Omicron

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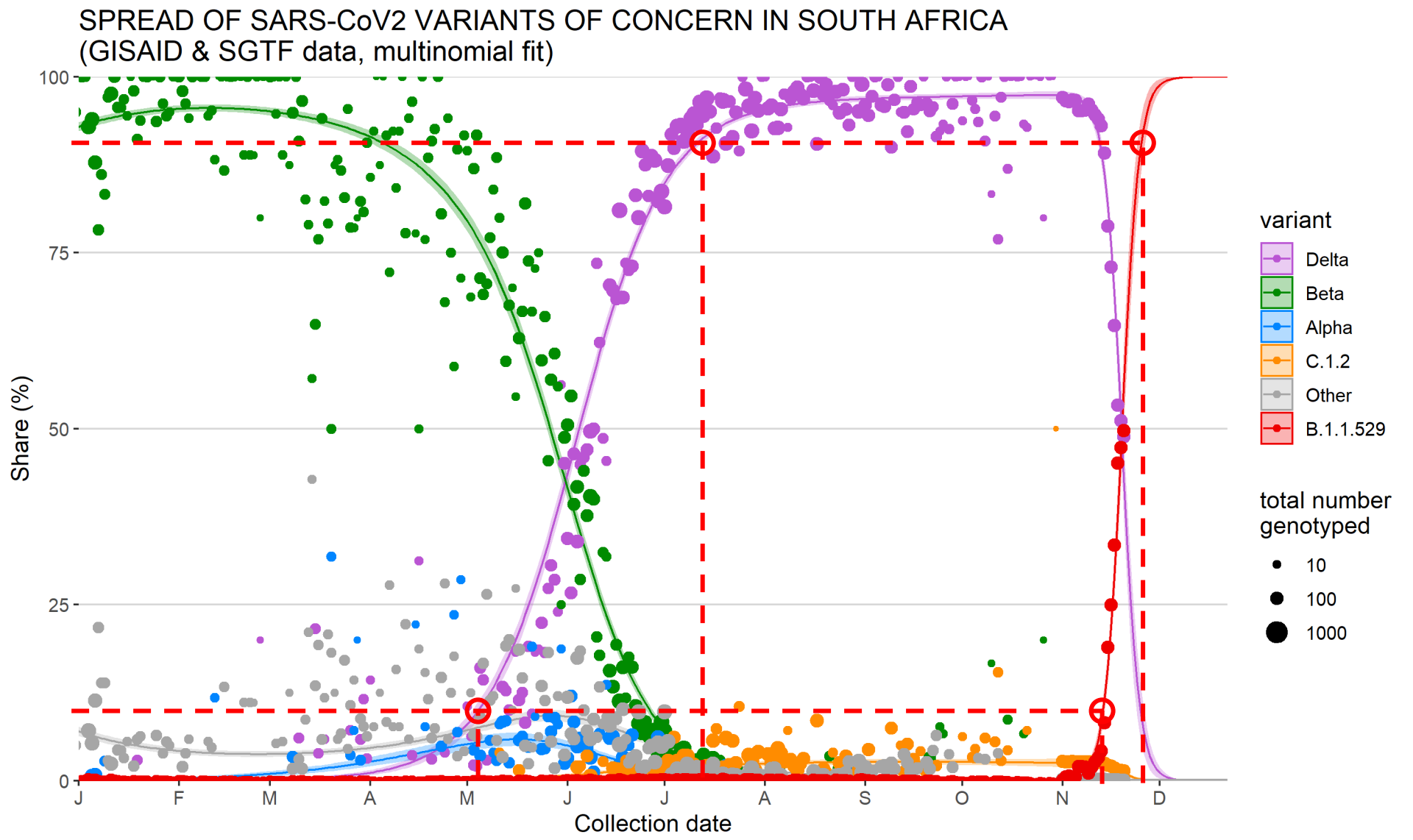
Scientific Director, Ontario COVID-19 Science Advisory Table

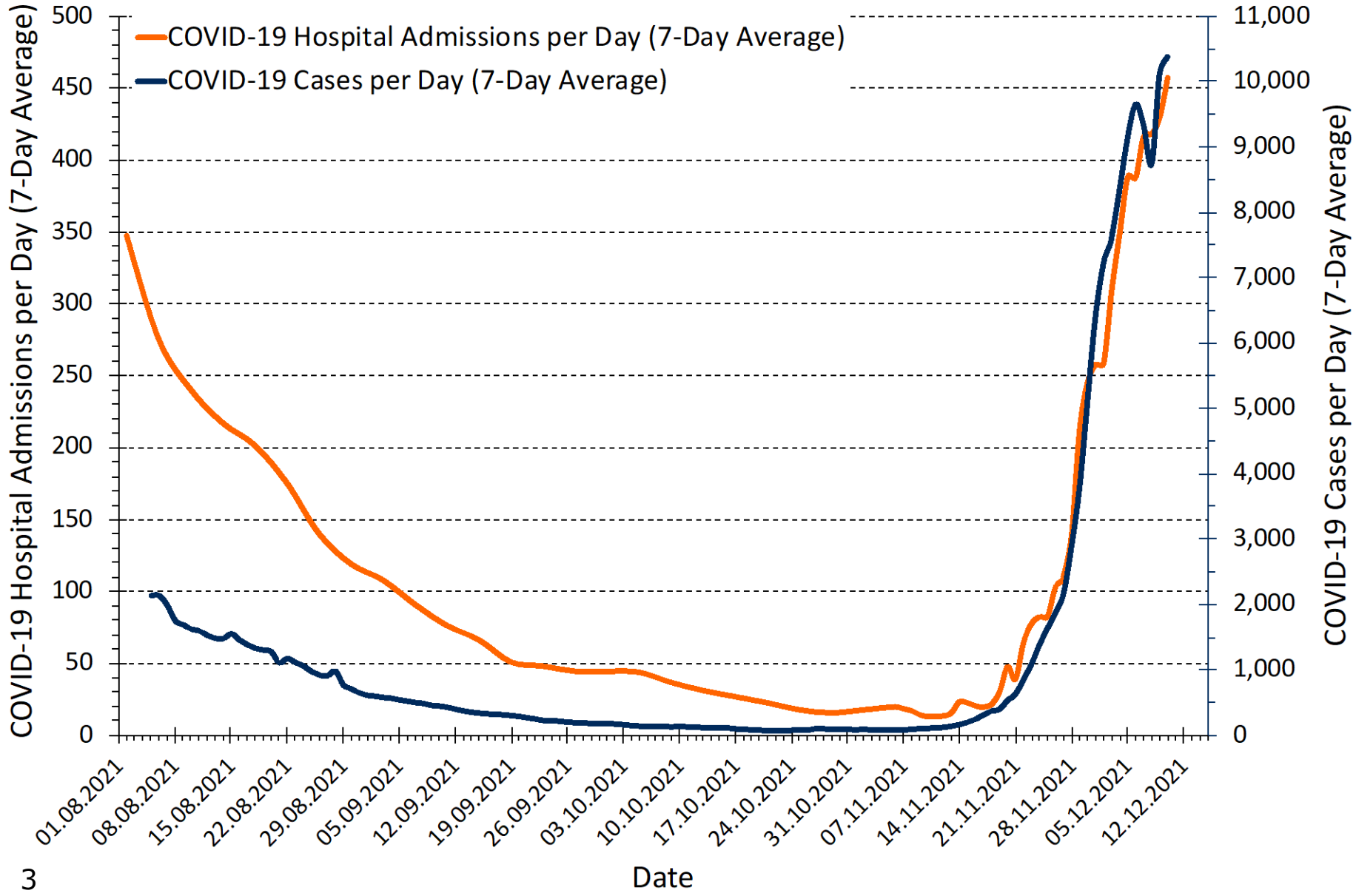
St. Michael's
Inspired Care.
Inspiring Science.

UNIVERSITY OF TORONTO

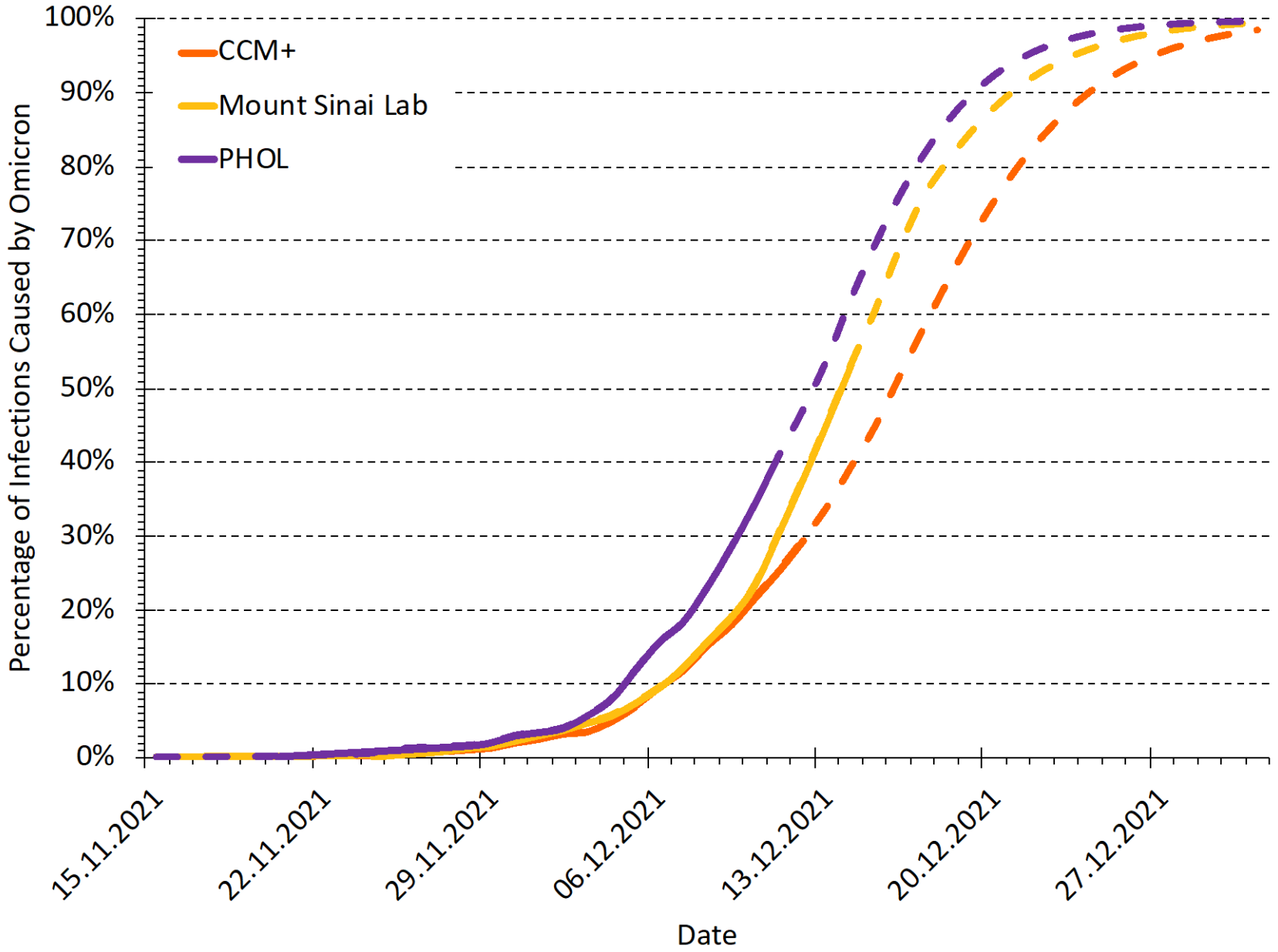
SCIENCE TABLE
COVID-19 ADVISORY FOR ONTARIO

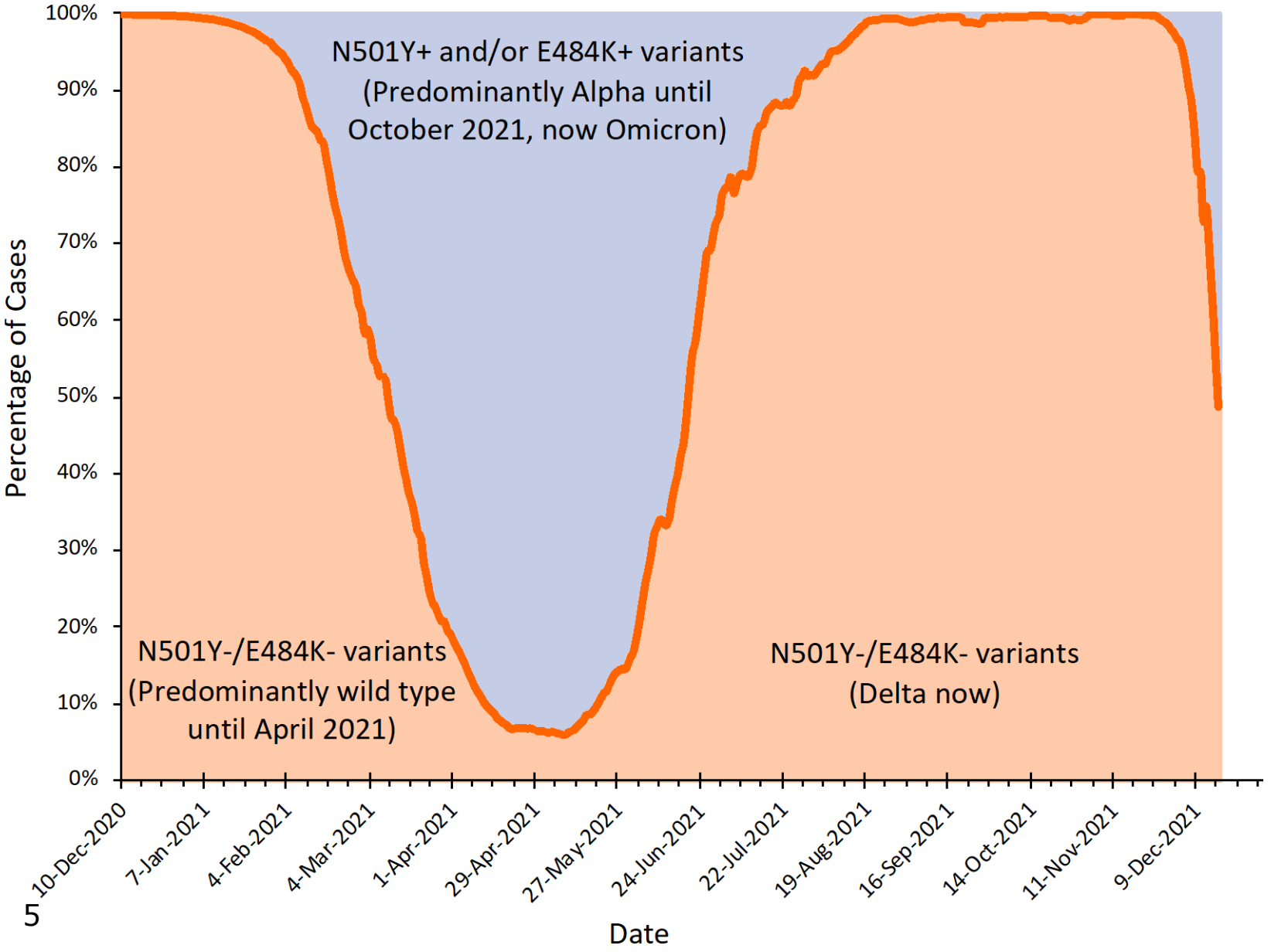

SPREAD OF SARS-CoV2 VARIANTS OF CONCERN IN SOUTH AFRICA
(GISAID & SGTF data, multinomial fit)
100
75
50
25
0
Share (%)
J
F
M
A
M
J
J
A
S
O
N
D
Collection date
variant
Delta
Beta
Alpha
C.1.2
Other
B.1.1.529
total number genotyped
10
100
1000

Number of Daily COVID-19 Cases and Hospital Admissions in Gauteng, South Africa (15.5 Million Inhabitants)



Percentage of Infections Caused by Omicron in Ontario




N501Y+ and/or E484K+ variants
(Predominantly Alpha until
October 2021, now Omicron)
N501Y-/E484K- variants
(Predominantly wild type
until April 2021)
N501Y-/E484K- variants
(Delta now)
Percentage of Cases
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
10-Dec-2020
7-Jan-2021
4-Feb-2021
4-Mar-2021
1-Apr-2021
29-Apr-2021
27-May-2021
24-Jun-2021
22-Jul-2021
19-Aug-2021
16-Sep-2021
14-Oct-2021
11-Nov-2021
9-Dec-2021
Date

AP

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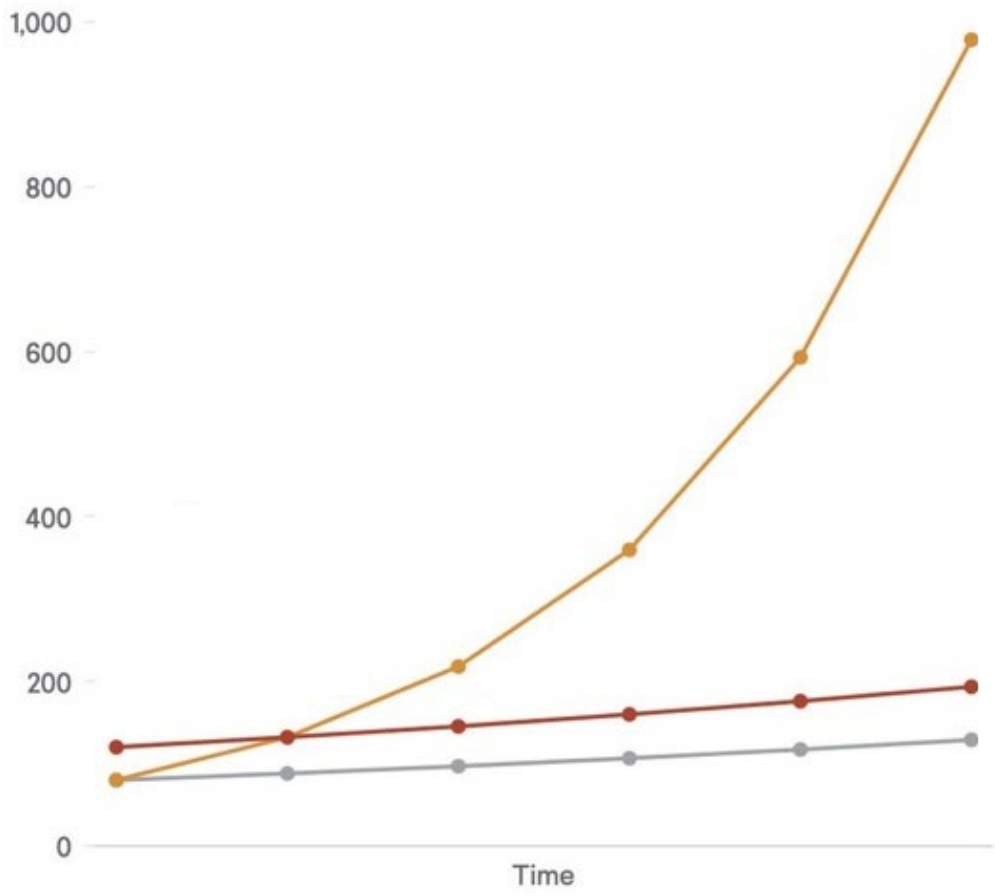
Fauci says early reports encouraging about omicron variant

By GENE JOHNSON December 5, 2021

Caveats regarding virulence

- Approximately 90% of population in Gauteng infected at least once
- 36% of population additionally vaccinated
- No evidence on virulence in non-immune, unvaccinated people
- Median age in Gauteng 27, less than 5% above 65 years



50% more transmissible

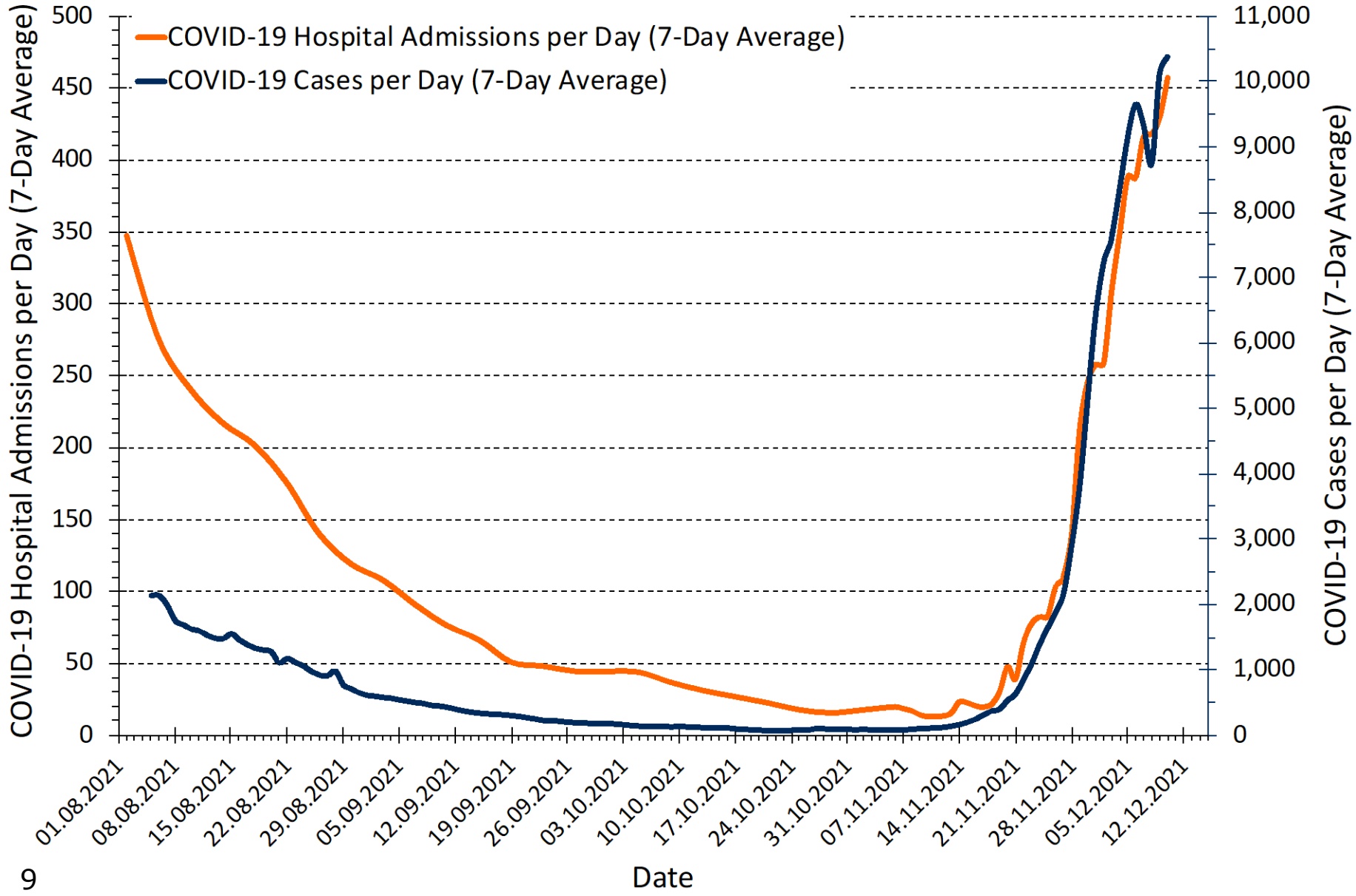
50% more severe

Notes: The line for the original strain assumes a fatality risk of 0.8% and that each infected person transmits the virus to 1.1 other people on average.

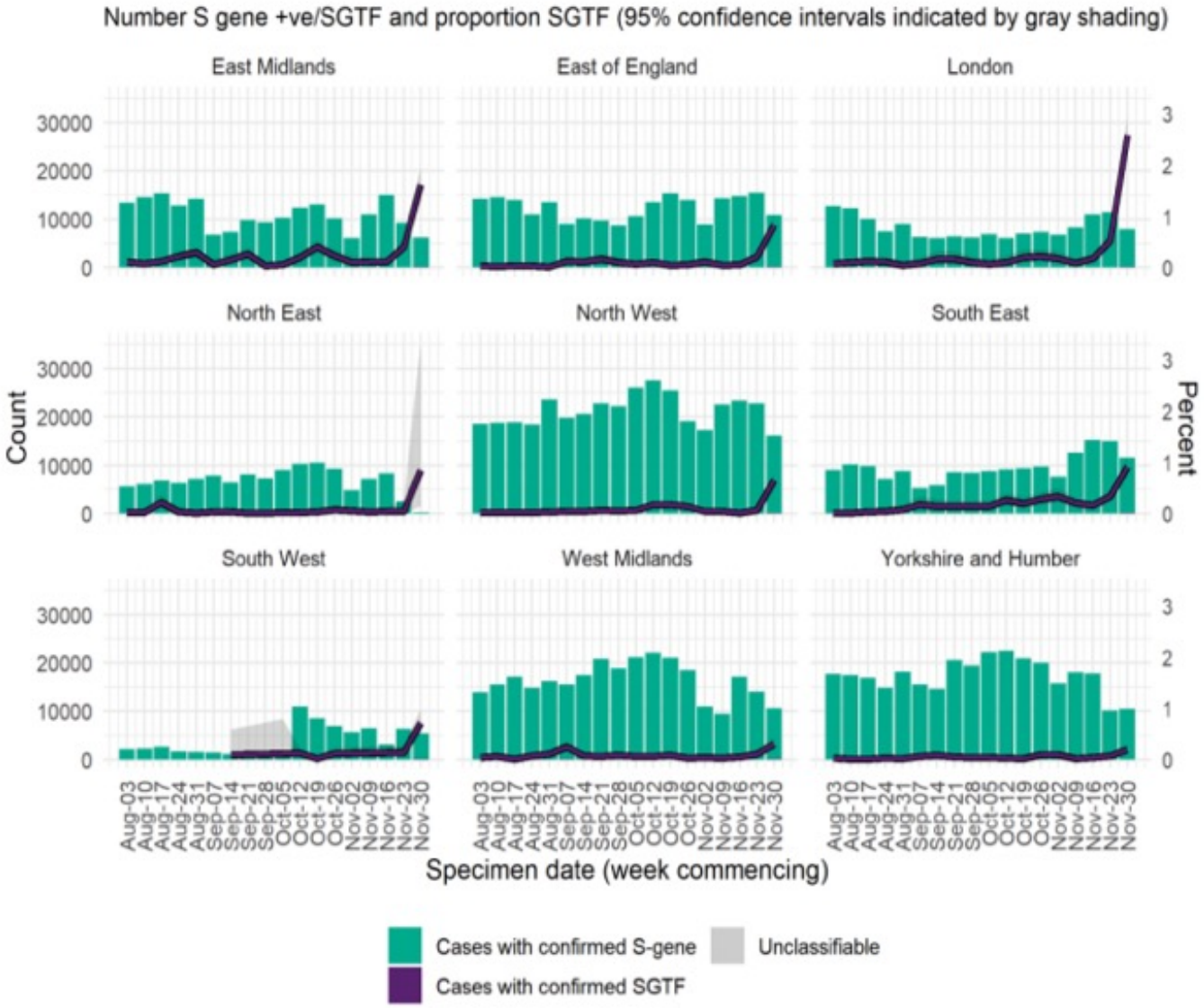
Adapted from: Adam Kucharski, Associate Professor, London School of Hygiene and Tropical Medicine.

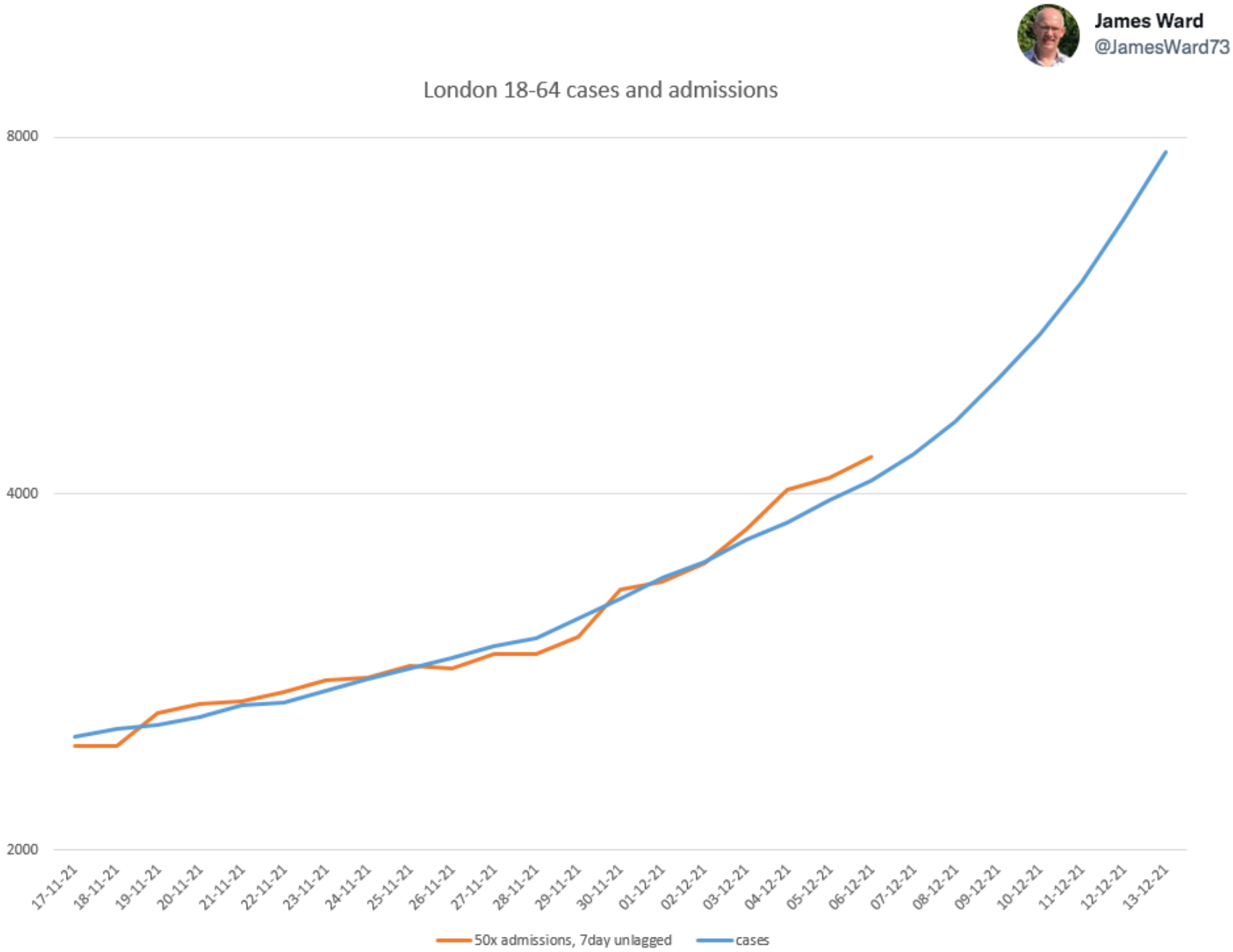
COUNCIL on FOREIGN RELATIONS

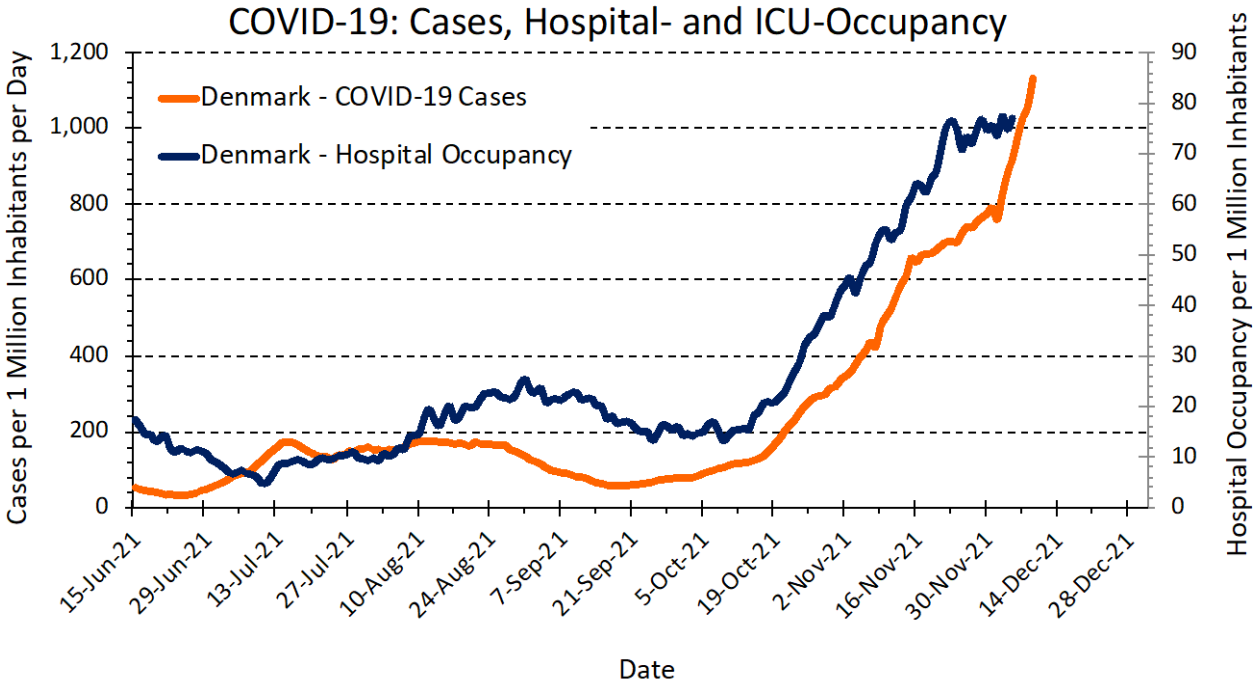
Number of Daily COVID-19 Cases and Hospital Admissions in Gauteng, South Africa (15.5 Million Inhabitants)



2021-08-03 to 2021-12-05. Data updated on 2021-12-06

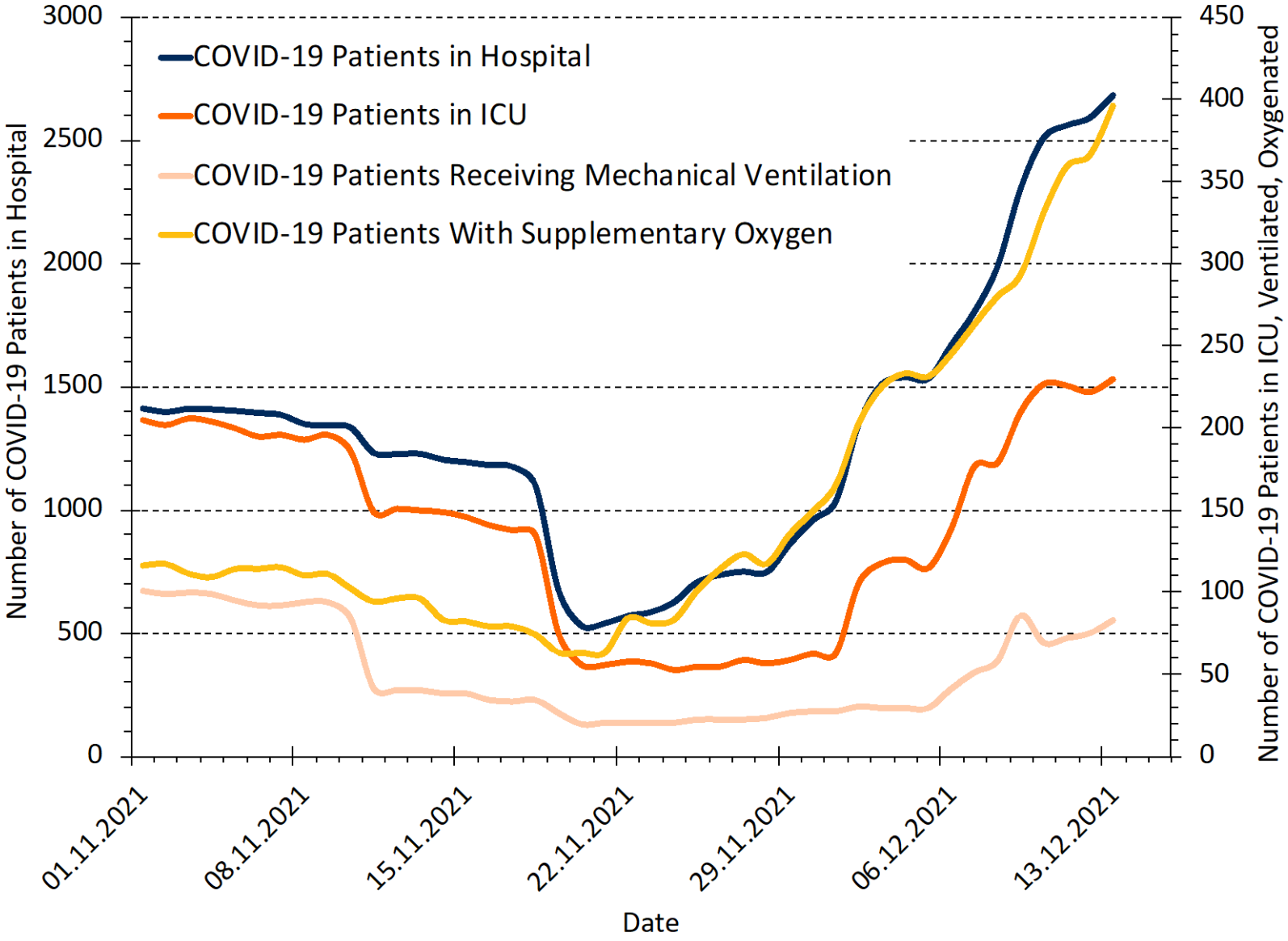



James Ward
@JamesWard73
London 18-64 cases and admissions
8000
4000
2000
17-11-21
18-11-21
19-11-21
20-11-21
21-11-21
22-11-21
23-11-21
24-11-21
25-11-21
26-11-21
27-11-21
28-11-21
29-11-21
30-11-21
01-12-21
02-12-21
03-12-21
04-12-21
05-12-21
06-12-21
07-12-21
08-12-21
09-12-21
10-12-21
11-12-21
12-12-21
13-12-21
50x admissions, 7day unlagged
cases

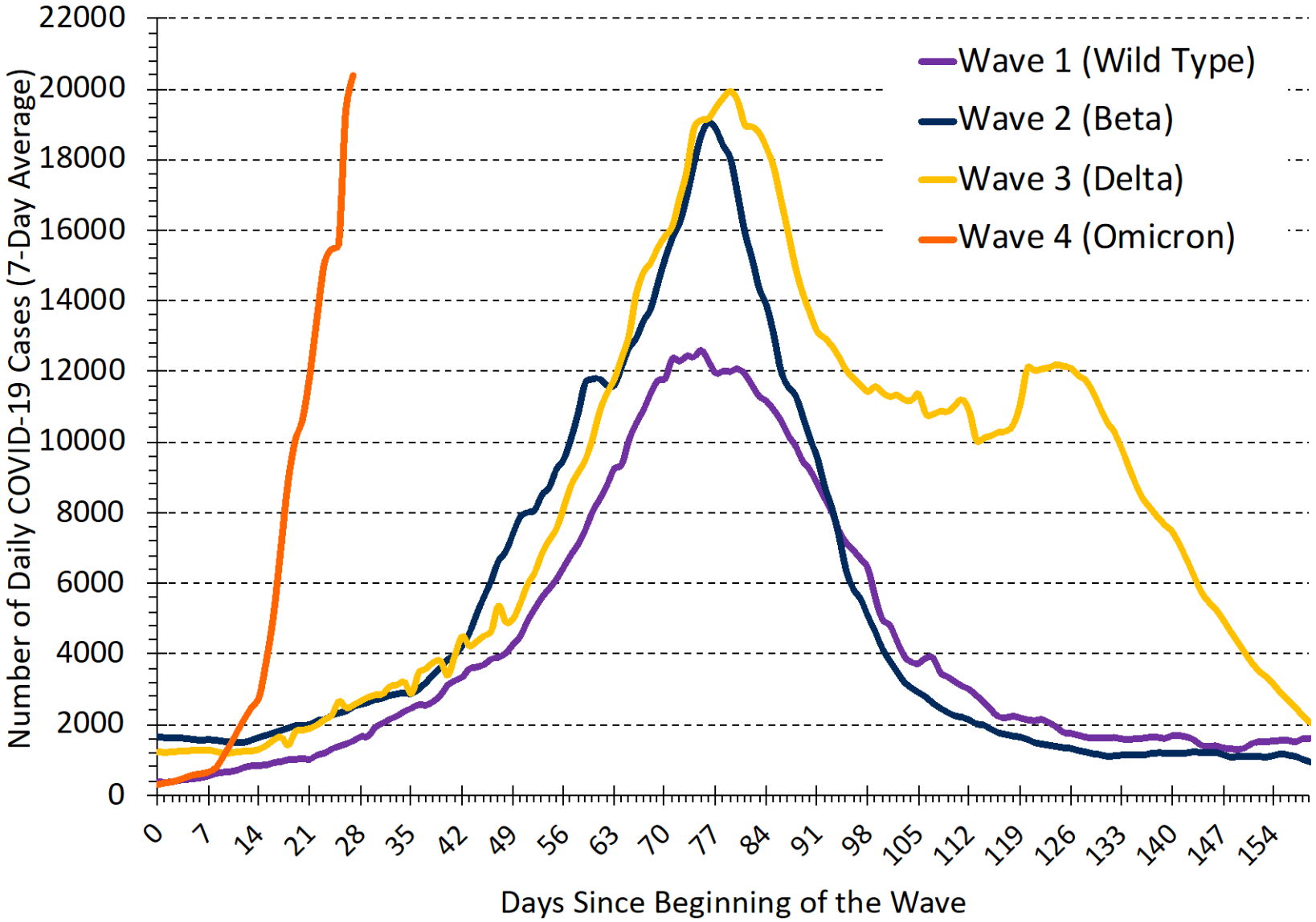


	Omicron	Other strains
Cases	3,437	88,940
Hospital admissions	28	665
Percentage hospitalized	0.81%	0.75%

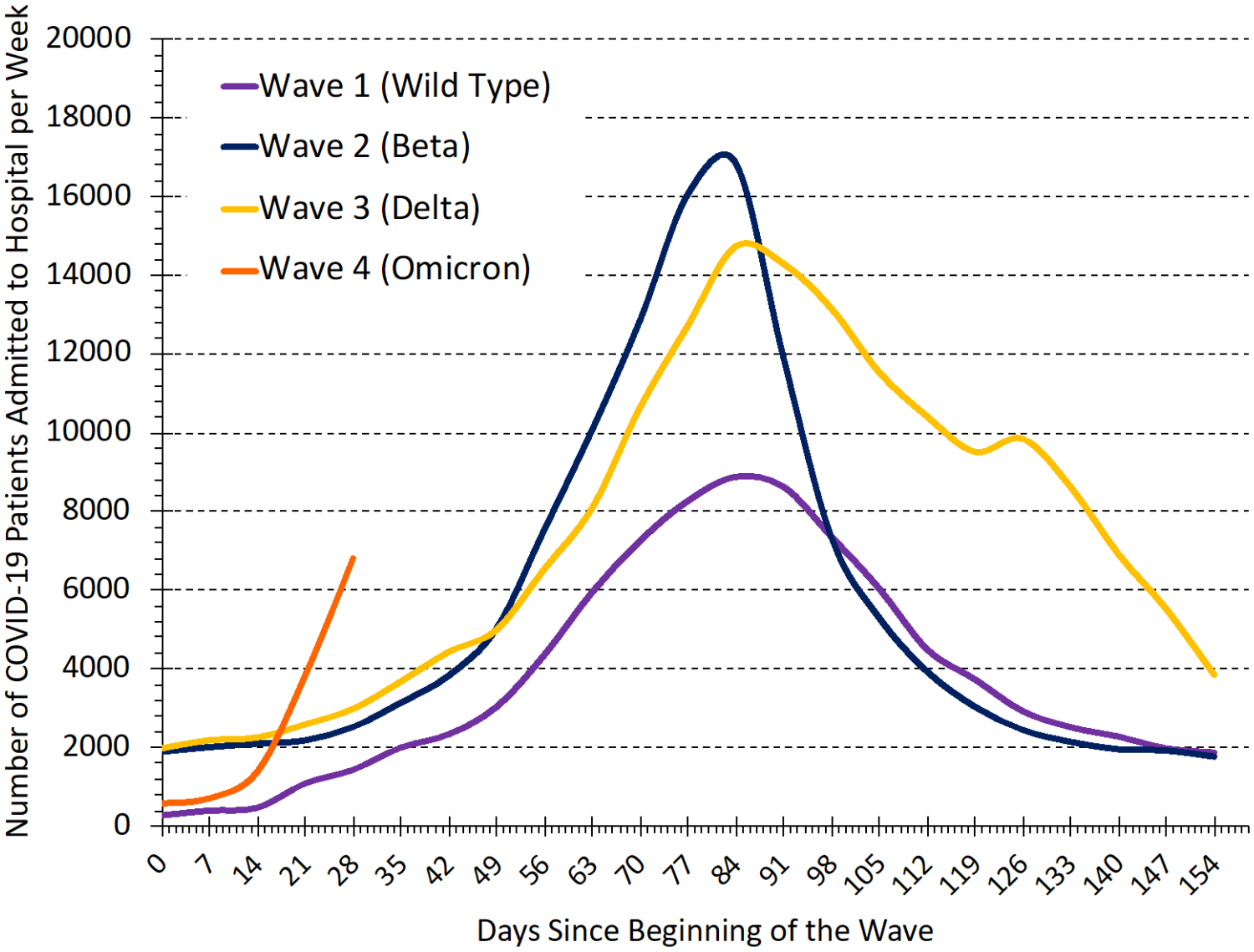
In-Hospital COVID-19 Patients in Gauteng, South Africa (15.5 Million Inhabitants)



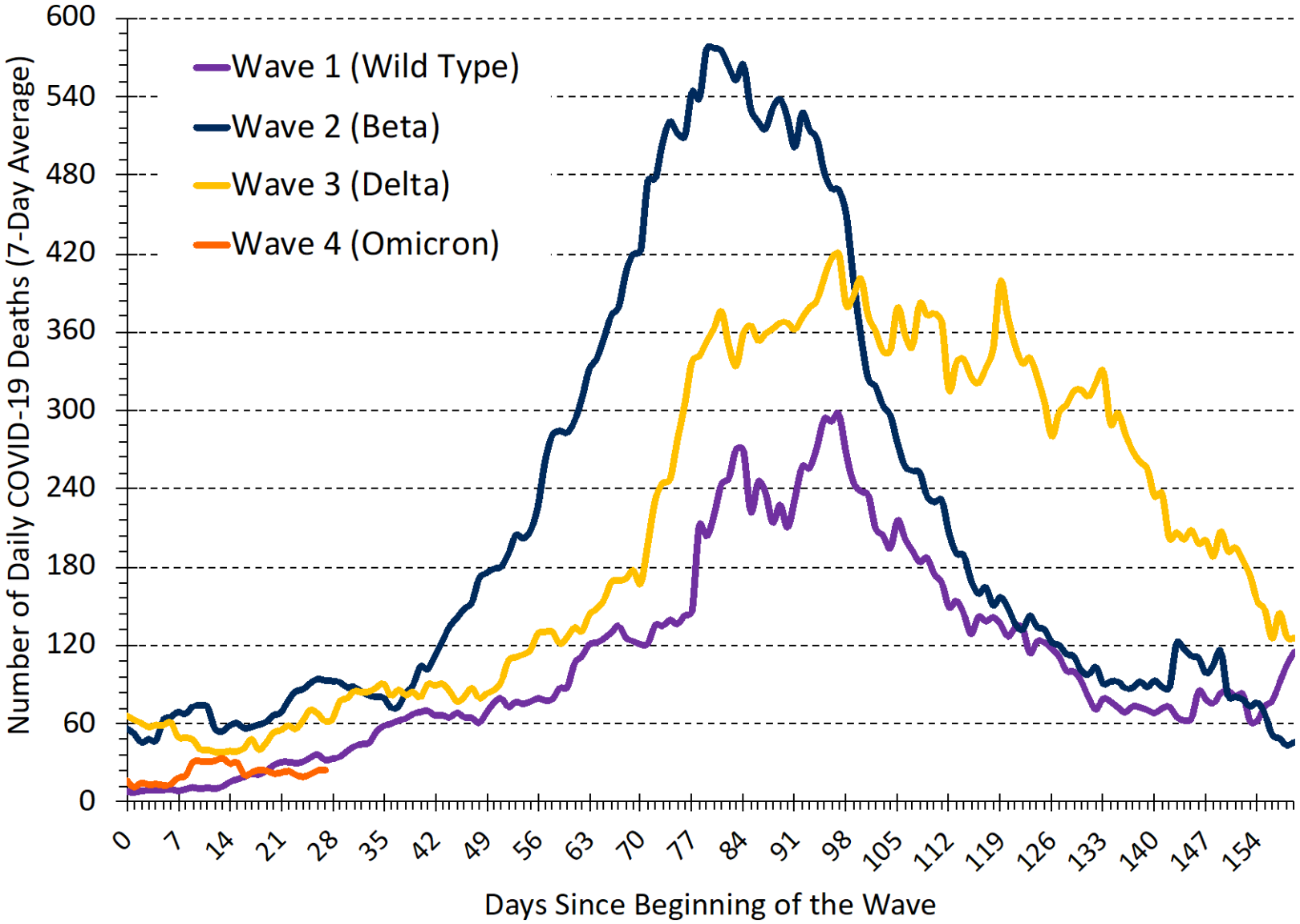
Daily COVID-19 Cases in South Africa



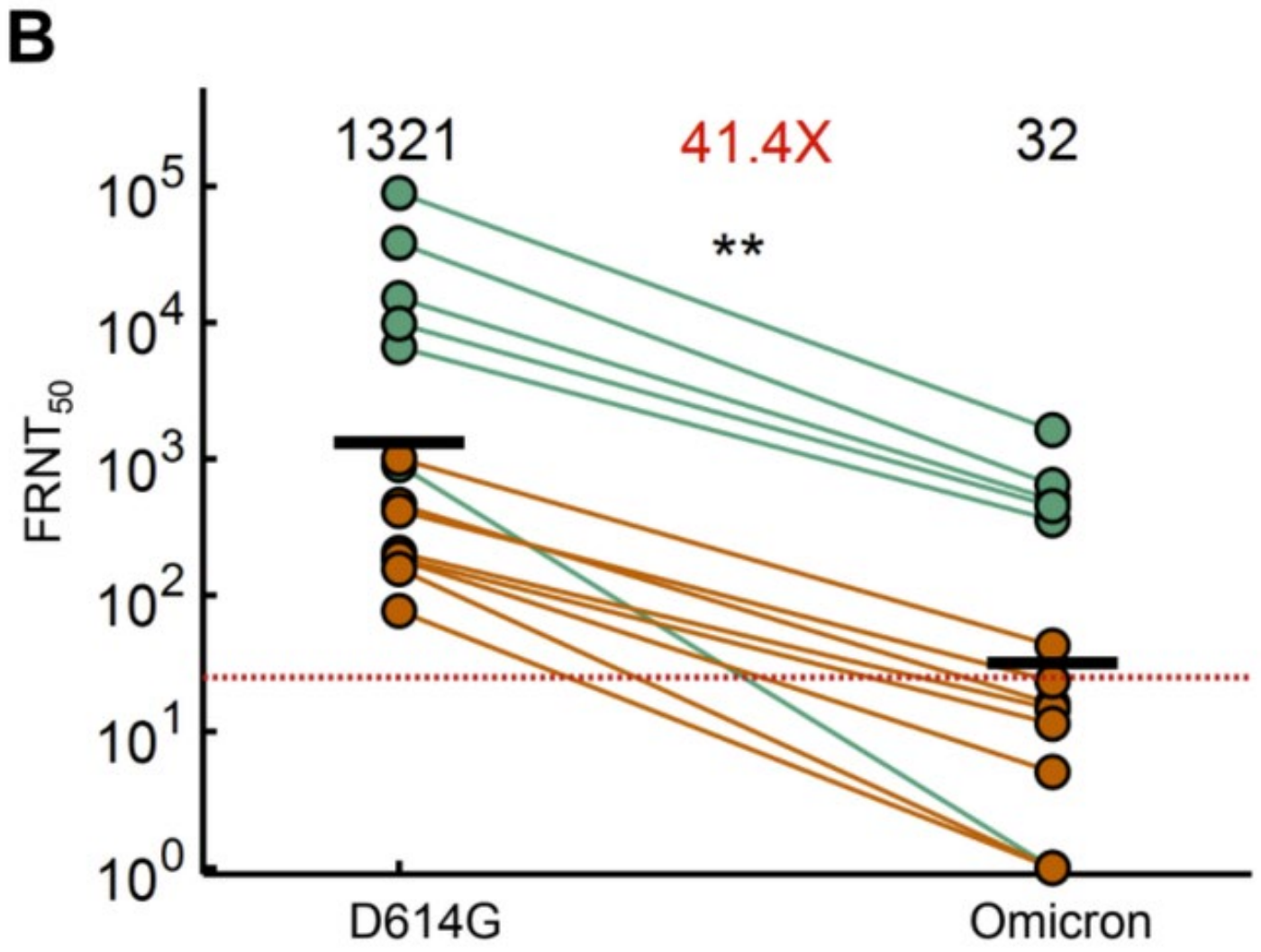
COVID-19 Patients Admitted to Hospital per Week in South Africa

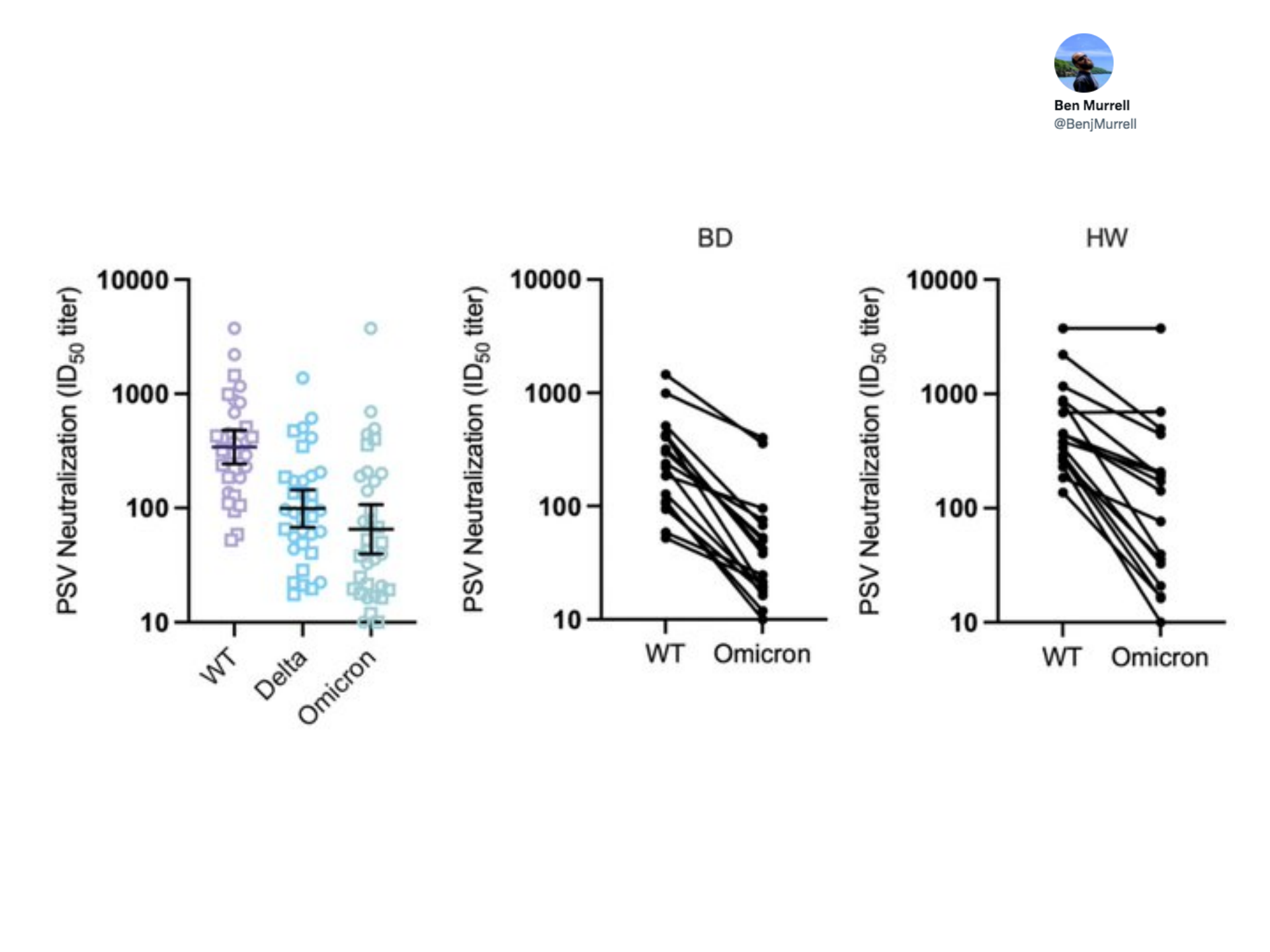


Daily In-Hospital COVID-19 Deaths in South Africa



Alex Sigal
@sigallab

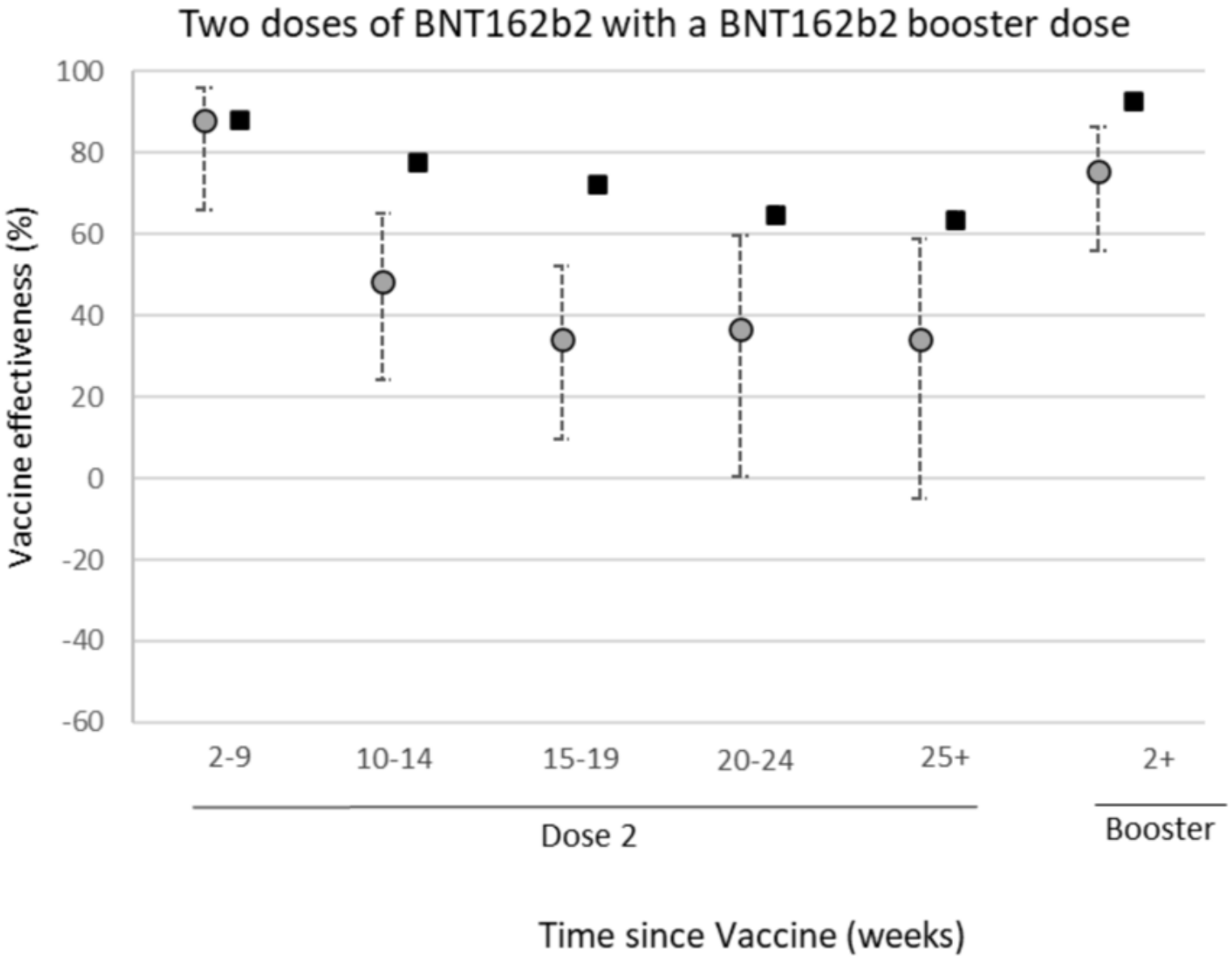



Ben Murrell
@BenjMurrell
PSV Neutralization (ID50 titer)
10000
1000
100
10
WT
Delta
Omicron
BD
PSV Neutralization (ID50 titer)
10000
1000
100
10
WT
Omicron
HW
PSV Neutralization (ID50 titer)
10000
1000
100
10
WT
Omicron

Crude, preliminary and unadjusted estimate of vaccine effectiveness against hospitalization in Gauteng

Hospital admissions	Risk	Risk ratio		VE
Vaccinated	0.125	0.35		
Unvaccinated	0.85	1.33	0.26	0.74

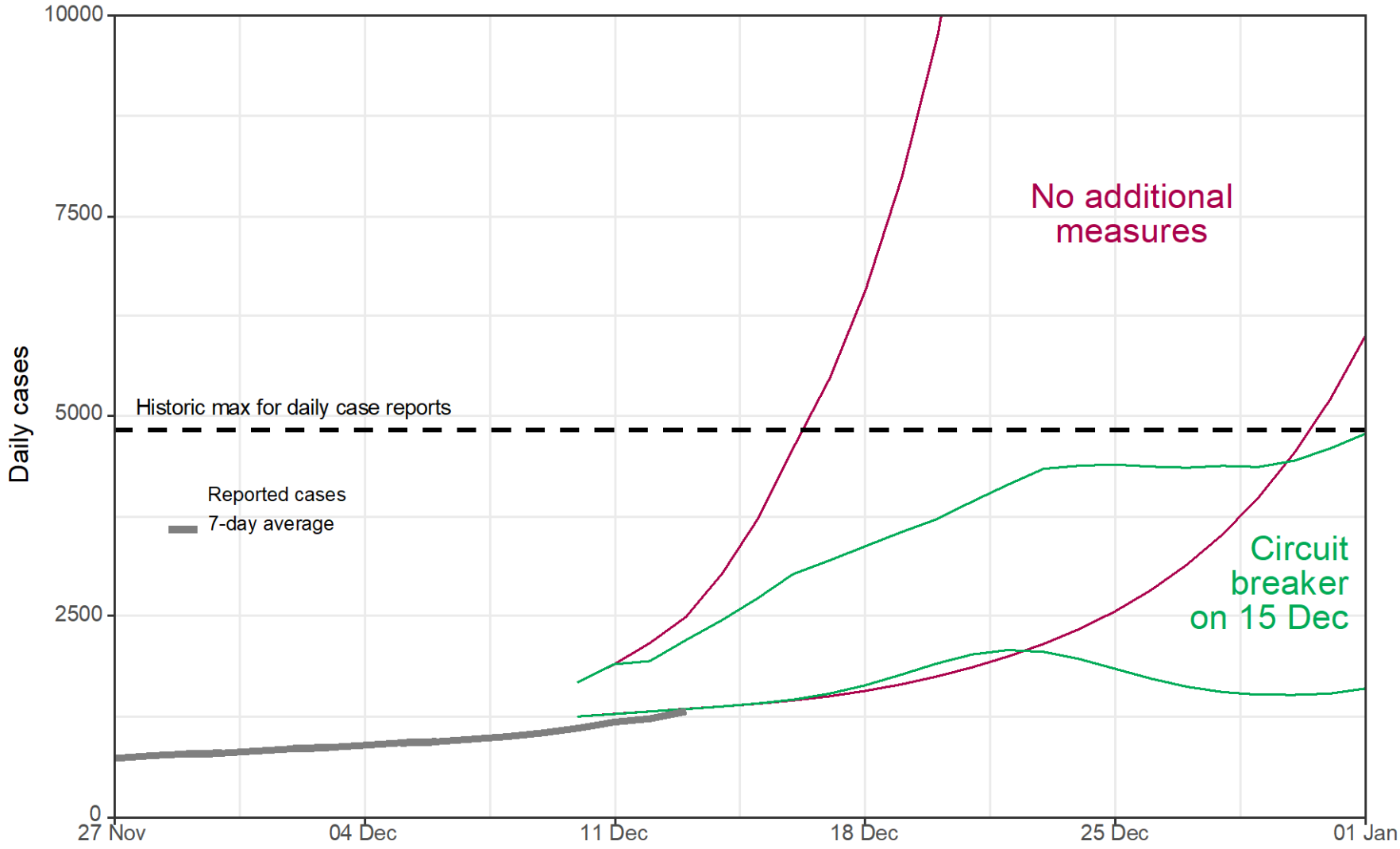
Vaccinated		
18+	0.36	Adult population 18+, 90% had at least 1 infection VE estimate crude, age cannot be adjusted for

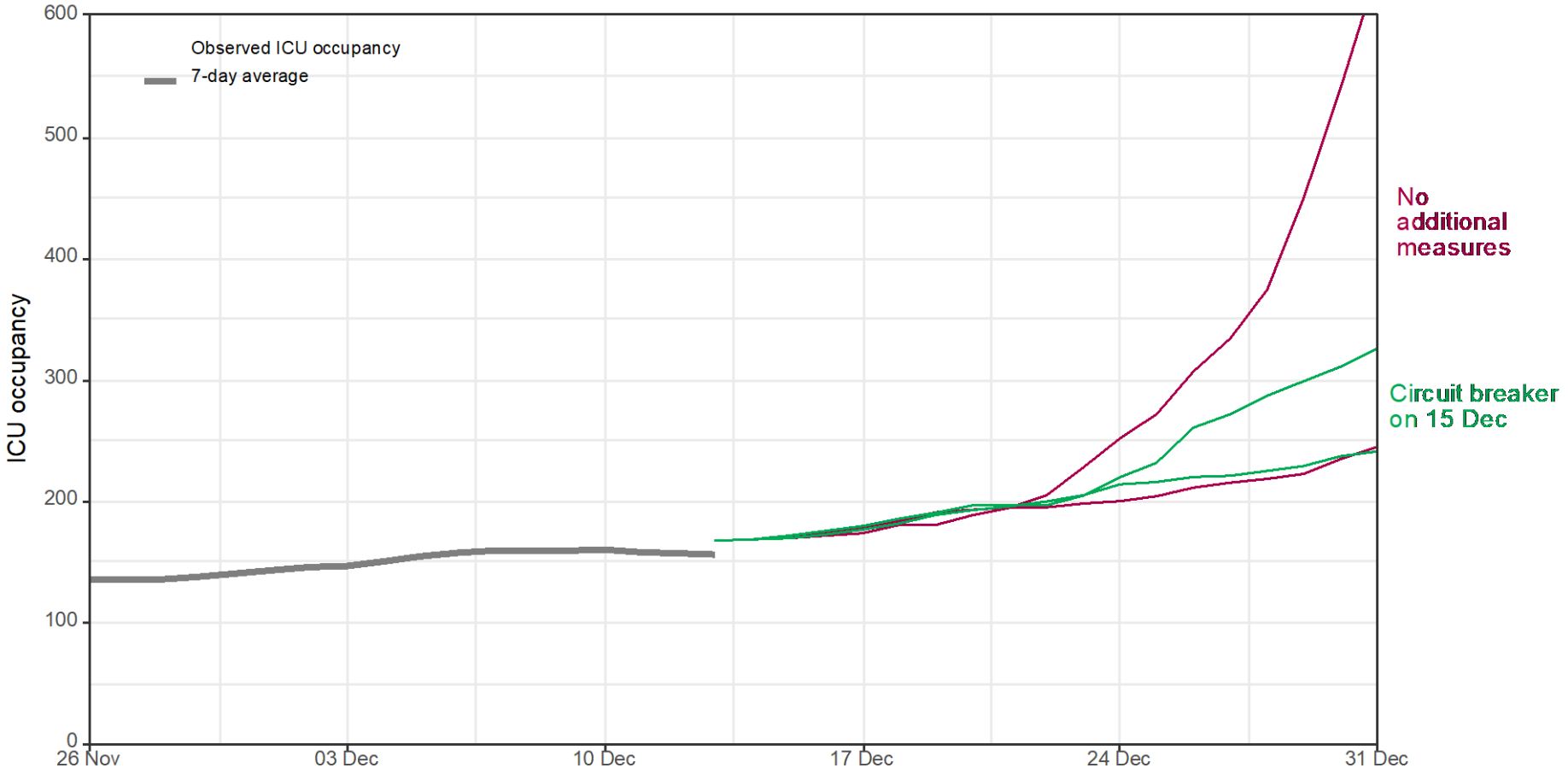


Source: UK HAS https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1040076/Technical_Briefing_31.pdf

Conclusions regarding neutralizing ability after vaccination

- 20 to 40-fold decrease in neutralizing ability of antibodies
  - Higher antibody levels required
- Impacts infections more than hospitalizations
  - Role of T- and B-cells and long lasting plasma cells in preventing serious outcomes


10000
7500
5000
2500
0
Daily cases
Historic max for daily case reports
Reported cases
7-day average
No additional measures
Circuit breaker on 15 Dec
27 Nov
04 Dec
11 Dec
18 Dec
25 Dec
01 Jan


Observed ICU occupancy
7-day average
ICU occupancy
600
500
400
300
200
100
0
26 Nov
03 Dec
10 Dec
17 Dec
24 Dec
31 Dec
No additional measures
Circuit breaker on 15 Dec

Conclusions

- Sotrovimab supply and distribution required
  - Previous antibodies do not work against Omicron
- Reduction of capacity limits in indoor spaces as VE against infection will be strongly reduced before 3rd dose
  - Vaccine certificates will protect unvaccinated from severe outcomes
- 3rd dose rollout needs to happen as soon and complete as possible
  - Increase in antibodies will decrease transmission among vaccinated
- Congregate settings currently at high risk of outbreaks given low VE against infection

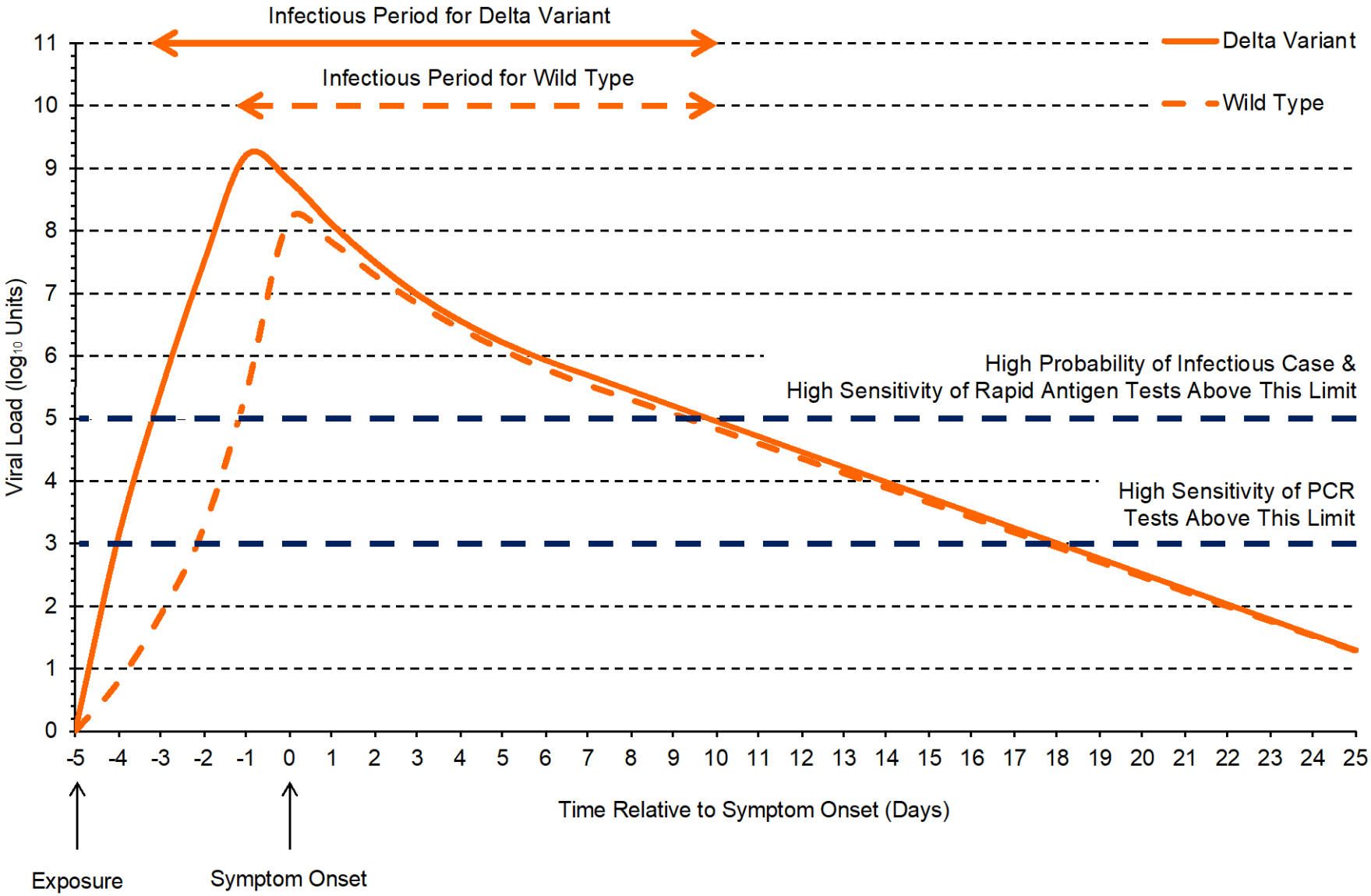


Figure 1. Representative Trajectories of Viral Loads for the Delta Variant as Compared with the Wild Type
After exposure, the Delta variant shows an early increase in viral loads that likely results in considerably higher viral loads than observed with the wild type one to four days after exposure, typically reaching a viral load of 100,000 copies/mL (5 $\log_{10}$ units) one to two days after exposure. The viral load of the Delta variant peaks about one day earlier than the wild type. After reaching the peak viral load, the trajectories between Delta and wild type are likely similar.

Type of Testing	Description
	Rapid Antigen Testing in Asymptomatic Individuals
Voluntary screen testing	Regular voluntary testing of asymptomatic individuals to find cases in moderate-risk settings such as schools and workplaces.
Test to stay	Daily voluntary testing of asymptomatic contacts of individuals with a positive COVID-19 test in schools instead of requiring isolation.
Test to protect	Regular mandatory testing of asymptomatic individuals to find cases in high-risk settings to protect the vulnerable (e.g. hospitals, long-term care homes, prisons).
Test to enable (including "test to play")	Regular mandatory testing of asymptomatic individuals to enable participation in activities with a high risk of transmission (e.g. close-contact sports, visits to long-term care homes).
Test to release	One-time or repeated mandatory testing of asymptomatic contacts or travellers to allow for early release from quarantine.
Outbreak response testing	One-time or repeated voluntary or mandatory testing of asymptomatic individuals in a facility with a COVID-19 outbreak as an alternative to closure.
	Rapid Antigen Testing in Symptomatic Individuals
Diagnostic testing	One-time or repeated testing of symptomatic individuals in settings where PCR testing is less accessible, or in individuals with few or atypical symptoms.

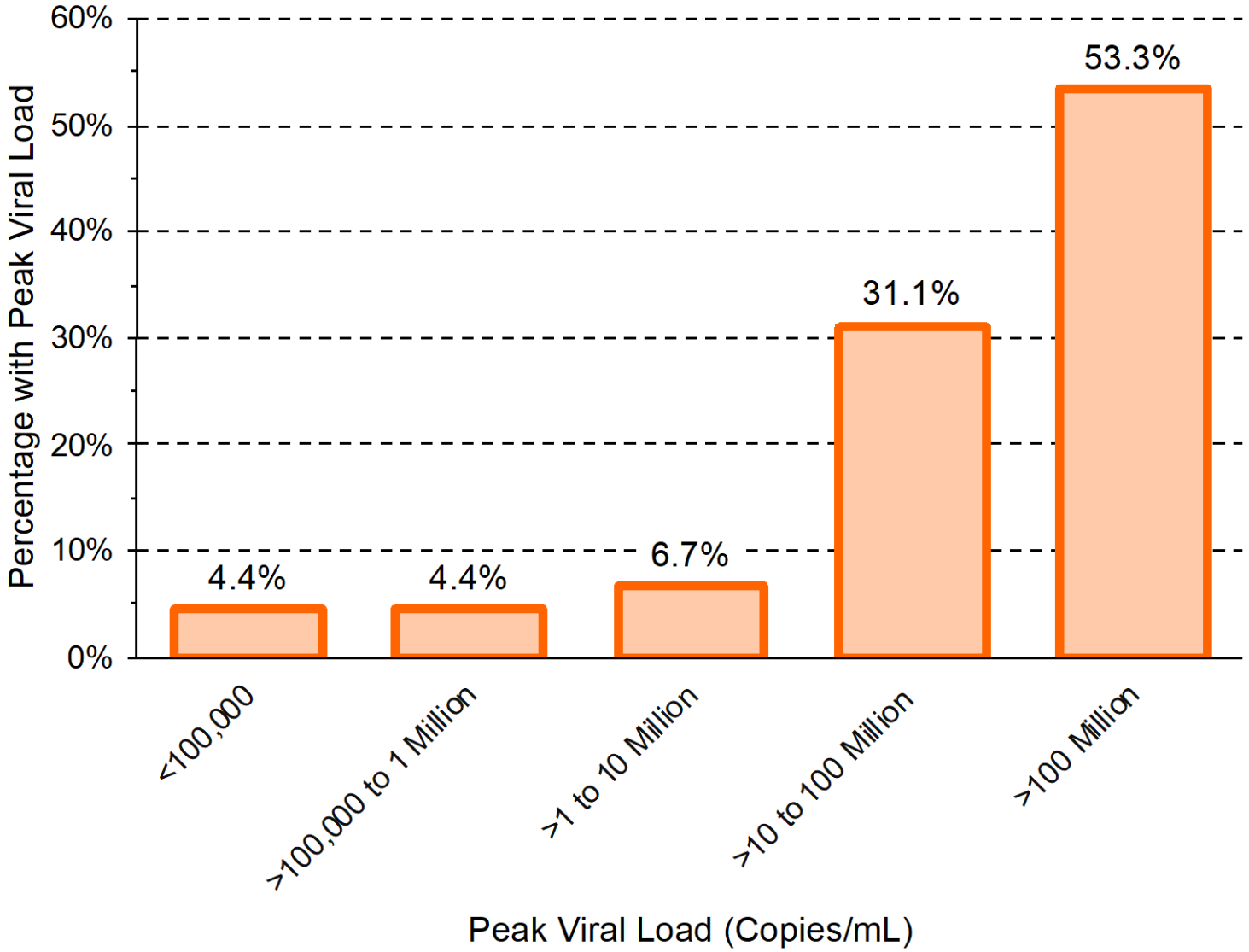
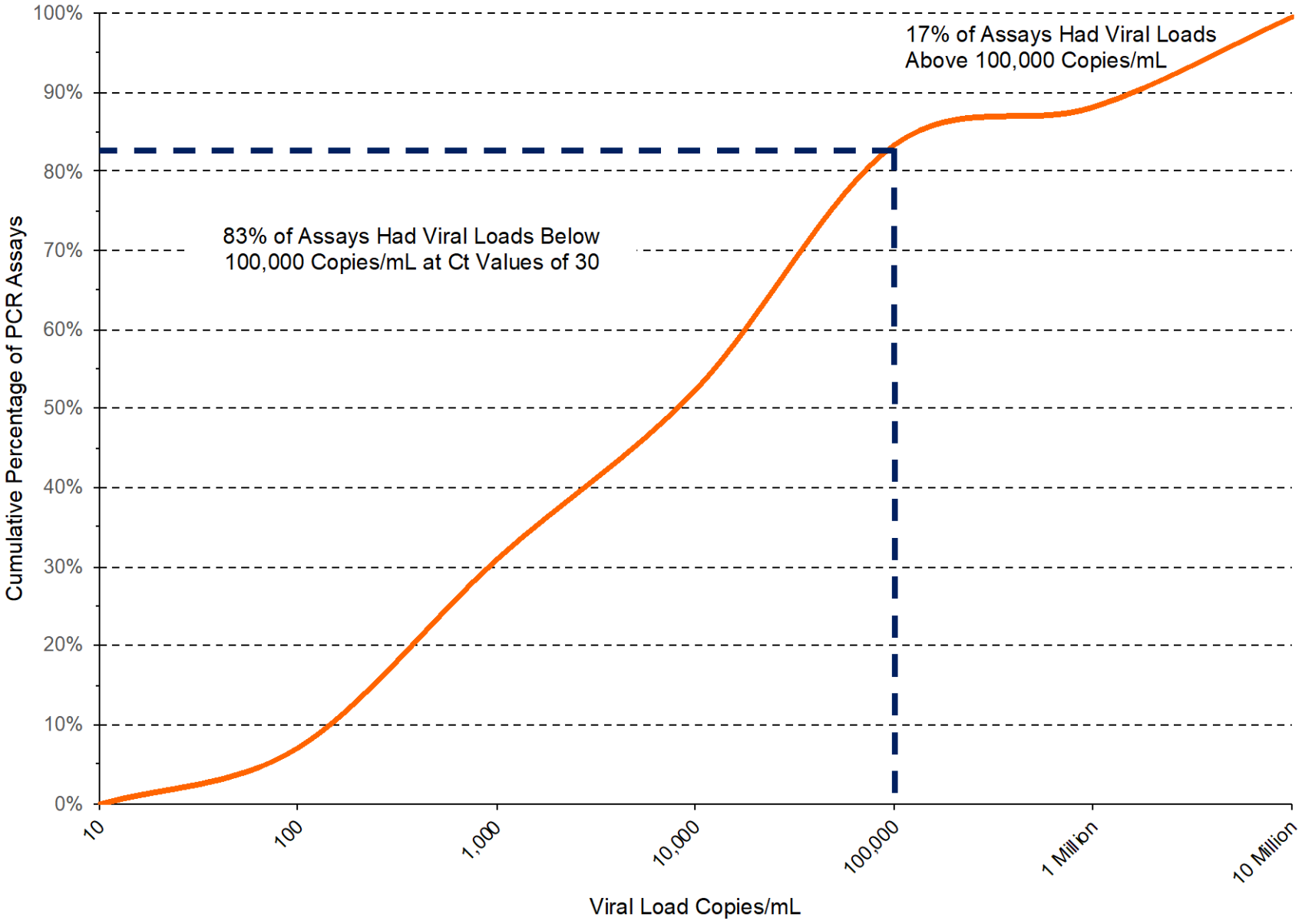


Figure 2. Peak Viral Load Observed in 45 Individuals Infected with the Delta Variant
45 individuals infected with the Delta variant who underwent daily testing after exposure were included. 16 individuals were unvaccinated, 29 were fully vaccinated. The peak viral loads were similar between unvaccinated and fully vaccinated individuals, but viral load declined faster in vaccinated individuals after reaching the peak. A total of 41 individuals (91.8%) had peak viral loads greater than 1 million copies/mL (6 $\log_{10}$ units). Data from Singanayagam (2021).

Test and Ct values	Number of Samples	Sensitivity (95% CI)
Any Rapid Antigen Test		
Ct value ≥25	987	50.7% (35.6% to 65.8%)
Ct value <25	3'004	95.8% (92.3% to 97.8%)
Abbott Panbio		
Ct value ≥25	482	61.2% (38.8% to 79.7%)
Ct value <25	838	94.1% (83.8% to 98.0%)
Any Rapid Antigen Test		
Ct value ≥30	509	20.9% (12.5% to 32.8%)
Ct value <30	2'879	79.9% (70.3% to 86.9%)
Abbott Panbio		
Ct value ≥30	215	30.5% (16.0% to 50.4%)
Ct value <30	1'233	83.4% (69.1% to 91.9%)

Data from Brümmer (2021)


17% of Assays Had Viral Loads
Above 100,000 Copies/mL
83% of Assays Had Viral Loads Below
100,000 Copies/mL at Ct Values of 30
Cumulative Percentage of PCR Assays
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
10
100
1,000
10,000
100,000
1 Million
10 Million
Viral Load Copies/mL

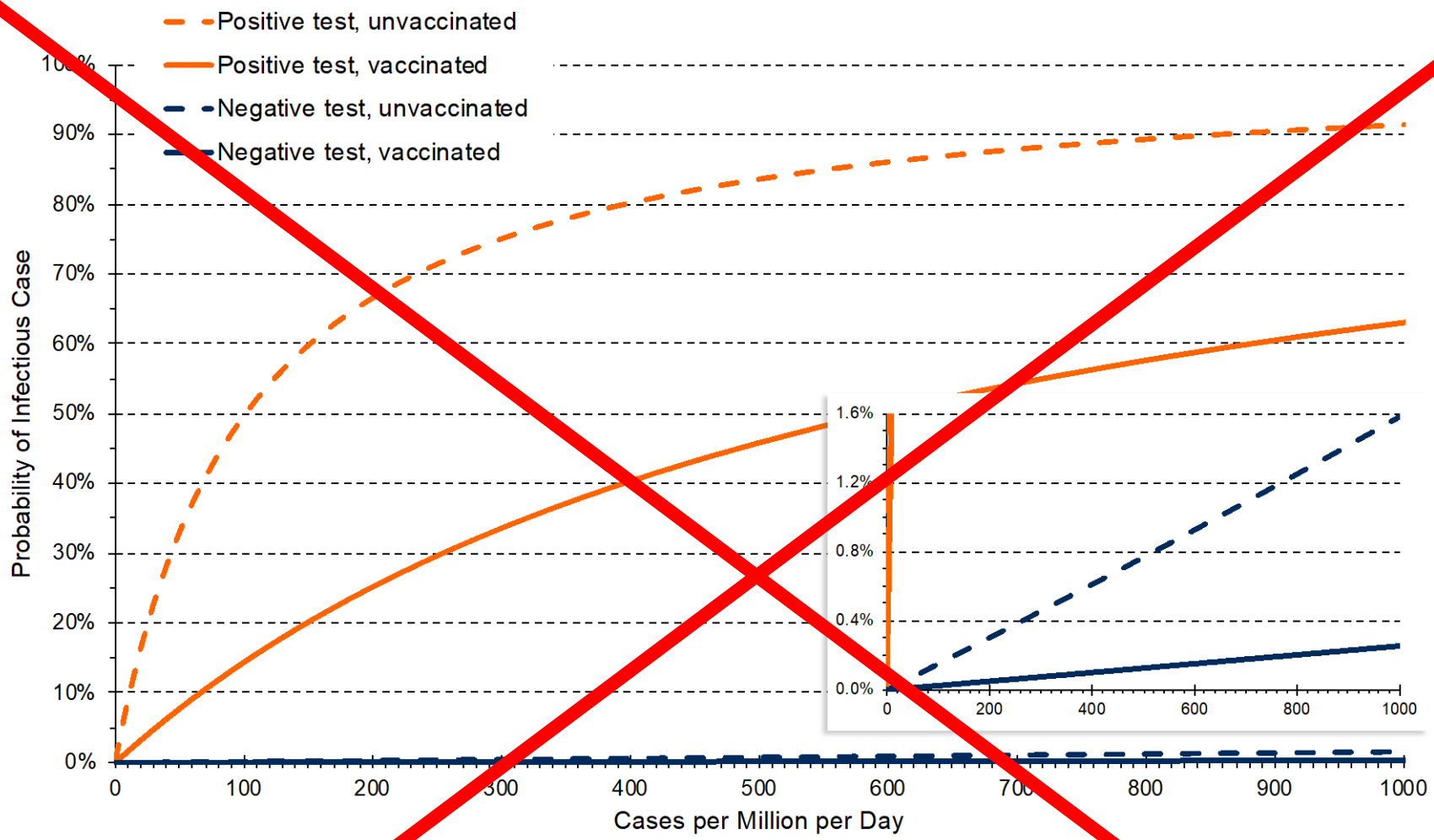


Figure 8. Probability of Infectious Case after a Positive or Negative Test by Vaccination Status

Relationship between the daily rate of COVID-19 cases in Ontario and post-test probability of an infectious case after a negative or positive rapid antigen test for unvaccinated and vaccinated people. Estimates are based on 14-day averages of the relationship between overall rates, and rates in unvaccinated and vaccinated individuals as of November 21, 2021. This relationship can change over time depending on vaccine coverage and immunity afforded by full vaccination. For example, the post-test probability of an infectious case after a positive test at 50 cases per 1 million inhabitants per day (740 cases per day in Ontario) is 33% in unvaccinated individuals, but only 8% in fully vaccinated individuals, which justifies rapid antigen tests only in unvaccinated individuals. However, at a rate of 200 cases per 1 million inhabitants per day, the post-test probability after a positive test is 67% in unvaccinated individuals and 25% in vaccinated individuals, justifying rapid antigen test use in both groups. The post-test probability of an infectious case after a negative test is always below 1% when the rate is below 600 cases per 1 million inhabitants per day.

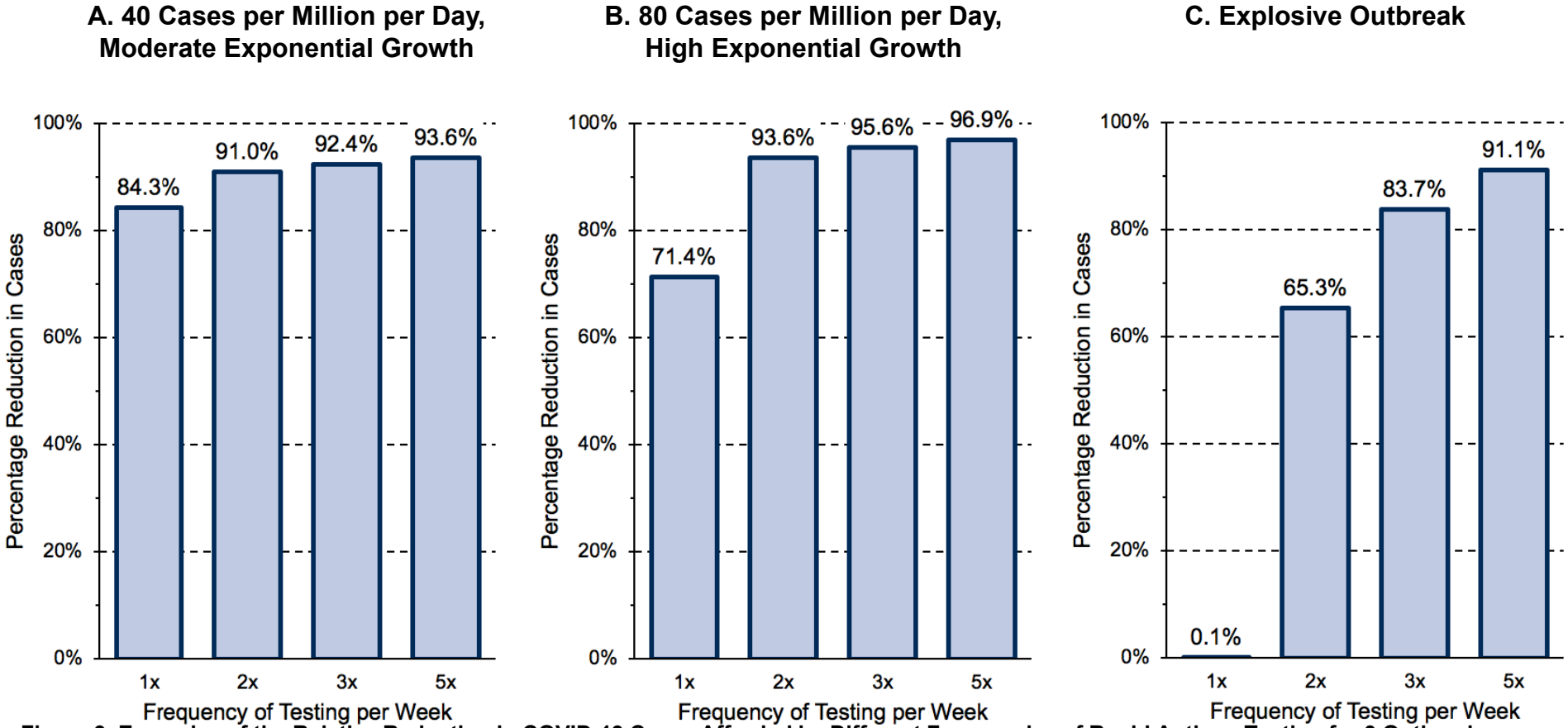


Figure 9. Examples of the Relative Reduction in COVID-19 Cases Afforded by Different Frequencies of Rapid Antigen Testing for 3 Outbreak Scenarios

Relative reduction in COVID-19 cases afforded by different frequencies of rapid antigen testing for 3 outbreak scenarios. Modelling was based on a hypothetical cohort of 5000 unvaccinated college students followed for 80 days when the wild type virus was dominant. Scenario A assumed a rate of 40 COVID-19 cases per million per day introduced in the college from the community and moderate exponential growth with an effective reproduction number (R_t) of 1.5. Scenario B assumed 80 cases per million per day, and high exponential growth with an R_t of 2.5. Scenario C assumed 200 cases per million per day, and explosive exponential growth with an Rt of 3.5. In scenarios B and C, weekly testing is unlikely to sufficiently reduce transmission and testing 2 to 3 times per week should be considered. Data from Paltiel 2020.

Thank you