

INTRODUCTION

The SARS-CoV-2 Delta variant (B.1.617.2) has superseded the Alpha variant (B.1.1.7) to become the predominant strain in the United States¹. It is highly contagious, more so than the Alpha variant. The 69-70del in the alpha variant results in S-Gene Target Failure (SGTF) with TaqPath™ COVID-19 Combo Kit, while the Delta variant does not. In this observational study, we analyzed real world RT-PCR data at a single site against biological characteristics of SARS-CoV-2 variants.

METHODS

The Life Science Testing Center conducts routine testing of students, faculty and staff at Northeastern University using the TaqPath™ COVID-19 Combo Kit. Deidentified data from testing was sourced from a cloud-based system. Data from testing performed over a 29-week time period (Feb 2021–Sept 2021) were analyzed for % positivity, inconclusive rates, SGTF, and Ct values for the 3 gene targets (Orf1ab, N, S).

RESULTS

473,000 samples were tested with cumulative positivity rate of 0.5% and peak weekly positivity rate of 1.4% during the 29-week time period (Fig. 1). While %SGTF increased from 10.3 to 47.7% (of positives) in the time period from mid-February to March (Fig. 2a), the inconclusive rate remained relatively constant (Fig. 1, teal line in upper panel).

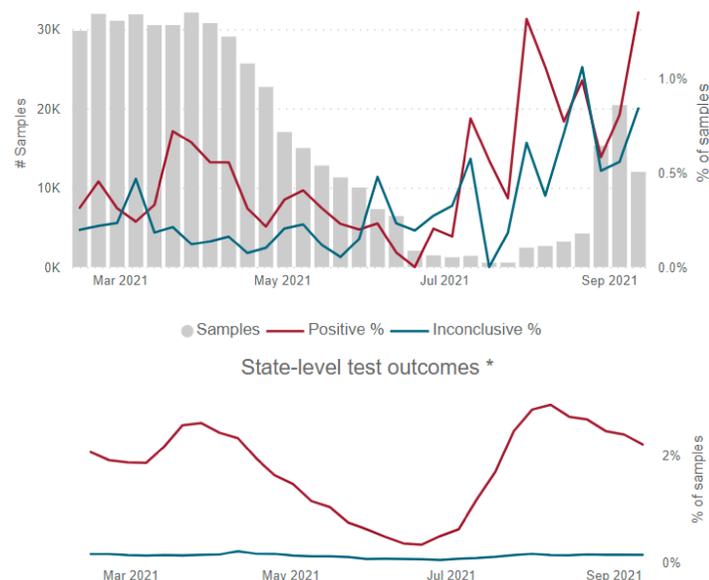


Figure 1. Weekly testing volume and % positivity with corresponding state-level outcomes²

RESULTS (Contd.)

The median Ct for the S-gene (40.0) was also elevated during the period, while median Cts for N and ORF1ab were lower, 24.2 and 23.5, respectively (Fig. 2b). Increase of SGTF positive cases (Feb-June 2021) indicated dominance of the Alpha variant which declined in July with the emergence of the Delta variant (Fig. 2c). SARS-CoV-2 lineages were confirmed using sequencing.

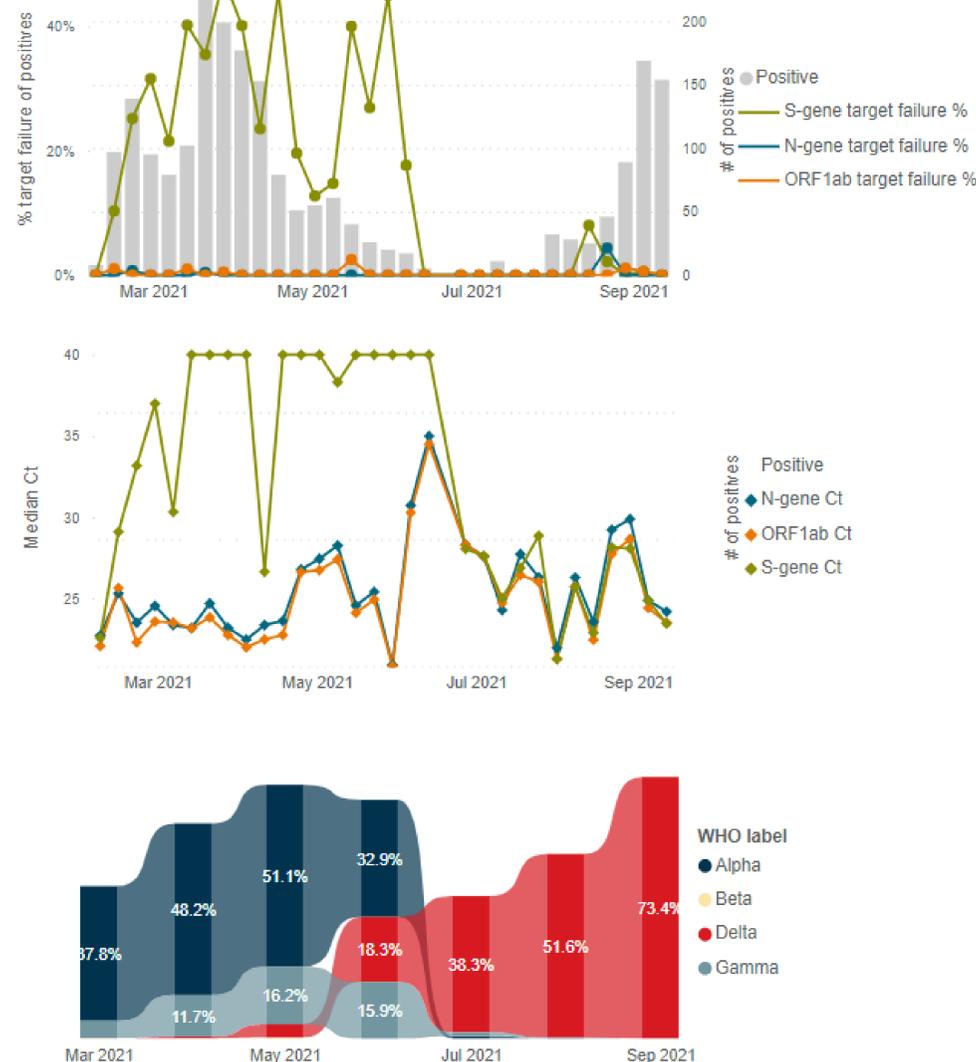


Figure 2. a) Gene target failure rates as % of positives
b) Median Ct trends in positive samples
c) Relative prevalence of variants of concern in the state

RESULTS (Contd.)

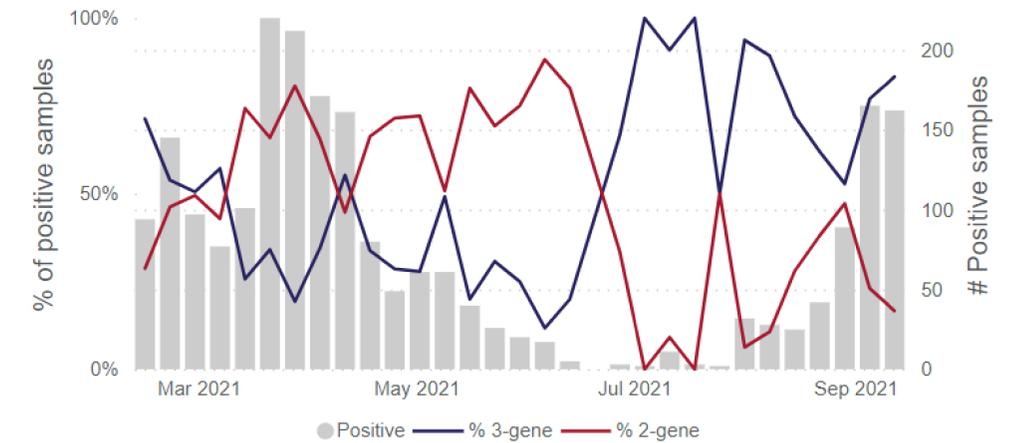


Figure 3. Trends for 3 and 2-gene target positives as % of positive samples

The last 3-months (July-Sept) showed a rise % positivity not associated with SGTF increase and convergence of the 3 gene's median Cts, detectable S-gene (Fig. 2b). During the entire time period, there was a drop in 3-gene positives corresponding to the dominance of alpha variant, which reverted back to the 3-gene positives (crossing of red and blue lines, Fig. 3) in July with the emergence of the Delta variant.

CONCLUSIONS

SGTF is associated with higher viral loads and potentially increased disease severity by the alpha variant. Despite SGTF, there were no increased inconclusive rates using TaqPath™ COVID-19 Combo kit. The return of 3-gene positives and decline in SGTF were associated with the emergence of Delta variant. Data analytics can signal important epidemiological trends for variants and shifts in their predominance which has potential implications on disease severity as well as public health countermeasures.

REFERENCES

1. CDC COVID Data Tracker Weekly Review, September 17, 2021; <https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html>
2. COVID-19 public datasets; <https://data.cdc.gov/>
3. GISAID; <https://www.gisaid.org/>