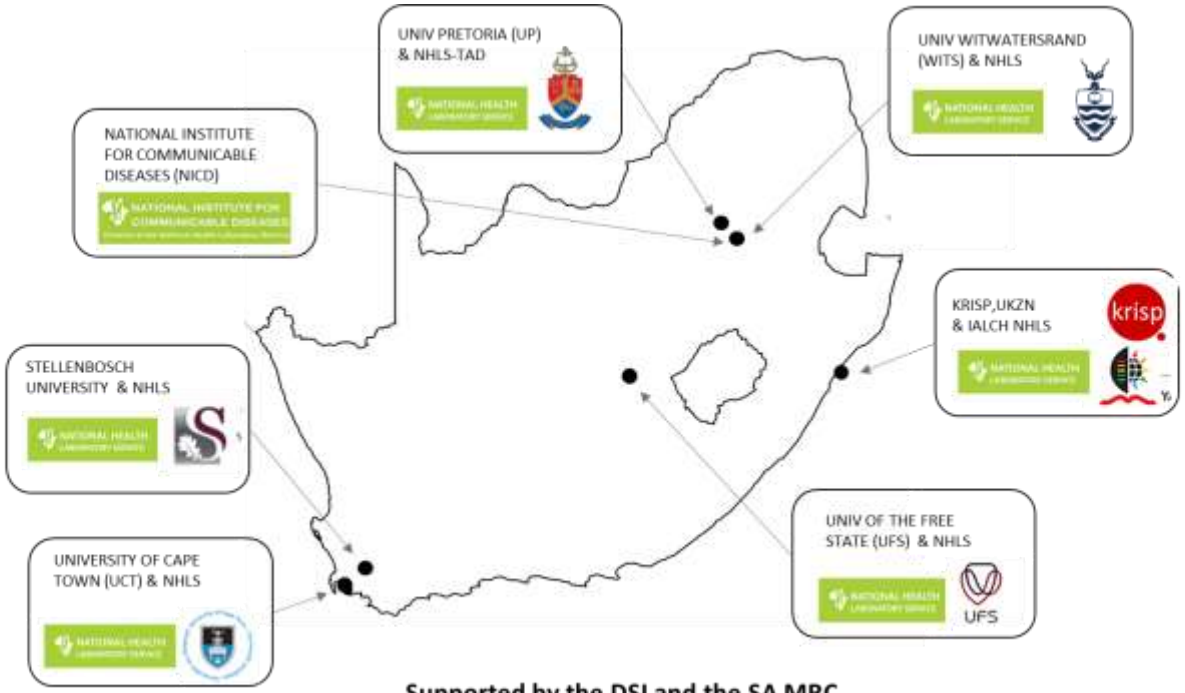
Network for Genomic Surveillance in South Africa (NGS-SA)

SARS-CoV-2 Sequencing Update
21 January 2022



Supported by the DSI and the SA MRC

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

Prepared by the National Institute for Communicable Diseases (NICD) of the National Health Laboratory (NHLS) on behalf of the Network for Genomics Surveillance in South Africa (NGS-SA)

The genomic data presented here are based on South African SARS-CoV-2 sequence data downloaded from GISAID (www.gisaid.org) on 21 January 2022 at 08h31

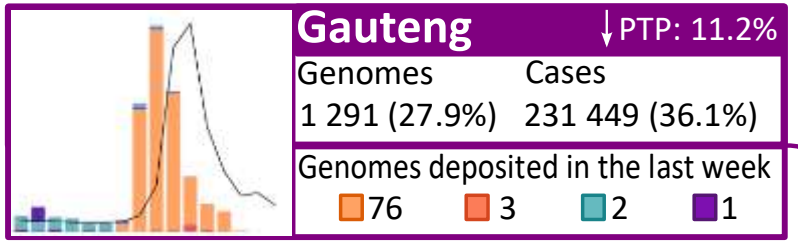
Data license: https://www.gisaid.org/registration/terms-of-use/

Elbe, S., and Buckland-Merrett, G. (2017) Data, disease and diplomacy: GISAID's innovative contribution to global health. Global Challenges, 1:33-46. DOI: 10.1002/gch2.1018 PMCID: 31565258

Shu, Y., McCauley, J. (2017) GISAID: Global initiative on sharing all influenza data – from vision to reality. EuroSurveillance, 22(13) DOI: 10.2807/1560-7917.ES.2017.22.13.30494 PMCID: PMC5388101

Case data is based on specimen collection date. Cases from https://www.nicd.ac.za/diseases-a-z-index/disease-index-covid-19/surveillance-reports/weekly-epidemiological-brief/
Test data gives weekly proportion testing positive rates, from https://www.nicd.ac.za/diseases-a-z-index/disease-index-covid-19/surveillance-reports/weekly-testing-summary/

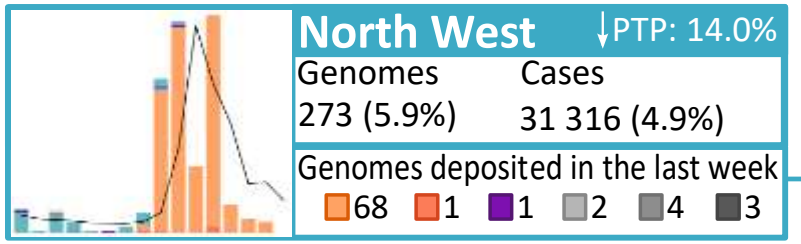
SARS-CoV-2
GENOMIC SURVEILLANCE
epiweeks 39 (2021) - 2 (2022)



Gauteng ↓PTP: 11.2%

Genomes	Cases
1 291 (27.9%)	231 449 (36.1%)

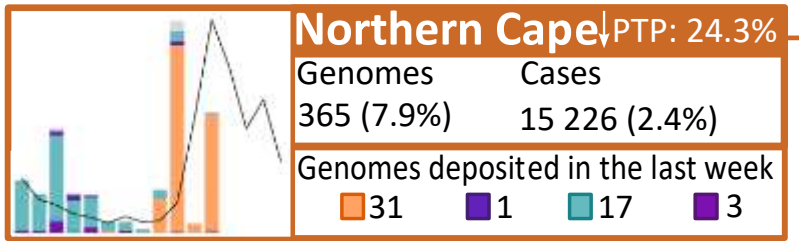
Genomes deposited in the last week
76 3 2 1



North West ↓PTP: 14.0%

Genomes	Cases
273 (5.9%)	31 316 (4.9%)

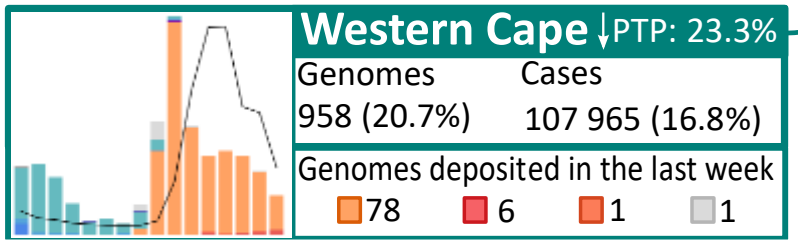
Genomes deposited in the last week
68 1 1 2 4 3



Northern Cape ↓PTP: 24.3%

Genomes	Cases
365 (7.9%)	15 226 (2.4%)

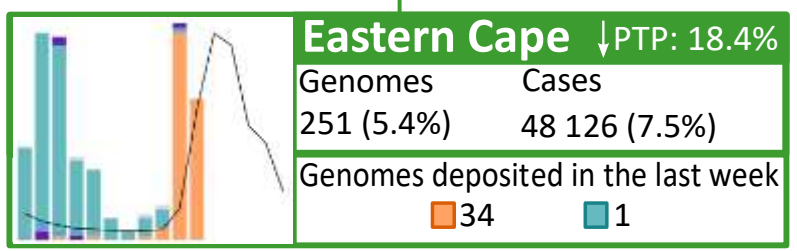
Genomes deposited in the last week
31 1 17 3



Western Cape ↓PTP: 23.3%

Genomes	Cases
958 (20.7%)	107 965 (16.8%)

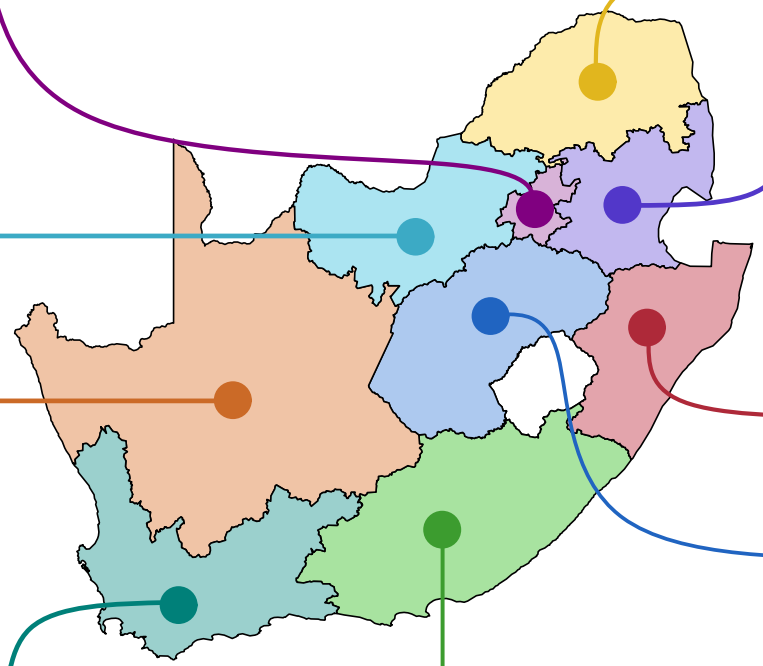
Genomes deposited in the last week
78 6 1 1

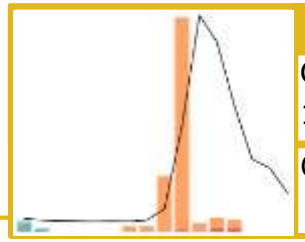


Eastern Cape ↓PTP: 18.4%

Genomes	Cases
251 (5.4%)	48 126 (7.5%)

Genomes deposited in the last week
34 1

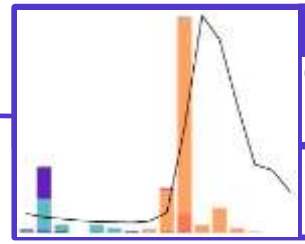




Limpopo ↓PTP: 19.8%

Genomes	Cases
114 (2.5%)	23 009 (3.6%)

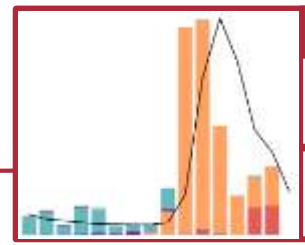
Genomes deposited in the last week
12 2



Mpumalanga ↓PTP: 16.2%

Genomes	Cases
354 (7.7%)	29 123 (4.5%)

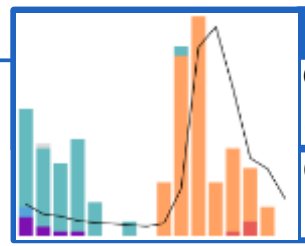
Genomes deposited in the last week
125 10 1



KwaZulu-Natal ↓PTP: 17.1%

Genomes	Cases
783 (16.9%)	123 001 (19.2%)

Genomes deposited in the last week
74 22 2



Free State ↓PTP: 12.8%

Genomes	Cases
234 (5.1%)	32 020 (5.0%)

Genomes deposited in the last week
89 4

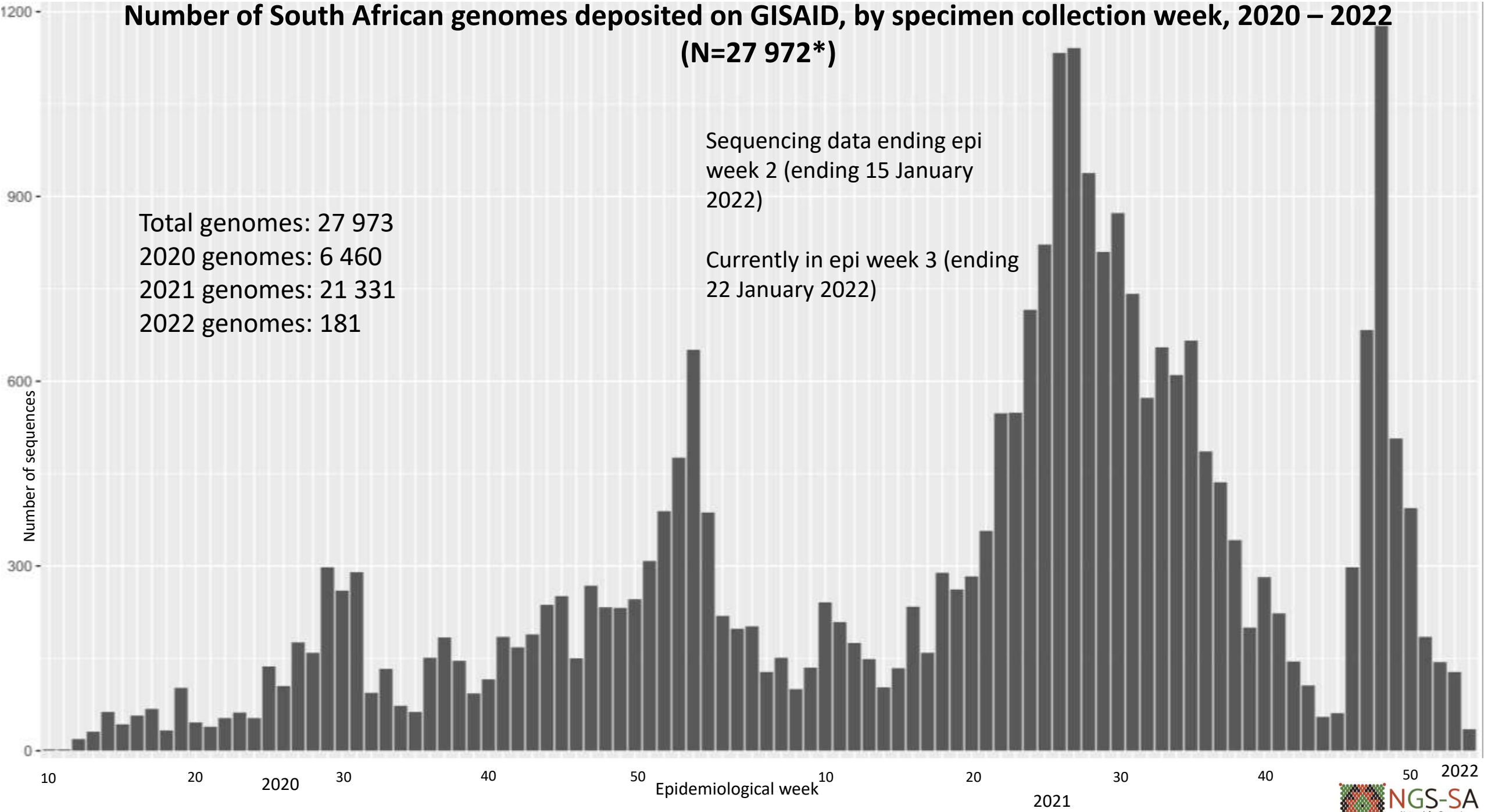
Omicron (21K) Beta (20H, V2) 20A 20C
Omicron (21L) Alpha (20I, V1) 20B 20D
Omicron (21M) Delta (21A) Unassigned
C.1.2 (20D) Delta (21I) Delta (21J) Cases

675 genomes deposited in the past week

Bar graphs represent genomes sequenced per epiweek, with lines representing cases by collection date (weeks 39 [2021] – 2 [2022])
Genomes and cases presented as provincial total (percentage of national total) for epiweeks 39 (2021) – 2 (2022)
PTP: percentage testing positive in week 2 (9 Jan 2022 – 15 Jan 2022); the arrow indicates direction of change since the previous week (2 Jan 2021 – 8 Jan 2022)

NGS-SA
Network for Genomic Surveillance in South Africa

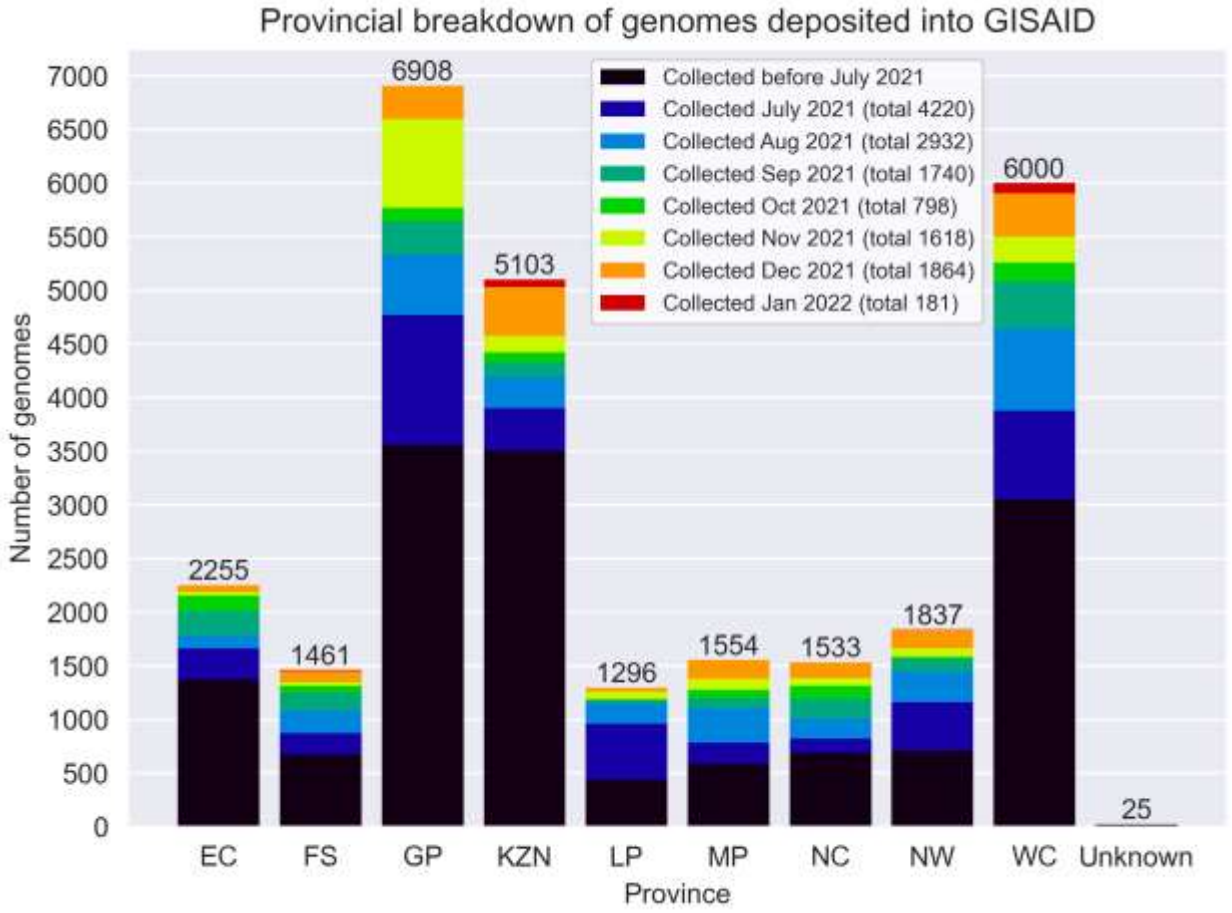
Number of South African genomes deposited on GISAID, by specimen collection week, 2020 – 2022 (N=27 972*)

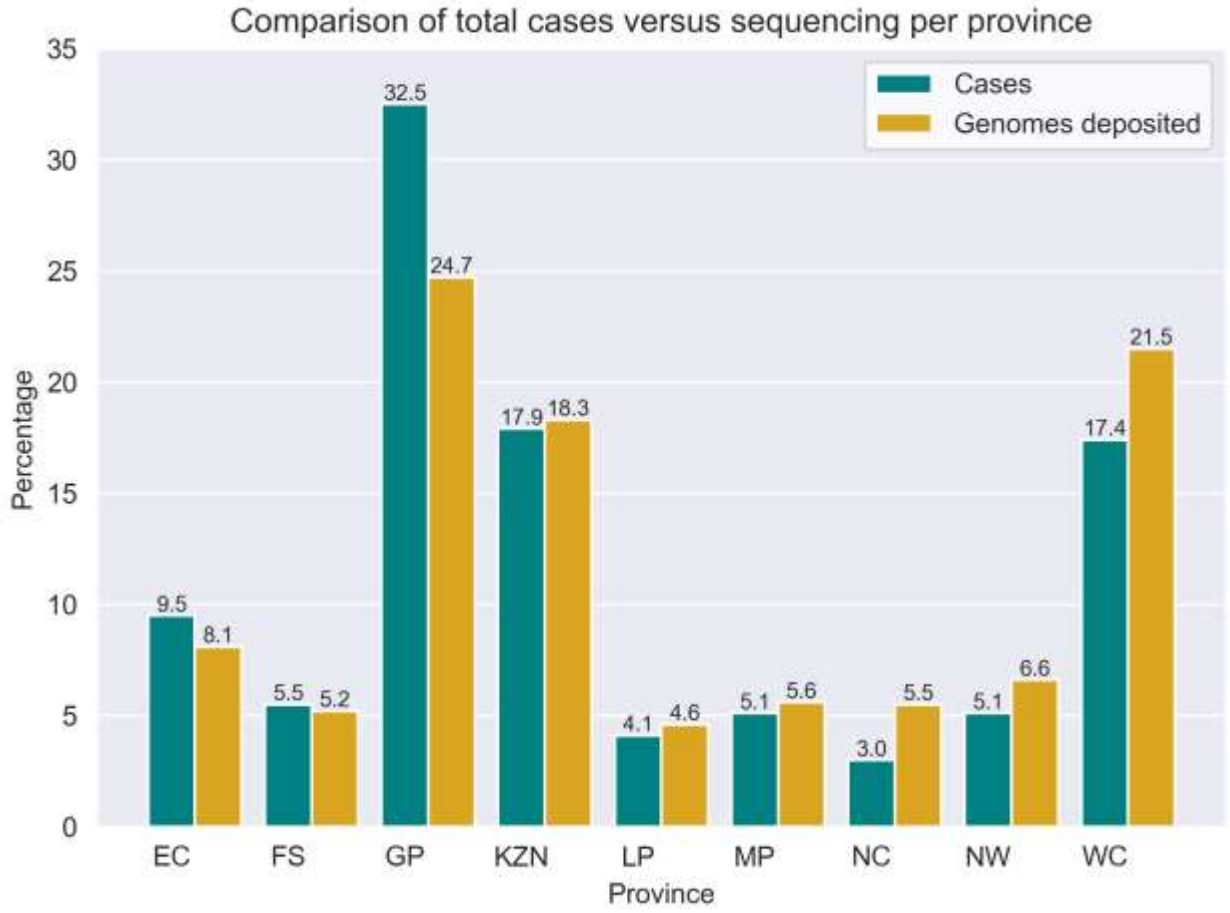


*This represents the cleaned, de-duplicated dataset of unique **National Surveillance** sequences. This dataset will be used for all further figures.

NGS-SA
Network for Genomic Surveillance in South Africa

GISAID genomes vs total cases, 2020 – 2022 (N=27 972)



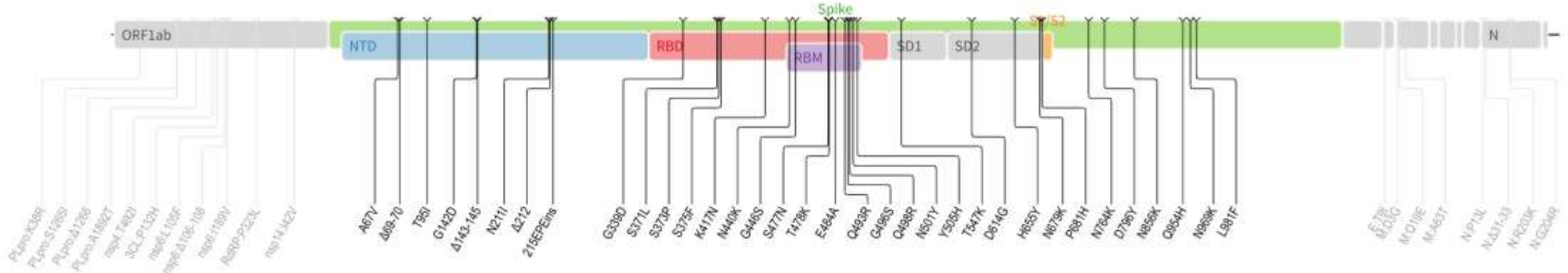


All provinces, apart from GP, NC and WC, have comparable percentages of overall cases and overall sequenced genomes.

NGS-SA
Network for Genomic Surveillance in South Africa

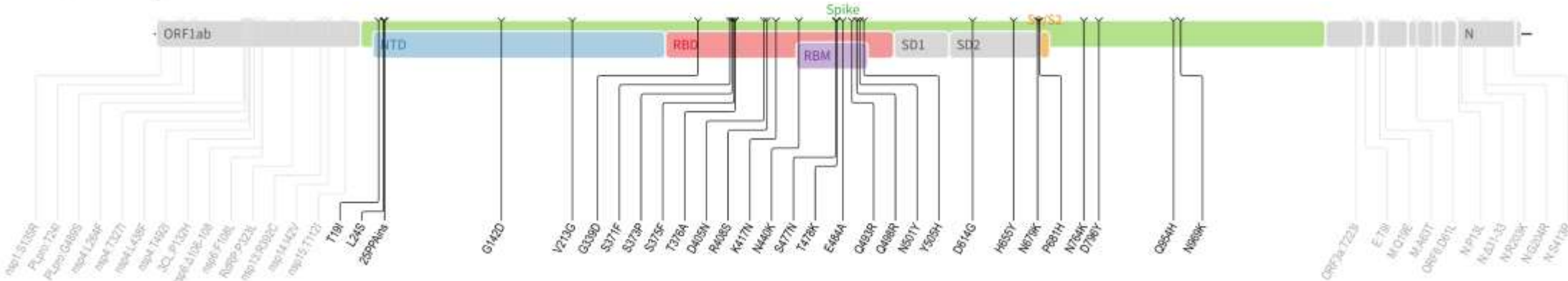
Omicron sub-lineage spike mutation profiles

BA.1
21K

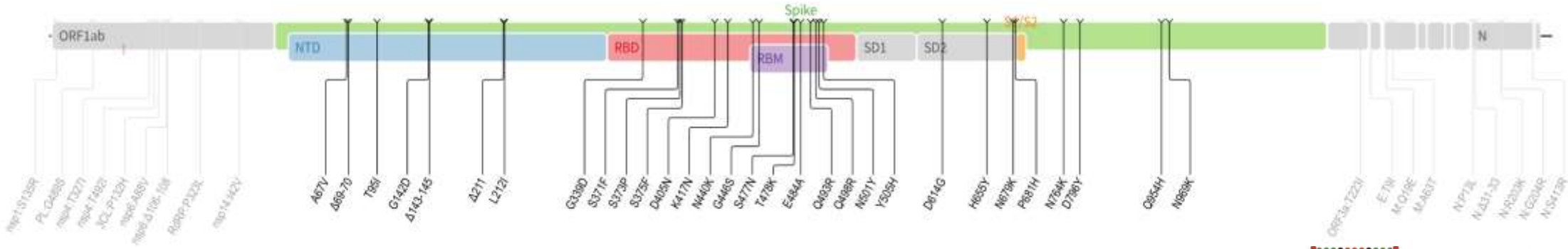


BA.2
21L

Lacks 69-70del
Not detectable by S-Gene Target Failure



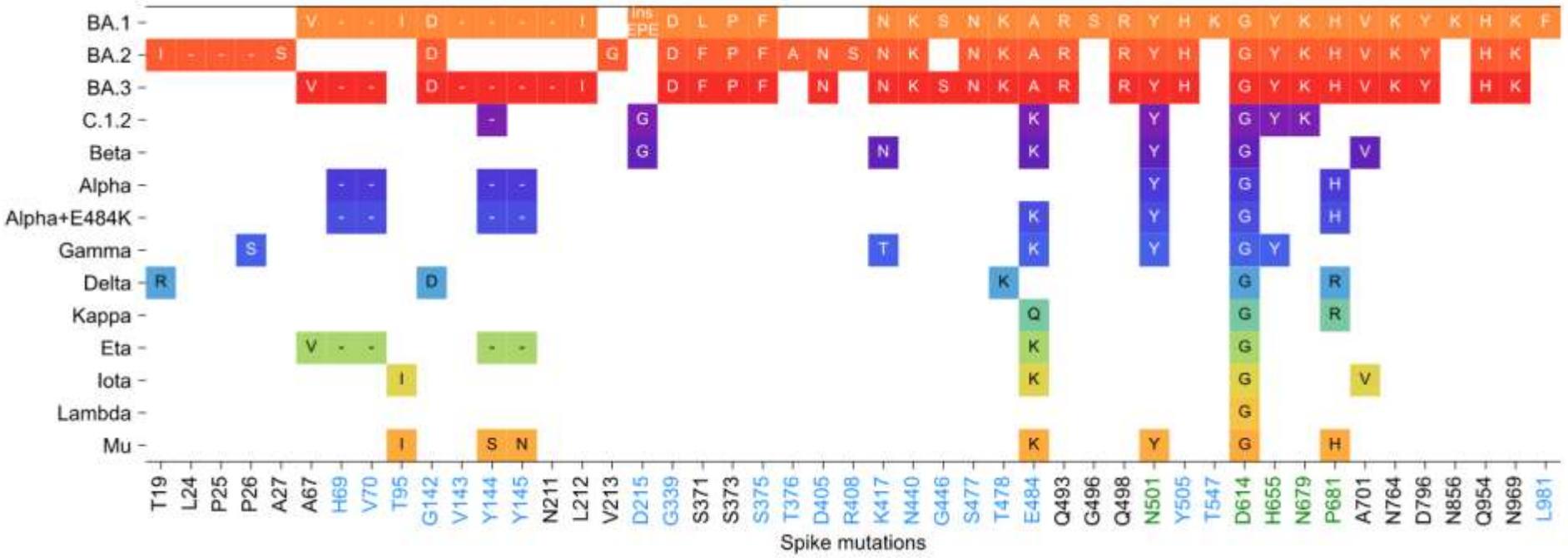
BA.3
21M



Lineage definitions based on https://github.com/cov-lineages/pango-designation/issues/367
Images from https://covdb.stanford.edu/page/mutation-viewer/

NGS-SA
Network for Genomic Surveillance in South Africa

Omicron spike mutations compared to other VOC/VOIs



Only lineage-defining mutations are pictured here. Low prevalence mutations can be seen on the following slide.

Mutation impact key

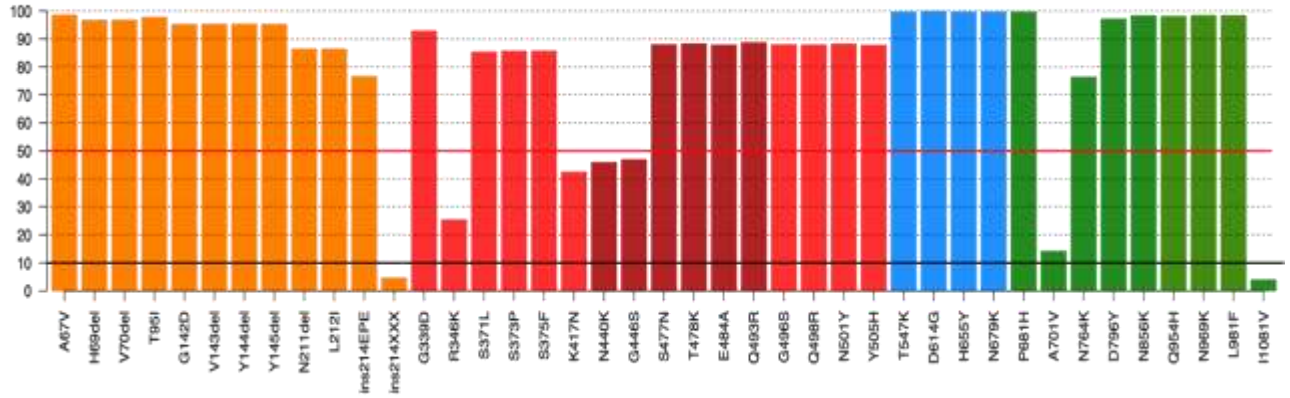
- Unknown or unconfirmed impact
- Known/predicted immune escape
- Enhanced infectivity

- 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, but may be linked to immune escape

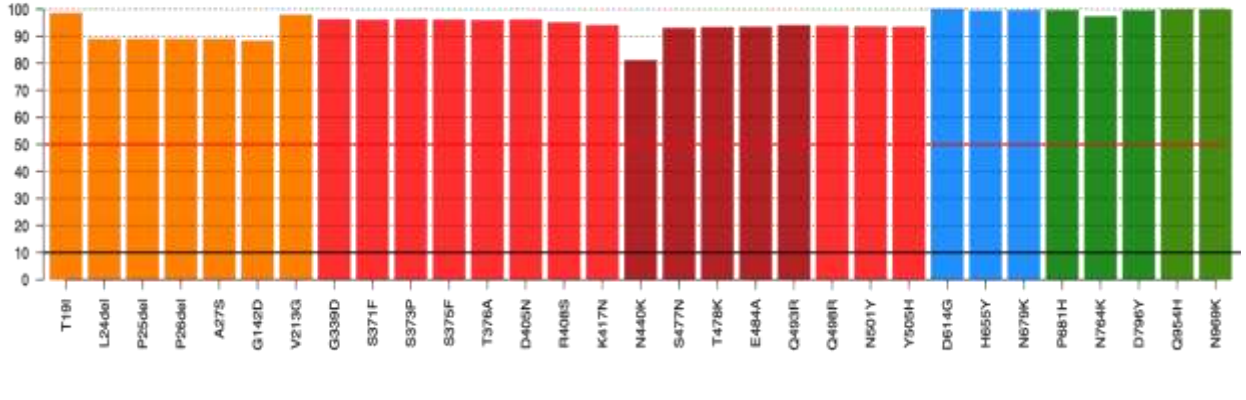
NGS-SA
Network for Genomic Surveillance in South Africa

Spike mutational profile of Omicron sequences

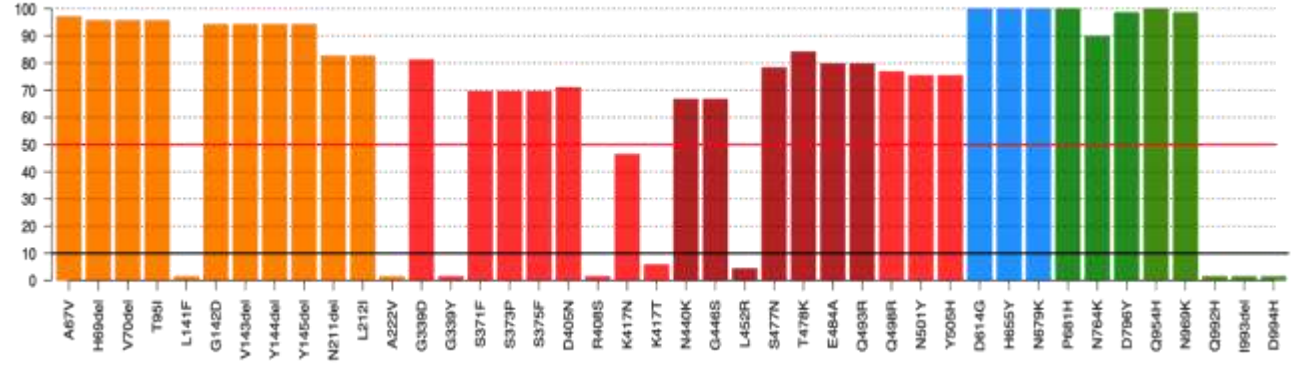
Frequency of Spike SNVs for BA.1 (n=462258)



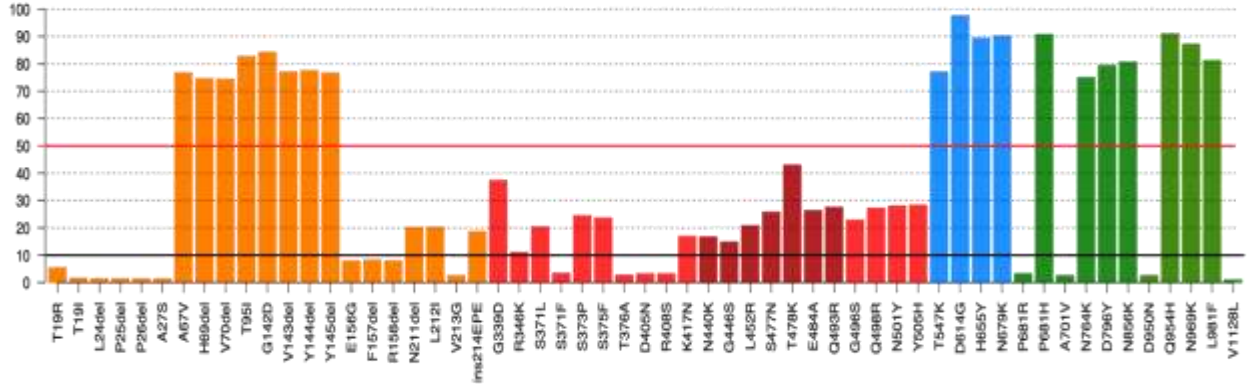
Frequency of Spike SNVs for BA.2 (n=8985)



Frequency of Spike SNVs for BA.3 (n=69)



Frequency of Spike SNVs for B.1.1.529 (n=3123)



NTD RBM RBD S1 S2

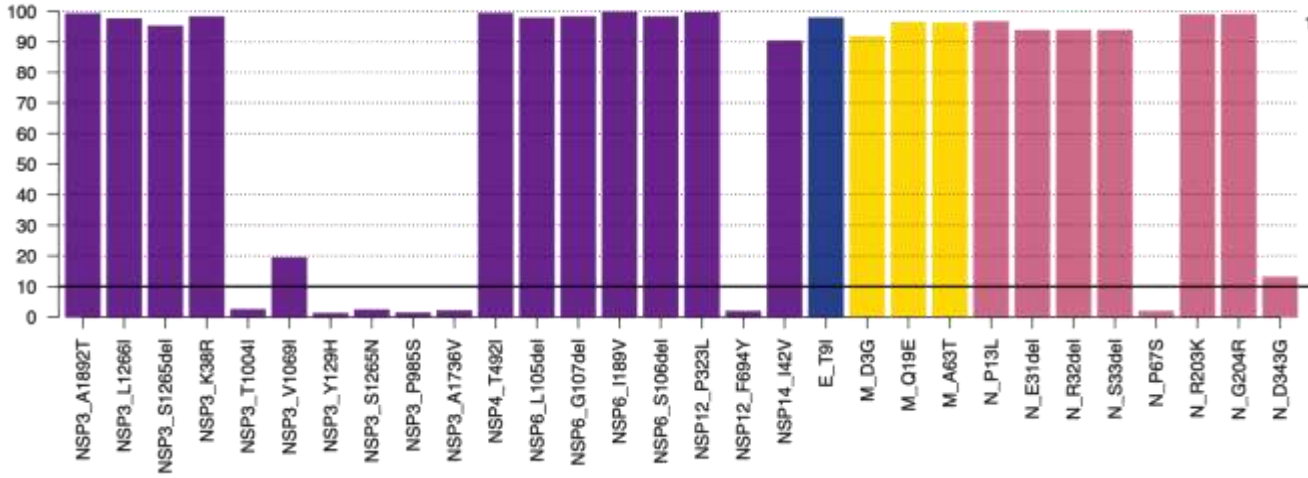
B.1.1.529 includes low-quality sequences that are missing data, so the frequency of these mutations cannot be considered fully reliable estimates.

Low mutation frequencies for N417N, N440K, G446S and N764K are most likely a result of poor coverage due to primer drop off. There are significant differences in insertions and deletions amongst sub-lineages. BA.2 has lowest spike diversity of all Omicron sub-lineages.

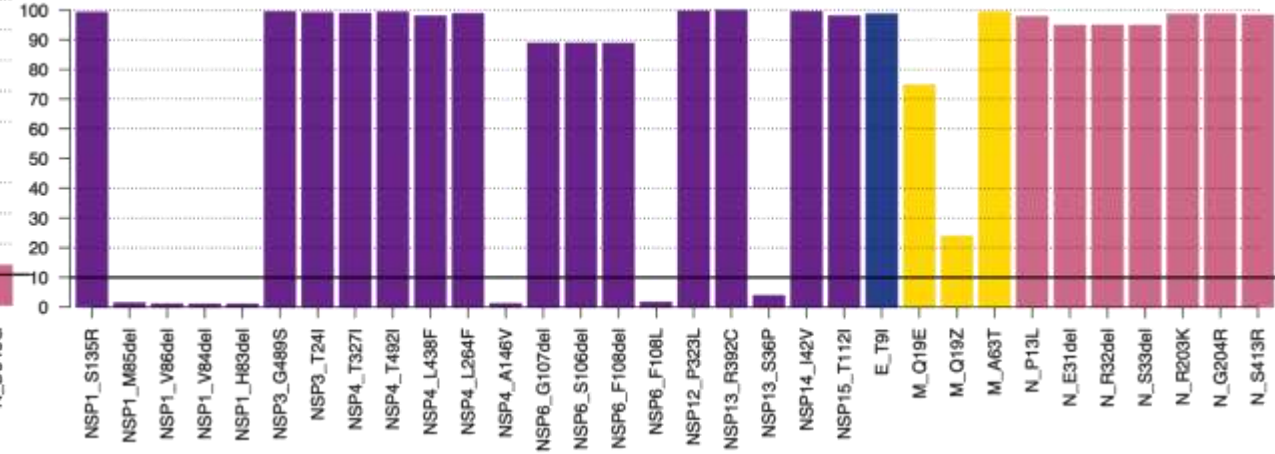
NGS-SA
Network for Genomic Surveillance in South Africa

Mutational profile of Omicron sequences

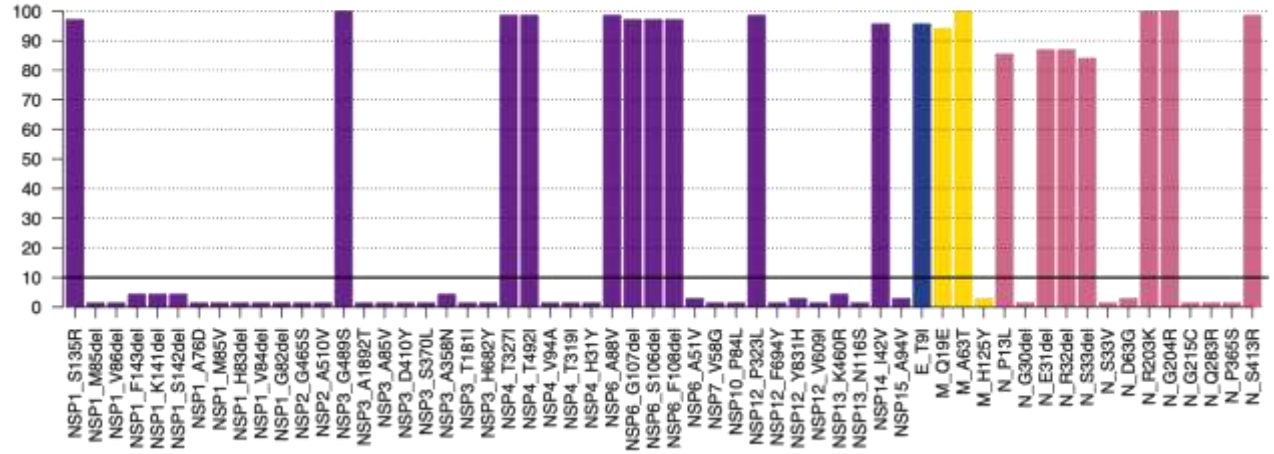
Frequency of whole genome SNVs for BA.1 (n=462258)



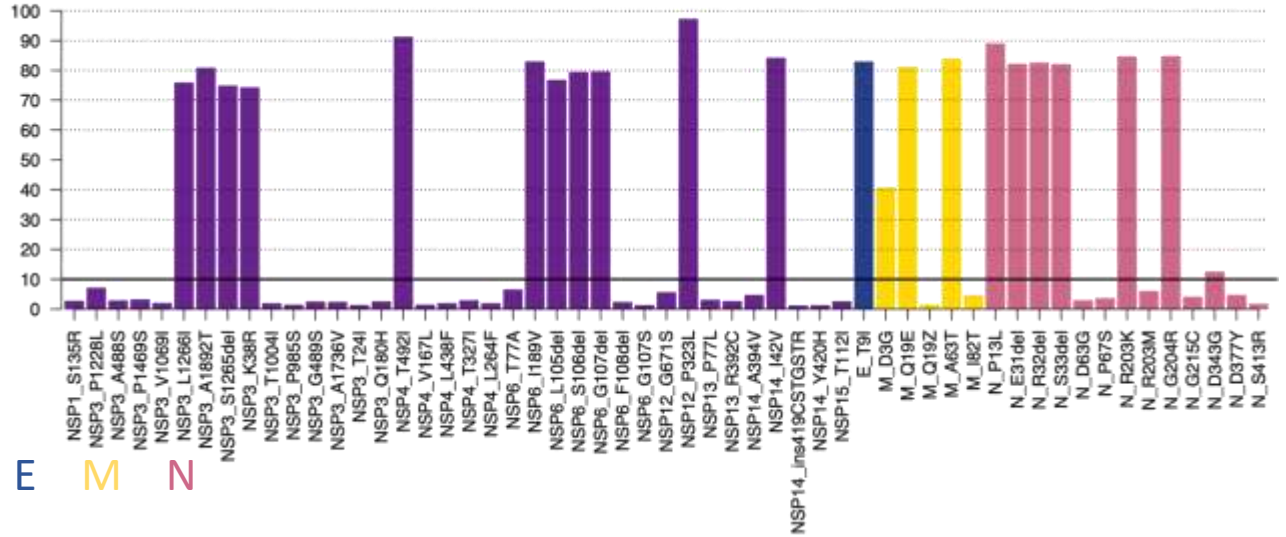
Frequency of whole genome SNVs for BA.2 (n=8985)



Frequency of whole genome SNVs for BA.3 (n=69)



Frequency of whole genome SNVs for B.1.1.529 (n=3123)

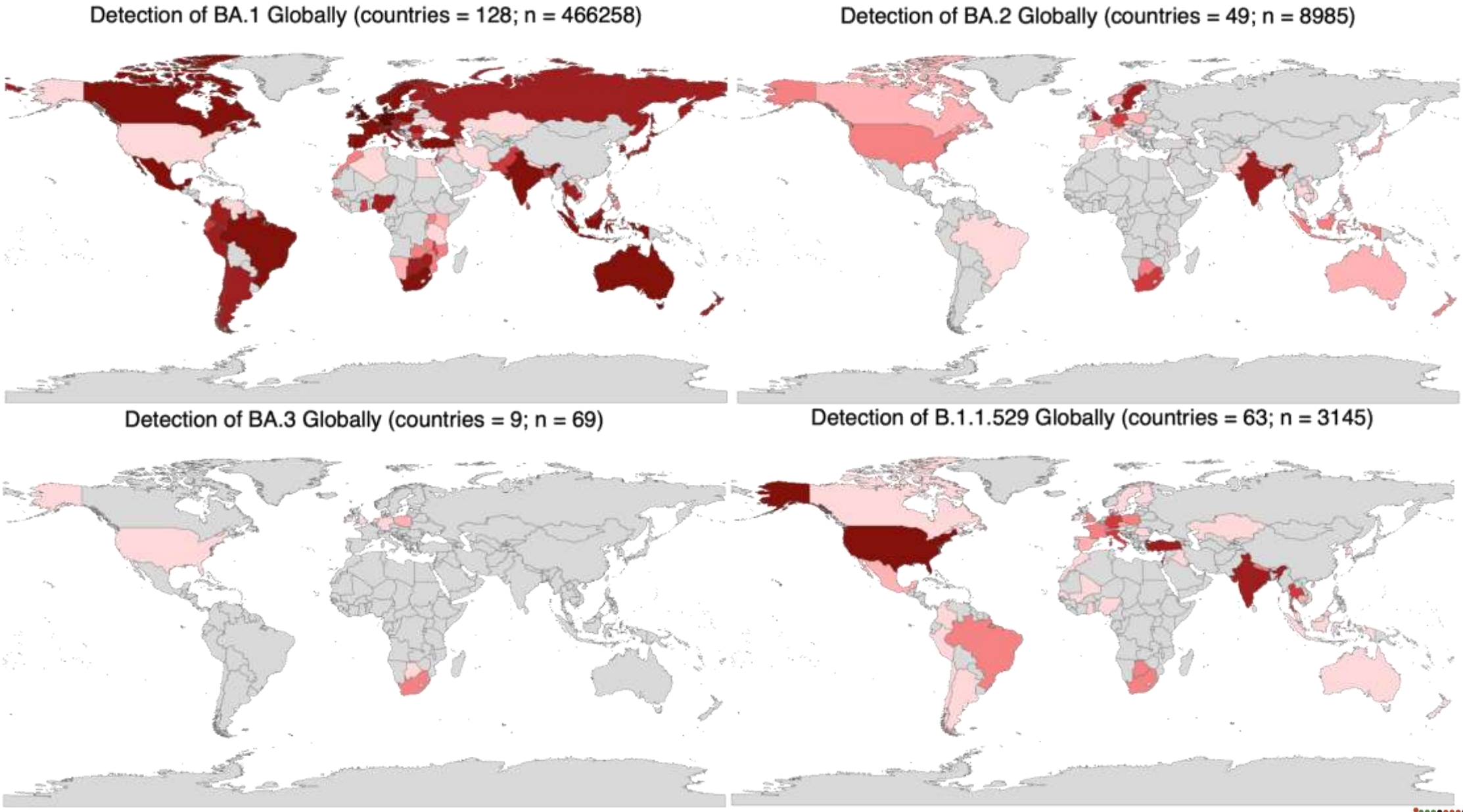


ORF1a/b E M N

Non-spike mutational profile of Omicron varies between sub-lineages, especially within ORF1a/b. Most defining E, M and N mutations are shared. BA.1 appears to be the least diverse of the sub-lineages.

NGS-SA
Network for Genomic Surveillance in South Africa

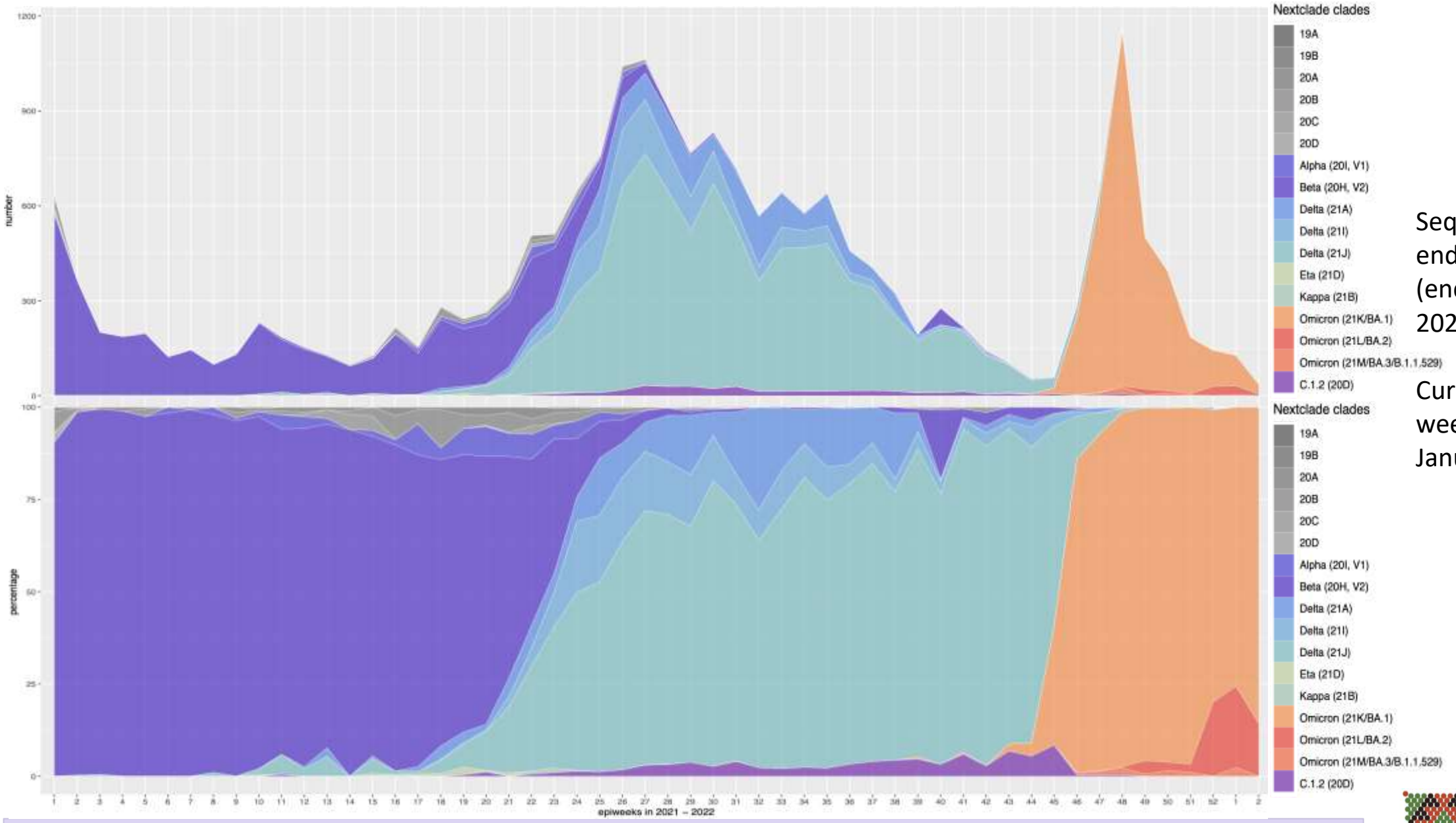
Omicron global prevalence



Omicron has been detected in 145 countries across the globe (detections based on GISAID).

NGS-SA
Network for Genomic Surveillance in South Africa

Proportion and number of clades by epiweek in South Africa, 2021 - 2022 (N=21 512)



Sequencing data ending epi week 2 (ending 15 January 2022)

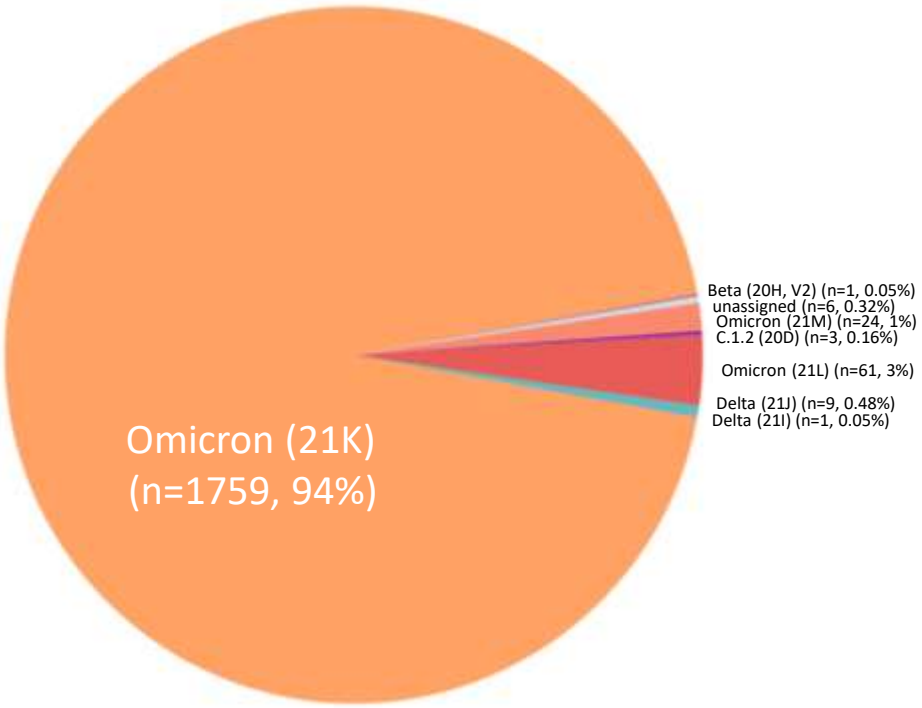
Currently in epi week 3 (ending 22 January 2022)

Delta dominated in South Africa until October at >80%. Omicron dominated November and December at >95%.

NGS-SA
Network for Genomic Surveillance in South Africa

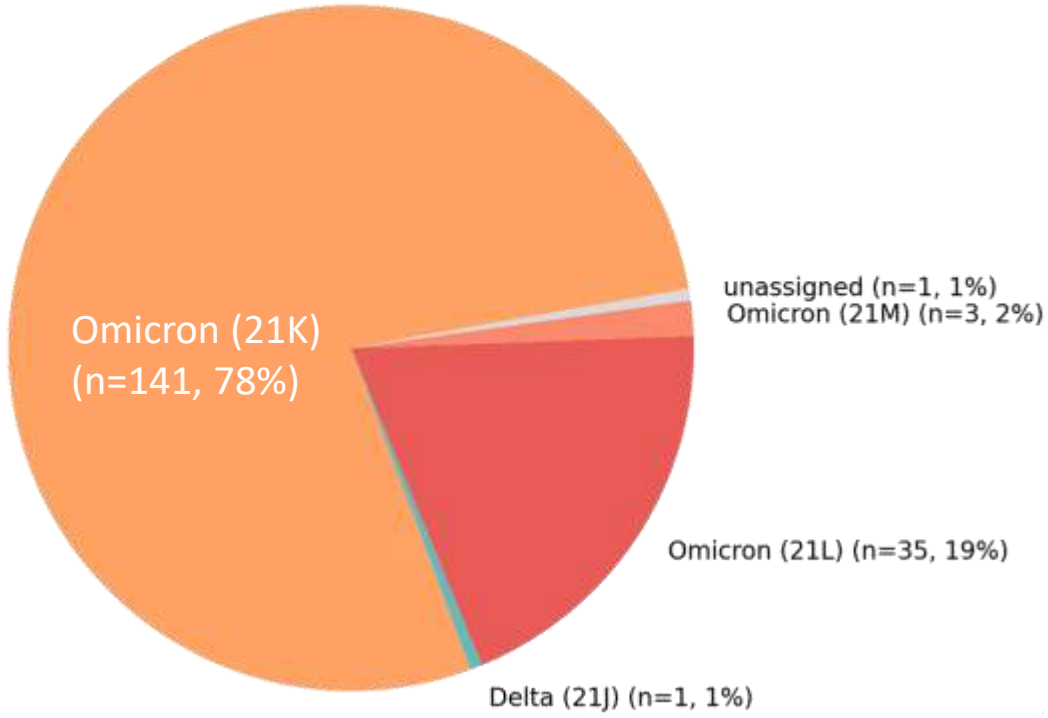
Prevalence of Variants of Concern (VOC) and Variants of Interest (VOI) in Dec 2021 – Jan 2022

December (N=1864)



Total Omicron in Dec: 1844 (98.9%)

January (N=181)



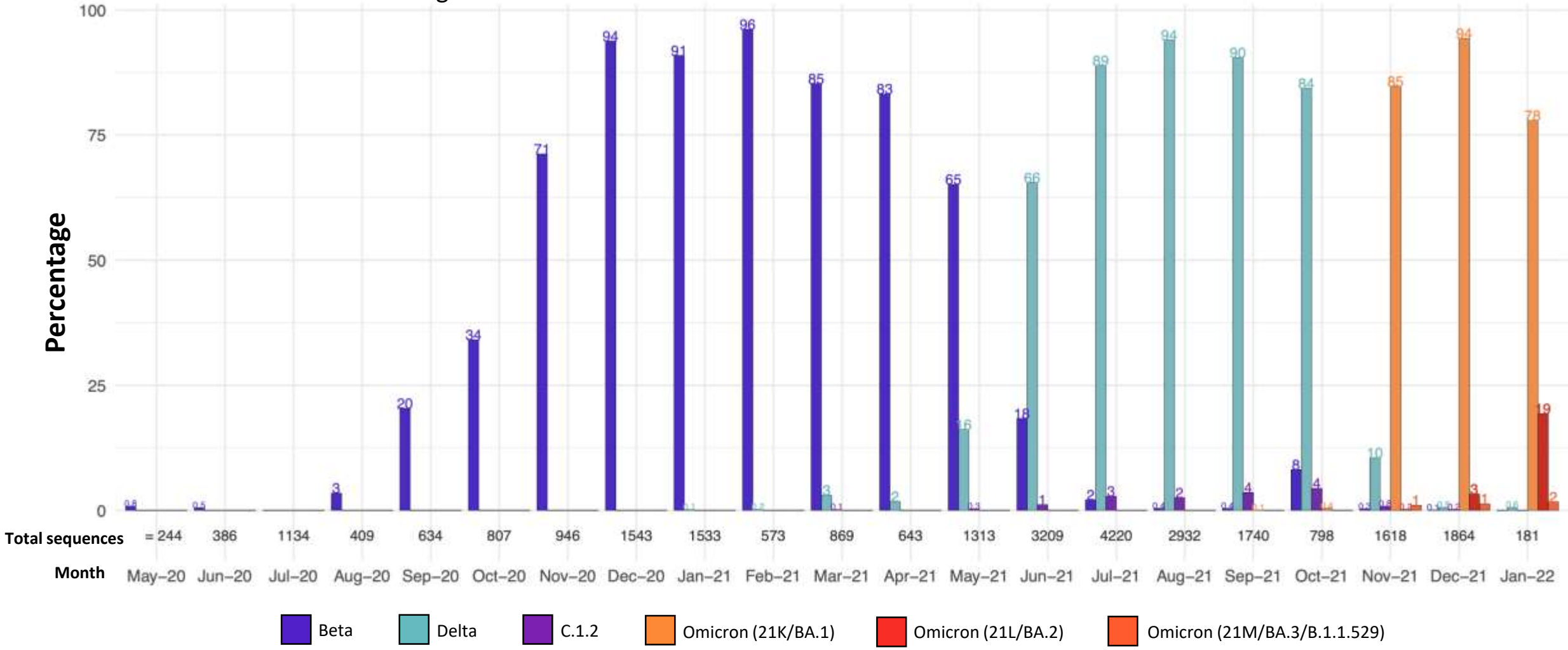
Total Omicron in Jan: 179 (98.9%)

Omicron dominated in December (99%, 1844/1864). Omicron appears to continue dominating in January (98%, 179/181), although more sequencing data is needed to confirm this trend and the BA.2 increase.

NGS-SA
Network for Genomic Surveillance in South Africa

Detection Rates: Beta, Delta, C.1.2 and Omicron

Detection rates of variants being monitored in South Africa*

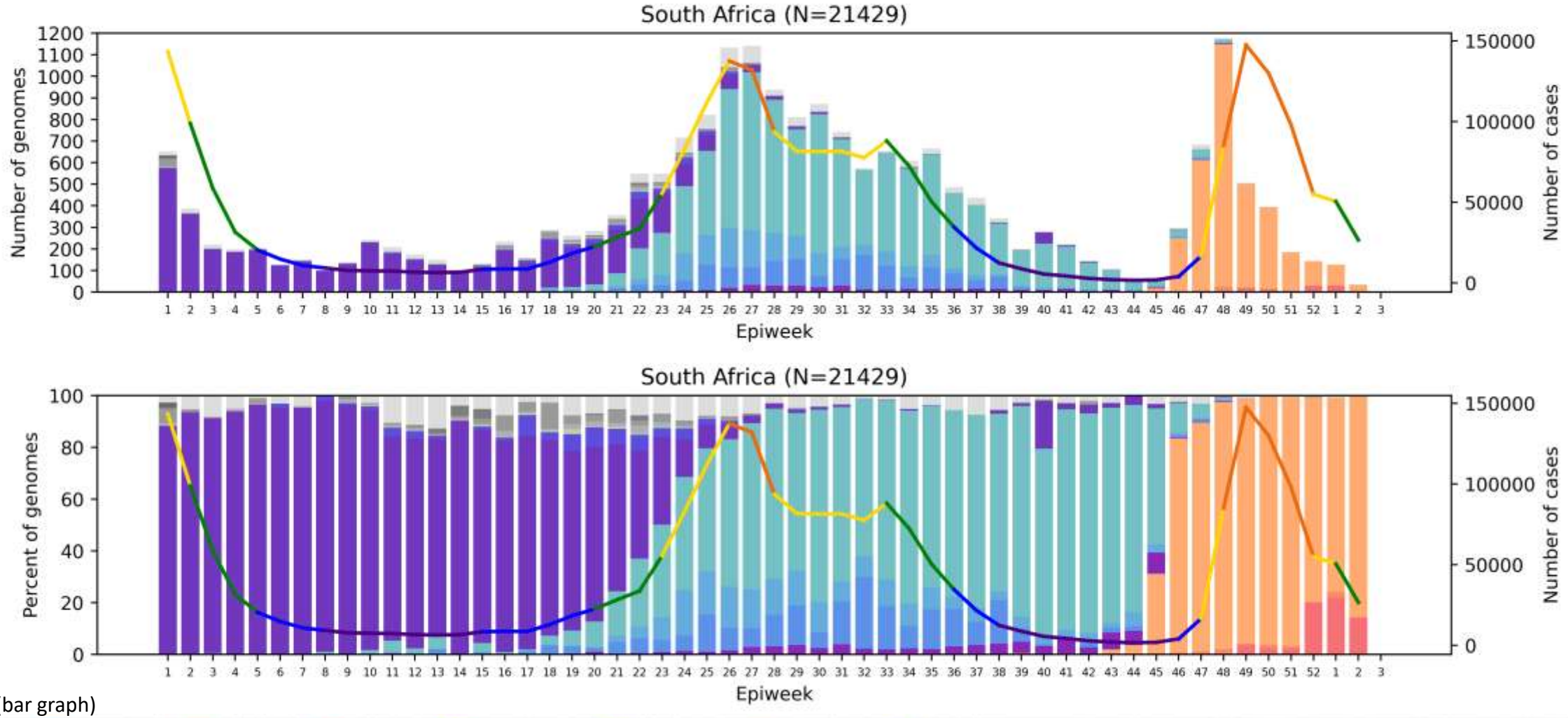


*Bars represent percentage prevalence of variant for the month; total sequences collected for the month are given below

C.1.2 has been detected at ≤ 4% of sequences monthly since May 2021.
Beta prevalence increased slightly in October but has since remained at low levels in November and December.
Omicron has been dominant since November (>80% in November, >98% in December and January).

NGS-SA
Network for Genomic Surveillance in South Africa

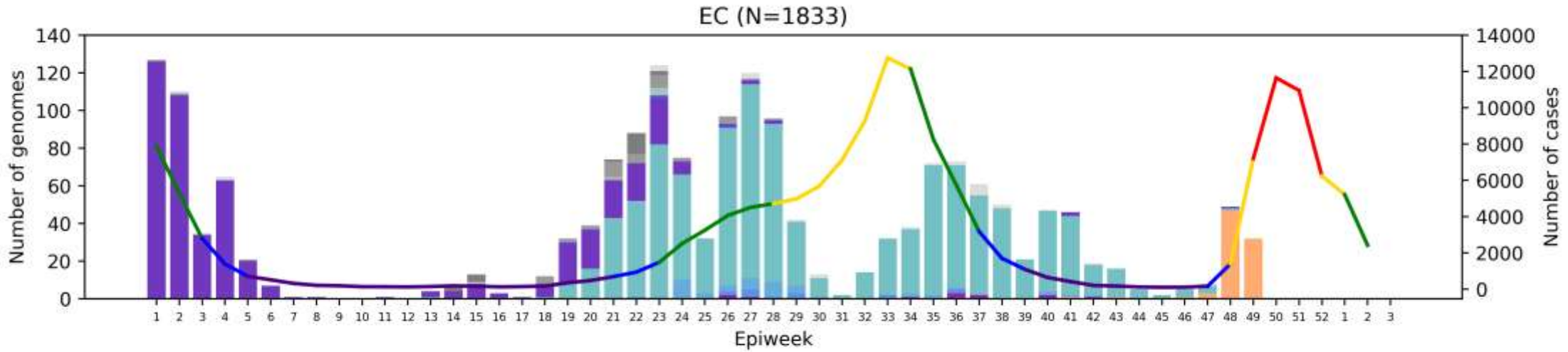
South Africa, 2021-2022, n = 21429*

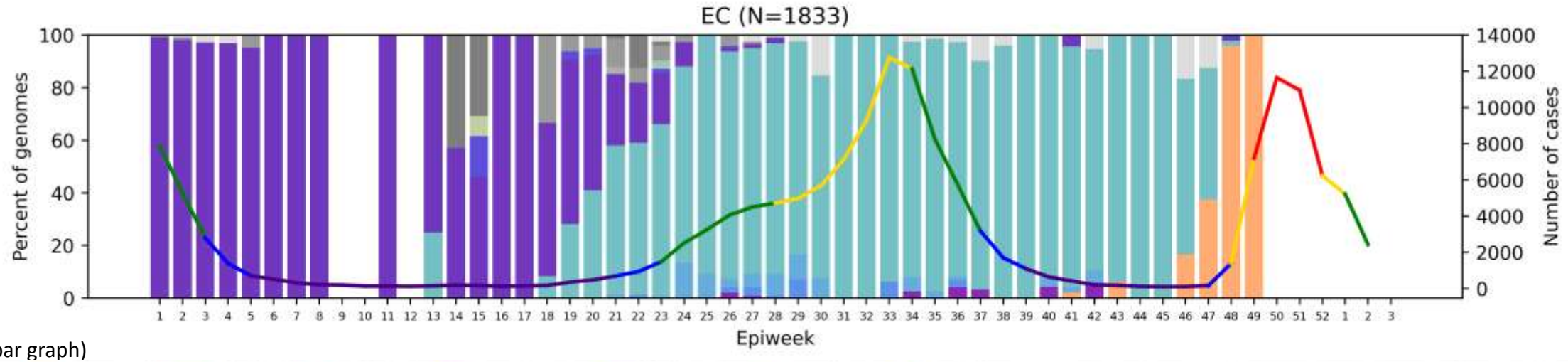


*Excludes sequences collected January 1st and 2nd (2021) as they fall under epiweek 53 of 2020, as well as those without complete collection dates.

NGS-SA
Network for Genomic Surveillance in South Africa

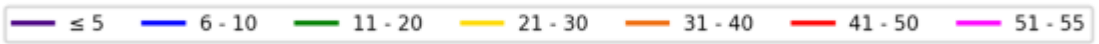
Eastern Cape Province, 2021-2022, n = 1833





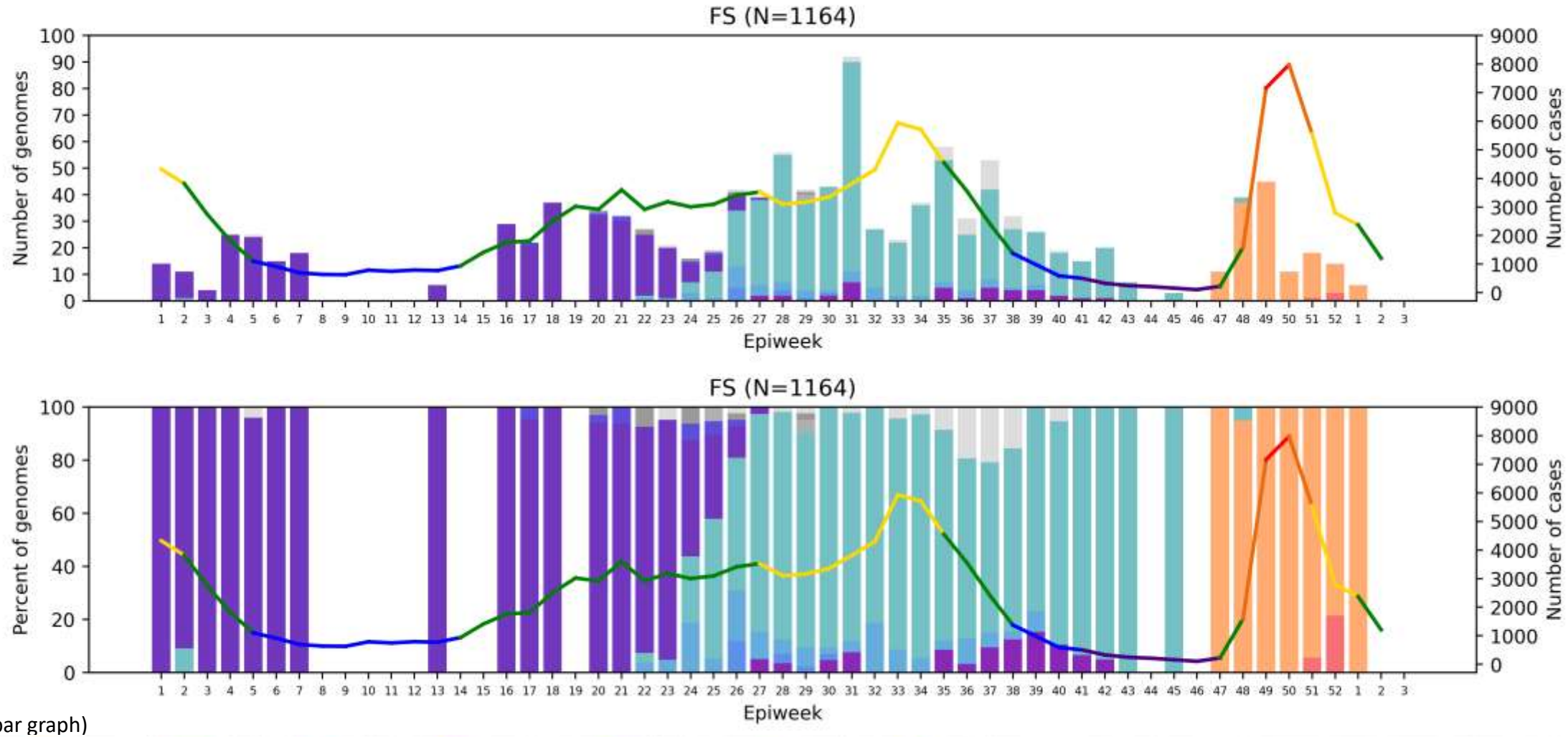
Clade key (bar graph)

Weekly percentage testing positive key (line graph)



NGS-SA
Network for Genomic Surveillance in South Africa

Free State Province, 2021-2022, n = 1164



Clade key (bar graph)

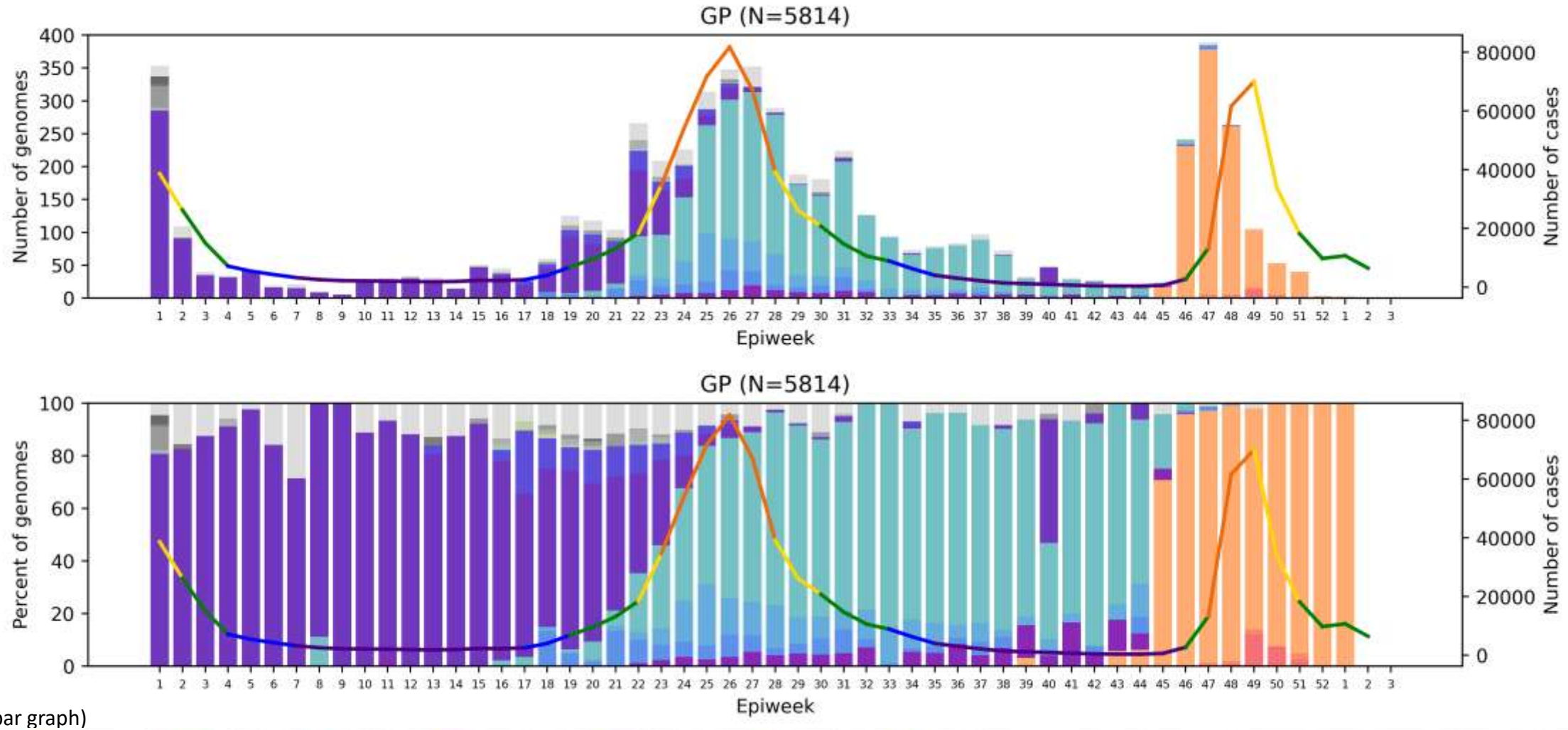
Omicron (21L) | Omicron (21K) | Delta (21A) | Delta (21J) | Beta (20H, V2) | Alpha (20I, V1) | Kappa (21B) | Eta (21D) | 20A | 20B | 20C | 20D | unassigned | 19A | 19B
Omicron (21M) | C.1.2 (20D) | Delta (21I) | Cases

Weekly percentage testing positive key (line graph)

≤ 5 | 6 - 10 | 11 - 20 | 21 - 30 | 31 - 40 | 41 - 50 | 51 - 55

NGS-SA
Network for Genomic Surveillance in South Africa

Gauteng Province, 2021-2022, n = 5814



Clade key (bar graph)

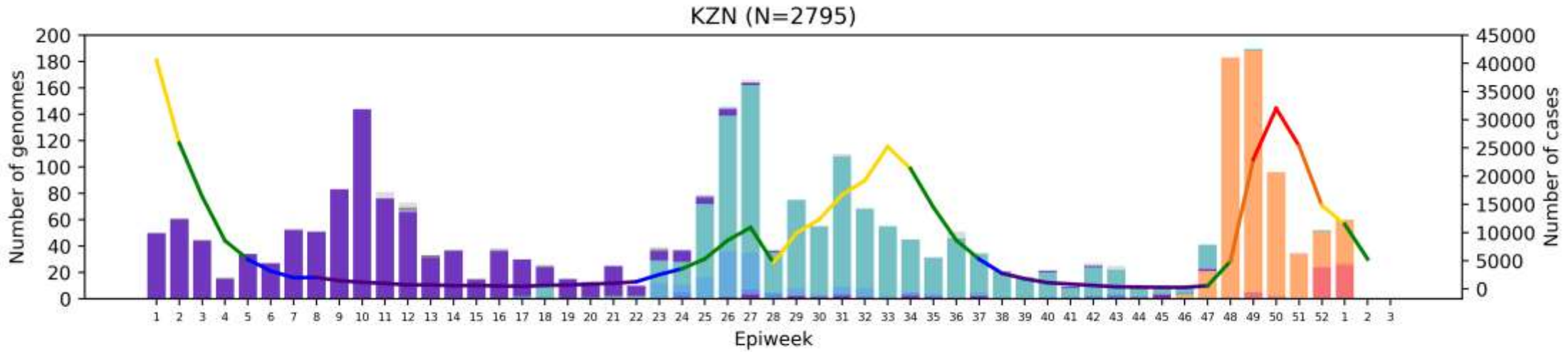
Omicron (21L) | Omicron (21K) | Delta (21A) | Delta (21J) | Beta (20H, V2) | Alpha (20I, V1) | Kappa (21B) | Eta (21D) | 20A | 20B | 20C | 20D | unassigned | 19A | 19B
Omicron (21M) | C.1.2 (20D) | Delta (21I) | Cases

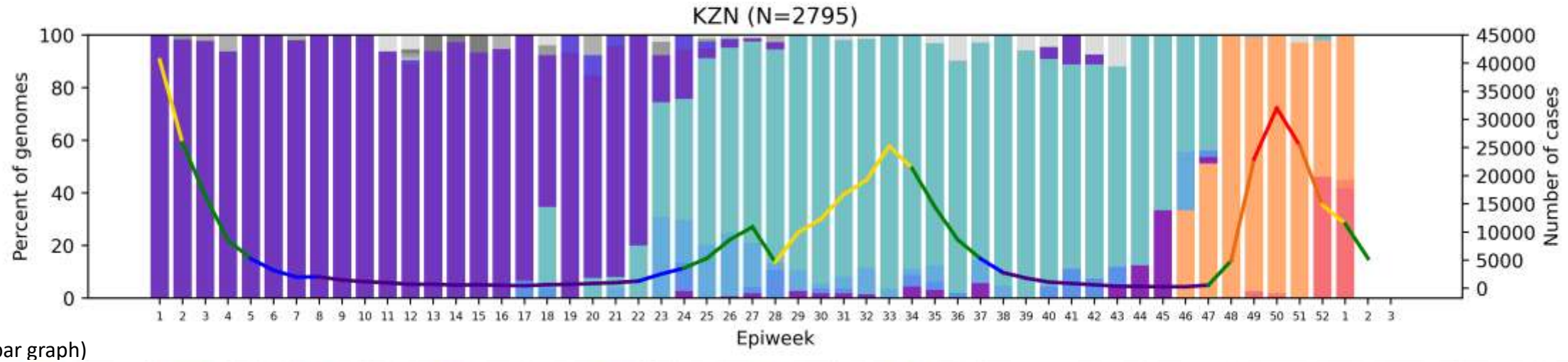
Weekly percentage testing positive key (line graph)

≤ 5 | 6 - 10 | 11 - 20 | 21 - 30 | 31 - 40 | 41 - 50 | 51 - 55

NGS-SA
Network for Genomic Surveillance in South Africa

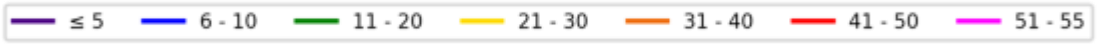
KwaZulu-Natal Province, 2021-2022, n = 2795





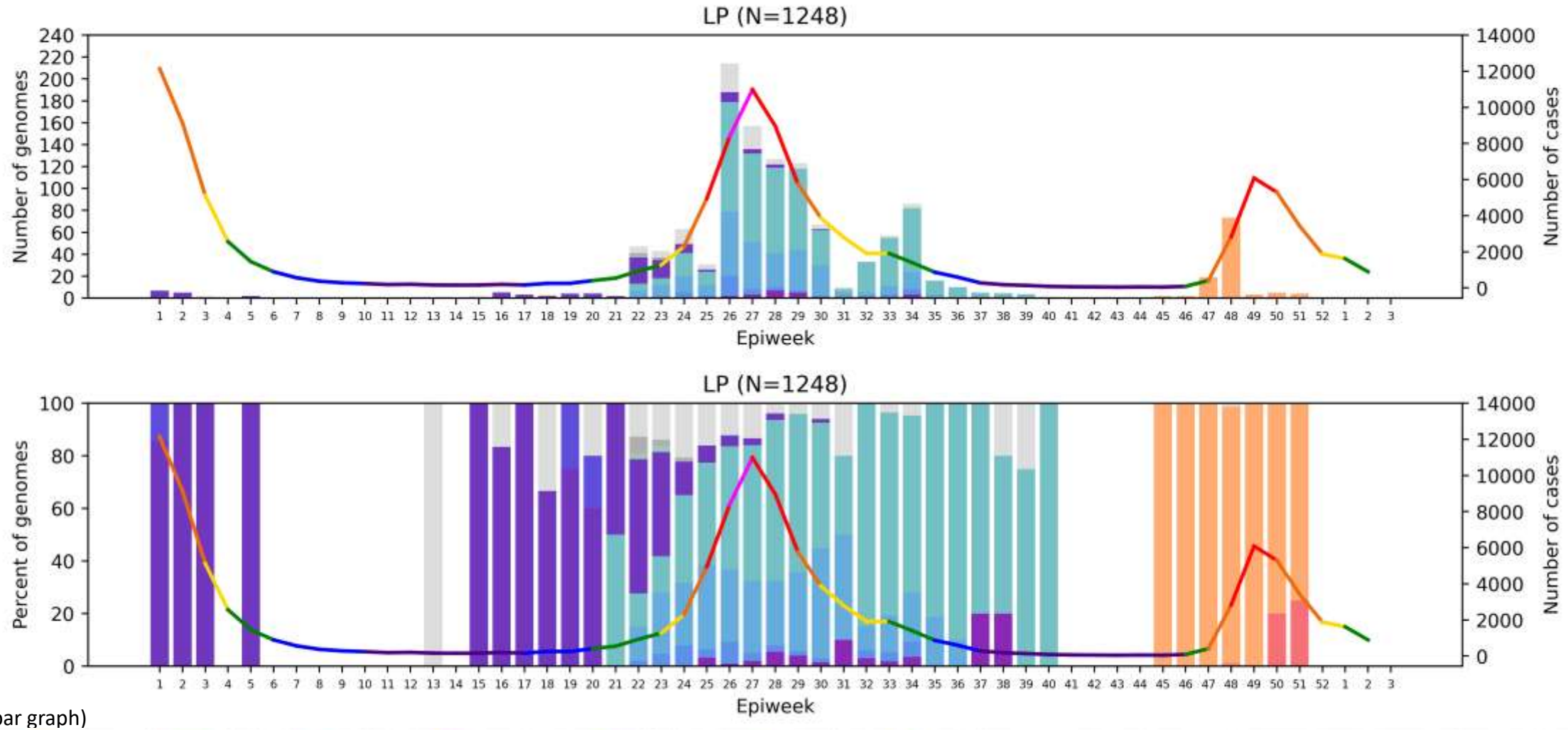
Clade key (bar graph)

Weekly percentage testing positive key (line graph)



NGS-SA
Network for Genomic Surveillance in South Africa

Limpopo Province, 2021-2022, n = 1248



Clade key (bar graph)

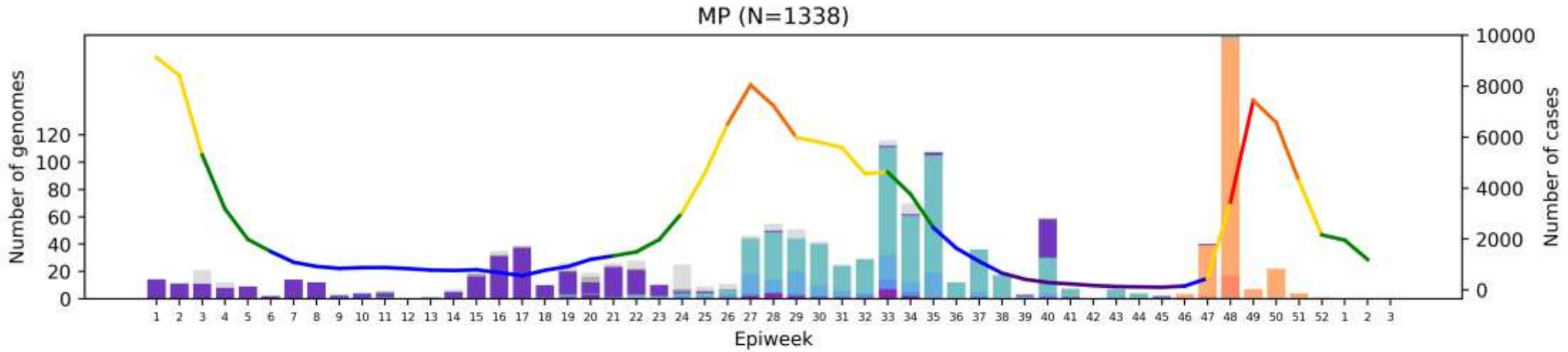
Omicron (21L) | Omicron (21K) | Delta (21A) | Delta (21J) | Beta (20H, V2) | Alpha (20I, V1) | Kappa (21B) | Eta (21D) | 20A | 20B | 20C | 20D | unassigned | 19A | 19B
Omicron (21M) | C.1.2 (20D) | Delta (21I) | Cases

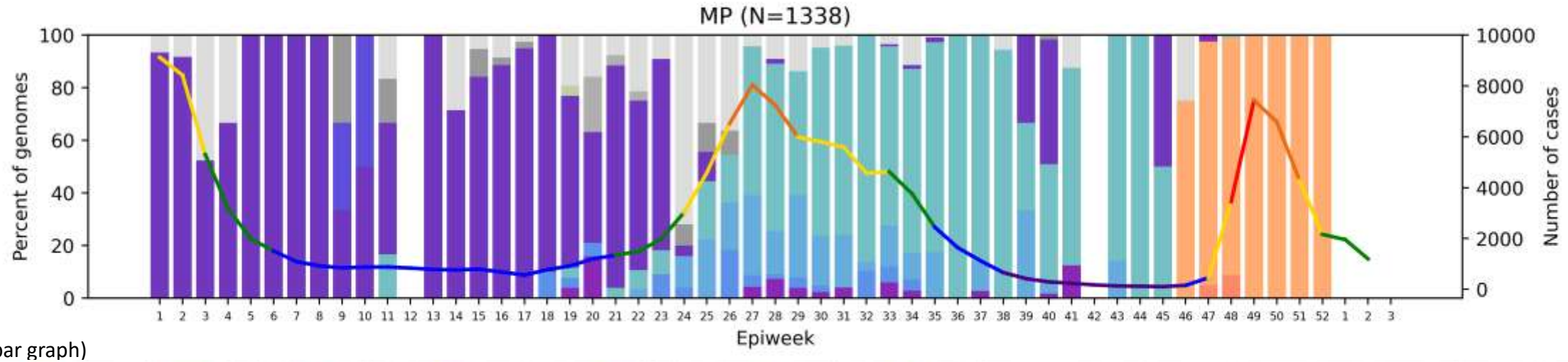
Weekly percentage testing positive key (line graph)

≤ 5 | 6 - 10 | 11 - 20 | 21 - 30 | 31 - 40 | 41 - 50 | 51 - 55

NGS-SA
Network for Genomic Surveillance in South Africa

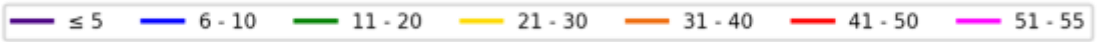
Mpumalanga Province, 2021-2022, n = 1338





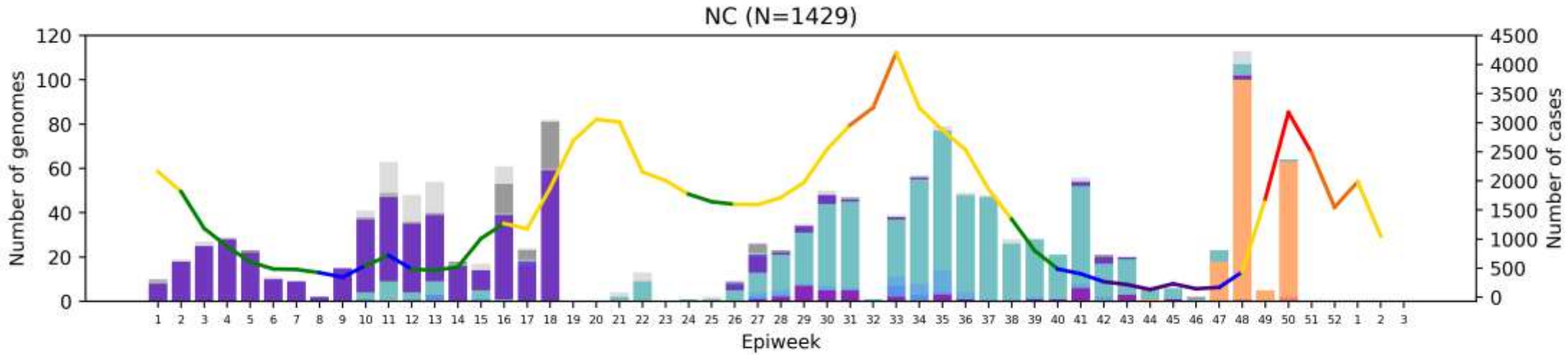
Clade key (bar graph)

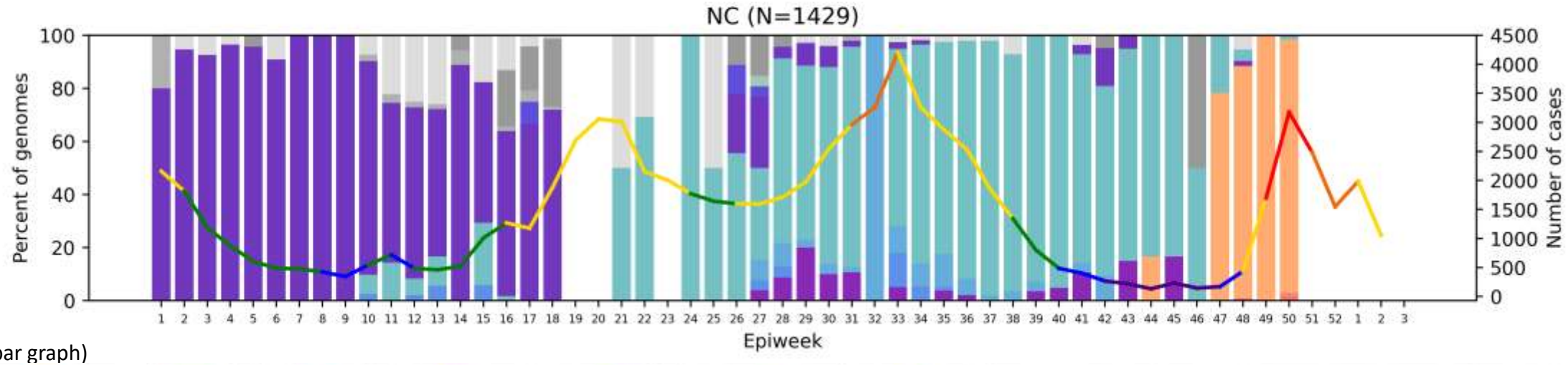
Weekly percentage testing positive key (line graph)



NGS-SA
Network for Genomic Surveillance in South Africa

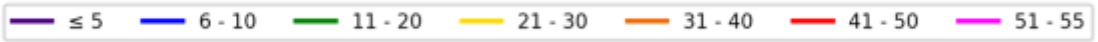
Northern Cape Province, 2021-2022, n = 1429





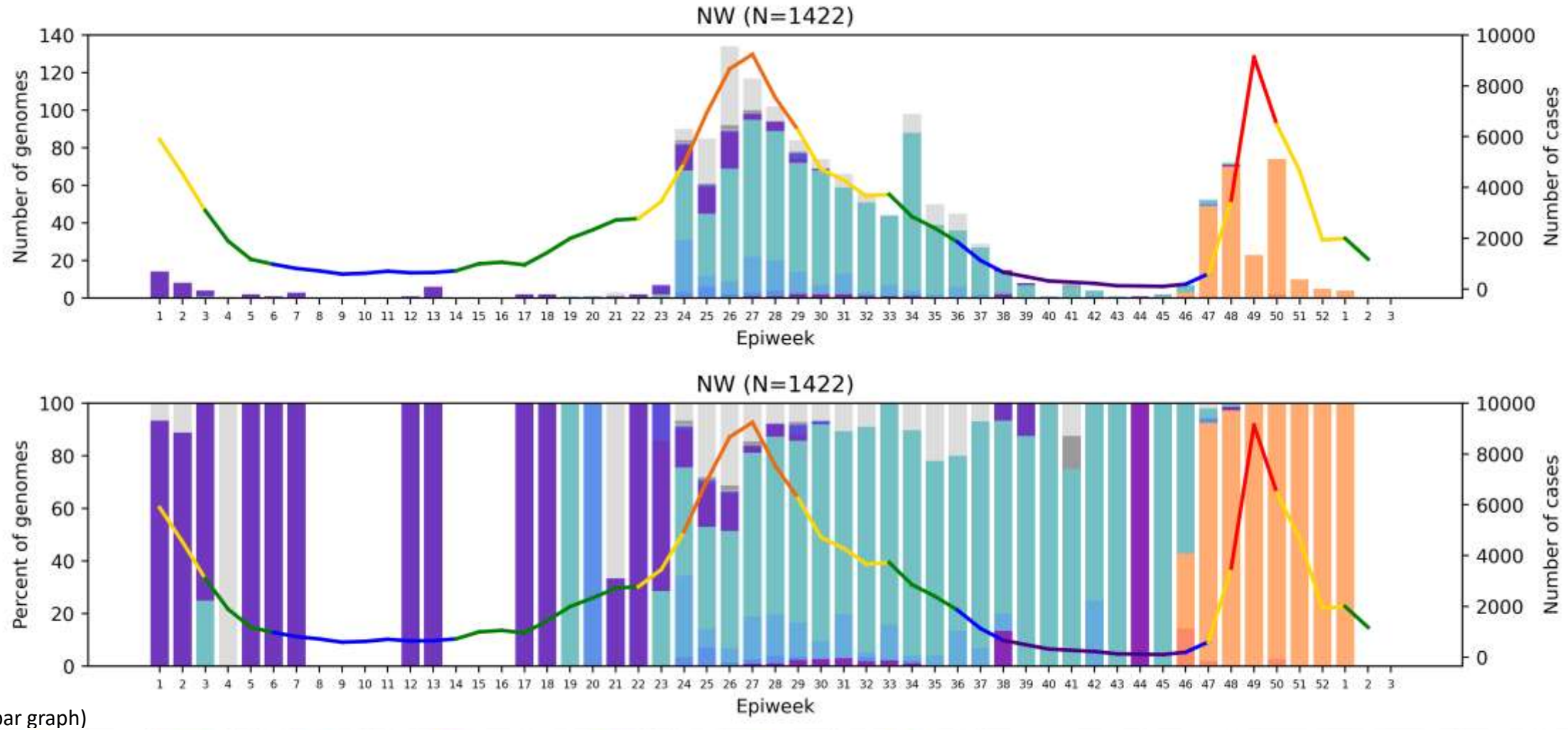
Clade key (bar graph)

Weekly percentage testing positive key (line graph)



NGS-SA
Network for Genomic Surveillance in South Africa

North West Province, 2021, n = 1422



Clade key (bar graph)

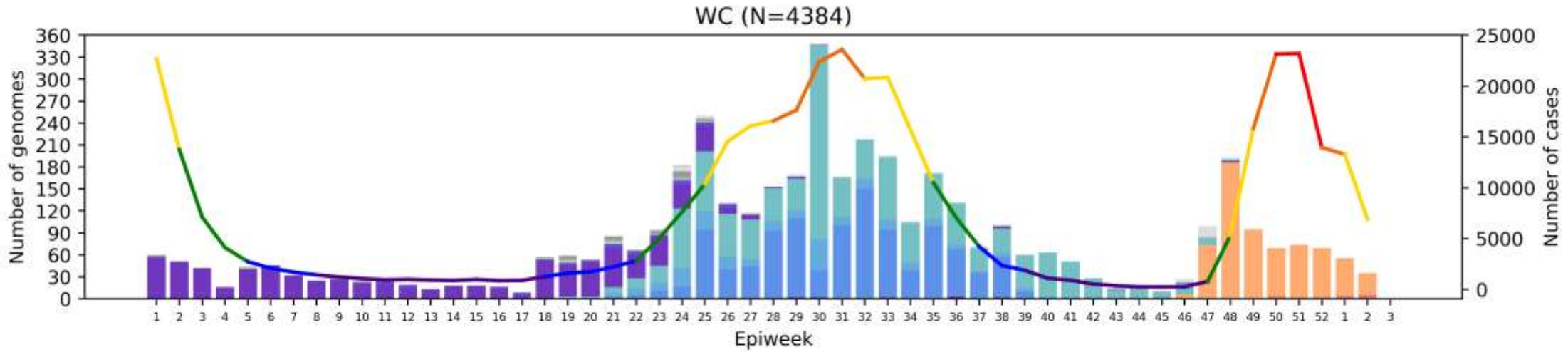
Omicron (21L) | Omicron (21K) | Delta (21A) | Delta (21J) | Beta (20H, V2) | Alpha (20I, V1) | Kappa (21B) | Eta (21D) | 20A | 20B | 20C | 20D | unassigned | 19A | 19B
Omicron (21M) | C.1.2 (20D) | Delta (21I) | Cases

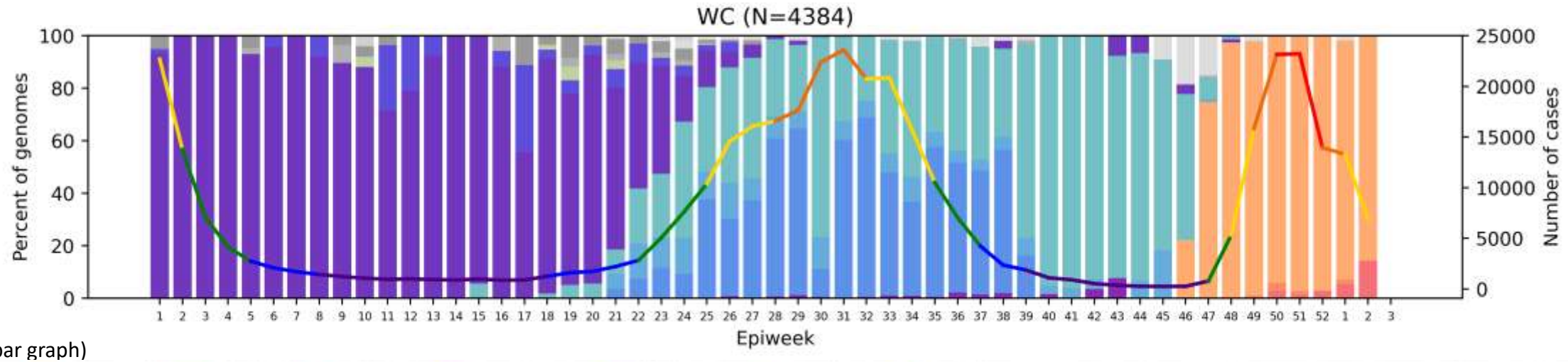
Weekly percentage testing positive key (line graph)

≤ 5 | 6 - 10 | 11 - 20 | 21 - 30 | 31 - 40 | 41 - 50 | 51 - 55

NGS-SA
Network for Genomic Surveillance in South Africa

Western Cape Province, 2021-2022, n = 4384





Clade key (bar graph)

Omicron (21L) | Omicron (21K) | Delta (21A) | Delta (21J) | Beta (20H, V2) | Alpha (20I, V1) | Kappa (21B) | Eta (21D) | 20A | 20B | 20C | 20D | unassigned | 19A | 19B
Omicron (21M) | C.1.2 (20D) | Delta (21I) | Cases

Weekly percentage testing positive key (line graph)

≤ 5 | 6 - 10 | 11 - 20 | 21 - 30 | 31 - 40 | 41 - 50 | 51 - 55

NGS-SA
Network for Genomic Surveillance in South Africa

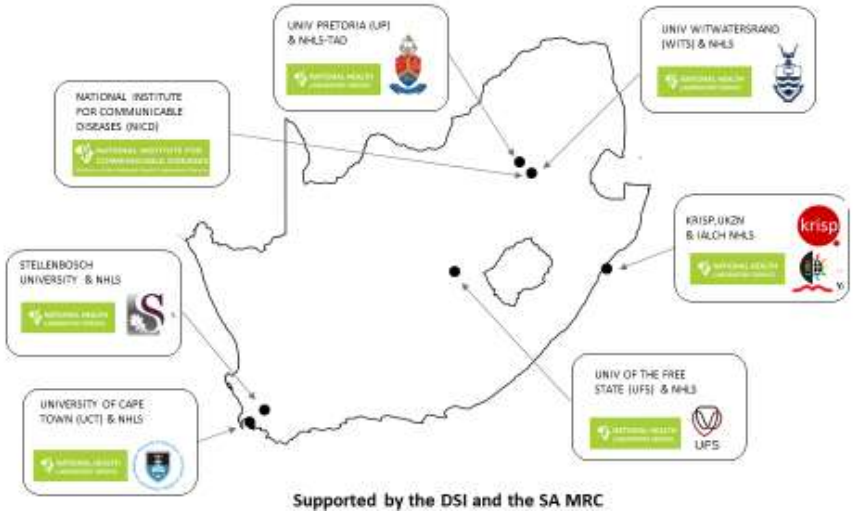
Summary

- **Variant of Concern Omicron**
  - Detected in 145 countries and dominating globally
  - Split into four lineages based on different mutational profiles: BA.1 (21K), BA.2 (21L), BA.3 (remains in 21M as does not meet requirements for new clade), B.1.1.529 (parent lineage, 21M)
    - New sub-lineage has been designated: BA.1.1. This contains lineage-defining BA.1.1 + spike:R346K
  - South Africa (detected in all provinces):
    - Dominated December sequencing data at 99% of genomes (n=1844/1864)
    - Limited sequence data for January shows continued dominance of Omicron (n=179/181)
    - BA.1 dominant in SA, with BA.2 increase recently observed and to be confirmed by additional data
      - BA.2 makes up 20% (n=29/144) of sequences in epiweek 53 of 2021, 22% (n=28/128) epiweek 1 of 2022, and 14% (n=5/35) sequences in epiweek 2.
- Low frequency of previously circulating variants such as Delta and C.1.2 still detected in recent data

NGS-SA
Network for Genomic Surveillance in South Africa

NGS-SA

Network for Genomic Surveillance in South Africa



Supported by the DSI and the SA MRC

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

UNIVERSITEIT iYUNIVESITHI STELLENBOSCH UNIVERSITY

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

UFS

saMRC advancinglife

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

EDCTP

This project (RIA2020EF-3030) is part of the EDCTP2 programme supported by the European Union"

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

WITS UNIVERSITY

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

NATIONAL HEALTH LABORATORY SERVICE

University of Stellenbosch & NHLS Tygerberg Virology

Susan Engelbrecht
Wolfgang Preiser
Gert van Zyl
Tongai Maponga
Bronwyn Kleinhans
Shannon Wilson
Karabo Phadu
Tania Stander
Kamela Mahlakwane
Mathilda Claassen
Diagnostic laboratory staff

UKZN-Inkosi Albert Luthuli Central Hospital

Dr Khanyi Msomi
Dr Kerusha Govender
Dr Pravi Moodley
Dr Aabida Khan
Dr Lili Gounder
Dr Kerri Francois
Dr Cherise Naicker
Dr Joedene Chetty
Dr Neli Ngcaba
Dr Tshepiso Mosito
Mr Malcolm Ellapen
Mr Kubendran Reddy
The COVID-19 Bench team

University of KwaZulu-Natal & Africa Health Research Institute

KRISP at UKZN:
Tulio de Oliveira
Richard Lessels
Houriiyah Tegally
Eduan Wilkinson
Jennifer Giandhari
Sureshnee Pillay
Emmanuel James San

AHRI
Alex Sigal
Sandile Cele
Willem Hanekom

University of Cape Town, NHLS & Western Cape Government

NHLS-UCT
Carolyn Williamson
Nei-yuan Hsiao
Diana Hardie
Kruger Marais
Stephen Korsman
Ziyaad Valley-Omar

WCG-UCT
Mary-Anne Davies
Hannah Hussey
Andrew Boulle
Masudah Paleker
Theuns Jacobs
Erna Morden

NHLS Greenpoint
Annabel Enoch

UCT, IDM and CIDRI-Africa
Deelan Doolabh
Arash Iranzadeh
Lynn Tyers
Innocent Mudau
Nokuzola Mbhele
Fezokuhle Khumalo
Thabang Serakge
Bruna Galvão
Arghavan Alisoltani
(U. California)
Robert Wilkinson
Darren Martin
Nicola Mulder
Wendy Burgers
Ntobeko Ntusi
Rageema Joseph
Sean Wasserman
Linda Boloko

Zoonotic arbo and respiratory virus program
Centre for Viral Zoonoses
Department Medical Virology/ NHLS
Tshwane Academic division
University of Pretoria

ZARV research program/UP
Marietjie Venter (Head: ZARV)
Adriano Mendes (Postdoc)
Amy Strydom (Postdoc)
Michaela Davis (MSc, intern medical scientist)

NHLS Tshwane
Prof Simnikiwe Mayaphi (HOD)

Funders:
GIZ/BMBF: African Network for Improved diagnostics and epidemiology of common and emerging infectious agents (ANDEMIA)
G7 Global Health fund, Robert Koch Institute, Dr Fabian Leendertz

National Institute for Communicable Diseases

Centre for Respiratory Diseases & Meningitis
Anne von Gottberg
Thabo Mohale
Daniel Amoako
Josie Everatt
Boitshoko Mahlangu
Noxolo Ntuli
Anele Mnguni
Amelia Buys
Cardia Fourie
Noluthando Duma
Linda de Gouveia
Jackie Kleynhans
Nicole Wolter
Sibongile Walaza
Mignon du Plessis
Stefano Tempia
Mvuyo Makhasi
Cheryl Cohen

Centre for HIV and STIs
Jinal Bhiman
Cathrine Scheepers
Constantinos Kurt Wibmer
Thandeka Moyo
Tandile Hermanus
Frances Ayres
Zanele Molaudzi
Bronwen Lambson
Tandile Hermanus
Mashudu Madzivhandila
Prudence Kgagudi
Brent Oosthuysen
Penny Moore
Lynn Morris

Sequencing Core Facility
Zamantungwa Khumalo
Annie Chan
Morne du Plessis
Stanford Kwenda
Phillip Senzo Mtshali
Mushal Allam
Florah Mnyameni
Arshad Ismail

NICD Groups
NICD COVID-19 response team
NICD SARS-CoV-2 Sequencing Group

University of the Free State

UFS
Dominique Goedhals
Armand Bester
Martin Myaga
Peter Mwangi
Emmanuel Ogunbayo
Milton Mogotsi
Makgotso Maotoana
Lutfiyya Mohamed

NHLS Division of Virology
Sabeehah Vawda
Felicity Burt
Thokozani Mkhize
Diagnostic laboratory staff

NGS-SA
Network for Genomic Surveillance in South Africa

Additional support and collaborators

NHLS
Koeleka Mlisana
Zinhle Makatini
Eugene Elliot
Florette K. Treurnicht
Kathleen Subramoney
Oluwakemi Laguda-Akingba
Shareef Abrahams
Greta Hoyland
Gloria Selabe
Elias Bereda
Jeannette Wadula

Hyrax Biosciences
Simon Travers

Cape Town HVTN Laboratory
Erica Anderson-Nissen
Anneta Naidoo

Ndlovu Research
Hugo Tempelman
CJ Umunnakwe

Lancet
Allison J. Glass
Raquel Viana

Ampath
Terry Marshall
Cindy van Deventer
Eddie Silberbauer

Pathcare Vermaak
Andries Dreyer
Howard Newman
Riaan Writes
Marianne Wolfaardt
Warren Lowman

Bridge-the-Gap
Raymond Rott

Cytespace Africa Laboratories
Christa Viljoen

ARC-OVI
Lia Rotherham

CAPRISA
Salim Abdool Karim
Nigel Garret

UKZN - Big Data
Francesco Pettruccione
Ilya Sinayskiy

University of Oxford
José Lourenço

FioCruz, Brazil
Vagner Fonseca
Marta Giovanetti
Luiz Carlos Junior Alcantara

Africa CDC
John Nkengasong
Sofonias Tessema

Netcare:
Richard Friedland
Craig Murphy
Caroline Maslo
Liza Sitharam

DSI
Glaudina Loots

SA MRC
Glenda Gray

NGS-SA
Network for Genomic Surveillance in South Africa

UKZN-Inkosi Albert Luthuli Central Hospital

Dr Khanyi Msomi
Dr Kerusha Govender
Dr Pravi Moodley
Dr Aabida Khan
Dr Lili Gounder
Dr Kerri Francois
Dr Cherise Naicker
Dr Joedene Chetty
Dr Neli Ngcaba
Dr Tshepiso Mosito
Mr Malcolm Ellapen
Mr Kubendran Reddy
The COVID-19 Bench team

University of KwaZulu-Natal & Africa Health Research Institute

KRISP at UKZN:
Tulio de Oliveira
Richard Lessels
Houriiyah Tegally
Eduan Wilkinson
Jennifer Giandhari
Sureshnee Pillay
Emmanuel James San

AHRI
Alex Sigal
Sandile Cele
Willem Hanekom

University of Stellenbosch & NHLS Tygerberg Virology

Susan Engelbrecht
Wolfgang Preiser
Gert van Zyl
Tongai Maponga
Bronwyn Kleinhans
Shannon Wilson
Karabo Phadu
Tania Stander
Kamela Mahlakwane
Mathilda Claassen
Diagnostic laboratory staff

NGS-SA
Network for Genomic Surveillance in South Africa

University of Cape Town, NHLS & Western Cape Government

NHLS-UCT
Carolyn Williamson
Nei-yuan Hsiao
Diana Hardie
Kruger Marais
Stephen Korsman
Ziyaad Valley-Omar

WCG-UCT
Mary-Anne Davies
Hannah Hussey
Andrew Boulle
Masudah Paleker
Theuns Jacobs
Erna Morden

NHLS Greenpoint
Annabel Enoch

UCT, IDM and CIDRI-Africa
Deelan Doolabh
Arash Iranzadeh
Lynn Tyers
Innocent Mudau
Nokuzola Mbhele
Fezokuhle Khumalo
Thabang Serakge
Bruna Galvão
Arghavan Alisoltani
(U. California)

Robert Wilkinson
Darren Martin
Nicola Mulder
Wendy Burgers
Ntobeko Ntusi
Rageema Joseph
Sean Wasserman
Linda Boloko

University of the Free State

UFS
Dominique Goedhals
Armand Bester
Martin Myaga
Peter Mwangi
Emmanuel Ogunbayo
Milton Mogotsi
Makgotso Maotoana
Lutfiyya Mohamed

NHLS Division of Virology
Sabeehah Vawda
Felicity Burt
Thokozani Mkhize
Diagnostic laboratory staff

NGS-SA
Network for Genomic Surveillance in South Africa

National Institute for Communicable Diseases

Centre for Respiratory Diseases & Meningitis
Anne von Gottberg
Thabo Mohale
Daniel Amoako
Josie Everatt
Boitshoko Mahlangu
Noxolo Ntuli
Anele Mnguni
Amelia Buys
Cardia Fourie
Noluthando Duma
Linda de Gouveia
Jackie Kleynhans
Nicole Wolter
Sibongile Walaza
Mignon du Plessis
Stefano Tempia
Mvuyo Makhasi
Cheryl Cohen

Centre for HIV and STIs
Jinal Bhiman
Cathrine Scheepers
Constantinos Kurt Wibmer
Thandeka Moyo
Tandile Hermanus
Frances Ayres
Zanele Molaudzi
Bronwen Lambson
Tandile Hermanus
Mashudu Madzivhandila
Prudence Kgagudi
Brent Oosthuysen
Penny Moore
Lynn Morris

NICD Groups
NICD COVID-19 response team
NICD SARS-CoV-2 Sequencing Group

Sequencing Core Facility
Zamantungwa Khumalo
Annie Chan
Morne du Plessis
Stanford Kwenda
Phillip Senzo Mtshali
Mushal Allam
Florah Mnyameni
Arshad Ismail

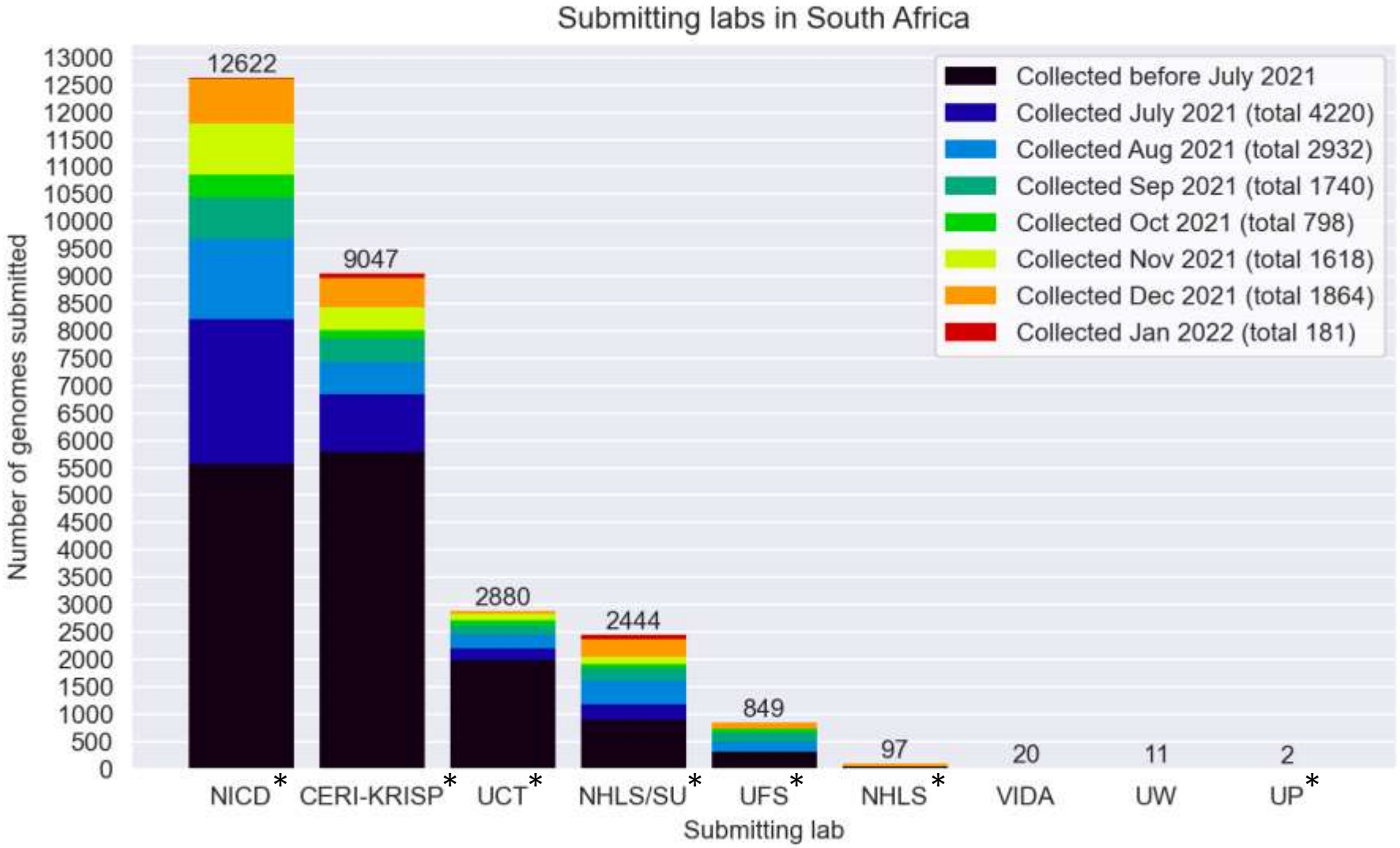
Zoonotic arbo and respiratory virus program
Centre for Viral Zoonoses
Department Medical Virology/ NHLS
Tshwane Academic division
University of Pretoria

ZARV research program/UP
Marietjie Venter (Head: ZARV)
Adriano Mendes (Postdoc)
Amy Strydom (Postdoc)
Michaela Davis (MSc, intern medical scientist)

NHLS Tshwane
Prof Simnikiwe Mayaphi (HOD)

Funders:
GIZ/BMBF: African Network for Improved diagnostics and epidemiology of common and emerging infectious agents (ANDEMIA)
G7 Global Health fund, Robert Koch Institute, Dr Fabian Leendertz

South African genomes submitted per submitting lab, 2020 and 2021 (N=27 972)



***NGS-SA Labs**

CERI: Centre for Epidemic Response and Innovation

KRISP: KZN Research Innovation and Sequencing Platform

NICD: National Institute for Communicable Diseases

NHLS: National Health Laboratory Service

SU: Stellenbosch University

UCT: University of Cape Town

UFS: University of the Free State

UP: University of Pretoria

Multiple labs from NGS-SA and collaborating public and private laboratories are contributing to sequencing, both as originating and as submitting (pictured here) laboratories.

NGS-SA
Network for Genomic Surveillance in South Africa

Variants of Concern (VOC)

WHO label	Pango lineage•	GISAID clade	Nextstrain clade	Additional amino acid changes monitored°	Earliest documented samples	Date of designation
Alpha	B.1.1.7	GRY	20I (V1)	+S:484K +S:452R	United Kingdom, Sep-2020	18-Dec-2020
Beta	B.1.351	GH/501Y.V2	20H (V2)	+S:L18F	South Africa, May-2020	18-Dec-2020
Gamma	P.1	GR/501Y.V3	20J (V3)	+S:681H	Brazil, Nov-2020	11-Jan-2021
Delta	B.1.617.2	G/478K.V1	21A	+S:417N +S:E484K	India, Oct-2020	VOI: 4-Apr-2021 VOC: 11-May-2021
Omicron*	B.1.1.529	GRA	21K, 21L, 21M	+S:R346K	Multiple countries, Nov-2021	VUM: 24-Nov-2021 VOC: 26-Nov-2021

https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/ accessed 14 January 2022

•Includes all descendant lineages. See the cov-lineages.org and the Pango network websites for further details.

* See TAG-VE statement issued on 26 November 2021

° Only found in a subset of sequences

Currently designated Variants of Interest (VOI)

WHO label	Pango lineage*	GISAID clade	Nextstrain clade	Earliest documented samples	Date of designation
Lambda	C.37	GR/452Q.V1	21G	Peru, Dec-2020	14-Jun-2021
Mu	B.1.631	GH	21H	Colombia, Jan-2021	30-Aug-2021

https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/ accessed 17 December 2021

*Includes all descendant lineages. See the cov-lineages.org and the Pango network websites for further details.

Submission of routine specimens for sequencing

- representative of multiple geographic regions (provinces/districts/health facilities) from individuals of
  - all ages
  - over as many time periods during the SARS-CoV-2 epidemic in South Africa
- requested that testing laboratories in both the private and public sectors, submit respiratory samples to their closest NGS-SA sequencing laboratory on a routine basis (ideally every week) as follows, depending on the capacity of the testing laboratory:
  - All positives samples should be sent every week (NGS-SA laboratory will perform random sampling as described below) **OR**
  - A weekly selection of approximately 10%-20% of randomly selected positive samples should be sent every week. Number of selected samples will depend on the size of laboratory and how many other laboratories are drained by the submitting laboratory.

Submission of special interest specimens for sequencing

In addition to routine samples mentioned above, please send specimens separately to above and clearly marked if:

- Suspected vaccine breakthrough (≥14 days after vaccine), especially if hospitalised and clinically severe
- Suspected re-infection (≥90 days after previous episode), especially if hospitalised and clinically severe
- Prolonged shedding with high SARS-CoV-2 viral loads (i.e. Ct values less than 30 for more than 1 month post-primary diagnosis) in immunocompromised individuals
- Possible animal-to-human transmission
- Suspected cases of importation from another country, especially countries known to harbour SARS-CoV-2 variants of concern or countries with little available information
- Clusters of “unusual” cases (e.g., in terms of disease presentation, patient groups affected, etc.)