

# Epidemiology of SARS-CoV-2 in South Africa including Omicron

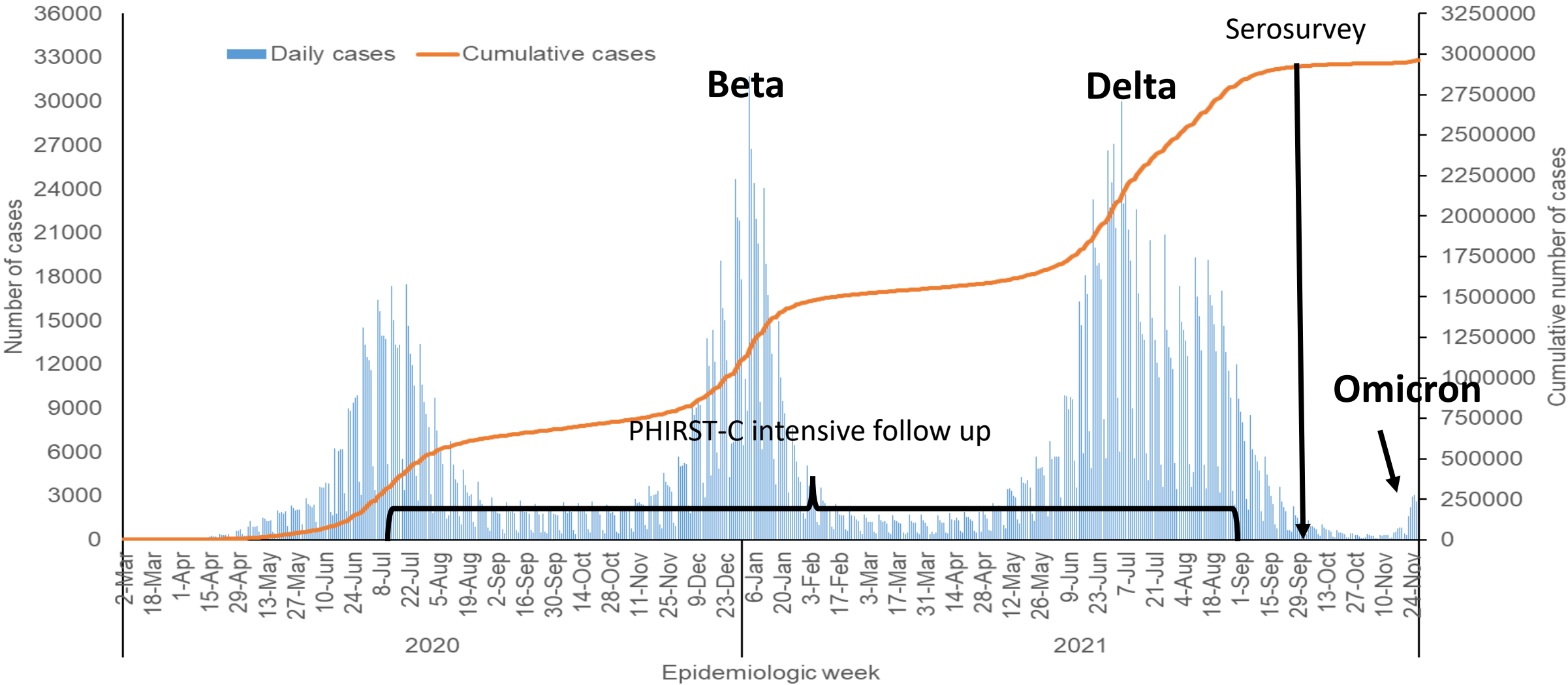
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National Institute for Communicable Diseases

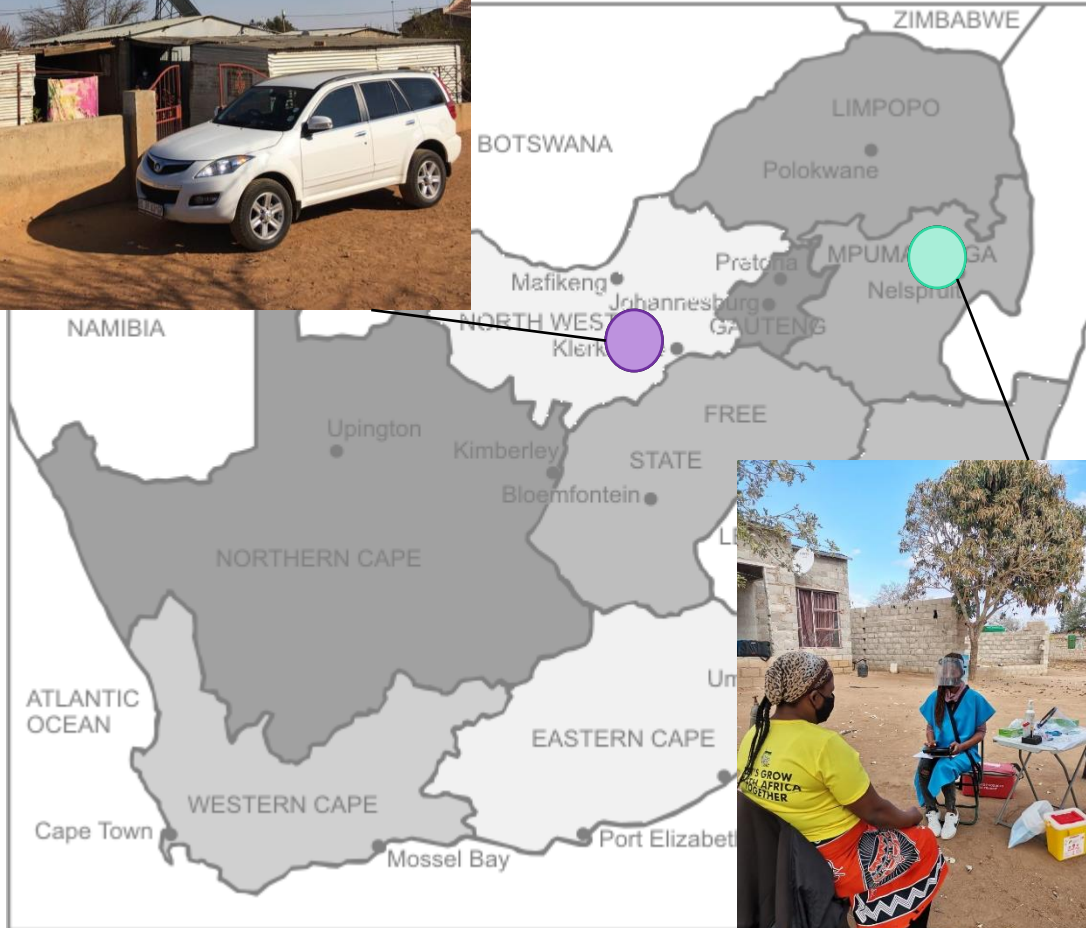
National Health Laboratory Service

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Number and cumulative number of laboratory-confirmed cases of COVID-19 by province and date of specimen collection, South Africa, 3 March 2020 – 22 May 2021 (n=1 635 465)



# PHIRST-C Study design and recruitment



- Prospective household-level community cohort
- 2 sites: **Agincourt Demographic Surveillance Site (rural)** and **Jouberton in Klerksdorp (urban)**
- Random selection of ~100 households at each site >500 individuals per site (>1000 total) – from previous PHIRST cohort (new households if needed)
- Verify eligibility and baseline data, baseline blood (serology), HIV status and viral load, underlying illness

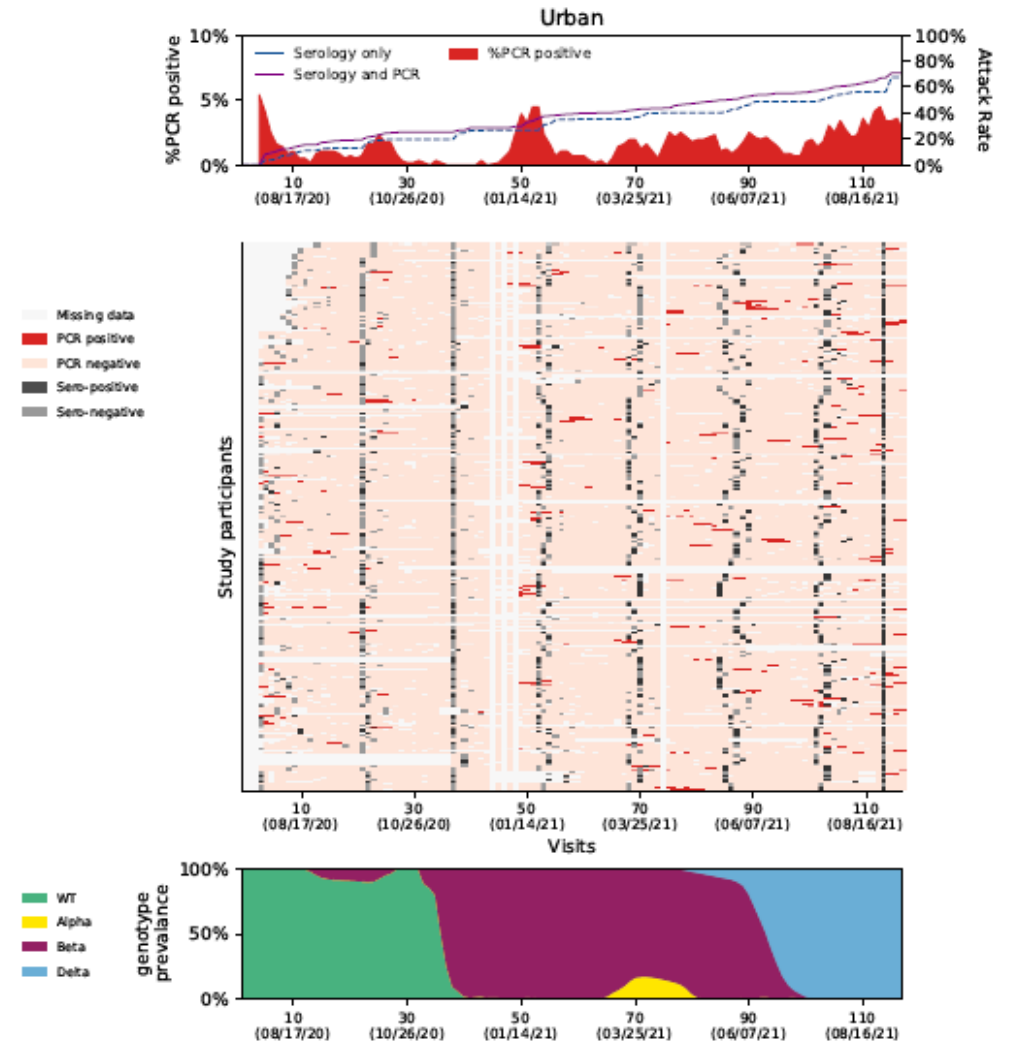
**Intense 14 months follow up** - July 2020 to end August 2021

- **Twice weekly** household visit (Monday to Wednesday and Thursday to Saturday), mid-turbinate **nasal swab** (Seegene real-time reverse transcriptase PCR – SARS-CoV-2, Flu, RSV), data on **symptoms** and healthcare seeking
- **Two monthly blood draw** (serology – ELISA Roche Elecsys and neutralising antibodies)

Cohen et al Lancet Global Health, 2021;  
Cohen et al Infl Other Resp Virus 2021

# High attack rate, mostly asymptomatic, some severe

- Of 125,088 potential follow-up visits July 2020 - 28 August 2021
  - 115,759 (93%) nasal swabs tested,
- 62% (749/1200) individuals at least one infection
  - 12% reinfection rate
- 90% (200/222) households at least one infection
- 15% (96/662) of infection episodes had symptoms
  - 6 (6%) attended outpatient clinic
  - 9 (9%) hospitalised
  - 2 (2%) died (IFR 0.3% (95% CI 0.03%-1%))
- 25% (213/856) of susceptible household contacts acquired infection
  - Beta variant 4 times and Delta 15 times more infectious than wild type virus

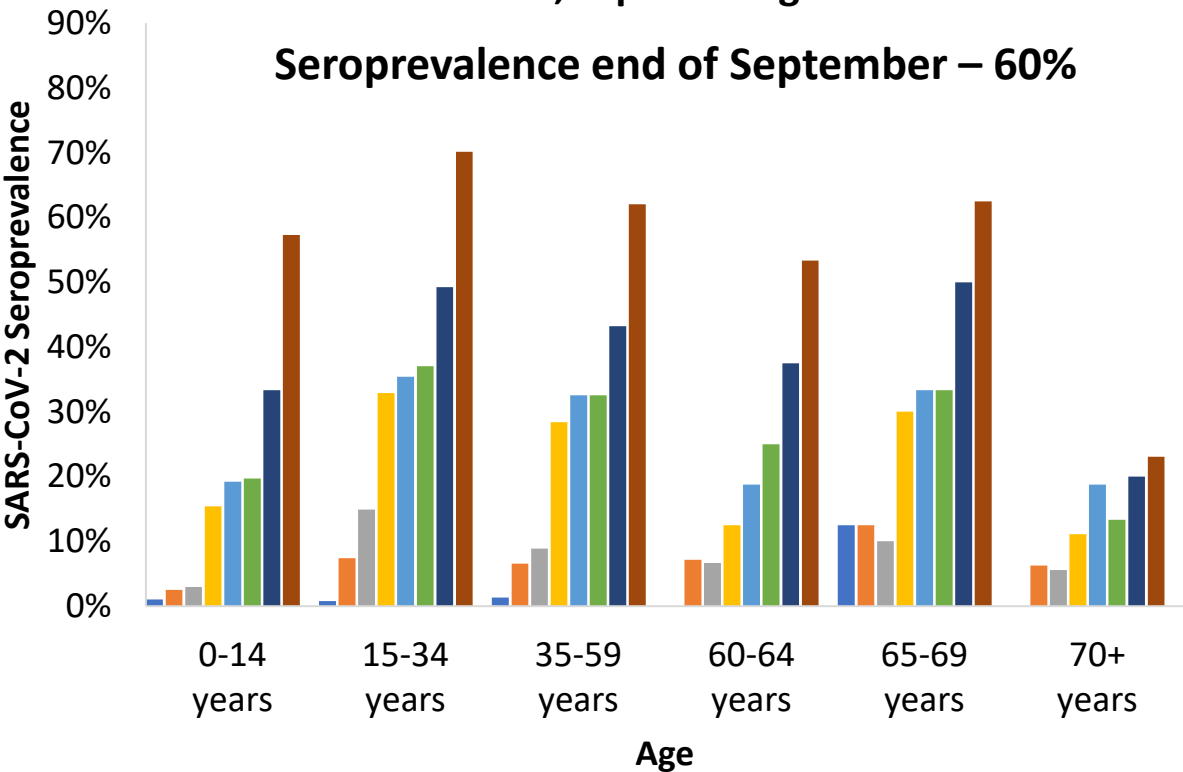


# High proportion of individuals with previous natural infection after third wave

4-6% of infections diagnosed in South Africa  
Age standardised infection fatality ratios 0.1-0.4% in 1<sup>st</sup> wave

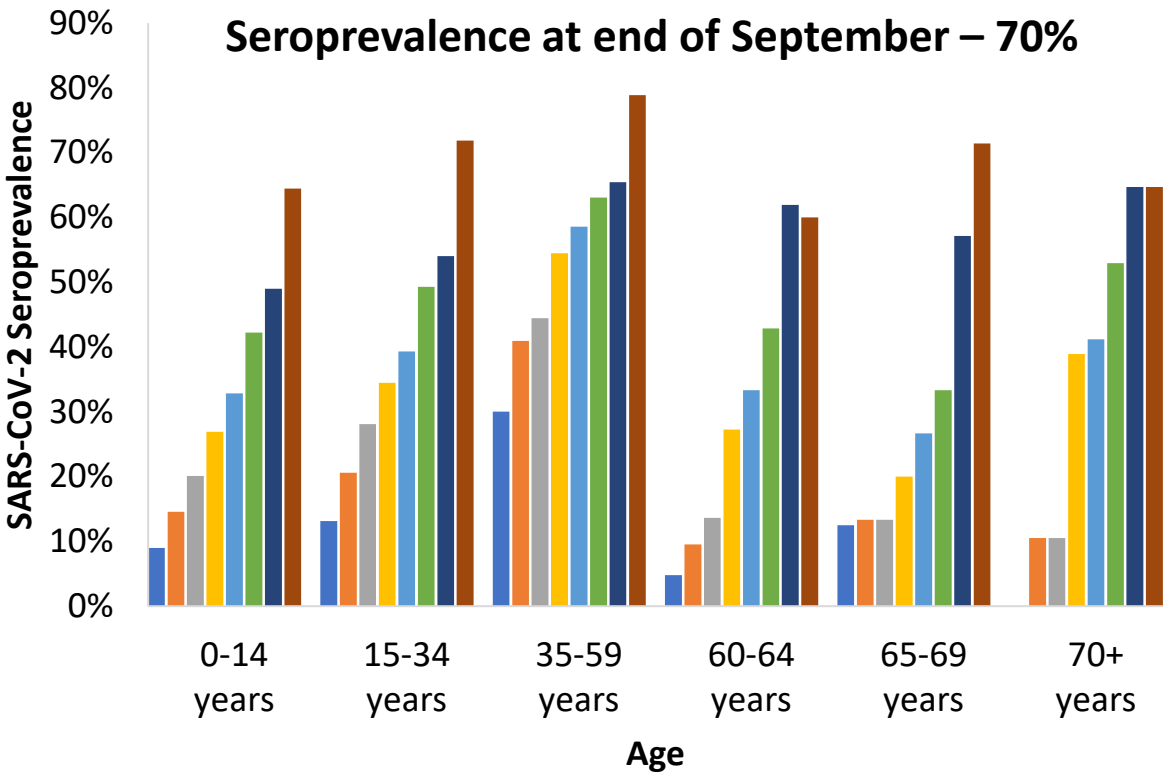
Rural site, Mpumalanga

Seroprevalence end of September – 60%



Urban Site, Northwest

Seroprevalence at end of September – 70%



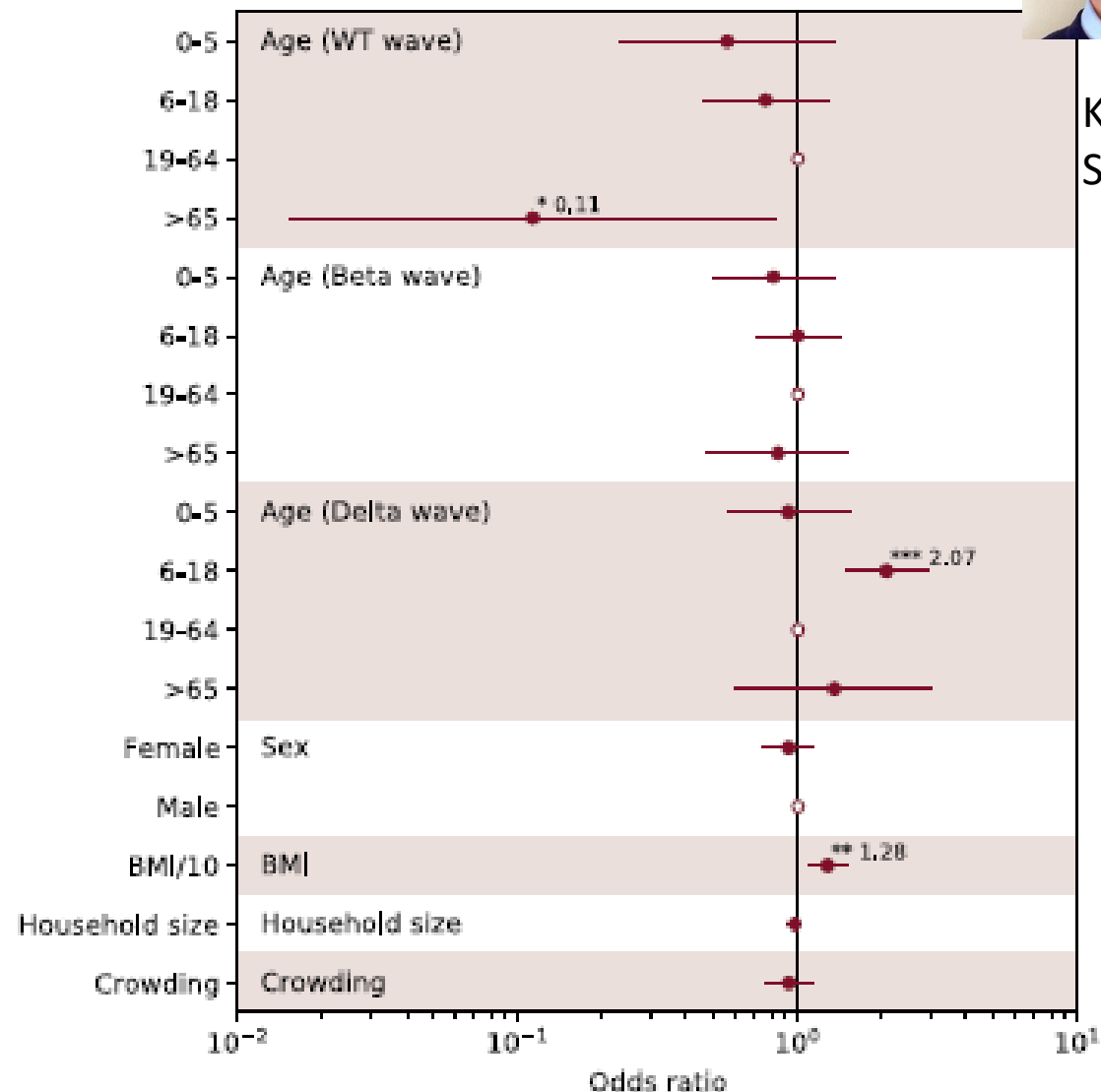
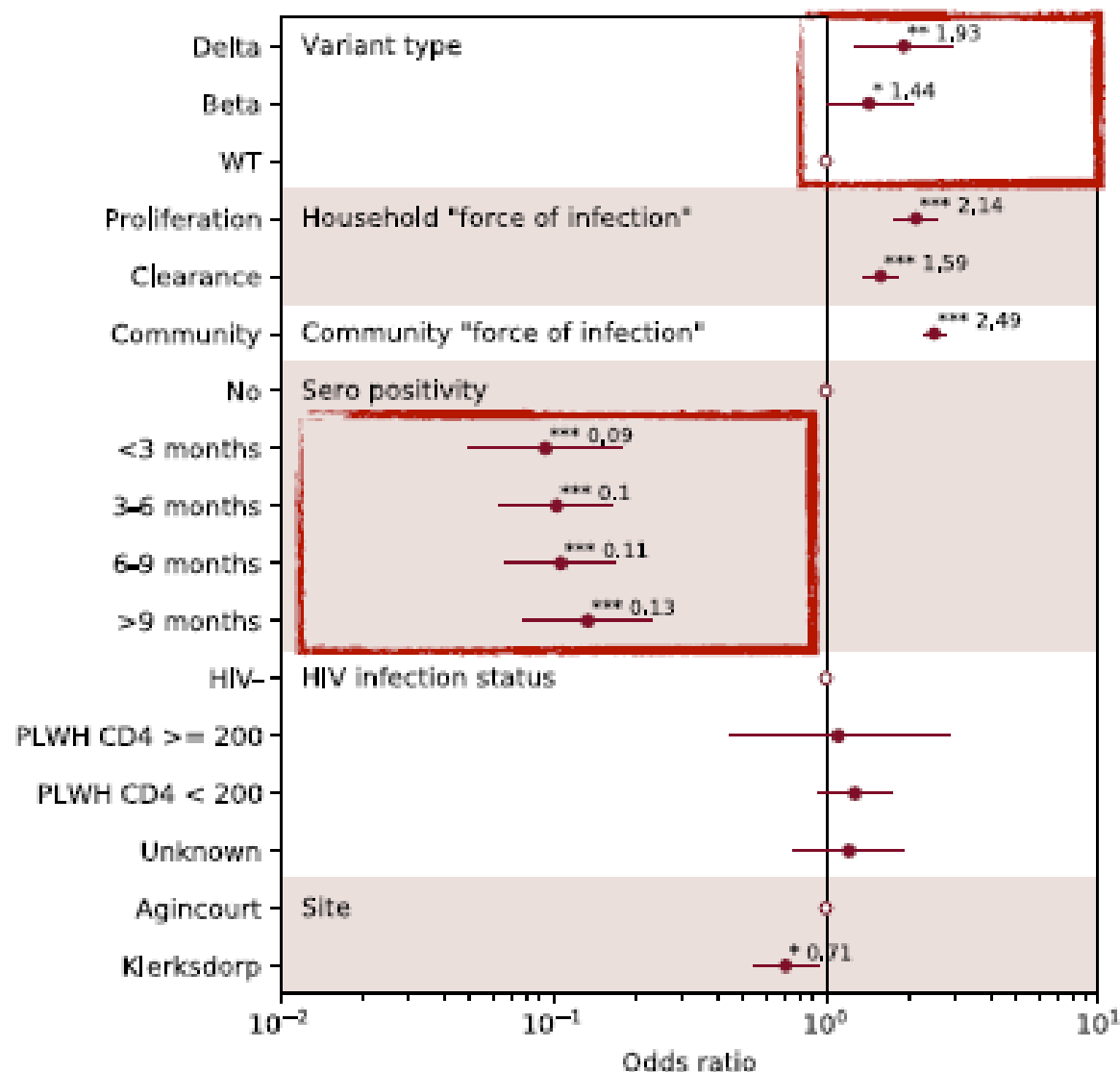
## PHIRST-C SARS-CoV-2 Seroprevalence, 20 July 2020 – 25 September 2021, South Africa

Blood draw (BD) 1: 20-Jul-20 to 17-Sep-20; BD 2: 21-Sep-20 to 10-Oct-20; BD 3: 23-Nov-20 to 12-Dec-20; BD 4: 25-Jan-21 to 21-Feb-21; BD 5: 22-Mar-21 to 11-Apr-21; BD 6: 20-May-21 to 09-Jun-21; BD 7: 19-Jul-21 to 05-Aug-21; BD 8: 13-Sep-21 to 25-Sep-21  
Kleynhans et al EID 2021 and unpublished data

# Risk factors associated with Transmission

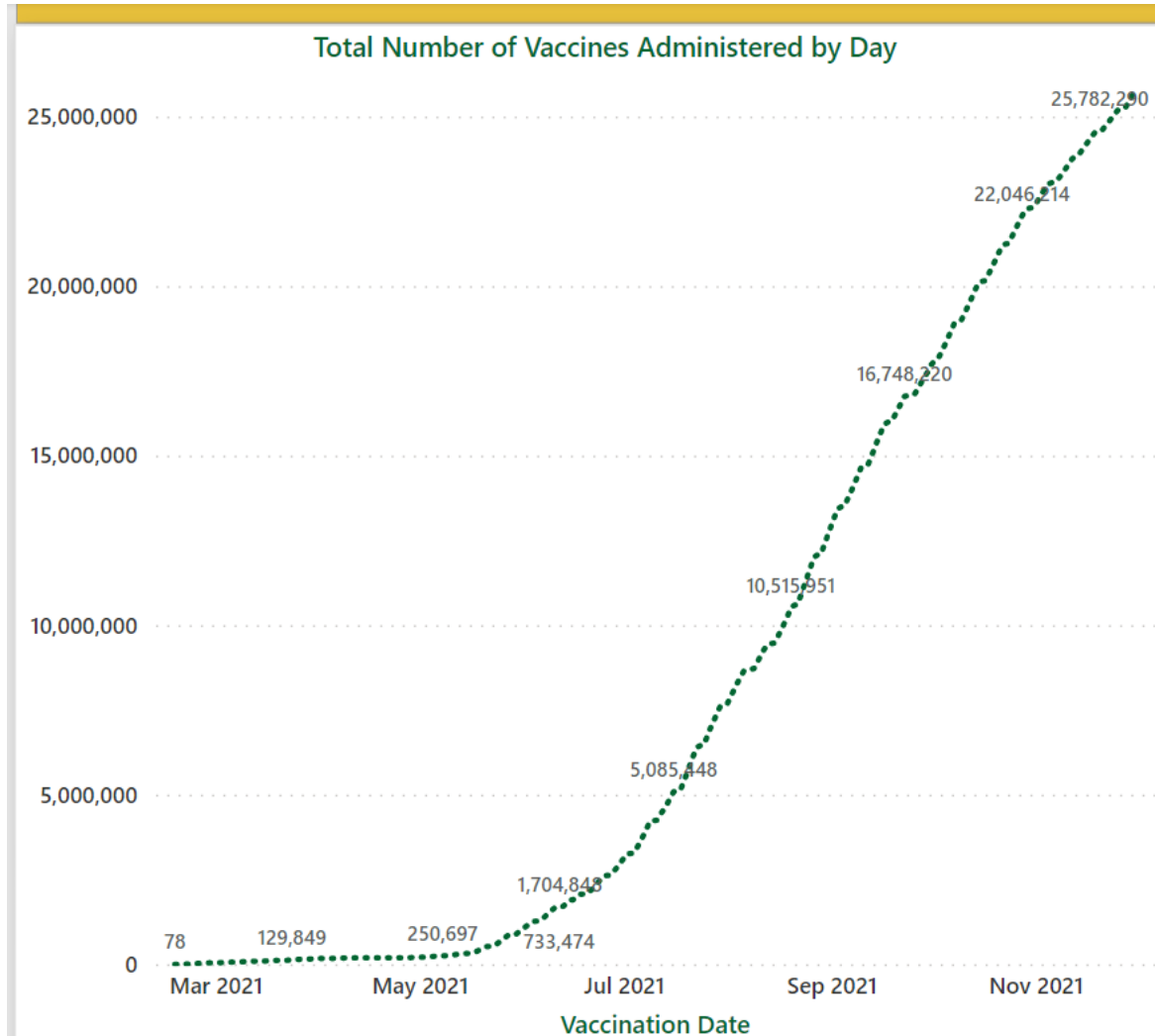


Kaiyuan Sun





# COVID-19 vaccination in SA, 01 Dec 2021



Province	Total Number of Individuals Vaccinated	Total Adult Population [18 Years & Older]	Individuals Vaccinated as a % of the Adult Population
Eastern Cape	1,951,655	4,099,543	47.61%
Free State	953,189	1,914,521	49.79%
Gauteng	4,366,033	11,311,326	38.60%
Kwazulu-Natal	2,598,912	7,219,795	36.00%
Limpopo	1,783,643	3,695,801	48.26%
Mpumalanga	1,095,238	3,039,520	36.03%
North West	1,107,772	2,693,247	41.13%
Northern Cape	368,568	847,545	43.49%
Western Cape	2,476,690	4,976,903	49.76%
<b>Total</b>	<b>16,701,700</b>	<b>39,798,201</b>	<b>41.97%</b>

Age Group	Total Number of Individuals Vaccinated	Total Adult Population [18 Years & Older]	Individuals Vaccinated as a % of the Adult Population
18-34	4,912,370	17,788,511	27.62%
35-49	5,399,205	11,686,937	46.20%
50-59	2,837,245	4,817,271	58.90%
60+	3,547,939	5,505,482	64.44%
Unidentified	4,941	0	0.00%
<b>Total</b>	<b>16,701,700</b>	<b>39,798,201</b>	<b>41.97%</b>

**NDoH, December 2021**

<https://sacoronavirus.co.za/latest-vaccine-statistics/>

# S gene target failure – proxy for 69-70del

## Thermo Fisher TaqPath assay

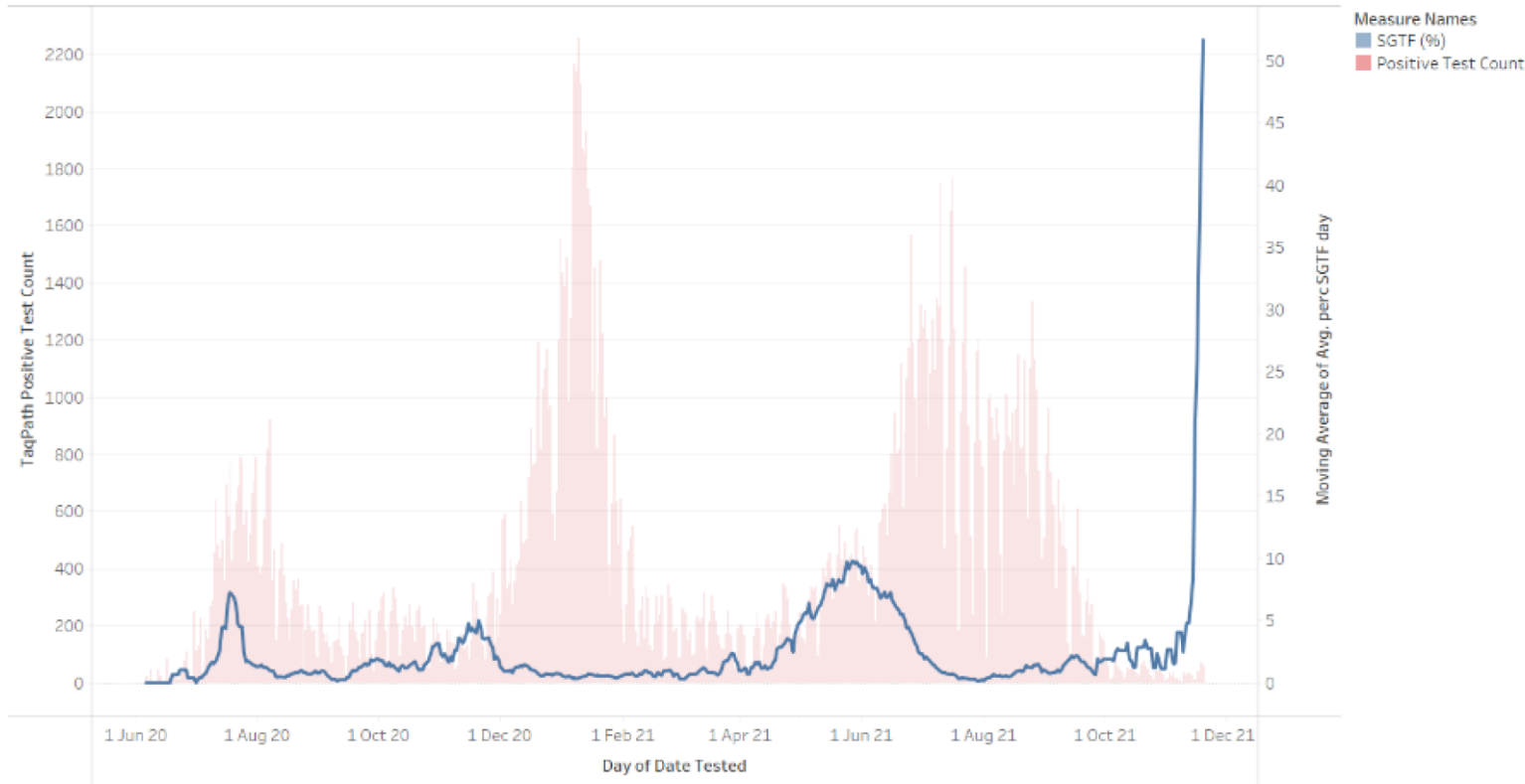


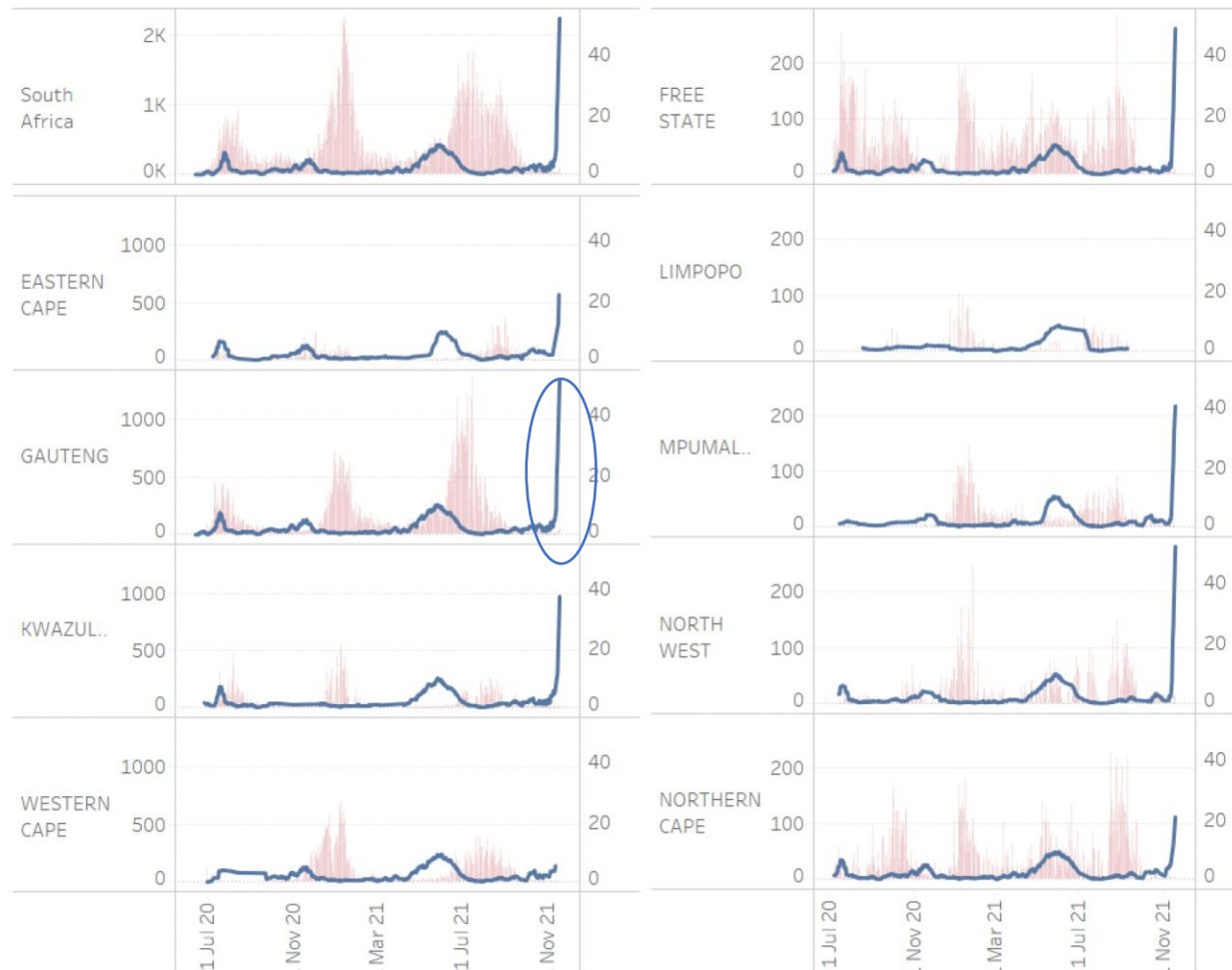
Figure 9: S-gene dropout (%) of cases with high VL (Ct value < 30 for ORF or N gene). The red bars are the number of tests reporting the presence of SARS-CoV-2 (daily) on the TaqPath assay. The solid blue line is the moving median of S-gene dropout (%).

\*Current (end of Nov '21) dramatically increasing trend in the proportion of SGTF (Ct value < 30 for ORF or N gene)

- S gene target failure was a proxy marker for Alpha variant, which was introduced in SA before Delta but never took over
- New increase in SGTF noted very recently - from mid-November
- ~20% of tests in public sector are TaqPath assay

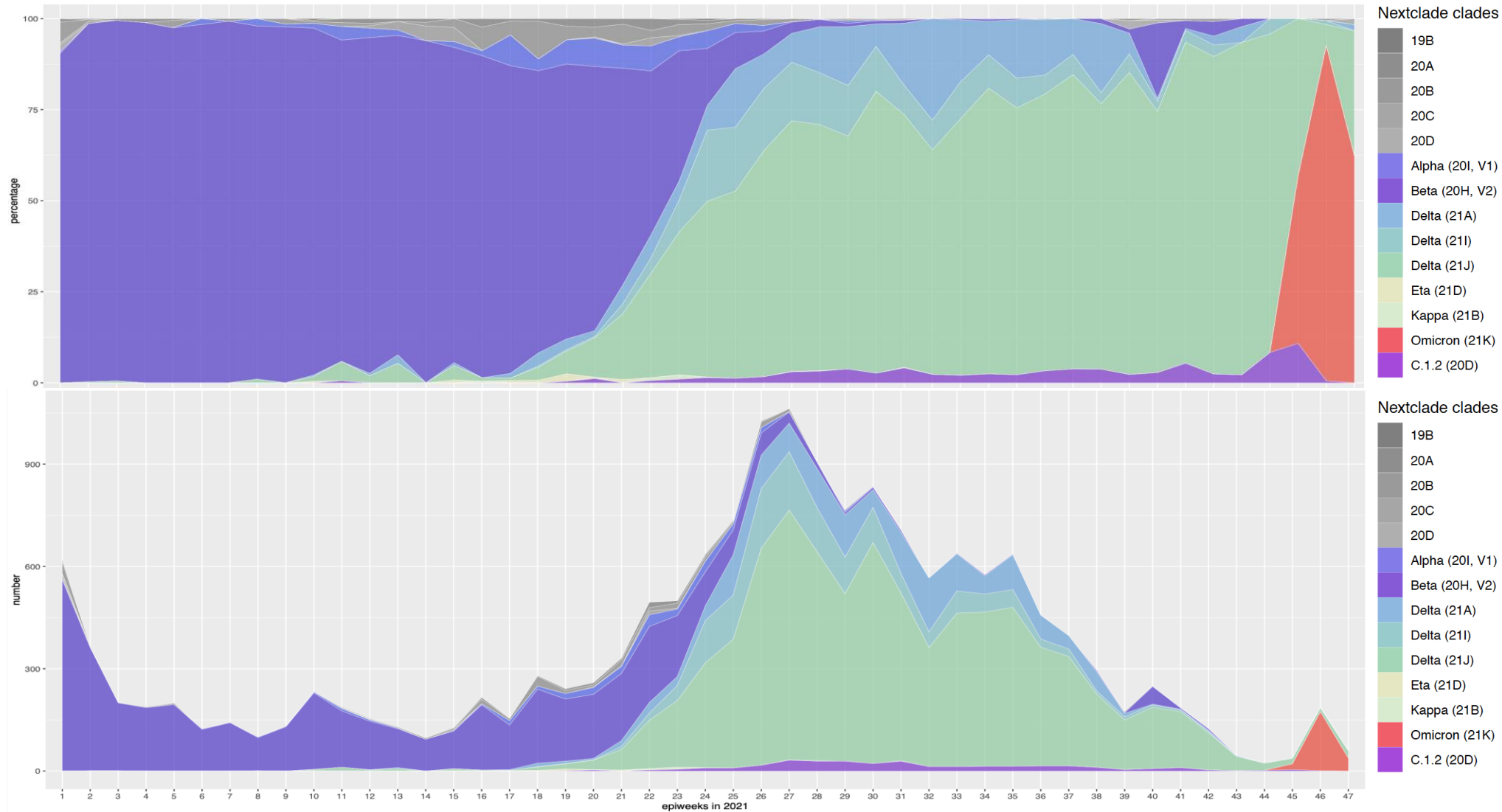


# S gene target failure by province



- Rapid increase in proportion with SGTF noted across multiple provinces (caution low number of tests in most provinces)
- Many samples with SGTF sequenced from Gauteng (samples collected 14-16 Nov) - majority were B.1.1.529
- Hundreds of recently collected samples being sequenced currently by NGS-SA labs – results available by end of week

# Proportion and number of clades by epiweek in South Africa, 2021 (N= 17 813)



Sequencing data  
ending epi week 47  
(ending 27  
November 2021)

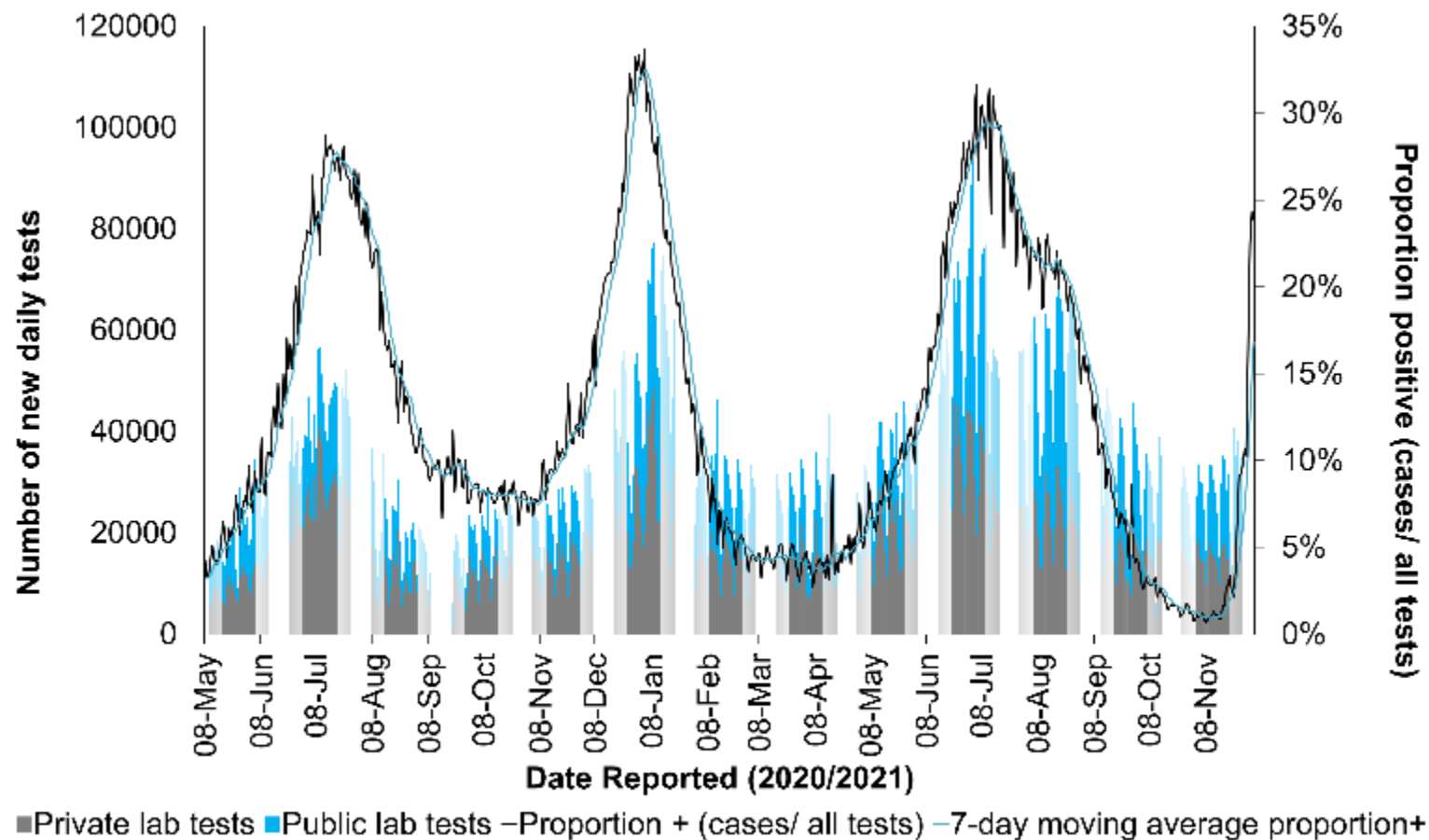
Currently in epi  
week 48 (ending 4  
December 2021)

**Delta dominated South Africa's third wave with >80% frequency in October, with C.1.2 detection remaining <4%.  
Omicron appears to dominate November sequencing data but sequencing is ongoing to determine its true prevalence.**

<https://www.nicd.ac.za/diseases-a-z-index/disease-index-covid-19/sars-cov-2-genomic-surveillance-update/>

# Testing – PCR and antigen

Sector	Total tests				New tests			
	No. tests	Percentage tested	No. positive	Percentage test positive	No. new tests	Percentage tested	No. positive	Percentage test positive
PRIVATE	10,630,898	53.8%	1,714,008	16.1%	35,052	75.0%	9,684	27.6%
PUBLIC	9,130,936	46.2%	1,525,242	16.7%	11,656	25.0%	3,157	27.1%
GRAND_TOTAL	19,761,834	100.0%	3,239,250	16.4%	46,708	100.0%	12,841	27.5%

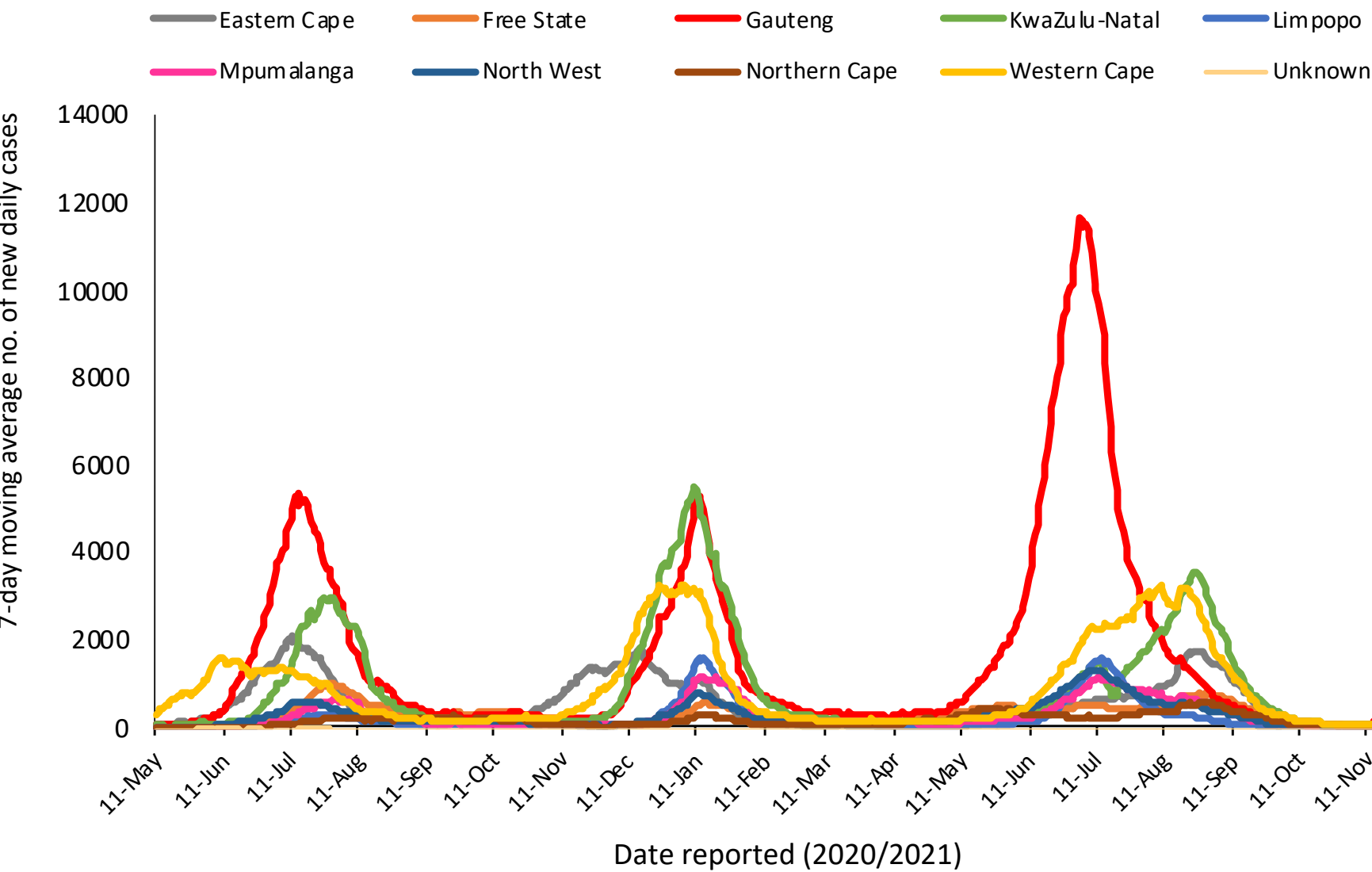


Week number	Week beginning	Percentage testing positive (%)
20	16-May-21	9.7
21	23-May-21	11.3
22	30-May-21	13.4
23	06-Jun-21	17.6
24	13-Jun-21	23.7
25	20-Jun-21	27.4
26	27-Jun-21	29.9
27	04-Jul-21	31.9
28	11-Jul-21	31.5
29	18-Jul-21	28.2
30	25-Jul-21	25.2
31	01-Aug-21	23.7
32	08-Aug-21	23.3
33	15-Aug-21	22.7
34	22-Aug-21	20.0
35	29-Aug-21	16.0
36	05-Sep-21	13.0
37	12-Sep-21	9.3
38	19-Sep-21	6.7
39	26-Sep-21	4.6
40	03-Oct-21	3.3
41	10-Oct-21	2.6
42	17-Oct-21	1.8
43	24-Oct-21	1.5
44	31-Oct-21	1.1
45	07-Nov-21	1.2
46	14-Nov-21	2.5
47	21-Nov-21	8.5
48	28-Nov-21	24.9

Number of new daily tests for SARS-CoV-2 and proportion positive by date of reporting and health sector, and 7-day moving average proportion positive, 6 April 2020 to date, South Africa

In week 48 the percentage testing positive was 24.9%, which was 16.4% higher than the previous week.

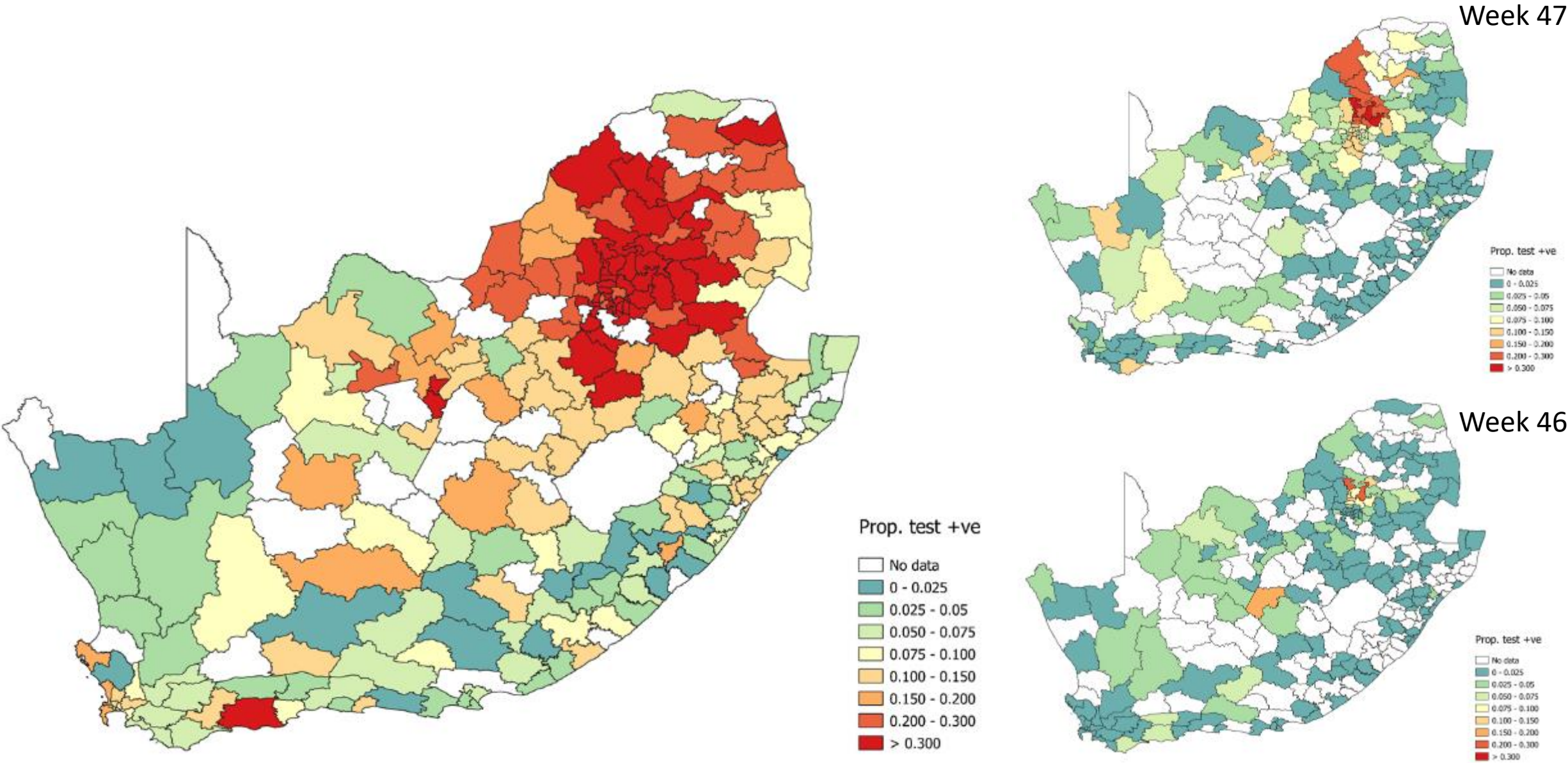
# 7-day moving average number of new cases by province and date of reporting, 12 April 2020 to date, South Africa



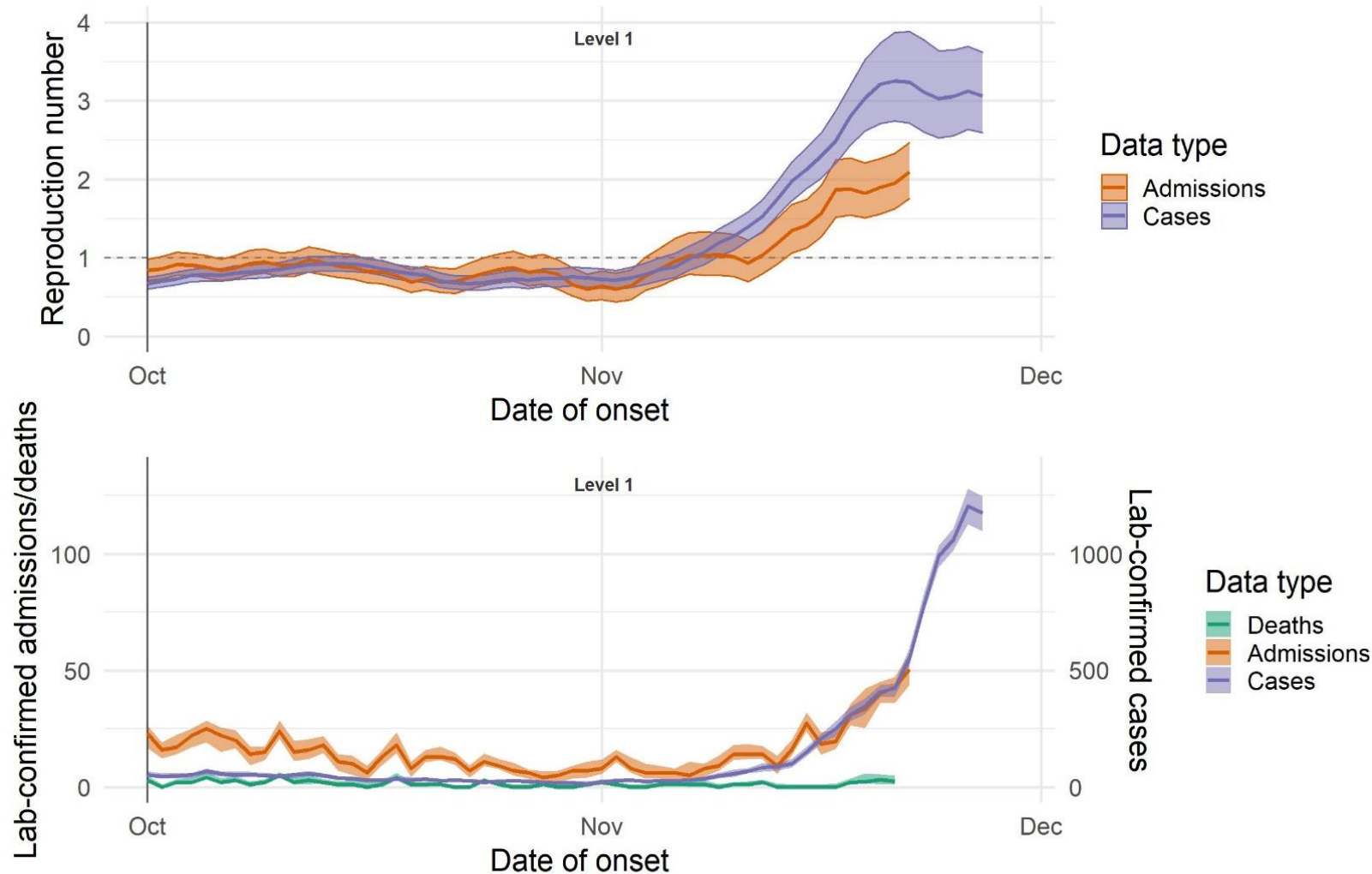
The 7-day moving average daily number of cases has increased



# Proportion testing positive by health sub-district in South Africa for the week of 28 November – 3 December 2021 (Week 48)



Upper panel: Estimated **daily reproduction number (R)**, with 95% confidence intervals Gauteng (last date included in the estimation: 29 November 2021).  
Lower panel: **estimated number of laboratory-confirmed COVID-19 cases and hospital admissions by onset date** with missing data imputed.



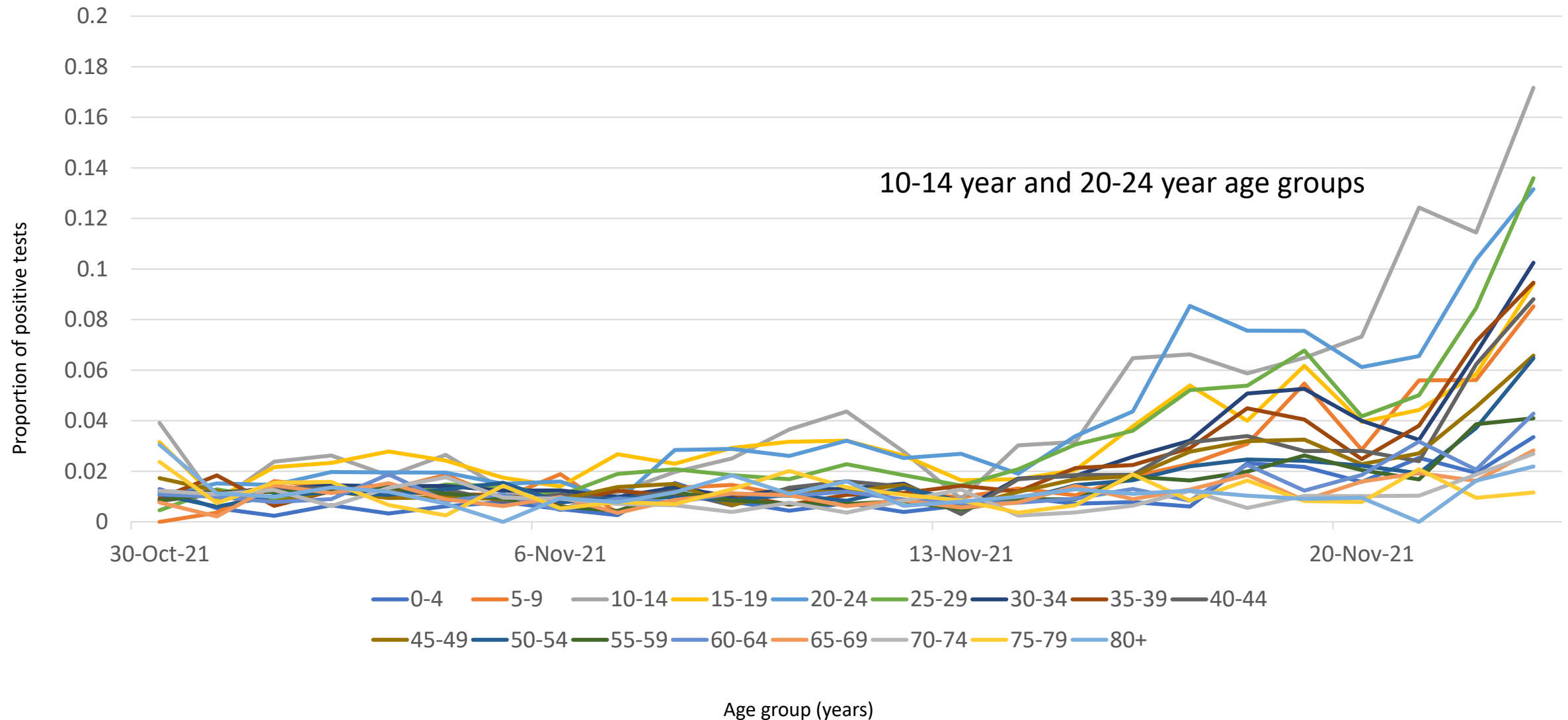
<https://www.nicd.ac.za/diseases-a-z-index/disease-index-covid-19/surveillance-reports/covid-19-special-reports/the-initial-and-daily-covid-19-effective-reproductive-number-in-south-africa/>

Trade off between:

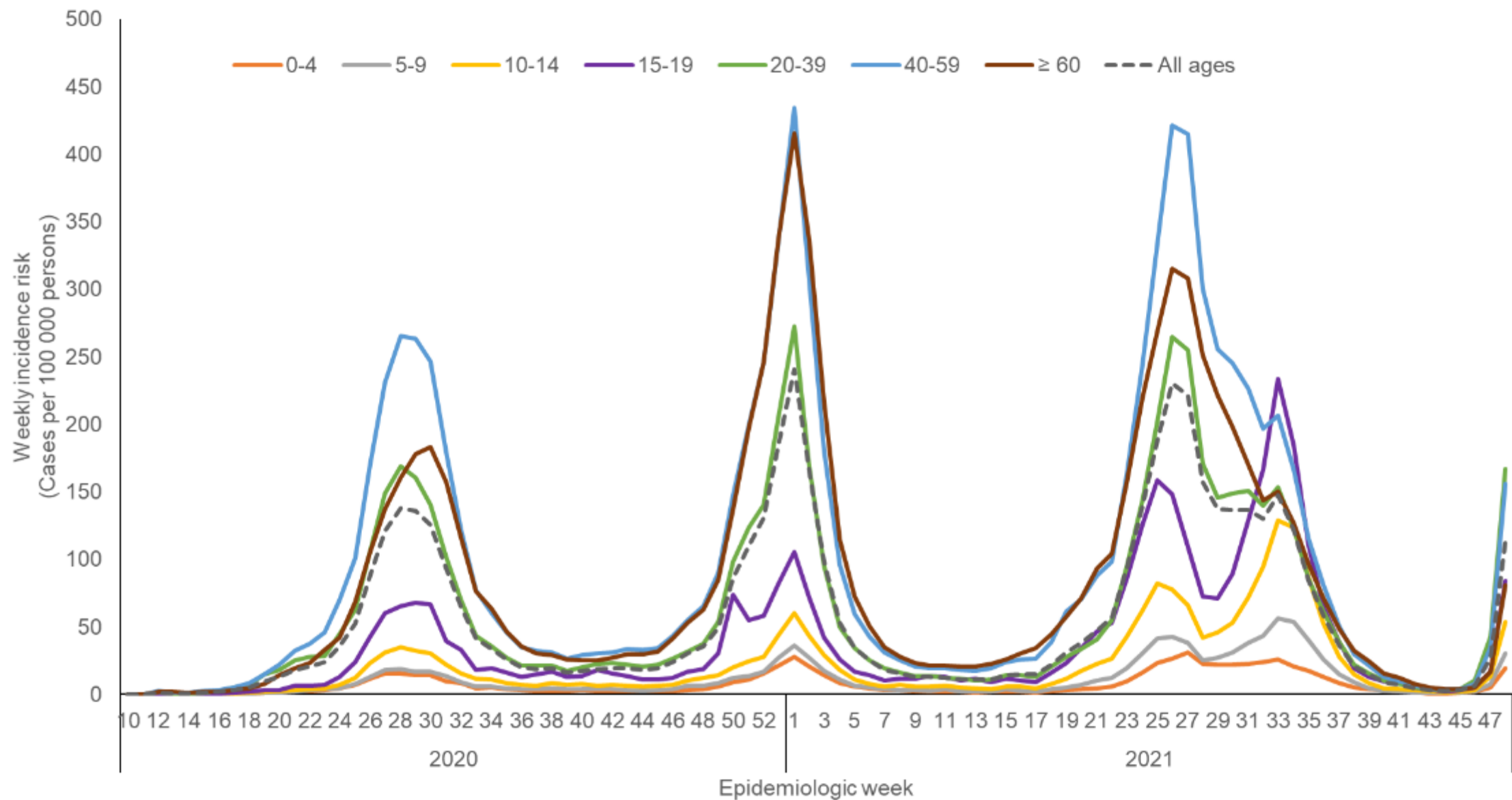
- Transmission per unit contact
- Contact patterns
- Population immunity (immune escape)



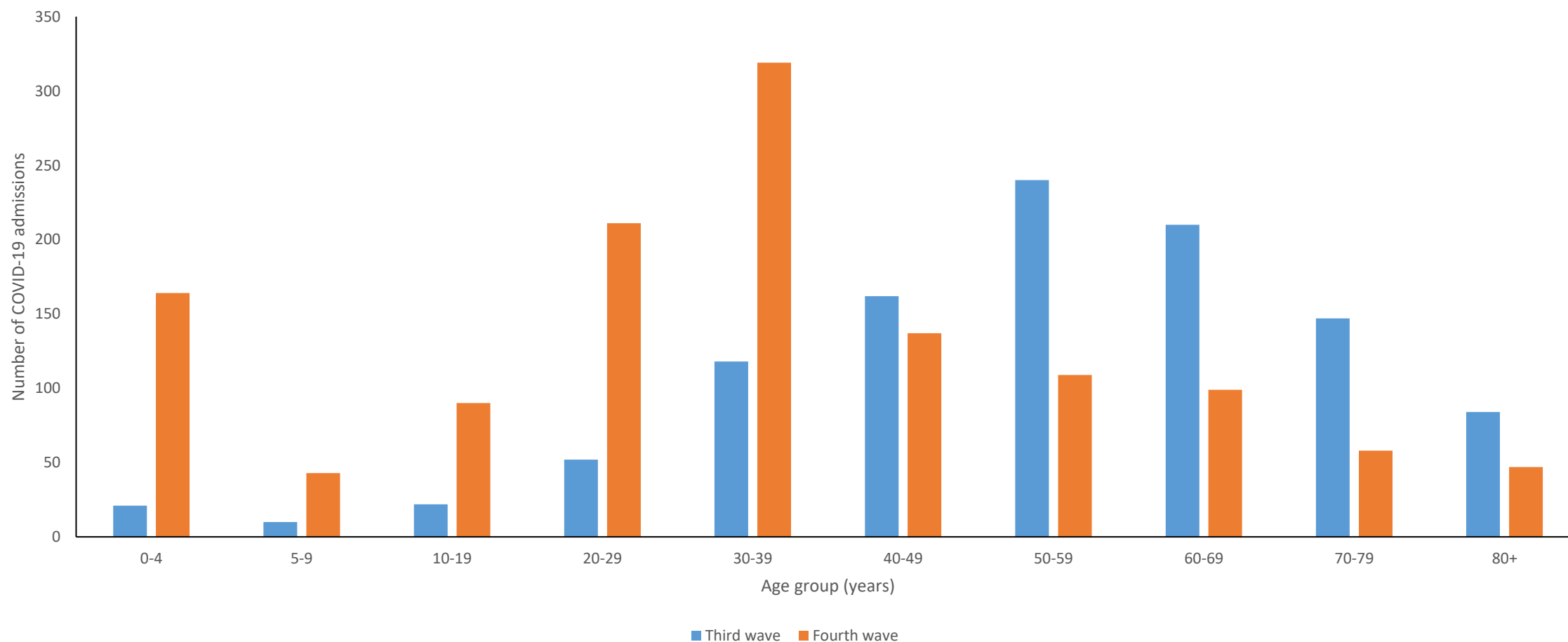
Weekly proportion testing positive by age group, South Africa, 31 October – 20 November 2021



# Weekly incidence of laboratory-confirmed cases by age



# Number of COVID-19 admissions in first two weeks of third and fourth wave, by age group in years, City of Tshwane Metro, 9-29 May 2021 and 14 November-4 December 2021



## Percentage of COVID-19 admissions with severe disease, by age group, Tshwane Metro, 5 March 2020 – 4 December 2021

Age group	Total percentage severe n/N (%)	November 2021 percentage severe n/N (%)
<20 years	291/1,039 (28.0%)	24/139 (17.3%)
20-34 years	750/2,108 (35.6%)	15/8114 (13.2%)
35-59 years	6,347/9,704 (65.4%)	35/154 (22.7%)
≥60 years	5,889/7,563 (77.9%)	45/88 (51.1%)
All ages	13,277/20,414 (65.0%)	119/495 (24.0%)

Clinician impressions milder illness  
More in-depth analyses underway

Severe = ARDS, Oxygen, Ventilation,  
ECMO, ICU, High care, Died  
Intrinsic bias around phase of wave  
Early and late wave less severity  
Incidental testing positive when  
admitted for surgery etc  
More likely to admit mild patient  
early when beds available  
Time to accumulate admissions  
and outcomes  
Limitations of the data  
Proxy indicator for severity  
Data quality and delays, note  
private sector more reliable  
daily update  
No data on vaccination or  
previous infection

# Acknowledgement

Staff at CRDM, NICD

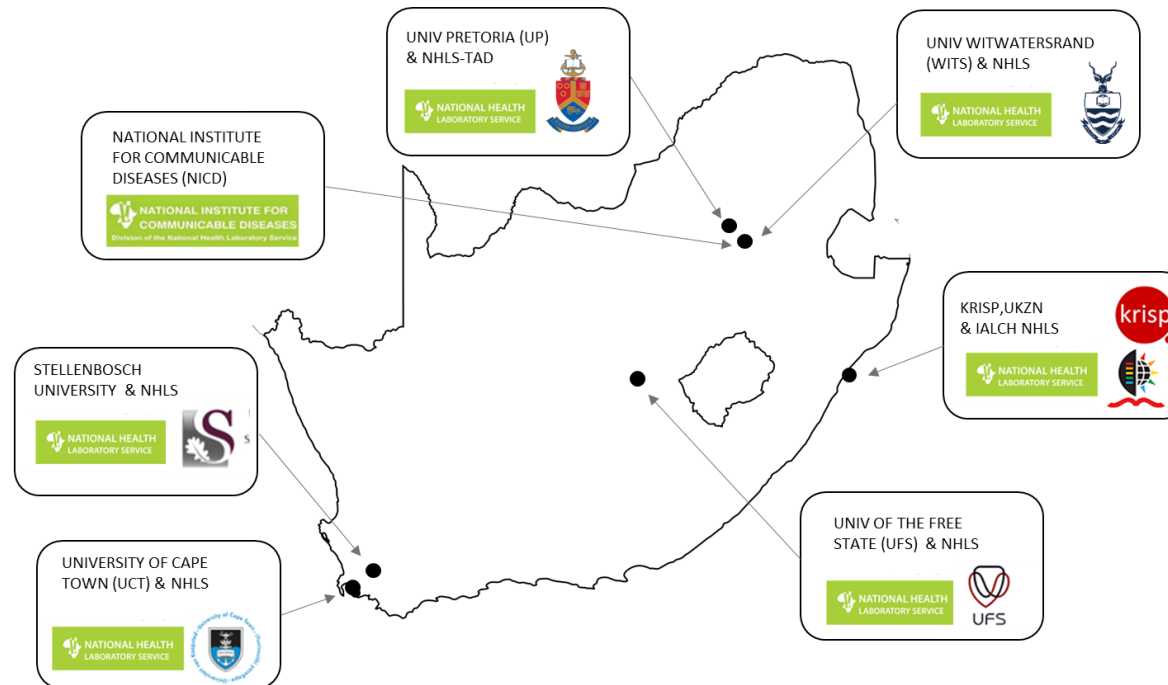
NICD COVID-19 response team

NICD DATCOV team

Many volunteers supporting NICD COVID-19 response



## SARS-CoV-2 Sequencing Update 26 November 2021



Supported by the DSI and the SA MRC

Msomi N, Mlisana K, et al. Lancet Microbe 2020



# A Prospective Household study of SARS-CoV-2, Influenza, and Respiratory Syncytial virus community burden, Transmission dynamics and viral interaction in South Africa (PHIRST-C Study)



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**Safety committee:** Andrew Whitelaw (NHLS), June Fabian (Wits Donald Gordon Medical Centre Wits University), Jennifer Verani (CDC), Lindiwe Qwabe (Community representative Agincourt site), Banele Faku (Community representative Klerksdorp site), Saheen Methar (Infection Control Africa Network (ICAN) and University of Stellenbosch)

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## FUNDING – US CDC

All the participants who kindly agreed to participate in the study

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## Data Management

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Mbusiseni Ngema



In memory of Solly Hlatshwayo

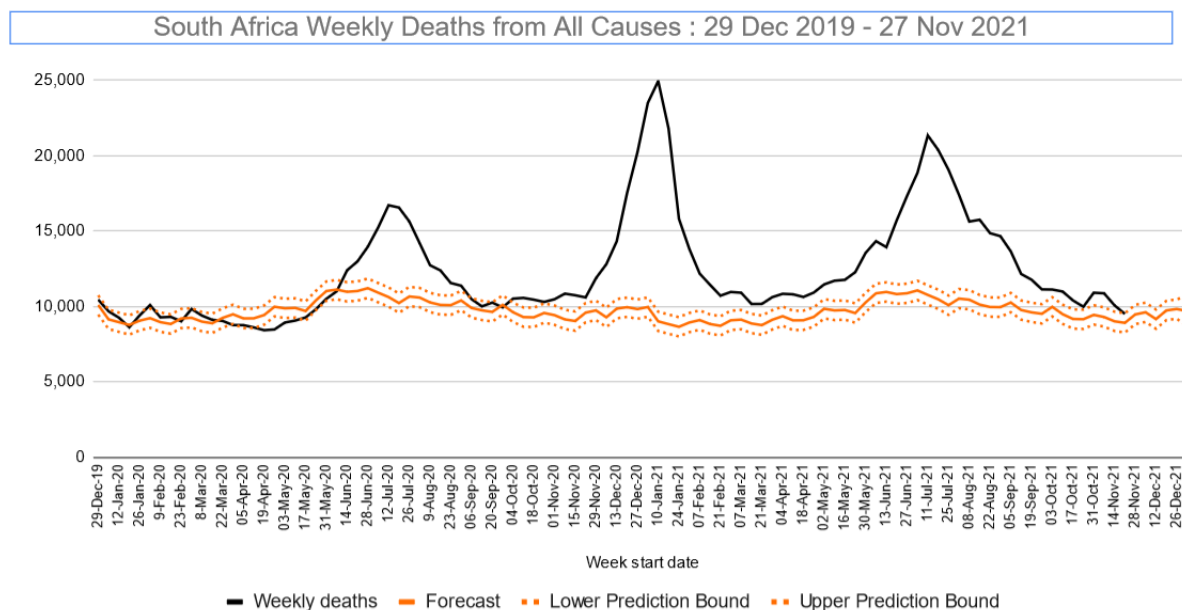


Rural Public Health &  
Health Transitions Research Unit



science & innovation  
Department:  
Science and Innovation  
REPUBLIC OF SOUTH AFRICA

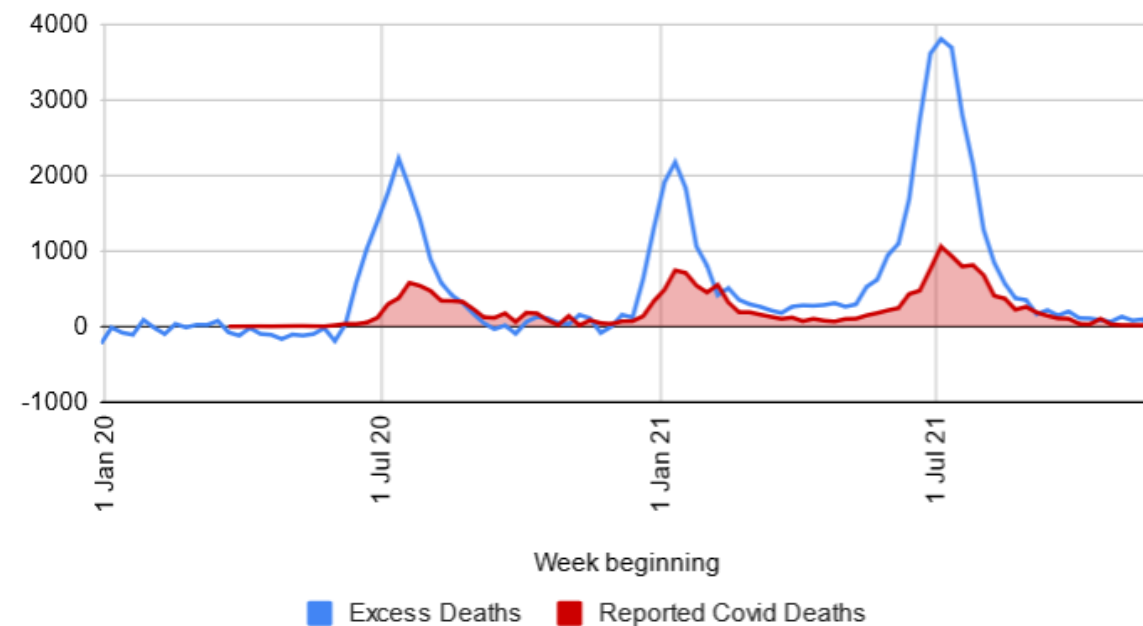
## Report on Weekly Deaths in South Africa



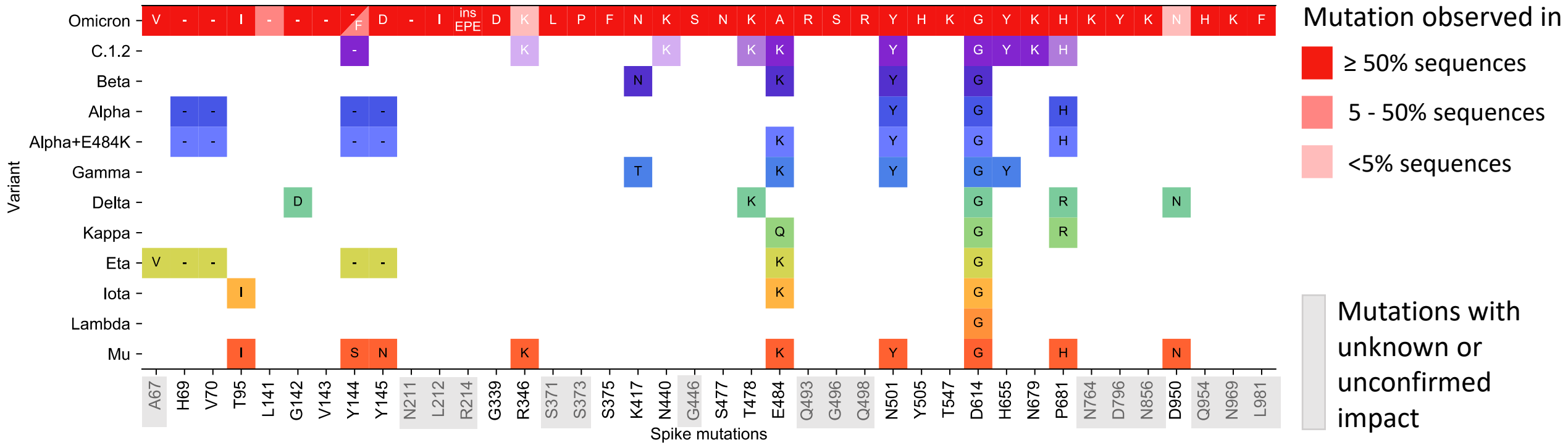
Excess deaths 3 May 2020-27 Nov 2021 N=273,239  
Age-standardise rate - 459 per 100,000 population

## Gauteng Province

### GT (Natural) Excess Deaths and Reported Covid-19 Deaths



# Omicron spike mutations compared to other VOC/VOIs



- Multiple changes within the two immunogenic regions in S1 (NTD and RBD)
  - including a three amino acid insertion
- Accumulation of mutations surrounding the furin cleavage site
  - Including combination of N679K and P681H
- Effect of most spike S2 subunit changes have not been defined