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Leveraging wastewater surveillance to actively monitor Covid-19 community dynamics in rural areas with reduced reliance on clinical testing

Michelle M. Jarvie[1], Thu N.T. Nguyen[1], Benjamin Southwell[1], and Derek Wright[1]

[1]Lake Superior State University School of Arts and Letters

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Abstract

The prevalence of COVID-19 in the community has become more difficult to gauge utilizing clinical testing due to a decrease in reported test results stemming from the availability of at-home test kits and a reduction in the number of cases seeking medical treatment. The purpose of this study was to examine the trend of diminishing correlation between reported clinical cases of COVID-19 and wastewater-based surveillance epidemiological data as home testing became available in the Eastern Upper Peninsula of Michigan. Wastewater grab samples were collected weekly from 16 regional locations from June 2021-December 2022. Samples were analyzed for SARS-CoV-2 N1 and N2 viral particles using reverse transcriptase digital droplet polymerase chain reaction (RT ddPCR). N1 and N2 gene copies were correlated with clinical cases. The t-test was used to determine correlation deterioration point. Clinical cases post-deterioration were calculated for high-correlated pre-deterioration locations using linear regression. Correlation between the wastewater-based surveillance of SARS-CoV-2 and reported clinical cases deteriorated after February 1, 2022. This corresponds with the timeframe in which commercially available at-home test kits became available in the United States. The increase in at-home testing for SARS-CoV-2 likely contributed to the decrease in reported clinical positive tests in early 2022, providing an unrealistic picture of the presence of Covid-19 in the community. As measures to reduce exposure such as personal masking, clinical testing, social isolating, and quarantining continue to decline, wastewater surveillance for the presence of SARS-CoV-2 may be the best method for public health professionals to remain aware of virus dynamics in localized regions. Time-series modeling adds another layer of information when clinical data is unobtainable or underreported.

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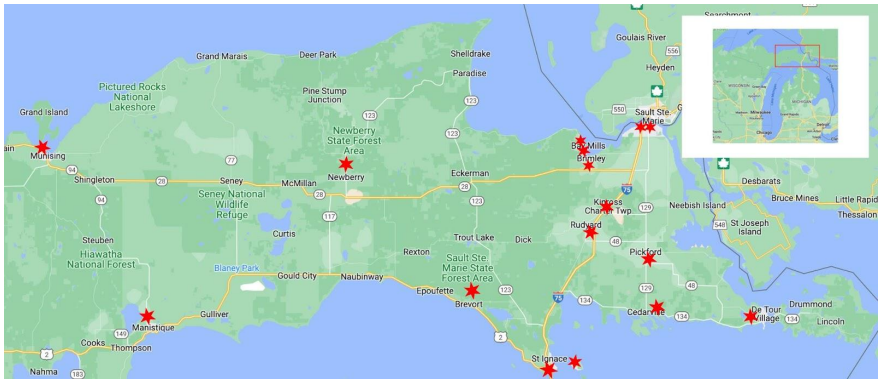

FIGURE 1 Regional map of Eastern Upper Peninsula, Michigan highlighting sample site locations.

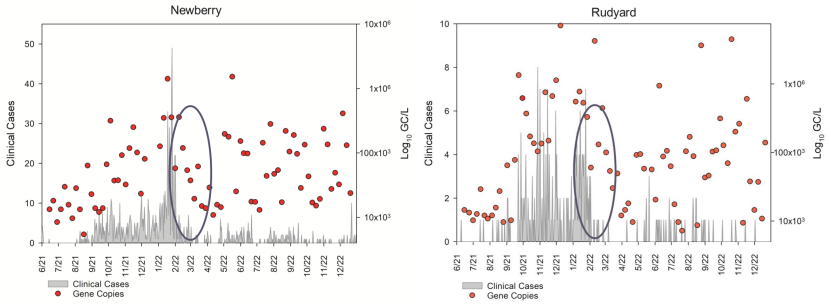

FIGURE 2 Clinical cases (bars) and sewer gene copies (dots) over the study period for Newberry and Rudyard locations. Area circled denotes a visual drop off in clinical cases while gene copes remained steady.

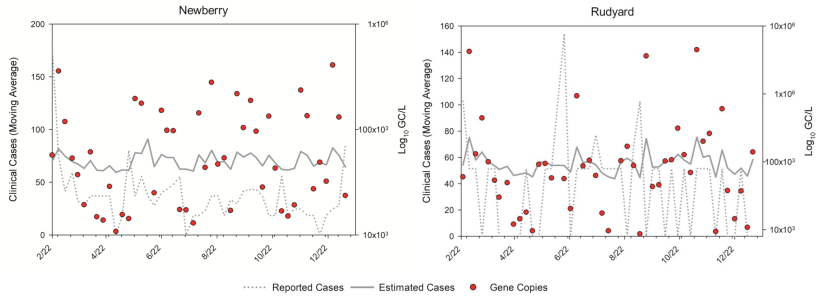

FIGURE 3 Regression-estimated cases (moving average) for low correlating period February 1-December 31, 2022 in Newberry and Rudyard locations.