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

Weekly respiratory pathogens report

Week 35 of 2022

Highlights

- The 2022 influenza season started in week 17 (week starting 25 April 2022) when the influenza detection rate among patients in pneumonia surveillance breached the epidemic threshold as determined by the Moving Epidemic Method (MEM) and is still ongoing.
- In 2022 to date, 783 influenza cases have been detected from all surveillance programmes. Majority of cases were reported from Western Cape (n=252) and Gauteng (n=212), followed by KwaZulu-Natal (n=100), Mpumalanga (n=84), North West (n=67), Eastern Cape (n=55), Free State (n=7), and Limpopo (n=6) sentinel surveillance sites.
- Early in the influenza season we saw mostly circulation of influenza A(H1N1 pdm09), but this was followed by the circulation of influenza A(H3N2) and influenza B(Victoria).
- The 2022 RSV season which started in week 7 (week starting 14 February 2022) when RSV detection rate among children under five years of age in pneumonia surveillance rose above the seasonal threshold, ended in week 26. In 2022 to date, 854 respiratory syncytial virus (RSV) cases have been detected from all surveillance programmes.
- In 2022 to date, we detected 16 cases of *Bordetella pertussis*, 88% (14/16) were detected from the Western Cape, with one case detected each (6%) from Mpumalanga and Gauteng.
- In 2022 to date, a total of 674 COVID-19 cases were detected from all surveillance programmes. Of the 319 hospitalised COVID-19 cases reported with available data on outcome, 23 (7%) died.
- Of the 600/674 (89%) SARS-CoV-2 specimens sequenced, 30% (225/600) sequences could not be assigned a variant. Of the 375 with assigned variants, Omicron was the dominant variant (99%, 370/375); of which 22% (83/370) was Omicron (21K/BA.1), 20% (73/370) was Omicron (21L/BA.2), 1% (2/370) was Omicron (21M/BA.3), 31% (114/370) was Omicron (22A/BA.4), 26% (97/370) was Omicron (22B/BA.5) and <1% (1/370) was Omicron (22C/BA.2.12.1). Alpha, Delta and C.1.2 (20D) variants contributed <1% each.
- A lower number of specimens was submitted in week 30 (31 July – 6 August 2022) due to staff training this likely affected numbers and proportions of viruses detected, therefore trends should be regarded with caution.

Programme Descriptions

Programme	Influenza-like illness (ILI)	Viral Watch	National syndromic surveillance for pneumonia
Start year	2012	1984	2009
Provinces*	KZ NW WC MP	EC FS GP LP MP NC NW WC	EC GP KZ MP NW WC
Type of site	Primary health care clinics	General practitioners	Public hospitals
Case definition	**ILI**: An acute respiratory illness with a temperature (≥38°C) and cough, & onset ≤10 days **Suspected pertussis** Any person with an acute cough illness lasting ≥14 days (or cough illness of any duration for children <1 year), without a more likely diagnosis AND one or more of the following signs or symptoms: • paroxysms of coughing, • or inspiratory "whoop", • or post-tussive vomiting • or apnoea in children <1 year; OR Any person in whom a clinician suspects pertussis **Suspected SARS-CoV-2** Any person presenting with an acute (≤14 days) respiratory tract infection or other clinical illness compatible with COVID-19**	**ILI**: An acute respiratory illness with a temperature (≥38°C) and cough, & onset ≤10 days **Suspected SARS-CoV-2** Any person presenting with an acute (≤14 days) respiratory tract infection or other clinical illness compatible with COVID-19**	**SRI**: Acute (symptom onset≤10 days) or chronic (symptom onset >10) lower respiratory tract infection **Suspected pertussis** Any person with an acute cough illness lasting ≥14 days (or cough illness of any duration for children <1 year), without a more likely diagnosis AND one or more of the following signs or symptoms: • paroxysms of coughing, • or inspiratory "whoop", • or post-tussive vomiting • or apnoea in children <1 year; OR Any person in whom a clinician suspects pertussis. **Suspected SARS-CoV-2** Any person admitted with a physician-diagnosis of suspected COVID-19 and not meeting SRI case definition.
Specimens collected	Oropharyngeal & nasopharyngeal swabs	Throat and/or nasal swabs or Nasopharyngeal swabs	Oropharyngeal & nasopharyngeal swabs
Main pathogens tested* **	INF RSV BP SARS-CoV-2	INF RSV BP SARS-CoV-2	INF RSV BP SARS-CoV-2
Testing Methods	**INF and RSV** - Fast-Track Diagnostics multiplex real-time reverse transcription polymerase chain reaction (until 31 March 2021) ***B. pertussis*** Multiplex real-time PCR (Tatti *et al*., *J Clin Microbiol* 2011) and culture (if PCR cycle threshold ≤25) **SARS-CoV-2** 1 April 2020 – 31 March 2021: Roche E gene real-time PCR essay (Corman *et al*., *Euro Surv* 2020) 1 April 2021 to date: Allplex™ SARS-CoV-2/FluA/FluB/RSV PCR kit - positivity assigned if PCR cycle threshold is <40 for ≥1 gene targets (N, S, OR RdRp)	**INF and RSV** - Fast-Track Diagnostics multiplex real-time reverse transcription polymerase chain reaction (until 31 March 2021) ***B. pertussis*** Multiplex real-time PCR (Tatti *et al*., *J Clin Microbiol* 2011) and culture (if PCR cycle threshold ≤25) **SARS-CoV-2** 1 April 2020 – 31 March 2021: Roche E gene real-time PCR essay Corman *et al*., *Euro Surv* 2020) 1 April 2021 to date: Allplex™ SARS-CoV-2/FluA/FluB/RSV PCR kit - positivity assigned if PCR cycle threshold is <40 for ≥1 gene targets (N, S, OR RdRp)	**INF and RSV** - Fast Track Diagnostics multiplex real-time reverse transcription polymerase chain reaction (until 31 March 2021) ***B. pertussis*** Multiplex real-time PCR (Tatti *et al*., *J Clin Microbiol* 2011) and culture (if PCR cycle threshold ≤25) **SARS-CoV-2** 1 April 2020 – 31 March 2021: Roche E gene real-time PCR essay (Corman *et al*., *Euro Surv* 2020) 1 April 2021 to date: Allplex™ SARS-CoV-2/FluA/FluB/RSV PCR kit - positivity assigned if PCR cycle threshold is <40 for ≥1 gene targets (N, S, OR RdRp)

Epidemic Threshold

Thresholds are calculated using the Moving Epidemic Method (MEM), a sequential analysis using the R Language, available from: http://CRAN.R-project.org/web/package=mem) designed to calculate the duration, start and end of the annual influenza epidemic. MEM uses the 40th, 90th and 97.5th percentiles established from available years of historical data to calculate thresholds of activity. Thresholds of activity for influenza and RSV are defined as follows: Below seasonal threshold, Low activity, Moderate activity, High activity, Very high activity. For influenza, thresholds from outpatient influenza like illness (ILI in primary health care clinics) are used as an indicator of disease transmission in the community and thresholds from pneumonia surveillance are used as an indicator of impact of disease. For RSV, thresholds from pneumonia surveillance, using data from children aged < 5 years are used to define the start and end of the season.

* EC: Eastern Cape; FS: Free State; GP: Gauteng; KZ: KwaZulu-Natal; LP: Limpopo; MP: Mpumalanga: NC: Northern Cape; NW: North West; WC: Western Cape

Symptoms include ANY of the following respiratory symptoms: cough, sore throat, shortness of breath, anosmia (loss of sense of smell) or dysgeusia (alteration of the sense of taste), with or without other symptoms (which may include fever, weakness, myalgia, or diarrhoea). Testing for SARS-CoV-2 was initiated in all three surveillance programmes in week 10 of 2020 (week starting 2 March 2020).*INF: influenza virus; RSV: respiratory syncytial virus; BP: *Bordetella pertussis*; SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

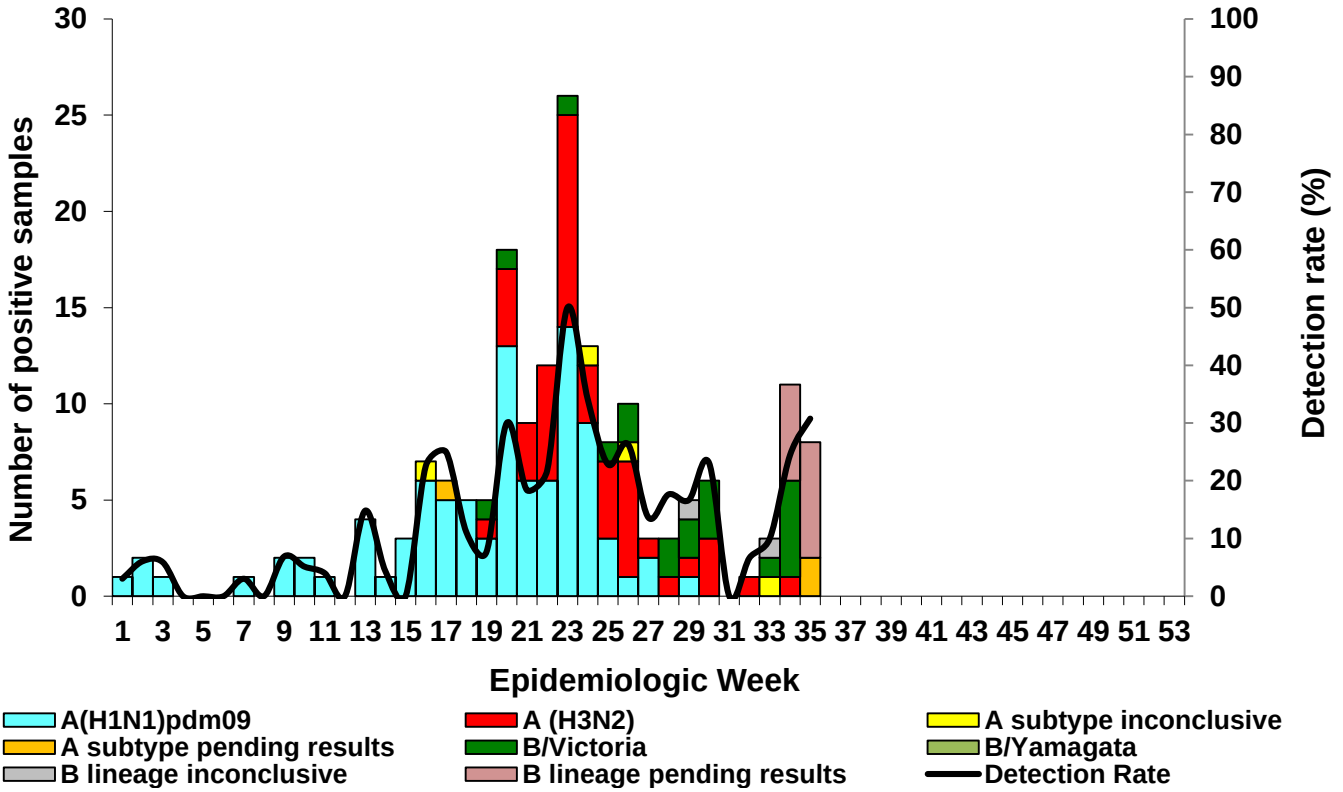

Figure 1. Number of influenza positive cases* by influenza subtype and lineage and detection rate*** by week, Influenza-like illness (ILI) surveillance in primary health care clinics, 03/01/2022 – 04/09/2022**

*Specimens from patients with influenza-like illnesses at 5 sentinel sites in 4 provinces

**Influenza was detected in two (8%) of 24 specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet Influenza-like illness (ILI) case definition. Of which one (50%) was influenza A(H3N2) and another (50%) was influenza B(Victoria). These are not included in the epidemiological curve.

***Only reported for weeks with >10 specimens submitted

Inconclusive: insufficient viral load in sample and unable to characterise further

One dual infection of influenza B(Victoria) + influenza A(H1N1)pdm09 in week 24 not included in the epidemiological curve.

Table 1. Number of laboratory-confirmed influenza* cases by subtype and lineage and total number of samples tested by clinic and province, Influenza-like illness (ILI) surveillance in primary health care clinics, 03/01/2022 – 04/09/2022

Clinic (Province)	A(H1N1) pdm09	A(H3N2)	A subtype in-conclusive**	A subtype pending results***	B/ Victoria	B/ Yamagata	B lineage in-conclusive*	B lineage pending results***	Total samples
Agincourt (MP)	20	0	0	1	11	0	1	0	183
Eastridge (WC)	11	11	0	0	5	0	0	5	196
Edendale Gateway (KZ)	23	27	0	0	2	0	0	0	325
Jouberton (NW)	24	0	1	2	1	0	0	5	253
Mitchell's Plain (WC)	15	8	3	0	1	0	1	1	196
Total:	**93**	**46**	**4**	**3**	**20**	**0**	**2**	**11**	**1153**

KZ: KwaZulu-Natal; NW: North West; WC: Western Cape; MP: Mpumalanga

*Influenza was detected in two (8%) of 24 specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet Influenza-like illness (ILI) case definition. Of which one (50%) was influenza A(H3N2) and another (50%) was influenza B(Victoria). These are not included in the epidemiological curve.

**Inconclusive: insufficient viral load in sample and unable to characterise further

***Influenza A subtype or B lineage results are pending

One dual infection (influenza B(Victoria) + influenza A(H1N1)pdm09 from Eastridge (WC) indicated in both columns.

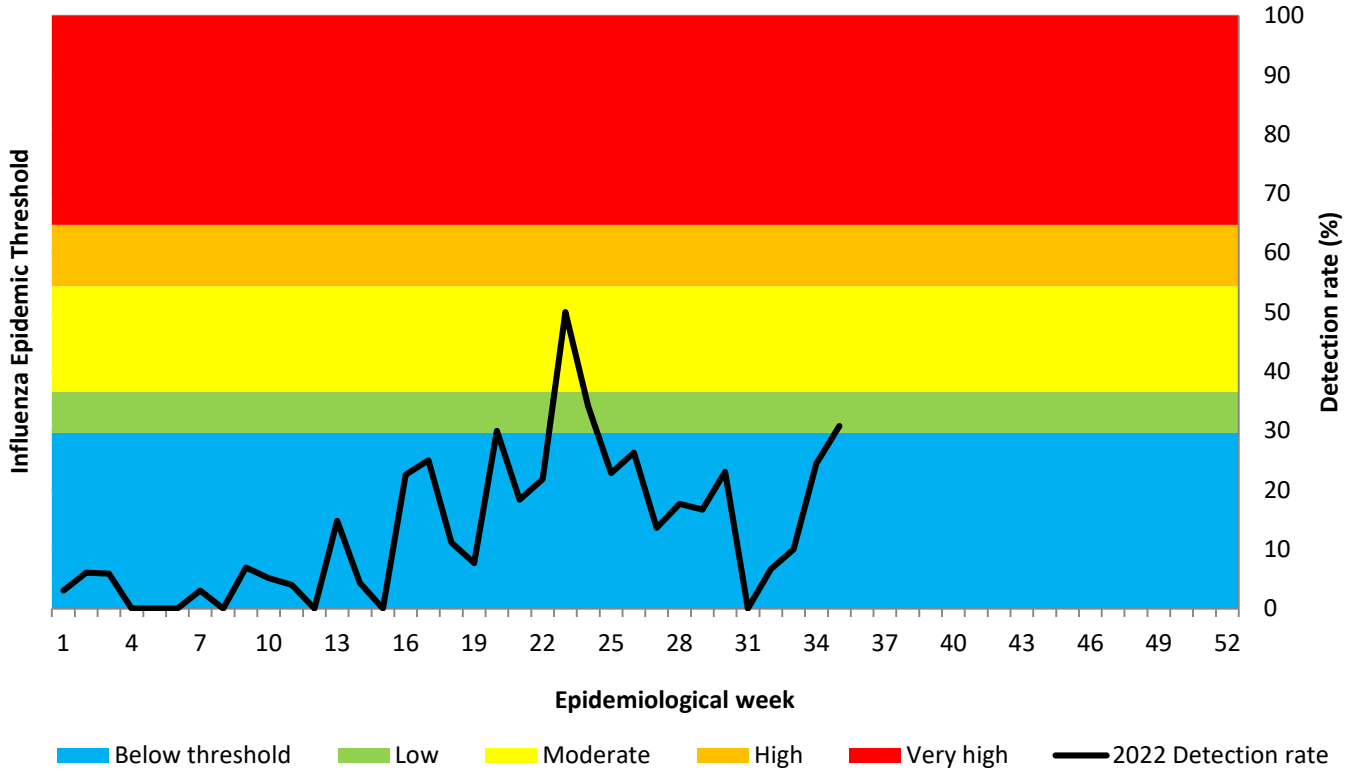

Figure 2. Influenza percentage detections and epidemic thresholds* among cases of all ages, Influenza-like illness (ILI) surveillance in primary health care clinics, 03/01/2022 – 04/09/2022

*Thresholds based on 2012-2019 data

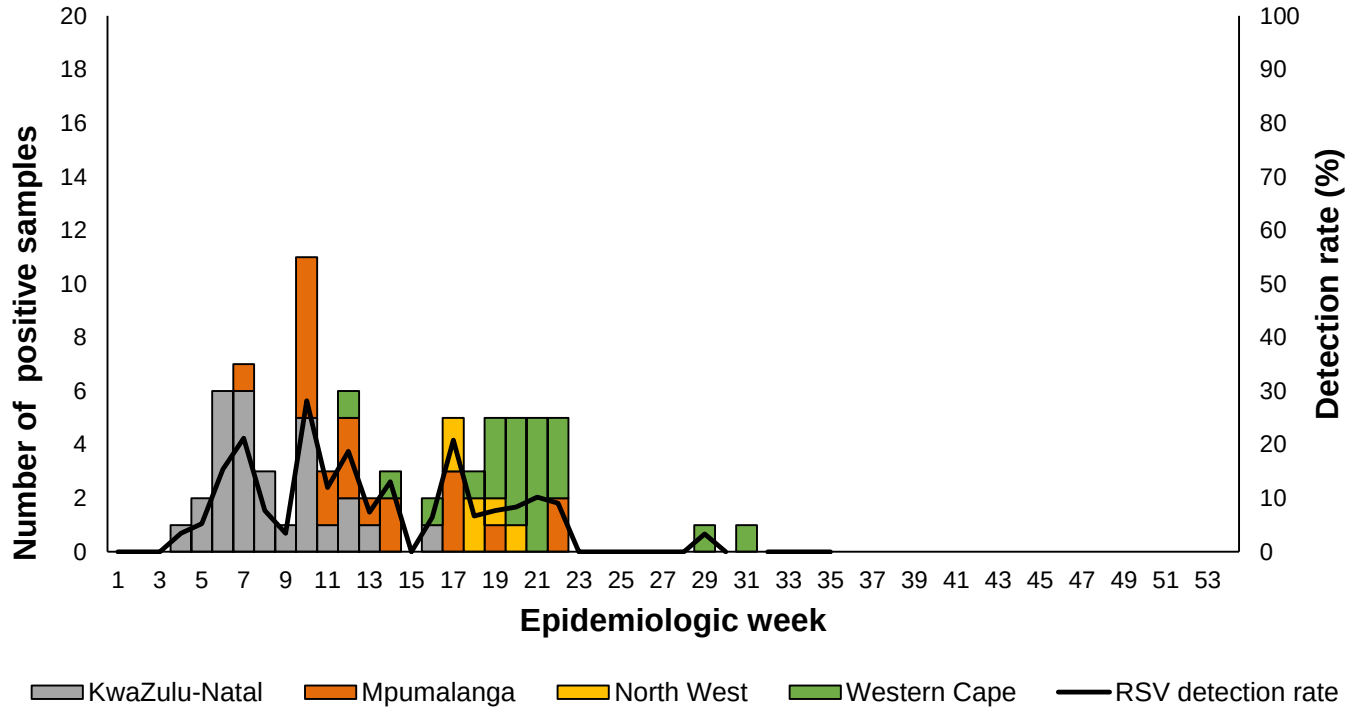

Figure 3. Number of patients testing positive for respiratory syncytial virus* by province and detection rate by week, Influenza-like illness (ILI) surveillance in primary health care clinics, 03/01/2022 – 04/09/2022

*RSV was not detected from 24 specimens of patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet influenza-like illness (ILI) case definition.

**Only reported for weeks with >10 specimens submitted

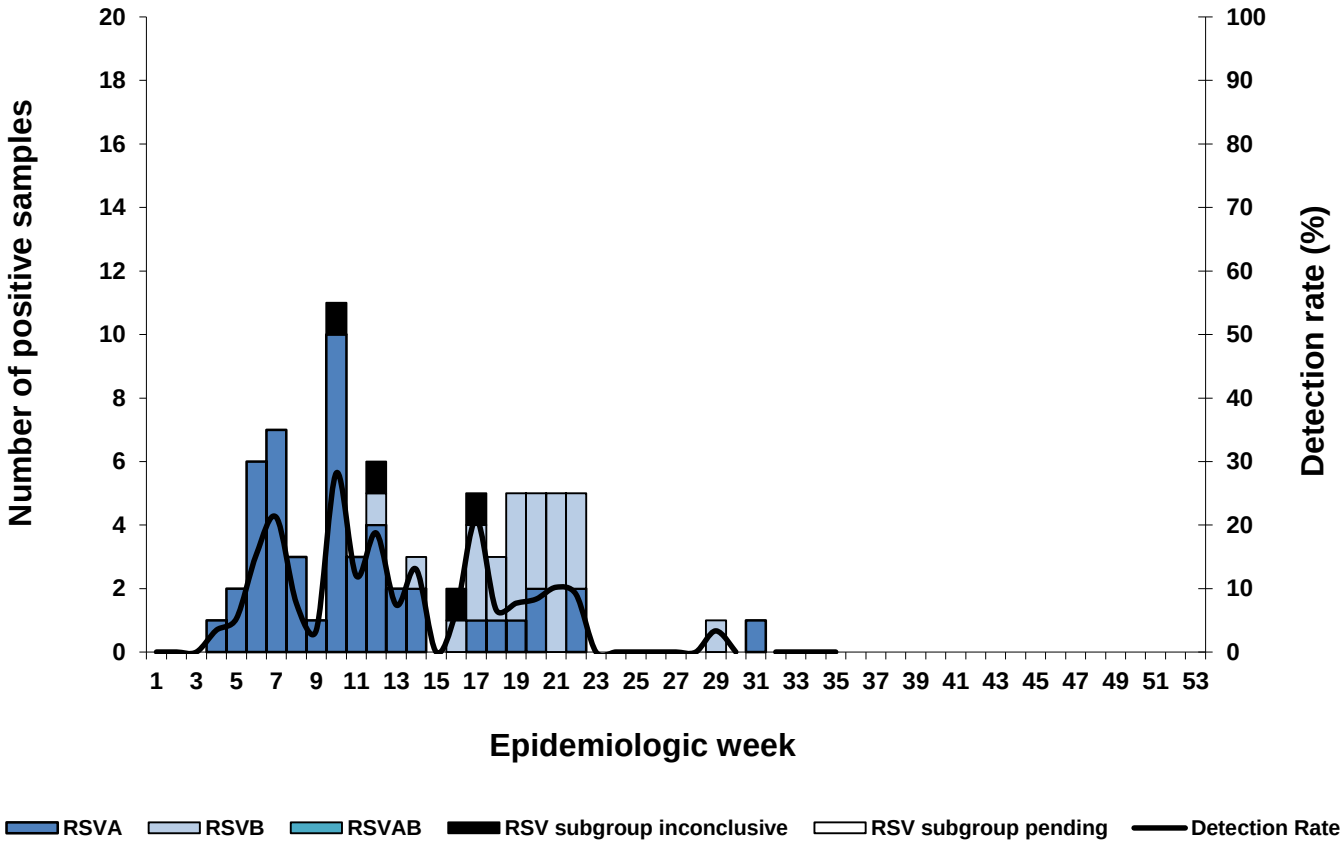

Figure 4. Number of patients testing positive for respiratory syncytial virus* by subgroup and detection rate by week, Influenza-like illness (ILI) surveillance in primary health care clinics, 03/01/2022 – 04/09/2022

*RSV was not detected from 24 specimens of patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet influenza-like illness (ILI) case definition. These are not included in the epidemiological curve.
**Only reported for weeks with >10 specimens submitted
RSV AB: Both RSV A and B subgroup identified.
Inconclusive: insufficient viral load in sample and unable to characterise further

Table 2. Number of patients testing positive for respiratory syncytial virus (RSV)* by subgroups identified and total number of samples tested by clinic and province, Influenza-like illness (ILI) surveillance in primary health care clinics, 03/01/2022 – 04/09/2022

Clinic (Province)	RSVA	RSVB	RSVAB**	RSV subgroup inconclusive***	RSV subgroup pending****	Total samples
Agincourt (MP)	18	2	0	1	0	183
Eastridge (WC)	2	9	0	0	0	196
Edendale Gateway (KZ)	26	0	0	3	0	325
Jouberton (NW)	3	3	0	0	0	253
Mitchell's Plain (WC)	0	10	0	0	0	196
Total	**49**	**24**	**0**	**4**	**0**	**1153**

KZ: KwaZulu-Natal; NW: North West; WC: Western Cape; MP: Mpumalanga
*RSV was not detected from 24 specimens of patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet influenza-like illness (ILI) case definition. These are not included in the table.
**RSV AB: Both RSV A and B subgroup identified
***Inconclusive: insufficient viral load in sample and unable to characterise further
****RSV results for subgroups are pending

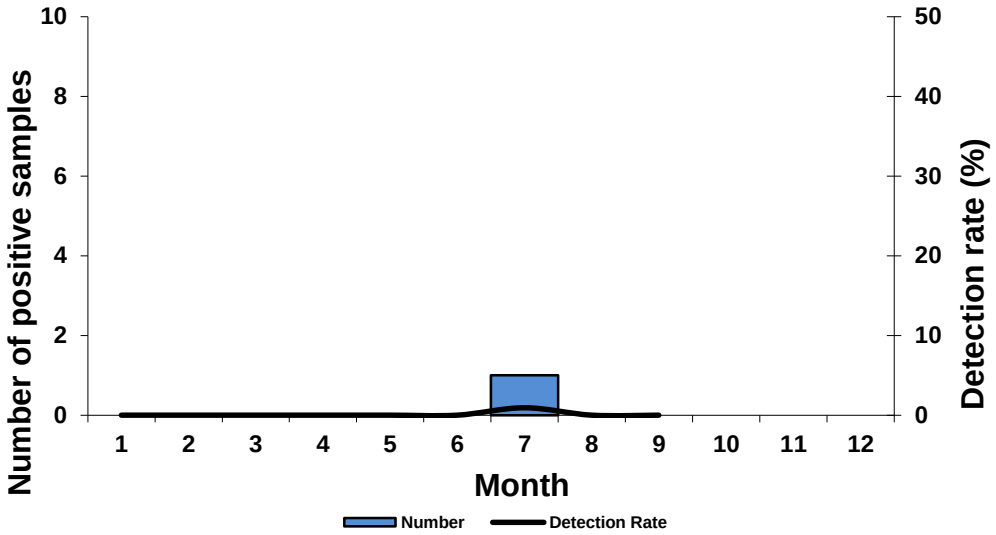

Figure 5. Number of patients testing positive for *B. pertussis and detection rate by month, Influenza-like illness (ILI) surveillance primary health care clinics**, 03/01/2022 – 04/09/2022**

*No *B. pertussis* was detected in 24 specimens of patients who met the suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet Influenza-like illness case definition. These are not included in the epidemiological curve

** Specimens from patients with influenza-like illnesses at 5 sentinel sites in 4 provinces

Table 3. Number of patients testing positive for *B. pertussis identified and total number of samples tested by province, Influenza-like illness (ILI) surveillance primary health care clinics, 03/01/2022 – 04/09/2022**

Clinic (Province)	*B. pertussis* Positive	Total samples
Agincourt (MP)	0	169
Eastridge (WC)	1	187
Edendale Gateway (KZ)	0	317
Jouberton (NW)	0	247
Mitchell's Plain (WC)	0	191
Total:	**1**	**1111**

KZ: KwaZulu-Natal; NW: North West; WC: Western Cape; MP: Mpumalanga

*No *B. pertussis* was detected in 24 specimens of patients who met the suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet Influenza-like illness case definition. These are not included in the table.

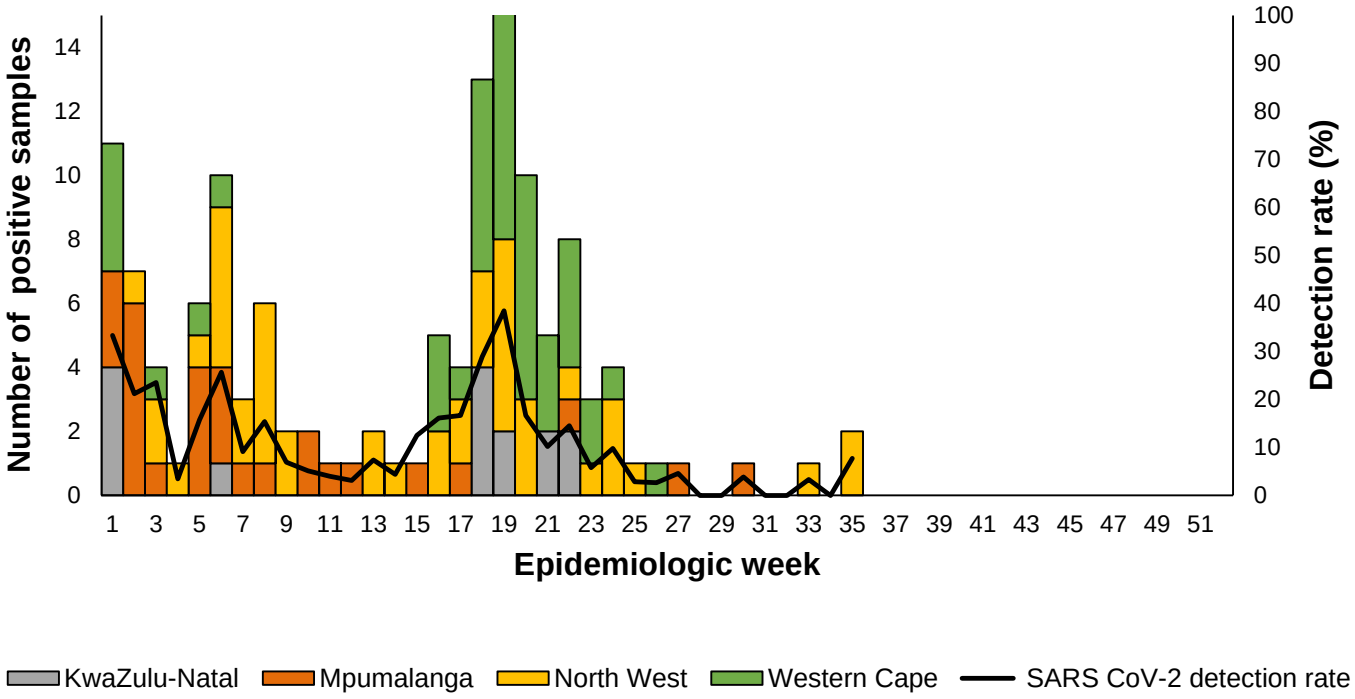

Figure 6. Number of patients* testing positive for SARS-CoV-2 by province and detection rate*** by week, Influenza-like illness (ILI) surveillance in primary health care clinics, 03/01/2022 – 04/09/2022**

*Specimens from patients with influenza-like illnesses at 5 sentinel sites in 4 provinces

**SARS-CoV-2 was detected in 5 of 24 (21%) specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet influenza-like illness (ILI) case definition. These are not included in the epidemiological curve.

***Only reported for weeks with >10 specimens submitted

Table 4. Number of patients positive for SARS-CoV-2* identified and total number of samples tested by clinic and province, Influenza-like illness (ILI) surveillance primary health care clinics, 03/01/2022 – 04/09/2022

Clinic (Province)	SARS-CoV-2 positive	Total samples tested
Agincourt (MP)	28	183
Eastridge (WC)	9	196
Edendale Gateway (KZ)	15	325
Jouberton (NW)	47	253
Mitchell's Plain (WC)	43	196
Total:	**142**	**1153**

KZ: KwaZulu-Natal; NW: North West; WCP: Western Cape; MP: Mpumalanga

*SARS-CoV-2 was detected in 5 of 24 (21%) specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet influenza-like illness (ILI) case definition. These are not included in the table.

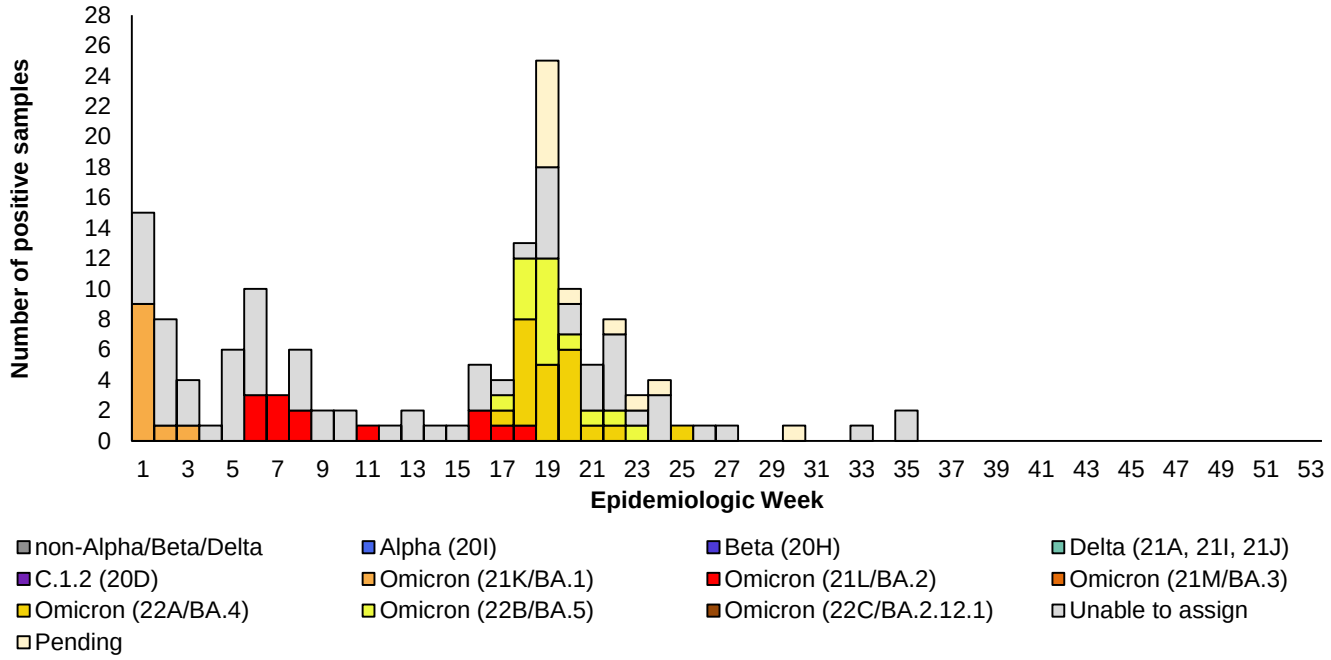

Figure 7. Number and detection rate of laboratory-confirmed SARS-CoV-2* cases by variant type (variant PCR/sequencing) and week, Influenza-like illness (ILI) surveillance in primary health care clinics, 03/01/2022 – 04/09/2022

*Specimens are from patients with influenza-like illness at 5 sentinel sites in 4 provinces who met suspected SARS-CoV-2 or *B. pertussis* case definition or met ILI case definition

Unable to assign: no lineage assigned due to poor- sequence quality **OR** low viral load ($C_t \geq 35$) **OR** variant PCR could not assign variant and no sequencing result

Pending: outstanding variant results

Table 5. Number of cases positive for SARS-CoV-2* by variant (variant PCR and/or sequencing) identified and total number of samples tested by clinic and province, Influenza-like illness (ILI) surveillance primary health care clinics, 03/01/2022 – 04/09/2022**

Clinic (Province)	Delta (21A, 21I, 21J)	Omicron (21K/BA.1)	Omicron (21L/BA.2)	Omicron (21M/BA.3)	Omicron (22A/BA.4)	Omicron (22B/BA.5)	Omicron (22C/ BA.2.12.1)	Unable to assign	Pending	Total SARS-CoV-2 positive	Total samples tested
Agincourt (MP)	0	4	3	0	0	0	0	22	1	30	188
Eastridge (WC)	0	2	0	0	0	0	0	4	3	9	196
Edendale Gateway (KZ)	0	2	1	0	0	6	0	7	1	17	338
Jouberton (NW)	0	1	5	0	6	6	0	27	3	48	259
Mitchell's Plain (WC)	0	2	4	0	16	4	0	13	4	43	196
Total:	**0**	**11**	**13**	**0**	**22**	**16**	**0**	**73**	**12**	**147**	**1177**

KZ: KwaZulu-Natal; NW: North West; WCP: Western Cape; MP: Mpumalanga

*Specimens are from patients with influenza-like illness at 5 sentinel sites in 4 provinces who met suspected or *B. pertussis* SARS-CoV-2 case definition or met ILI case definition

**No cases of Alpha, Beta or 20D (C.1.2) variants detected.

Unable to assign: no lineage assigned due to poor- sequence quality **OR** low viral load ($C_t \geq 35$) **OR** variant PCR could not assign variant and no sequencing result

Pending: outstanding variant results

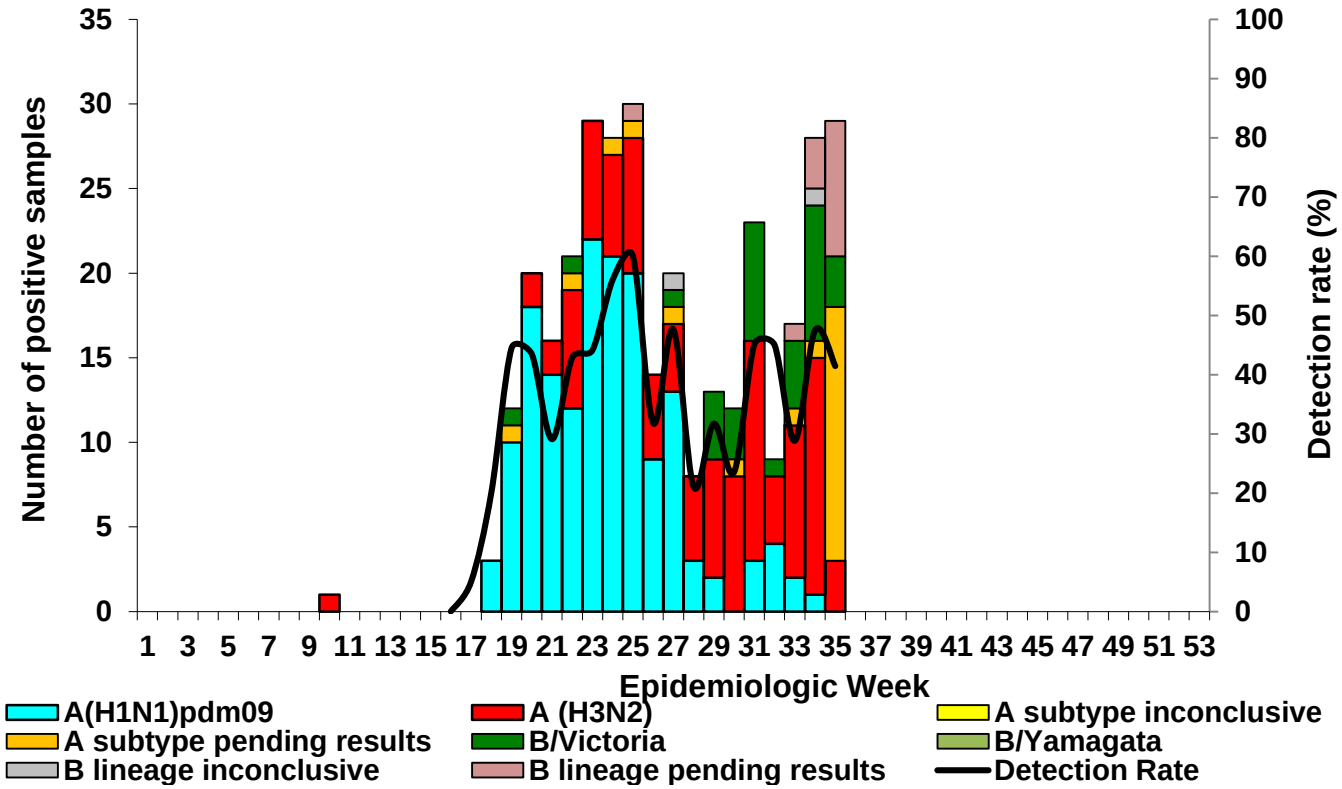

Figure 8. Number of positive patients* by influenza subtype and lineage and detection rate by week, ILI surveillance - Viral Watch, 03/01/2022 – 04/09/2022**

*Specimens from patients with Influenza-like illnesses at 92 sentinel sites in 8 provinces
**Only reported for weeks with >10 specimens submitted.
Inconclusive: insufficient viral load in sample and unable to characterise further
Two dual infections from GP (one influenza A(H3N2) + influenza A(H1N1)pdm09 in week 17 and one influenza B(lineage inconclusive) + influenza A(H1N1)pdm09 in week 23) not included in the epidemiological curve.

Table 6. Number of laboratory confirmed influenza cases by influenza subtype and lineage and total number of samples tested by province, ILI surveillance - Viral Watch, 03/01/2022 – 04/09/2022

Province	A(H1N1) pdm09	A(H3N2)	A subtype inconclusive	A subtype pending results*	B/Victoria	B/Yamagata	B lineage inconclusive	B lineage pending results*	Total samples
Eastern Cape	20	7	0	1	4	0	0	3	54
Free State	7	0	0	0	0	0	0	0	8
Gauteng	82	30	0	8	17	0	0	11	586
Limpopo	2	2	0	1	1	0	0	0	8
Mpumalanga	7	1	0	0	1	0	0	1	23
North West	3	0	0	0	0	0	0	0	6
Northern Cape	0	0	0	0	0	0	0	0	0
Western Cape	38	66	0	13	10	0	0	1	243
Total:	**159**	**106**	**0**	**23**	**33**	**0**	**0**	**16**	**928**

*Inconclusive: insufficient viral load in sample and unable to characterise further
**Influenza A subtype or B lineage results are pending
Two dual infections from GP (one influenza A(H3N2) + influenza A(H1N1)pdm09 in week 17 and one influenza B(lineage inconclusive) + influenza A(H1N1)pdm09 in week 23) indicated in both columns.

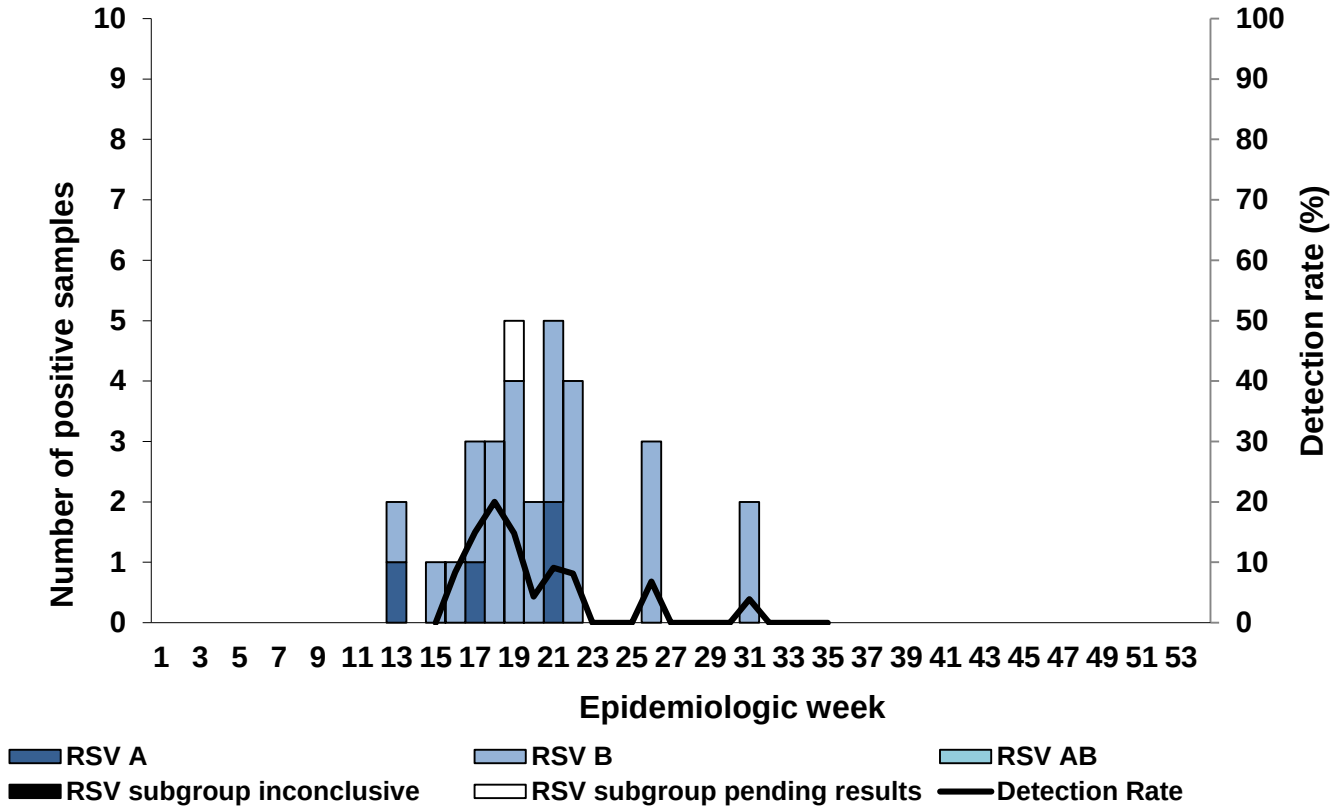

Figure 9. Number of RSV positive cases testing positive for respiratory syncytial virus (RSV)* by subgroup and detection rate by week, ILI surveillance - Viral Watch, 03/01/2022 – 04/09/2022**

*Specimens from patients with Influenza-like illnesses at 92 sentinel sites in 8 provinces
**Only reported for weeks with >10 specimens submitted.

Table 7. Number of RSV positive cases identified and total number of samples tested by province, ILI surveillance - Viral Watch, 03/01/2022 – 04/09/2022

Province	RSV A	RSV B	RSV AB*	RSV subgroup inconclusive **	RSV subgroup pending results***	Total samples tested
Eastern Cape	0	1	0	0	0	54
Free State	0	0	0	0	0	8
Gauteng	4	13	0	0	0	586
Limpopo	0	0	0	0	0	8
Mpumalanga	0	0	0	0	0	23
North West	0	0	0	0	0	6
Northern Cape	0	0	0	0	0	0
Western Cape	0	12	0	0	0	243
Total:	**4**	**26**	**0**	**0**	**0**	**928**

*RSV AB: Both RSV A and B subgroup identified
**Inconclusive: insufficient viral load in sample and unable to characterise further
***RSV results for subgroups are pending

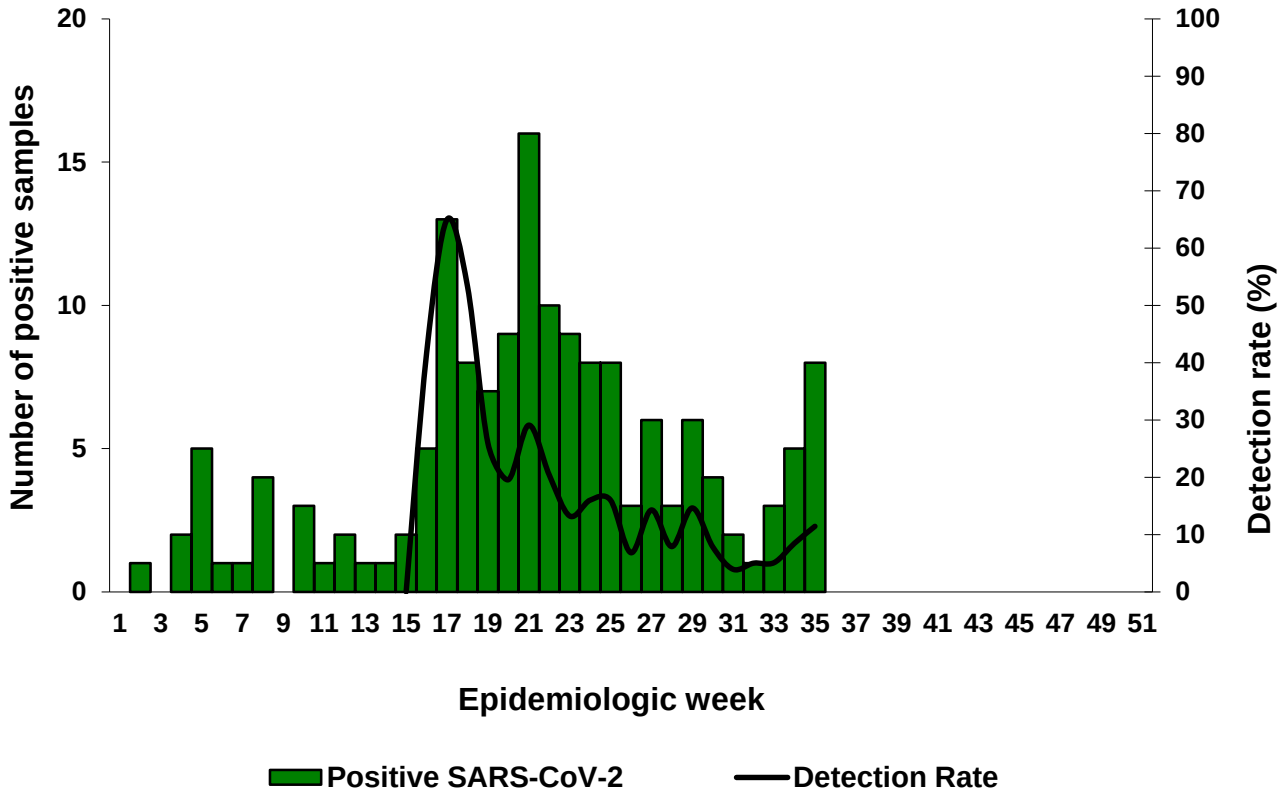

Figure 10. Number of patients testing positive for SARS-CoV-2*, by site and detection rate by week, ILI surveillance - Viral Watch, 03/01/2022 – 04/09/2022**

*Specimens from patients with Influenza-like illnesses at 92 sentinel sites in 8 provinces

**Only reported for weeks with >10 specimens submitted.

Table 8. Number of SARS-CoV-2 positive cases identified and total number tested by province, ILI surveillance - Viral Watch, 03/01/2022 – 04/09/2022

Province	SARS-CoV-2 positive	Total samples tested
Eastern Cape	4	54
Free State	0	8
Gauteng	114	586
Limpopo	1	8
Mpumalanga	2	23
North West	0	6
Northern Cape	0	0
Western Cape	37	243
Total:	**158**	**928**

Data are provisional as reported to date (Data for this report drawn on (06/09/2022). Number of consultations/specimens are reported/analysed by date of consultation/specimen collection. Data cleaning is ongoing and this may result in some changes in subsequent reports.

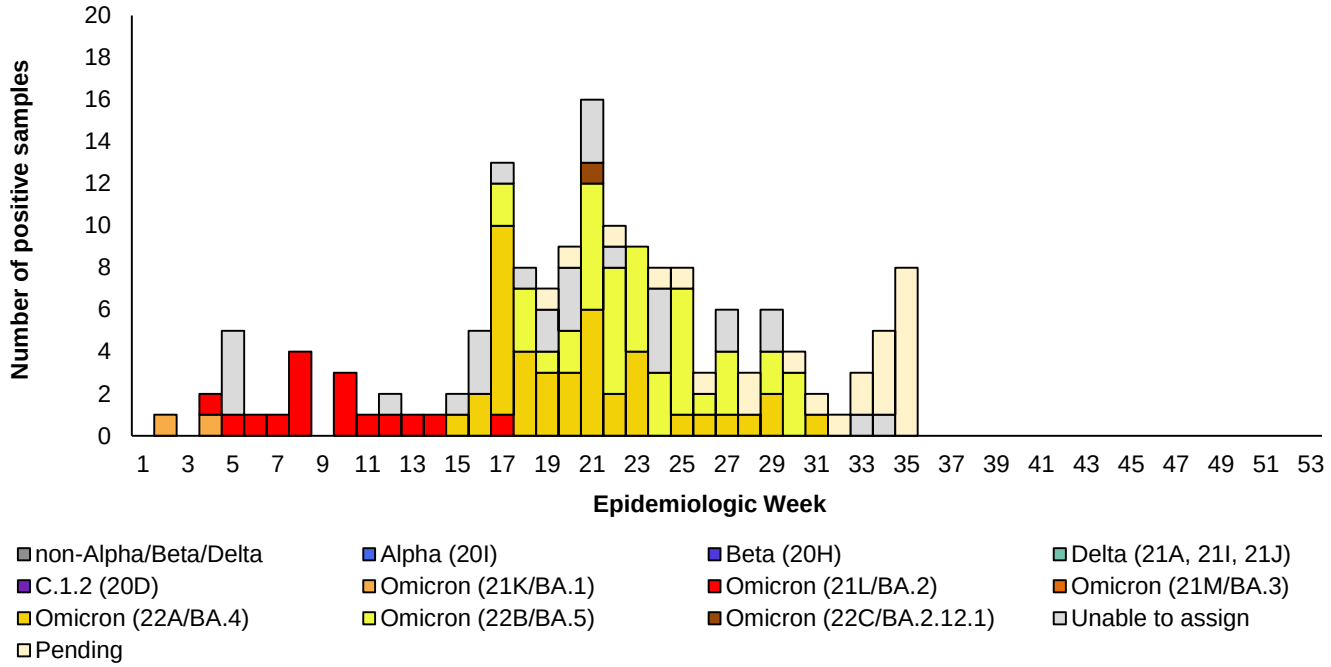

Figure 11. Number and detection rate of laboratory confirmed SARS-CoV-2* cases by variant type (variant PCR/sequencing) and week, ILI surveillance - Viral Watch, 03/01/2022 – 04/09/2022

*Specimens from patients with Influenza-like illnesses at 92 sentinel sites in 8 provinces
Unable to assign: no lineage assigned due to poor- sequence quality **OR** low viral load (C_t ≥35) **OR** variant PCR could not assign variant and no sequencing result
Pending: outstanding variant results

Table 9. Number of SARS-CoV-2* positive cases by variant (variant PCR and/or sequencing) identified and total number of samples tested by province, ILI surveillance - Viral Watch, 03/01/2022 – 04/09/2022

Clinic (Province)	Delta (21A,21I, 21J)	Omicron (21K/BA.1)	Omicron (21L/BA.2)	Omicron (21M/BA.3)	Omicron (22A/BA.4)	Omicron (22B/BA.5)	Omicron (22C/BA.2.12.1)	Unable to assign	Pending	Total SARS-CoV-2 positive	Total samples tested
Eastern Cape	0	0	1	0	1	0	0	0	2	4	54
Free State	0	0	0	0	0	0	0	0	0	0	8
Gauteng	0	2	8	0	34	32	1	22	15	114	586
Limpopo	0	0	0	0	0	0	0	1	0	1	8
Mpumalanga	0	0	0	0	1	1	0	0	0	2	23
North West	0	0	0	0	0	0	0	0	0	0	6
Northern Cape	0	0	0	0	0	0	0	0	0	0	0
Western Cape	0	0	7	0	5	10	0	7	8	37	243
Total:	0	**2**	**16**	**0**	**41**	**43**	**1**	**30**	**25**	**158**	**928**

*Specimens from patients with Influenza-like illnesses at 92 sentinel sites in 8 provinces
**No cases of Alpha, Beta or 20D (C.1.2) variants detected.
Unable to assign: no lineage assigned due to poor- sequence quality **OR** low viral load (C_t≥35) **OR** variant PCR could not assign variant and no sequencing result
Pending: outstanding variant results

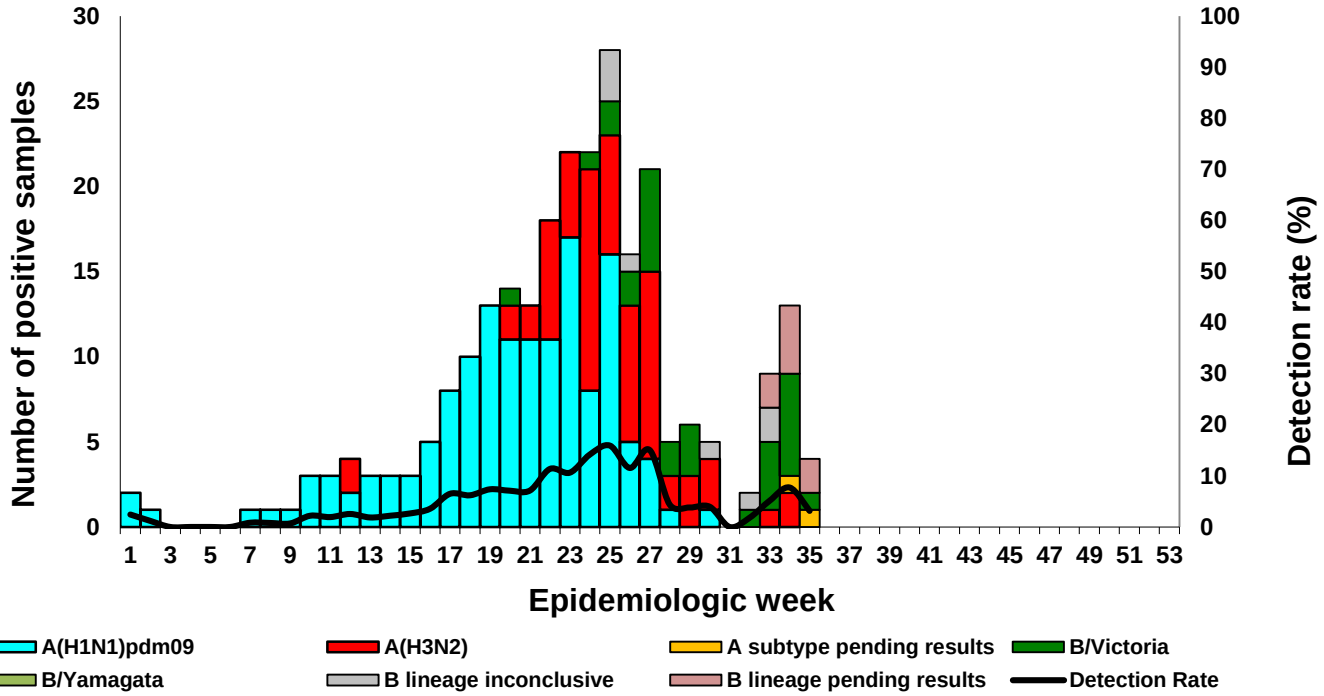

Figure 12. Number of positive influenza positive cases* by influenza subtype and lineage and detection rate*** by week, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022**

Inconclusive: insufficient viral load in sample and unable to characterise further
*Specimens from patients hospitalised with pneumonia at 10 sentinel sites in 6 provinces
**Influenza was not detected in 16 specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet pneumonia (SRI) case definition. These are not included in the epidemiological curve.
***Only reported for weeks with >10 specimens submitted
One dual infection of influenza B(Victoria) + influenza A(H3N2) in week 24 not included in the epidemiological curve.

Table 10. Number of laboratory confirmed influenza cases by subtype and lineage* and total number of samples tested by hospital, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

Hospital (Province)	A(H1N1)pdm09	A(H3N2)	A subtype inconclusive	A subtype pending results***	B/Victoria	B/Yamagata	B lineage inconclusive	B lineage pending results***	Total samples
Edendale (KZ)	26	16	1	0	2	0	0	1	706
Helen Joseph-Rahima Moosa (GP)	30	11	1	0	8	0	2	1	1060
Klerksdorp-Tshepong (NW)	27	1	0	0	1	0	2	0	414
Livingstone (EC)	8	1	1	2	6	0	2	0	271
Mapulaneng-Matikwana (MP)	11	0	0	0	5	0	0	1	406
Mitchell's Plain (WC)	5	12	1	0	2	0	1	1	524
Red Cross (WC)	9	19	2	0	2	0	0	3	954
Tembisa (GP)	7	2	0	0	2	0	1	1	186
Tintswalo (MP)	18	4	1	0	2	0	0	0	258
Tygerberg (WC)	3	3	1	0	0	0	0	0	101
Total:	**144**	**69**	**8**	**2**	**30**	**0**	**8**	**8**	**4880**

EC: Eastern Cape (Livingstone started enrolling on the 3rd of May 2022); GP: Gauteng (Tembisa started enrolling on the 10th March 2022); KZ: KwaZulu-Natal; NW: North West; MP: Mpumalanga; WC: Western Cape (Tygerberg started enrolling on the 20th April 2022)
*Influenza was not detected in 16 specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet pneumonia (SRI) case definition. These are not included in the table.
**Inconclusive: insufficient viral load in sample and unable to characterise further
***Influenza A subtype or B lineage results are pending
One dual infection of influenza B(Victoria) + influenza A(H3N2) in week 24 from Tintswalo (MP) indicated in both columns.

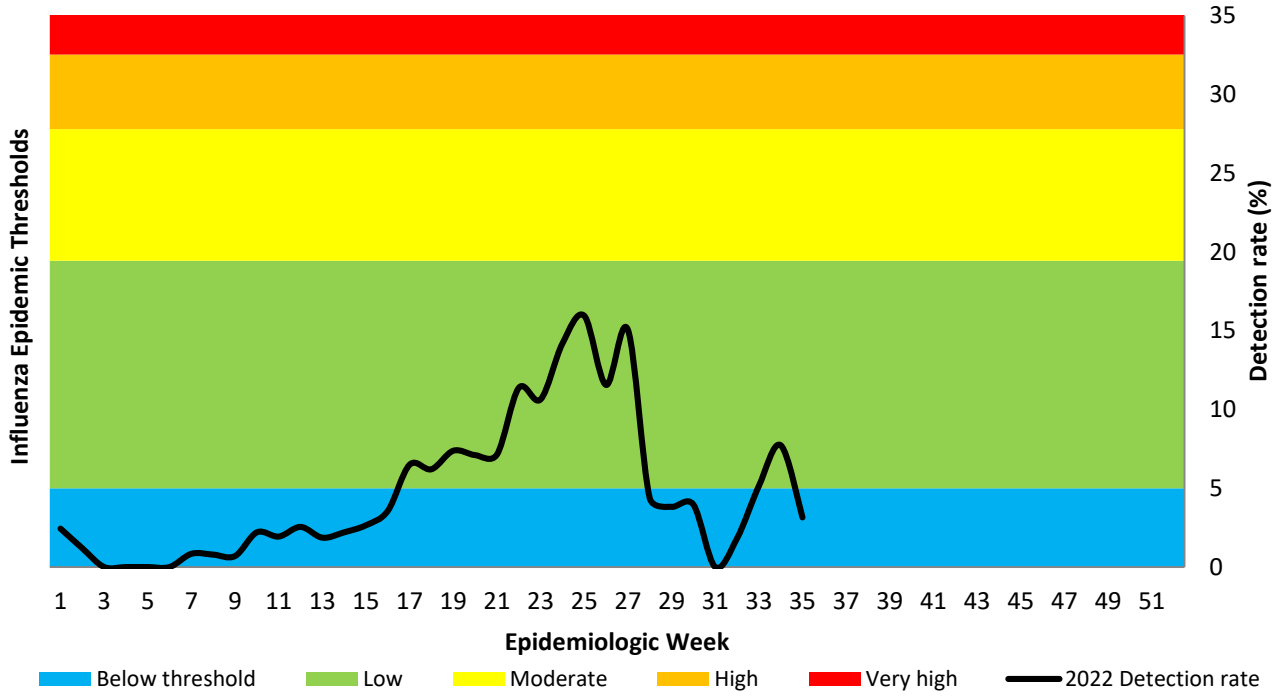

Figure 13. Influenza percentage detections and epidemic thresholds* among cases of all ages, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

*Thresholds based on 2010-2019 data

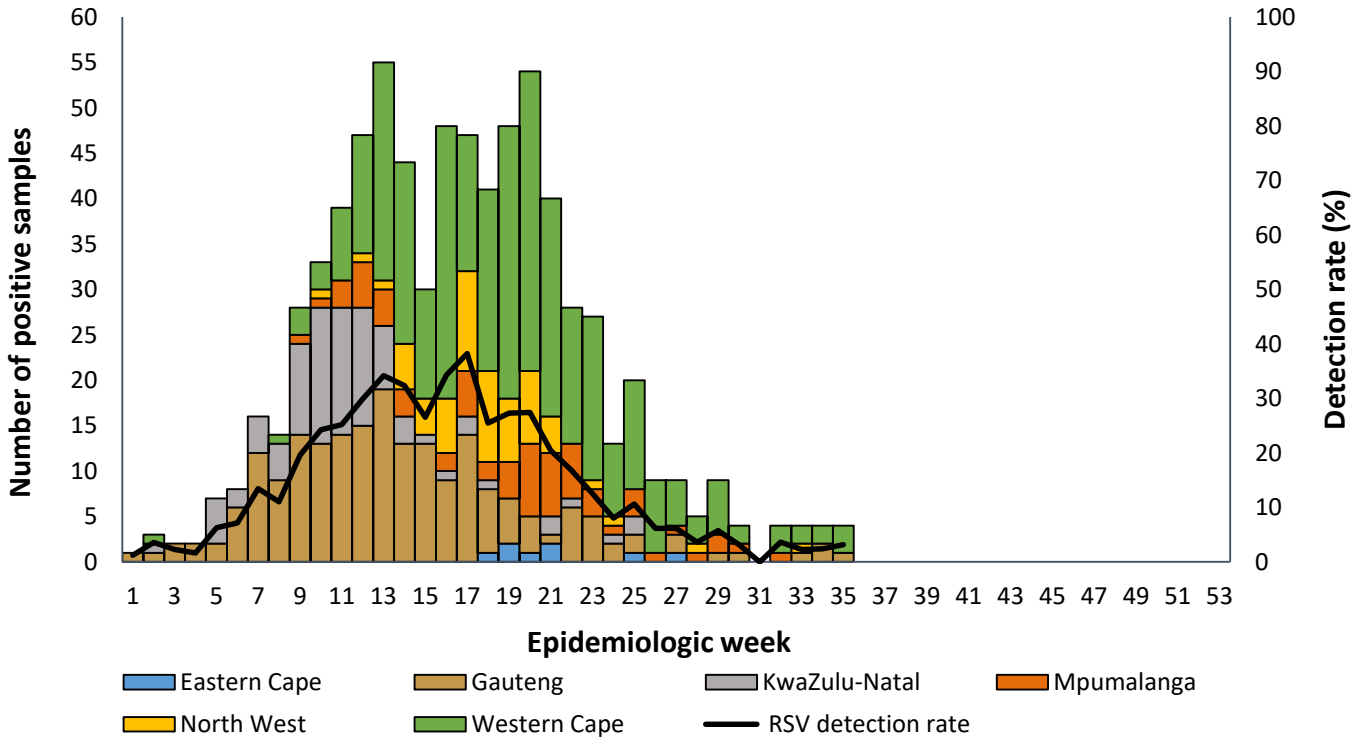

Figure 14. Number of patients (all ages) testing positive for respiratory syncytial virus* by province and detection rate by week, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

*RSV was not detected in 16 specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet pneumonia (SRI) case definition.

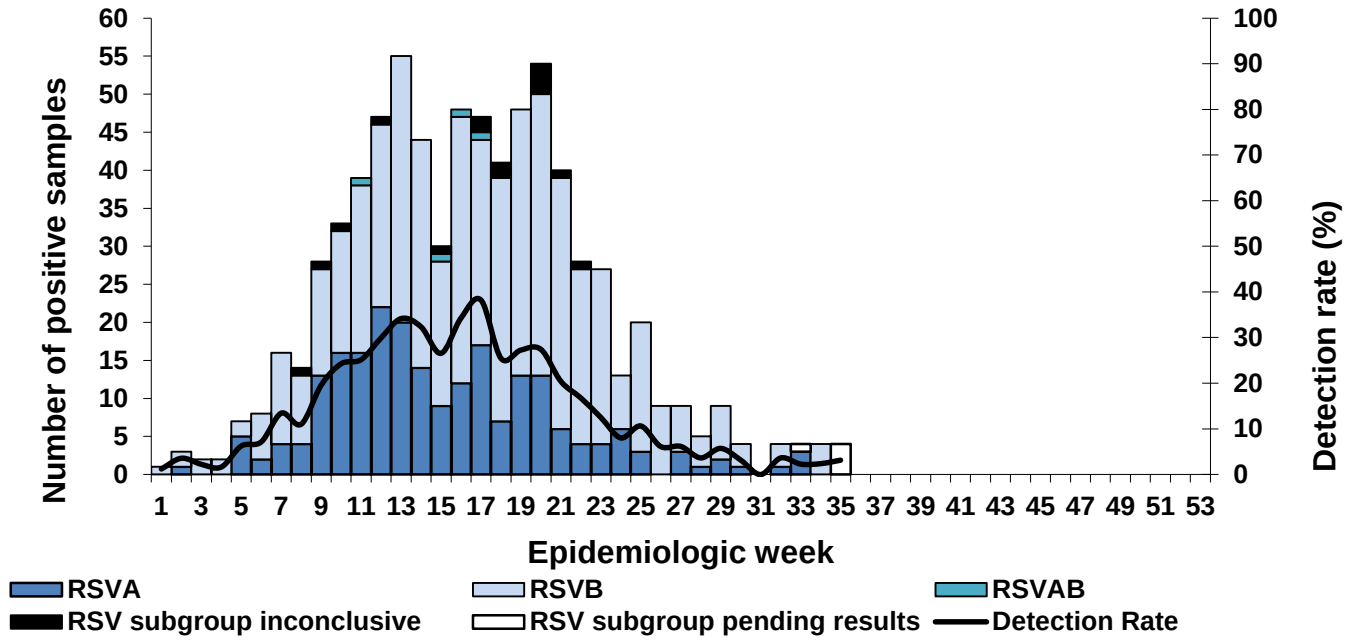

Figure 15. Number of patients (all ages) testing positive for respiratory syncytial virus* by subgroup and detection rate by week, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

Inconclusive: insufficient viral load in sample and unable to characterise further
RSV AB: Both RSV A and B subgroup identified
RSV subgroup pending: RSV results for subgroups are pending
*RSV was not detected in 16 specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet pneumonia (SRI) case definition. These are not included in the epidemiological curve.

Table 11. Number of patients (all ages) positive for respiratory syncytial virus subgroups* by subgroups identified and total number of samples tested by hospital, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

Hospital (Province)	RSVA	RSVB	RSVAB**	RSV subgroup inconclusive***	RSV subgroup pending****	Total samples
Edendale (KZ)	86	1	0	2	0	706
Helen Joseph-Rahima Moosa (GP)	40	153	3	1	1	1060
Klerksdorp-Tshepong (NW)	30	31	1	0	0	414
Livingstone (EC)	1	6	0	1	0	271
Mapulaneng-Matikwana (MP)	18	25	0	0	0	406
Mitchell's Plain (WC)	6	63	0	0	1	524
Red Cross (WC)	37	202	0	8	3	954
Tembisa (GP)	0	1	0	0	0	186
Tintswalo (MP)	4	15	0	3	0	258
Tygerberg (WC)	0	4	0	0	0	101
Total:	**222**	**501**	**4**	**15**	**5**	**4880**

EC: Eastern Cape (Livingstone started enrolling on the 3rd of May 2022); GP: Gauteng (Tembisa started enrolling on the 10th March 2022); KZ: KwaZulu-Natal; NW: North West; MP: Mpumalanga; WC: Western Cape (Tygerberg started enrolling on the 20th April 2022)
*RSV was not detected in 16 specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet pneumonia (SRI) case definition. These are not included in the table.
**RSV AB: Both RSV A and B subgroup identified
***Inconclusive: insufficient viral load in sample and unable to characterise further
****RSV results for subgroups are pending

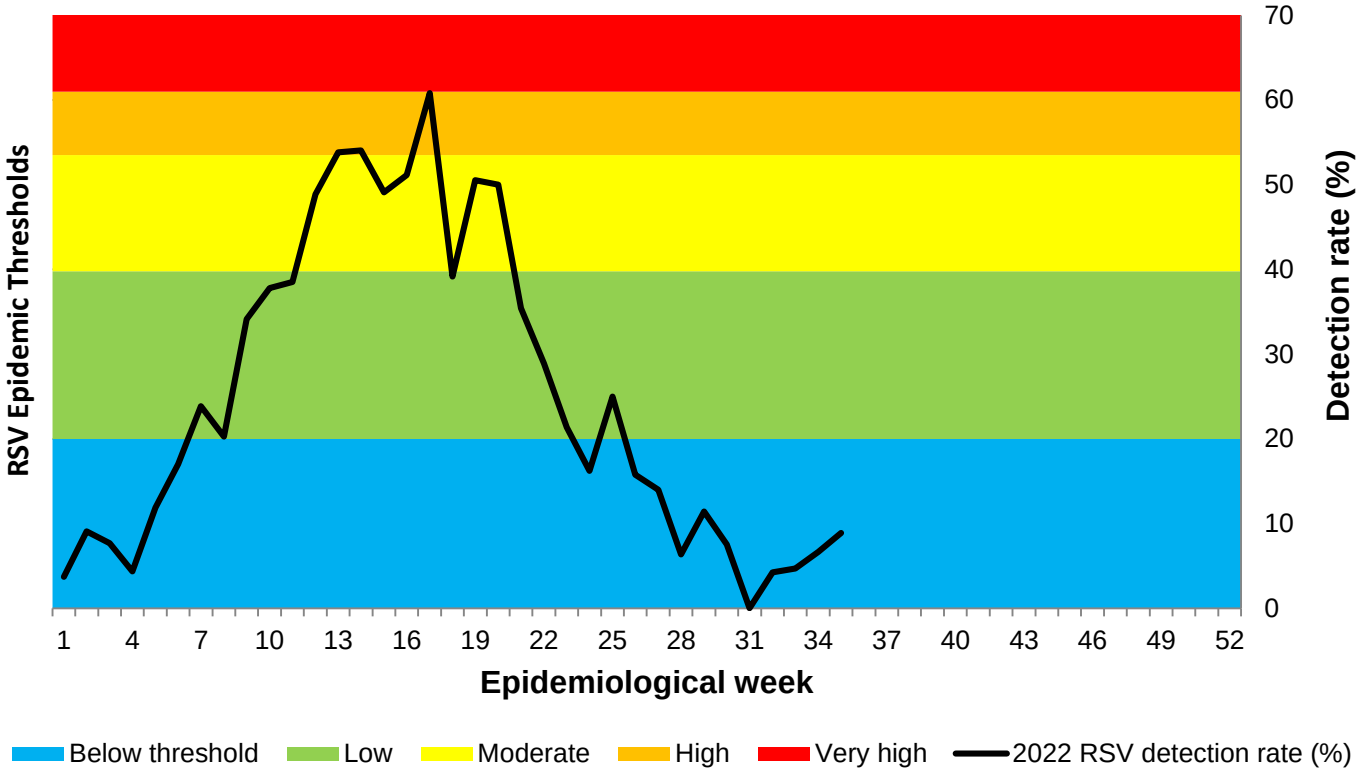

Figure 16. RSV percentage detections and epidemic thresholds* among children aged < 5 years, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

*Thresholds based on 2010-2019 data

Data are provisional as reported to date (Data for this report drawn on (06/09/2022). Number of consultations/specimens are reported/analysed by date of consultation/specimen collection. Data cleaning is ongoing and this may result in some changes in subsequent reports.

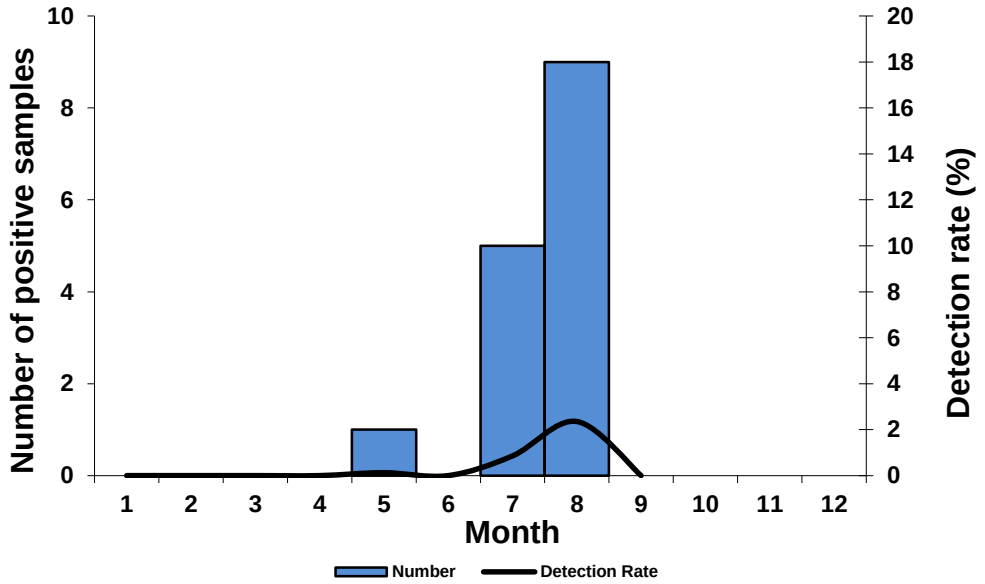

Figure 17. Number of patients testing positive for *B. pertussis and detection rate by month, pneumonia surveillance public hospitals**, 03/01/2022 – 04/09/2022**

*No *B. pertussis* was detected in 16 specimens of patients who met the suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet Pneumonia Surveillance case definition. These are not included in the epidemiologic curve.
*Specimens from patients hospitalised with pneumonia at 10 sentinel sites in 6 provinces.

Table 12. Number of patients testing positive for *B. pertussis identified and total number of samples tested by hospital and province, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022**

Hospital (Province)	*B. pertussis* Positive	Total samples
Edendale (KZ)	0	678
Helen Joseph-Rahima Moosa (GP)	0	1018
Klerksdorp-Tshepong(NW)	0	401
Livingstone (EC)	0	234
Mapulaneng-Matikwana (MP)	1	388
Mitchell'S Plain (WC)	0	504
Red Cross (WC)	12	927
Tembisa (GP)	1	153
Tintswalo (MP)	0	236
Tygerberg	1	89
Total:	**15**	**4628**

GP: Gauteng; KZ: KwaZulu-Natal; NW: North West; EC: Eastern Cape. MP: Mpumalanga; WC: Western Cape
*No B. pertussis was detected in 16 specimens of patients who met the suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet Pneumonia Surveillance case definition. These are not included in the table.

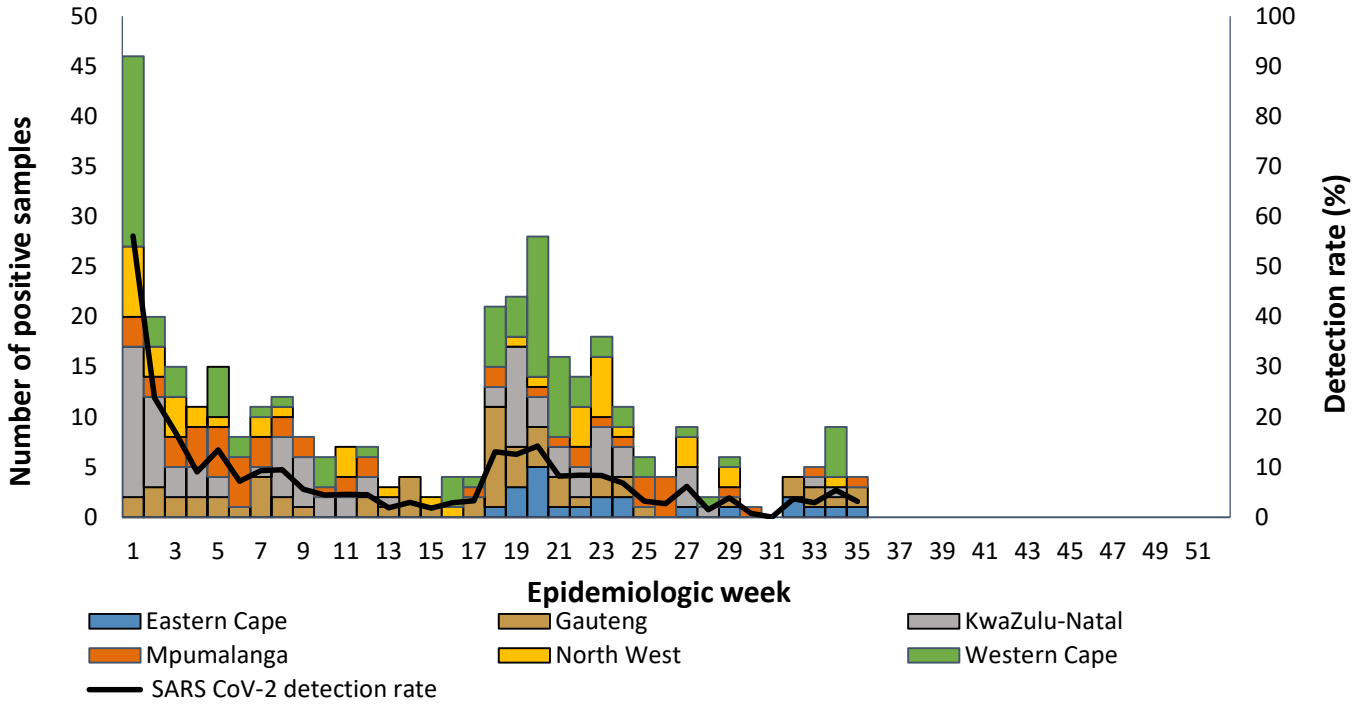

Figure 18. Number of patients testing positive for SARS-CoV-2 by province and detection rate by week, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022**

*Specimens from patients hospitalized with pneumonia at 6 sentinel sites in 5 provinces
**SARS-CoV-2 was detected in 6 of 16 (38%) specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet pneumonia (SRI) case definition. These are not included in the epidemiological curve.

Table 13. Number of patients positive for SARS-CoV-2* and total number of samples tested by hospital, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

Hospital (Province)	SARS-CoV-2 positive	Total samples tested
Edendale (KZ)	87	706
Helen Joseph-Rahima Moosa (GP)	52	1060
Klerksdorp-Tshepong (NW)	45	414
Livingstone (EC)	22	271
Mapulaneng-Matikwana (MP)	34	406
Mitchell's Plain (WC)	50	524
Red Cross (WC)	37	954
Tembisa (GP)	12	186
Tintswalo (MP)	20	258
Tygerberg (WC)	4	101
Total:	**363**	**4880**

EC: Eastern Cape (Livingstone started enrolling on the 3rd of May 2022); GP: Gauteng (Tembisa started enrolling on the 10th March 2022); KZ: KwaZulu-Natal; NW: North West; MP: Mpumalanga; WC: Western Cape (Tygerberg started enrolling on the 20th April 2022)
*SARS-CoV-2 was detected in 6 of 16 (38%) specimens from patients who met suspected SARS-CoV-2 or *B. pertussis* case definition but did not meet pneumonia (SRI) case definition. These are not included in the table.

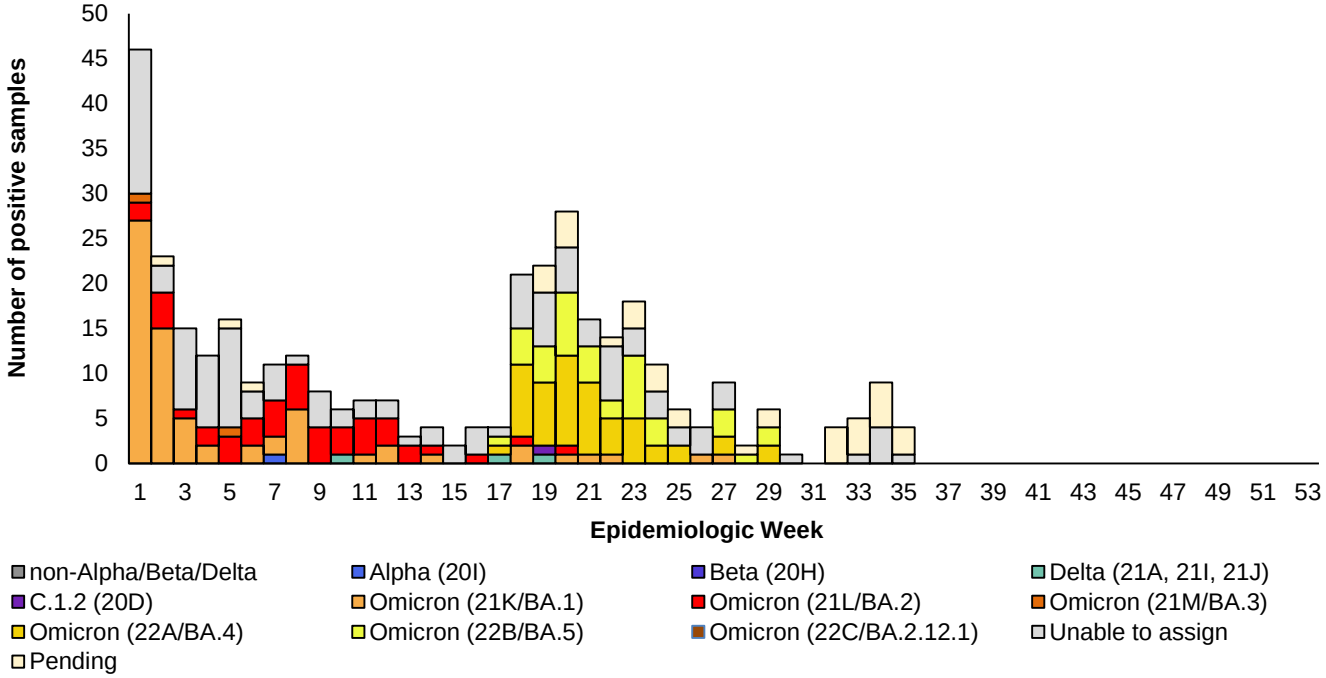

Figure 19. Number and detection rate of laboratory-confirmed SARS-CoV-2 cases* by variant type (variant PCR/sequencing), pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

*Specimens are from hospitalized patients at 10 sentinel sites in 6 provinces who met suspected SARS-CoV-2 or *B. pertussis* case definition and met pneumonia (SRI) case definition

Unable to assign: no lineage assigned due to poor- sequence quality **OR** low viral load (C_t≥35) **OR** variant PCR could not assign variant and no sequencing result

Pending: outstanding variant results

Table 14. Number of SARS-CoV-2 positive cases* by variant (variant PCR and/or sequencing) identified and total number of samples tested by hospital, pneumonia surveillance public hospitals, 03/01/2022 – 04/09/2022

Hospital (Province)	Delta (21A, 21I, 21J)	Omicron (21K/BA.1)	Omicron (21L/BA.2)	Omicron (21M/BA.3)	Omicron (22A/BA.4)	Omicron (22B/BA.5)	Omicron (22C/BA.2.12.1)	Unable to assign	Pending	Total SARS-CoV-2 positive	Total samples tested
Edendale (KZ)	1	24	13	1	3	16	0	26	6	91	715
Helen Joseph-Rahima Moosa (GP)	0	7	9	0	6	5	0	16	8	52	1060
Klerksdorp-Tshepong (NW)	0	10	2	1	3	4	0	19	6	45	414
Livingstone (EC)	0	1	1	0	7	4	0	4	5	22	271
Mapulaneng-Matikwana (MP)	0	6	8	0	3	0	0	18	1	36	413
Mitchell's Plain (WC)	0	12	1	0	13	3	0	14	7	50	524
Red Cross (WC)	0	4	6	0	12	3	0	11	1	37	954
Tembisa (GP)	2	1	0	0	2	1	0	4	2	12	186
Tintswalo (MP)	0	4	4	0	1	1	0	9	1	20	258
Tygerberg (WC)	0	1	0	0	1	1	0	0	1	4	101
Total:	**3**	**70**	**44**	**2**	**51**	**38**	**0**	**121**	**38**	**369**	**4896**

EC: Eastern Cape (Livingstone started enrolling on the 3rd of May 2022); GP: Gauteng (Tembisa started enrolling on the 10th March 2022); KZ: KwaZulu-Natal; NW: North West; MP: Mpumalanga; WC: Western Cape (Tygerberg started enrolling on the 20th April 2022)

*Specimens are from hospitalized patients at 10 sentinel sites in 6 provinces who met suspected SARS-CoV-2 or *B. pertussis* case definition and met pneumonia (SRI) case definition

**One case of Alpha variant from Helen Joseph-Rahima Moosa (GP), no cases of Beta variant and one case of 20D (C.1.2) variant detected from Edendale (KZ).

Unable to assign: no lineage assigned due to poor- sequence quality **OR** low viral load (C_t≥35) **OR** variant PCR could not assign variant and no sequencing result

Pending: outstanding variant results

Table 15: Characteristics of individuals with laboratory-confirmed SARS-CoV-2, enrolled in influenza-like illness (ILI) and pneumonia surveillance programmes, South Africa, 03/01/2022 – 04/09/2022

Characteristic	Influenza-like illness (ILI), public-sector, n=147 (%)	Pneumonia, public-sector, n=369 (%)
Age group (years)		
0-9	29/147 (20)	91/369 (25)
10-19	12/147 (8)	8/369 (2)
20-39	37/147 (25)	97/369 (26)
40-59	53/147 (36)	89/369 (24)
60-79	15/147 (10)	73/369 (20)
≥80	1/147 (1)	11/369 (3)
Sex-female	94/147 (64)	192/369 (52)
Province*		
Eastern Cape	0/147 (0)	22/369 (6)
Gauteng	0/147 (0)	64/369 (17)
KwaZulu-Natal	17/147 (12)	91/369 (25)
Mpumalanga	30/147 (20)	56/369 (15)
North West	48/147 (33)	45/369 (12)
Western Cape	52/147 (35)	91/369 (25)
Race		
Black	83/147 (56)	272/369 (74)
Coloured	37/147 (25)	59/369 (16)
Asian/Indian	0/147 (0)	1/369 (0)
White	15/147 (10)	12/369 (3)
Other	12/147 (8)	25/369 (7)
Variant		
Non-Alpha/Beta/Delta	0/147 (0)	0/369 (0)
Alpha(20I)	0/147 (0)	1/369 (0)
Beta(20H)	0/147 (0)	0/369 (0)
Delta(21A, 21I, 21J)	0/147 (0)	3/369 (1)
C.1.2(20D)	0/147 (0)	1/369 (0)
Omicron (21K/BA.1)	11/147 (7)	70/369 (19)
Omicron (21L/BA.2)	13/147 (9)	44/369 (12)
Omicron (21M/BA.3)	0/147 (0)	2/369 (1)
Omicron (22A/BA.4)	22/147 (15)	51/369 (14)
Omicron (22B/BA.5)	16/147 (11)	38/369 (10)
Omicron (22C/ BA.2.12.1)	0/147 (0)	0/369 (0)
Unable to assign**	73/147 (50)	121/369 (33)
Pending results***	12/147 (8)	38/369 (10)
Presentation		
Fever	96/136 (71)	138/349 (40)
Cough	135/137 (99)	325/349 (93)
Shortness of breath	57/135 (42)	228/342 (67)
Chest pain	58/135 (43)	135/342 (39)
Diarrhoea	19/135 (14)	36/342 (11)
Underlying conditions		
Hypertension	30/135 (22)	59/343 (17)
Cardiac	3/147 (2)	14/369 (4)
Lung disease	0/135 (0)	1/343 (0)
Diabetes	8/135 (6)	39/343 (11)
Cancer	0/147 (0)	4/369 (1)
Tuberculosis - Previous	1/147 (1)	5/369 (1)
Tuberculosis - Current	2/147 (1)	42/369 (11)
HIV-infection	18/147 (12)	130/369 (35)
Other ****	0/135 (0)	3/333 (1)
SARS-CoV-2 Vaccine		
Pfizer-BioNTech (1st dose)	20/147 (14)	37/369 (10)
Pfizer-BioNTech (2nd dose)	19/147 (13)	30/369 (8)
Johnson & Johnson (1st dose)	17/147 (12)	26/369 (7)
Johnson & Johnson (2nd dose)	3/147 (2)	2/369 (1)
Unknown	14/147 (10)	32/147 (22)
No vaccine	75/147 (51)	266/369 (72)
Management		
Oxygen therapy	0/135 (0)	186/333 (56)
ICU admission	0/135 (0)	3/333 (1)
Ventilation	0/135 (0)	7/333 (2)
Outcome***		
Died	0/135 (0)	23/319 (7)

*ILI surveillance not conducted in Gauteng or Eastern Cape province

**Unable to assign: no lineage assigned due to poor- sequence quality OR low viral load (Ct ≥35) OR variant PCR could not assign variant and no sequencing result

***Pending results: outstanding variant results

****Chronic lung, liver and kidney disease, organ transplant, pregnancy, malnutrition, obesity, tracheostomy, prematurity, seizure, stroke, anaemia, asplenia, burns, Systemic lupus erythematosus, seizures

*****Outcome includes patients who are still hospitalised, have been discharged or referred, and those who died

Note: Children may be over-represented amongst hospitalised patients due to the inclusion of a large paediatric hospital in Cape Town.
Of the 23 patients who died, six were in the 20-39-year age group, nine were in 40-59 age group and eight were ≥60 years; 15/23 (65%) were female.

Methods

SARS-CoV-2 Testing

March 2020 – March 2021: SARS-CoV-2 was detected using the Roche E gene real-time PCR assay (Corman et al. *Euro Surveillance* 2020) with cycle threshold (C_t) <40 interpreted as positive for SARS-CoV-2. From April 2021 to date the laboratory changed to the Allplex™ SARS-CoV-2/FluA/FluB/RSV kit (Seegene Inc., Seoul, South Korea), with positivity assigned if the PCR cycle threshold (C_t) was <40 for ≥1 gene targets (N, S or RdRp).

A confirmed SARS-CoV-2 case is a person of any age enrolled in surveillance with laboratory confirmation of SARS-CoV-2 infection by PCR. Only positive SARS-CoV-2 specimens on PCR are further tested to determine variant/lineage type by variant PCR or genomic sequencing.

Variant PCR

Allplex™ SARS-CoV-2 Variants I PCR detects Alpha and Beta/Gamma variants. The assay was conducted on all SARS-CoV-2-positive samples from 1 March 2020 – 30 June 2021.

Allplex™ SARS-CoV-2 Variants II PCR detects Delta variant and distinguishes Beta from Gamma. The assay was conducted on SARS-CoV-2-positive samples from 1 Jan to 30 June 2021.

Extraction: Total nucleic acids were extracted from 200µl NP/OP samples in universal or viral transport medium using a MagNA Pure 96 automated extractor and DNA/Viral NA Small Volume v2.0 extraction kit (Roche Diagnostics, Mannheim, Germany).

SARS-CoV-2 genomic surveillance

SARS-CoV-2 Whole-Genome Sequencing and Genome Assembly

RNA Extraction

RNA was extracted either manually or automatically in batches, using the QIAamp viral RNA mini kit (QIAGEN, CA, USA) or the Chemagic 360 using the CMG-1049 kit (PerkinElmer, MA, USA). A modification was done on the manual extractions by adding 280 µl per sample, in order to increase yields. 300 µl of each sample was used for automated magnetic bead-based extraction using the Chemagic 360. RNA was eluted in 60 µl of the elution buffer. Isolated RNA was stored at -80 °C prior to use.

PCR and Library Preparation

Sequencing was performed using the Illumina COVIDSeq protocol (Illumina Inc., CA, USA) or nCoV-2019 ARTIC network sequencing protocol v3 (https://artic.network/ncov-2019). These are amplicon-based next-generation sequencing approaches. Briefly, for the nCoV-2019 ARTIC network sequencing protocol, the first strand synthesis was carried out on extracted RNA samples using random hexamer primers from the SuperScript IV reverse transcriptase synthesis kit (Life Technologies, CA, USA) or LunaScript RT SuperMix Kit (New England Biolabs (NEB), MA , USA). The synthesized cDNA was amplified using multiplex polymerase chain reactions (PCRs) using ARTIC nCoV-2019 v3 primers. For the COVIDSeq protocol, the first strand synthesis was carried out using random hexamer primers from Illumina and the synthesized cDNA underwent two separate multiplex PCR reactions.

For Illumina sequencing using the nCoV-2019 ARTIC network sequencing protocol, the pooled PCR products underwent bead-based tagmentation using the Nextera Flex DNA library preparation kit (Illumina Inc., CA, USA). The adapter-tagged amplicons were cleaned up using AmpureXP purification beads (Beckman Coulter, High Wycombe, UK) and amplified using one round of PCR. The PCRs were indexed using the Nextera CD indexes (Illumina Inc., CA, USA) according to the manufacturer's instructions. For COVIDSeq sequencing protocol, pooled PCR amplified products were processed for tagmentation and adapter ligation using IDT for Illumina Nextera UD Indexes. Further enrichment and cleanup was performed as per protocols provided by the manufacturer (Illumina Inc., CA, USA). Pooled samples from both COVIDSeq protocol and nCoV-2019 ARTIC network protocol were quantified using Qubit 3.0 or 4.0 fluorometer (Invitrogen Inc., MA, USA) using the Qubit dsDNA High Sensitivity assay according to manufacturer's instructions. The fragment sizes were analyzed using TapeStation 4200 (Invitrogen Inc., MA, USA). The pooled libraries were further normalized to 4nM concentration and 25 µl of each normalized pool containing unique index adapter sets were combined in a new tube. The final library pool was denatured and neutralized with 0.2 N sodium hydroxide and 200 mM Tris-HCL (pH7), respectively. 1.5 pM sample library was spiked with 2% PhiX. Libraries were loaded onto a 300-cycle NextSeq 500/550 HighOutput Kit v2 and run on the Illumina NextSeq 550 instrument (Illumina Inc., CA, USA).

Assembly, Processing and Quality Control of Genomic Sequences

Raw reads from Illumina sequencing were assembled using the Exatype NGS SARS-CoV-2 pipeline v1.6.1, (https://sars-cov-2.exatype.com/). The resulting consensus sequence was further manually polished by considering and correcting indels in homopolymer regions that break the open reading frame (probably sequencing errors) using Aliview v1.27, (http://ormbunkar.se/aliview/) (Larsson, 2014). Mutations resulting in mid-gene stop codons and frameshifts were reverted to wild type. All assemblies determined to have acceptable quality (defined as having at least 1 000 000 reads and at least 40 % 10 X coverage) were deposited on GISAID (https://www.gisaid.org/) (Elbe & Buckland-Merrett, 2017; Shu & McCauley, 2017).

Classification of Lineage, Clade and Associated Mutations

Assembled genomes were assigned lineages using the 'Phylogenetic Assignment of Named Global Outbreak Lineages' (PANGOLIN) software suite (https://github.com/hCoV-2019/pangolin) (Rambaut et al., 2020), a tool used for dynamic SARS-CoV-2 lineage classification. The SARS-CoV-2 genomes in our dataset were also classified using the clade classification proposed by NextStrain (https://nextstrain.org/), a tool built for real-time tracking of the pathogen evolution (Hadfield et al., 2018).