



On December 8, 2022, Arizona State University issued a [press release](#) that announced the results of a [study](#) in Lancet Microbe that demonstrated that health hazard detection in municipal sewer systems can provide early warning for pandemics and other public health risks. Recently, media outlets have published stories indicating that various airlines have started testing wastewater for the presence of SARS-CoV-2 among other pathogens on flights arriving from China:

CNN:

“CDC has tested wastewater from aircraft amid concerns over Covid-19 surge in China”

The Baltic Times:

“Vilnius Airport to test wastewater amid COVID-19 situation in China”

Bloomberg.com:

“Malaysia to Test Wastewater From Flights Arriving From China”

In October 2022, the Biden Administration published the [National Biodefense Strategy and Implementation Plan](#). From that document:

GOAL 1. Enable Risk Awareness and Detection to Inform Decision-Making across the Biodefense Enterprise

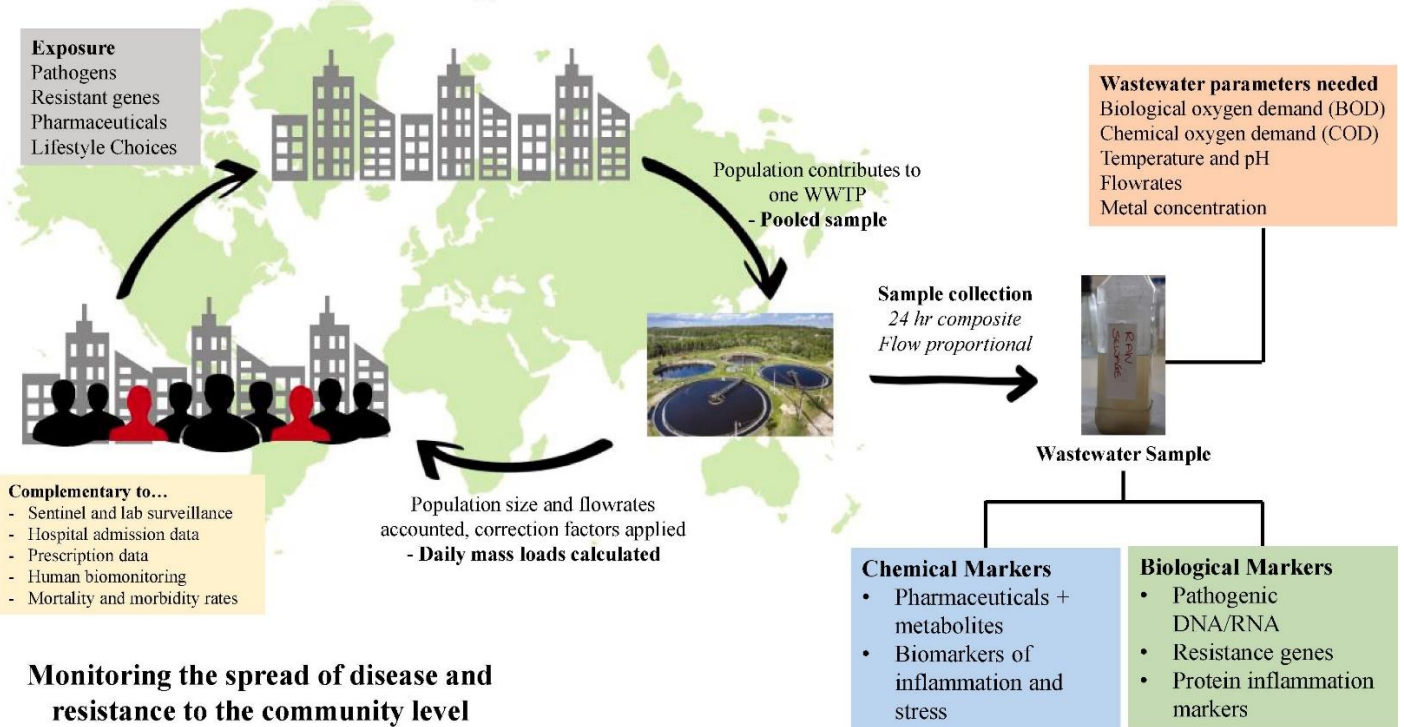
“1.1.3. Data Integration for Early Warning

After receiving relevant information and data, share domestically and internationally, ... tightly integrated with existing state, local, tribal, and territorial (SLTT), national, and international surveillance and monitoring systems for public health, animal health†, plant health, and water infrastructure.”

“I. Develop a U.S. Government early warning joint capabilities plan to: ... focus on areas including, but not limited to, data platforms and sharing, real-world evidence based infectious disease modeling, reportable disease lists, improved integration of laboratory response, and **wastewater** and environmental surveillance, as well as insights gleaned from outreach and partnerships described herein.”

These stories and others reflect a renewed interest in wastewater-based epidemiology (WBE). According to Wikipedia, WBE “analyzes wastewater to determine the consumption of, or exposure to, chemicals or pathogens in a population. This is achieved by measuring chemical or biomarkers in wastewater generated by the people contributing to a sewage treatment plant catchment.” The following graphic displays the process of sampling wastewater:

Wastewater-Based Epidemiology



Source: Natalie Sims and Barbara Kasprzyk-Hordern. Future perspectives of wastewater-based epidemiology: Monitoring infectious disease spread and resistance to the community level. *Environment International* 139 (2020). Article 105689.

Federal, state, and local governments share a responsibility to provide clean drinking water to protect the nation’s health. The federal government, through the EPA, works with its federal, state, and tribal regulatory partners to monitor and ensure compliance with clean water laws and regulations. The Clean Water Act (CWA) is the primary law governing water pollution. The CWA’s [National Pollutant Discharge Elimination System \(NPDES\)](#) Program regulates point sources that discharge pollutants into waters of the United States.



Given the speed and frequency at which a potential pathogen can spread to cause a pandemic, what private sector industry groups or companies can play a role in preventing or mitigating the effects of the next pandemic?

Geospatial Intelligence (GEOINT) Community:

- The near-real-time monitoring of automobile traffic patterns into or out of cities in which a pathogen biomarker is detected in wastewater
- The near-real-time monitoring of airline traffic patterns into or out of major hubs where a pathogen biomarker is detected in airplane wastewater
- The location of confined animal feeding operations (CAFO) in cities where a pandemic may be starting
- Geospatial analysis of geo-tagged social media images in cities or locations where a pandemic may be starting
- Impact of a pandemic on the environment using high-resolution imagery and change detection

Academic Health Centers (AHCs). Particularly those that have engineering, medical, and veterinary schools:

- The ability to research, model, and analyze the detection and measuring of chemical contaminants and biomarkers in wastewater could prove to be very valuable.
- The ability to research, model, and analyze the zoonotic transmission of animal pathogens to humans would also be very valuable.
- Scholarship and publication of national health security policy issues related to infectious disease pandemics in high-impact journals can attract well-funded faculty and help to diversify funding streams for AHCs
- The synergy created by access to clinical adult and pediatric infectious disease subject matter experts and wastewater engineering subject matter experts who can collaborate on federal RO1 research grant proposals
- The ability to bring AI/ML/Deep Learning modalities to the classroom and the research lab to speed the discovery of vaccines and tests for infectious disease pathogens in wastewater

These and other “communities,” such as the open-source intelligence (OSINT) industry, which can monitor social media posts, can also play a role in wastewater monitoring to prevent and help to mitigate the next pandemic.