



Wastewater-based epidemiology for SARS-CoV-2 surveillance in South Africa

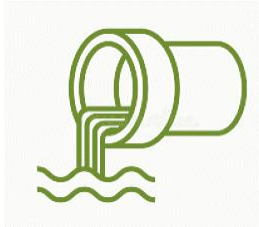
Report date: 19 November 2021

**Sample collection dates up to 16 November 2021
(epidemiological week 46)**

Centre for Vaccines and Immunology
National Institute for Communicable Diseases

Wastewater-based Epidemiology for COVID-19

Why test wastewater for SARS-CoV-2?

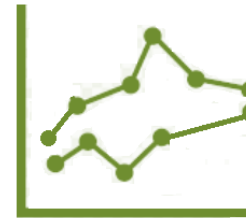


SARS-CoV-2 virus is excreted in stool by persons with active and recovering COVID-19 and can be found in wastewater

SARS-CoV-2 is not transmitted by faeco-oral route.
Wastewater with SARS-CoV-2 is **not infectious**



Levels of SARS-CoV-2 in wastewater reflect population changes in case load and geographical distribution of cases



SARS-CoV-2 can be detected in wastewater before clinical cases appear

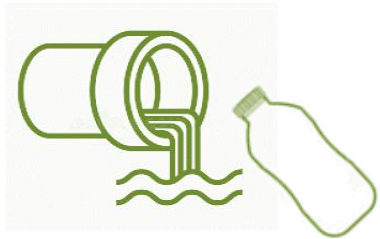
Increases in SARS-CoV-2 levels will appear before increases in clinical case load



Monitoring changes in SARS-CoV-2 levels can support public health preparedness and response activities

Wastewater-based Epidemiology for COVID-19

How is wastewater tested for SARS-CoV-2?



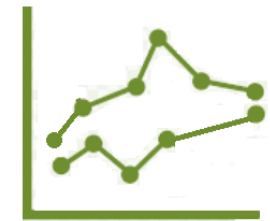
One litre of influent wastewater is collected in the morning (a 'grab' sample) and transported on ice to the lab



The one litre sample is concentrated



Viral RNA is extracted and PCR for SARS-CoV-2 is done



Results are visualised in a graph

SARS-CoV-2 is not transmitted by faeco-oral route.
Wastewater with SARS-CoV-2 is not infectious

Wastewater-based Epidemiology for COVID-19

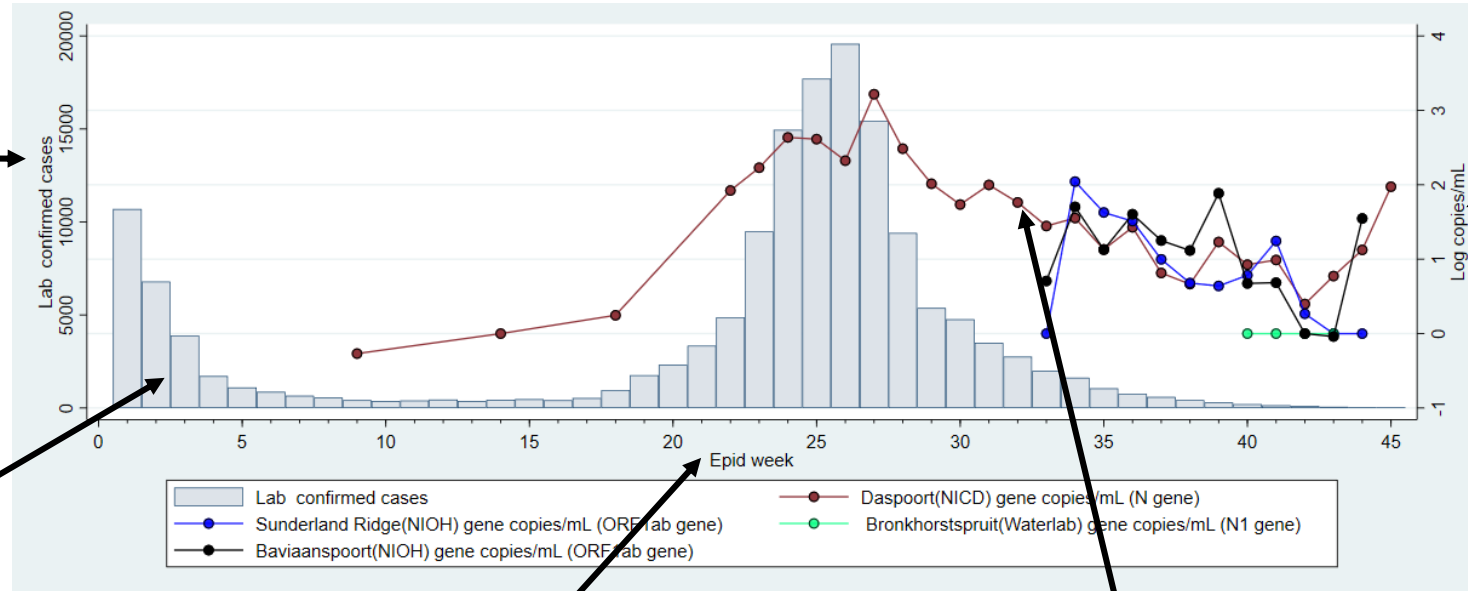
What does wastewater testing for SARS-CoV-2 mean?

Left vertical axis:

Number of lab confirmed cases in *the metro or district where the water treatment plant is located*

Bars:

Number of lab confirmed clinical cases in specimens submitted to NICD from persons in the metro/subdistrict where the plant is located



Right vertical axis:

Log (ie 10 to the power x) copies of SARS-CoV-2 genome per ml of wastewater. So $\log 2 = 10^2 = 100$ copies per millilitre, $\log 3 = 10^3 = 1000$ copies per millilitre

Horizontal axis:

Epidemiological weeks

Coloured lines:

Changes in wastewater SARS-CoV-2 results over time for different treatment facilities

Wastewater-based Epidemiology for COVID-19

How can we use wastewater testing for strengthening public health responses



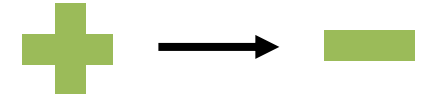
- What should we do if levels go from **negative** to **positive**?
 - Inform public
 - Strengthen health promotion messages regarding NPIs and vaccination
 - Strengthen testing in affected areas



- What should we do if levels are **increasing**?
 - Inform public
 - Identify where NPIs are not being adhered to and target these areas for strengthened health promotion messages regarding NPIs and vaccination
 - Strengthen testing in affected areas
 - Prepare hospitals for overflow

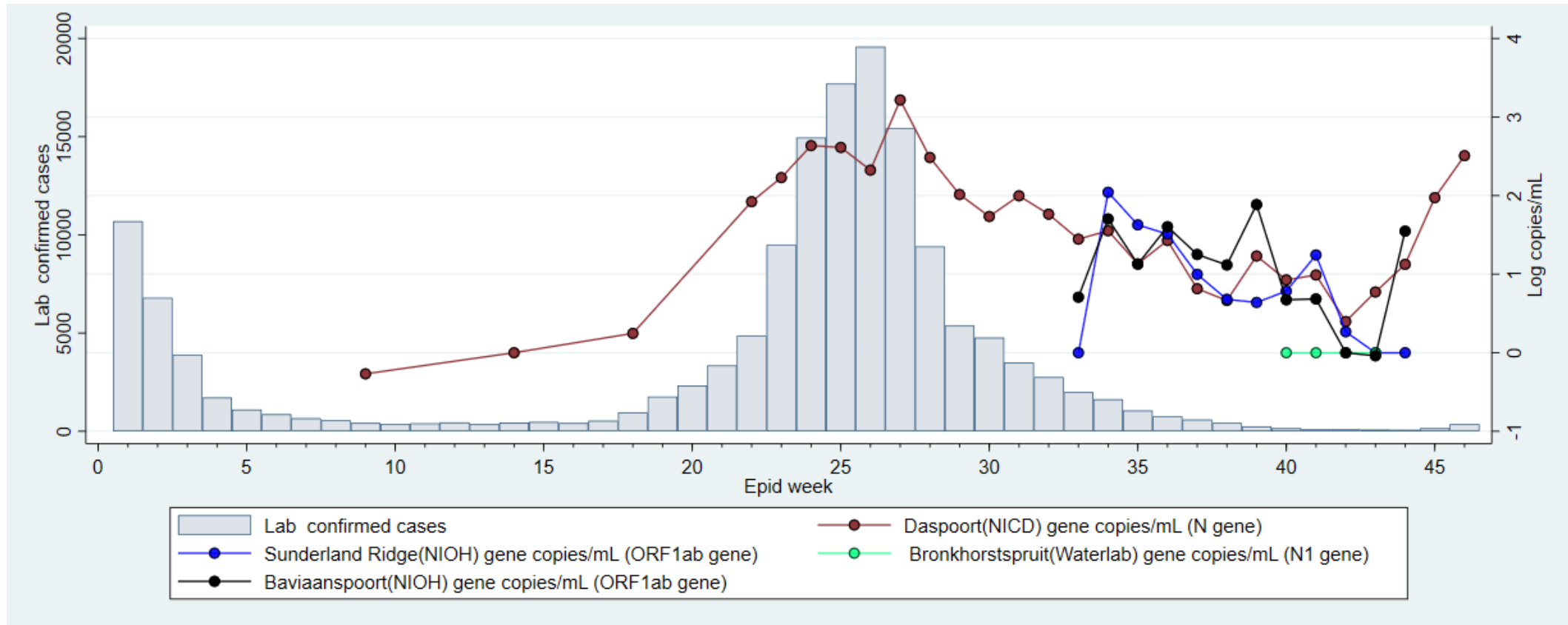


- What should we do if levels are **decreasing**?
 - Inform and congratulate public
 - Reinforce public health messaging regarding NPIs
 - Strengthen vaccination to ensure population is protected for the next wave



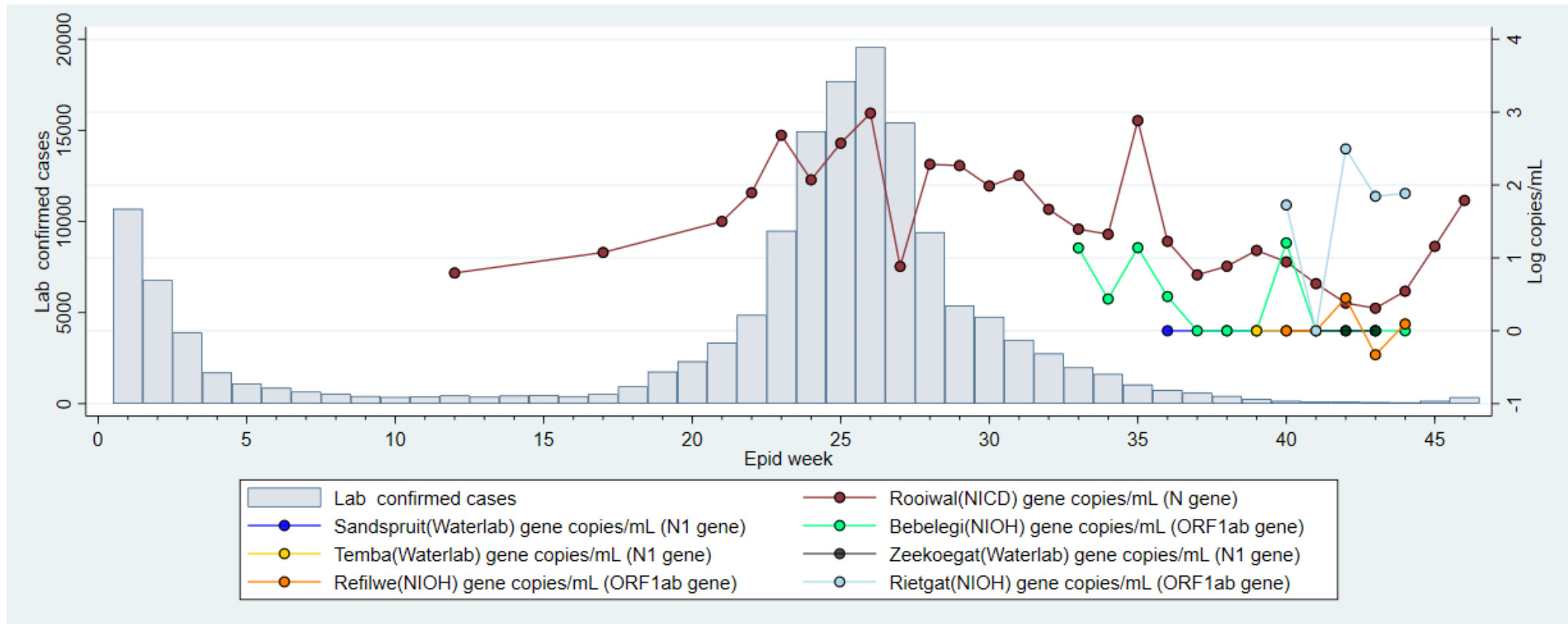
- What should we do if levels go from **positive** to **negative**?
 - Inform public
 - Redirect resources from NPIs to vaccination to ensure population is protected for the next wave

Results: Gauteng - Tshwane South



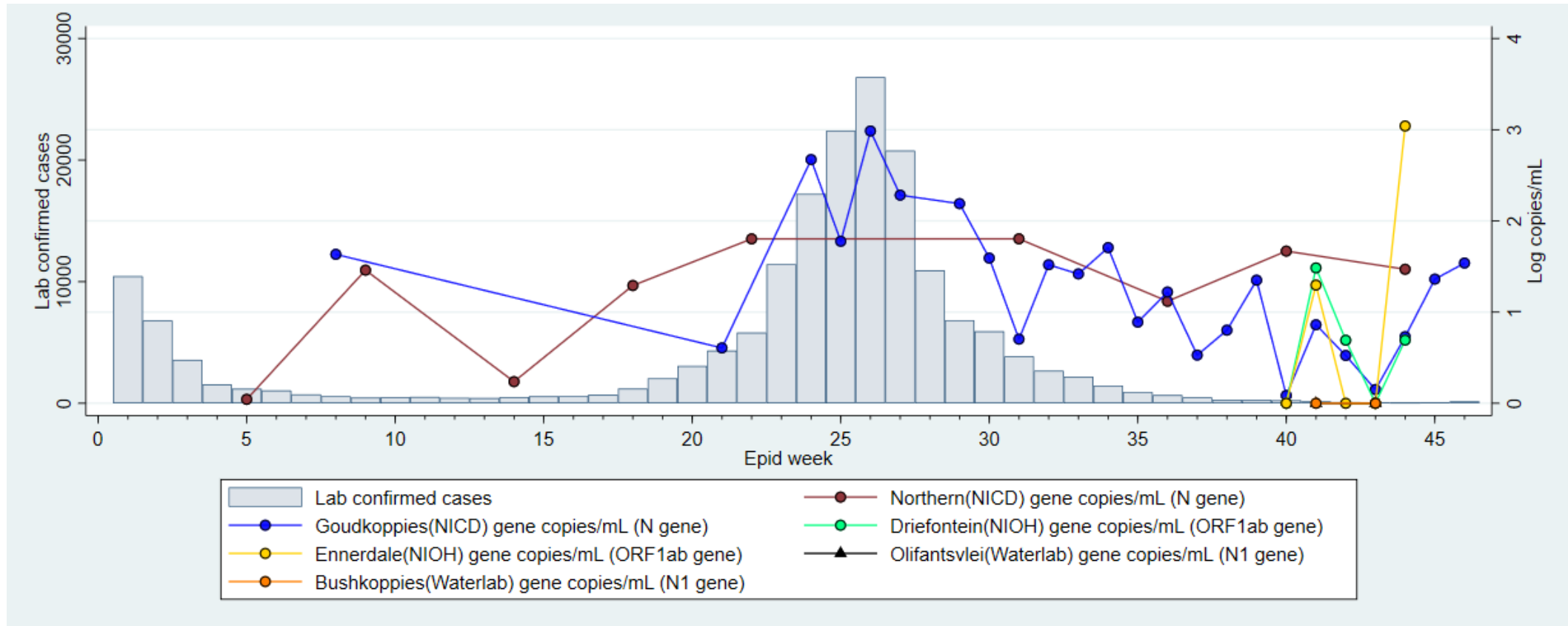
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in City of Tshwane, compared with laboratory-confirmed cases resident in City of Tshwane (grey bars), by epidemiological week, 2021.

Results: Gauteng – Tshwane North



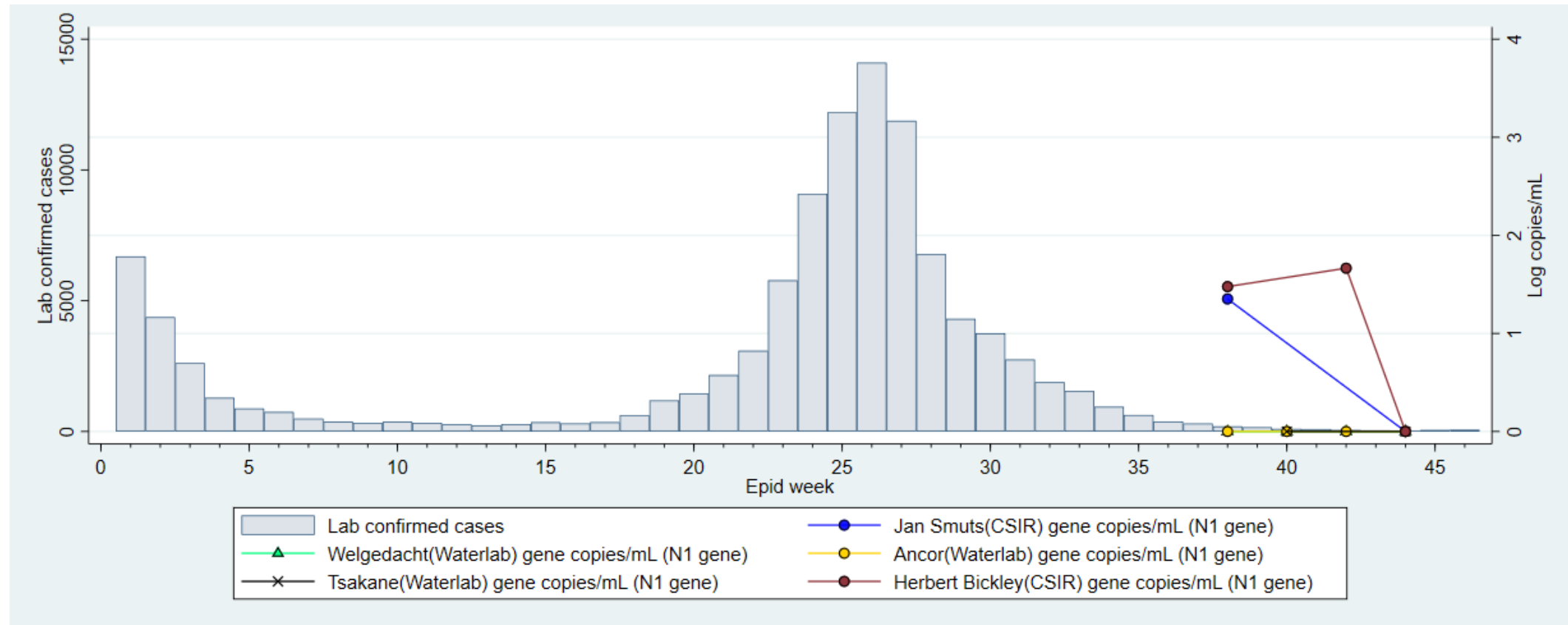
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in City of Tshwane, compared with laboratory-confirmed cases resident in City of Tshwane (grey bars), by epidemiological week, 2021

Results: Gauteng - Johannesburg



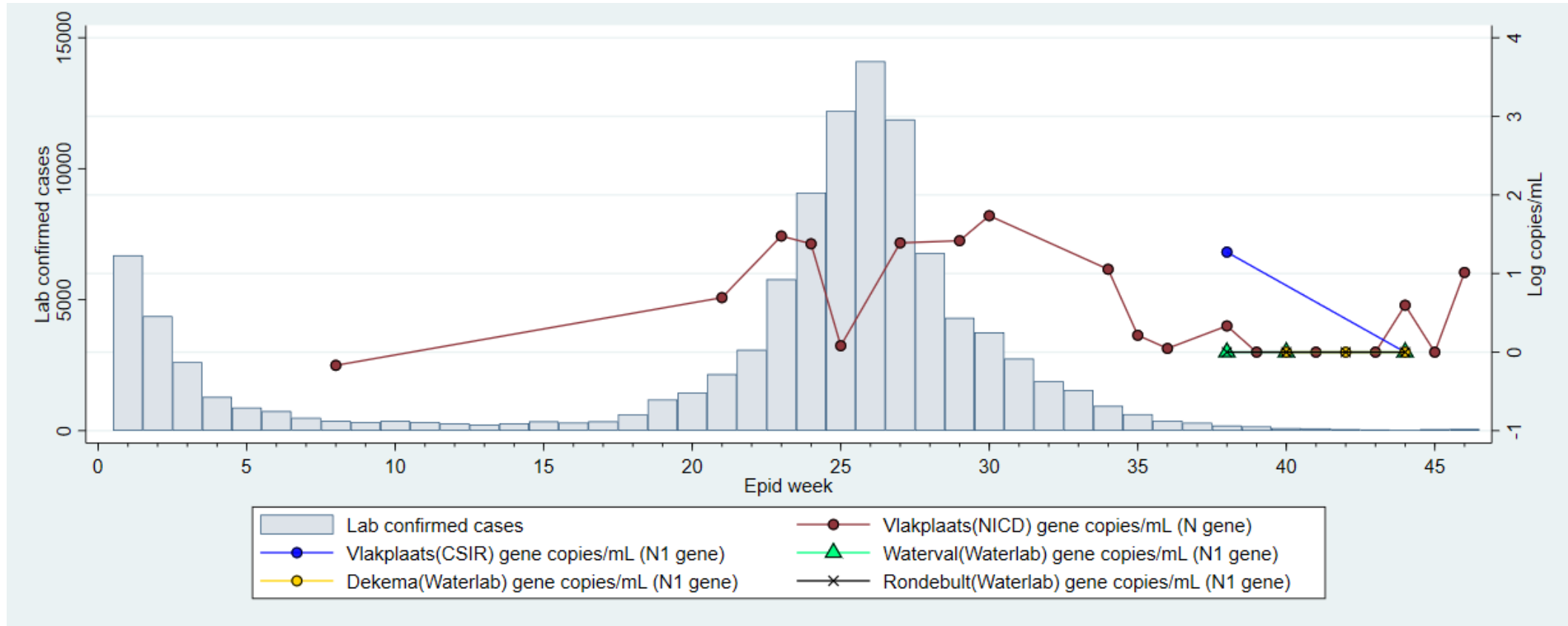
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in City of Johannesburg, compared with laboratory-confirmed cases resident in City of Johannesburg (grey bars), by epidemiological week, 2021

Results: Gauteng – Ekurhuleni East



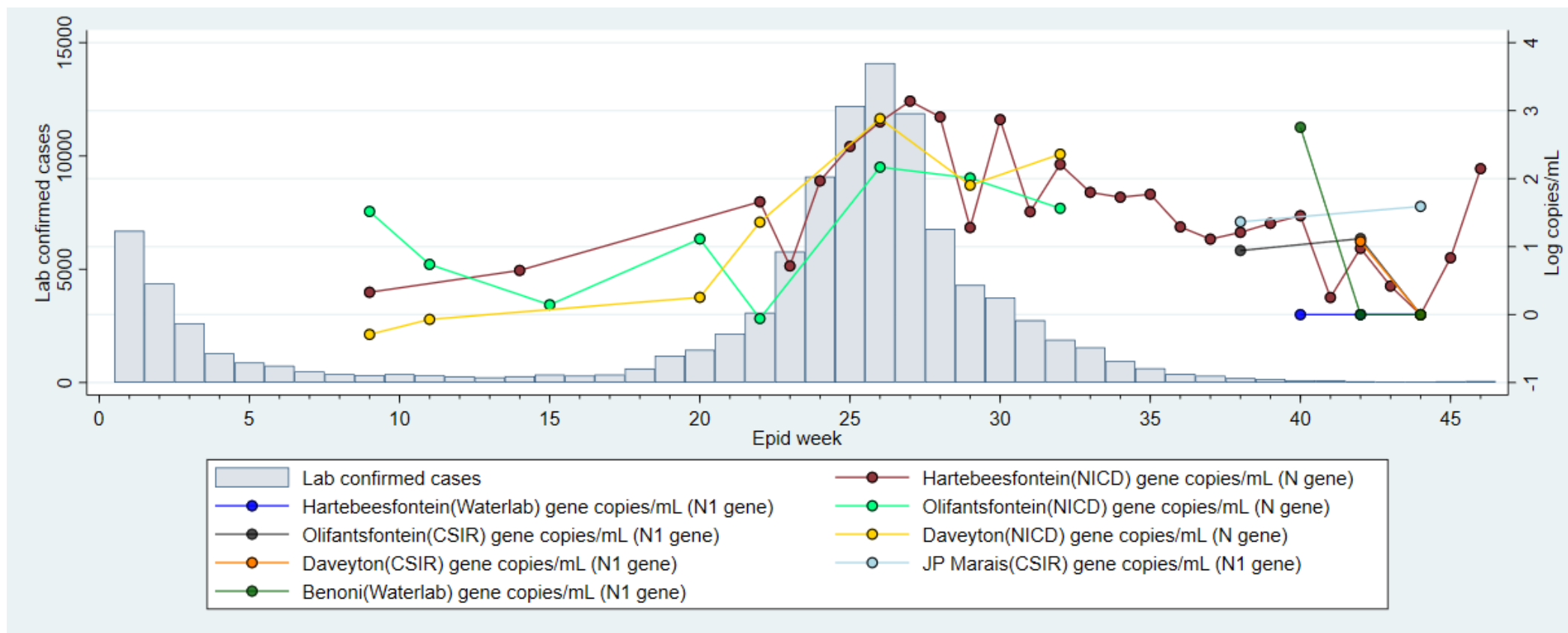
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Ekurhuleni, compared with laboratory-confirmed cases [resident in Ekurhuleni](#) (grey bars), by epidemiological week, 2021

Results: Gauteng – Ekurhuleni South



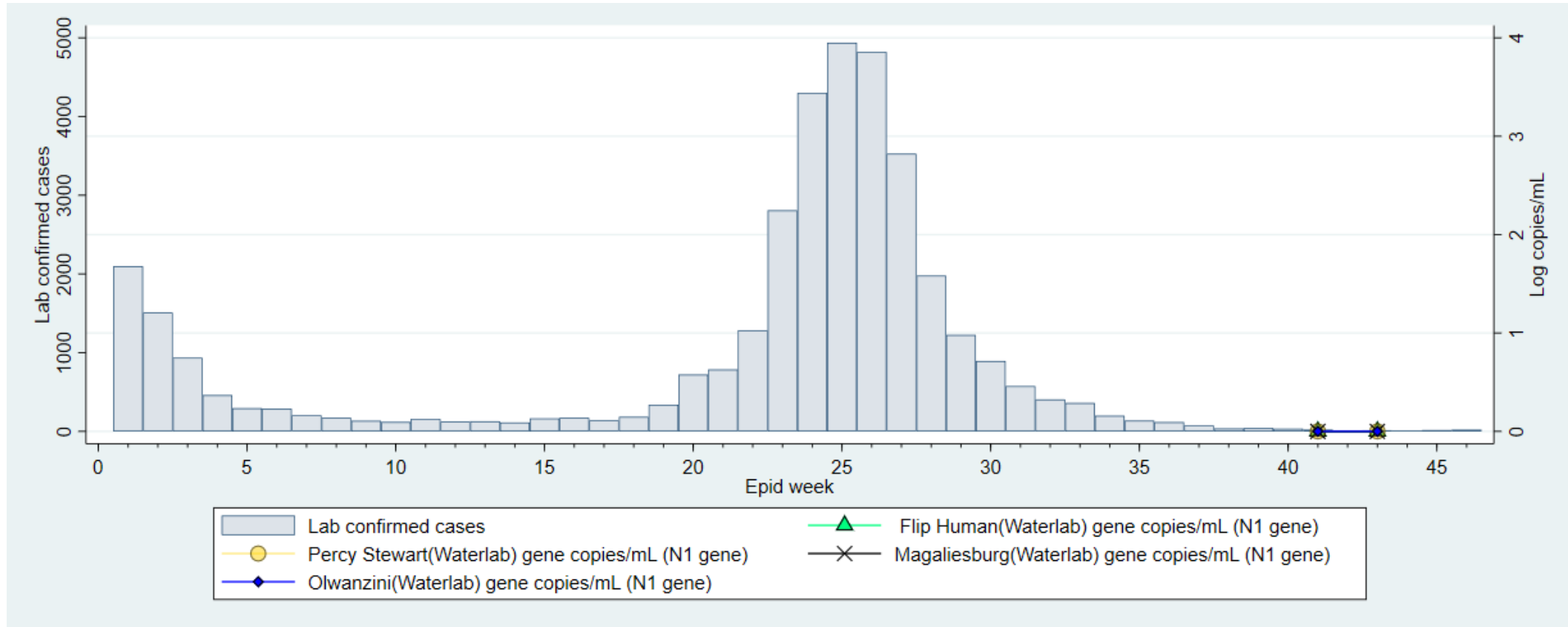
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Ekurhuleni, compared with laboratory-confirmed cases **resident in Ekurhuleni** (grey bars), by epidemiological week, 2021

Results: Gauteng – Ekurhuleni North



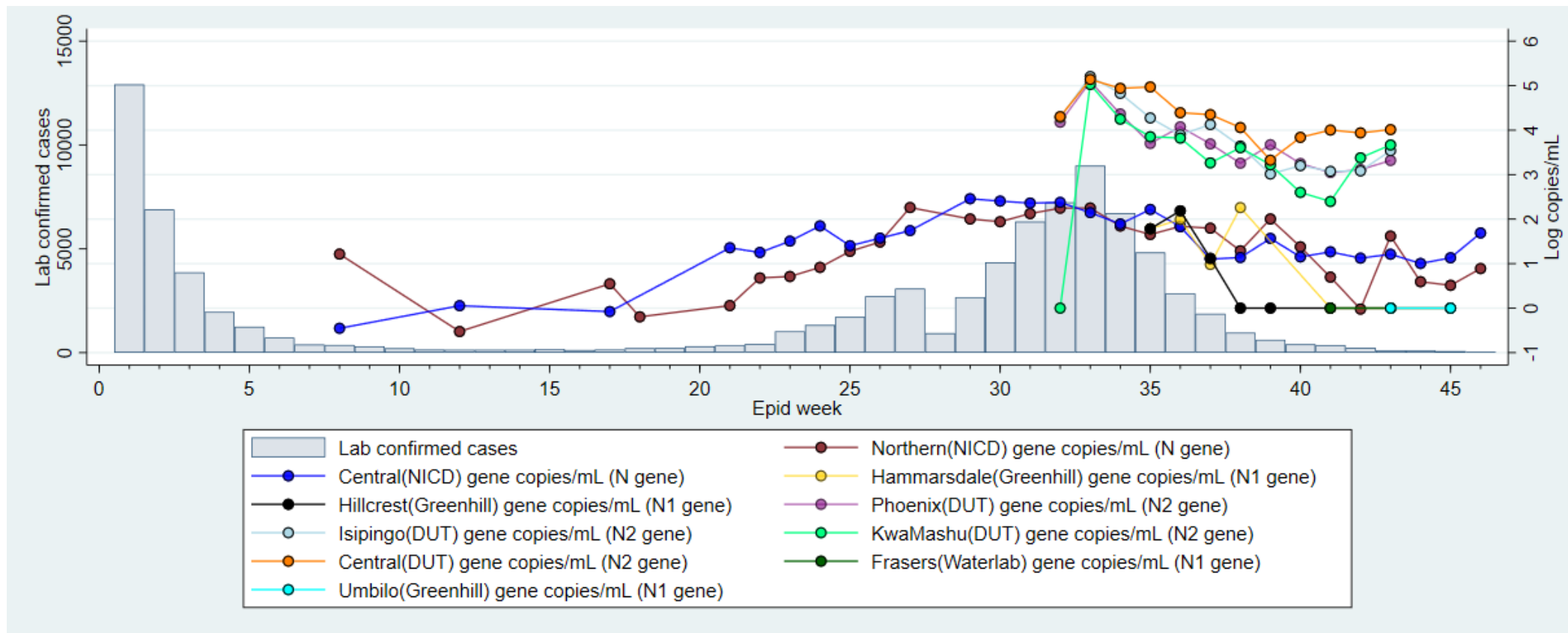
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Ekurhuleni, compared with laboratory-confirmed cases **resident in Ekurhuleni** (grey bars), by epidemiological week, 2021

Results: Gauteng – West Rand



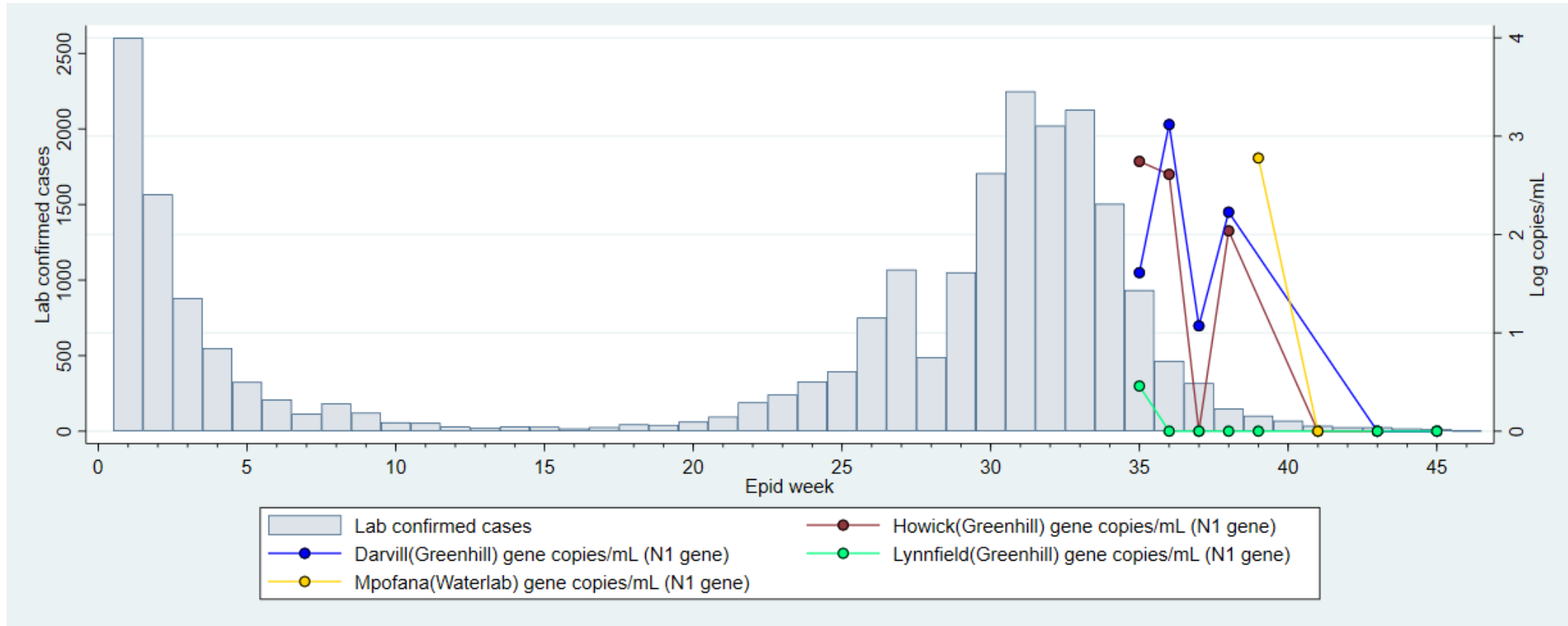
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in West Rand, compared with laboratory-confirmed cases **resident in West Rand** (grey bars), by epidemiological week, 2021

Results: KwaZulu-Natal - eThekweni



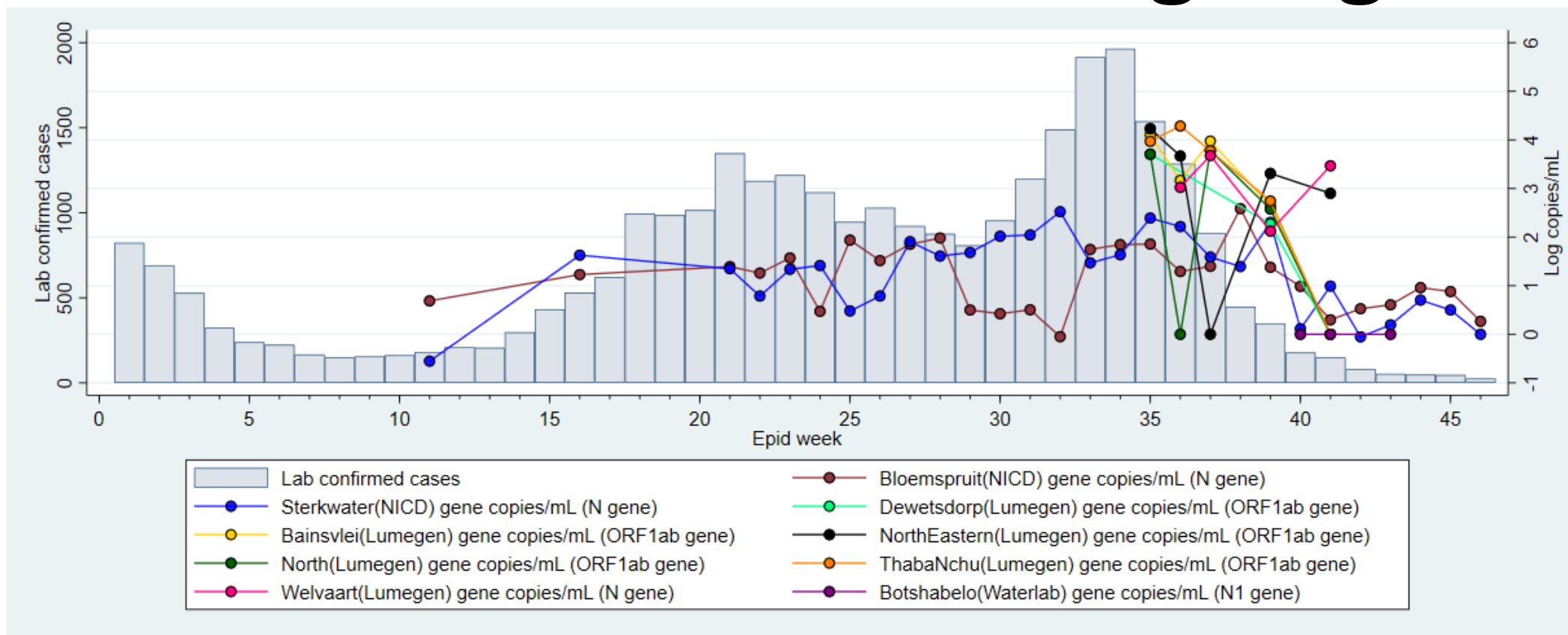
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in eThekweni, compared with laboratory-confirmed cases resident in eThekweni (grey bars), by epidemiological week, 2021

Results: KwaZulu-Natal - Umgungundlovu



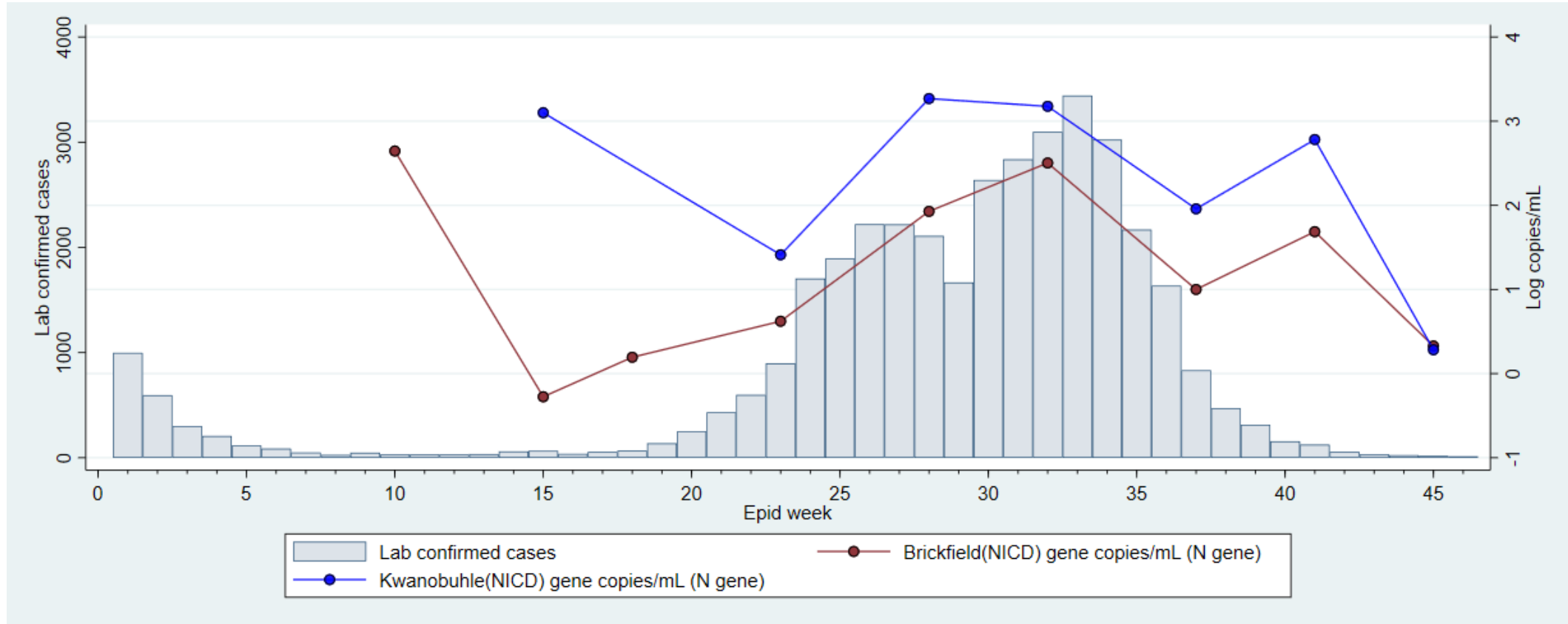
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Umgungundlovu, compared with laboratory-confirmed cases resident in Umgungundlovu (grey bars), by epidemiological week, 2021

Results: Free State - Mangaung



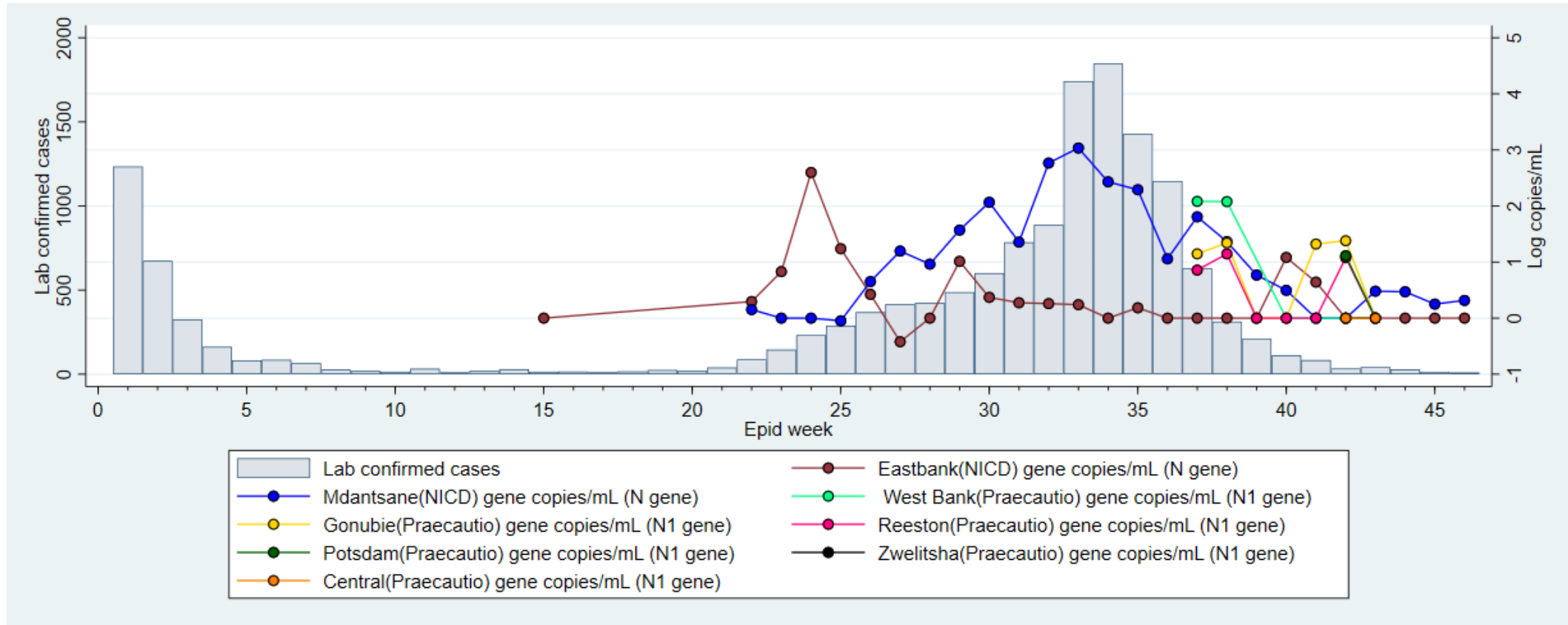
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Mangaung, compared with laboratory-confirmed cases in Mangaung (grey bars), by epidemiological week, 2021

Results: Eastern Cape – Nelson Mandela



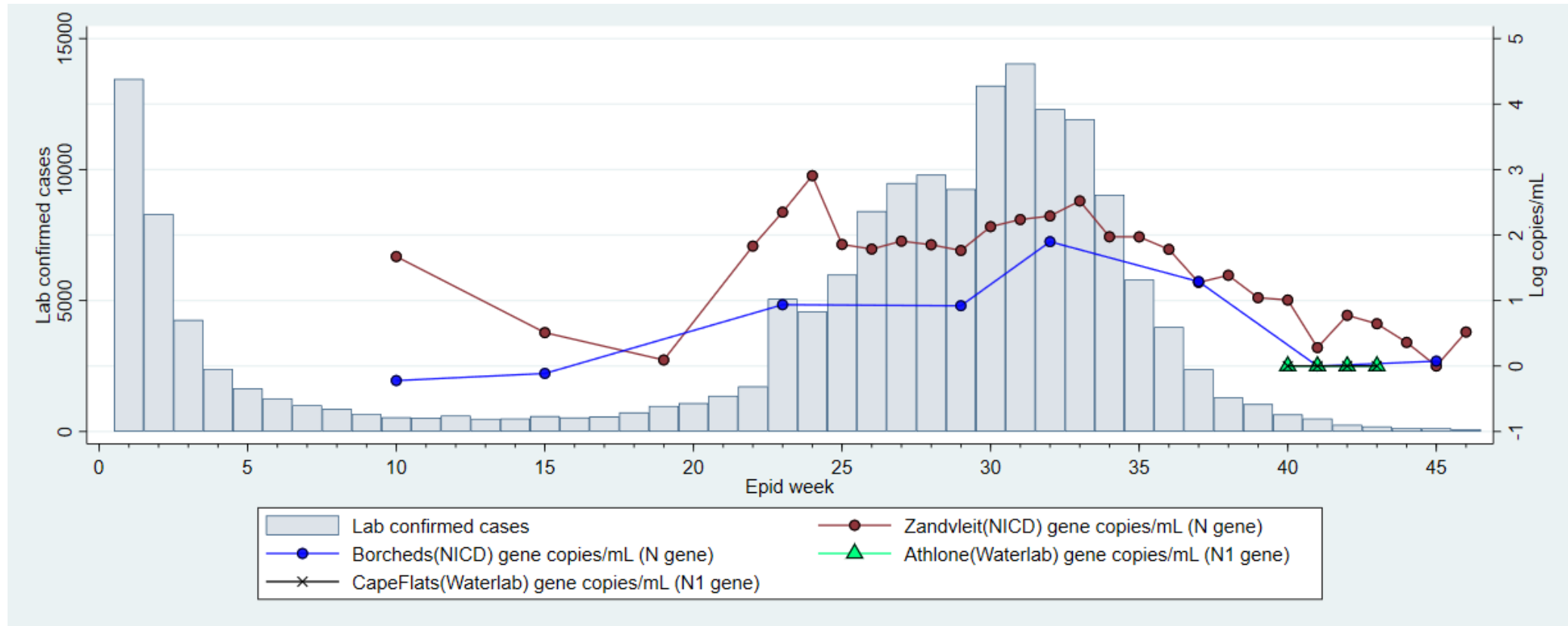
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Nelson Mandela Metro, compared with laboratory-confirmed cases resident in Nelson Mandela Metro (grey bars), by epidemiological week, 2021

Results: Eastern Cape – Buffalo City



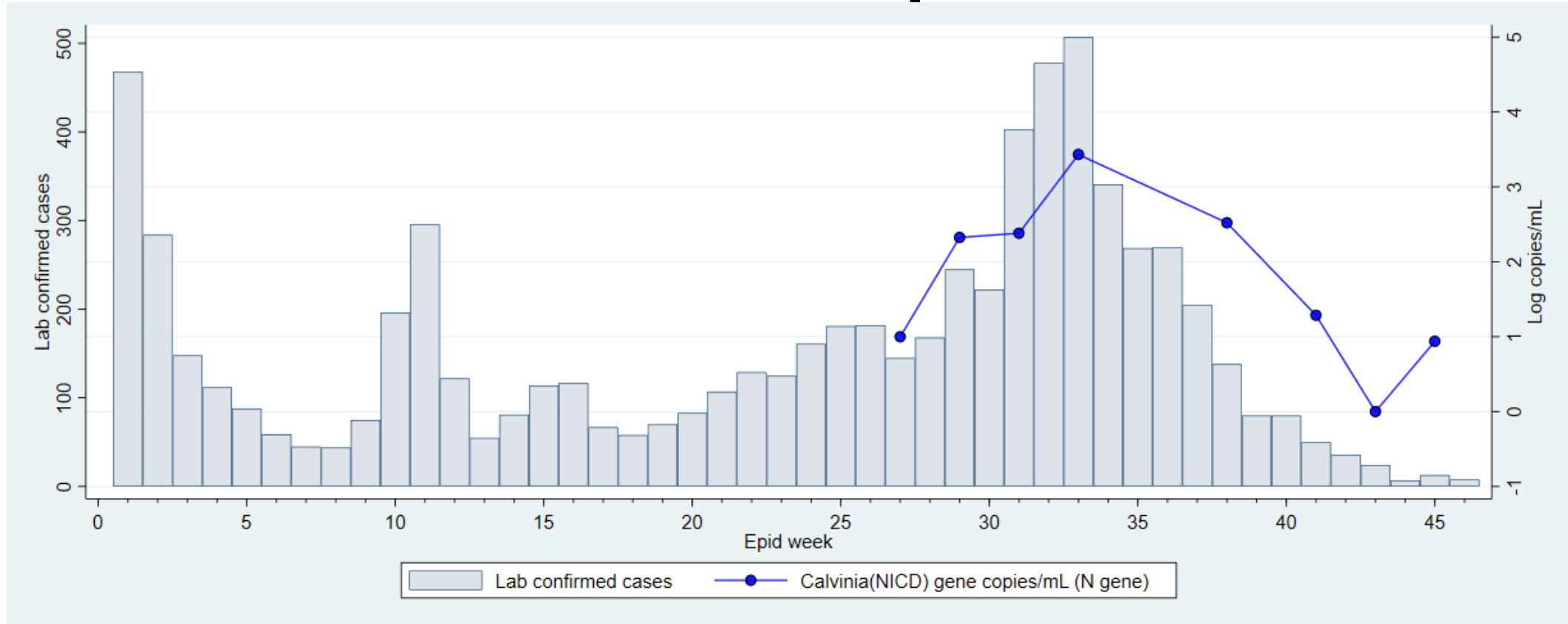
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Buffalo City Metro, compared with laboratory-confirmed cases resident in Buffalo City (grey bars), by epidemiological week, 2021

Results: Western Cape – City of Cape Town



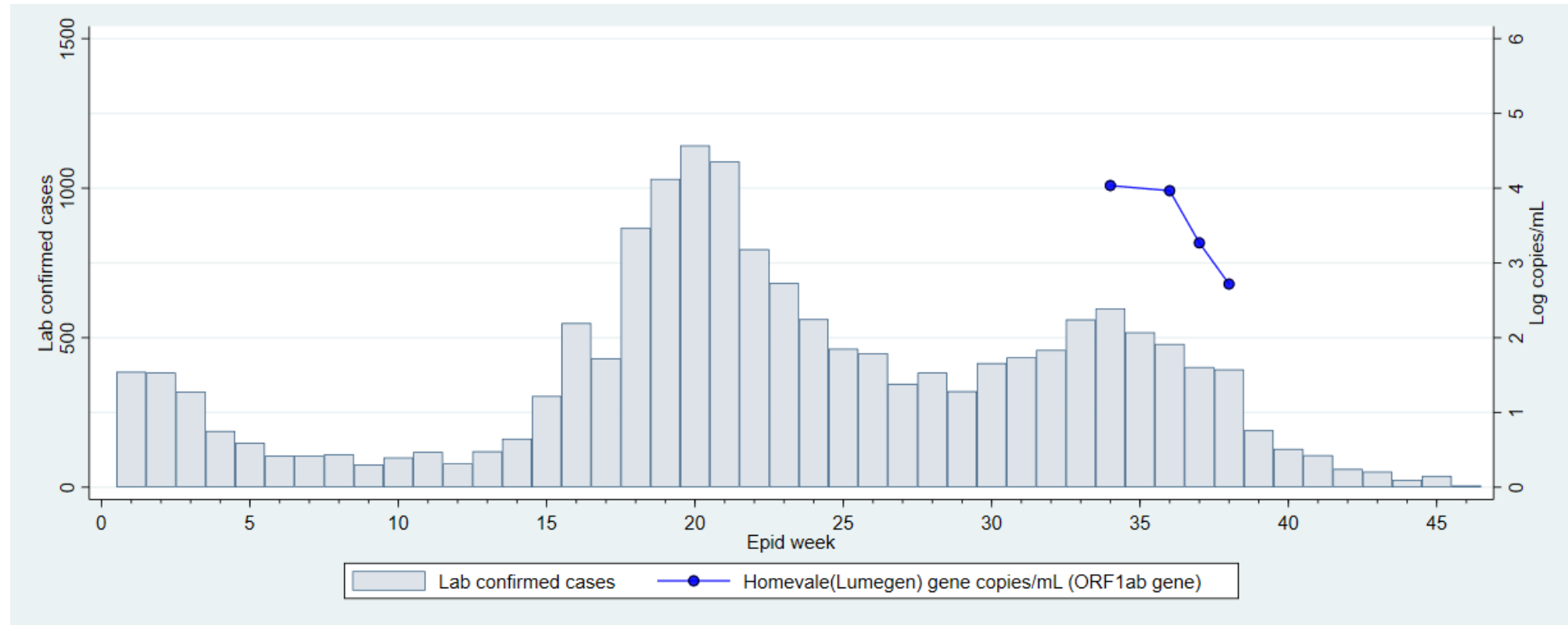
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Western Cape Province, compared with laboratory-confirmed cases resident in City of Cape Town (grey bars), by epidemiological week, 2021

Results: Northern Cape - Namakwa



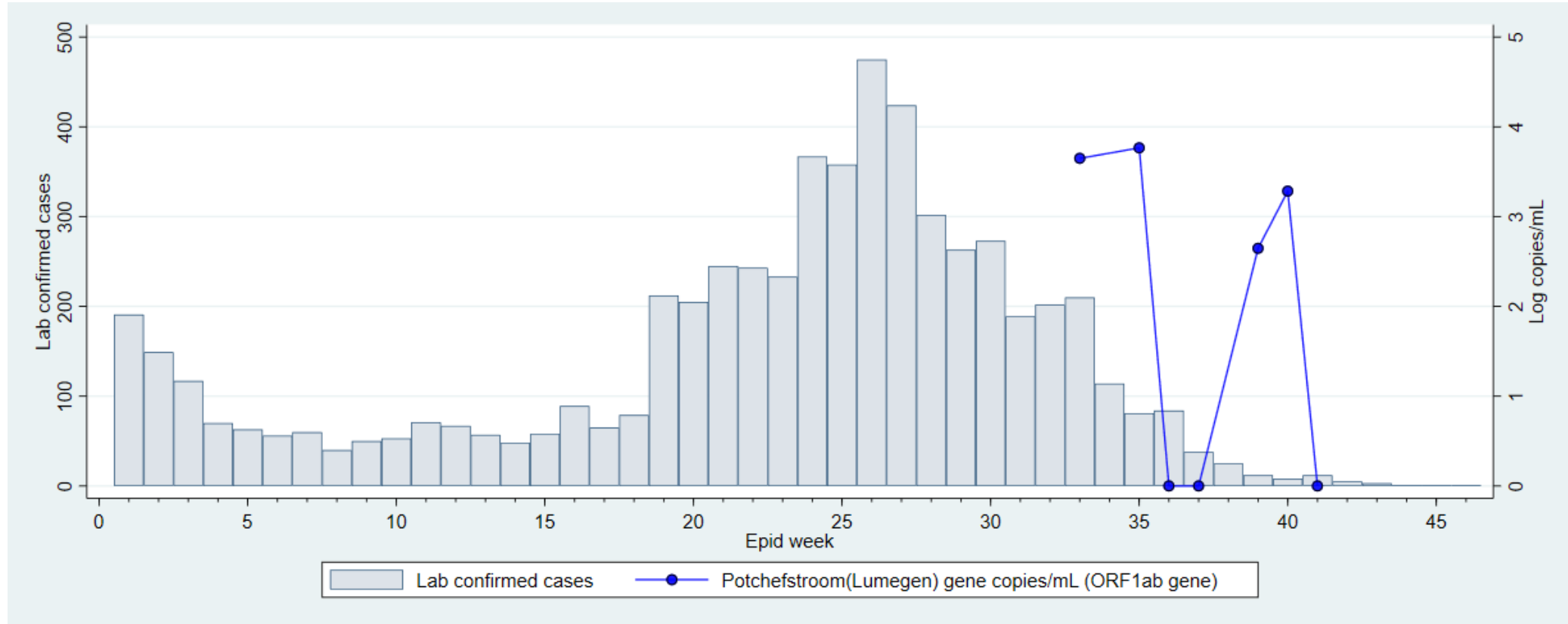
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Northern Cape Province, compared with laboratory-confirmed cases resident in Namakwa (grey bars), by epidemiological week, 2021

Results: Northern Cape – Frances Baard



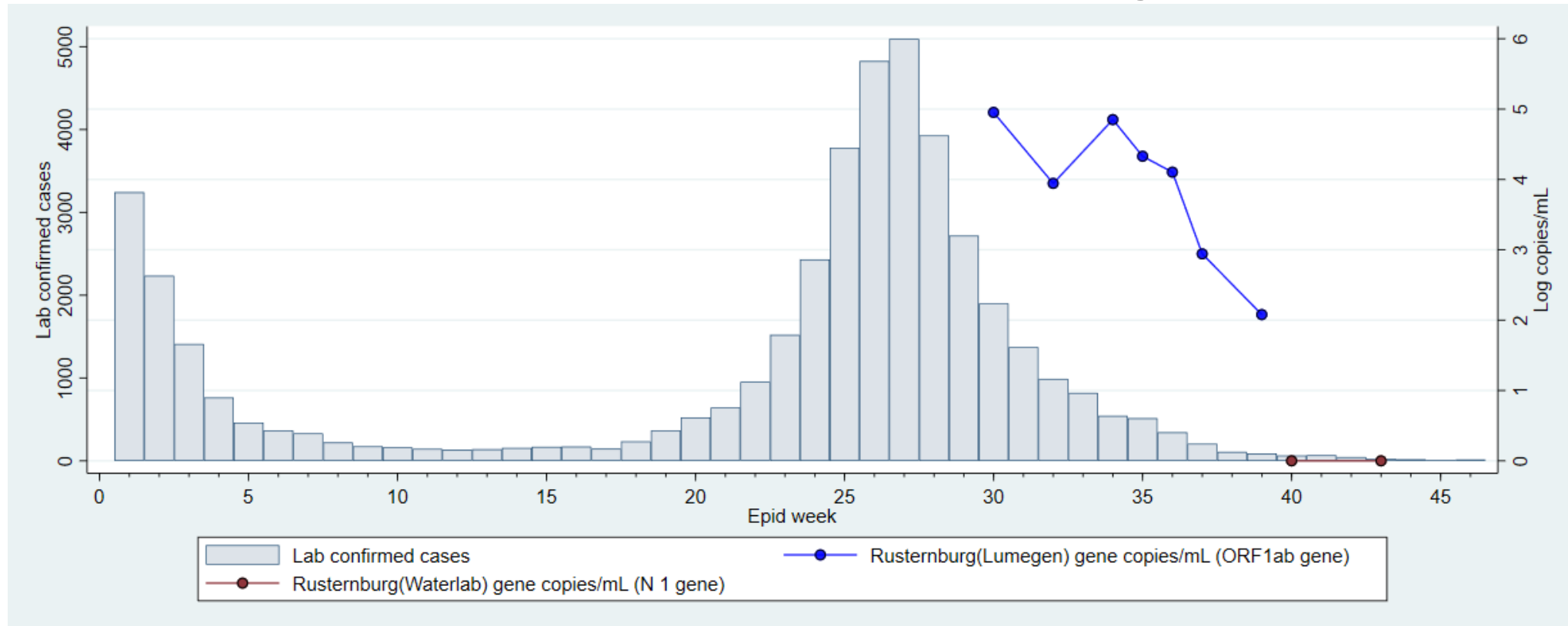
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Northern Cape Province, compared with laboratory-confirmed cases [resident in Frances Baard](#) (grey bars), by epidemiological week, 2021

Results: North West – JB Marks



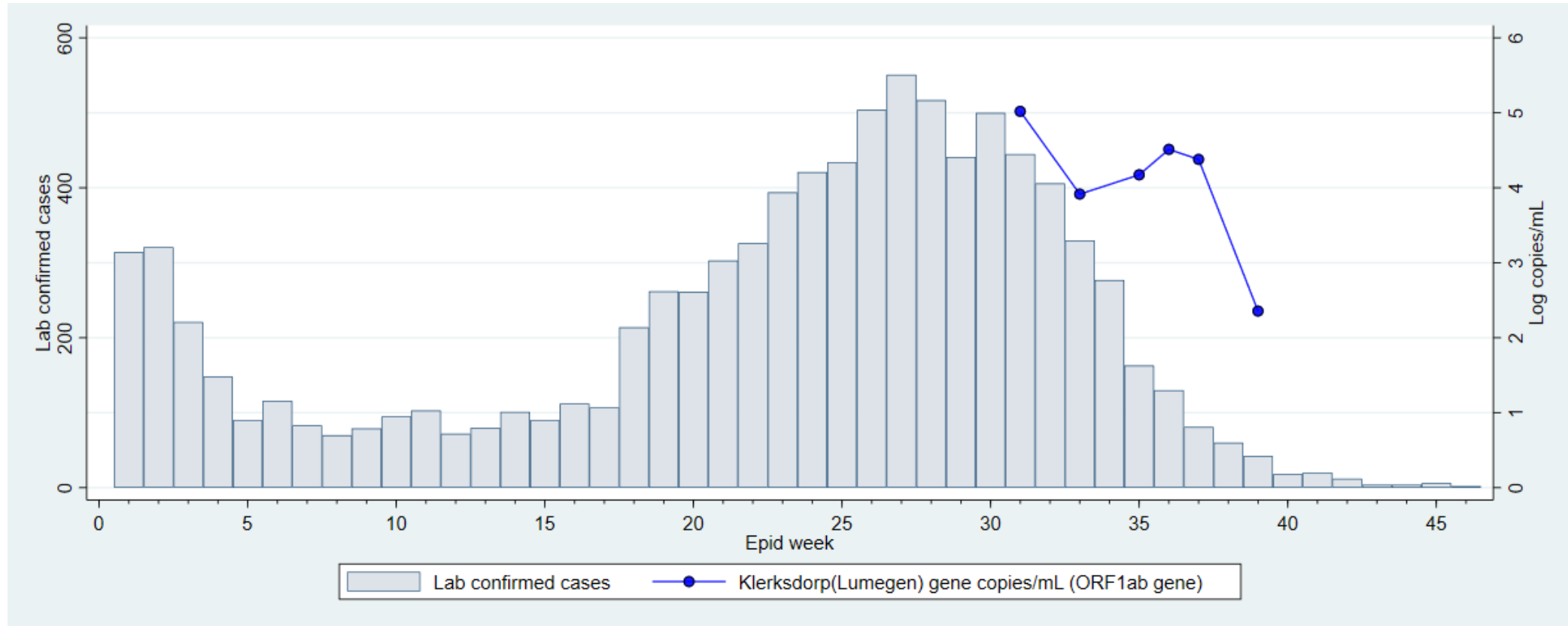
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the North West Province, compared with laboratory-confirmed cases resident in JB Marks (grey bars), by epidemiological week, 2021

Results: North West - Bojanala



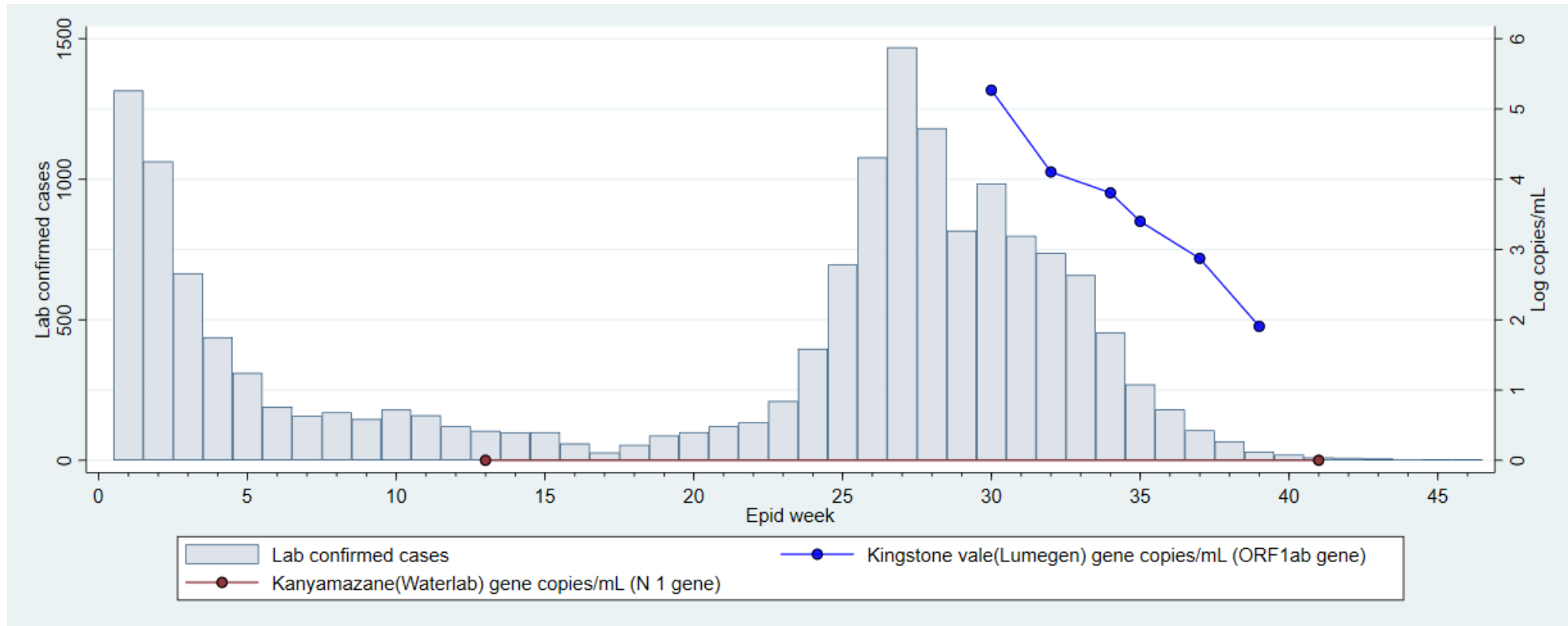
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the North West Province, compared with laboratory-confirmed cases [resident in Bojanala](#) (grey bars), by epidemiological week, 2021

Results: North West - Matlosana



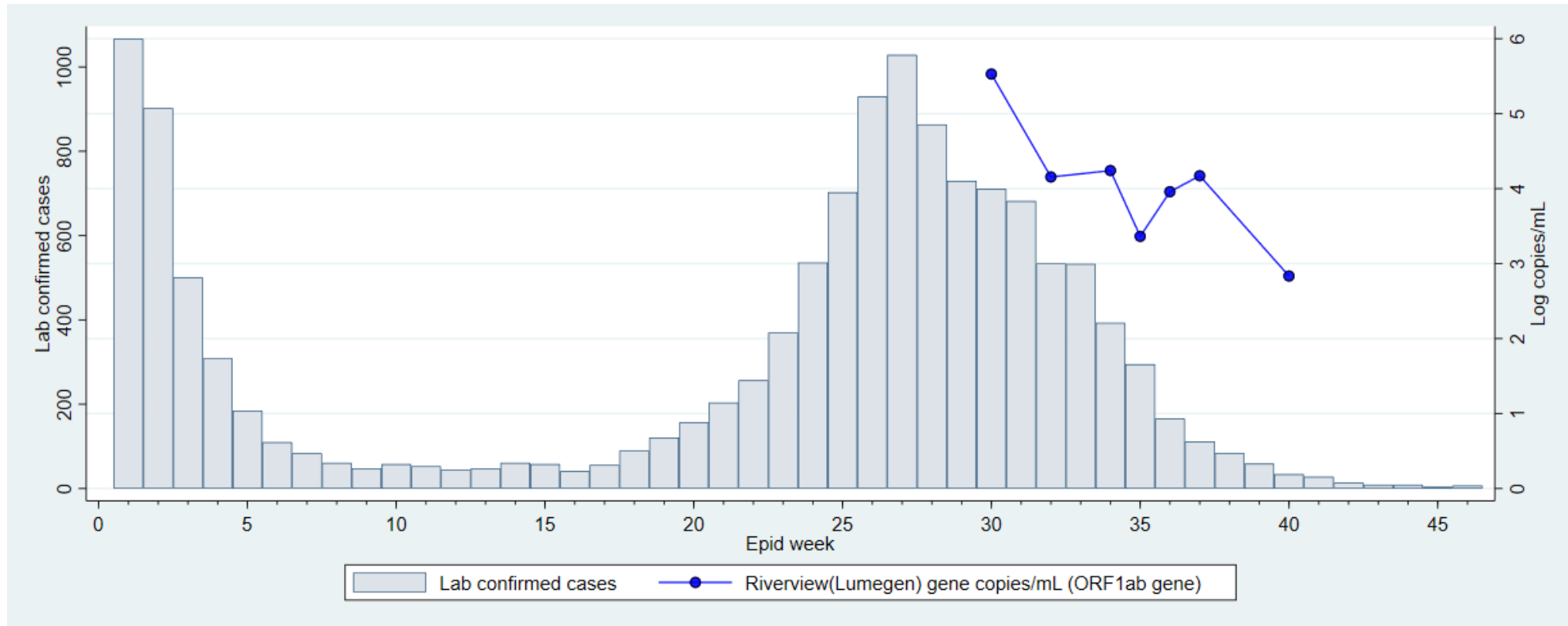
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the North West Province, compared with laboratory-confirmed cases [resident in Matlosana](#) (grey bars), by epidemiological week, 2021

Results: Mpumalanga - Mbombela



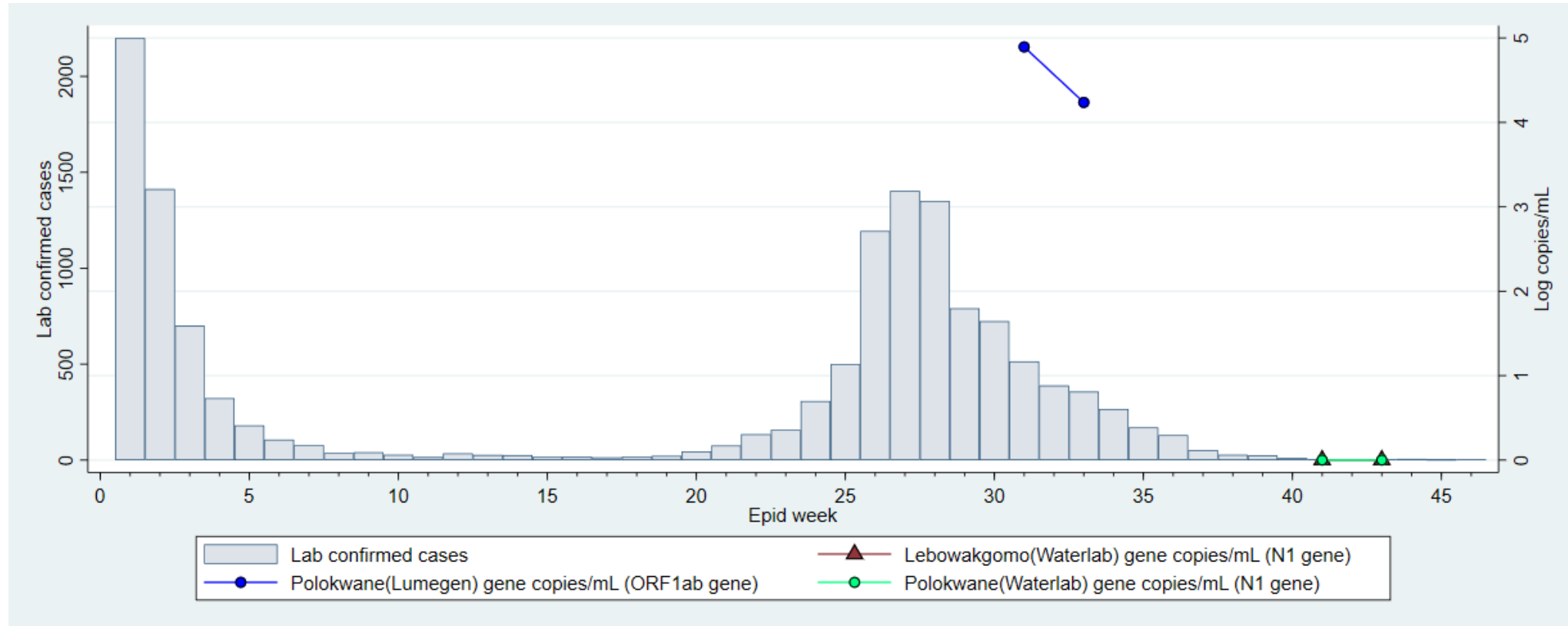
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Mpumalanga Province, compared with laboratory-confirmed cases [resident in Mbombela](#) (grey bars), by epidemiological week, 2021

Results: Mpumalanga - Emalahleni



Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Mpumalanga Province, compared with laboratory-confirmed cases [resident in Emalahleni](#) (grey bars), by epidemiological week, 2021

Results: Limpopo - Polokwane



Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Limpopo Province, compared with laboratory-confirmed cases resident in Polokwane (grey bars), by epidemiological week, 2021

Acknowledgements

- NICD – Center for Vaccines and Immunology, Administration, Finances and Procurement
- Water Research Commission
- Laboratory partners

