

Data report: Monitoring COVID-19 in Wastewater in the Chicago region

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Background

The [Illinois Department of Public Health \(IDPH\)](#), [Cook County Department of Public Health \(CCDPH\)](#) and [Chicago Department of Public Health \(CDPH\)](#) collect data from a variety of sources to understand the COVID-19 pandemic.

One way to monitor the spread of SARS-CoV-2 is by monitoring wastewater (sewage). Wastewater can be used to track spread since the virus is shed in the feces of infected individuals, and unlike relying on reports from diagnostic testing, which are dependent on someone having symptoms or being able to access testing, infected individuals shed SARS-CoV-2 to the sewer when using the toilet or other drains. By measuring the amount of SARS-CoV-2 in wastewater, public health officials gather information about the amount of COVID-19 transmission at a community level.

Combined with other types of data, wastewater monitoring helps public health officials better understand transmission of SARS-CoV-2 in Chicago and the suburbs. Follow these links to read more about the wastewater monitoring program in [Chicago](#) and [Illinois](#).

The wastewater monitoring system in the Chicago region

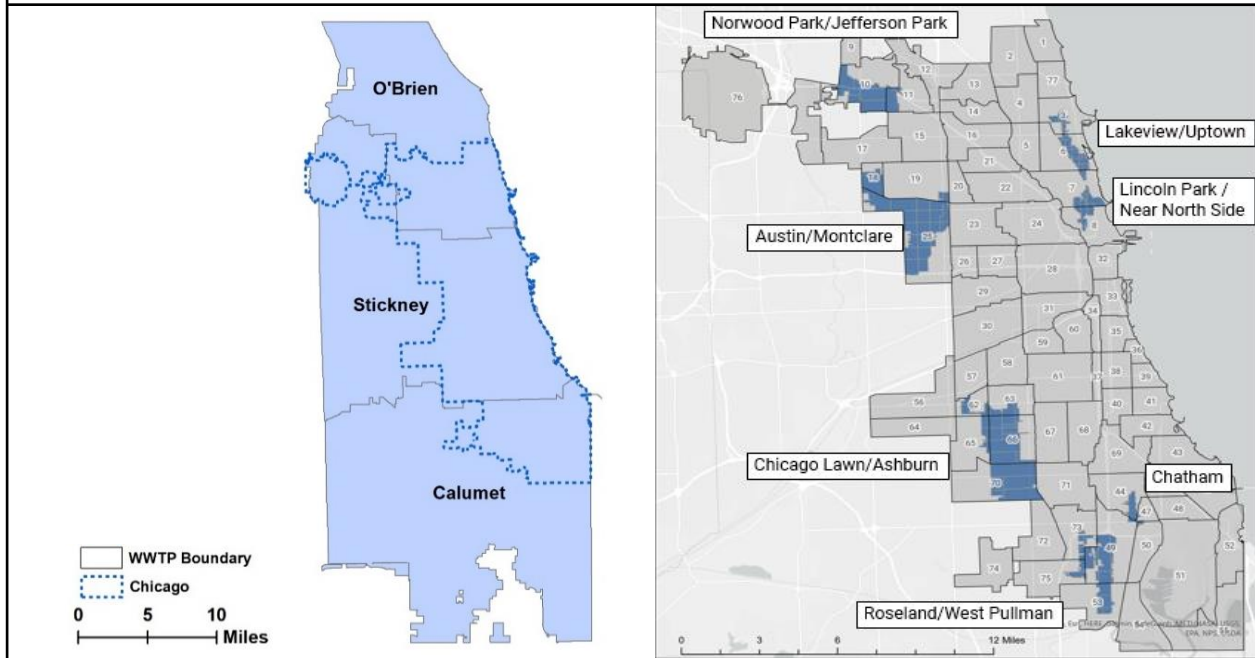
IDPH, CCDPH, and CDPH partner with the [University of Illinois Discovery Partners Institute \(DPI\)](#) and the [Metropolitan Water Reclamation District of Greater Chicago \(MWRD\)](#) to conduct surveillance at two main levels: wastewater treatment plants, and neighborhood sewers.

The three large wastewater treatment plants serving Chicago and Cook County (the O'Brien, Stickney and Calumet Water Reclamation Plants) each collect and process wastewater from over a million people. Samples are also collected from seven local sewers in Chicago, including one in each [Healthy Chicago Equity Zone](#). The number of people living in each sewershed ranges from 3,816 to 83,455 people (**Figure 1**).

Samples are usually collected from each plant and neighborhood sewer twice each week. However, beginning in mid-April, three samples were collected weekly, and as of late May five samples are collected weekly at treatment plants to improve the ability to monitor trends. As [recommended by the CDC](#), the concentration of SARS-CoV-2 is compared to the concentration of genetic material from Pepper Mild Mottle Virus (PMMoV). The PMMoV concentration reflects the amount of human waste in wastewater relative to other things like stormwater runoff.

Data from the local wastewater monitoring system is submitted to the CDC as part of the [National Wastewater Surveillance System \(NWSS\)](#). You can view NWSS data on the [CDC's COVID-19 data tracker](#). In August 2022, [we reported data](#) detailing sustained high virus concentration across the Chicagoland area indicating likely ongoing high levels of transmission of the virus that causes COVID-19.. This report displays data from July 1 through September 30, 2022.

Figure 1: Wastewater treatment plants (left) and neighborhood sewers (right) that are monitored for SARS-CoV-2.



Wastewater concentrations in the Chicago region

Figure 2: Left: SARS-CoV-2 concentration at each water reclamation plant serving Chicago (points) and trend lines. Please note: Stickney WRP is represented by two locations representing the two pipes that carry sewage into the facility. Right: 7-day rolling average of daily infections per 100,000 Cook County residents (blue, right), July-September 2022. The line is a trend of the population-weighted sum of daily viral load from the treatment plants that serve Chicago.

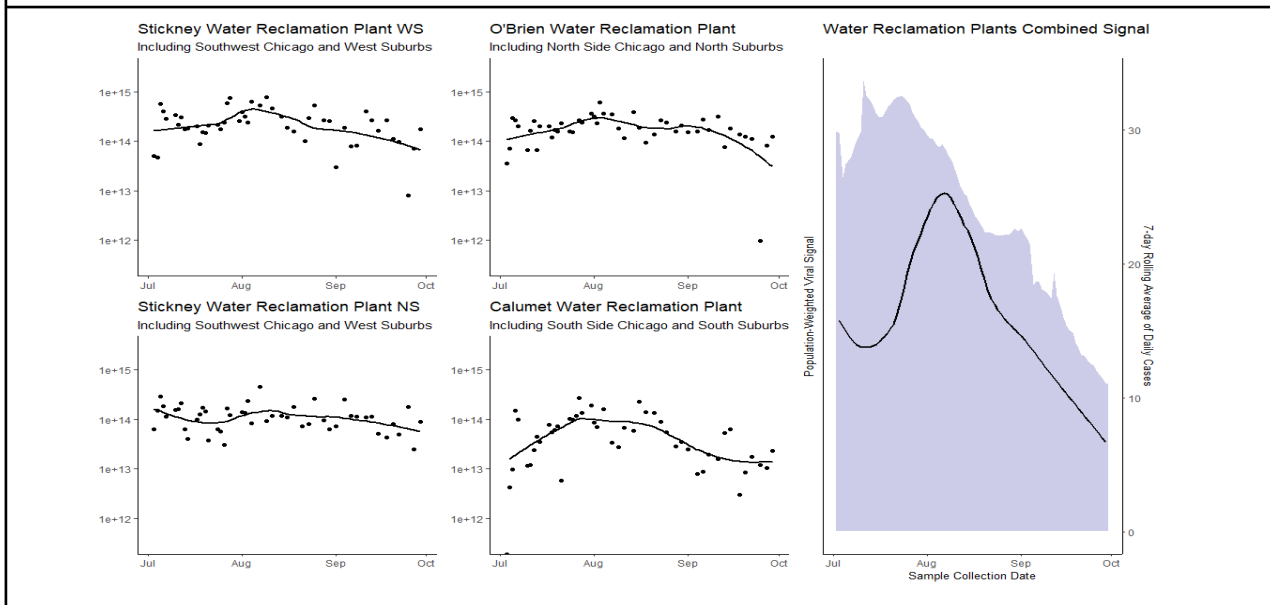
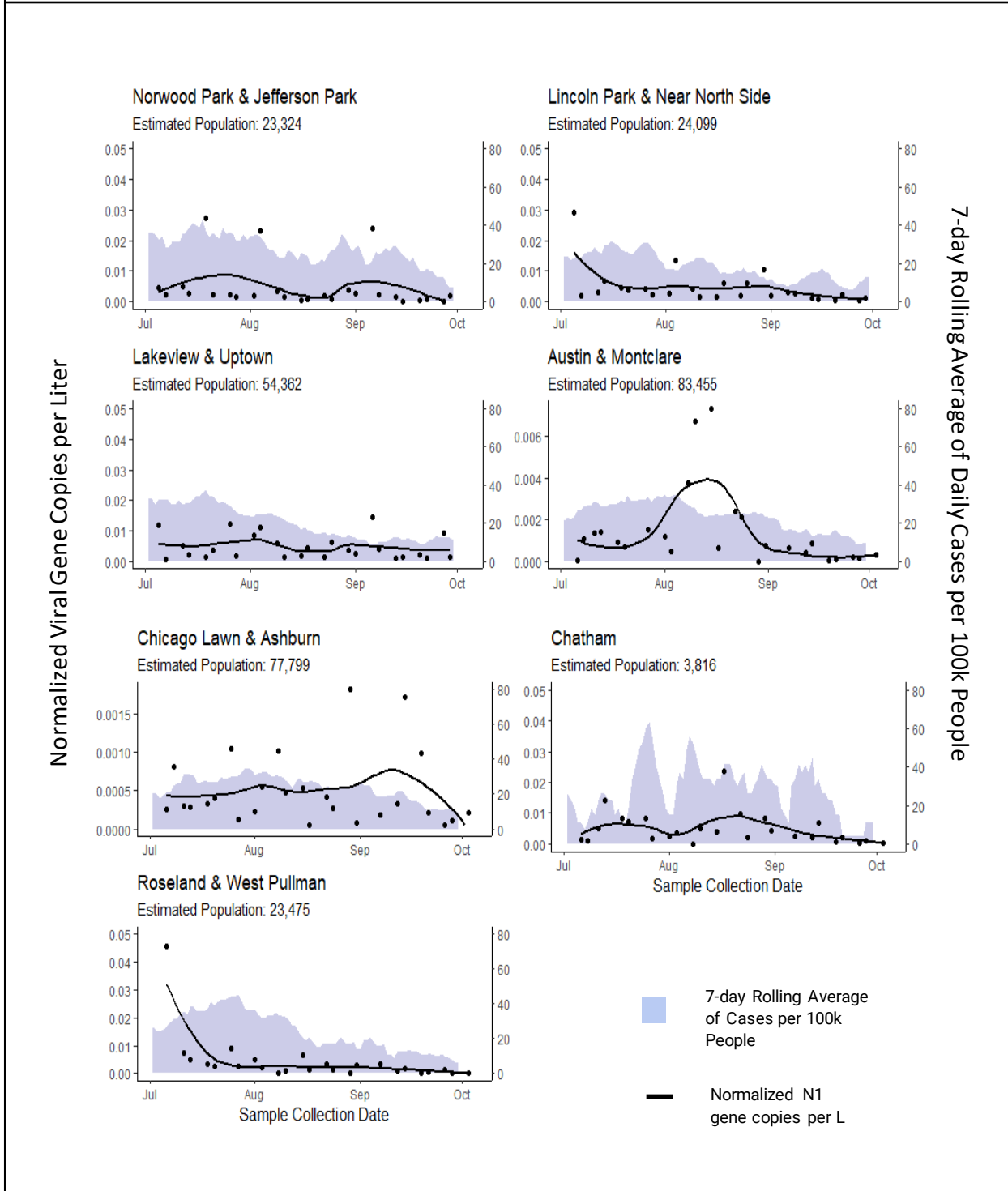


Figure 3. SARS-CoV-2 concentration at 7 sewersheds in Chicago normalized to the concentration of the human waste signal marker PMMoV (lines) and compared to the 7-day rolling average of daily infections in each sewershed per 100,000 people (blue). Catchment population estimates were calculated using 2020 US Census data.



In September, both the concentration of SARS-CoV-2 and reported COVID-19 cases trended downward for the Chicago region. Within the City of Chicago, cases also decreased through the end of September, though trend in the concentration in wastewater varied. Exactly why the trend in reported case counts differ from the trend in viral concentration in wastewater is still under investigation, but the greater use of rapid at-home tests (which are not usually reported to public health authorities) might account for some of the difference. The patterns of viral shedding into wastewater, which can also differ by viral lineage, may also contribute. CDPH collects samples throughout the city at the local sewer level to better observe these differences in the wastewater signal. **(Figure 3).**

Monitoring variants of SARS-CoV-2

Like all viruses, SARS-CoV-2 constantly changes through genetic mutation. These mutations can lead to the emergence of new SARS-CoV-2 variants and sublineages of those variants. Omicron and Delta are examples of SARS-CoV-2 variants of concern, while BA.2.12.1 and BA.4 are examples of sublineages of the Omicron SARS-CoV-2 variant of concern.

When SARS-CoV-2 is identified in wastewater, specialized laboratory testing, including genomic sequencing, can identify variants, including variants of concern and their sublineages. The initial Omicron wave was driven by the BA.1 sublineage, though as with clinical samples the BA.2 sublineage and its descendants have been the dominant sublineage in Cook County wastewater samples. In late June we observed another change, with sublineages BA.4 and BA.5 overtaking BA.2 and its descendants as the predominant sublineage group. At several locations, >80% of sequences were BA.4 or BA.5 as of September 24th.

Summary

We continued to observe regional trends in the viral concentration in wastewater in the Chicago region, with the overall viral signal declining throughout most of September. Additionally, localized sampling at the local sewer scale show that the viral concentration levels are trending downward throughout the city of Chicago itself. We continued to collect samples from the three largest treatment plants in Cook County five times per week to gather better trend information. The concentration of virus is trending downward and is reflective of COVID-19 case counts in the city.

What comes next?

IDPH, CCDPH and CDPH continue to refine wastewater monitoring systems in the Chicago region and across the state. As the use of rapid At-Home COVID-19 tests increases, a smaller proportion of COVID-19 cases may be reported to public health departments. Wastewater data, which is not affected by reporting to public health authorities, may become more valuable for monitoring levels of community transmission. Wastewater will also continue to be used to track the presence and proportion of SARS-CoV-2 variants and sublineages.

We anticipate continuing to produce reports in the future, and updated data is available through the [Wastewater Surveillance dashboard on the CDC's COVID-19 Data Tracker](#).

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