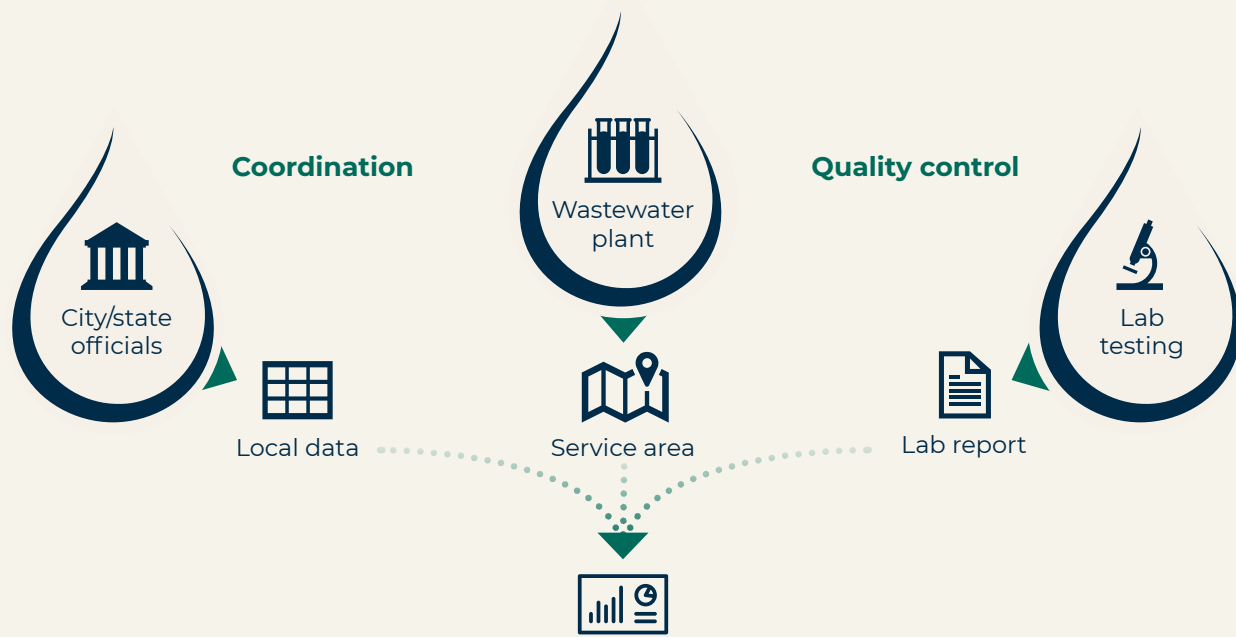


Expanding COVID-19 Surveillance Through Wastewater Testing



Synthesizing, analyzing, and translating wastewater data into policy insights

Why test wastewater?

Public health threats like the COVID-19 pandemic can come with little to no warning. Sewage surveillance can change that. By testing samples of municipal wastewater, officials can quickly assess the presence and spread of COVID-19 infections in their community. For communities without documented cases, wastewater testing can provide an early warning when the virus enters, and for second-wave infections. In communities already exposed, repeated testing can identify shifts in viral epicenters, whether transmission is rising or waning, and when it's safe to lift restrictions such as social distancing without endangering public health.

Mathematica's scalable solutions offer the confidence and clarity to address COVID-19's complex challenges. Our evidence-based approach is built on decades of experience to help you: quickly scale response to the current crisis, guide responsible recovery for your community, and strengthen resilience to better meet the evolving challenges moving forward.

To boost COVID-19 pandemic response, learn more about how we can partner with state and local officials to combine individual testing with wastewater testing—a cutting-edge surveillance tool that has broad population coverage.

By sampling and testing wastewater, which combines household sewage, industrial runoff, and sometimes storm water, officials can quickly assess viral levels among thousands of people in the community. This innovative strategy to test populations can shed light on infections among those who are asymptomatic or do not present for testing, and at a small fraction of the cost of testing individuals. We work alongside our community partners to:

- Synthesize wastewater data with local data on community demographics, social vulnerability, patients' health care needs, and providers' capacity;

- Apply advanced analytics and visualization techniques to uncover data gaps and hidden insights;
- Develop a data-driven strategy to help officials target individual testing and medical equipment;
- Evaluate how effective official policies are in mitigating the spread of the virus.

Once implemented, wastewater testing can become a cost-effective means for directing COVID-19 response to protect those most vulnerable to the SARS-CoV-2 virus.

Scale response to address testing gaps

A single wastewater sample collected at a central treatment plant can reflect the viral exposure of *thousands* of people. This means that officials can test large segments of the population at a fraction of the cost and a fraction of the time, compared to testing individuals. Across the country's 15,000 wastewater treatment plants, employees already test wastewater to measure roughly 90 toxins regulated by the U.S. Environmental Protection Agency. Because the methodology builds on this existing infrastructure, officials can quickly implement and deploy wastewater testing to assess the threat posed by untested segments of the population.

To scale up wastewater testing for pandemic control, Mathematica is actively working alongside government, research, and scientific communities. We are developing a service ecosystem that connects the sampling to the testing, and the testing results to other data sources. Lessons from previous epidemics and other countries that have broadly deployed wastewater testing inform our work.

Guide responsible recovery using wastewater data

The key to translating wastewater data into policy insights that can inform recovery is data triangulation. For the opioid epidemic, Mathematica's comparative analysis of wastewater data alongside pharmacy, law enforcement, and emergency medical response data in Montana gave a roadmap for how sewage surveillance can provide an early warning for health threats, fill in knowledge gaps, and evaluate the impact of official actions.

Our data, policy, and health professionals can identify features associated with higher rates of COVID-19 infections or deaths. We can then examine the association between these features and increased viral loads in the wastewater. Doing so can help officials assess where to send resources or how to triage new treatments or vaccines.



Snapshots of circulating viral levels in a community provide an early warning for second-wave infections.



Trends in viral loads over time can help determine when to lift restrictions such as social distancing.



Hot spots of viral activity inform a data-driven strategy to target individual testing and resources.



The value of comprehensive, rapid, and scalable testing coverage for policymaking is unmatched.

Strengthen resilience with flexible monitoring

To equip officials with the data needed to build resilience, Mathematica brings innovative solutions to complex challenges. With wastewater testing, the same infrastructure and workflows developed to address the COVID-19 pandemic now can provide an early warning for second-wave infections and a range of infectious disease threats. For example, in India and Israel, routine sewage surveillance led to early detection of the poliovirus, and when coupled with epidemiologic modeling, enabled officials to curtail the spread of the virus. Our goal is to provide U.S. officials with the tools needed to stem future public health issues before they develop into crises or epidemics.

Mathematica's scalable services provide our partners with the confidence and clarity they need to take on the complex challenges of COVID-19. To learn more about Mathematica's other services to help officials scale response, recovery, and resilience to address COVID-19, visit www.mathematica.org/services/covid19 or email Aparna Keshaviah at akeshaviah@mathematica-mpr.com or John Stern at jstern@mathematica-mpr.com.

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