Wastewater-based epidemiology for SARS-CoV-2 surveillance in South Africa
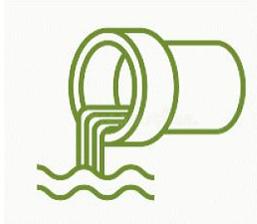
Report date: 17 September 2021

Sample collection dates up to 14 September 2021
(epidemiological week 37)

Centre for Vaccines and Immunology
National Institute for Communicable Diseases

Wastewater-based Epidemiology for COVID-19
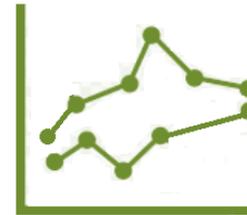
Why test wastewater for SARS-CoV-2?

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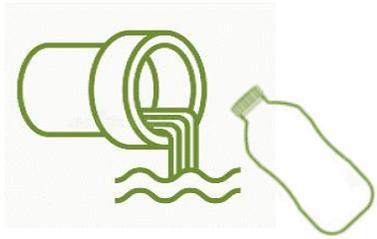
Increases in SARS-CoV-2 levels will appear before increases in clinical case load

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
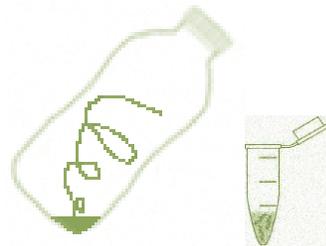
The one litre sample is concentrated

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*

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

Bars:

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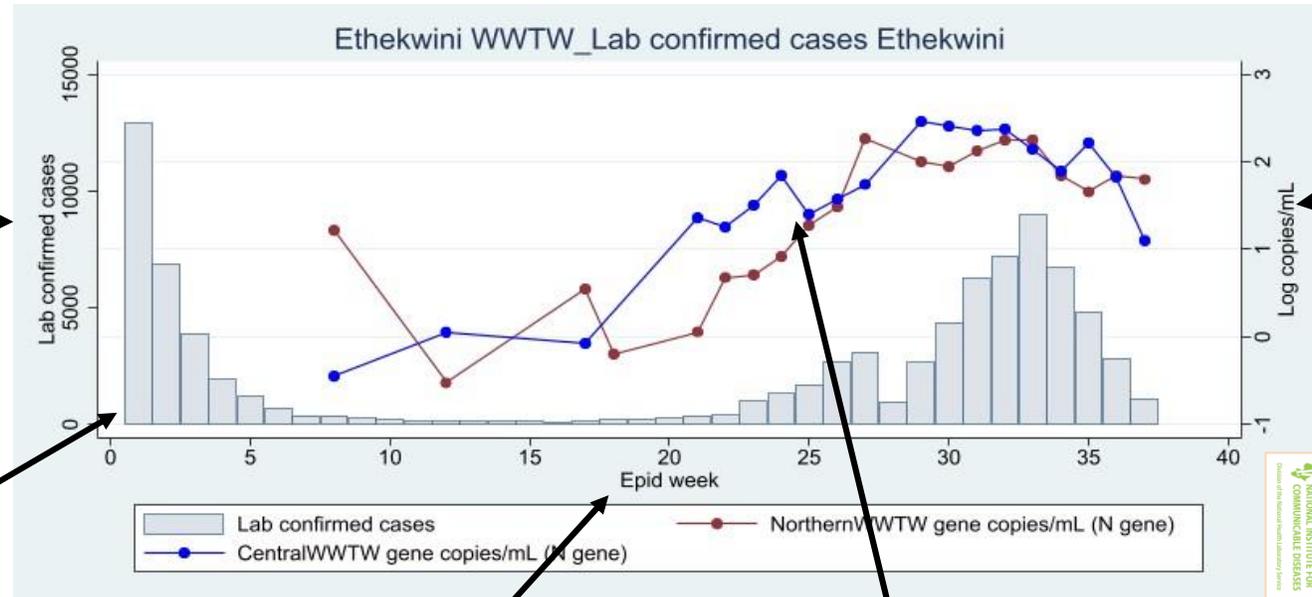
Horizontal axis:

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
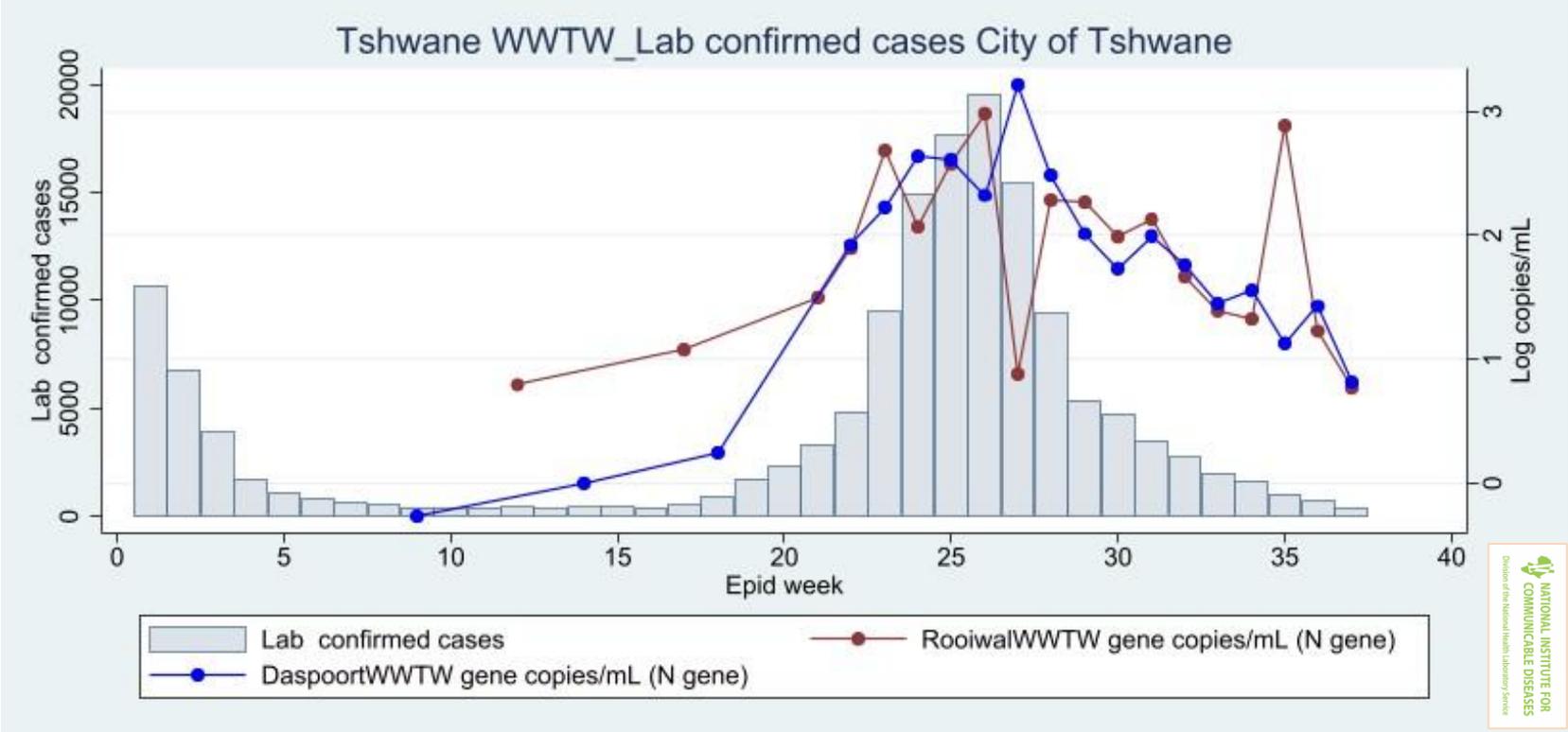 - Prepare hospitals for overflow

- **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

health
Department:
Health
REPUBLIC OF SOUTH AFRICA

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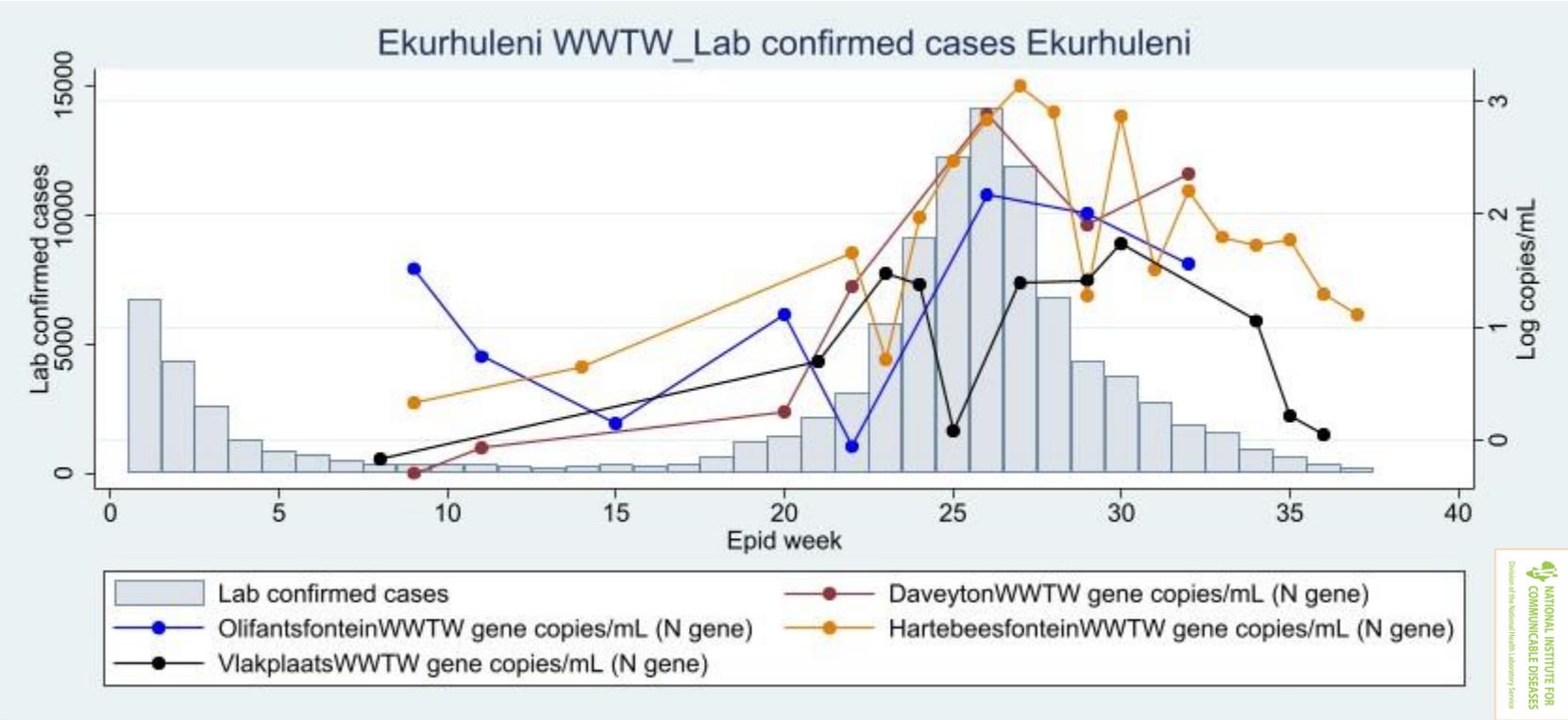Division of the National Health Laboratory Service

Results: Gauteng 1

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
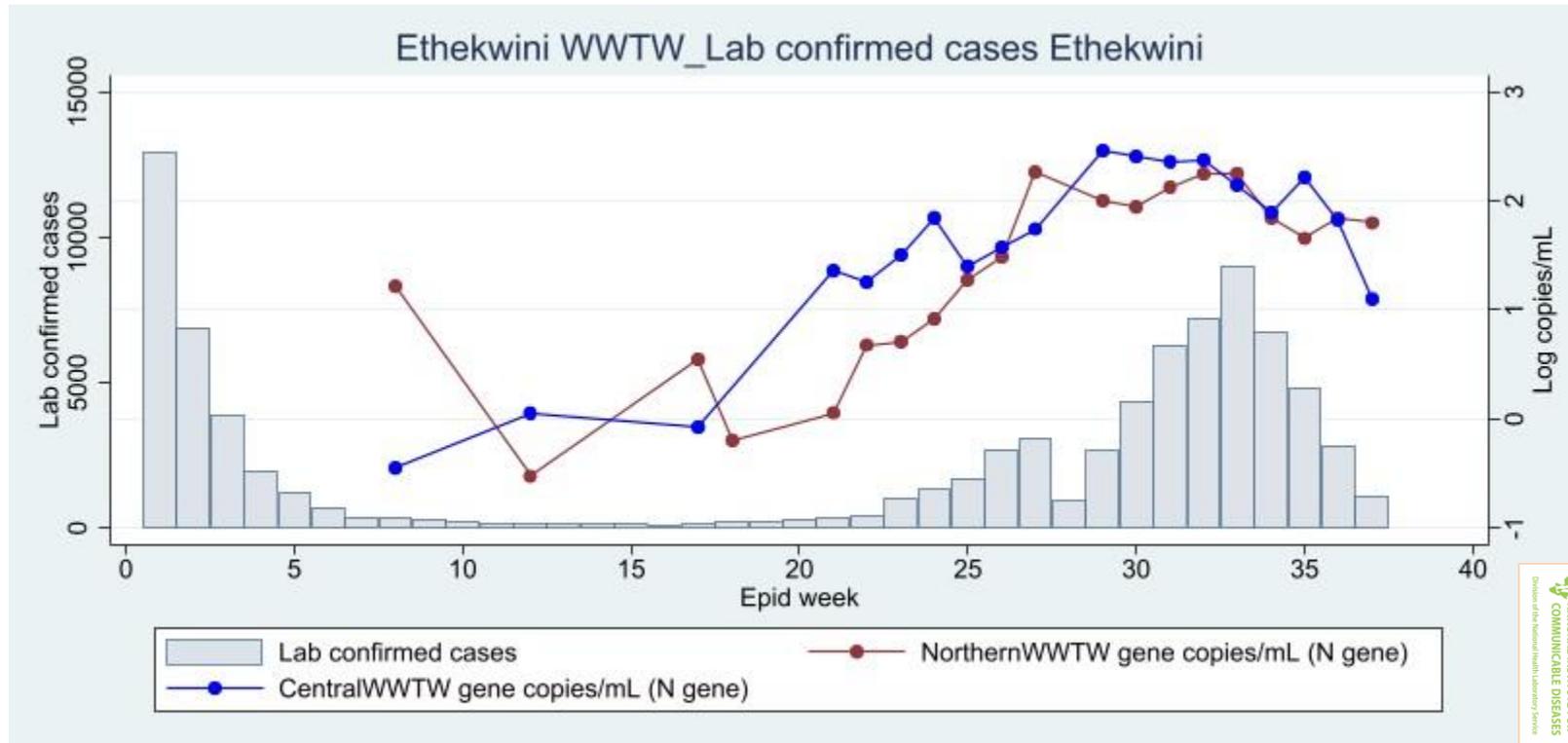
Results: Gauteng 2
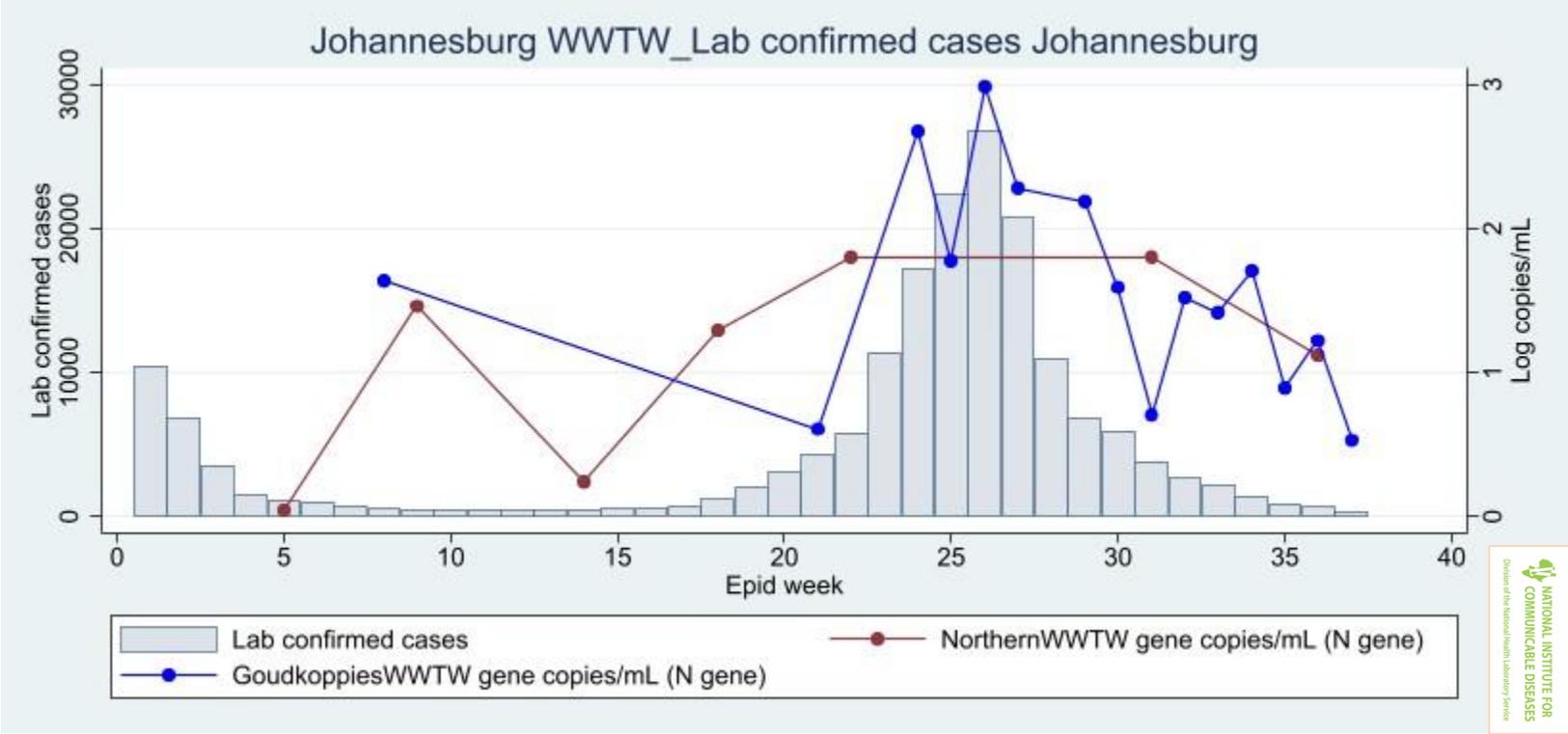
Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in City of Johannesburg, compared with laboratory-confirmed cases resident in City of Johannesburg (grey bars), by epidemiological week, 2021
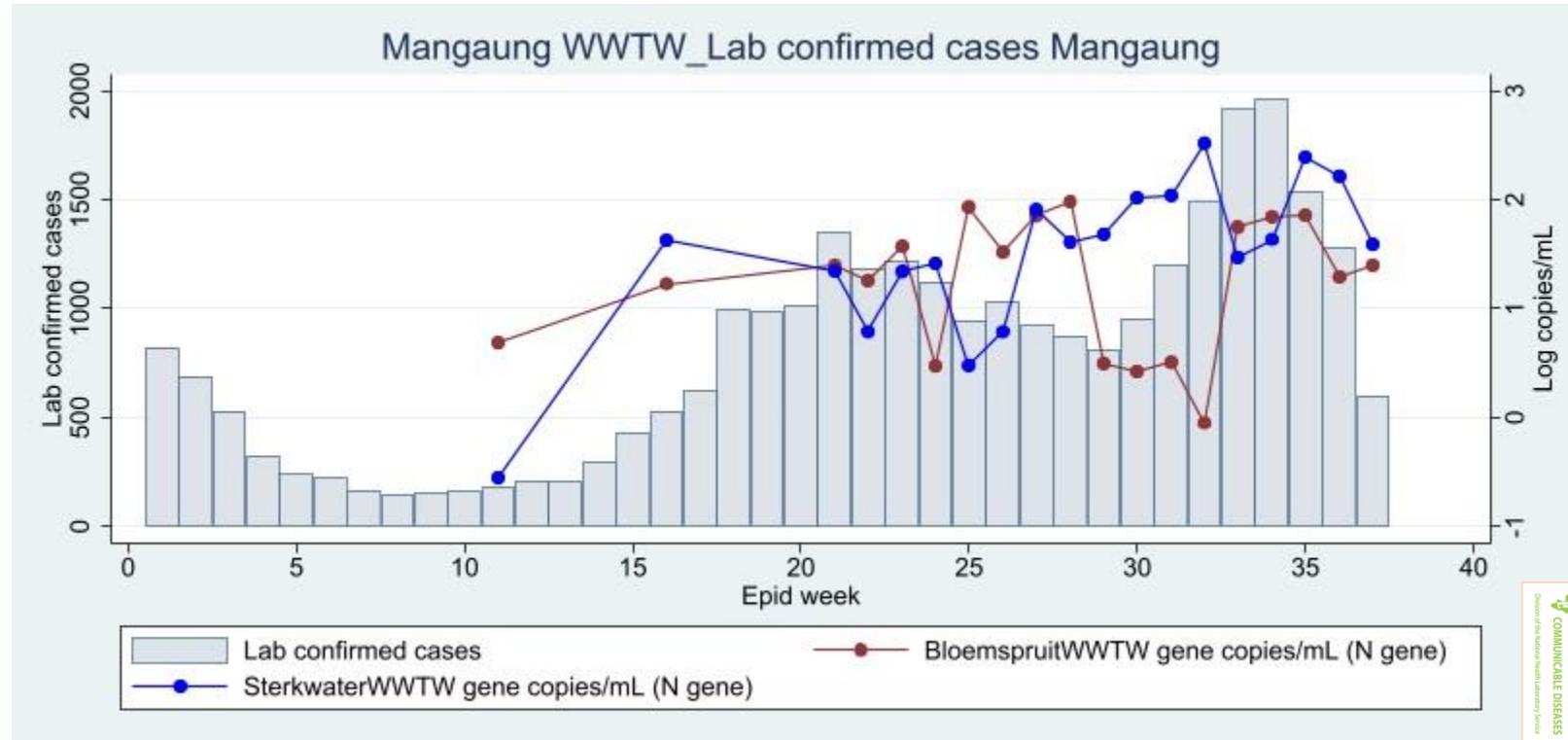
Results: Gauteng 3

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
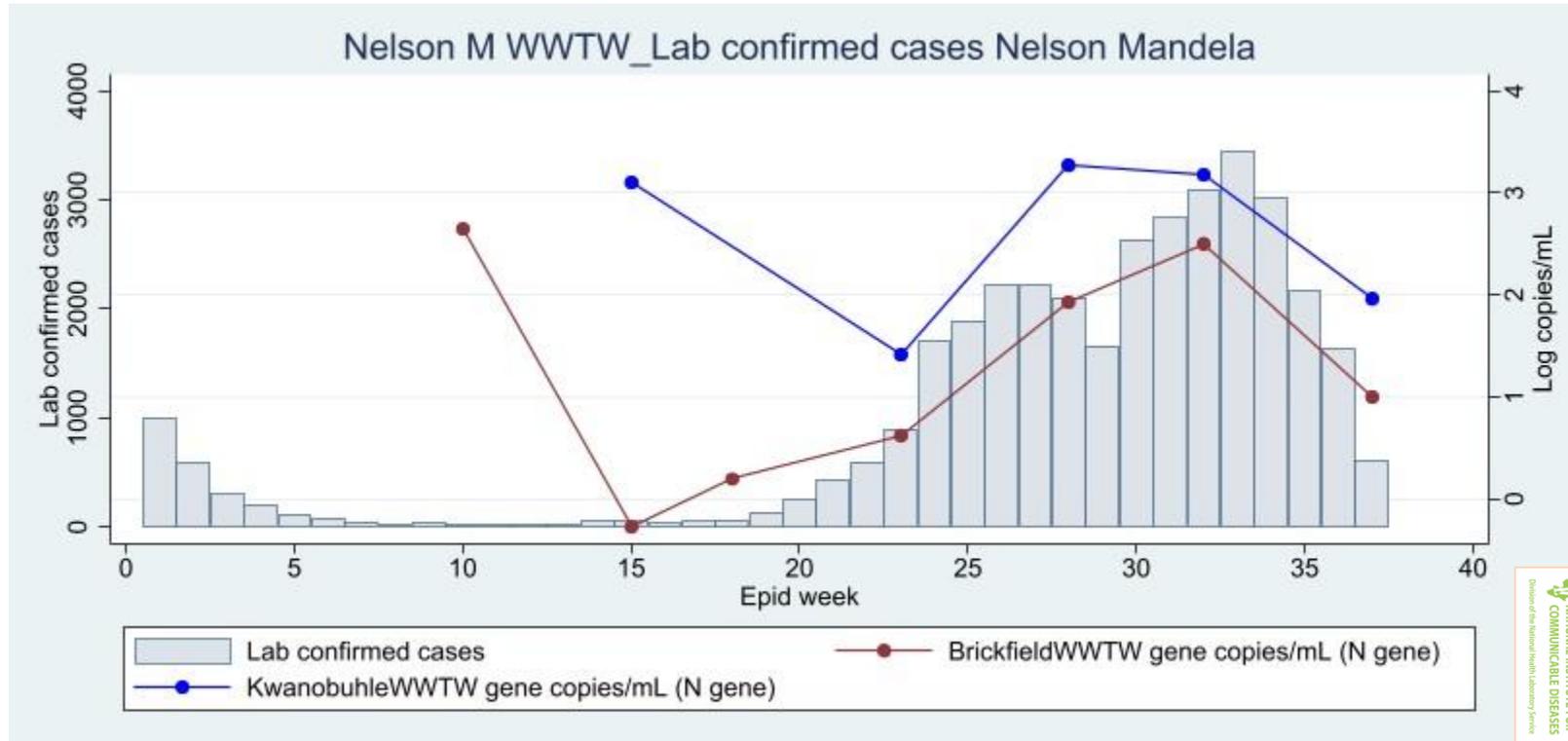
Results: KwaZulu-Natal

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

Results: Free State
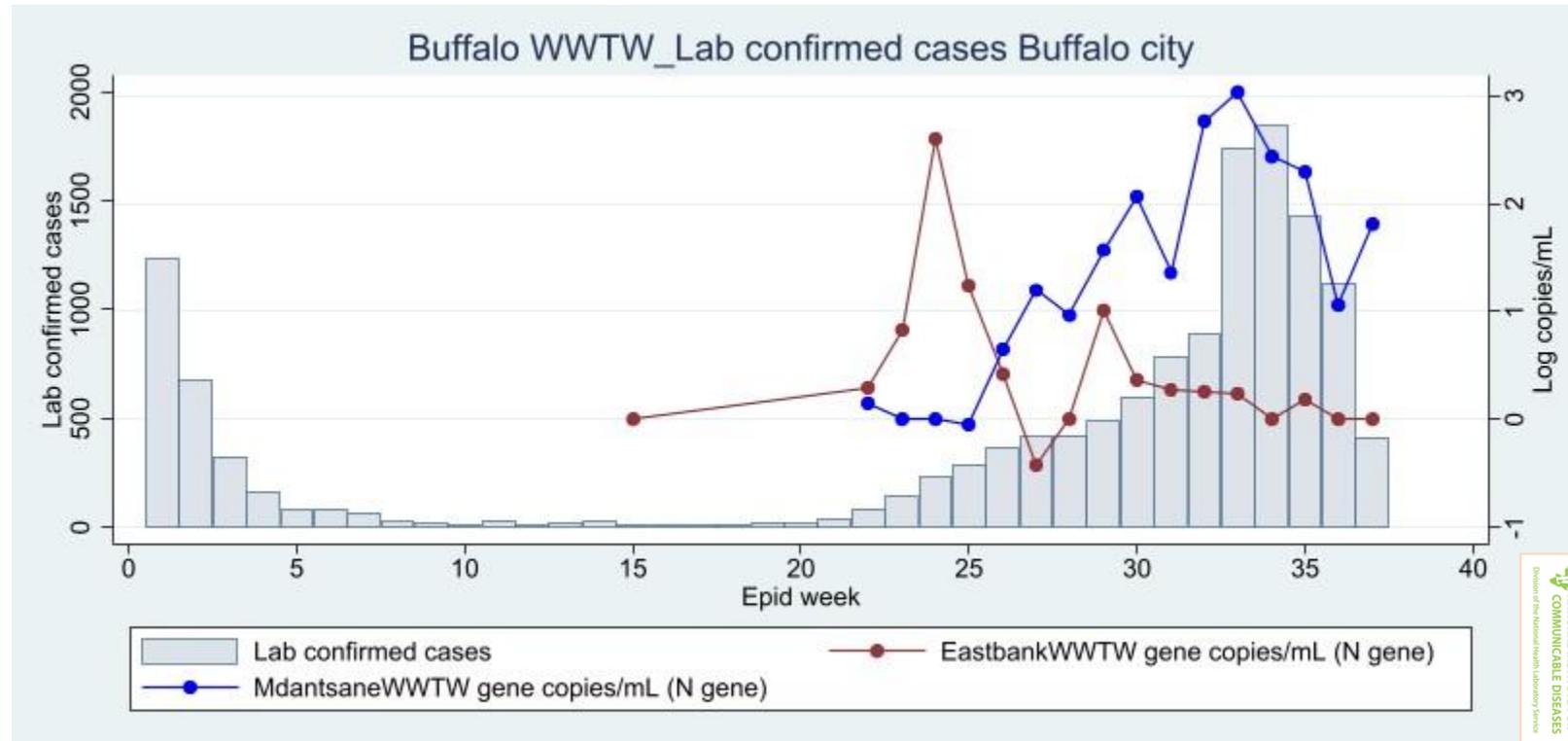

Mangaung WWTW_Lab confirmed cases Mangaung

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
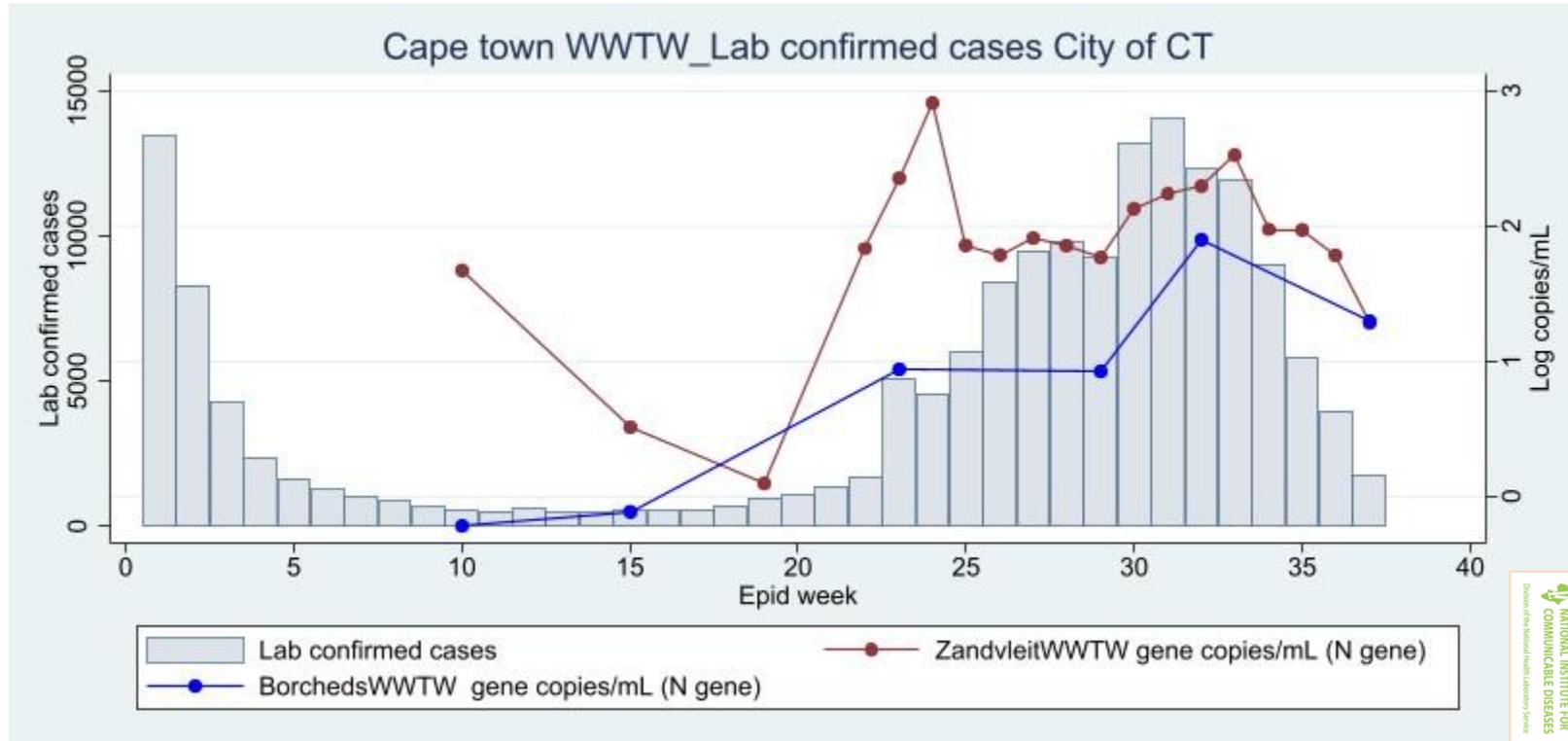
Results: Eastern Cape 1

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
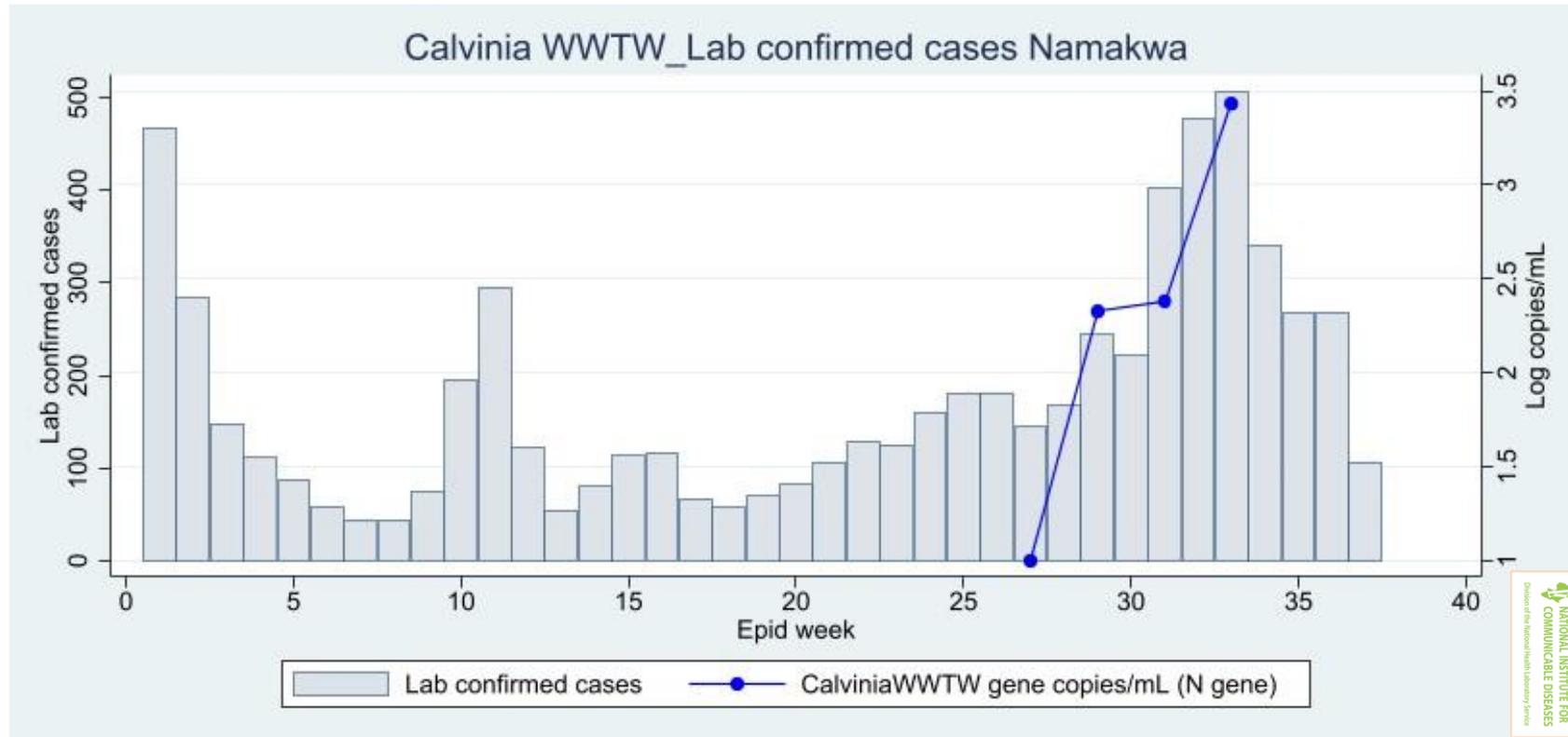
Results: Eastern Cape 2

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

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

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