

CORONAVIRUS DISEASE (COVID-19) PANDEMIC

Proposed definition of COVID-19 wave in South Africa

South Africa reported its first case of COVID-19 on 5 March 2020, and as of 20 November 2021, the country had reported 2 929 862 cases including 94 471 deaths.

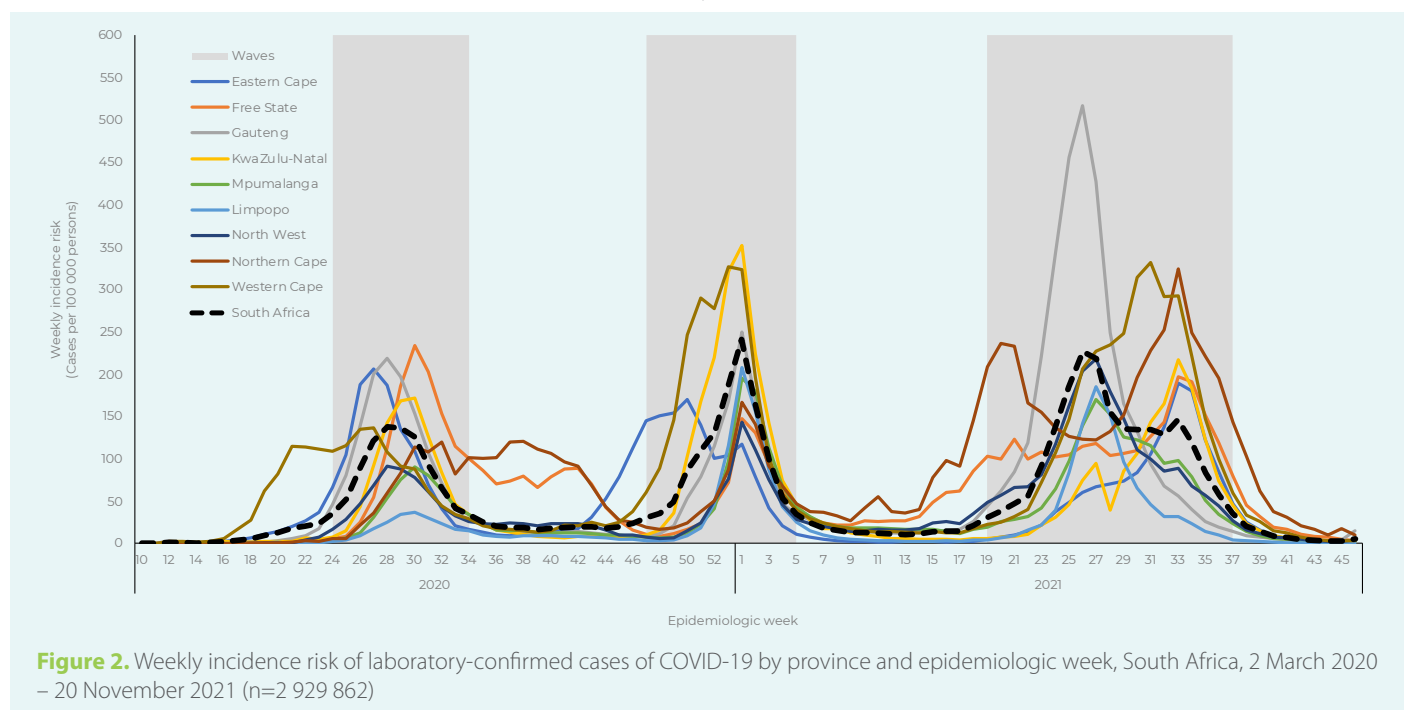
To date, there have been three periods of increased transmission (waves). There have been several different definitions proposed for the start of a COVID-19 wave in South Africa, which may cause inconsistencies amongst researchers or policy makers. A clear simple working definition for retrospective analyses describing wave characteristics can be very helpful for researchers to communicate consistent messages about COVID-19. The aim of this article is to propose a simple working definition for a COVID-19 wave (upward and downward periods) in South Africa for use in retrospective analyses of wave characteristics. We do not propose that this wave definition be used prospectively to define the start of a new wave or to guide any public health action.

Some different wave definitions that have been used are described here. Based on the South African resurgence plan, a wave can be defined as the period from when COVID-19 weekly incidence is equal to or greater than 30 cases per 100 000 persons until the weekly incidence is equal to or below 30 cases per 100 000 persons (resurgence plan not published). A similar definition was used to describe a COVID-19 wave among hospitalized cases;¹ however, they used a weekly incidence of 5 cases per 100 000 persons (upward and downward trends) as a cutoff, probably because they were looking at a subset of COVID-19 cases (admissions only) in whom the rate is lower. This definition correlated well with the case-based rate definition. The South African Ministerial Advisory Committee on COVID-19 proposed the following definition: a wave starts when cases

reach 30% of the previous wave's peak, and ends when cases reach 15% of the peak (in the ending wave/ downward trend) (<https://sacoronavirus.co.za/wp-content/uploads/2020/12/Secondwave-Appendix.pdf>).

We would like to propose that for retrospective analyses describing wave characteristics the following definition could be used - a wave can be defined as the period from when COVID-19 weekly incidence is equal to or greater than 30 cases per 100 000 persons until the weekly incidence equal or below 30 cases per 100 000 persons. The reason we are proposing the above definition is that it is not computationally difficult, can be applied to different geographic areas and time scales and can be easily estimated using available data on case counts. The incidence should be determined by dividing the number of new cases (weekly) by population at risk (mid-year population estimates-2020) per 100 000 persons. Epidemiologic weeks should be computed using USA Centre for Disease Control (CDC) epidemiologic week definition (Sunday-Saturday). A limitation of the proposed definition is that it is dependent on testing volumes remaining at a constant level. For this reason we do not propose using this measure for potential future waves pending evaluation of its performance as compared to other metrics.

Using the above proposed COVID-19 wave definition in South Africa, the first wave was from week 24 of 2020 (35.7 cases per 100 000 persons) to week 34 of 2020 (<30 cases per 100 000 persons), second wave from week 47 of 2020 (30.2 cases per 100 000 persons) to week 5 of 2021 (<30 cases per 100 000 persons), and third wave from week 19 of 2021 (30.9 cases per 100 000 persons) to week 37 of 2021 (<30 cases per 100 000 persons), see Figure 2.



CORONAVIRUS DISEASE (COVID-19) PANDEMIC

The provinces experienced the beginning and ending of the waves at different weeks (periods). The first province to enter first wave was the Western Cape in week 19 of 2020 (61.8 cases per 100 000 persons), and Limpopo was the last to enter first wave in week 29 of 2020 (34.1 cases per 100 000 persons), and first to exit first wave in week 31 of 2020 (30.1 cases per 100 000 persons), and the last provinces to exit first wave were Free State and Northern Cape in week 44 of 2020 (43.1 cases per 100 000 persons) and (43.7 cases per 100 000 persons), respectively, table 1.

In the second wave Eastern Cape was the first province to enter the second wave in week 43 of 2020 (31.1 cases per

100 000 persons), and Northern Cape was the last province to exit second wave in week 8 of 2021 (32.6 cases per 100 000 persons). In the third wave, Northern Cape was the first and last province to enter and exit the third wave in week 10 of 2021 (42.1 cases per 100 000 persons) and week 41 of 2021 (30.9 cases per 100 000 persons), respectively.

To date the province that has experienced the shortest wave was Limpopo in the first wave $n=3$ weeks (weeks 29-31 of 2020), and the province that experienced the longest wave was Northern Cape in the third wave $n=32$ weeks (weeks 10-41 of 2021).

Table 1: COVID-19 wave periods by weekly incidence, South Africa, 2 March 2020 – 20 November 2021

Province	First wave		Second wave		Third wave	
	Week ¹ number (year 2020)	Weekly incidence (100 000 persons)	week number (year 2020-2021)	Weekly incidence (100 000 persons)	week number (year 2021)	Weekly incidence (100 000 persons) 6 734 001
Eastern Cape	23-32	37.0 - 40.7	43 - 3	31.1-41.5	24-37	37.3-46.5
Free State	27-44	54.6-43.1	52 - 6	45.0-31.2	14-39	32.0-31.8
Gauteng	24-34	45.8-34.1	50 - 5	53.5-35.2	19-34	44.4-40.4
KwaZulu-Natal	26-34	43.5-34.2	49 - 5	36.2-45.6	24-37	31.1-44.9
Limpopo	29-31	34.1-30.1	52 - 4	47.0-43.6	24-33	39.3-31.6
Mpumalanga	27-34	30.6-34.0	52 - 6	41.0-32.2	22-36	31.9-34.6
North West	26-33	46.9-32.4	53 - 4	49.9-46.0	18-36	34.9-44.3
Northern Cape	27-44	35.9-43.7	51 - 8	37.8-32.6	10-41	42.1-30.9
Western Cape	19-33	61.8-34.5	46 - 5	37.4-39.0	21-38	31.5-33.1
South Africa	24-34	35.7-33.9	47-5	30.2-34.3	19-37	30.9-35.7

Epidemiologic weeks constructs using America's Centre for Disease Control week definition (Sunday-Saturday)

In summary, the proposed COVID-19 wave definition will aid researchers and policy makers to communicate consistent messages re-COVID-19 waves. As demonstrated by provinces

as they entered and exited waves at different time periods, the definition should be applied in a specified geographic area e.g. national, province or district.

1. Jassat W, Mudara C, Ozougwu L, Tempia S, Blumberg L, Davies M-A, et al. Difference in mortality among individuals admitted to hospital with COVID-19 during the first and second waves in South Africa: A cohort study. *The Lancet. Global health.* 2021; 9(9):e1216-e25.