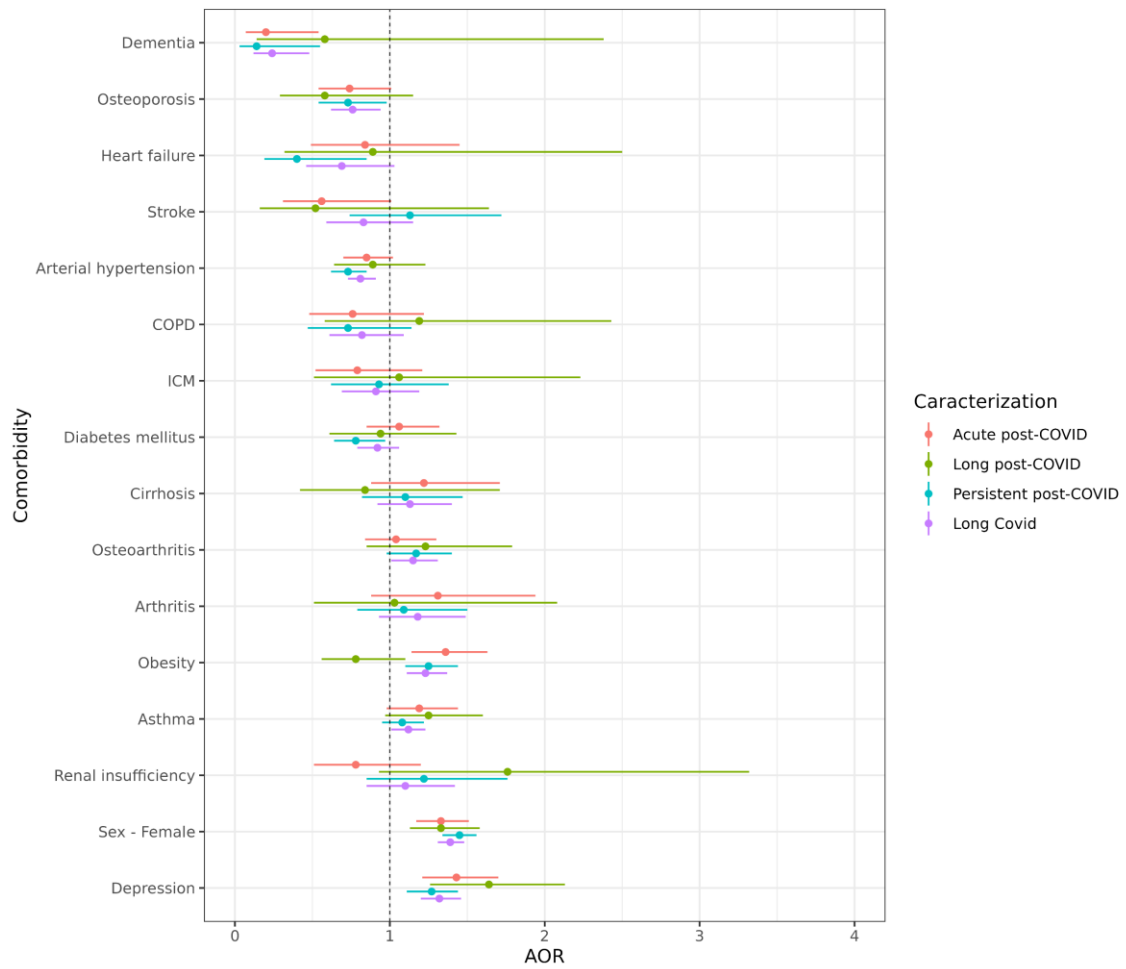
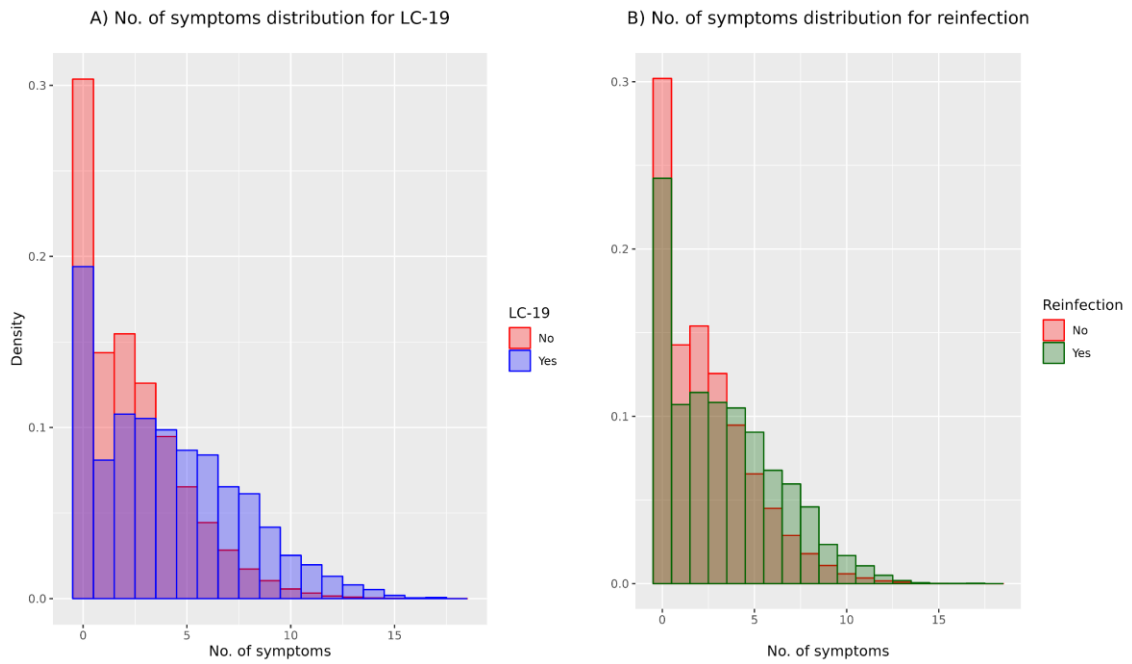


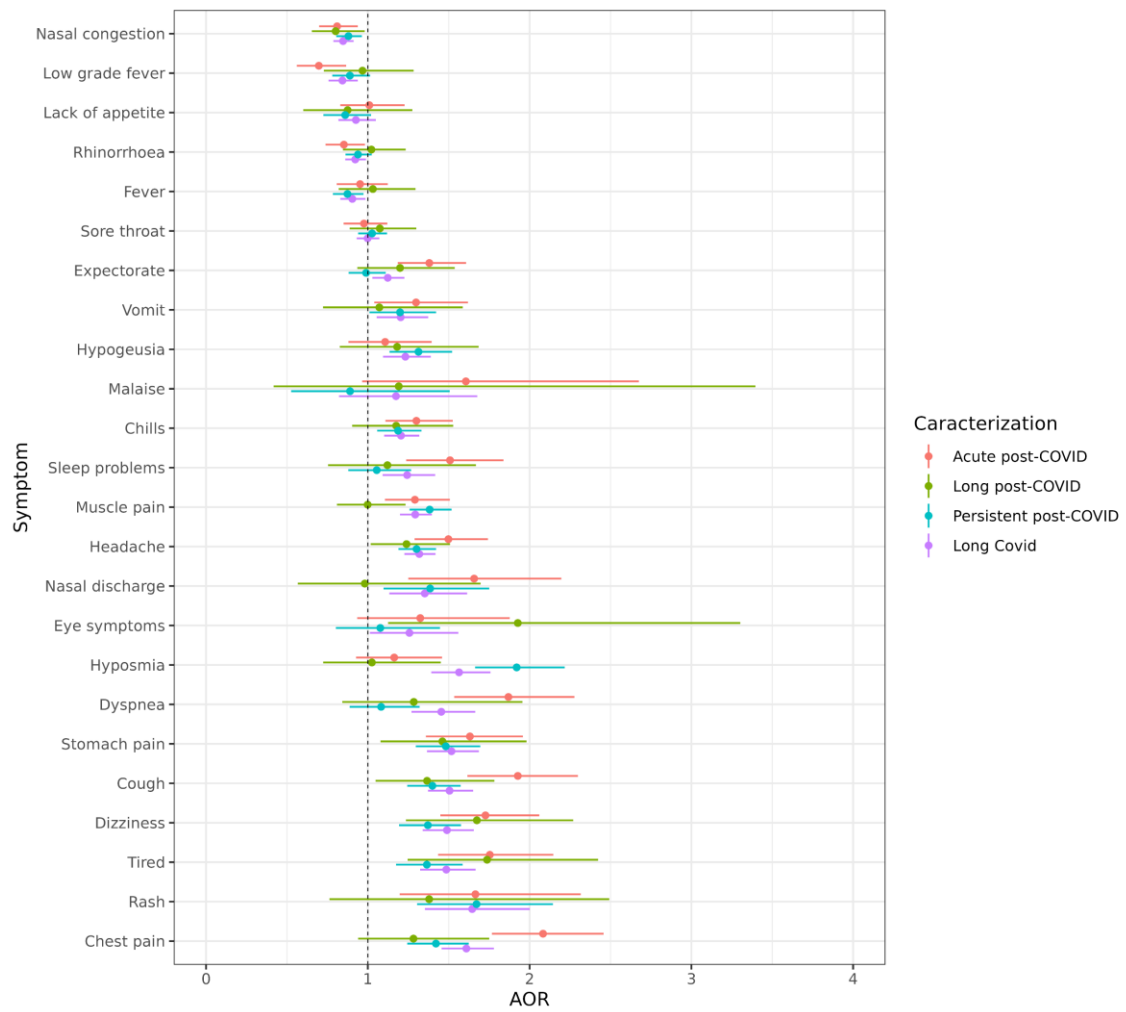
SUPPLEMENTARY MATERIAL



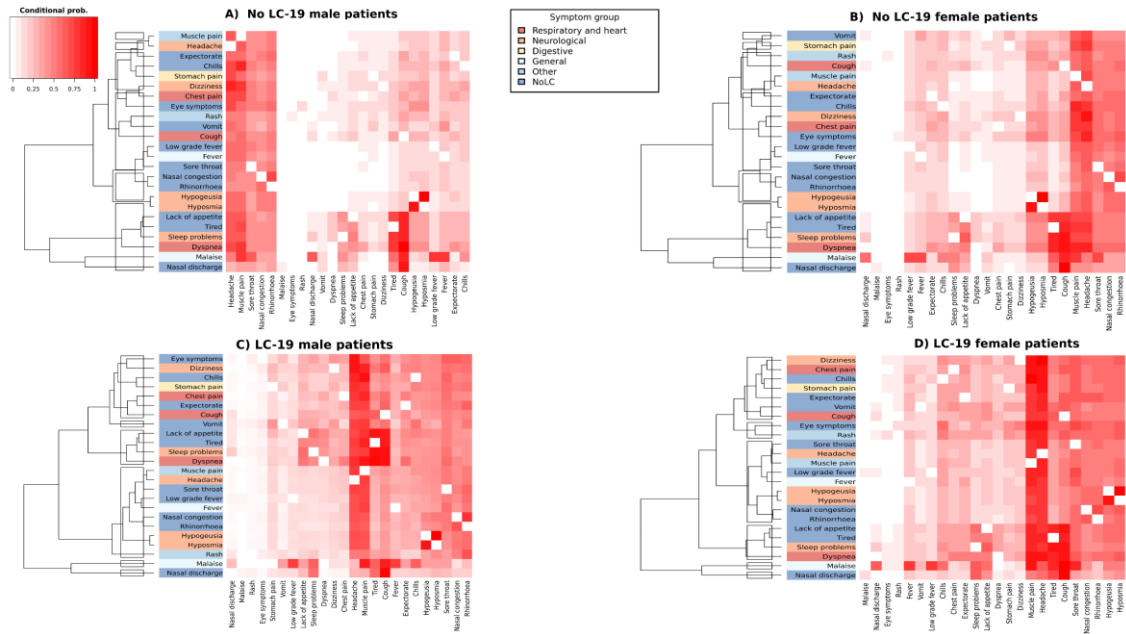
Supplementary Fig. 1: Adjusted odds ratios for developing different types of Long COVID-19 according to comorbidities. Different types of Long COVID-19 are coded by colours. Odds ratios are adjusted for age, sex, and comorbidities.



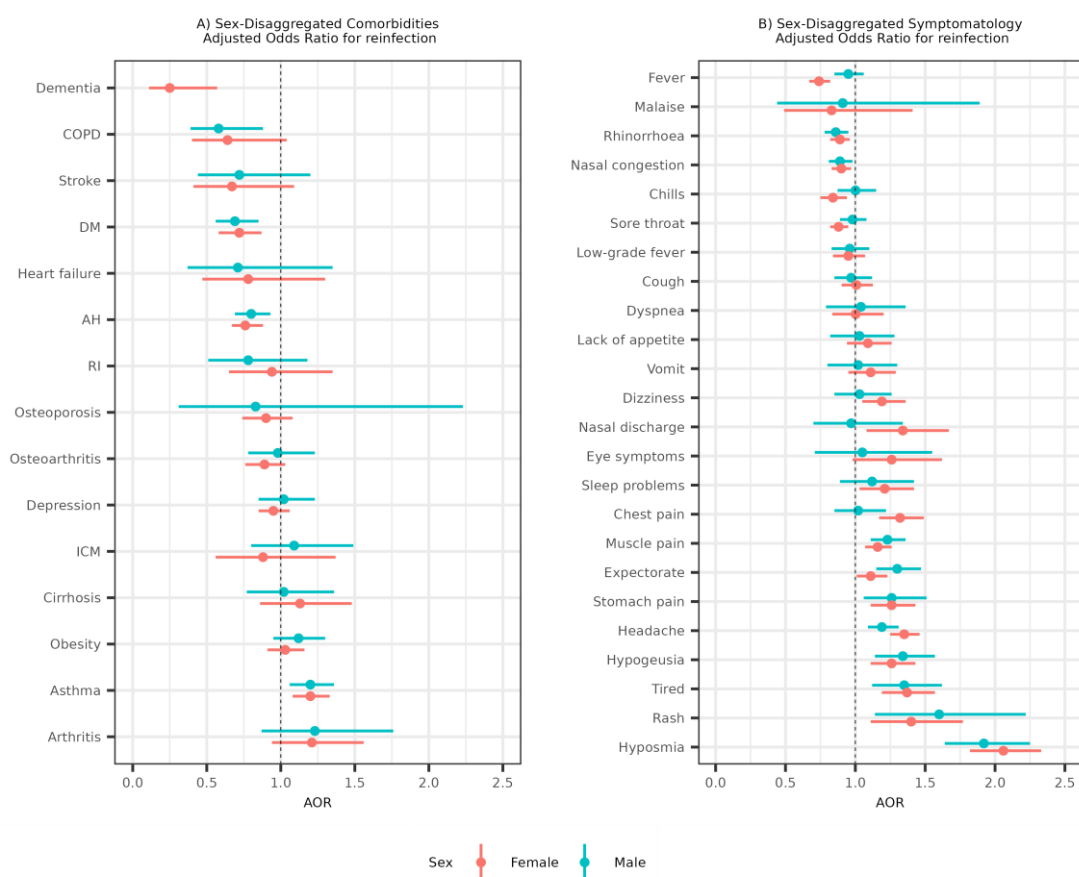
Supplementary Fig. 2: Distribution of the number of symptoms in Long COVID-19 and reinfected patients. A) Distribution of the number of symptoms for LC-19 (blue) vs. non-LC-19 (red) patients during primary infection. B) Distribution of the number of symptoms for reinfected (green) vs. non-reinfected (red) patients during primary infection.



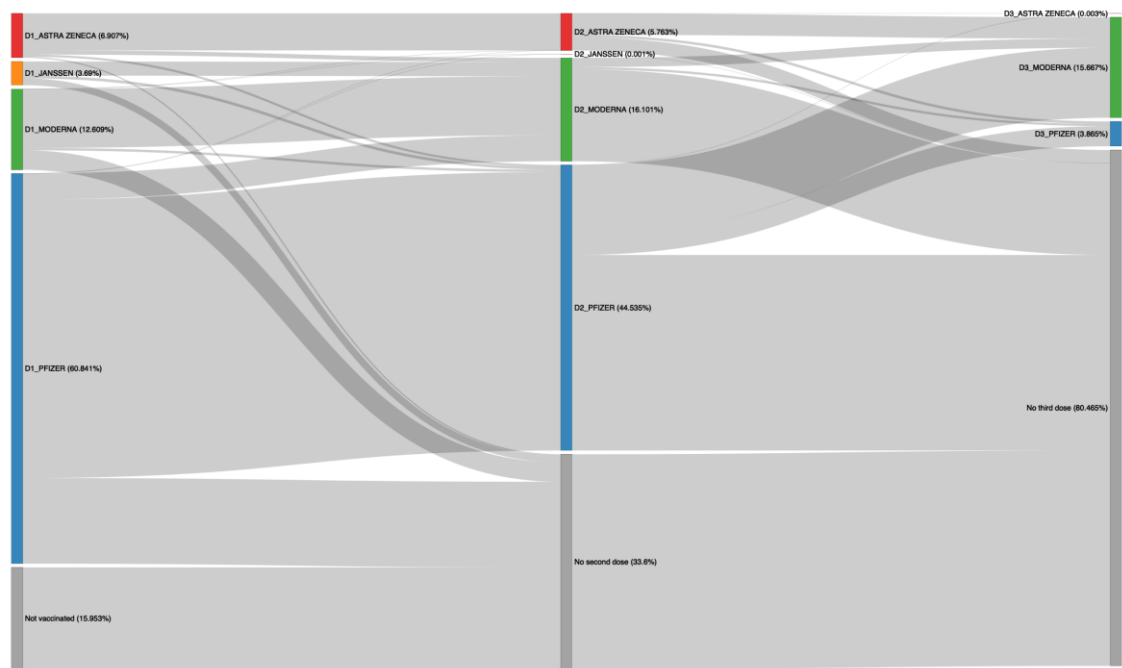
Supplementary Fig. 3: Adjusted odds ratios for developing different types of Long COVID-19 according to symptoms in primary infection. Different types of Long COVID-19 are coded by colours. Odds ratios are adjusted for age, sex, and symptoms.



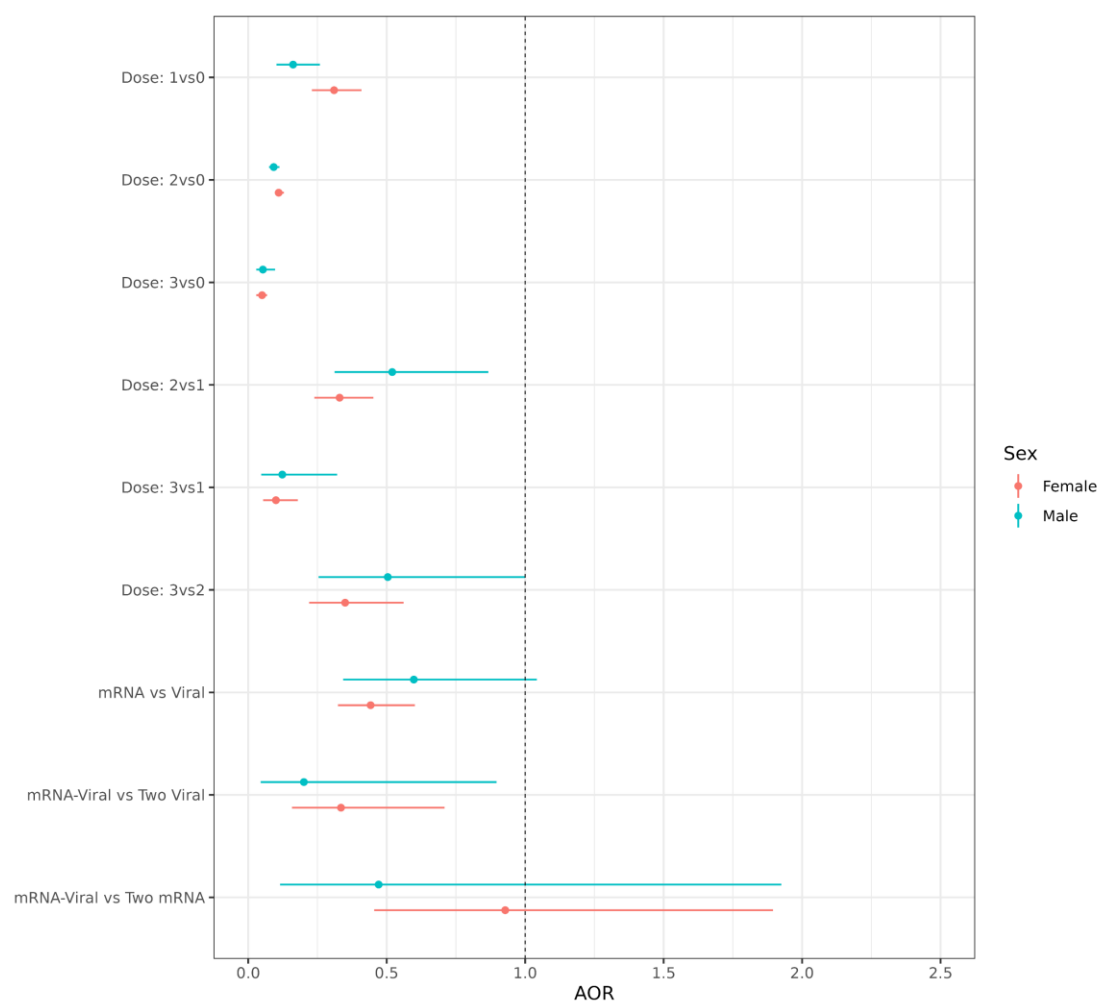
Supplementary Fig. 4: Heatmap of correlation analysis of symptom patterns categorized by sex and LC-19 status. A) Heatmap of symptom patterns in non-LC-19 male patients. B) Heatmap of symptom patterns in non-LC-19 female patients. C) Heatmap of symptom patterns in LC-19 male patients. D) Heatmap of symptom patterns in LC-19 female patients. The intensity of the red squares indicates the level of conditional probability of symptom concurrence. Symptom groups are coloured according to CDC categorization for informational purposes. Rectangles in the dendrogram mark the different clusters extracted from each correlation analysis.



Supplementary Fig. 5: Sex-disaggregated adjusted odds ratios for reinfection. A) Adjusted odds ratios for reinfection by sex and comorbidities, adjusted for age and comorbidities. B) Adjusted odds ratios for reinfection by sex and symptoms, adjusted for age and symptoms. Female patients are represented in red and male patients in blue.

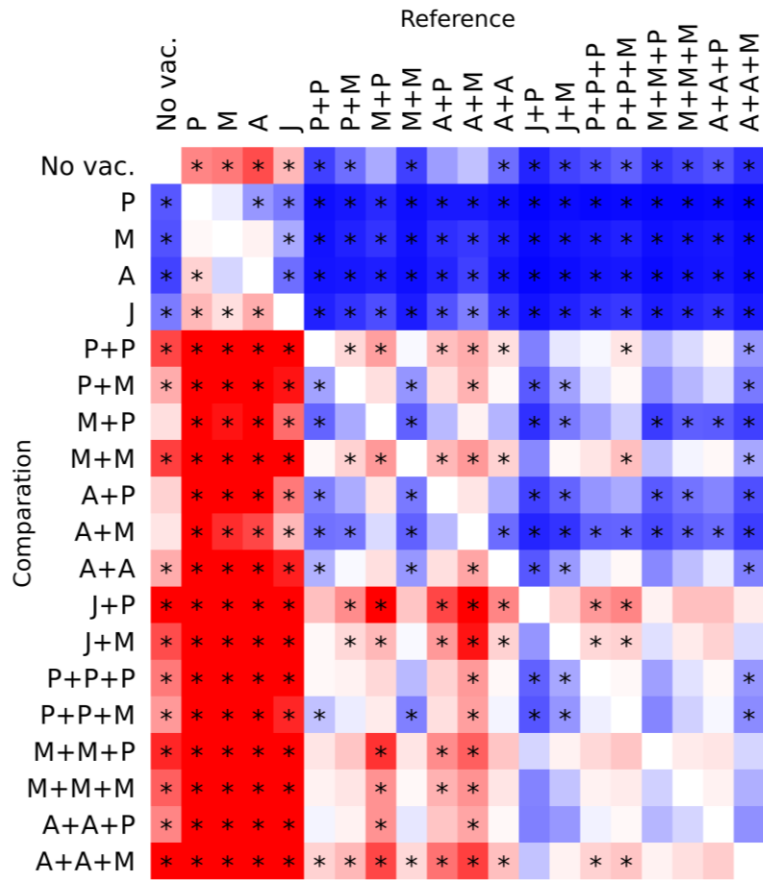


Supplementary Fig. 6: Vaccine administration flow in our cohort.

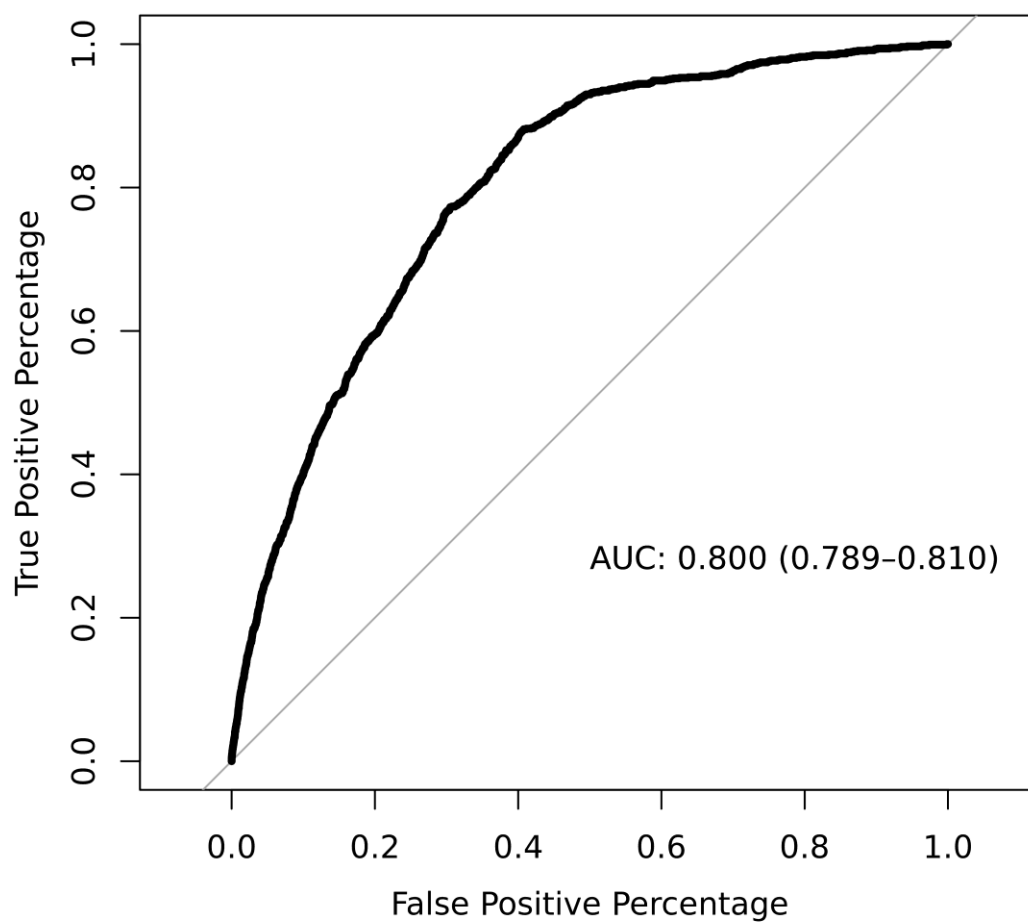


Supplementary Fig. 7: Odds ratio of vaccination effectiveness against LC-19 disaggregated by sex. The dose comparison is represented as the first number vs. the second number; for example, 'Dose: 1vs0' shows the odds ratio of having 1 dose of any vaccine compared to 0 doses. Female patients are represented in red, and male patients in blue.

Vaccination schedule effectiveness vs reinfection



Supplementary Fig. 8: Adjusted odds ratios (AORs) for various vaccination schedules against reinfection. With A for AstraZeneca, P for Pfizer, M for Moderna, and J for Janssen vaccines. Blue squares suggest greater protective effectiveness with lower AOR values comparing reference schedules (columns) against comparison ones (rows), while red squares indicate a higher AOR, suggesting less protective effectiveness against the outcome. If a p-value from AOR is less than 0.05, it is flagged with one star (*).



Supplementary Fig. 9: ROC curve for LC-19 prediction in the test dataset. This curve plots the true positive rate (TPR) against the false positive rate (FPR) at various thresholds. The area under the curve (ROC-AUC) is 0.800 (95% CI: 0.789-0.810).

Supplementary Table 1: Demographic characteristics and comorbidities for reinfected and non-reinfected COVID-19 patients.
Continuous data are reported as median with interquartile range (Q3–Q1), and categorical data are expressed as percentages (%).
COPD is chronic obstructive pulmonary disease and ICM is Ischemic cardiomyopathy.

Characteristics	No Reinfected	Reinfected
Number of individuals (N)	322303	6360
Age median (IQR)	38 (21, 52)	34 (23, 46)
Sex		
Male (%)	152869 (47.4%)	2659 (41.8%)
Female (%)	169434 (52.6%)	3701 (58.2%)
Comorbidities		
Number of Chronic diseases median (IQR)	2 (1, 4)	2 (1, 4)
Number of systems affected median (IQR)	2 (1, 3)	2 (1, 3)
Diabetes mellitus (%)	20826 (6.5%)	221 (3.5%)
Heart failure (%)	3257 (1%)	26 (0.4%)
COPD (%)	4916 (1.5%)	41 (0.6%)
Arterial hypertension (%)	47586 (14.8%)	615 (9.7%)
Depression (%)	29813 (9.2%)	527 (8.3%)
ICM (%)	5881 (1.8%)	67 (1.1%)
Stroke (%)	4056 (1.3%)	33 (0.5%)
Renal insufficiency (%)	6019 (1.9%)	58 (0.9%)
Cirrhosis (%)	6352 (2%)	106 (1.7%)
Osteoporosis (%)	8868 (2.8%)	130 (2%)
Osteoarthritis (%)	18818 (5.8%)	281 (4.4%)
Arthritis (%)	4544 (1.4%)	97 (1.5%)
Obesity (%)	29351 (9.1%)	513 (8.1%)
Asthma (%)	30768 (9.5%)	718 (11.3%)

Supplementary Table 2: Symptomatology for different types of reinfected and non-reinfected COVID-19 patients. Categorical data are expressed as percentages (%).

Characteristics	No Reinfected	Reinfected first infection
No. of individuals (%)	291354 (97.864%)	6360 (2.136%)
Symptoms		
Chest pain (%)	12733 (4.4%)	516 (8.1%)
Muscle pain (%)	79616 (27.3%)	2361 (37.1%)
Cough (%)	32572 (11.2%)	1092 (17.2%)
Lack of appetite (%)	10488 (3.6%)	483 (7.6%)
Sleep problems (%)	7997 (2.7%)	388 (6.1%)
Nasal congestion (%)	76629 (26.3%)	1870 (29.4%)
Dyspnea (%)	5009 (1.7%)	246 (3.9%)
Rhinorrhoea (%)	88987 (30.5%)	2046 (32.2%)
Low grade fever (%)	23779 (8.2%)	562 (8.8%)
Dizziness (%)	10813 (3.7%)	447 (7%)
Hyposmia (%)	42887 (14.7%)	2091 (32.9%)
Hypogeusia (%)	38902 (13.4%)	1879 (29.5%)
Headache (%)	89363 (30.7%)	2708 (42.6%)
Tired (%)	16989 (5.8%)	783 (12.3%)
Eye symptoms (%)	2032 (0.7%)	99 (1.6%)
Expectorate (%)	27817 (9.5%)	885 (13.9%)
Fever (%)	37776 (13%)	829 (13%)
Sore throat (%)	74460 (25.6%)	1769 (27.8%)
Stomach pain (%)	11631 (4%)	475 (7.5%)
Vomit (%)	7644 (2.6%)	270 (4.2%)
Nasal discharge (%)	4728 (1.6%)	150 (2.4%)
Chills (%)	24704 (8.5%)	708 (11.1%)
Rash (%)	2287 (0.8%)	122 (1.9%)
Malaise (%)	897 (0.3%)	24 (0.4%)

Supplementary Table 3: Table of vaccination differences for non-reinfected and reinfected patients.

	Reinfected	No Reinfected				
	N (%)		OR	p	AOR	Adj p
No vaccinated (Ref)	1161 (2.2%)	51159 (97.8%)	0.844	< 0.001	0.93	0.04
Vaccinated	5150 (1.87%)	268977 (98.13%)				
No. of doses						
0 (Ref) vs	1161 (2.2%)	51159 (97.8%)	-			
1	3560 (6.1%)	54346 (93.9%)	2.89	< 0.001	2.77	< 0.001
2	1089 (0.7%)	151517 (99.3%)	0.32	< 0.001	0.29	< 0.001
3	501 (0.8%)	62913 (99.2%)	0.35	< 0.001	0.35	< 0.001
1 (Ref) vs	3560 (6.1%)	54346 (93.9%)	-			
2	1089 (0.7%)	151517 (99.3%)	0.11	< 0.001	0.09	< 0.001
3	501 (0.8%)	62913 (99.2%)	0.12	< 0.001	0.07	< 0.001
2 (Ref) vs	1089 (0.7%)	151517 (99.3%)	-			
3	501 (0.8%)	62913 (99.2%)	1.108	0.06	1.034	0.58