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# Epidemiology of respiratory pathogens from the influenza-like illness and pneumonia surveillance programmes, South Africa, 2023

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## Summary

Syndromic respiratory illness surveillance programmes co-ordinated by the National Institute for Communicable Diseases, a division of the National Health Laboratory Service, include the hospital-based Pneumonia Surveillance Programme (PSP) and two Influenza-like Illness (ILI) programmes: systematic ILI surveillance at primary health clinics in the public sector (ILI-PHC surveillance programme) and the Viral Watch programme (ILI-VW) at private general practitioner practices. Respiratory specimens collected from enrolled individuals and meeting the case definitions at sentinel sites were tested for influenza, respiratory syncytial virus (RSV), *Bordetella pertussis (B. pertussis)*, and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by real-time polymerase chain reaction. Since 2022, the influenza season has returned to its pre-pandemic pattern, including a bi-phasic peak, and this trend continued in 2023. The 2023 influenza season began in week 17 (starting 27 April 2023) and ended in week 27 (starting 10 July 2023). In total, 10 785 samples (99.1%) were tested: 7 379 from PSP, 1 824 from ILI-PHC, and 1 582 from ILI-VW. The overall influenza detection rate was 9.6% (1 038/10 785). In the PSP, the influenza detection rate was 5.0% (370/7 379). The most commonly detected influenza subtypes and lineages were influenza A (H3N2) (90.3%, 334/370), influenza B/Victoria (5.4%, 20/370), and influenza A(H1N1)pdm09 (0.3%, 1/370). Of the 9 203 individuals with specimens collected and tested in ILI-PHC and PSP, 8 756 (95.1%) had available HIV results. The HIV prevalence among patients of all ages was 27.5% (1 939/7 054) in the PSP and 12.0% (204/1 702) in the ILI-PHC surveillance programme. The HIV prevalence was highest in the 25–44-year-age-group for patients enrolled in ILI-PHC (29.3%, 109/372) and in PSP (64.2%, 1 012/1 576) programmes, respectively. Although the RSV season preceded the influenza season and began in week 6 (starting 06 February 2023) and concluded in week 21 (starting 22 May 2023), RSV was detected year-round across all three surveillance programmes. The overall detection rate was 7.6% (819/10 785). In the PSP, RSV subgroup A was the most common, comprising 74.1% (520/702) of cases. Among children under 5 years in the PSP, the RSV detection rate was 21.7% (658/3 029), with 61% of cases (1 849/3 029) occurring in children under one year of age. In 2023, *B. pertussis* cases were identified throughout the year, with the highest case counts reported during the first half of the year in both the ILI-PHC and PSP platforms. A total of 210 cases (detection rate at 2.3%, 210/9 234) were identified in 2023. Circulation of SARS-CoV-2 was consistently at low levels throughout 2023, with no seasonality observed. Overall, in all three surveillance programmes, the annual detection rate for SARS-CoV-2 was 4.7% (513/10 817). In 2023, Omicron lineage XBB.1.5 (clade 23A) predominated in the first half of the year, with Omicron lineage 2.86 (clade 23I) increasing in the second half of the year. This report highlights the evolving epidemiology of respiratory pathogens. The findings offer valuable data to support stakeholders and policymakers in making informed decisions regarding the implementation of new or adjusted prevention and control strategies, such as planning for respiratory disease surges or vaccination programmes, including the implementation of newly approved RSV preventive interventions for infants.

# Introduction

Surveillance programmes are used globally to monitor disease patterns, identify seasonal changes, and characterise the epidemiology of individuals affected by specific illnesses.[1-4] These programmes also help to identify populations at higher risk for severe diseases. An effective sentinel syndromic surveillance programme plays an important role in detecting, managing, and tracking respiratory diseases, as specimens are taken systematically from all patients presenting with the syndrome. Additionally, it provides valuable information for the introduction of new preventive measures and evaluating their effectiveness.[2,4]

Sentinel surveillance programmes collect data to characterise the epidemiological characteristics of individuals infected with respiratory pathogens of public health significance. These data contribute to disease burden estimates and enable the evaluation of vaccine effectiveness, providing evidence for policymakers and stakeholders who develop and monitor prevention strategies. Findings from respiratory disease surveillance should be compiled regularly and shared through reports and peer-reviewed publications.[1,3,5]

In South Africa, the Centre for Respiratory Diseases and Meningitis (CRDM) at the National Institute for Communicable Diseases (NICD), a division of the National Health Laboratory Service (NHLS), conducts sentinel site systematic syndromic respiratory illness surveillance. This includes the Pneumonia Surveillance Programmes (PSP) at public sector hospitals and two Influenza-like Illness (ILI) surveillance programmes: ILI surveillance at public sector primary health clinics (ILI-PHC) and the Viral Watch programme (ILI-VW) conducted at private general practitioner practices.

This report aims to outline the epidemiology of key respiratory pathogens in South Africa in 2023, providing data to support evidence-based policies and strategies for their prevention, control, and management.

# Methods

A summary of each surveillance programme is included below. Mid-turbinate nasal swabs collected from enrolled participants at ILI-PHC and PSP sites were tested for four pathogens: influenza, respiratory syncytial virus (RSV), *Bordetella pertussis (B. pertussis),* and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Specimens collected from participants at ILI-VW sites were tested for influenza, RSV, and SARS-CoV-2 only.

### Description of surveillance programmes and study sites

The PSP in South Africa is a hospital-based, active, prospective, sentinel surveillance programme established in 2009, enrolling patients based on three case definitions (Table 1). In 2023, the PSP included sites in six provinces, namely Gauteng (GP), North West (NW), KwaZulu-Natal (KZN), Eastern Cape (EC),

Western Cape (WC), and Mpumalanga (MP), and 14 hospitals (Rahima Moosa Mother and Child Hospital (GP), Helen Joseph Hospital (GP), Tembisa Hospital (GP), OR Tambo Memorial Hospital (GP), Harry Gwala Memorial Hospital (KZN), Livingstone Hospital (EC), Mapulaneng Hospital (MP), Matikwana Hospital (MP), Tintswalo (MP), Klerksdorp-Tshepong Hospital Complex (NW), Red Cross Children's Hospital (WC), Mitchell's Plain Hospital (WC), Khayelitsha District Hospital (WC), and Tygerberg Hospital (WC).

The ILI-PHC programme was established in 2012 and enrols outpatients with ILI, suspected COVID-19, or suspected pertussis at sentinel sites in five clinics in four provinces (Harry Gwala Memorial Hospital Gateway Clinic in KZN, Jouberton Clinic in NW, Agincourt Clinic in MP, and Eastridge and Mitchell's Plain clinics in WC) (Table 1). Suspected COVID-19 was dropped from severe respiratory illness (SRI) and ILI case definitions from 01 November 2023.

The ILI-VW programme was established in 1984 and is a prospective, sentinel, outpatient-based surveillance programme operating through a private general practitioner network.[5] General practitioners submit nasopharyngeal (NP) swabs from patients who met the ILI or suspected COVID-19 case definitions for laboratory testing (Table 1). This programme is active in eight provinces: EC, Free State (FS), Limpopo (LP), MP, Northern Cape (NC), GP, NW, and WC.

**Table 1.** Case definitions by age group and surveillance programme for the clinical syndromes included in the Influenza-like Illness (ILI-PHC surveillance programme and ILI-Viral Watch) and Pneumonia Surveillance Programme (PSP), South Africa, 2023.

| Case definition | Criteria | Surveillance programme |
|---|---|---|
| **Severe respiratory illness (SRI)** | **2 days – <3 months**<br>Any child hospitalised with a diagnosis of sepsis/suspected sepsis or physician-diagnosed lower respiratory tract infection (LRTI*), including bronchiolitis, pneumonia, bronchitis, and pleural effusion<br><br>**≥3 months – <5 years**<br>Any child ≥3 months to <5 years of age hospitalised with physician-diagnosed LRTI, including bronchiolitis, pneumonia, bronchitis, and pleural effusion<br><br>**≥5 years**<br>Any person hospitalised with physician-diagnosed LRTI or suspected COVID-19** | PSP |
| **Suspected COVID-19 (January – October 2023)** | Any person admitted with a physician-diagnosis of suspected COVID-19** and not meeting the SRI case definitions above | PSP |
| **Suspected pertussis** | Any infant <12 months of age with apnoea **OR**<br>Any patient presenting with a cough of any duration **and** any of the following:<br>a. Paroxysms of coughing (coughing fits/spells) OR<br>b. Inspiratory whoop OR<br>c. Post-tussive vomiting | ILI-PHC, PSP |
| **ILI or suspected COVID-19 (January-October 2023)** | Any outpatient presenting with:<br>a. acute fever of ≥38°C and/or self-reported fever within the last 10 days **AND** cough<br>**OR**<br>b. acute (≤14 days) respiratory tract infection<br>**OR**<br>c. other clinical illness compatible with COVID-19**<br>**OR**<br>d. physician-diagnosed suspected COVID-19** | ILI-PHC, ILI-VW |

*LRTI = lower respiratory tract infection and includes suspected pulmonary TB and suspected pertussis.

**Suspected COVID-19 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). From 01 November 2023, suspected COVID-19 was removed from the SRI and ILI case definitions. Thereafter, ILI was defined as any outpatient presenting with an acute fever (≥38°C) or self-reported fever and cough within the past 10 days. In addition, the SRI cases aged ≥5 years had to present with a history of fever (≥38°C) or self-reported fever and cough.

### Sample and data collection

In the PSP and ILI-PHC programmes, surveillance officers screened potentially eligible patients. Consenting patients whose symptoms met the case definitions were enrolled. A case investigation form (CIF), either paper-based or electronic, was completed and uploaded to the NICD structured query language (SQL) database, and a mid-turbinate nasal swab was collected for testing. HIV status was determined through routine testing or medical record review. For the ILI-VW programme, a physician completed a short paper-based CIF, which was then submitted to the NICD and entered into a Microsoft Access database. Specimens were stored at 4°C and transported in cooler boxes with ice packs to the NICD for testing within 72 hours of collection.

### Laboratory testing for influenza, RSV, *B. pertussis,* and SARS-CoV-2

The CRDM laboratory at the NICD tested for influenza A and B, RSV, and SARS-CoV-2 using a commercial multiplex real-time polymerase chain reaction (RT-PCR) assay (Allplex SARS-CoV-2/FluA/FluB/RSV PCR kit, Seegene Inc., Seoul, South Korea).[6] A specimen was considered SARS-CoV-2 positive if the cycle threshold (Ct) value was <40 for at least one of the gene targets (S, N, or RdRp). Positive specimens with a Ct value <35 underwent sequencing using the Illumina COVIDSeq protocol (Illumina, CA, USA).[6] Influenza A-positive specimens were further subtyped by RT-PCR using primers and probes from the Centers for Disease Control and Prevention (CDC, Atlanta, Georgia, USA) to detect A(H1N1)pdm09 and A(H3N2). Influenza B lineage was determined for influenza B-positive specimens using CDC primers and probes. *B.pertussis* was tested using a previously described RT-PCR method.[7] A specimen was classified as *B. pertussis*-positive if the IS481 gene was detected with a Ct value <40. All IS481-positive specimens were confirmed as negative for *Bordetella holmesii* using the hIS1001 gene target.[7]

### Data management and analysis

Data management was centralised at the NICD, with all electronic records stored in Microsoft Access or SQL databases. Laboratory, clinical, and demographic information were collated for all enrolled patients. The CRDM data team ensured data quality by performing checks for missing entries and duplicates. Seasonal thresholds were 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. The detection rate for the year was plotted against the moving average using historical data to determine the level of activity for the year using an algorithm.[8]

MEM uses the historical 40th, 90th, and 97.5th percentiles to calculate thresholds of activity, defined as:

- Below seasonal threshold: Median of weekly values for all baseline years;
- Low activity: Between the epidemic threshold and 40th percentile;
- Moderate activity: Between the 40th and 90th percentiles;
- High activity: Between the 90th and 97.5th percentiles;
- Very high activity: 97.5th percentile and above.

The beginning of the season was determined as the epidemiologic week when the detection rate exceeded the epidemic threshold and stayed above that threshold for at least two consecutive weeks. The season concluded when the detection rate dropped below the epidemic threshold for two consecutive weeks. Data from 2023 were compared against these thresholds, which were established using data from the ILI-PHC programme between 2012 and 2019 (before the COVID-19 pandemic) and the PSP from 2010 to 2019. For influenza, thresholds from outpatient ILI-PHC were used to track disease transmission in the community, while thresholds from PSP indicated the impact of the influenza season or epidemic on the healthcare system and society. For RSV, thresholds from PSP using data for children <5 years of age were applied to define the season's start and end. All analyses were performed using Stata (version 18, StataCorp LP, College Station, TX, USA).

# Results

## Patients enrolled and tested

In ILI-VW, 1 585 patients were enrolled from 01 January through 31 December 2023. Of the specimens collected, 1 582 (99.8%) were tested for influenza, RSV, and SARS-CoV-2. From January 2023 through December 2023, 9 282 patients were enrolled in the two systematic syndromic surveillance programmes conducted in the public sector (ILI-PHC and PSP). Of these, 9 203 (99.1%) had specimens collected and tested for respiratory pathogens (Figure 1), of which 19.8% (1 824/9 203) were enrolled in the ILI-PHC, and 80.2% (7 379/9 235) were enrolled in the PSP. In the PSP, more than half of the enrolled individuals were ≥15 years old (59.0%, 4 350/7 379). In contrast, the ILI-PHC programme had a more balanced age distribution, with 49.8% (916/1 824) of participants being ≥15 years of age. The majority of individuals enrolled in the PSP presented with symptom duration of ≤10 days (96.4%, 2 920/3 029 in individuals aged <15 years and 64.7%, 2 815/4 350 in individuals aged ≥15 years).

Of the 9 203 individuals with specimens collected and tested in ILI-PHC and PSP, 8 756 (95.1%) had available HIV results. The HIV prevalence among patients of all ages was 27.5% (1 939/7 054) in the PSP and 12.0% (204/1 702) in the ILI-PHC surveillance programme (Figure 2). The HIV prevalence was highest in the 25–44-year-old age group for patients enrolled in the ILI-PHC (29.3%, 109/372) and in the PSP (64.2%, 1 012/1 576) programmes, respectively (Figure 2).

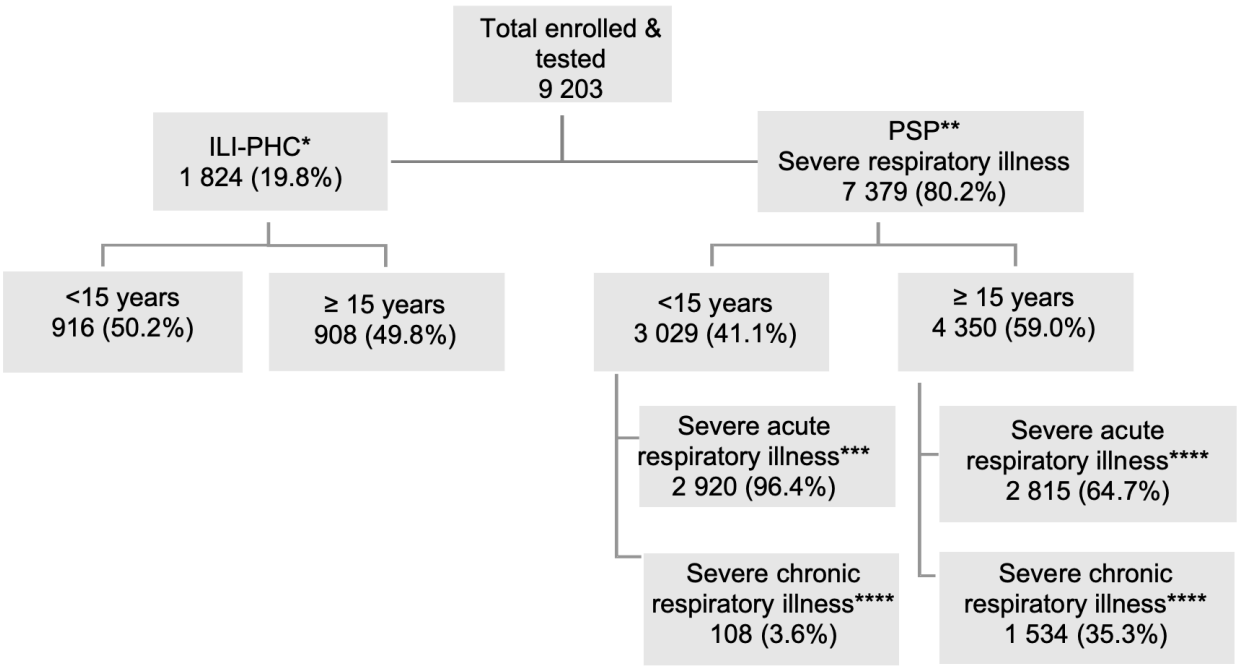



**Figure 1.** Numbers of individuals enrolled and specimens tested for respiratory pathogens in the Pneumonia Surveillance Programme (PSP) and Influenza-Like Illness in Public Health Clinics (ILI-PHC) surveillance programme, South Africa, 2023.

*ILI-PHC = ILI surveillance at primary health clinics in the public sector.

**PSP = Pneumonia Surveillance Programme.

***PSP patients with a symptom duration of ≤10 days were classified as having severe acute respiratory illness.

****PSP patients with a symptom duration of >10 days were classified as having severe chronic respiratory illness.

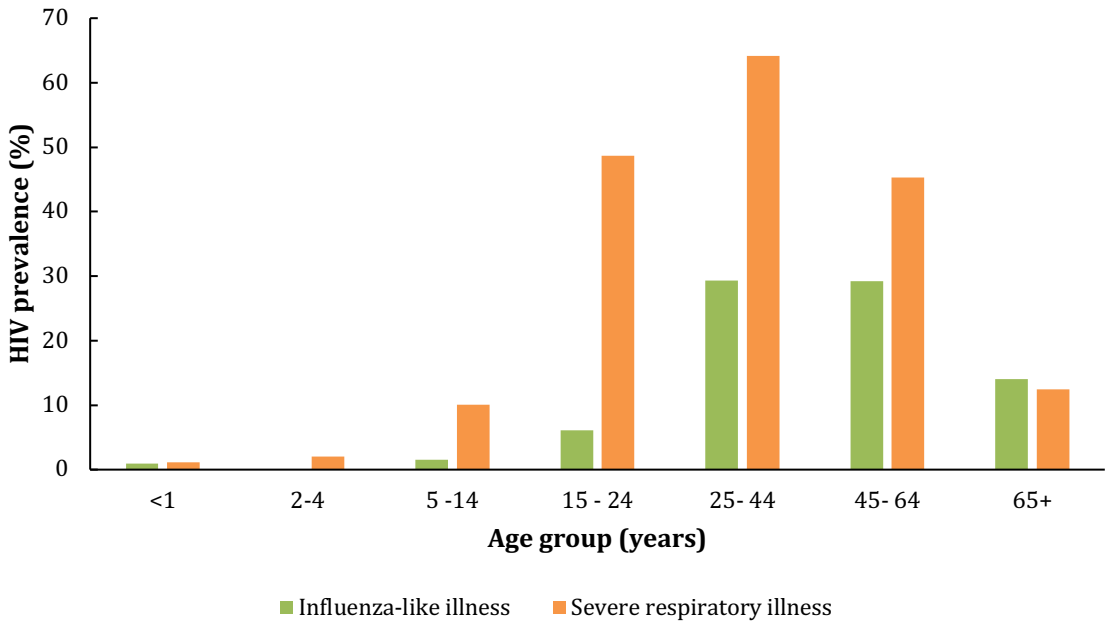



**Figure 2.** HIV prevalence by age group for individuals enrolled and tested in the Pneumonia Surveillance Programme[1] (PSP) and Influenza-Like Illness in Public Health Clinics[2] (ILI-PHC) surveillance programme, South Africa, 2023.

[1]PSP sites were active in six provinces, including Gauteng, North West, KwaZulu-Natal, Eastern Cape, Western Cape, and Mpumalanga.

[2]ILI-PHC sites were active in four provinces, including KwaZulu-Natal, North West, Mpumalanga, and Western Cape.

### Influenza, RSV, SARS-CoV-2, and *Bordetella pertussis* among individuals enrolled in ILI-PHC

In the 2023 ILI-PHC surveillance programme, influenza was the most frequently detected pathogen among individuals under 15 years of age, with a detection rate of 16.7% (153/916), followed by RSV at 6.8% (62/916), SARS-CoV-2 at 3.2% (29/916), and *B. pertussis* at 2.0% (18/916) (Table 2). Among individuals aged 15 years and older, influenza remained the most commonly identified pathogen at 9.9% (90/908), followed by SARS-CoV-2 at 5.5% (50/908), *B. pertussis* at 2.0% (18/908), and RSV at 1.4% (13/908) (Table 3).

### Influenza, RSV, SARS-CoV-2, and *Bordetella pertussis* among individuals enrolled in PSP

In the 2023 PSP surveillance programme, RSV was the most frequently detected pathogen among individuals under 15 years of age, with a detection rate of 21.7% (658/3 029), followed by influenza at 4.4% (133/3 029), *B. pertussis* at 3.8% (115/3 029), and SARS-CoV-2 at 3.1% (94/3 029) (Table 4). The in-hospital mortality rate for this age group was 0.9% (28/3 029). Among individuals aged 15 years and older, influenza was the most commonly detected pathogen at 5.4% (237/4 350), followed by

SARS-CoV-2 at 4.2% (181/4 350), *B. pertussis* at 1.4% (61/4 350), and RSV at 1.0% (44/4 350). The in-hospital mortality rate for this age group was higher than in children at 10.3% (449/4 350) (Table 5).

### Influenza

The 2023 influenza season started in week 17 (week starting 27 April 2023) when the influenza detection rate (3-week moving average) breached the seasonal threshold and peaked in week 22 (week starting on 04 June 2023). The season ended in week 27 (week starting 10 July 2023) based on thresholds from PSP, with sporadic cases of influenza B detected from week 35 (week starting 28 August 2023). Transmission peaked at the high level (Figure 3D), and influenza-associated morbidity in PSP reached the moderate level (Figure 3F).

In the ILI-VW programme, influenza was detected in 26.7% (423/1 582) of the tested specimens. Among these, the predominant subtypes and lineages were influenza A(H3N2) at 82.0% (347/423), followed by influenza A(H1N1)pdm09 at 2.4% (10/423), and influenza B/Victoria at 13.0% (55/423) (Figure 3A). Nine specimens (2.1%) had inconclusive results for influenza A subtyping, and two specimens (0.5%) had inconclusive influenza B lineage results due to a low viral load (Ct ≥35), preventing further characterisation. Using the Viral Watch programme, transmission peaked at the low level (Figure 3B).

In the ILI-PHC surveillance programme, out of the 1 824 specimens tested, 243 (13.3%) were positive for influenza. Of these influenza-positive specimens, 93.0% (226/243) were influenza A(H3N2), 4.5% (11/243) were influenza B/Victoria, 0.8% (2/243) were influenza A(H1N1)pdm09, 0.4% (1/243) were inconclusive for influenza B lineage, and 1.2% (3/243) were inconclusive for influenza A subtype due to low viral load (Ct ≥35), preventing further characterisation (Figure 3C).

In PSP, influenza was detected in 5.0% (370/7 379) of specimens tested. Among the 370 influenza-positive specimens, the majority were identified as influenza A(H3N2), accounting for 90.3% (334/370) of positive tests. Influenza B/Victoria comprised 5.4% (20/370), while influenza A(H1N1)pdm09 made up a small portion at 0.3% (1/370). Additionally, 1.1% (4/370) of specimens had inconclusive results for the influenza B lineage, and 3.5% (13/370) of specimens had inconclusive results for the influenza A subtype, likely due to low viral loads (Ct ≥35), preventing further characterisation (Figure 3E).

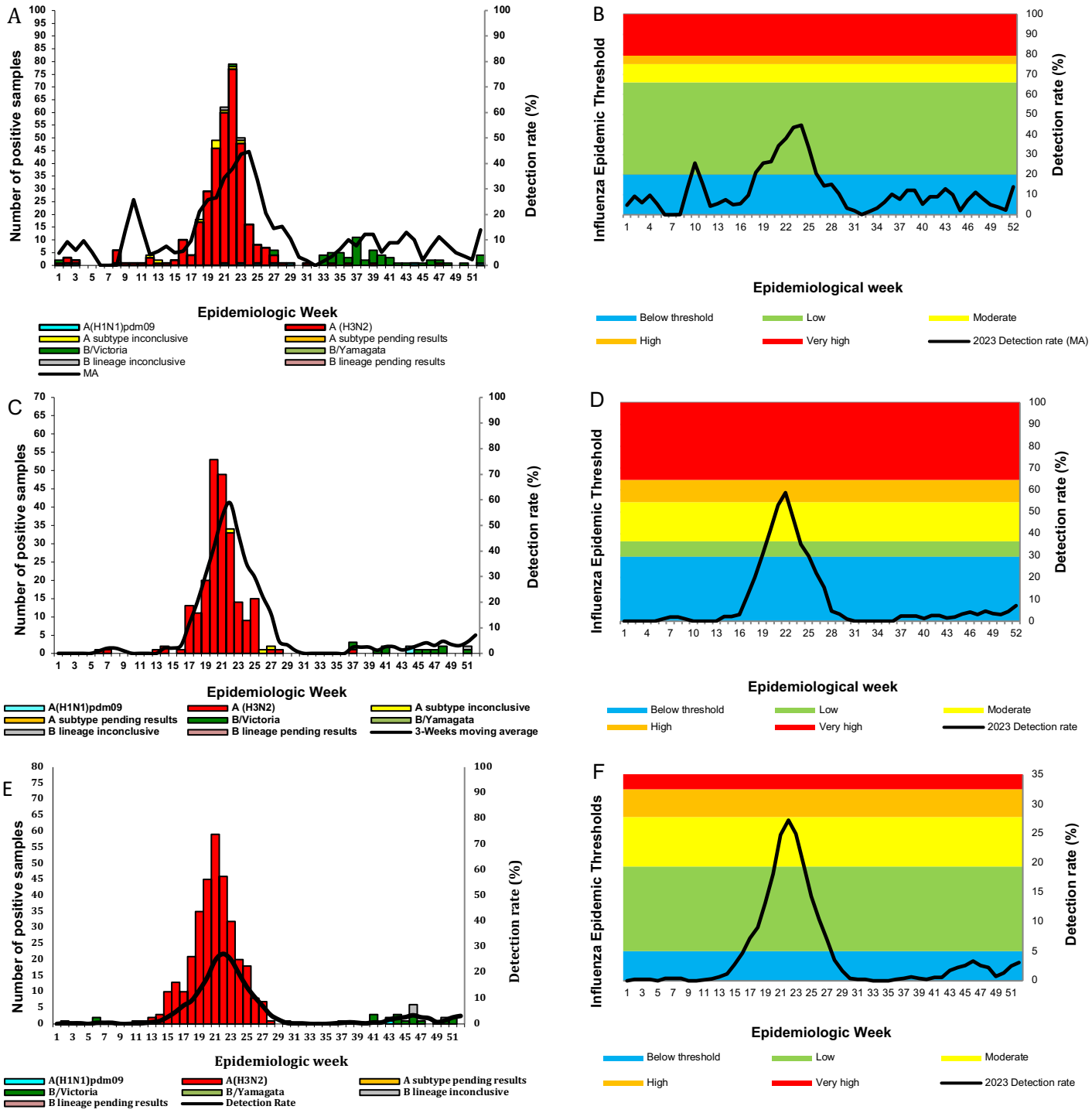



**Figure 3.** Number of influenza-positive specimens by influenza subtype and lineage, and detection rate by epidemiologic week for (A) Influenza-like Illness – Viral Watch[1] (ILI-VW), (C) Influenza-like Illness – Public Health Clinics[2] (ILI-PHC), and (E) Pneumonia Surveillance Programme[3] (PSP). Influenza detection rate and epidemic threshold by epidemiological week for all age groups using the Moving Epidemic Method for (B) ILI-VW (based on 2012-2019 data), (D) ILI-PHC (based on 2012-2019 data), and (F) PSP (based on 2010-2019 data, South Africa 2023).

[1]ILI-VW sites were active in eight provinces, including Eastern Cape, Free State, Limpopo, Mpumalanga, Northern Cape, Gauteng, North West, and Western Cape.
[2]ILI-PHC sites were active in four provinces, including KwaZulu-Natal, North West, Mpumalanga, and Western Cape.
[3]PSP sites were active in six provinces, including Gauteng, North West, KwaZulu-Natal, Eastern Cape, Western Cape, and Mpumalanga.

### Respiratory syncytial virus

The 2023 RSV season preceded the influenza season, starting in week six (week starting 06 February 2023) when the detection rate (3-week moving average) among children aged <5 years in PSP crossed and remained above the seasonal threshold. The season ended in week 21 (week starting 22 May 2023) (Figures 4C and D). Compared to the 2012–2019 detection rates among children aged <5 years enrolled in PSP, RSV hospitalisations peaked in week 13 (week starting 27 March 2023), dominated by RSV subgroup A.

In the ILI-VW programme, RSV was detected in 2.7% (42/1 582) of specimens, with RSV subgroup A predominating at 73.8% (31/42), followed by RSV subgroup B at 26.2% (11/42) (Figure 4A).

Within the ILI-PHC surveillance programme, RSV was identified in 4.1% (75/1 824) of tested specimens (Figure 4B). Among the 75 RSV-positive samples, RSV subgroup A was the most prevalent, accounting for 64.0% (48/75), followed by RSV subgroup B at 33.3% (25/75). One case had a co-infection of RSV subgroups A and B (1.3%, 1/75). Additionally, one specimen (1.3%, 1/75) had inconclusive RSV subgroup results due to a low viral load (Ct ≥35).

Of the 7 379 specimens collected and tested among patients enrolled in the PSP, 9.5% (702/7 379) were positive for RSV (Figure 4C). The RSV detection rate was higher among children aged under 5 years, at 21.7% (658/3 029), compared to 1.0% (44/4 350) in individuals aged ≥5 years. Infants under one year of age accounted for the majority of cases, with a 41.2% (271/658) detection rate in children <2 months within the PSP (Table 4). Similar to the ILI-PHC surveillance programme, RSV subgroup A was the most prevalent (74.1%, 520/702), followed by RSV subgroup B (25.2%, 177/702) and mixed infections with both subgroups (0.3%, 2/702). Additionally, five specimens (0.7%) had inconclusive RSV subgroup results due to a low viral load (Ct ≥35).

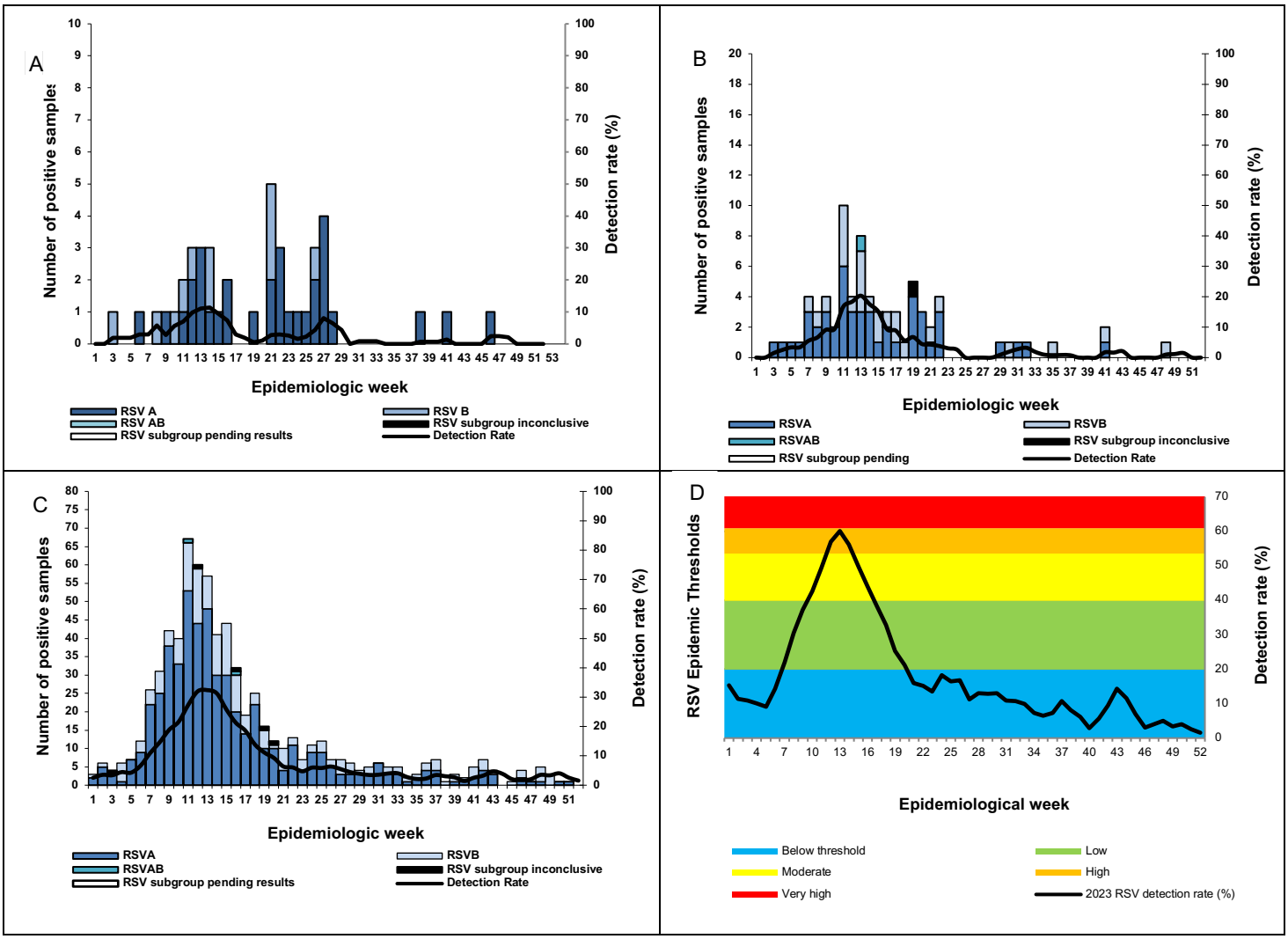



**Figure 4.** Number of respiratory syncytial virus (RSV)-positive specimens by subgroup and detection rate by epidemiologic week for (A) Influenza-like Illness – Viral Watch[1] (ILI-VW), (B) Influenza-like Illness – Public Health Clinics[2] (ILI-PHC), (C) Pneumonia Surveillance Programme[3] (PSP), (D) RSV detection rate, and epidemic threshold (based on 2010-2019 data) by epidemiological week among children aged <5 years using the Moving Epidemic Method, South Africa 2023.

[1]ILI-VW sites were active in eight provinces, including Eastern Cape, Free State, Limpopo, Mpumalanga, Northern Cape, Gauteng, North West, and Western Cape.

[2]ILI-PHC sites were active in four provinces, including KwaZulu-Natal, North West, Mpumalanga, and Western Cape.

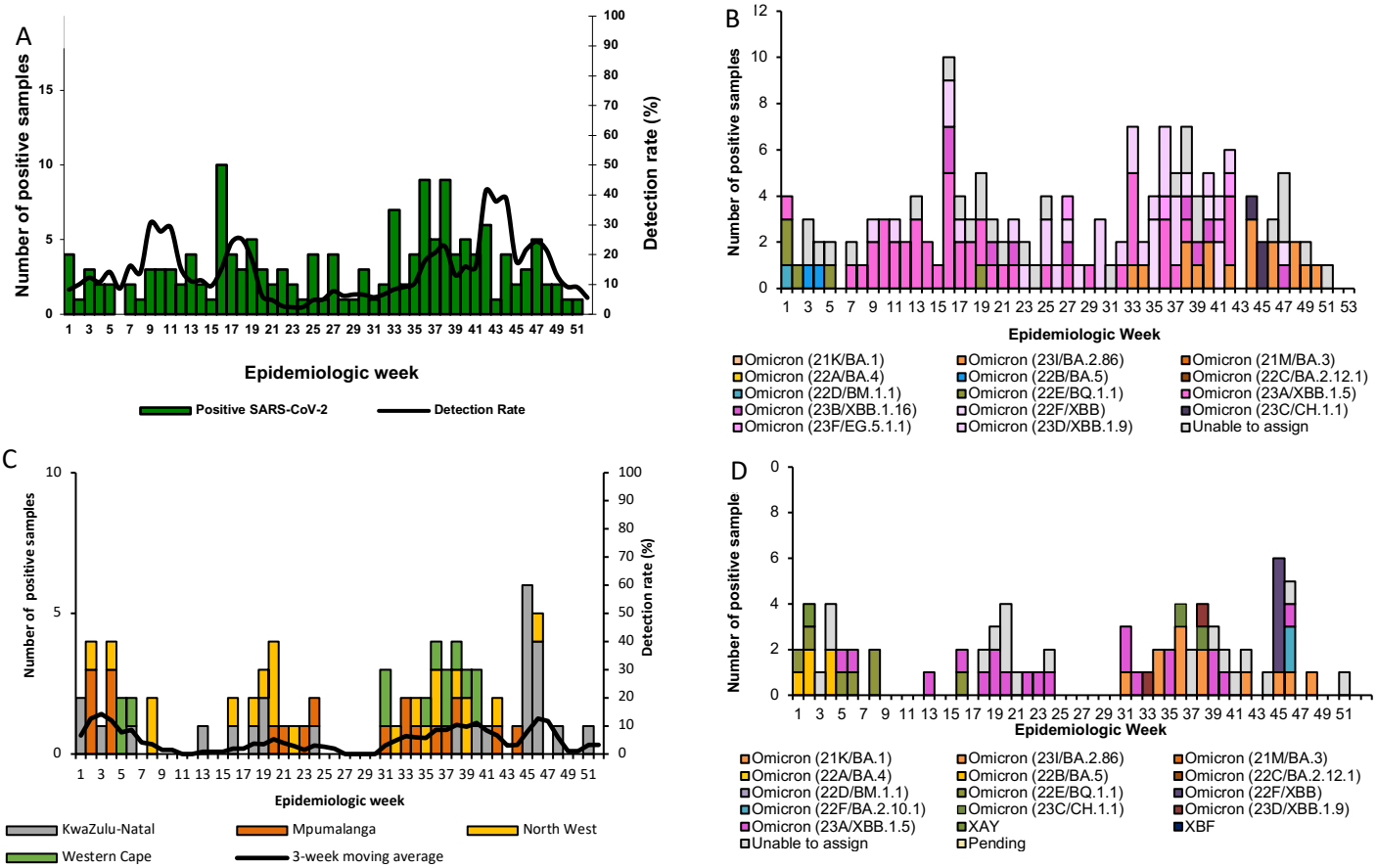
[3]PSP sites were active in six provinces, including Gauteng, North West, KwaZulu-Natal, Eastern Cape, Western Cape, and Mpumalanga.

## SARS-CoV-2

SARS-CoV-2 circulated at consistently low levels throughout 2023, with no clear seasonal trends observed across all three surveillance systems (ILI-VW, ILI-PHC, and PSP). Across all platforms, detections remained sporadic and limited, indicating minimal but ongoing community transmission. This suggests that many infections may have been mild or asymptomatic, and therefore affected individuals did not present for care, resulting in low detection rates in routine surveillance. Of the 10 785 tests conducted, 513 (4.7%) SARS-CoV-2 cases were detected across all three surveillance programmes.

In the ILI-VW programme, SARS-CoV-2 was detected in 10.1% (159/1 582) of specimens tested (Figure 5A). In the ILI-PHC surveillance programme, the detection rate was 4.3% (79/1 824) (Figure 5C). Meanwhile, in the PSP, SARS-CoV-2 was identified in 3.7% (275/7 379) of specimens tested (Figure 5E).

Among 514 SARS-CoV-2 specimens sequenced in 2023 (across all surveillance platforms), 403 (78.4%) were assigned a lineage. The dominant variant was Omicron, constituting 99.7% (402/403) of sequences, the majority of which were lineage XBB.1.5 (clade 23A) (35.8%, 144/402), followed by lineage BA.2.86 (clade 23I) (19.7%, 79/402) (Figures 5B, 5D, and 5F).



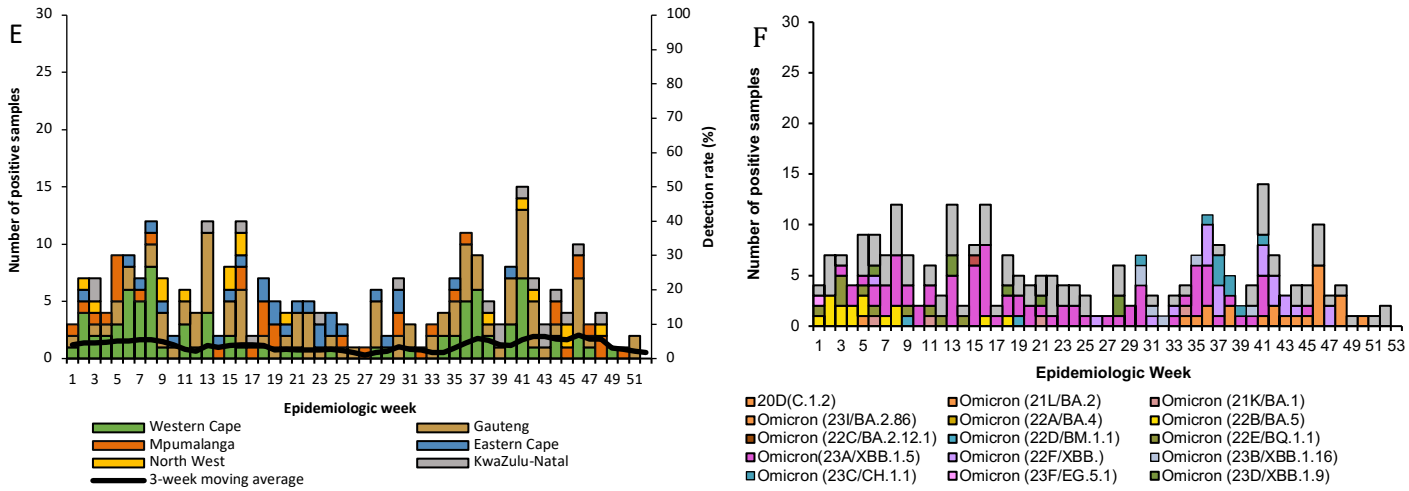



**Figure 5**. Number of SARS-CoV-2-positive specimens and detection rate by province (left) and clade/lineage (right) in all ages, (A & B) Influenza-like Illness – Viral Watch[1] (ILI-VW), (C & D) Influenza-like Illness - Public Health Clinics[2] (ILI-PHC), and (E & F) Pneumonia Surveillance Programme[3] (PSP), South Africa, 2023.

[1]ILI-VW sites were active in eight provinces, including Eastern Cape, Free State, Limpopo, Mpumalanga, Northern Cape, Gauteng, North West, and Western Cape.

[2]ILI-PHC sites were active in four provinces, including KwaZulu-Natal, North West, Mpumalanga, and Western Cape.

[3]PSP sites were active in six provinces, including Gauteng, North West, KwaZulu-Natal, Eastern Cape, Western Cape, and Mpumalanga.

### *Bordetella pertussis*

Of the 1 824 specimens collected and tested from patients enrolled in the ILI-PHC surveillance programme, 2.0% (36/1 824) tested positive for *B. pertussis* (Figure 6A). Cases were detected throughout the year, with the highest numbers observed in January, March, and May 2023. The majority of cases were identified in NW (16/36, 44.4%), followed by KZN (10/36, 27.7%), MP (6/36, 16.7%), and WC (3/36, 8.3%).

Within the PSP, a total of 176 *B. pertussis* cases were identified out of 7 379 specimens tested (Figure 6B). The number of cases was high at the start of the surveillance period in January 2023 and declined thereafter, with a second increase observed in May 2023, during which 28 cases were detected. The highest proportion of cases was reported in GP (66/176, 37.5%), followed by the MP (28/176, 15.9%) and NW (28/176, 15.9%) provinces.

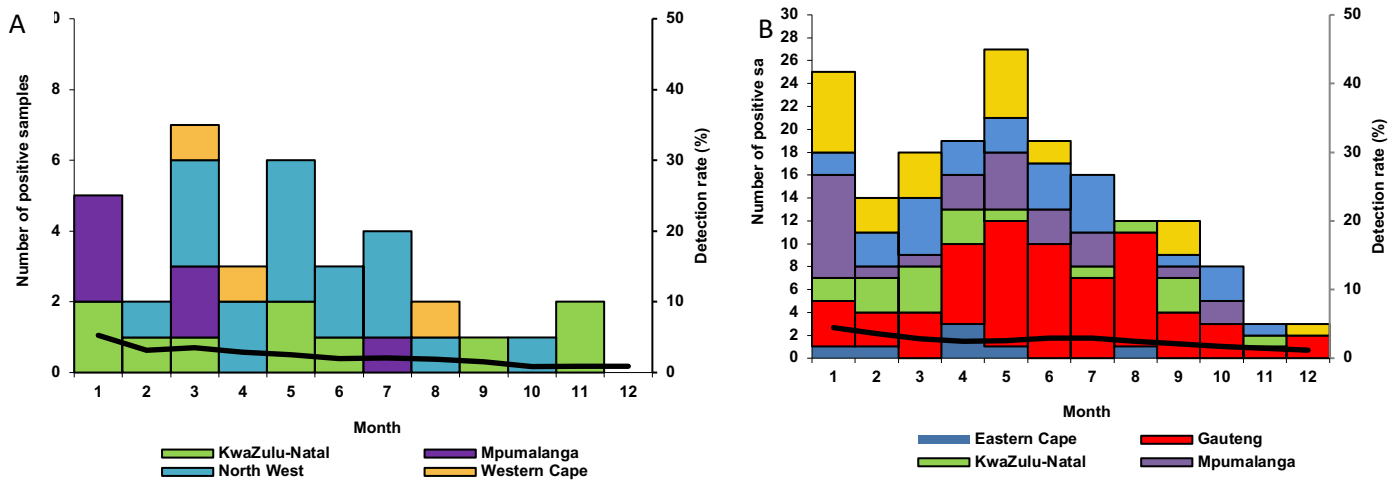



**Figure 6**. Number of *Bordetella pertussis*-positive specimens by province for (A) Influenza-like Illness – Public Health Clinics[1] (ILI-PHC) and (B) Pneumonia Surveillance Programme[2] (PSP), South Africa, 2023.

[1]ILI-PHC sites were active in four provinces, including KwaZulu-Natal, North West, Mpumalanga, and Western Cape.
[2]PSP sites were active in six provinces, including Gauteng, North West, KwaZulu-Natal, Eastern Cape, Western Cape, and Mpumalanga.

**Table 2.** Demographic and clinical characteristics of patients aged <15 years enrolled and tested in the Influenza-like Illness – Public Health Clinics (ILI-PHC) surveillance programme overall, and individuals testing positive for influenza, respiratory syncytial virus (RSV), *Bordetella pertussis,* and SARS-CoV-2, South Africa. 2023.

| | **Overall n/N (%) N=916** | **Influenza n/N (%) N=153** | **RSV n/N (%) N=62** | ***B. pertussis* n/N (%) N=18** | **SARS-CoV-2 n/N (%) N=29** |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| 0–2 months | 17/916 (1.9) | 0/153 (0.0) | 3/62 (4.8) | 3/18 (16.7) | 1/29 (3.5) |
| 3–5 months | 33/916 (3.6) | 2/153 (1.3) | 6/62 (9.7) | 0/18 (0.0) | 3/29 (10.3) |
| 6–11 months | 70/916 (7.6) | 3/153(2.0) | 6/62 (9.7) | 3/18 (16.7) | 2/29 (6.9) |
| 12–23 months | 101/916(11.0) | 6/153 (3.9) | 13/62 (21.0) | 1/18 (5.6) | 4/29 (13.8) |
| 2–<4 years | 275/916(30.0) | 38/153(24.8) | 19/62 (30.7) | 3/18 (16.7) | 6/29 (20.7) |
| ≥5–14 years | 420/916 (45.9) | 104/153 (68.0) | 15/62 (24.2) | 8/18 (44.4) | 13/29 (44.8) |
| **Sex** | | | | | |
| Female | 472/915 (51.6) | 72/153 (47.1) | 29/62 (46.8) | 10/18 (55.6) | 18/29 (62.1) |
| **Race** | | | | | |
| Black**** | 618/878 (70.4) | 116/147 (78.9) | 39/58 (67.2) | 17/18 (94.4 | 20/27 (74.1) |
| **Province** | | | | | |
| Mpumalanga | 148/916 (16.2) | 23/153 (15.0) | 8/62 (12.9) | 4/18 (22.2) | 4/29 (13.8) |
| North West | 156/916 (17.0) | 52/153 (34.0) | 14/62 (22.6) | 4/18 (22.2) | 8/29 (27.6) |
| KwaZulu-Natal | 246/916 (26.9) | 34/153 (22.2) | 16/62 (25.8) | 7/18 (38.9) | 7/29 (24.1) |
| Western Cape | 366/916 (40.0) | 44/153 (28.8) | 24/62 (38.7) | 3/18 (16.7) | 10/29 (34.5) |
| Living with HIV | 7/864 (0.8) | 3/144 (2.1) | 0/57 (0.0) | 2/17 (11.8) | 0/25 (0.0) |
| Malnutrition* | 1/916 (0.1) | 0/153 (0.0) | 0/62 (0.0) | 0/18 (0.0) | 0/29 (0.0) |
| Premature** | 4/873 (0.5) | 0/147 (0.0) | 0/58 (0.0) | 0/18 (0.0) | 0/27 (0.0) |
| Underlying illness*** | 21/916 (2.3) | 3/153 (2.0) | 3/62 (4.8) | 0/18 (0.0) | 0/29 (0.0) |

*Malnutrition defined by <-2 Z-scores (-2 standard deviations) of the mean weight for age in months and gender. This also includes any children recorded as having kwashiorkor or marasmus.

**Premature is defined as born before 37 completed weeks of gestation.

***Underlying illness included any of the following: asthma, other chronic lung diseases, chronic heart disease (valvular heart disease, coronary heart disease, or heart failure excluding hypertension), stroke, seizures, liver disease (cirrhosis or liver failure), renal disease (nephrotic syndrome or chronic renal failure), immunocompromising conditions excluding HIV infection (organ transplant, immunosuppressive therapy, immunoglobulin deficiency, malignancy, or autoimmune disease), diabetes, pregnancy, burns, obesity, or neurological disease (spinal cord injury or neuromuscular conditions).

****Non-Black races include Coloured, Indian, White, and other unspecified groups.

**Table 3.** Demographic and clinical characteristics of patients aged ≥15 years enrolled and tested in the Influenza-like Illness – Public Health Clinics (ILI-PHC) surveillance programme overall, and testing positive for influenza, respiratory syncytial virus (RSV), *Bordetella pertussis,* and SARS-CoV-2,South Africa, 2023.

| | **Overall n/N (%) N=908** | **Influenza n/N (%) N=90** | **RSV n/N (%) N=13** | ***B. pertussis* n/N (%) N=18** | **SARS-CoV-2 n/N (%) N=50** |
|---|---|---|---|---|---|
| **Age group (years)** | | | | | |
| 15–24 | 196/908 (21.6) | 38/90 (42.2) | 5/13 (38.5) | 5/18 (27.8) | 8/50 (16.0) |
| 25–44 | 406/908 (44.7) | 28/90 (31.1) | 7/13 (53.9) | 8/18 (44.4) | 18/50 (36.0) |
| 45–64 | 235/908 (25.9) | 16/90 (17.8) | 1/13 (7.7) | 5/18 (27.8) | 18/50 (36.0) |
| ≥65 | 71/908 (7.8) | 8/90 (8.9) | 0/13 (0.0) | 0/18 (0.0) | 6/50 (12.0) |
| **Sex** | | | | | |
| Female | 529/905 (58.5) | 55/90 (61.1) | 8/13 (61.5) | 10/18 (55.6) | 29/50 (58.0) |
| **Race** | | | | | |
| Black** | 724/876 (82.7) | 73/83 (88.0) | 8/9 (88.9) | 16/18 (89.0) | 46/50 (92.0) |
| **Province** | | | | | |
| Mpumalanga | 146/908 (16.1) | 18/90 (20.0) | 0/13 (0.0) | 2/18 (11.1) | 15/50 (30.0) |
| North West | 230/908 (25.3) | 26/90 (28.9) | 5/13 (38.5) | 13/18 (72.2) | 13/50 (26.0) |
| KwaZulu-Natal | 373/908 (41.1) | 37/90 (41.1) | 7/13 (53.7) | 3/18 (16.7) | 19/50 (38.0) |
| Western Cape | 159/908 (17.5) | 9/90 (10.0) | 1/13 (7.7) | 0/18 (0.0) | 3/50 (6.0) |
| Living with HIV | 197/838 (23.5) | 16/81 (19.8) | 3/7 (42.9) | 3/16 (18.8) | 12/50 (24.0) |
| Underlying illness* | 123/908 (13.6) | 8/90 (8.9) | 3/13 (23.1) | 2/18 (11.1) | 11/50 (22.0) |

*Underlying illness included any of the following: asthma, other chronic lung diseases, chronic heart disease (valvular heart disease, coronary heart disease, or heart failure excluding hypertension), stroke, seizures, liver disease (cirrhosis or liver failure), renal disease (nephrotic syndrome or chronic renal failure), immunocompromising conditions excluding HIV infection (organ transplant, immunosuppressive therapy, immunoglobulin deficiency, malignancy, or autoimmune disease), diabetes, pregnancy, burns, obesity, or neurological disease (spinal cord injury or neuromuscular conditions).

** Non-Black races include Coloured, Indian, White, and other unspecified groups.

**Table 4.** Demographic and clinical characteristics of patients aged <15 years enrolled and tested in the hospital-based Pneumonia Surveillance Programme (PSP) overall and testing positive for influenza, respiratory syncytial virus (RSV), *Bordetella pertussis,* and SARS-CoV-2,South Africa, 2023.

| | **Overall n/N (%) N=3029** | **Influenza n/N (%) N=133** | **RSV n/N (%) N=658** | ***B. pertussis* n/N (%) N=115** | **SARS-CoV-2 n/N (%) N=94** |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| 0–2 months | 941/3 029 (31.1) | 12/133 (9.0) | 271/658 (41.2) | 80/115 (69.6) | 34/94 (36.2) |
| 3–5 months | 418/3 029 (13.8) | 13/133 (9.8) | 132/658 (20.1) | 5/115 (4.4) | 21/94 (22.3) |
| 6–11 months | 490/3 029 (16.2) | 30/133 (22.6) | 120/658 (18.2) | 11/115 (9.6) | 21/94 (22.3) |
| 12–23 months | 494/3 029 (16.3) | 35/133 (26.3) | 80/658 (12.2) | 9/115 (7.8) | 11/94 (11.7) |
| 2–<5 years | 475/3 029 (15.7) | 34/133 (25.6) | 45/658 (6.8) | 7/115 (6.1) | 2/94 (2.1) |
| ≥5–14 years | 211/3 029 (7.0) | 9/133 (6.8) | 10/658 (1.5) | 3/115 (2.6) | 5/94 (5.3) |
| **Sex** | | | | | |
| Female | 1 268/3 026 (41.9) | 40/133 (30.1) | 297/657 (45.2) | 64/115 (55.7) | 41/94 (43.6) |
| **Race** | | | | | |
| Black**** | 2 252/3 016 (74.7) | 103/133 (77.4) | 492/657 (74.9) | 90/115 (78.3) | 68/94 (72.3) |
| **Province** | | | | | |
| Gauteng | 730/3 029 (24.1) | 44/133 (33.1) | 175/658 (26.6) | 36/115 (31.3) | 20/94 (21.3) |
| Mpumalanga | 347/3 029 (11.5) | 14/133 (10.5) | 44/658 (6.7) | 22/115 (19.1) | 14/94 (14.9) |
| North West | 247/3 029 (8.2) | 13/133 (9.7) | 46/658 (7.0) | 20/115 (17.4) | 7/94 (7.5) |
| KwaZulu-Natal | 449/3 029 (14.8) | 26/133 (19.6) | 115/658 (17.5) | 18/115 (15.7) | 9/94 (9.6) |
| Western Cape | 1 256/3 029 (41.5) | 36/133 (27.1) | 278/658 (42.3) | 19/115 (16.5) | 44/94 (46.8) |
| Symptom duration (≤10 days) | 2 920/3 028 (96.4) | 128/133 (96.3) | 649/658 (98.6) | 105/115 (91.3) | 92/94 (97.9) |
| Living with HIV | 59/2 971 (2.0) | 4/129 (3.1) | 4/644 (0.6) | 1/94 (0.9) | 4/92 (4.4) |
| Malnutrition* | 51/2 981 (1.7) | 4/130 (3.1) | 4/644 (0.6) | 3/114 (2.6) | 4/94 (4.3) |
| Premature** | 270/2 981 (9.1) | 9/130 (6.9) | 59/644 (9.2) | 9/114 (7.9) | 17/94 (18.1) |
| Underlying illness*** | 188/3 029 (6.2) | 10/133 (7.5) | 25/658 (3.8) | 2/115 (1.7) | 6/94 (6.4) |
| Hospital duration (≤5 days) | 2 199/2 896 (75.9) | 95/128 (74.2) | 457/618 (74.0) | 55/108 (50.9) | 69/92 (75.0) |
| ICU admission | 33/2 550 (1.3) | 0/127 (0.0) | 10/627 (1.6) | 3/98 (3.1) | 2/77 (2.6) |
| In-hospital mortality | 28/3 029 (0.9) | 0/133 (0.0) | 3/658 (0.5) | 4/115 (3.5) | 1/94 (1.1) |

*Malnutrition defined by <-2 Z-scores (-2 standard deviations) of the mean weight for age in months and gender. This also includes any children recorded as having kwashiorkor or marasmus.

**Premature is defined as born before 37 completed weeks of gestation.

***Underlying illness included any of the following: asthma, other chronic lung diseases, chronic heart disease (valvular heart disease, coronary heart disease, or heart failure excluding hypertension), stroke, seizures, liver disease (cirrhosis or liver failure), renal disease (nephrotic syndrome or chronic renal failure), immunocompromising conditions excluding HIV infection (organ transplant, immunosuppressive therapy, immunoglobulin deficiency, malignancy, or autoimmune disease), diabetes, pregnancy, burns, obesity, or neurological disease (spinal cord injury or neuromuscular conditions).

****Non-Black races include Coloured, Indian, White, and other unspecified groups.

**Table 5.** Demographic and clinical characteristics of patients aged ≥15 years enrolled and tested in the hospital-based Pneumonia Surveillance Programme (PSP) overall and testing positive for influenza, respiratory syncytial virus (RSV), *Bordetella pertussis,* and SARS-CoV-2,South Africa, 2023.

| | **Overall n/N (%) N=4350** | **Influenza n/N (%) N=237** | **RSV n/N (%) N=44** | ***B. pertussis* n/N (%) N=61** | **SARS-CoV-2 n/N (%) N=181** |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| 15–24 | 238/4 350 (5.5) | 19/237 (8.0) | 2/44 (4.6) | 4/61 (6.6) | 14/181 (7.7) |
| 25–44 | 1 695/4 350 (39.0) | 79/237 (33.3) | 13/44 (30.0) | 36/61 (59.0) | 66/181 (36.5) |
| 45–64 | 1 530/4 350 (35.2) | 78/237 (32.9) | 20/44 (45.5) | 12/61 (19.7) | 57/181 (31.5) |
| ≥65 | 887/4 350 (20.4) | 61/237 (25.7) | 9/44 (20.5) | 9/61 (14.8) | 44/181 (24.3) |
| **Sex** | | | | | |
| Female | 2 126/4 348 (48.9) | 125/237 (52.7) | 23/44 (52.3) | 27/61 (44.3) | 91/181 (50.3) |
| **Race** | | | | | |
| Black** | 3 442/4 327 (79.6) | 184/236 (78.0) | 31/43 (72.09) | 54/60 (90.0) | 137/179 (76.5) |
| **Province** | | | | | |
| Gauteng | 1 818/4 350 (41.8) | 99/237 (41.8) | 18/44 (40.9) | 30/61 (49.2) | 76/181 (42.0) |
| Mpumalanga | 4 44/4 350 (10.2) | 22/237 (9.3) | 7/44 (15.9) | 6/61 (9.8) | 22/181 (12.2) |
| North West | 293/4 350 (6.7) | 34/237 (14.4) | 3/44 (6.8) | 10/61 (13.6) | 9/181 (5.0) |
| KwaZulu-Natal | 278/4 350 (6.4) | 7/237 (3.0) | 0/44 (0.0) | 1/61 (1.6) | 9/181 (5.0) |
| Eastern Cape | 615/4 350 (14.1) | 22/237 (9.3) | 6/44 (13.6) | 7/61 (11.5) | 25/181 (13.8) |
| Western Cape | 902/4 350 (20.7) | 53/237 (22.4) | 10/44 (22.7) | 7/61 (11.5) | 40/181 (22.1) |
| Symptom duration (≤10 days) | 2 815/4 349 (64.7) | 178/237 (75.1) | 32/44 (72.7) | 31/61 (50.8) | 119/181 (65.8) |
| Living with HIV | 1 880/4 083 (46.0) | 87/219 (39.7) | 14/40 (35.0) | 35/58 (60.3) | 92/175 (52.6) |
| Underlying illness* | 1 449/4 350 (33.3) | 85/237 (35.9) | 14/44 (31.8) | 15/61 (24.6) | 54/181 (29.8) |
| Hospital duration (≤5 days) | 1 457/4 075 (35.8) | 82/202 (40.6) | 17/40 (42.5) | 21/59 (35.6) | 56/173 (32.4) |
| ICU admission | 20/2902 (0.7) | 3/212 (1.4) | 1/36 (2.8) | 1/51 (2.0) | 1/123 (0.8) |
| In-hospital mortality | 449/4 350 (10.3) | 9/237 (3.8) | 3/44 (6.8) | 9/61 (14.8) | 15/181 (8.3) |

*Underlying illness included any of the following: asthma, other chronic lung diseases, chronic heart disease (valvular heart disease, coronary heart disease, or heart failure excluding hypertension), stroke, seizures, liver disease (cirrhosis or liver failure), renal disease (nephrotic syndrome or chronic renal failure), immunocompromising conditions excluding HIV infection (organ transplant,

immunosuppressive therapy, immunoglobulin deficiency, malignancy, or autoimmune disease), diabetes, pregnancy, burns, obesity, or neurological disease (spinal cord injury or neuromuscular conditions).

**Non-Black races include Coloured, Indian, White and other unspecified groups.

# Discussion

The 2023 influenza season in South Africa showed a pre-pandemic pattern characterised by a bi-phasic peak. Following low influenza circulation in 2020 and the out-of-season increase in influenza circulation during 2021, 2022 was the first year in which the season returned to the pre-pandemic pattern, including the bi-phasic peak. This trend persisted in 2023, with the season beginning in week 17 (starting 24 April) and ending in week 27 (starting 10 July). The beginning of the 2023 season was dominated by influenza A(H3N2), whereas influenza B/Victoria was most commonly detected towards the end of the season. Transmission was at a high level, and the impact of the influenza season/epidemic on the healthcare system and socioeconomic structures was moderate. The high transmission may possibly be related to a residual immunity gap to the influenza A(H3N2) subtype, as this was the first year in which this subtype predominated following the SARS-CoV-2 pandemic. Similar trends have been observed in surveillance systems across Europe, Australia, and New Zealand, where influenza type A predominated.[8,9] In contrast, Chile reported continued circulation of influenza B/Victoria, with positivity remaining above the seasonal threshold, albeit at low levels.[9,10]

Similar to 2022, RSV circulated throughout 2023, with the seasonal peak in autumn preceding the influenza season and reaching moderate to high levels from week 09 to week 17. This reflects the continued return to typical RSV circulation patterns following the disruptions seen during the SARS-CoV-2 pandemic in 2020–2021, consistent with trends observed in other Northern and Southern Hemisphere countries.[4,11] The highest number of cases was observed in children under one year of age, particularly in the PSP, where the detection rate was 41.2% in children younger than two months of age (271/658). RSV subgroup A (74.1%, 520/702) predominated. Given this substantial burden in young infants, inclusion of the recently approved maternal RSV immunisation as part of the immunisation programme in South Africa should be prioritised to help prevent severe disease in this high-risk group, as clinical trials and World Health Organization/ United States Centers for Disease Control and Prevention guidance have demonstrated reductions in infant hospitalisations of 50–80% in the first 3–6 months of life.[12]

According to data from the Notifiable Medical Conditions (NMC) system, South Africa experienced a marked resurgence of *B. pertussis* between 2022 and 2023. In 2022, cases began rising in May, followed by a sharp increase from July, with 147 cases reported by mid-September. Forty-two per cent of these cases occurred in the WC, and 77% were among children under five years of age, particularly infants younger than three months.[13] Following the increase in *B. pertussis* reported in ILI-PHC from July 2022, detection rate data from the ILI-PHC (36/1,826; 2.0%) and PSP (176/7,408; 2.4%) surveillance platforms in 2023 showed sustained *B. pertussis* activity throughout the year. The highest numbers of cases were observed in January, March, and May, reflecting ongoing circulation across multiple surveillance systems. Pertussis cases during 2022–2023 were substantially higher than in 2021, underscoring the ongoing need for high vaccination coverage and robust surveillance systems to monitor and control outbreaks effectively. Among children aged <15 years, infants aged 0–2 months made up 69.6% of all diagnosed cases. The introduction of maternal pertussis vaccination into South Africa's

national immunisation schedule in 2024 is an important intervention, with the potential to substantially reduce severe disease and hospitalisations, particularly among infants aged 0–2 months who are too young to be vaccinated themselves.[14]

Consistently low levels of SARS-CoV-2 without a distinctive seasonality were observed throughout the year, similar to what was documented in a study published in the WC.[15] This pattern has also been reported internationally, including in studies from the United Kingdom, the United States, and Australia, where sporadic SARS-CoV-2 circulation persisted outside of typical respiratory virus seasons.[16–18] Ongoing surveillance is essential to determine whether SARS-CoV-2 will adopt a seasonal pattern as it transitions to an endemic phase, as well as to monitor viral evolution and emerging variants. Additionally, further research is needed to quantify the burden of SARS-CoV-2 in an endemic setting, providing critical insights for guiding appropriate public health interventions and preventive measures.

## Conclusion

Systematic syndromic surveillance was useful in describing the sustained return of the influenza and RSV seasons to typical pre-COVID-19 pandemic patterns. These important surveillance programmes also identified a pertussis outbreak following low levels of circulation during the COVID-19 pandemic and describe the circulation of SARS-CoV-2, including emerging variants.

In conclusion, in 2023, influenza remained the most frequently detected respiratory pathogen among adults presenting with ILI or hospitalised with lower respiratory tract infection, whereas RSV was the predominant pathogen in children, particularly in those hospitalised with pneumonia. The highest burden was observed in infants under six months of age, highlighting a critical target population for preventive interventions, including the recently approved maternal RSV immunisation. These findings underscore the continuing impact of RSV on young children and the importance of age-targeted strategies for respiratory pathogen prevention in South Africa.

## Recommendations

- Considering that influenza and RSV seasons have returned to typical pre-pandemic patterns, influenza vaccination among risk groups is strongly recommended to protect against infection and severe illness. Ideally, the influenza vaccine should be administered prior to the start of the influenza season, although it may also be beneficial if administered after influenza circulation has started. Individuals at risk for severe influenza illness are strongly encouraged to vaccinate, either at a public health clinic or privately through general practitioners and pharmacies. High-risk groups include pregnant women and women during the

six-week postpartum period, individuals living with HIV, those with chronic conditions such as diabetes, lung disease, tuberculosis, heart disease, renal disease and obesity, older individuals (aged ≥65 years), and healthcare workers.

- To minimise the transmission of seasonal influenza and RSV, non-pharmaceutical interventions recommended during the COVID-19 pandemic (social distancing and staying home when ill, wearing of masks, and handwashing/sanitising) can be utilised by persons experiencing respiratory symptoms and during periods of high virus circulation, especially when in contact with individuals at risk of severe respiratory disease.
- Policymakers should implement RSV prevention strategies for infants – including maternal immunisation and a single dose of long-acting monoclonal antibodies – as part of the standard of care.
- To reduce the burden of pertussis, it is crucial to enhance routine immunisation coverage and introduce maternal immunisation strategies. Strengthening the Expanded Programme on Immunisation (EPI) will ensure high uptake of the pertussis-containing vaccine (DTaP) in infants and young children, while catch-up campaigns can address missed vaccinations due to pandemic-related disruptions. Additionally, vaccinating pregnant women with Tdap during the second or third trimester (27–36 weeks) will provide passive immunity to newborns, who are at the highest risk of severe disease.[19]
- Syndromic respiratory illness surveillance should be sustained (and expanded, should resources become available) to allow ongoing systematic monitoring of disease trends, circulating strains, impact of intervention(s), identification of outbreaks, and risk factors for severe illness due to respiratory pathogens. Weekly and annual reports can help inform policymakers (such as the National Department of Health or the World Health Organization) in decision-making. This is especially important as new vaccines to prevent RSV become available and as maternal pertussis vaccination is included in the vaccination programme in South Africa.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### Laboratory team

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## Conflicts of interest

The authors report no conflict of interest, other than the source of funding noted above.

## Ethics clearance/considerations

The severe acute respiratory infection (SARI) and SRI protocols were approved by the University of the Witwatersrand Human Research Ethics Committee (HREC) and the University of KwaZulu-Natal Human Biomedical Research Ethics Committee (BREC), protocol numbers M081042 and BF157/08, respectively. The ILI protocol was approved by HREC and BREC protocol numbers M120133 and BF080/12, respectively. Ethical approval for ILI-VW was obtained from the University of the Witwatersrand Research Ethics Committee. This surveillance was deemed non-research by the US CDC. All participants in the surveillance programmes gave written informed consent to participate. Patient information was anonymised and de-identified prior to analysis.

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