

Using Wastewater Surveillance, Partnerships, and Predictive Modeling to Support Public Health Response in Louisville, Kentucky



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CATEGORY: Wastewater Surveillance

In Louisville, wastewater surveillance has evolved from a tool for monitoring current disease activity into a broader system for early detection, targeted investigation, and predictive modeling.

The “What”

Public health teams often face the same challenge during emerging health threats: clinical surveillance can be delayed, incomplete, or uneven across communities. Clinical testing depends on access and individual behavior, which can limit how quickly health departments understand what is happening in real time. Utilizing wastewater surveillance in these situations provides a complementary source of information because it can detect pathogens circulating across a community without relying on individuals to seek testing or medical care.

In Louisville, wastewater surveillance has evolved from a tool for monitoring current disease activity into a broader system for early detection, targeted investigation, and predictive modeling. Through partnerships among the Metropolitan Sewer District (MSD), Louisville Metro Department of Public Health and Wellness (LMPHW), the University of Louisville (UofL), and other local partners, wastewater results can be interpreted alongside clinical, epidemiologic, environmental, and community data.



One example of this evolution is a partnership with Jefferson County Public Schools (JCPS) that combined wastewater measurements with weather conditions to predict patterns in student attendance during the 2025-2026 school year. Rather than using wastewater data only to describe disease activity occurring today, this model tests whether those signals can help anticipate population-level impacts in the days ahead. This predictive approach has the potential to give schools and public health partners additional time to prepare for periods of increased respiratory illness and absenteeism.

The “So What”

Louisville’s wastewater surveillance work has directly supported public health situational awareness by providing an independent measure of infectious disease activity that can be reviewed alongside traditional surveillance. MSD collects wastewater samples, UofL researchers conduct and interpret laboratory and analytic work, and LMPHW reviews wastewater findings in the context of clinical and other public health surveillance data. Depending on the public health question, additional partners such as JCPS can contribute data and help translate findings into sector-specific decisions. During respiratory disease surveillance, for example, wastewater trends can provide evidence that influenza, COVID-19, or other pathogens are increasing in the community even when clinical testing is limited. This gives public health partners another source of information for determining whether observed increases in cases or healthcare utilization represent isolated events or broader community transmission.





Representatives from the Metropolitan Sewer District, Louisville Metro Department of Public Health and Wellness, and the University of Louisville collaborated to transform wastewater surveillance into a system for early detection, targeted investigation, and predictive modeling.

Wastewater surveillance has also been used for targeted investigations of emerging threats. When a pathogen of concern is detected, or when clinical, environmental, or other surveillance suggests a potential threat, wastewater can help determine whether there is evidence of broader, population-level circulation. Conversely, the absence of a sustained wastewater signal can provide important context when evaluating an isolated detection. This ability to distinguish persistent community signals from background or transient detections can help partners determine when additional sampling, investigation, communication, or other response activities are warranted.

Together, these activities represent a broader Louisville wastewater surveillance and response program built around collaboration among wastewater utilities, academic researchers, and public health.

The “Now What”

The Louisville wastewater surveillance program continues to evolve from surveillance toward a more integrated early warning and decision-support framework. Current efforts include continued development of decision frameworks and workflows that connect specific wastewater findings with clearly defined next steps. Future efforts will focus on across-agency partnerships and developing adaptable decision trees that reflect local capacity, available resources, and existing collaboration to support coordinated and actionable responses.

For Louisville residents, the ultimate value of this work is not simply generating more data. It is creating a system that can recognize emerging health threats earlier, identify where additional investigation is most useful, reduce uncertainty during rapidly changing events, and give public health and community partners more time to respond. Earlier information can support more timely communication, better targeting of limited public health resources, and more proactive preparation by organizations such as schools and healthcare providers. By connecting wastewater surveillance, traditional public health data, local partnerships, and predictive modeling, Louisville is working toward a surveillance system that moves from detecting what has already happened to helping communities prepare for what may happen next.



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