

Chicago Department of Public Health establishes a Regional Innovative Public Health Laboratory to provide SARS-CoV-2 genomic sequencing

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The Chicago Department of Public Health established the Regional Innovative Public Health Laboratory, which now provides local genomic sequencing capacity. This capacity has allowed the Department to better evaluate SARS-CoV-2 variant growth rates to inform local mitigation measures.



The “What”

As more SARS-CoV-2 variants of concern and their sub-lineages were introduced and spread throughout the US, the need for routine genomic surveillance and rapid SARS-CoV-2 genomic sequencing capabilities became more important. Epidemiology and Laboratory Capacity for the Prevention and Control of Emerging Infectious Diseases (ELC) funding helped CDPH establish the Regional Innovative Public Health Laboratory (RIPHL), which now provides local genomic sequencing capacity. As new COVID-19 Omicron sublineages were identified, it was critical to evaluate how new Omicron sublineages compared to other variants of concern to evaluate the need to implement local mitigation.

In 2022, CDPH ELC-funded staff and RIPHL laboratory partners began to monitor the growth rates of emerging variants. Logistic growth rates are used to measure how quickly variants are growing in the population; quickly expanding variants likely have an advantage over existing variants due to evasion of immune responses or increased transmissibility. These rates are calculated for all variants that are designated on the CDC COVID Data Tracker for Lineage Proportions and currently increasing in prevalence locally. CDPH uses these growth rates to determine an ‘Early Alert Signal’ level (Figure 1) and compares the rate of emergence of new variants to concurrent and past variants.



CDPH developed a **playbook for future variant detection**, outlining a public health laboratory response with multiple tiers to rapidly respond to new SARS-CoV-2 variants of interest or concern.

The “So What”

Over 12,000 SARS-CoV-2 positive specimens have been sequenced by RIPHL, with approximately 6,100 specimens sequenced in 2022 (a 144% increase from 2021). At the end of January 2023, XBB, BN.1, CH.1.1, and XBB.1.5 were the most common circulating SARS-CoV-2 omicron sublineages circulating in Chicago. CDPH established an 'Early Alert Signal' which contextualizes the variant sublineages growth in relative prevalence into three categories: low concern, medium concern, and high concern (Figure 1). As of June 2023, Chicago has remained at a medium concern threshold for the past 6 months as new sublineages have demonstrated a logistic growth rate between .05-.13 each week. Along with other local metrics (wastewater concentration levels, case rates, COVID-19 admissions, and percent staffed inpatient beds), CDPH leverages the SARS-CoV-2 variant concern assessment to inform local mitigation strategies.

	Concern assessed as low	Concern assessed as medium	Concern assessed as high
SARS-CoV-2 variant concern assessment	<p>Relatively stable lineage proportions for ~2 weeks (i.e. no lineage with log growth rate >0.05)</p> <p style="text-align: center;">AND</p> <p>No VOHC designated. No 'particularly concerning' VOC detected anywhere in the world.</p>	<p>A variant or sublineage increasing in relative prevalence locally (log growth rate 0.05-0.13)</p> <p style="text-align: center;">OR</p> <p>A VOHC designated or 'particularly concerning' VOC detected somewhere.</p>	<p>A variant or sublineage rapidly increasing in relative prevalence locally (log growth rate >0.13)</p> <p style="text-align: center;">OR</p> <p>A VOHC designated or 'particularly concerning' VOC detected in the United States.</p>

Figure 1. CDPH Early Alert Signal level definitions. VOHC = Variant of High Consequence.

The “Now What”

RIPHL provides genomic surveillance for SARS-CoV-2 at the local level and will provide infrastructure for genomic surveillance of other pathogens of high consequence in the future. Funded by ELC, these activities have allowed CDPH to have timely local sequencing data to make informed decisions about next steps in the COVID-19 response. CDPH aims to improve the early alert signal metric as the characteristics of the pandemic change over time including formal analyses comparing the utility of local sequencing capacity versus sequencing at the state health department and data available through CDC's sequencing work. CDPH developed a playbook for future variant detection, outlining a public health laboratory response with multiple tiers to rapidly respond to new SARS-CoV-2 variants of interest or concern. Increased sequencing capacity also has the potential to be applied to other diseases of public health significance.

Key contributors to this project include Alyse Kittner and other members of Lab-based Surveillance program at Chicago Department of Public Health, and members of the Regional Innovative Public Health Laboratory (RIPHL) at RUSH University Medical Center.