

Supplemental material 2

Vaccination status and COVID-19 ED prevalence plot

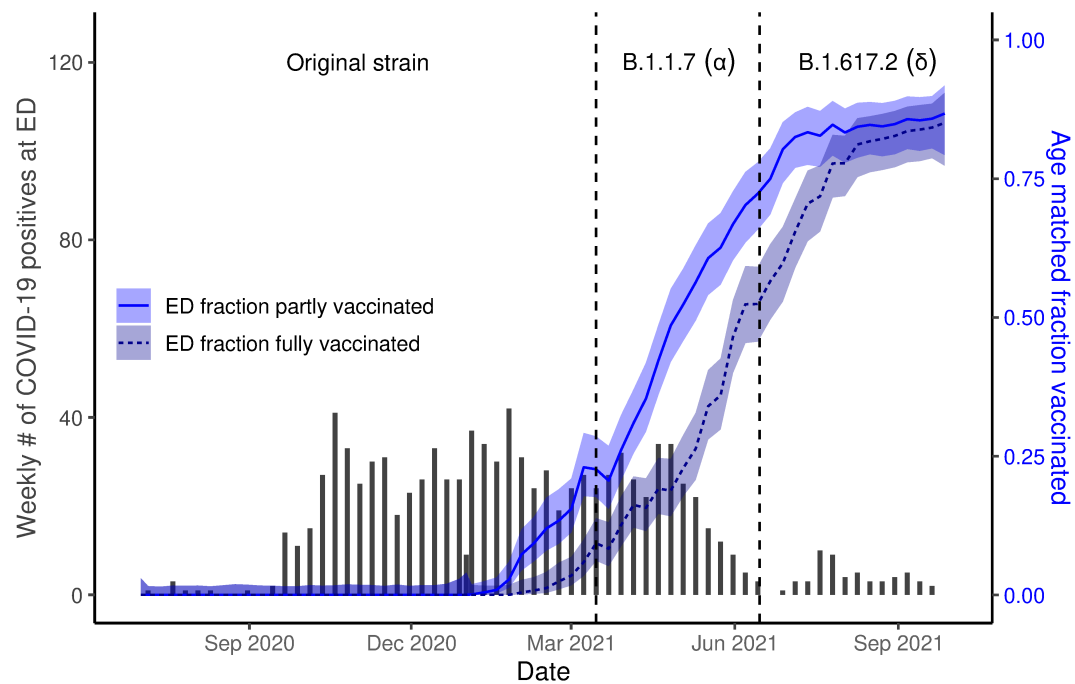


Figure 1: Temporal validation period split into three phases characterized by weekly number of new COVID-19 cases at the emergency department (ED) and estimated fraction of ED patients vaccinated.

The temporal validation dataset consists of ED presentations from July 2020 until October 2021. As stated in the “Materials and Methods” section, this period was split into three phases: i) from July 2020 until March 2021, no vaccination and no variants of concern identified ii) from March 2021 until June 2021, partial vaccination and B.1.1.7 (Alpha) variant identified as dominant iii) from June 2021 until October 2021, widespread vaccination and B.1.617.2 (Delta) variant identified as dominant. The ED fraction vaccinated is estimated by merging data from the Dutch national institute of public health by the date of the ED presentation and the year of birth of the patient. The gray bars depict weekly number of new COVID-19 cases at the ED, the blue lines the estimated fraction of ED patients fully or partially vaccinated.

CoLab-score performance

Phase	Cases/controls (prevalence)	AUC
Original strain & no vaccinations	694/7999 (8.6%)	0.909 (0.896 - 0.923)
B.1.1.7 strain & partial vaccination	287/2845 (10.1%)	0.937 (0.921 - 0.953)
B.1.617.2 strain & full vaccination	58/3236 (1.8%)	0.898 (0.857 - 0.939)

CoLab-score	Phase	Sensitivity	Specificity	PPV	NPV
0	Original strain & no vaccinations	0.960 (0.944 - 0.974)	0.418 (0.407 - 0.429)	0.135 (0.133 - 0.138)	0.991 (0.987 - 0.994)
	B.1.1.7 strain & partial vaccination	0.983 (0.969 - 0.997)	0.432 (0.413 - 0.450)	0.162 (0.158 - 0.168)	0.996 (0.992 - 0.999)
	B.1.617.2 strain & full vaccination	0.983 (0.948 - 1.000)	0.415 (0.396 - 0.432)	0.030 (0.028 - 0.031)	0.999 (0.998 - 1.000)
≤1	Original strain & no vaccinations	0.879 (0.854 - 0.902)	0.789 (0.779 - 0.798)	0.283 (0.273 - 0.294)	0.986 (0.983 - 0.988)
	B.1.1.7 strain & partial vaccination	0.916 (0.885 - 0.948)	0.809 (0.793 - 0.824)	0.350 (0.332 - 0.370)	0.989 (0.984 - 0.993)
	B.1.617.2 strain & full vaccination	0.862 (0.776 - 0.948)	0.780 (0.765 - 0.794)	0.067 (0.059 - 0.074)	0.997 (0.995 - 0.999)
≤2	Original strain & no vaccinations	0.813 (0.784 - 0.842)	0.894 (0.887 - 0.901)	0.421 (0.404 - 0.441)	0.980 (0.978 - 0.983)
	B.1.1.7 strain & partial vaccination	0.864 (0.826 - 0.902)	0.897 (0.885 - 0.908)	0.484 (0.455 - 0.516)	0.983 (0.979 - 0.988)
	B.1.617.2 strain & full vaccination	0.690 (0.569 - 0.810)	0.892 (0.881 - 0.902)	0.104 (0.086 - 0.123)	0.994 (0.991 - 0.996)
≤3	Original strain & no vaccinations	0.697 (0.661 - 0.731)	0.962 (0.957 - 0.966)	0.634 (0.605 - 0.662)	0.971 (0.968 - 0.974)
	B.1.1.7 strain & partial vaccination	0.760 (0.711 - 0.812)	0.963 (0.955 - 0.970)	0.696 (0.650 - 0.739)	0.973 (0.967 - 0.978)
	B.1.617.2 strain & full vaccination	0.621 (0.483 - 0.741)	0.960 (0.954 - 0.967)	0.222 (0.178 - 0.268)	0.993 (0.990 - 0.995)
≤4	Original strain & no vaccinations	0.566 (0.529 - 0.602)	0.984 (0.981 - 0.987)	0.775 (0.740 - 0.808)	0.960 (0.957 - 0.963)
	B.1.1.7 strain & partial vaccination	0.645 (0.589 - 0.704)	0.983 (0.978 - 0.988)	0.809 (0.762 - 0.856)	0.961 (0.955 - 0.967)
	B.1.617.2 strain & full vaccination	0.517 (0.397 - 0.638)	0.986 (0.982 - 0.990)	0.400 (0.319 - 0.500)	0.991 (0.989 - 0.993)

Table 1: Diagnostic performance of the CoLab-score in the temporal validation dataset, split by phase.

Sensitivities, specificities, positive predictive values (PPV) and negative predictive values (NPV) are shown for fixed cut-offs (CoLab-score 0 till ≤ 4) with bootstrapped 95% confidence intervals in parentheses. The temporal validation dataset is split into three phases according to dominant SARS-CoV-2 strains in the Netherlands and estimated fraction of ED patients vaccinated (see Figure above). Note that “0” lists the sensitivity and NPV of CoLab-score 0 and “ ≤ 4 ” lists the specificity and PPV of CoLab-score 5. The AUC was significantly higher in the second phase as compared to the first phase (DeLong test p-value: 0.0175), but did not differ significantly between the third and first phase (DeLong test p-value: 0.3903).

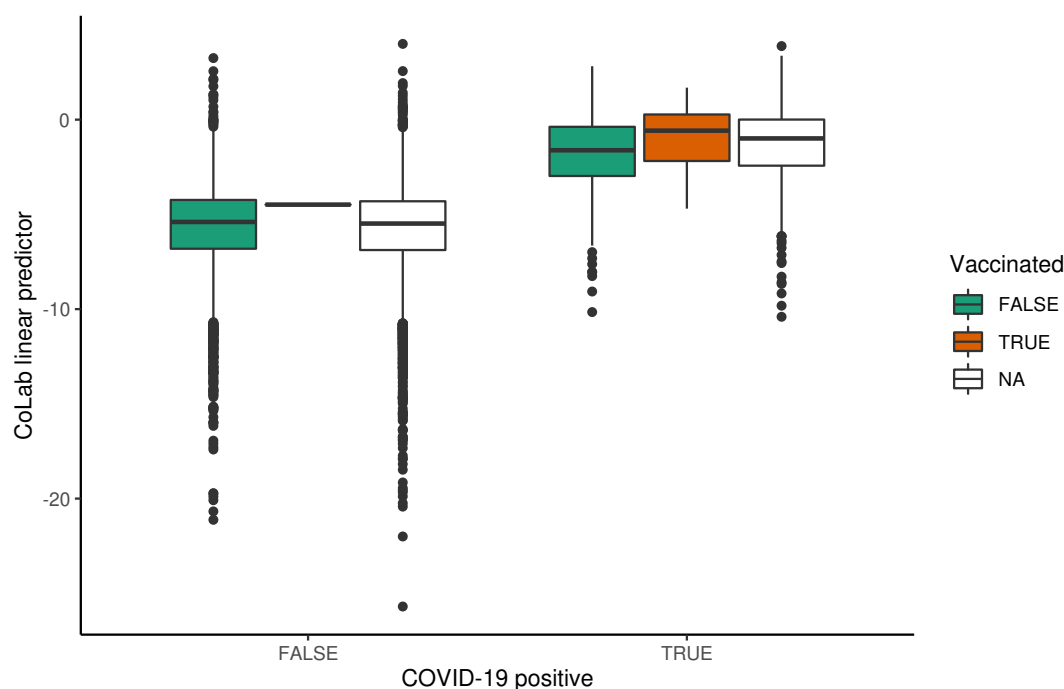


Figure 2: Boxplots of CoLab linear predictor versus COVID-19 positive, split by registered vaccination status.

The CoLab linear predictor is calculated for all ED presentations in the temporal validation set. Presentations who are registered as vaccinated are labeled TRUE ($N = 13$).

Presentations before vaccine roll-out are labeled FALSE ($N = 5855$). Presentations during

vaccine roll-out but where no status is registered are labeled NA (N = 8212). Of the 13 presentations who were registered as vaccinated, 12 were COVID-19 positive and 1 negative. Note that vaccination status is only registered if a patient is SARS-CoV-2 PCR positive or considered positive until proven otherwise, therefore there is only one COVID-19 negative patient with a registered vaccination status.