

# Real-World Trends in SARS-CoV-2 Antibody Levels and Their Link to Subsequent COVID-19 in the United States

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## Background

- The global morbidity associated with SARS-CoV-2 and the rapid spread of new variants of concern suggest that it remains critical to understand the general efficacy of COVID-19 vaccines in clinical practice. Further, studying changes in SARS-CoV-2 antibody levels over time aids in evaluating epidemic control measures and adding valuable insights into the dynamics of the pandemic.
- Antibodies can be assessed in high throughput with reasonable technical effort, appear to be associated with protection against symptomatic SARS-CoV-2 infection<sup>1,2</sup> and could be used as a surrogate measure for the strength of an individual's immune response against SARS-CoV-2.<sup>2-5</sup>
- The Elecsys® Anti-SARS-CoV-2 S (Spike) (ACOV2S) assay quantifies antibodies for the receptor binding domain (RBD) of the SARS-CoV-2 S protein in human serum and plasma.<sup>6</sup>

## Objective

The objective of this study is to assess the SARS-CoV-2 antibody levels over time (2021-2022) in the real-world setting, and assess the association between the antibody levels and subsequent COVID-19 outcomes.

## Methods

This retrospective observational study linked two real-world data sources via tokenization:

- Antibody data from the Elecsys Anti-SARS-CoV-2 S assay obtained from routine clinical testing by Labcorp laboratories in the US between 2021-04-01 and 2022-06-30
- Infection and vaccination records of the same subjects captured from PurpleLab® Open and Closed claims repository.

Figure 1. Study data sources and cohort definition

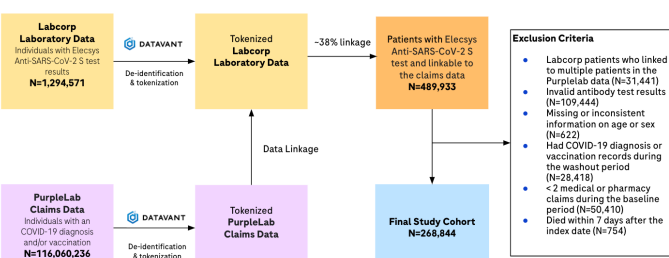
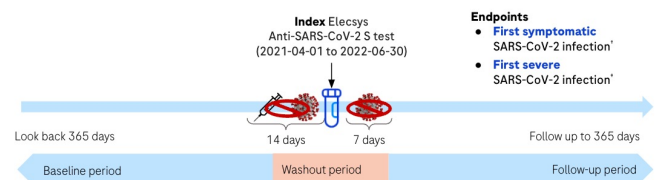


Figure 2. Study Design



Descriptive statistics of antibody titers were analyzed monthly to understand the trend over time, and by the past infection/vaccination status. Incidence of subsequent COVID-19 outcomes within 12 months of the antibody testing were reported.

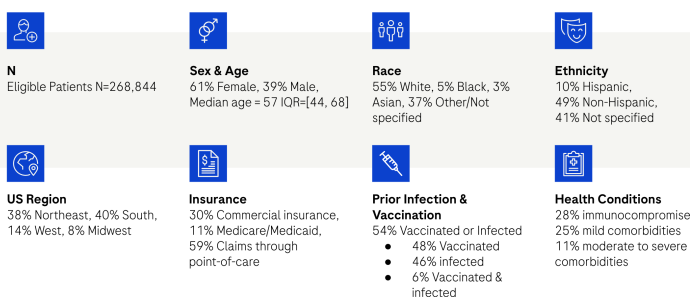
The COVID-19 outcomes include:

- Symptomatic SARS-CoV-2 infections: confirmed COVID-19 diagnosis code in the claims database for a clinic/hospital encounter from any healthcare setting
- Severe SARS-CoV-2 infections: confirmed COVID-19 diagnosis code in the claims database leading an inpatient hospitalization, intensive care unit hospitalization, ventilation or intubation, death and/or emergency department encounter within 30 days of COVID-19 diagnosis date

## Results

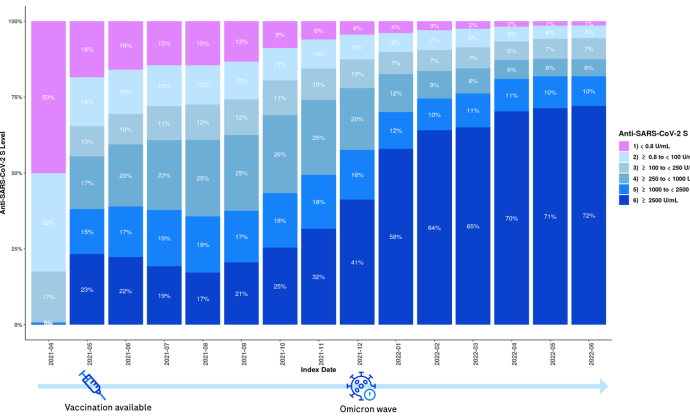
In total, 268,844 individuals tested with the Anti-SARS-CoV-2 S assay were included.

Table 1. Baseline demographics



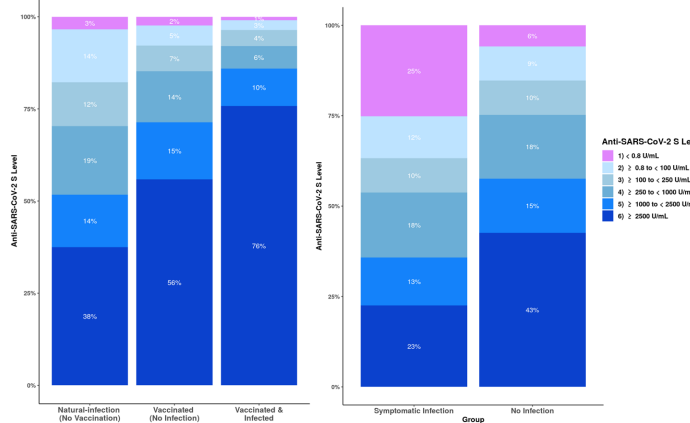
Over the 15-month study period, the overall SARS-CoV-2 antibody levels increased significantly.

Figure 3. Anti-SARS-CoV-2 S levels over time



Vaccinated individuals who were not previously infected had a higher median antibody titer (2500 U/mL, IQR=[779, 2500]) compared to those with a prior natural-infection only (1110 U/mL, IQR=[187, 2500]) (p<0.001).

Figure 4. Anti-SARS-CoV-2 S levels by vaccination/COVID-19 status



## Conclusion

- The increased antibody levels over time suggest that a growing number of the study population gained immunity via prior infections or vaccinations, which is also associated with the reduced risk of COVID-19 outcomes.
- Increasing antibody thresholds were associated with decreasing risk to develop COVID-19 outcomes. The thresholds were consistent across patient subgroups.
- The results suggest the relevance of SARS-CoV-2 antibody levels as a valuable surveillance tool during and potentially beyond the pandemic era.

## Reference

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This work was supported by Roche Diagnostics International Ltd. YJ, CR and PR are Roche stock holders; SL participates in employee stock plans at Labcorp; FY is currently an employee of Philip Morris International but was an employee of Roche Information Solutions Ltd at the time the study was conducted. Philip Morris International has not been involved in the study or publication. The Elecsys Anti-SARS-CoV-2 S assay is approved under an Emergency Use Authorisation in the US. ELECSYS is a trademark of Roche. All other product names and trademarks are the property of their respective owners.

Patients with a higher antibody level was associated with a lower risk of developing COVID-19 outcomes.

Table 2. Cumulative incidence rate of SARS-CoV-2 infections, by Anti-SARS-CoV-2 S levels

Anti-SARS-CoV-2 S level	% Covid event	Cumulative Incidence Rate* (95% CI)	Crude Incidence Rate Ratio (95% CI)
<b>Symptomatic SARS-CoV-2 Infection</b>			
1) < 0.8	40.30%	24.64 (24.14, 25.15)	Ref level
2) ≥ 0.8 to < 100	16.20%	7.54 (7.31, 7.76)	0.31 (0.30, 0.31)
3) ≥ 100 to < 250	13.60%	6.64 (6.42, 6.86)	0.27 (0.26, 0.27)
4) ≥ 250 to < 1000	13.80%	6.56 (6.4, 6.72)	0.27 (0.26, 0.27)
5) ≥ 1000 to < 2500	12.20%	6.0 (5.83, 6.16)	0.24 (0.24, 0.25)
6) ≥ 2500	7.70%	4.19 (4.1, 4.28)	0.17 (0.16, 0.17)
Overall	13.60%	6.99 (6.92, 7.06)	
<b>Severe SARS-CoV-2 Infection</b>			
1) < 0.8	4.10%	1.76 (1.65, 1.87)	Ref level
2) ≥ 0.8 to < 100	1.40%	0.57 (0.51, 0.63)	0.32 (0.28, 0.36)
3) ≥ 100 to < 250	0.80%	0.37 (0.32, 0.42)	0.21 (0.19, 0.23)
4) ≥ 250 to < 1000	0.60%	0.26 (0.23, 0.29)	0.15 (0.14, 0.16)
5) ≥ 1000 to < 2500	0.50%	0.22 (0.18, 0.25)	0.13 (0.11, 0.14)
6) ≥ 2500	0.30%	0.17 (0.15, 0.19)	0.09 (0.08, 0.10)
Overall	0.90%	0.4 (0.39, 0.42)	

\*Incidence rate presented as number of infections/10,000 person-days at risk

The association between antibody level and COVID-19 outcomes are consistent across age groups and immunocompromised conditions.

Figure 5. Hazard ratios of symptomatic and severe infection by Anti-SARS-CoV-2 S levels across patient subgroups

