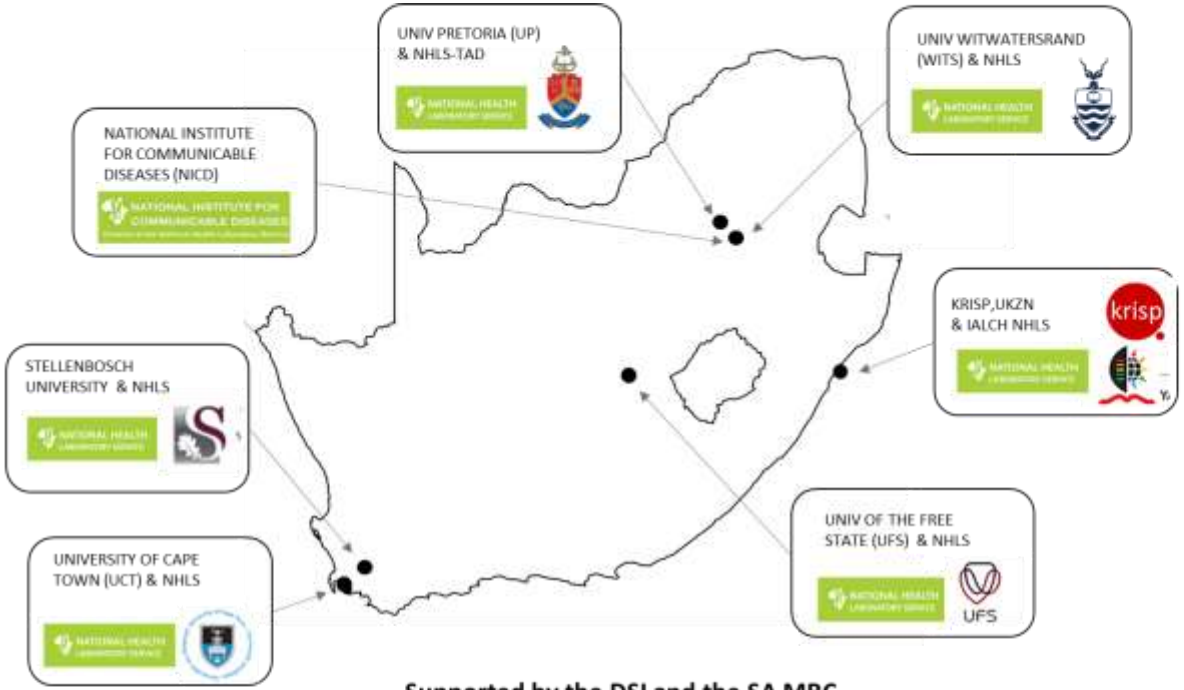
Network for Genomic Surveillance South Africa (NGS-SA)

SARS-CoV-2 Sequencing Update
5 November 2021



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NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES (NICD)

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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 4 November at 21h36

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

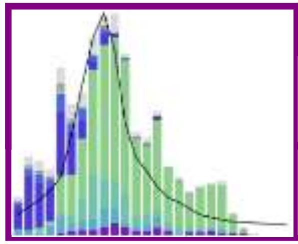
Elbe, S., and Buckland-Merrett, G. (2017) Data, disease and diplomacy: GISAID's innovative contribution to global health. Global Challenges, 1:33-46. DOI: 10.1002/gch2.1018 PMCID: 31565258

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/

GENOMIC SURVEILLANCE IN THE THIRD WAVE

epiweeks 18 - 43



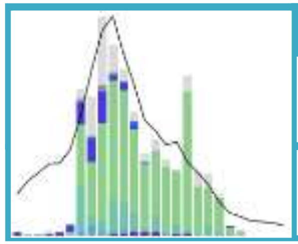
Gauteng

PTP: 0.9%

Genomes	Cases
3 488 (27.6%)	494 744 (37.0%)

Genomes deposited in the last week

🟦 1 🟦 3 🟦 1 🟩 6 🟩 103 🟪 5 ⬜ 14



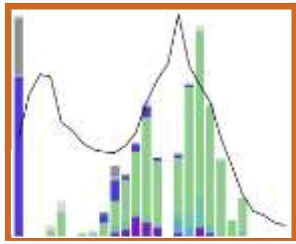
North West

PTP: 1.5%

Genomes	Cases
1 025 (8.1%)	82 606 (6.2%)

Genomes deposited in the last week

🟦 1 🟩 4 🟩 27 ⬜ 10



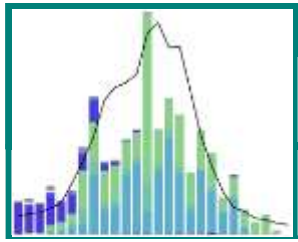
Northern Cape

PTP: 5.2%

Genomes	Cases
538 (4.3%)	51 911 (3.9%)

Genomes deposited in the last week

🟩 3 🟩 72 🟪 1 ⬜ 2



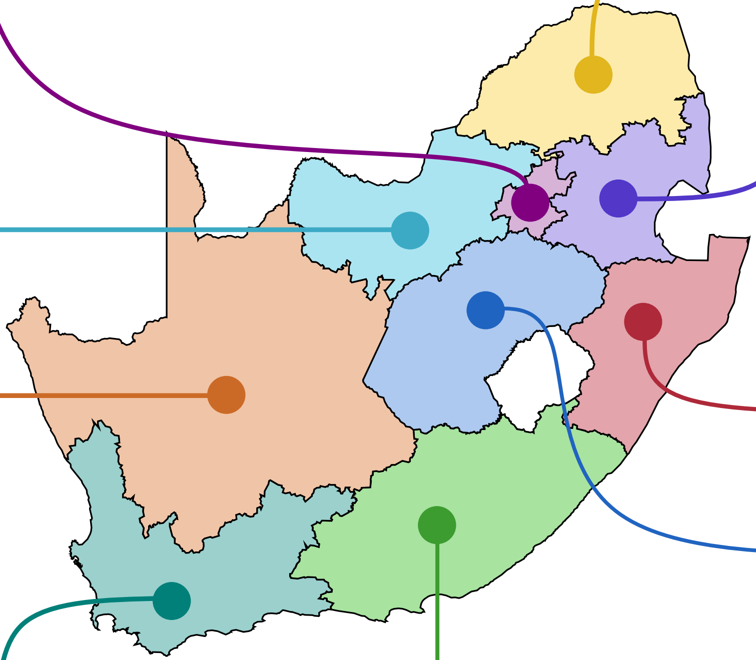
Western Cape

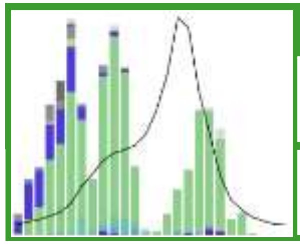
PTP: 1.7%

Genomes	Cases
2 816 (22.3%)	226 593 (17.0%)

Genomes deposited in the last week

🟩 1 🟩 6 ⬜ 1





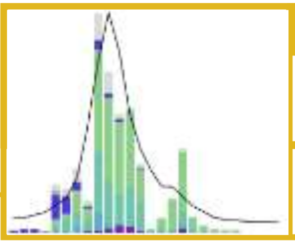
Eastern Cape

PTP: 1.5%

Genomes	Cases
1 140 (9.0%)	96 204 (7.2%)

Genomes deposited in the last week

🟩 42 🟪 1 ⬜ 5



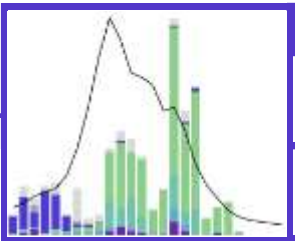
Limpopo

PTP: 1.0%

Genomes	Cases
1 036 (8.2%)	58 231 (4.4%)

Genomes deposited in the last week

🟩 5 🟩 16 ⬜ 2



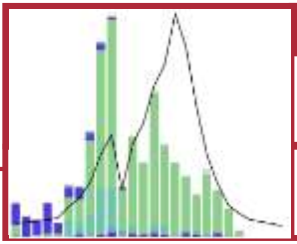
Mpumalanga

PTP: 1.6%

Genomes	Cases
701 (5.5%)	73 540 (5.5%)

Genomes deposited in the last week

🟦 1 🟩 2 🟩 23 🟪 1 ⬜ 1



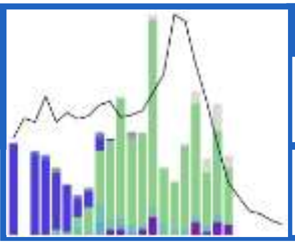
KwaZulu-Natal

PTP: 1.3%

Genomes	Cases
1 145 (9.1%)	178 752 (13.4%)

Genomes deposited in the last week

🟩 1



Free State

PTP: 2.9%

Genomes	Cases
755 (6.0%)	73 718 (5.5%)

Genomes deposited in the last week

🟩 4 🟩 1

🟪 C.1.2 (20D)
🟦 Beta (20H, V2)
🟦 Alpha (20I, V1)
🟦 Delta (21A)
🟩 Delta (21I)
🟩 Delta (21J)
🟩 Kappa (21B)
🟨 Eta (21D)
⬛ 20A
⬛ 20B
⬛ 20C
⬛ 20D
⬜ Unassigned
— Cases

Bar graphs represent genomes sequenced per epiweek, with lines representing cases by collection date (weeks 18 – 43)
Genomes and cases presented as provincial total (percentage of national total) for epiweeks 18 – 43
PTP: percentage testing positive

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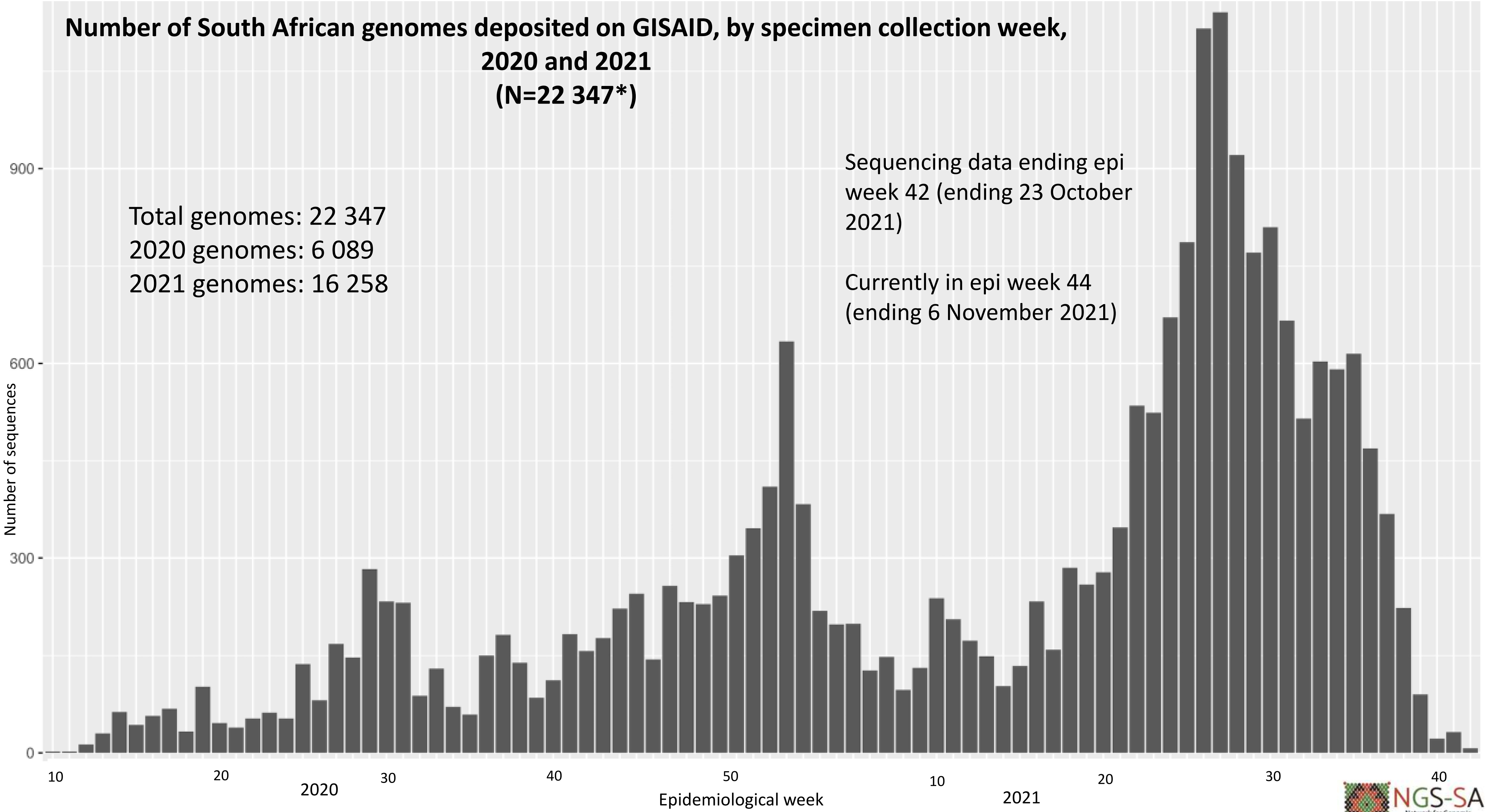
Number of South African genomes deposited on GISAID, by specimen collection week, 2020 and 2021 (N=22 347*)



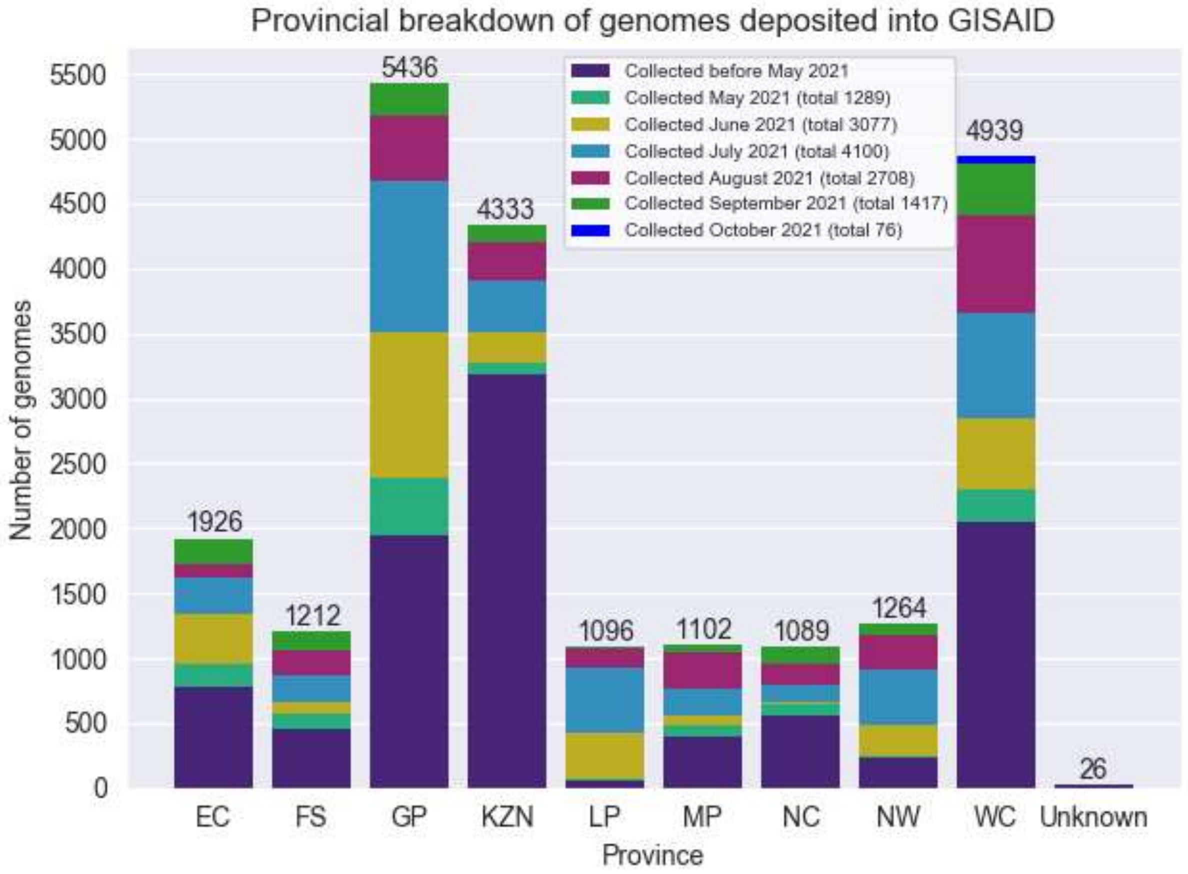
Total genomes: 22 347
2020 genomes: 6 089
2021 genomes: 16 258

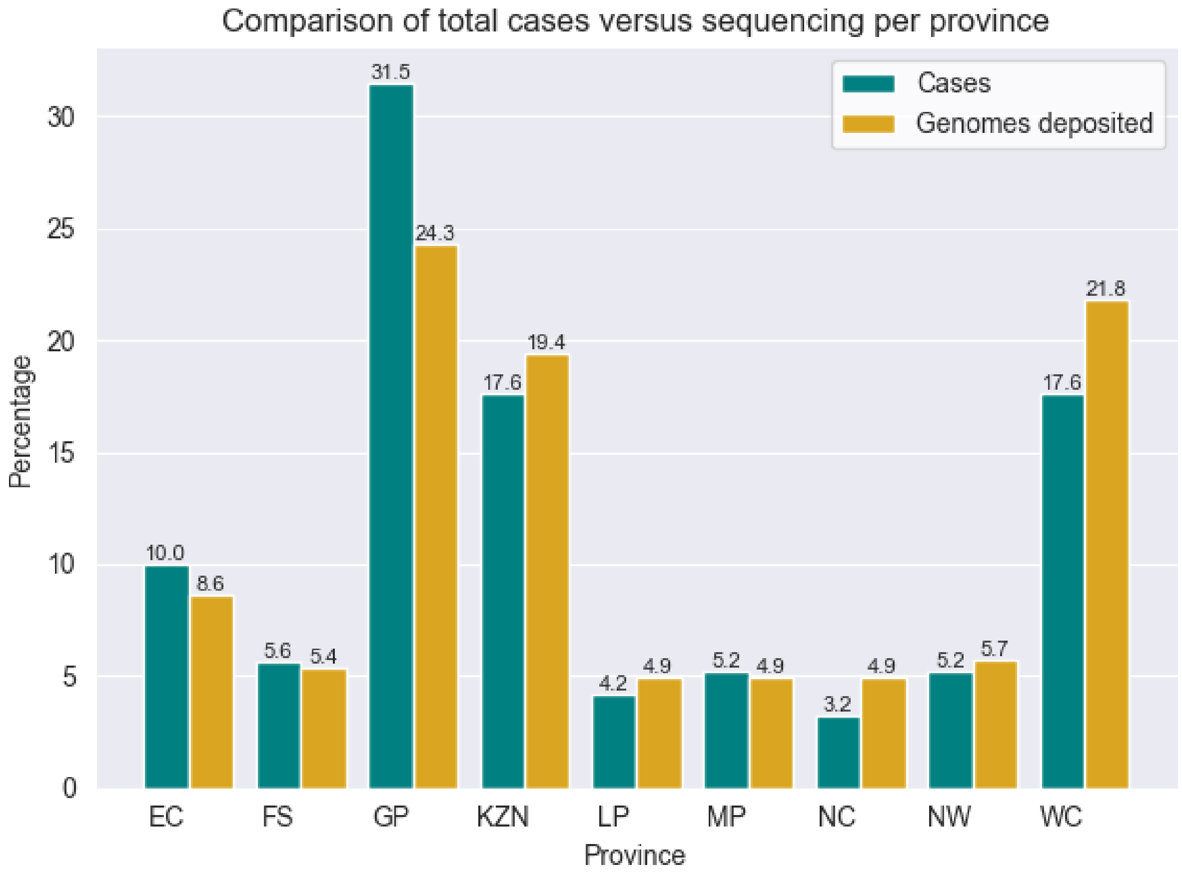
Sequencing data ending epi week 42 (ending 23 October 2021)

Currently in epi week 44 (ending 6 November 2021)

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

GISAID genomes vs total cases, 2020 and 2021 (N=22 347)





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

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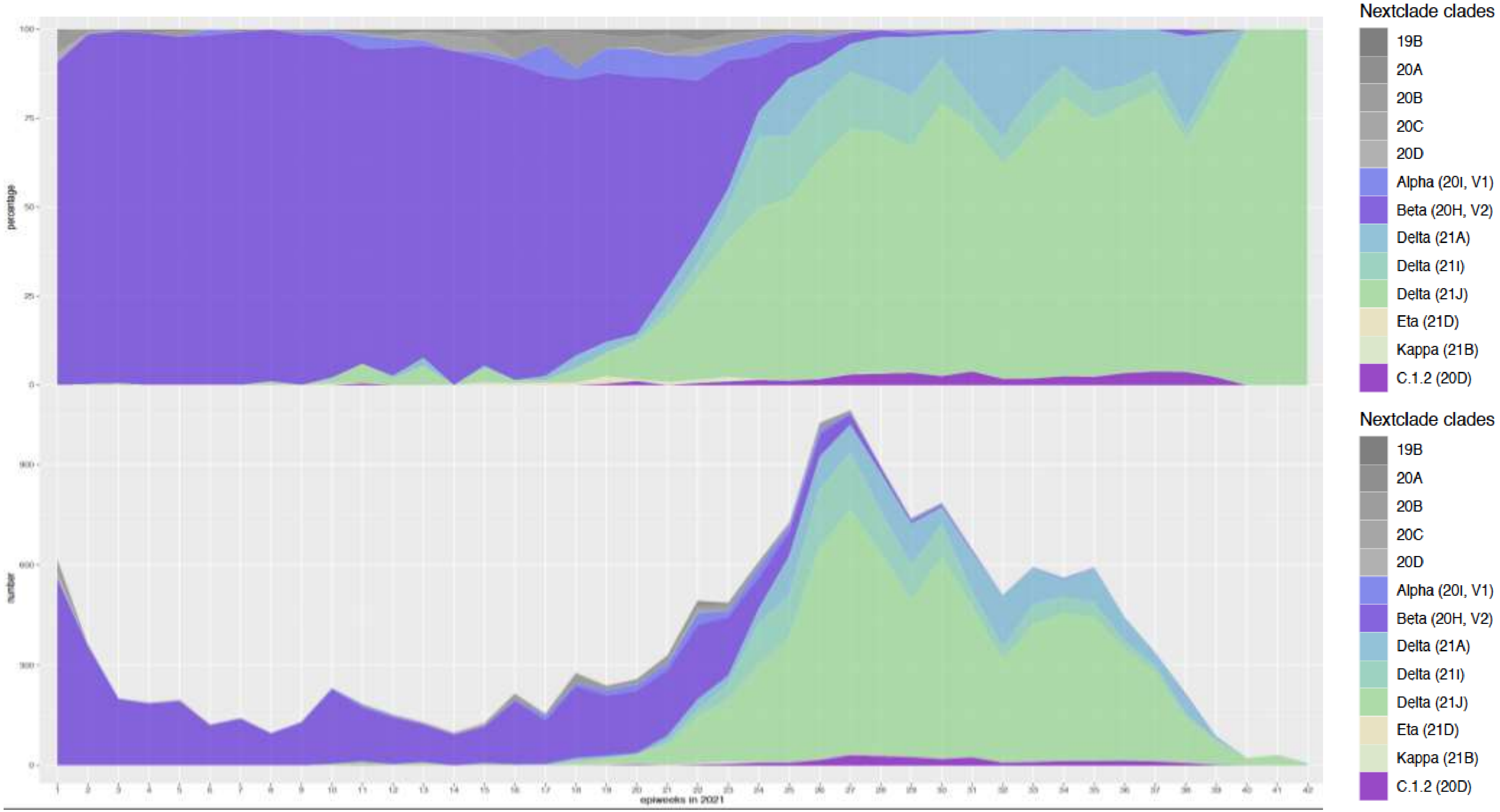
Distribution and number of clades in South Africa, 2021 (N= 16 258)



Delta has recently been split into three clades (21A, 21I, 21J).

Sequencing data ending epi week 42 (ending 23 October 2021)

Currently in epi week 44 (ending 6 November 2021)

Delta came to dominate by end June at >65% , in July at >85% and in August and September at >90%
C.1.2 present at <4% frequency since March

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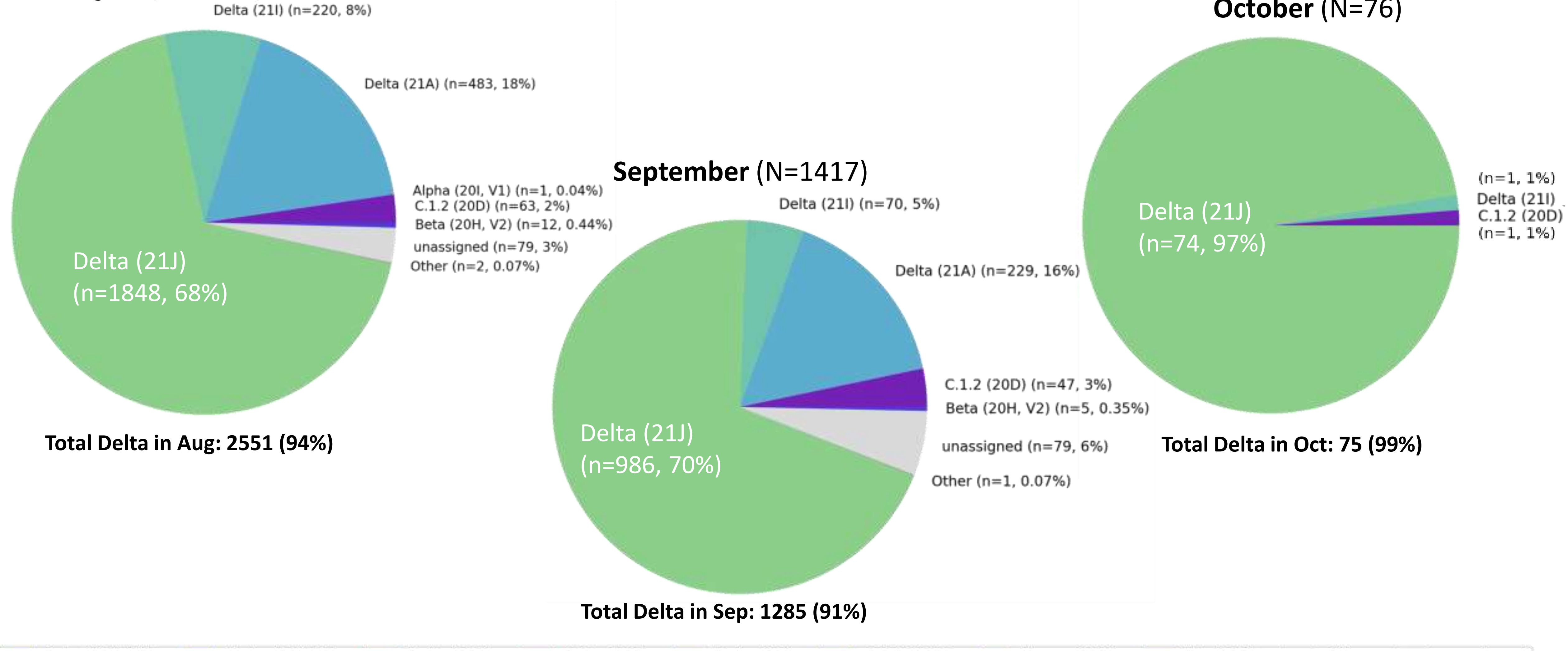
Prevalence of Variants of Concern (VOC) and Variants of Interest (VOI) in August – October 2021 sequences, South Africa


August (N=2708)

September (N=1417)

October (N=76)

Total Delta in Aug: 2551 (94%)

Total Delta in Sep: 1285 (91%)

Total Delta in Oct: 75 (99%)

The Delta variant dominated August and September in South Africa, and appears to still dominate in October.

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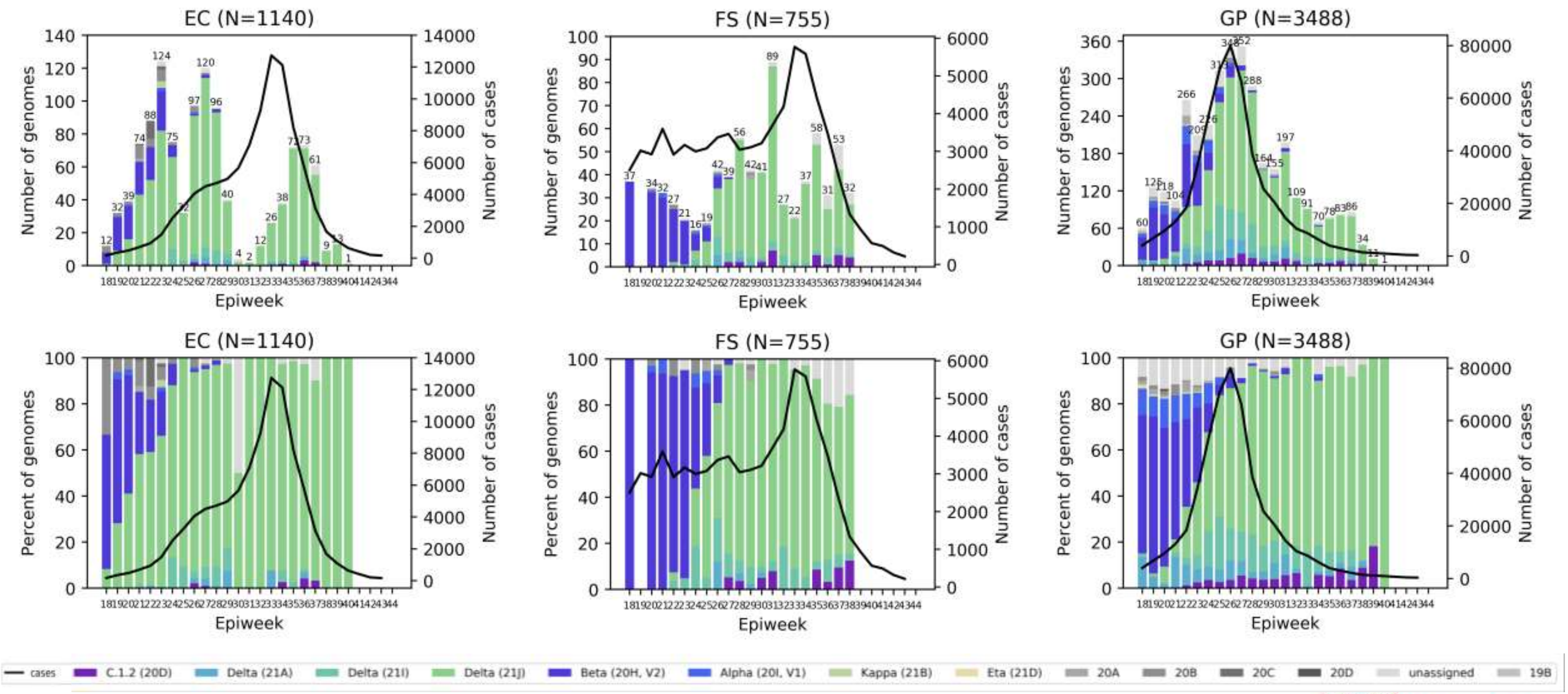
Genomes sequenced from specimens collected in May to October 2021 (epiweeks 18 – 44) from Eastern Cape, Free State and Gauteng Provinces



Delta dominates the third wave in Eastern Cape, Free State and Gauteng provinces

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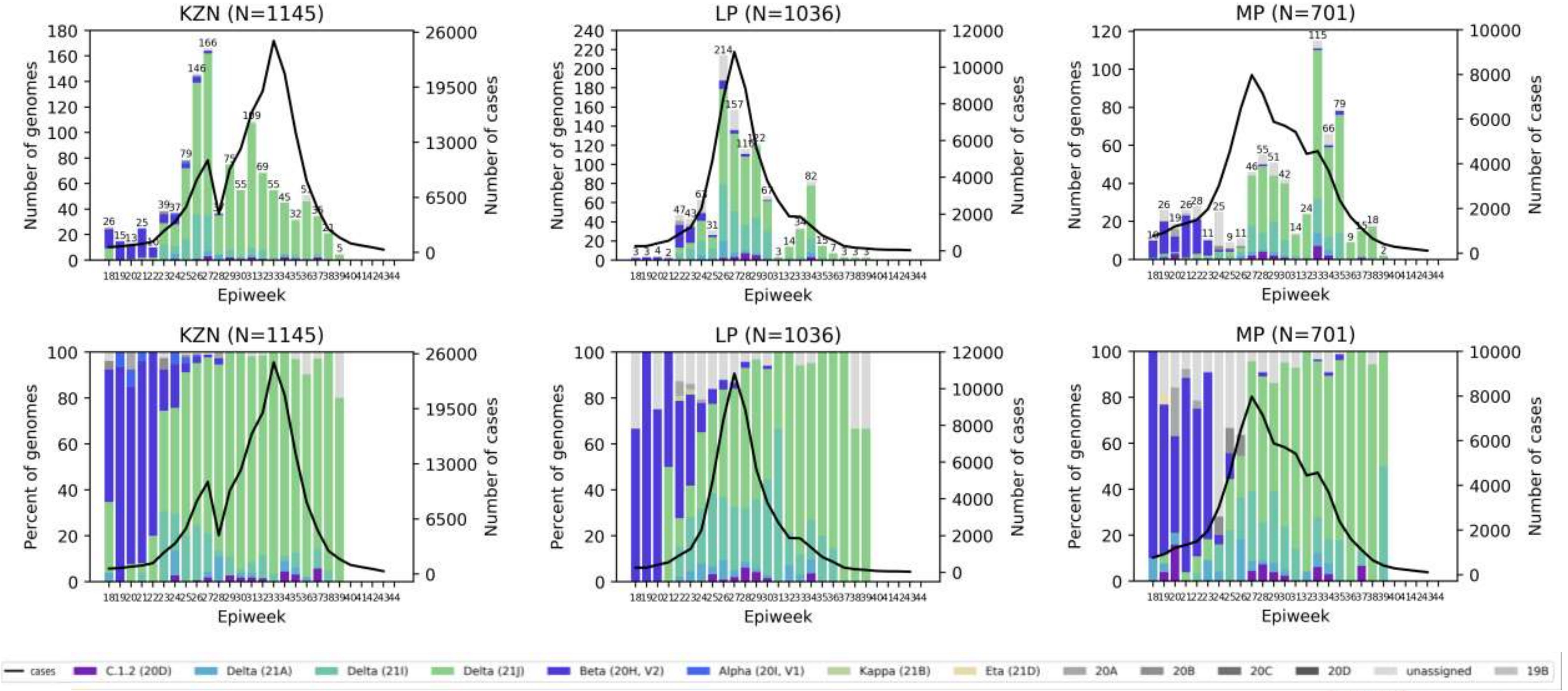
Genomes sequenced from specimens collected in May to October 2021 (epiweeks 18 – 44) from KwaZulu-Natal, Limpopo and Mpumalanga Provinces



Delta variant dominates the third wave in KwaZulu-Natal, Limpopo and Mpumalanga Provinces

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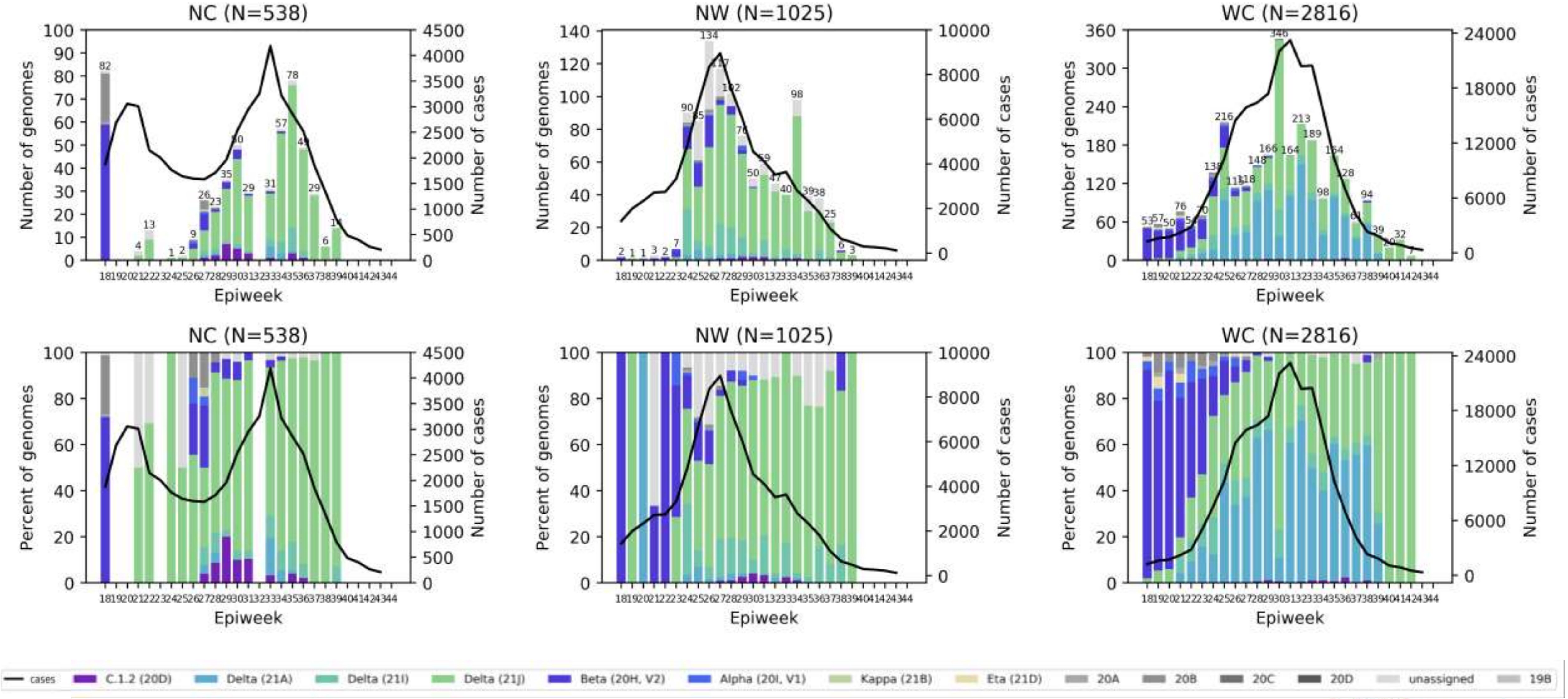
Genomes sequenced from specimens collected in May to October 2021 (epiweeks 18 – 44) from Northern Cape, North West, and Western Cape Provinces



Delta dominates the third wave in Northern Cape, North West, and Western Cape provinces

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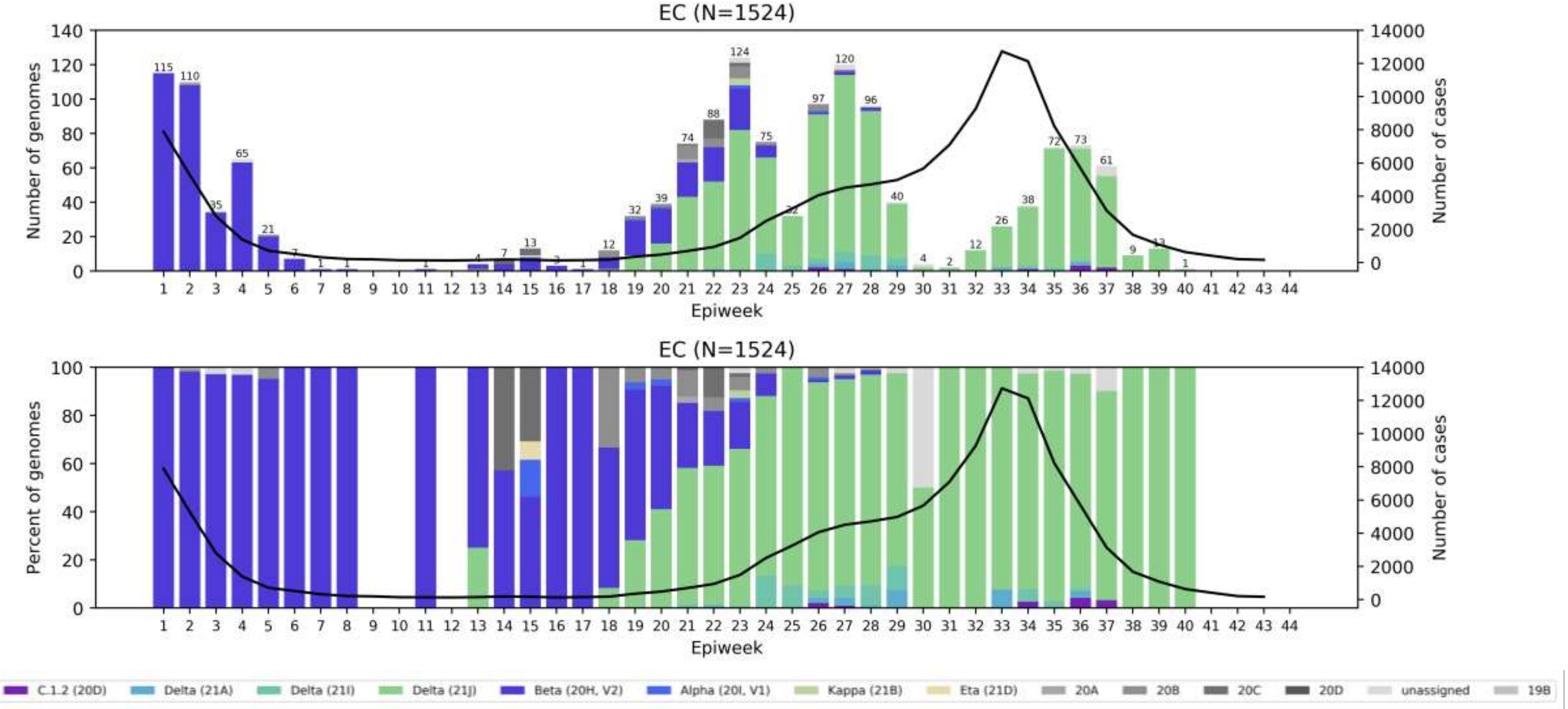
Eastern Cape Province, 2021, n = 1524



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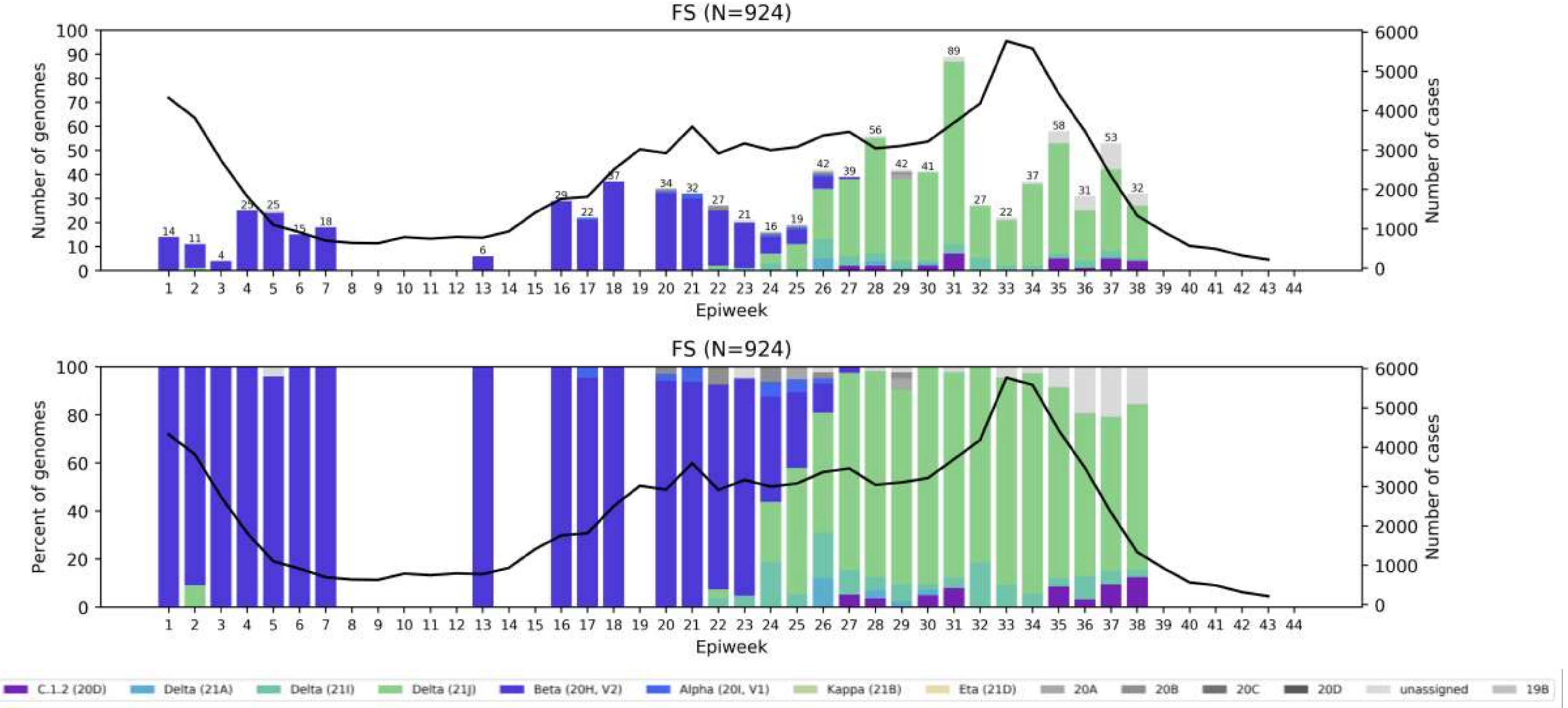
Free State Province, 2021, n = 924



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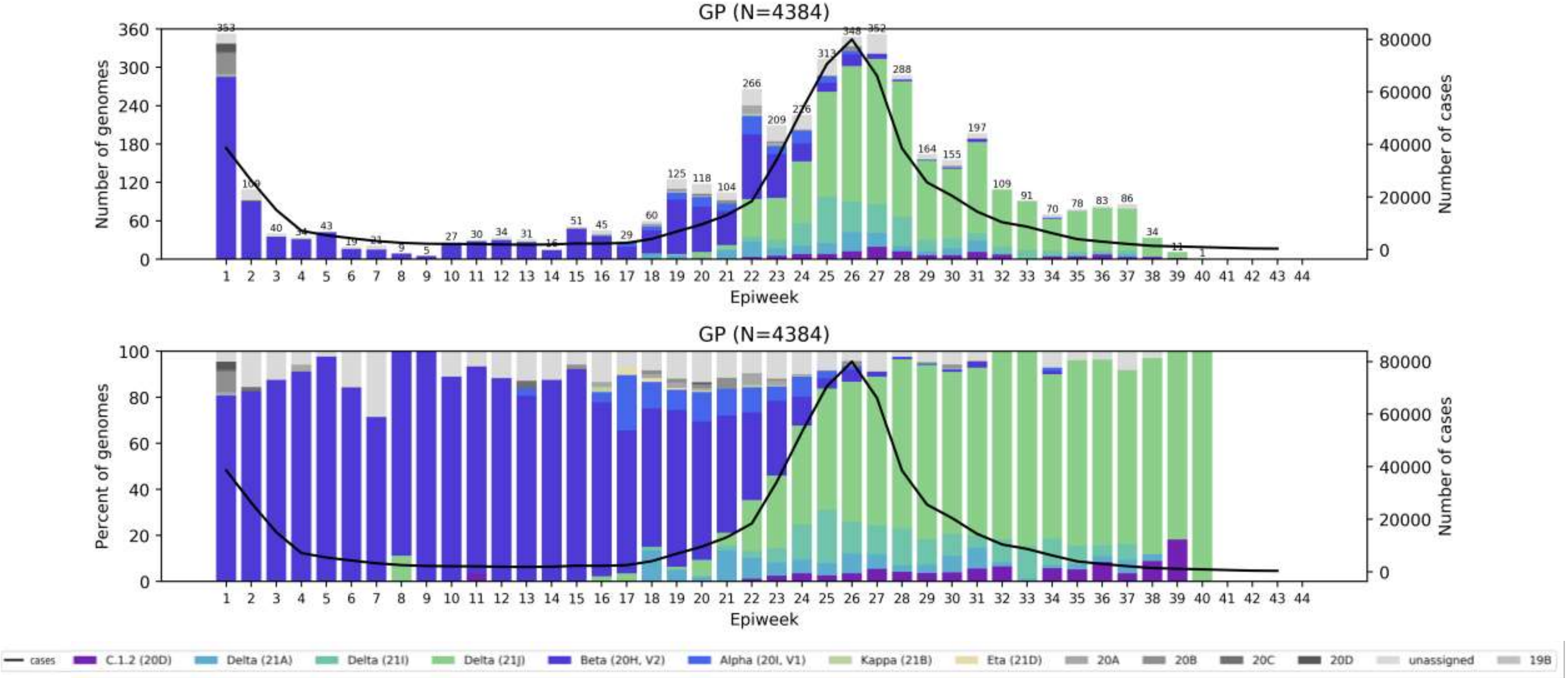
Gauteng Province, 2021, n = 4384



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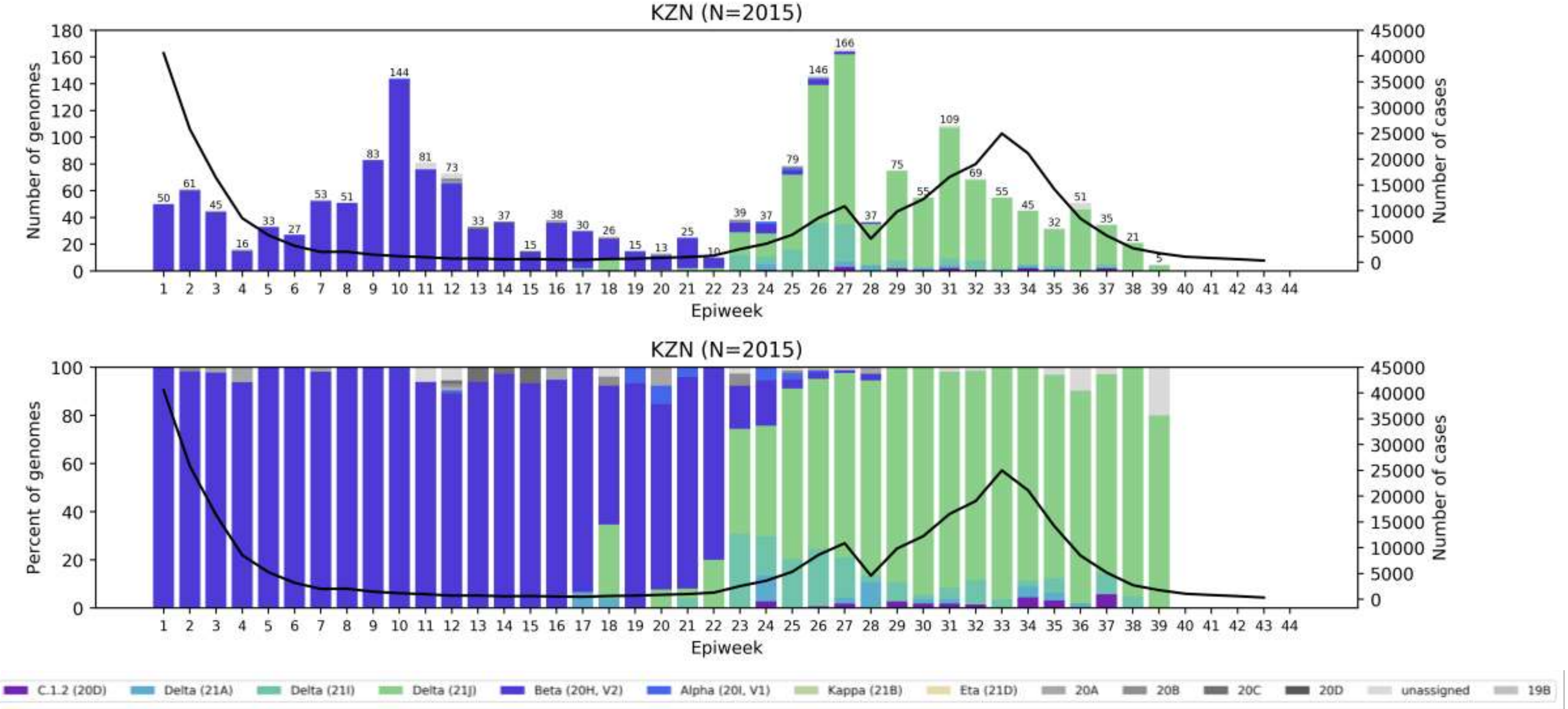
KwaZulu-Natal Province, 2021, n = 2015



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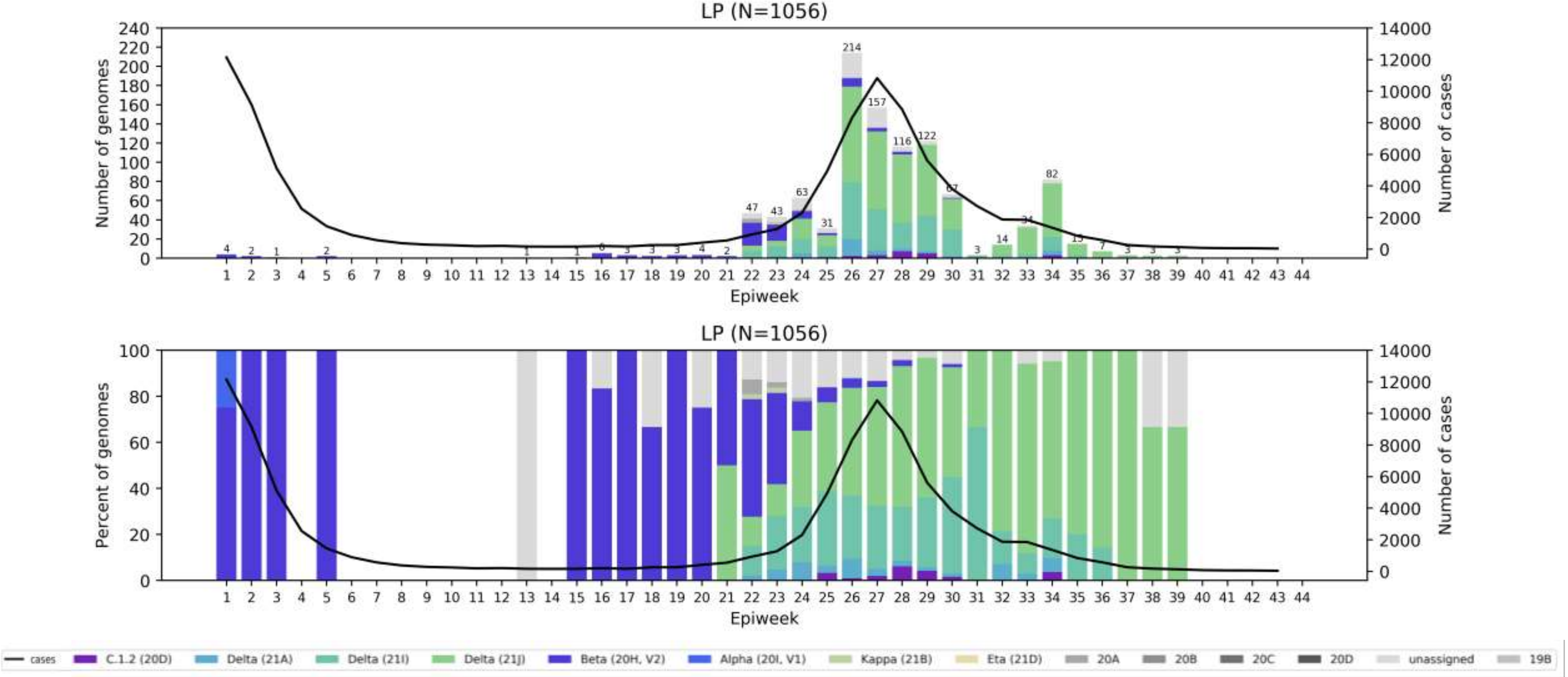
Limpopo Province, 2021, n = 1056



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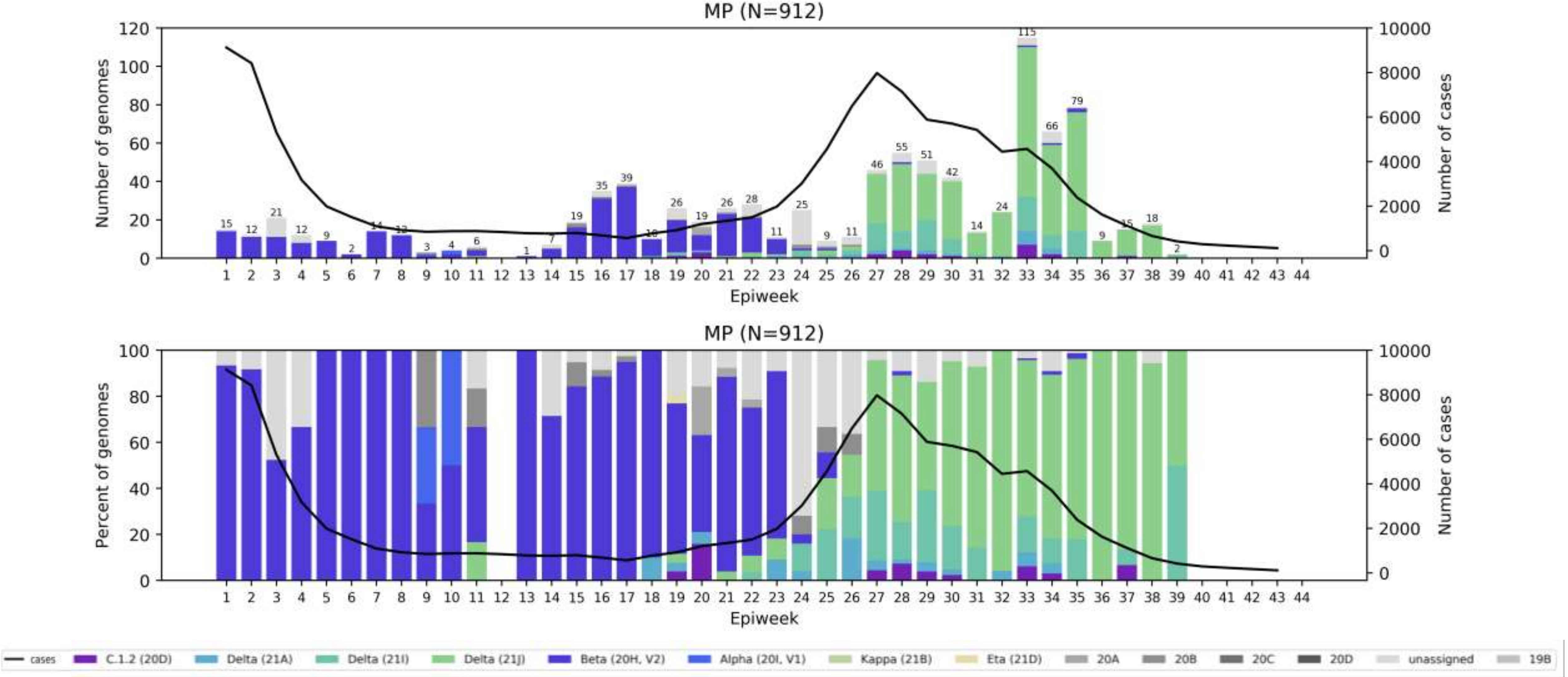
Mpumalanga Province, 2021, n = 912



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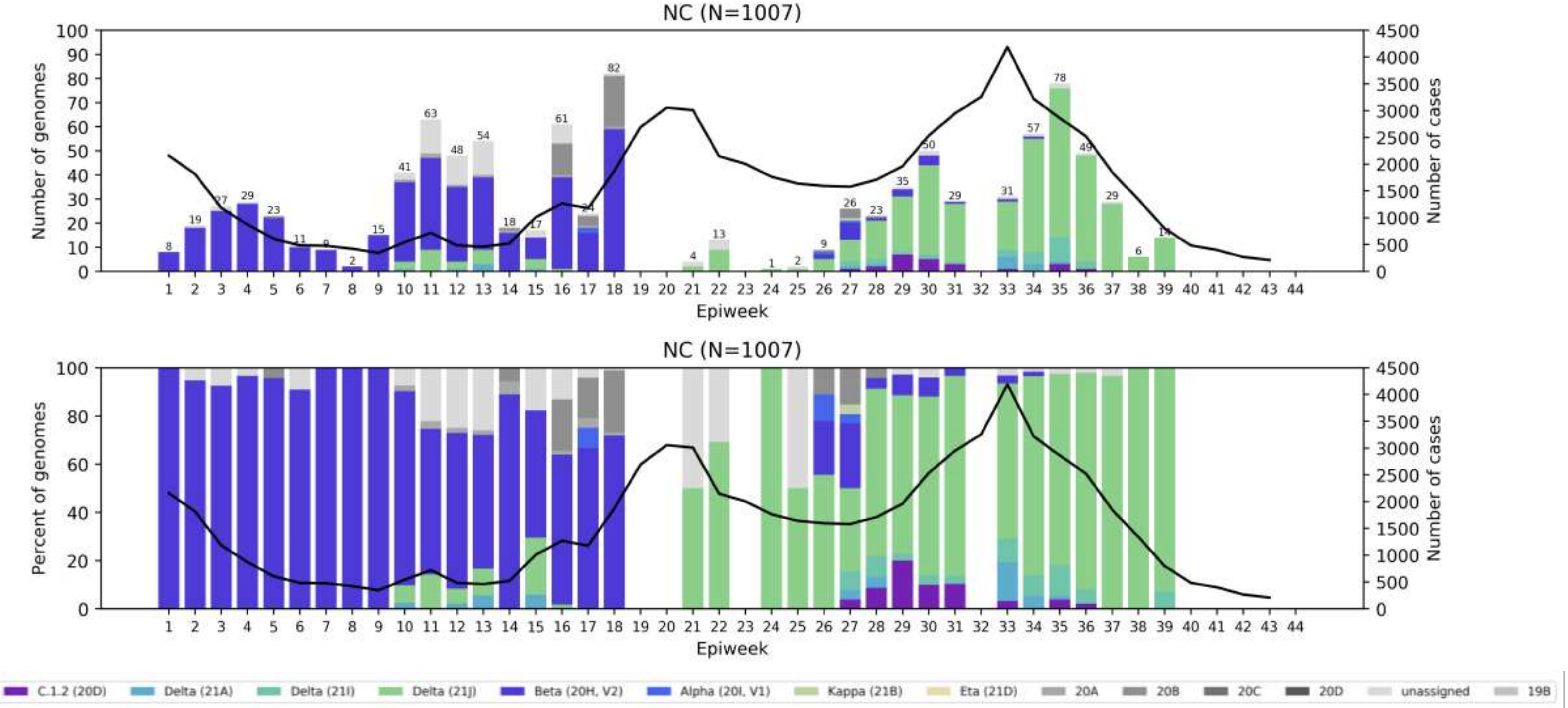
Northern Cape Province, 2021, n = 929



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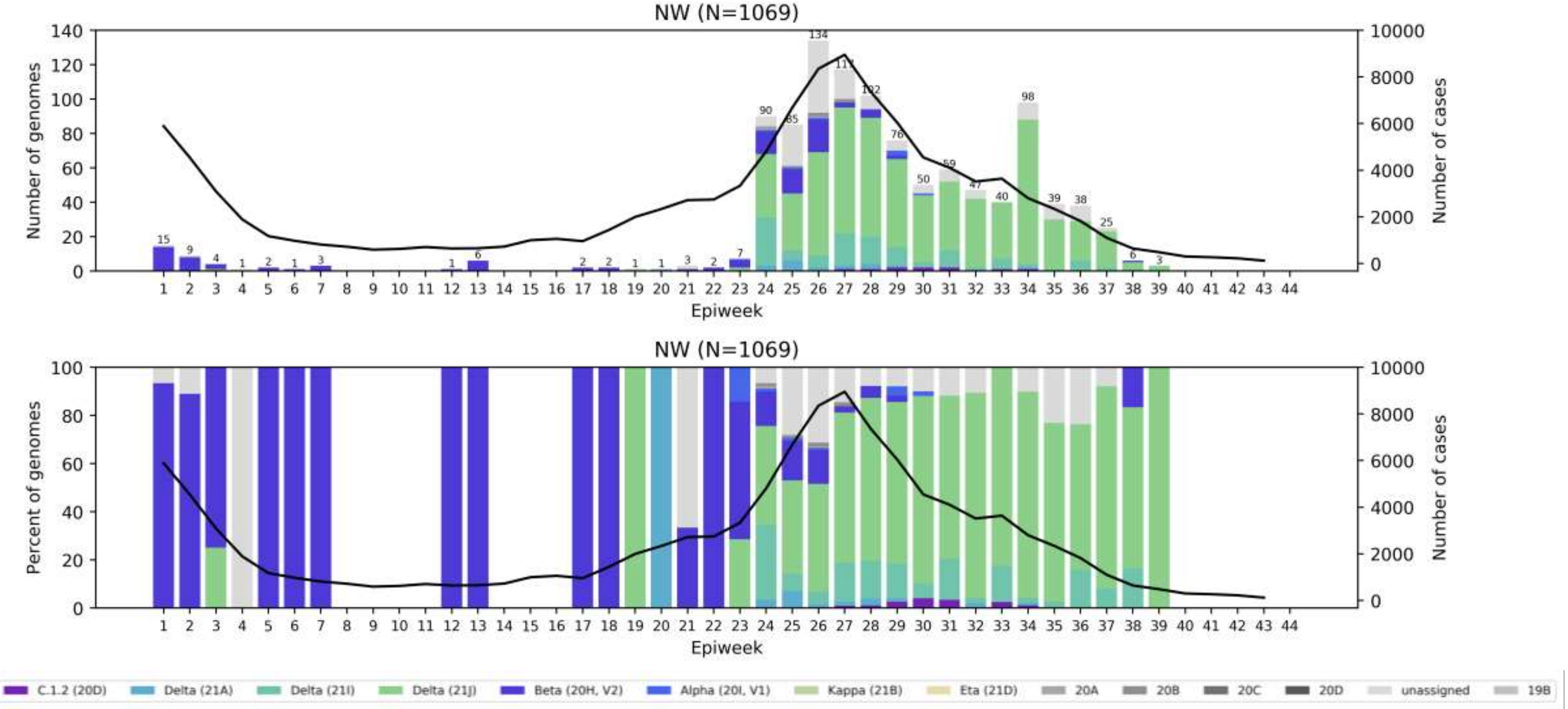
North West Province, 2021, n = 970



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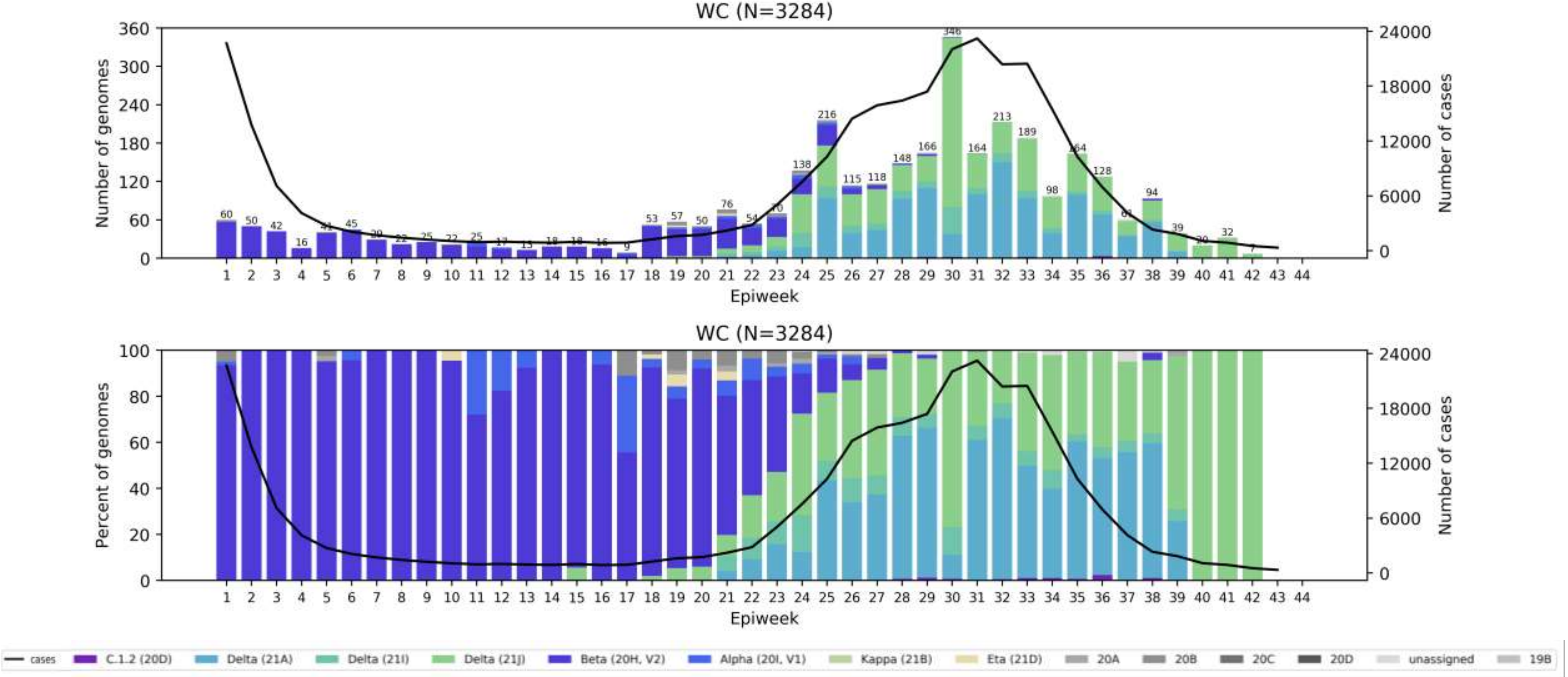
Western Cape Province, 2021, n = 3284



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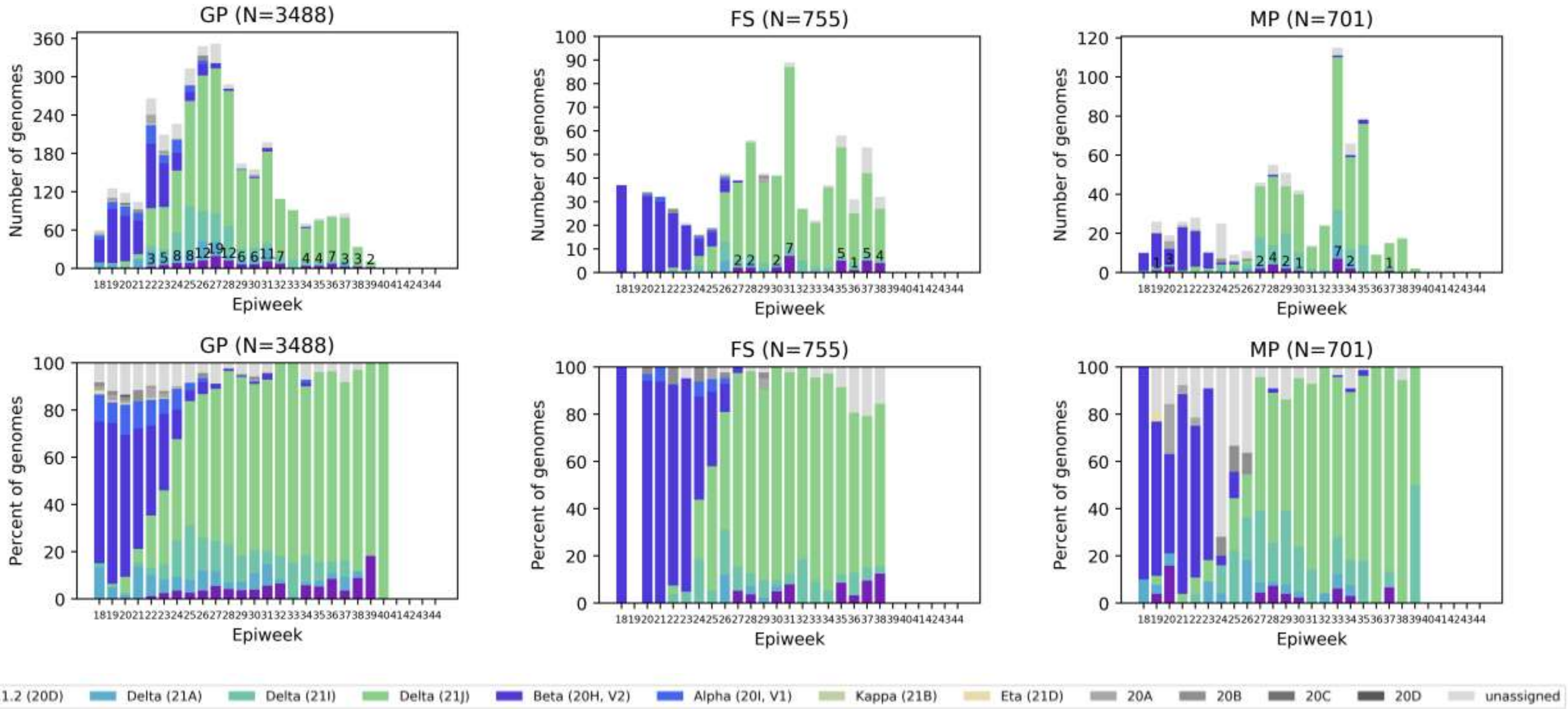
C.1.2 (n=265 in SA) in May – October 2021 by epiweek

Number of C.1.2 samples indicated above bar, provinces ordered by number of detections



The majority of C.1.2 sequences have been detected in Gauteng (n=120), followed by the Free State (n=28) and then Mpumalanga (n=23).

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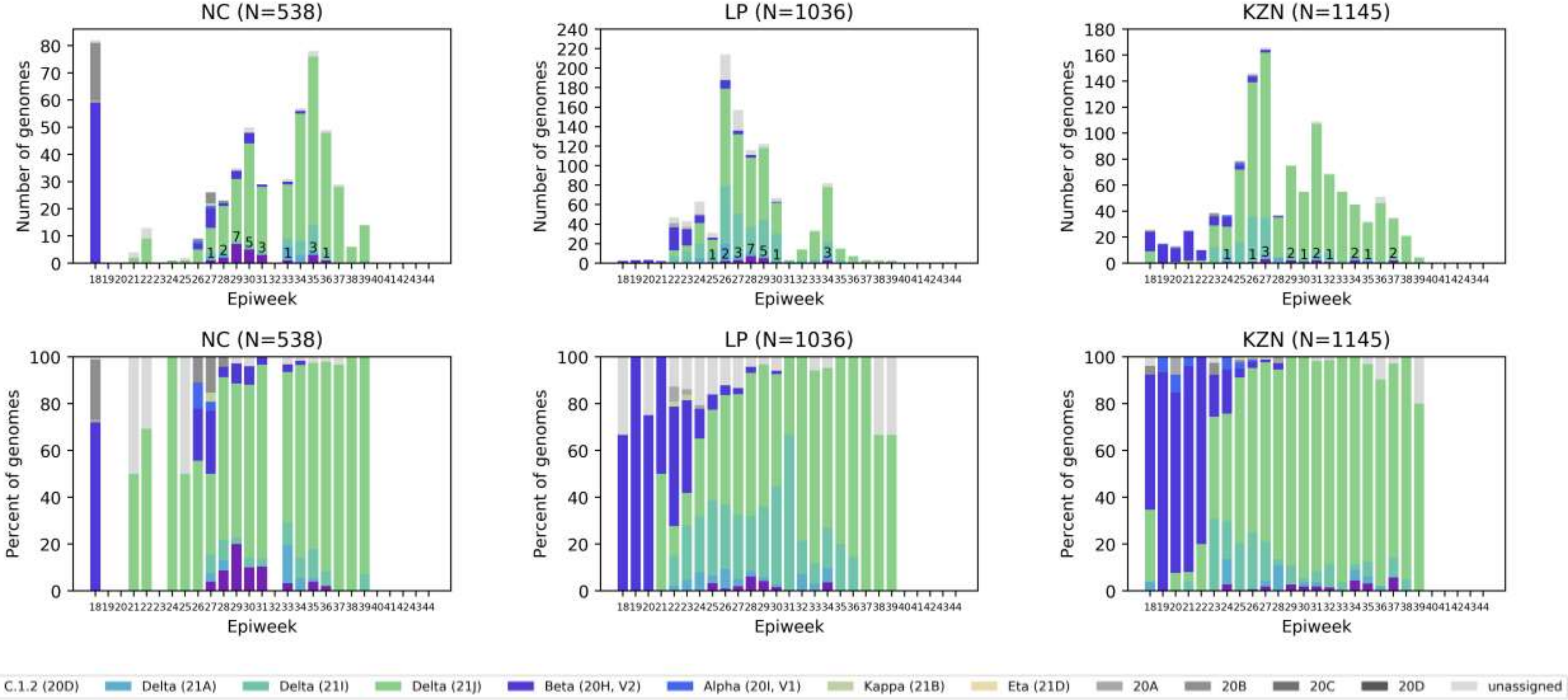
C.1.2 (n=265 in SA) in May – October 2021 by epiweek

Number of C.1.2 samples indicated above bar, provinces ordered by number of detections



23 C.1.2 sequences have been detected in the Northern Cape, 22 in the Limpopo, and 16 in KwaZulu-Natal.

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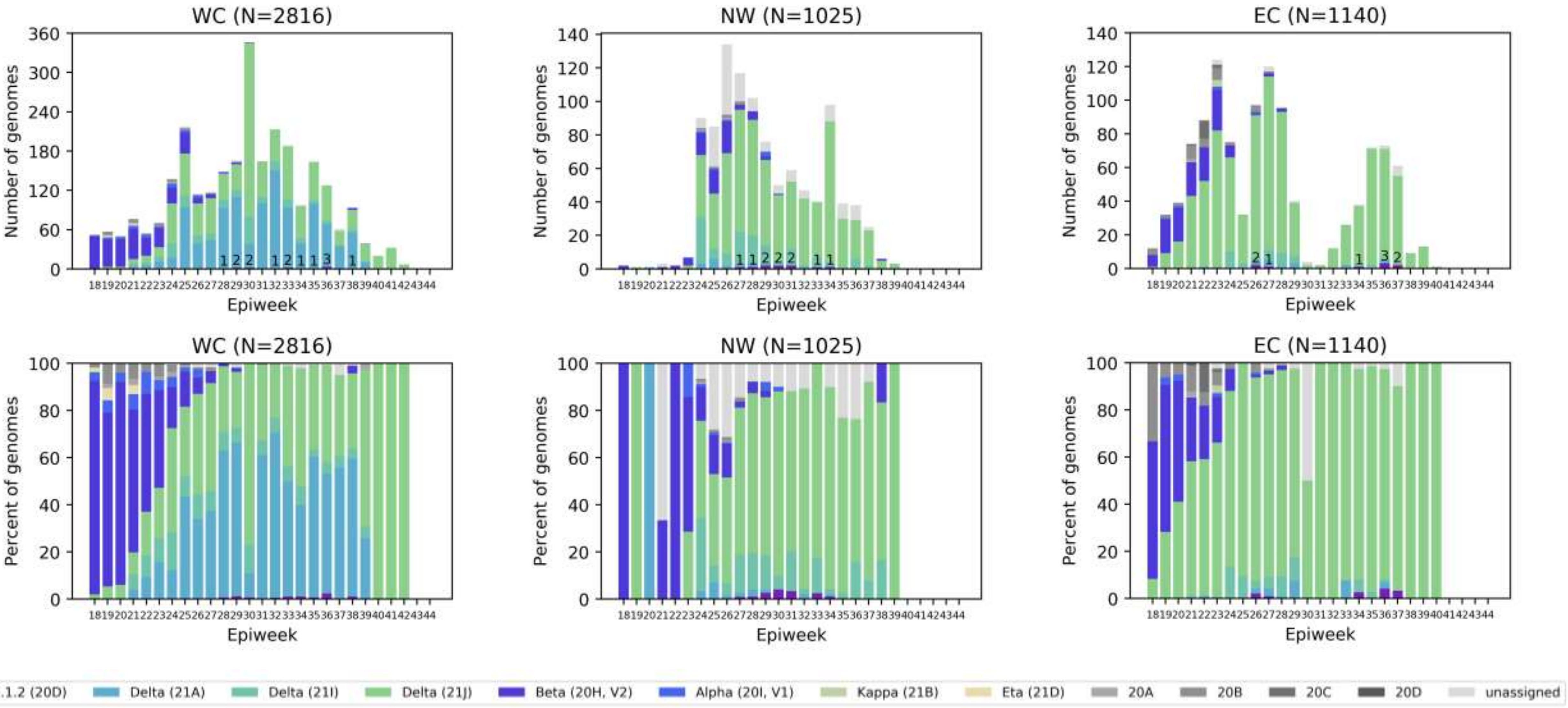
C.1.2 (n=265 in SA) in May – October 2021 by epiweek

Number of C.1.2 samples indicated above bar, provinces ordered by number of detections



The Western Cape has 14 sequences, the North West has 10, and the Eastern Cape has 9 detections of C.1.2.

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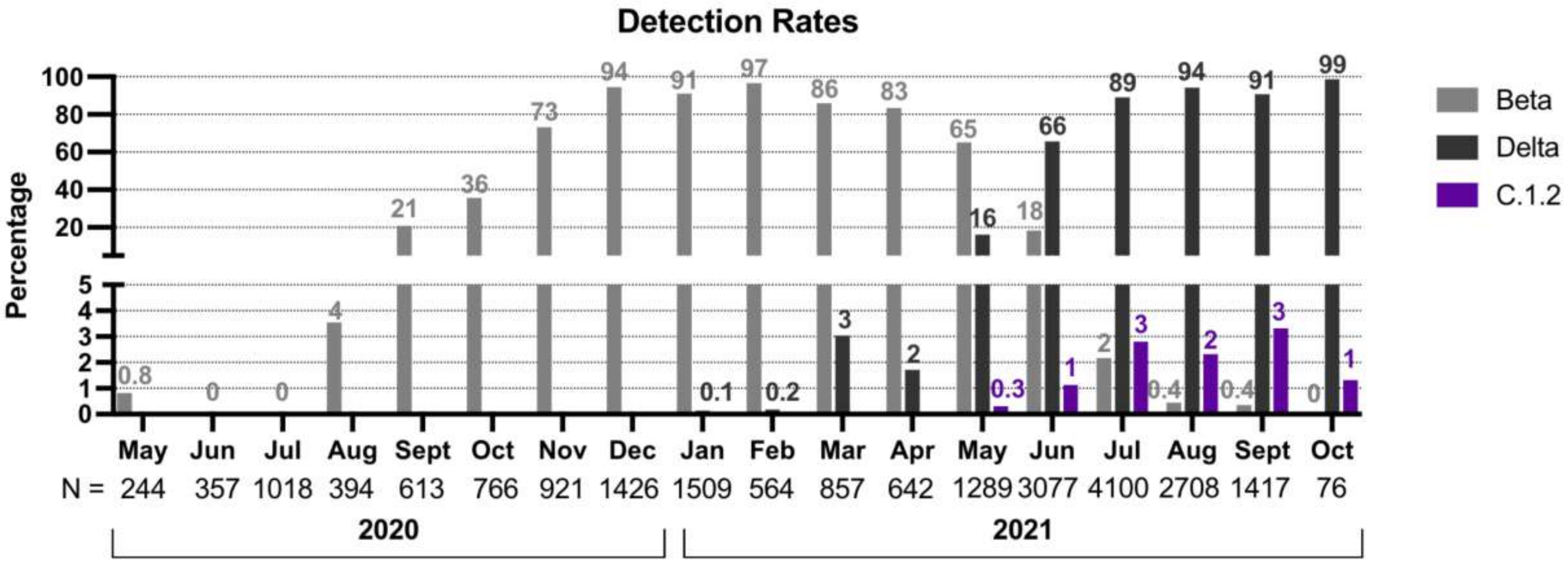
C.1.2 growth compared to Beta and Delta



C.1.2 continues to be detected at low levels (less than 4% of genomes per month)

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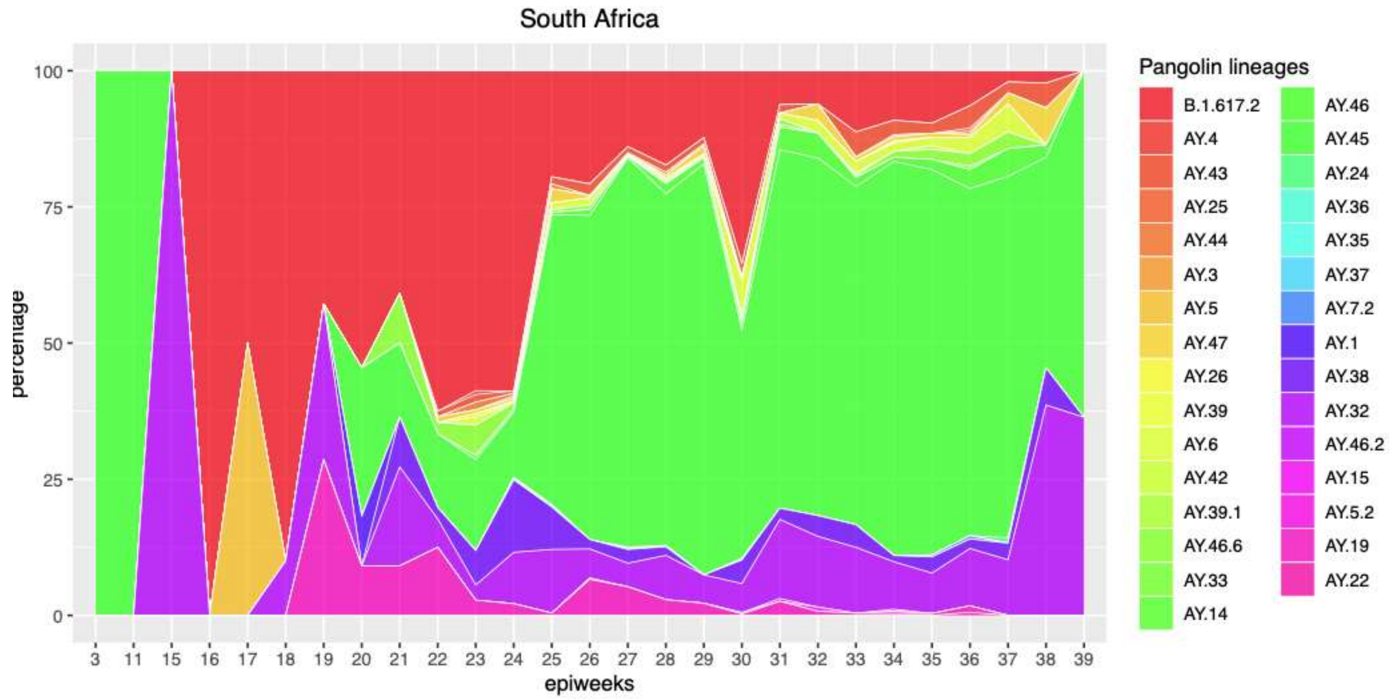
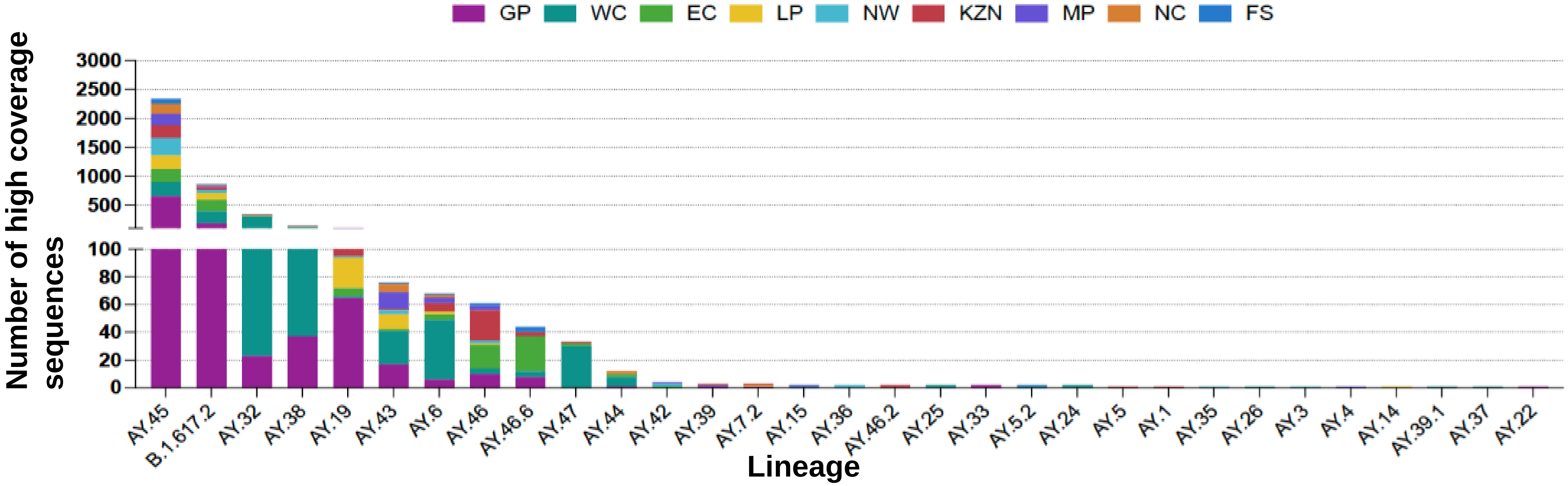
Delta sub-lineages* in South Africa



Delta in South Africa is dominated by the AY.45, B.1.617.2, AY.32, AY.38 and AY.19 sub-lineages, although the dominance of sub-lineages varies with province. None of these are known to have a fitness advantage.

*Data sourced from the GISAID variant surveillance file, high coverage sequences only, lineages assigned using lineages version 2021-10-18



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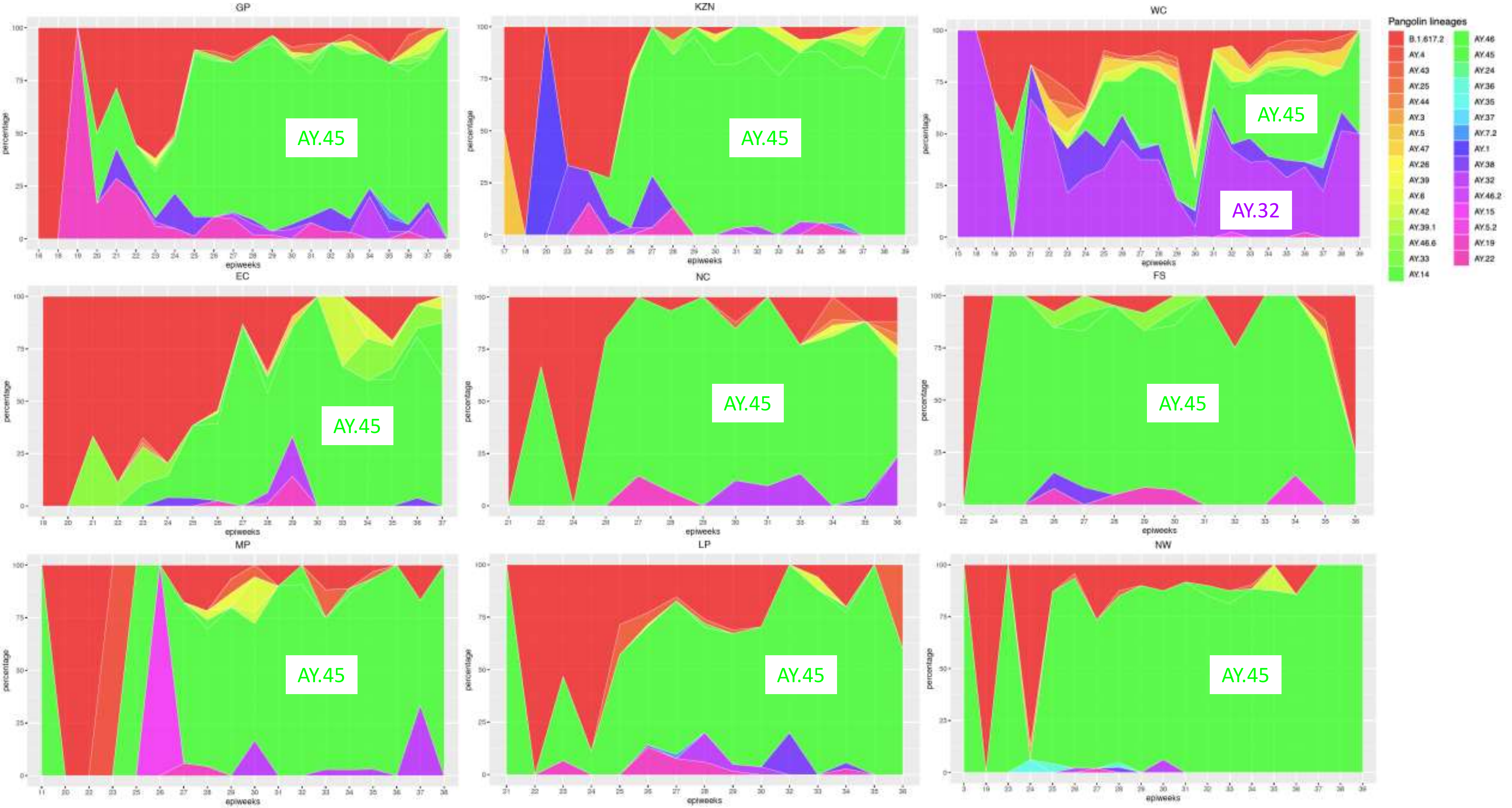
Delta by province (epiweeks 16 – 38)

The Western Cape has a different distribution of AY lineages, with AY.32 more dominant than elsewhere



Summary

- Delta continues to dominate in all provinces from specimens collected in September and October
  - Delta has recently been split into three clades.
    - New clades have been assigned due to >20% global circulation of particular sequences for more than 2 months
    - All SA Delta samples have been updated
    - Delta 21J is the dominant clade globally and in SA
    - The Delta sub-lineages vary by province
    - Based on updated definitions of AY.4.2[1,2], this sub-lineage has not been detected in the country

- Mutated C.1.2 lineage detected in all provinces of South Africa at less than 4% of genomes

- Lambda and Mu variants not detected in South Africa

1. https://github.com/cov-lineages/constellations/blob/main/constellations/definitions/cAY.4.2.json
2. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1028113/Technical_Briefing_26.pdf

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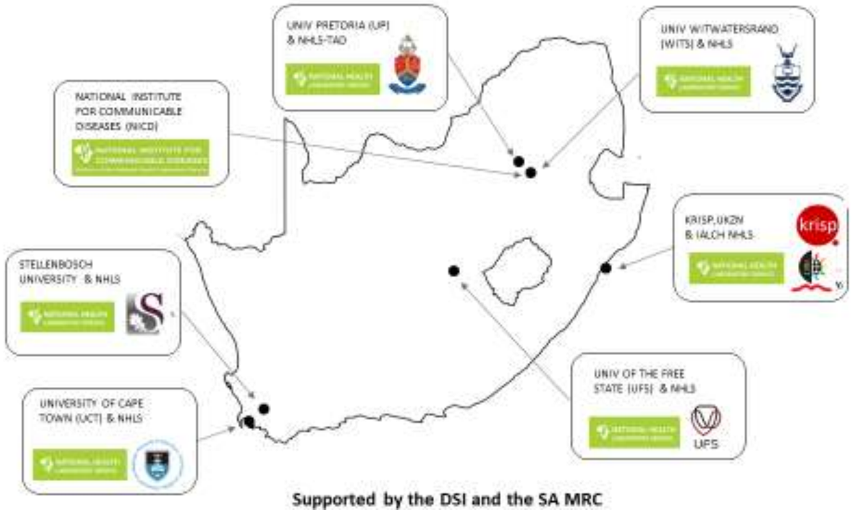

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Brent Oosthuysen
Penny Moore
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Centre for Viral Zoonoses
Department Medical Virology/ NHLS Tshwane Academic division
University of Pretoria

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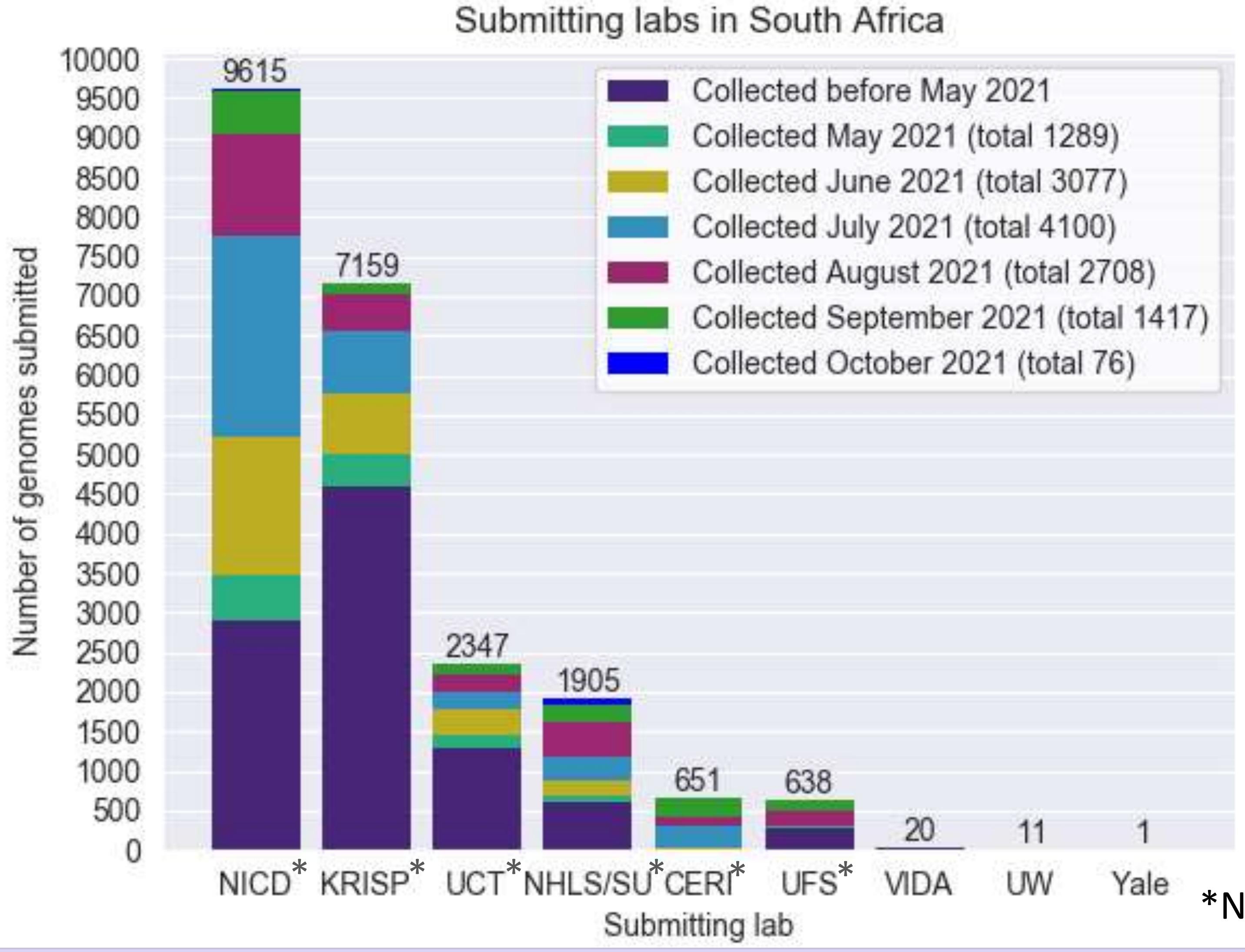
South African genomes submitted per sequencing lab, 2020 and 2021 (N=22 347)



*NGS-SA laboratories

Multiple labs from NGS-SA are contributing to the sequencing effort. Sequencing efforts increased with the third wave.

NGS-SA
Network for Genomic Surveillance in South Africa

Variants of Concern (VOC)

WHO label	Pango lineages[+]	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	India, Oct-2020	VOI: 4-Apr-2021 VOC: 11-May-2021

https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/ accessed 5 November 2021

*Notable spike (S) amino acid changes under monitoring, which are currently reported in a minority of sequenced samples

[+] Includes all descendant lineages.

[#] Includes all Q.* lineages in the PANGO nomenclature system.

[§] Includes all AY.* lineages in the PANGO nomenclature system.

Currently designated Variants of Interest (VOI)

WHO label	Pango[*] lineages	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 5 November 2021

[*] Includes all descendant lineages.

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.)