



Biobot Analytics

# Diving into Data: How Wastewater Complements Other Public Health Data Systems

**Krisandra Allen, MPH**

May 2022

Meeting Recording:

<https://us02web.zoom.us/rec/share/cus-gsFh9gn-mBkQhVugkZXeY44lZ9FJBvPQoz2VIWwg6XijHSDRTXiNVYwbGV1Z.oWcPVvz6xw3uy4gc>

# Outline

- Overview and importance of public health data collection systems
  - Definitions
  - History
  - Legal Authority
- Example of COVID-19 case data
  - How the system works
  - What are some of the challenges?
- Data to action: outbreak examples
- Wastewater testing for public health
  - How does wastewater complement other sources?
  - What are some future possibilities?

# Overview and importance of public health data collection

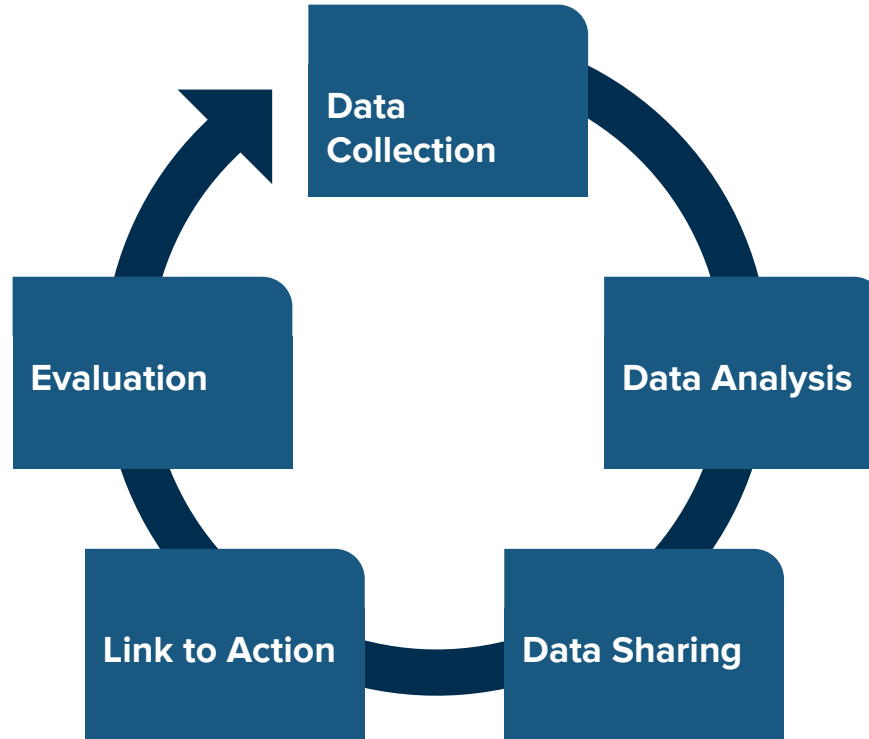
# Technical Term Alert: Public Health Surveillance

Public health surveillance is “...the ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice.”

— *Field Epidemiology*

Adapted by the CDC from: Thacker SB, Birkhead GS. Surveillance. In: Gregg, MB, ed. Field epidemiology. Oxford, England: Oxford University Press; 2008.

# Data collected should drive action



# Public health data collection has a long history in the U.S.

- **1741** – Rhode Island passed an act requiring tavern keepers to report contagious disease
- **1850** – Mortality statistics first published by the federal government for the U.S.
- **1874** – Massachusetts instituted weekly reporting of diseases by physicians
- **1889** – Congress establishes Public Health Service Commissioned Corp, whose officers still contribute to public health disease surveillance today
- **1925** – All states began participating in national morbidity\* reporting
- **1935** – First national health survey
- **1946** – “Communicable Disease Center (CDC)” created in Atlanta with the mission of controlling malaria
- **1951** – Council of State and Territorial Epidemiologists (CSTE) authorized to determine diseases to be reported to the Public Health Service
- **1961** – Morbidity and Mortality Weekly Report (MMWR) published

\*The condition of suffering from a disease or medical condition.

# Disease reporting is legally mandated

- List of conditions varies by state
- Primarily for infectious conditions
- More non-infectious conditions are being added over time
- Process to update varies by state

## Washington State 2021 conditions added

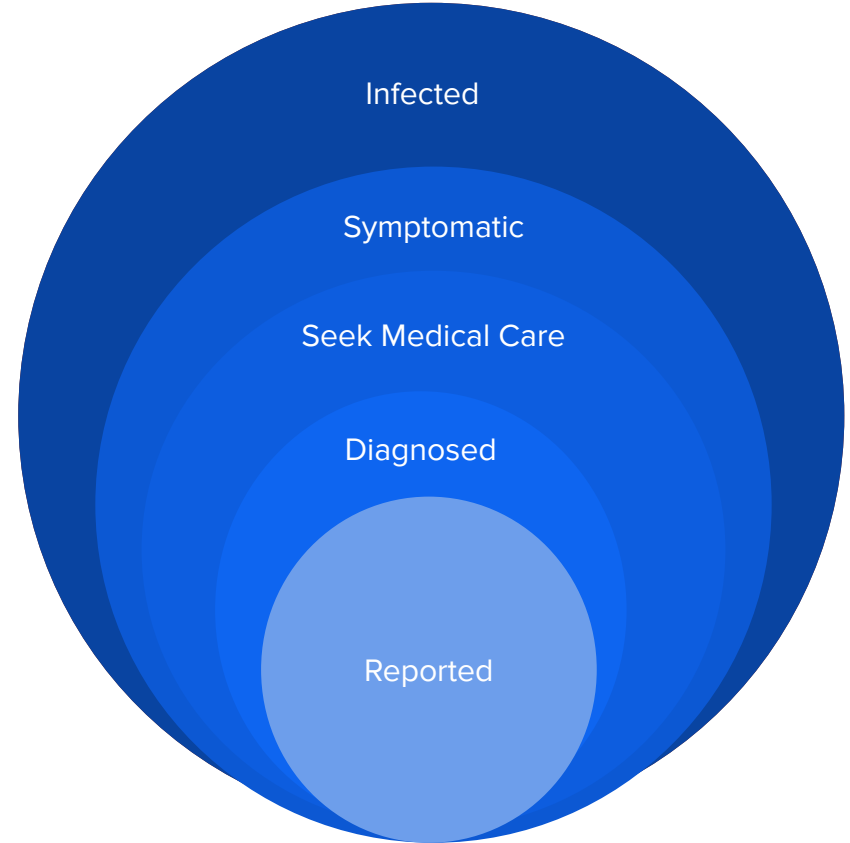
|  |  |   |
|--|--|---|
| <ul style="list-style-type: none"> <li>● Amebic Meningitis</li> <li>● Anaplasmosis</li> <li>● Babesiosis</li> <li>● Baylisascariasis</li> <li>● Candida Auris</li> <li>● Certain Carbapenem-Resistant Enterobacteriaceae Infections</li> <li>● Chagas Disease</li> </ul> | <ul style="list-style-type: none"> <li>● Coccidioidomycosis</li> <li>● Cryptococcus gattii</li> <li>● Cysticercosis</li> <li>● Echinococcosis</li> <li>● Ehrlichiosis</li> <li>● Nonfatal Gunshot Wound</li> <li>● Histoplasmosis</li> </ul> | <ul style="list-style-type: none"> <li>● Hypersensitivity Pneumonitis-Occupational</li> <li>● Pregnancy in Patients with Hepatitis B</li> <li>● Rickettsia Infection</li> <li>● Silicosis</li> <li>● Taeniasis</li> <li>● Tick Paralysis</li> <li>● Typhus</li> </ul> |
|--|--|---|

Reporting of the following diseases is required by state law (Sections 32.1-36 and 32.1-37 of the Code of Virginia and 12 VAC 5-90-80 of the Board of Health Regulations for Disease Reporting and Control – <http://www.vdh.virginia.gov/surveillance-and-investigation/division-of-surveillance-and-investigation/commonwealth-of-virginia-state-board-of-health/>). Report all conditions when suspected or confirmed to your local health department (LHD). Reports may be submitted by computer-generated printout, Epi-1 form, CDC or VDH surveillance form, or upon agreement with VDH, by means of secure electronic submission.

**BOLD** = Laboratories must submit initial isolate or other initial specimen to the Division of Consolidated Laboratory Services (DCLS) within 7 days of identification. All specimens must be identified with patient and physician information, and the LHD must be notified within the timeframe specified below.

| REPORT IMMEDIATELY   | REPORT WITHIN 3 DAYS   |
|--|--|
| <p>Anthrax (<i>Bacillus anthracis</i>) [a]</p> <p>Botulism (<i>Clostridium botulinum</i>) [a]</p> <p>Brucellosis (<i>Brucella</i> spp.) [a]</p> <p>Cholera (<i>Vibrio cholerae</i> O1/O139) [a]</p> <p>Coronavirus infection, severe (e.g., SARS-CoV, MERS-CoV) [a]</p> <p>Diphtheria (<i>Corynebacterium diphtheriae</i>) [a]</p> <p>Disease caused by an agent that may have been used as a weapon</p> <p><b>Haemophilus influenzae</b> infection, invasive [a]</p> <p>Hepatitis A [a]</p> <p>Influenza-associated deaths if younger than 18 years of age</p> <p>Influenza A, novel virus [a]</p> <p>Measles (Rubella) [a]</p> <p>Meningococcal disease (<i>Neisseria meningitidis</i>) [a]</p> <p>Outbreaks, all (including but not limited to foodborne, healthcare-associated, occupational, toxic substance-related, waterborne, and any other outbreak)</p> <p>Pertussis (<i>Bordetella pertussis</i>) [a]</p> <p>Plague (<i>Yersinia pestis</i>) [a]</p> <p>Poliovirus infection, including poliomyelitis [a]</p> <p>Psittacosis (<i>Chlamydia philipii</i>) [a]</p> <p>Q fever (<i>Coxiella burnetii</i>) [a]</p> <p>Rabies, human and animal [a]</p> <p>Rubella [a], including congenital rubella syndrome [a]</p> <p>Smallpox (Variola virus) [a]</p> <p>Syphilis (<i>Treponema pallidum</i>), congenital, primary, and secondary [a]</p> <p>Tuberculosis, active disease (<i>Mycobacterium tuberculosis</i> complex) [a,b]</p> <p>Tularemia (<i>Francisella tularensis</i>) [a]</p> <p>Typhoid/Paratyphoid infection (<i>Salmonella</i> Typhi, <i>Salmonella</i> Paratyphi) [a]</p> <p>Unusual occurrence of disease of public health concern</p> <p>Vaccinia, disease or adverse event [a]</p> <p>Vibriosis (<i>Vibrio</i> spp.) [a,e]</p> <p>Viral hemorrhagic fever [a]</p> <p>Yellow fever [a]</p> | <p>Amebiasis (<i>Entamoeba histolytica</i>) [a]</p> <p>Arboviral infections (e.g., CHIK, dengue, EEE, LAC, SLE, WNV, Zika) [a]</p> <p>Babesiosis (<i>Babesia</i> spp.) [a]</p> <p>Campylobacteriosis (<i>Campylobacter</i> spp.) [a]</p> <p><b>Candida auris</b>, infection or colonization [a,c]</p> <p>Carbapenemase-producing organism, infection or colonization [a]</p> <p>Chancroid (<i>Haemophilus ducreyi</i>) [a]</p> <p>Chickenpox (Varicella virus) [a]</p> <p><b>Chlamydia trachomatis</b> infection [a]</p> <p>Cryptosporidiosis (<i>Cryptosporidium</i> spp.) [a]</p> <p>Cyclosporiasis (<i>Cyclospora</i> spp.) [a]</p> <p>Ehrlichiosis/Anaplasmosis (<i>Ehrlichia</i> spp., <i>Anaplasma phagocytophilum</i>) [a]</p> <p>Giardiasis (<i>Giardia</i> spp.) [a]</p> <p>Gonorrhea (<i>Neisseria gonorrhoeae</i>) [a]</p> <p>Granuloma inguinale (<i>Calymmatobacterium granulomatis</i>)</p> <p>Hantavirus pulmonary syndrome [a]</p> <p>Hemolytic uremic syndrome (HUS)</p> <p>Hepatitis B (acute and chronic) [a]</p> <p>Hepatitis C (acute and chronic) [a]</p> <p>Hepatitis, other acute viral [a]</p> <p>Human immunodeficiency virus (HIV) infection [a]</p> <p>Influenza, confirmed seasonal strain [a]</p> <p>Lead, blood levels [a]</p> <p>Legionellosis (<i>Legionella</i> spp.) [a]</p> <p>Leprosy/Hansen's disease (<i>Mycobacterium leprae</i>)</p> <p>Leptospirosis (<i>Leptospira interrogans</i>) [a]</p> <p>Listeriosis (<i>Listeria monocytogenes</i>) [a]</p> <p>Lyme disease (<i>Borrelia</i> spp.) [a]</p> <p>Lymphogranuloma venereum (<i>Chlamydia trachomatis</i>)</p> <p>Malaria (<i>Plasmodium</i> spp.) [a]</p> <p>Mumps [a]</p> <p>Neonatal abstinence syndrome (NAS)</p> <p>Ophthalmia neonatorum</p> <p>Rabies treatment, post-exposure</p> <p>Salmonellosis (<i>Salmonella</i> spp.) [a]</p> <p>Shiga toxin-producing <i>Escherichia coli</i> infection [a,d]</p> <p>Shigellosis (<i>Shigella</i> spp.) [a]</p> <p>Spotted fever rickettsiosis (<i>Rickettsia</i> spp.) [a]</p> <p>Streptococcal disease, Group A, invasive or toxic shock [a]</p> <p><b>Streptococcus pneumoniae</b> infection, invasive and &lt;5 years of age [a]</p> <p>Syphilis (<i>Treponema pallidum</i>), if not primary, secondary, or congenital</p> <p>Tetanus (<i>Clostridium tetani</i>)</p> <p>Toxic substance-related illness [a]</p> <p>Trichinosis/Trichinellosis (<i>Trichinella spiralis</i>) [a]</p> <p>Tuberculosis infection [a]</p> <p>Vancomycin-intermediate or vancomycin-resistant <i>Staphylococcus aureus</i> infection [a]</p> <p>Yersiniosis (<i>Yersinia</i> spp.) [a]</p> |
| LEGEND   |  |
| <p>[a] Reportable by directors of laboratories. These and all other conditions listed must be reported by physicians and directors of medical care facilities.</p> <p>[b] Laboratories report AFB, <i>M. tuberculosis</i> complex or any other mycobacteria, and antimicrobial susceptibility for <i>M. tuberculosis</i> complex.</p> <p>[c] Includes submission of <i>Candida haemulonii</i> specimens to DCLS.</p> <p>[d] Laboratories that use EIA without a positive culture should forward positive stool specimens or enrichment broth to DCLS.</p> <p>[e] Includes reporting of <i>Photobacterium damsela</i> and <i>Grimontia hollisae</i>.</p>  |  |

# Public Health case reporting iceberg





# Why is tracking disease activity important?

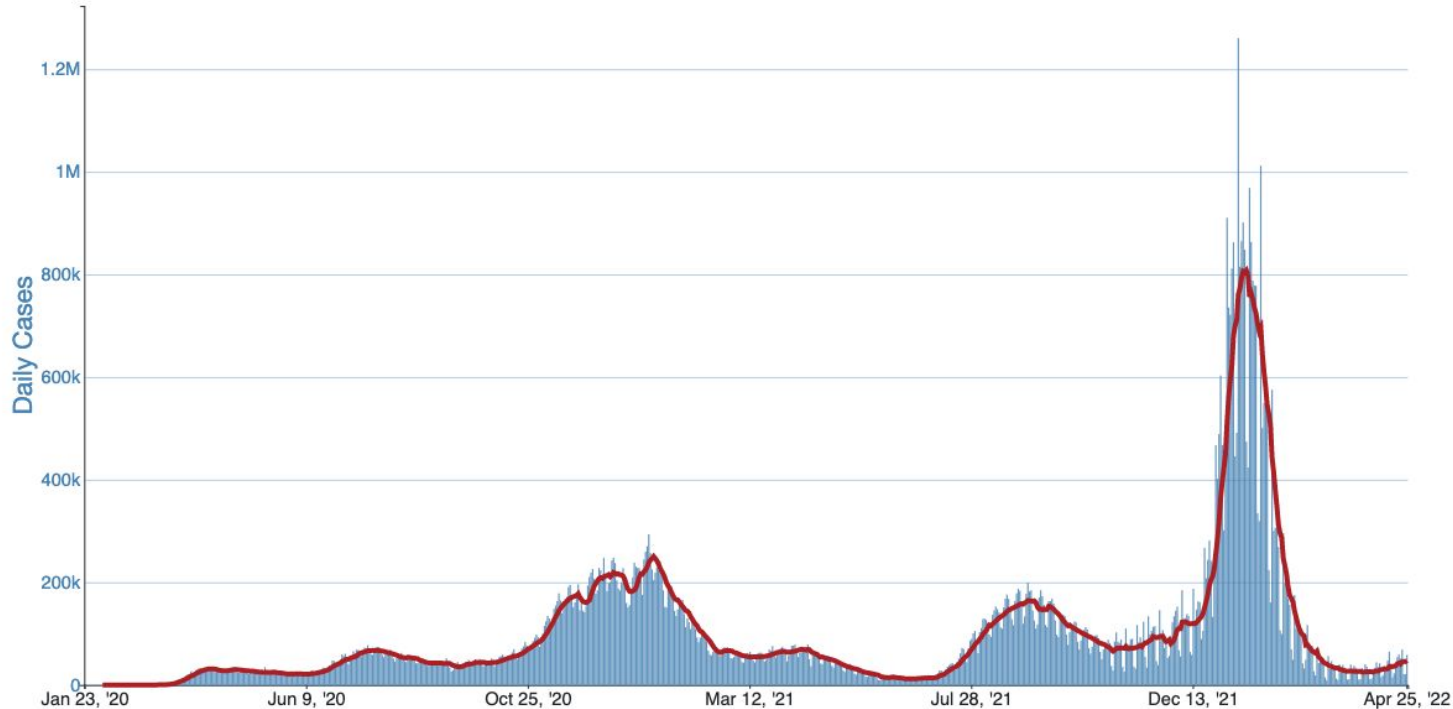
Helps prevent and control disease by:

- Describing disease trends
- Identifying and controlling sources of infection
- Educating the public, policy makers and healthcare planners so they can make informed decisions

# COVID-19 Case Reporting Example

# The final product - national epidemiological curve

Daily Trends in Number of COVID-19 Cases in The United States Reported to CDC



- Daily reported cases in the blue bars
- 7-day rolling average of cases as the red line

# How does the CDC get all that data?

Laboratories



Facilities/Clinicians



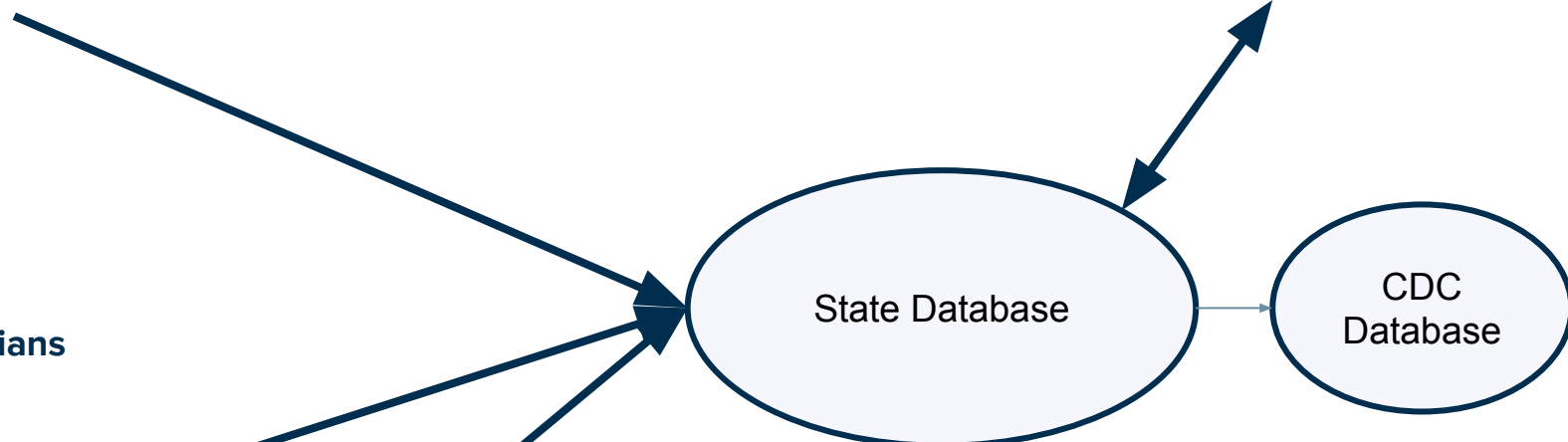
Health Department Staff

Epidemiologists



State Database

CDC Database



# Work of epidemiologists to clean and share case data



- Apply the case definition
- De-duplication and matching
- Investigate case
- Update database

# Case Definitions: when is a case a case?

- **Goal:** When you look at case counts across states, everyone is classifying things the same way
- **Mechanism:** Epidemiologists get together and write out long complicated criteria on how to count cases of a disease
- **Outcome:** It works...to a degree

# What counts as a case for COVID-19?

## Suspect

- Someone who tests positive at home

## Probable

- Someone who tests positive on an antigen test in a clinic/testing site
- Someone who is linked to a person that tests positive

## Confirmed

- Someone who tests positive using a molecular test (PCR is a common type of molecular test)

# When is a case a case, again?

- Prior to September 2021, everyone only got counted once, no matter how many times they tested positive
- Only exception was for cases that had specimens sequenced - if someone was confirmed to have two different variants, they were counted a second time
- Case definition changed in August 2021 to say that anyone who tests positive at least 90 days apart gets counted again



# A person, by any other name, is not the same person...or are they?

**Name:** Jan Smith

**DOB:** 1987-04-16

**Address:** 8392 Osprey Lane, Anytown

**Collection Date:** 2022-04-07

**Name:** Jon Smith

**DOB:** 1987-04-16

**Address:** 3938 Quail Lane, Anytown

**Collection Date:** 2021-08-25

**Option 1:** This is the same person and there was a typo or name change, and they've recently moved

**Option 2:** Twins that live nearby

# Investigate cases - data collection and action



FAX to Spokane Regional Health District Epidemiology 509-324-3623

Clear Form

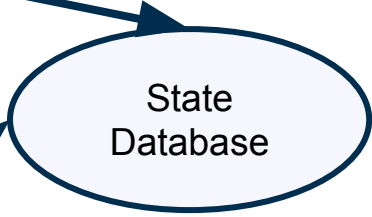
| COVID-19 CASE REPORTING FORM   |   |  |   |
|--|---|--|---|
| <b>Section 1: PATIENT DEMOGRAPHICS REQUIRED</b>                        |   |  |   |
| FIRST NAME:  |   | LAST NAME:   | Date of birth:  |
| Patient address:   |   |  | Sex at birth:<br><input type="checkbox"/> Female <input type="checkbox"/> Male                      |
| City   | State<br><b>WA</b>  | Zip  | PHONE:  |
| RACE: <input type="checkbox"/> Asian<br><input type="checkbox"/> White | <input type="checkbox"/> Black<br><input type="checkbox"/> Native Hawaiian/Other Pac Islander | <input type="checkbox"/> American Indian/Alaska Native<br><input type="checkbox"/> Unknown | ETHNICITY: <input type="checkbox"/> Hispanic/Latino<br><input type="checkbox"/> Not Hispanic/Latino |

“You’re a college student?” Is this your home or school address?

| CLINICAL INFORMATION  |  |
|---|--|
| Complainant ill <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk Symptom Onset ___/___/___ <input type="checkbox"/> Derived Diagnosis date ___/___/___   |  |
| Illness duration ___ <input type="checkbox"/> Days <input type="checkbox"/> Weeks <input type="checkbox"/> Months <input type="checkbox"/> Years Illness is still ongoing <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk |  |
| Disease suspected <input type="checkbox"/> MERS <input type="checkbox"/> SARS <input type="checkbox"/> Other novel coronavirus  |  |
| <b>Clinical Features</b>  |  |
| Y N Unk   |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>Any fever, subjective or measured</b> Temp measured? <input type="checkbox"/> Yes <input type="checkbox"/> No Highest measured temp ___°F   |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Chills or rigors   |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Headache   |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Myalgia (muscle aches or pains)  |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Pharyngitis (sore throat)  |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>Cough</b>   |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>Productive cough</b> Onset date ___/___/___   |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Dry cough Onset date ___/___/___   |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Dyspnea (shortness of breath)  |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>Acute respiratory infection with fever and cough</b>  |  |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <b>Pneumonia</b>   |  |
| Diagnosed by <input type="checkbox"/> X-Ray <input type="checkbox"/> CT <input type="checkbox"/> MRI <input type="checkbox"/> Provider Only   |  |
| Result <input type="checkbox"/> Positive <input type="checkbox"/> Negative <input type="checkbox"/> Indeterminate <input type="checkbox"/> Not tested <input type="checkbox"/> Other  |  |

Coronavirus required variables are in **bold**. Answers are: Yes, No, Unknown to case

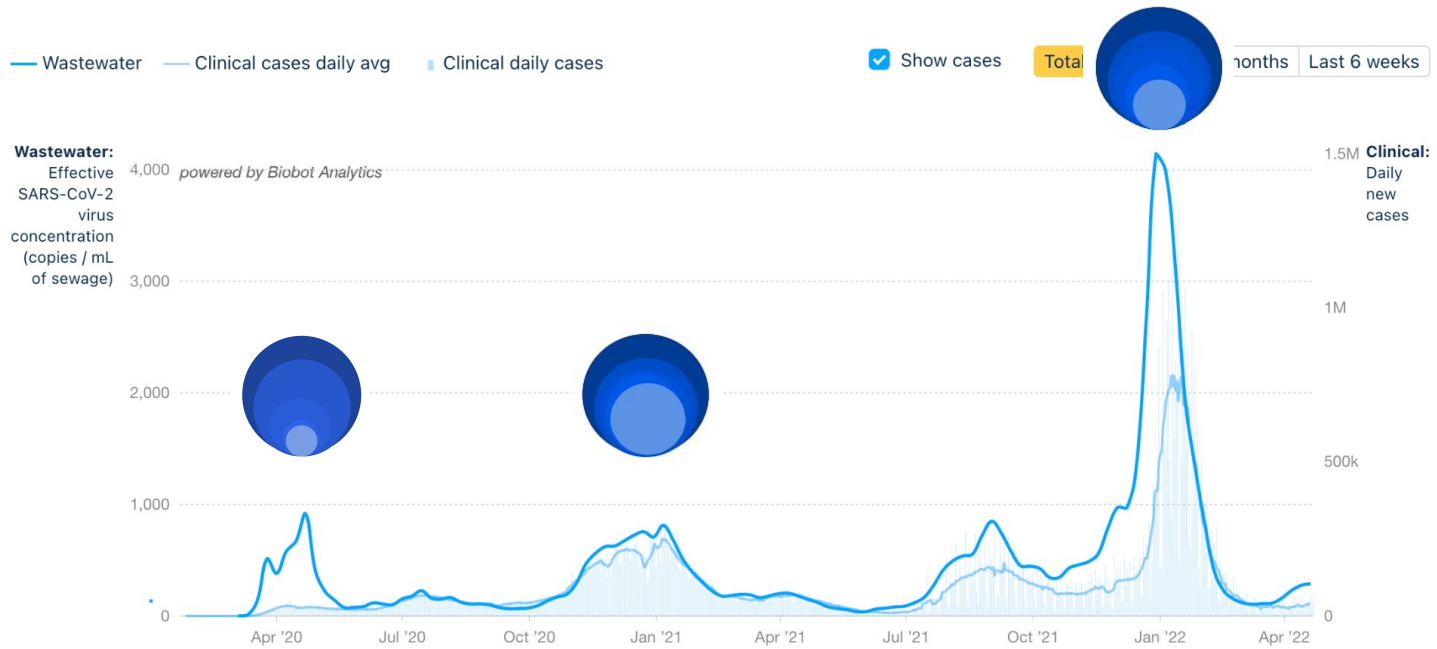
DOH 420-110 (Rev. 03/06/2020)



# Challenges with Case Data

- Not all cases are reported
- Reporting can take a long time
- Changing case definitions over time affects continuity of data
- Very resource intensive to maintain at scale

# The percentage of totals cases that reported changes over time

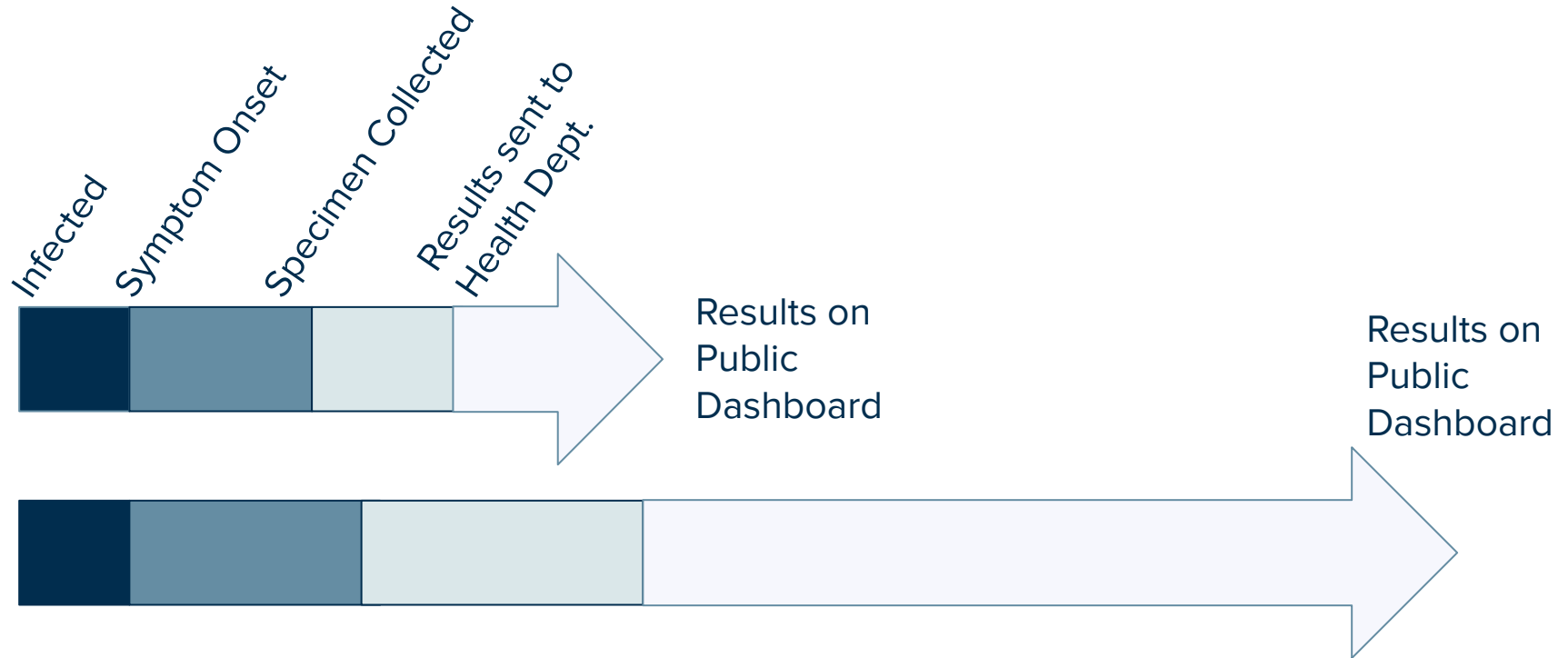


Sources: Wastewater data from Biobot Analytics, Inc.; Clinical data from USAFacts

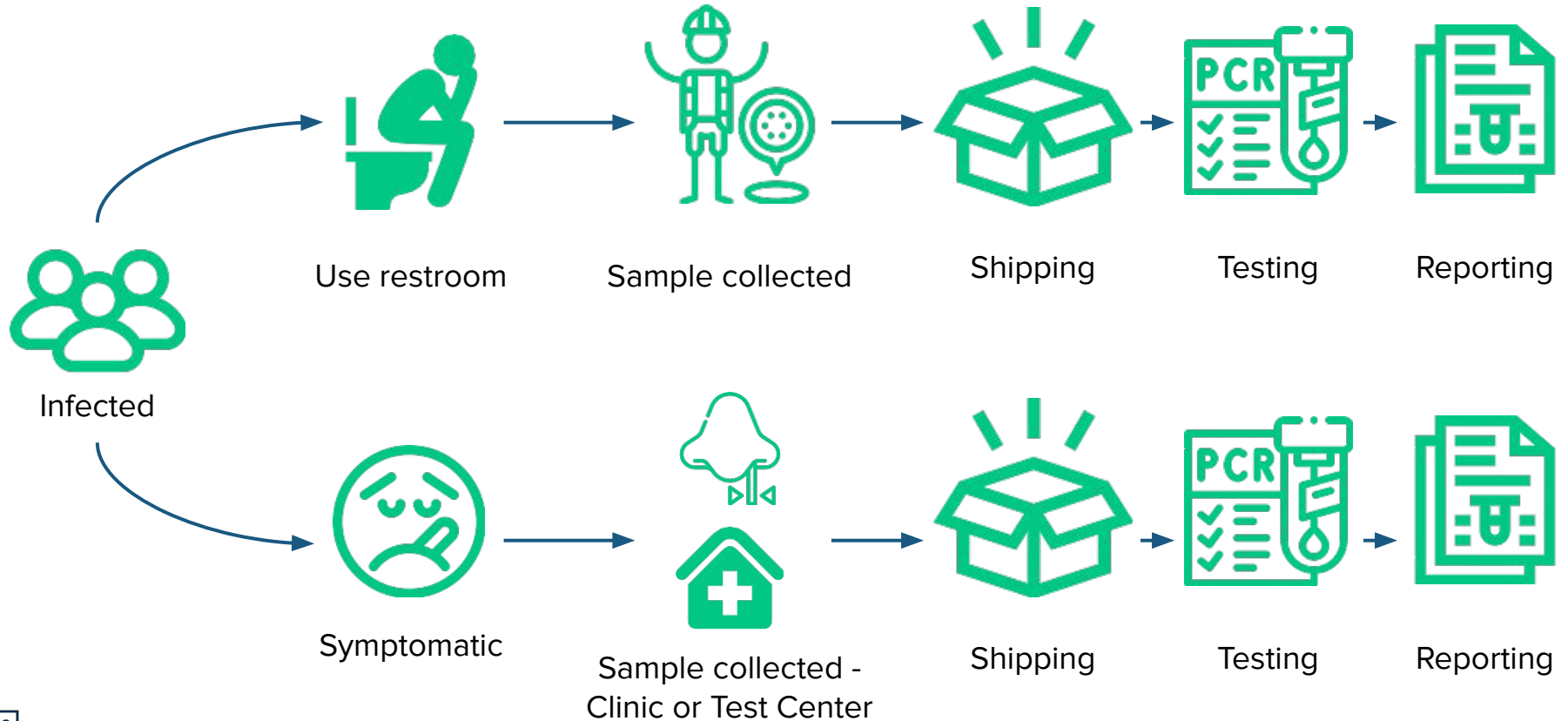


> About the data

# Timeline for cases to become publicly reported can get stretched out when resources are strained



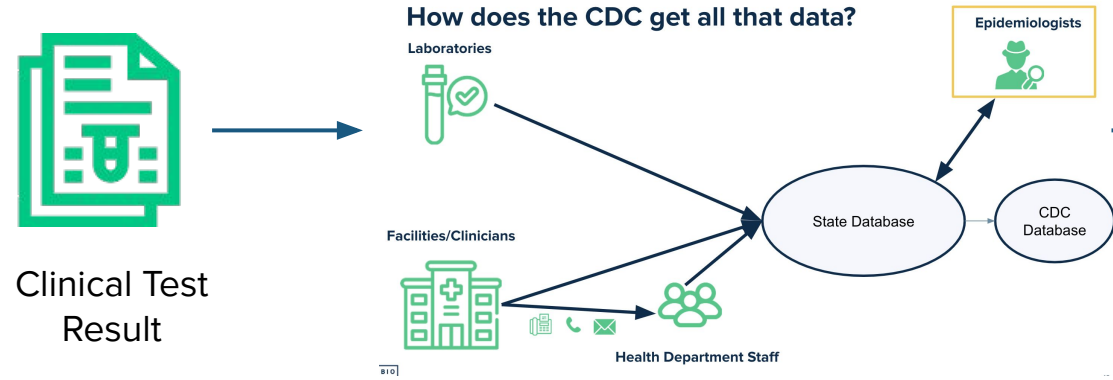
# The journal of sample, clinical and wastewater



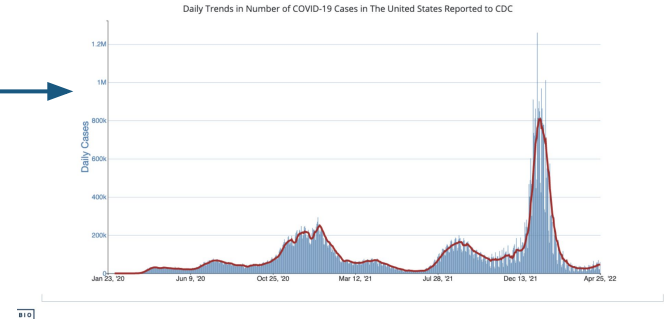
# From Lab Report to Visualized Data



Clinical Test Result



The final product - national epidemiological curve



Wastewater Result

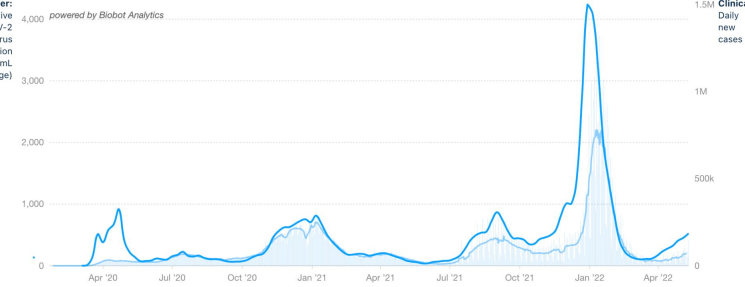
Quality checks, data aggregation

Berkshire County, MA



BA.2: 99.8% | BA.1 & 1.1: 0% | Delta: 0%

Wastewater: Effective SARS-CoV-2 virus concentration (copies / mL of sewage)



Sources: Wastewater data from Biobot Analytics, Inc.; Clinical data from USAFacts



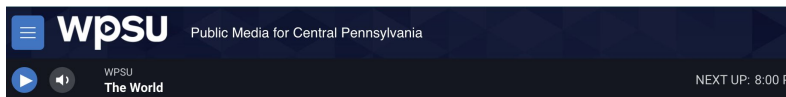
# Changing Case Definitions over Time

## CORONAVIRUS

### Maryland adds 24,800 reinfections to COVID-19 dashboard as state approaches 1 million cases

By Meredith Cohn  
Baltimore Sun • Feb 16, 2022 at 5:56 pm

<https://www.baltimoresun.com/coronavirus/bs-hs-thousands-reinfected-with-covid-20220216-rdb6varbwjfhobf63tmrrcny-story.html>



### Pennsylvania Department of Health adds more than 17,000 COVID-19 reinfection cases to state count

WPSU | By Min Xian  
Published November 15, 2021 at 6:05 PM EST



<https://radio.wpsu.org/2021-11-15/pennsylvania-department-of-health-adds-more-than-17-000-covid-19-reinfection-cases-to-state-count>

Media Advisory  
Nov. 1, 2021

[Contact information](#)

### Media Advisory: Reinfection cases added to COVID-19 web data today

Today's update includes 2,857 newly reported cases and 7,597 reinfection cases recorded since the start of the pandemic for a total of 10,454

As part of the data updates announced last Wednesday, the Minnesota Department of Health (MDH) today is adding the number of COVID-19 reinfections to the total shown under the Minnesota Case Overview of the [Situation Update](#) webpage.

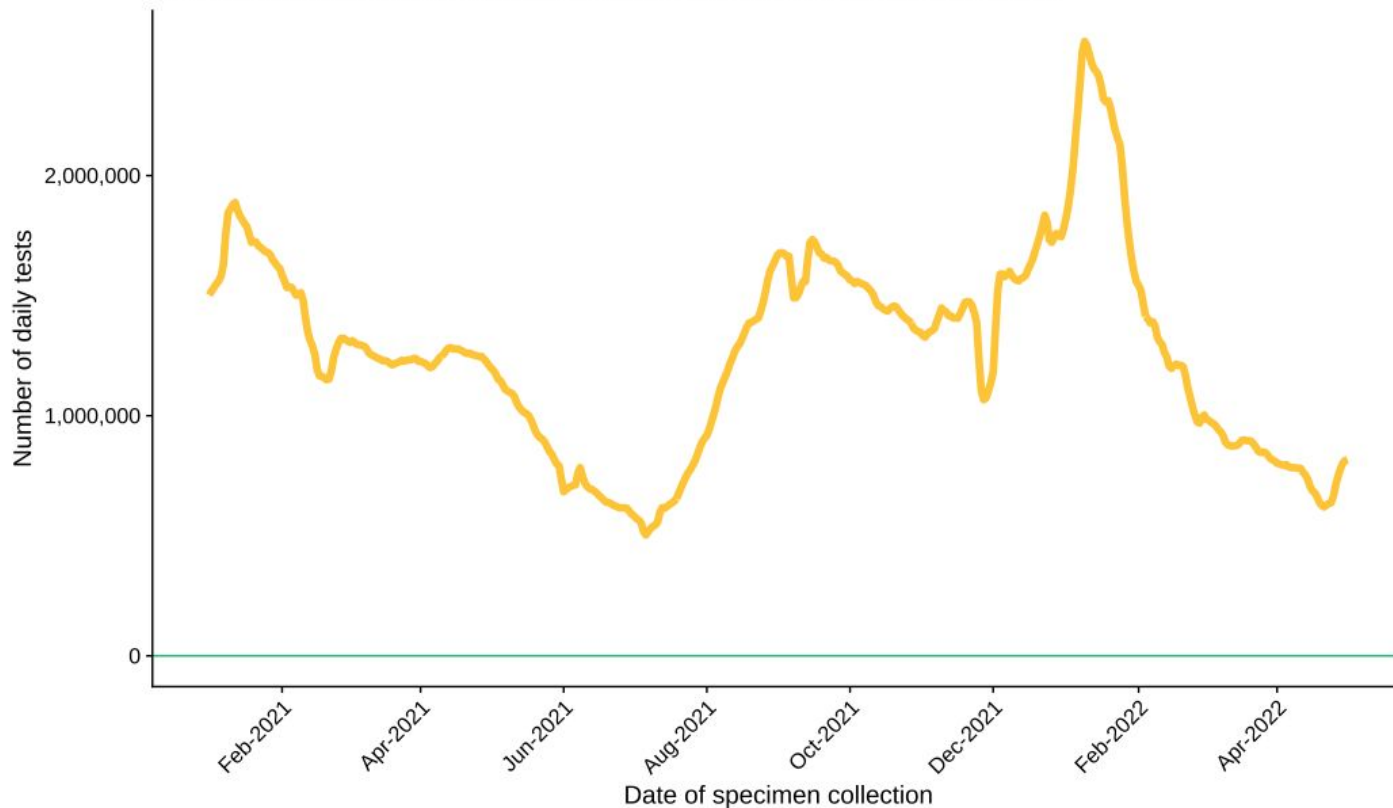
<https://www.health.state.mn.us/news/pr/essrel/2021/mediaadv110121.html>




# Clinical testing volume peaked at over 2 million a day

## Rolling Average of Clinical Molecular Tests for SARS-CoV-2 in the US

Green line is the number of EPA registered municipal wastewater treatment facilities (~16,000)

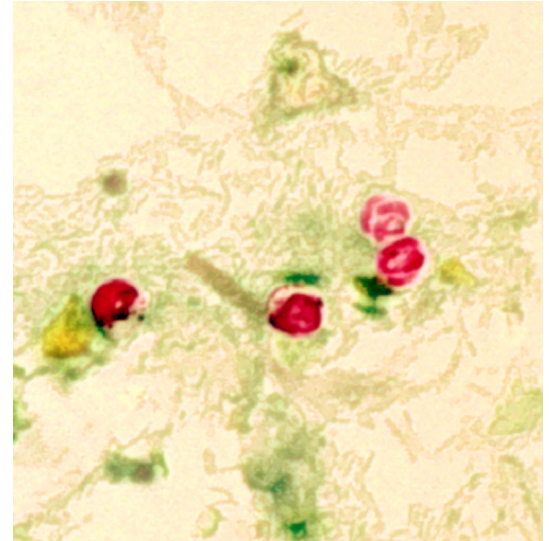


A microscopic view of cells, likely from a tissue sample, with a blue overlay. The cells are irregularly shaped and contain various organelles, including nuclei and cytoplasm. The blue overlay is semi-transparent, allowing the underlying cellular structures to be visible. The text is centered over the image.

**Outbreak interlude: stories from the field of public health data to action**

# Cryptosporidiosis outbreak at a campground, 2015

- Cryptosporidiosis is a common waterborne illness caused by several different *Cryptosporidium* species that can infect both humans and animals
- Increased number of reported cases led to investigation
- Cryptosporidiosis outbreak at a campground that affected at least 76 individuals from multiple states
- Source was identified, and pool remediation removed the public health danger



Picture Source: [CDC Public Health Image Library](#)

# Craving cookie dough? It's not just the eggs: contaminated flour and E. coli

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## Shiga Toxin–Producing *E. coli* Infections Associated with Flour

Samuel J. Crowe, Ph.D., M.P.H., Lyndsay Bottichio, M.P.H.,  
Lauren N. Shade, B.S., Brooke M. Whitney, Ph.D., Nereida Corral, M.P.H.,  
Beth Melius, M.N., M.P.H., Katherine D. Arends, M.P.H.,  
Danielle Donovan, M.S., Jolianne Stone, M.P.H., Krisandra Allen, M.P.H.,  
Jessica Rosner, M.P.H., Jennifer Beal, M.P.H., Laura Whitlock, M.P.H.,  
Anna Blackstock, Ph.D., June Wetherington, M.S., Lisa A. Newberry, Ph.D.,  
Morgan N. Schroeder, M.P.H., Darlene Wagner, Ph.D., Eija Trees, D.V.M., Ph.D.,  
Stelios Viazis, Ph.D., Matthew E. Wise, M.P.H., Ph.D.,  
and Karen P. Neil, M.D., M.S.P.H.

- Increased number of *E. coli* O121 infections detected across multiple states with the same genetic signature
- Interviews identified a lot of home bakers, which lead to the hypothesis of a common baking ingredient
- Ultimately over 250 different flour products were recalled

# Hepatitis A outbreak...in the water, or the berries?

## 2016 – Multistate outbreak of hepatitis A linked to frozen strawberries (Final Update)

Posted December 16, 2016 2:30 PM ET

This particular outbreak appears to be over. However, *Viral Hepatitis* is still an important cause of human illness in the United States. More information about *Viral Hepatitis*, and steps people can take to reduce their risk of infection, can be found on the [CDC Viral Hepatitis website](#).

### Highlights

- [Read the Advice to Retailers, Public Health Officials, and Consumers >>](#)
- Several states, CDC, and the U.S. [Food and Drug Administration](#) [↗](#) (FDA) have completed investigation of a multistate outbreak of foodborne hepatitis A. Hepatitis A is a contagious liver disease that results from infection with the hepatitis A virus. It can range in severity from a mild illness lasting a few weeks to a severe illness lasting several months. Although rare, people have died from infection with hepatitis A.

### At a Glance

- Case Count: 143
- States: 9
- Deaths: 0
- Hospitalizations: 56
- Recall: Yes

<https://www.cdc.gov/hepatitis/outbreaks/2016/hav-strawberries.htm>



An aerial, night-time photograph of a city. The image shows a complex highway interchange with multiple lanes and overpasses. The roads are illuminated by streetlights, and the surrounding urban area is filled with buildings of various heights and styles. The overall scene is dark, with the primary light sources being the city's artificial lighting, creating a high-contrast, moody atmosphere. The text 'Role of wastewater-based epidemiology' is overlaid in the center in a white, sans-serif font.

# Role of wastewater-based epidemiology

# The role of wastewater-based epidemiology

- Wastewater-based epidemiology helps address some of the same questions as case-based data collection systems
  - Is pathogen / substance X detected in the community?
  - Is there a little or a lot of pathogen / substance X?
  - What are the trends - are they increasing, decreasing or stable?
  - Is this affecting some geographic areas more than others?



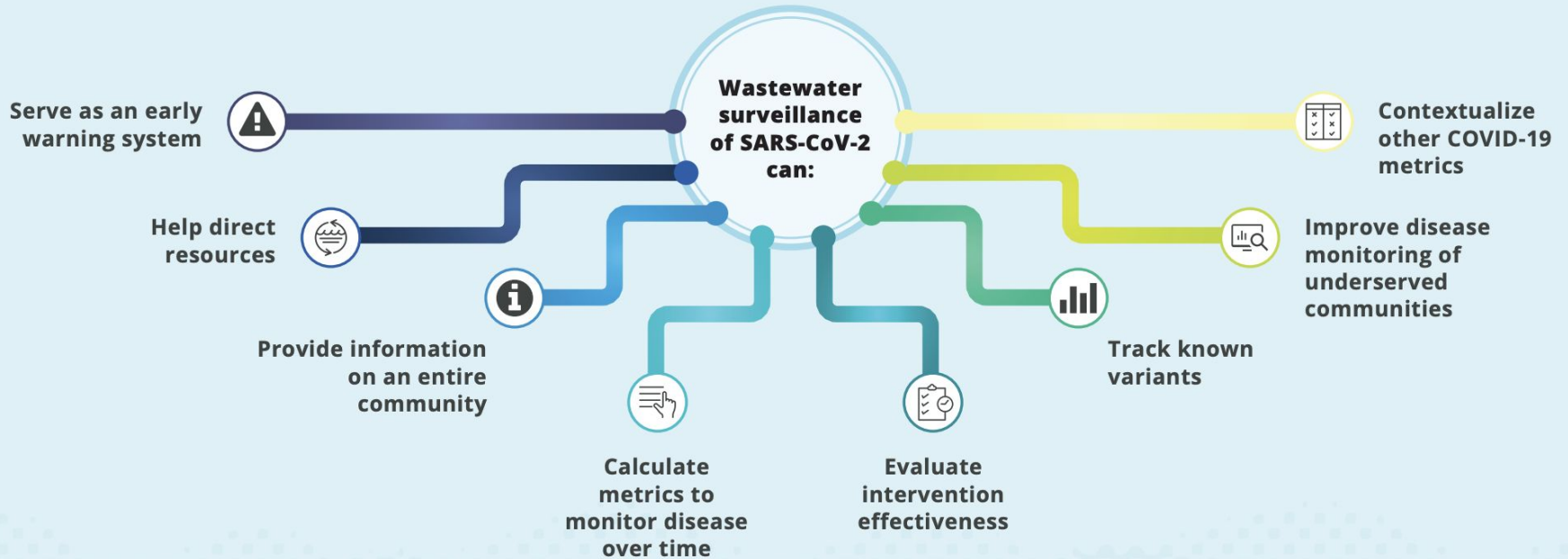
# The role of wastewater-based epidemiology

- Wastewater-based epidemiology has some unique advantages
  - Includes symptomatic and asymptomatic individuals
  - Includes everyone regardless of healthcare-seeking behaviors
  - Non-invasive
  - Scalable and cost efficient
  - Effective way to track variants in communities
  - Doesn't have the same variability in testing demand as clinical samples

# Benefits of wastewater-based epidemiology



## Public Health Benefits



# Wastewater-Based Epidemiology: Data to Action

# Data to Action for SARS-CoV-2

## Hospital system

Trigger rescheduling of elective surgeries when omicron peaked

## Correctional facilities

Deploy testing & promote vaccine adoption

## School system

Advisory note sent to parents - notice of impending remote schooling

## Health Department

Making data visualization accessible to the public

## University

Determining if and how the university needs to shift its operations

## City

Mask recommendations based on both rising cases and rising wastewater

# Wastewater levels as part of metrics for schools



## COVID-19 Dashboard

### COMMUNITY METRICS

The data below is used by CPS and the Cambridge Public Health Department to make dynamic determinations about individual, school, and district quarantine needs.

This data is provided by the City of Cambridge. Follow [this link](#) for more Cambridge community data. It will be updated daily at 4:30pm (MRWA data is updated less regularly)

#### Case Rate per 100,000 (7-day average)

101.7 new cases per day  
(Through 05/15/2022,  
reported as of 05/16/2022)

#### Rate of Positive COVID-19 Tests in Cambridge

6.11% (As of 05/16/2022)

#### Wastewater Monitoring of COVID- 19 in MRWA

613 viral particles/mL of  
wastewater (As of  
05/3/2022)

<https://www.cpsd.us/covid19data>

# Wastewater as part of mask recommendations

 **City Of Waltham** @CityofWaltham · 14m

 A reminder that on Thurs, 5/19, the Waltham Board of Health issued a citywide mask advisory due to a surge in positive COVID-19 cases & rising coronavirus levels in regional wastewater. This is not a mandate, but masks are highly recommended.

More: [bit.ly/3NfESb](https://bit.ly/3NfESb)



**MASKS  
RECOMMENDED**  
FOR EVERYONE

VACCINATED  
AND  
UNVACCINATED

# Looking forward: It's not just SARS-CoV-2!



APRIL 2022

## Pathogen biomarkers in wastewater, stool, and urine: an informal literature survey

### Key points

- 94% of pathogens had some scientific study reporting that the pathogen had been detected in wastewater, stool, or urine.
- Gastrointestinal pathogens are the most studied in wastewater, but many other types of pathogens have been detected in wastewater, including respiratory viruses like SARS-CoV-2.
- Polymerase chain reaction (PCR) and metagenomic sequencing are the most commonly-used methods for detecting pathogens in wastewater.

<http://biobot.io/wp-content/uploads/2022/05/2022-04-28-Pathogen-lit-survey-combined.pdf>

# Future example: data to action for Hepatitis A

Increase in Hepatitis A detected in a community's wastewater - potential actions:

- Health department issues alerts to medical care providers
  - Encouraging them to test for Hepatitis A if patient present with symptoms that could be attributed to Hepatitis A
  - Reminding them to report Hepatitis A cases to public health
- Health department notifies licensed food service establishments
  - Reinforce employee hand hygiene messages
  - Remind employees to staying home from work while sick
  - Encourage vaccination
- Community notified through a press release
  - Encourage the public to seek testing is symptomatic
  - Recommend vaccination



# Future: example data to action for Norovirus

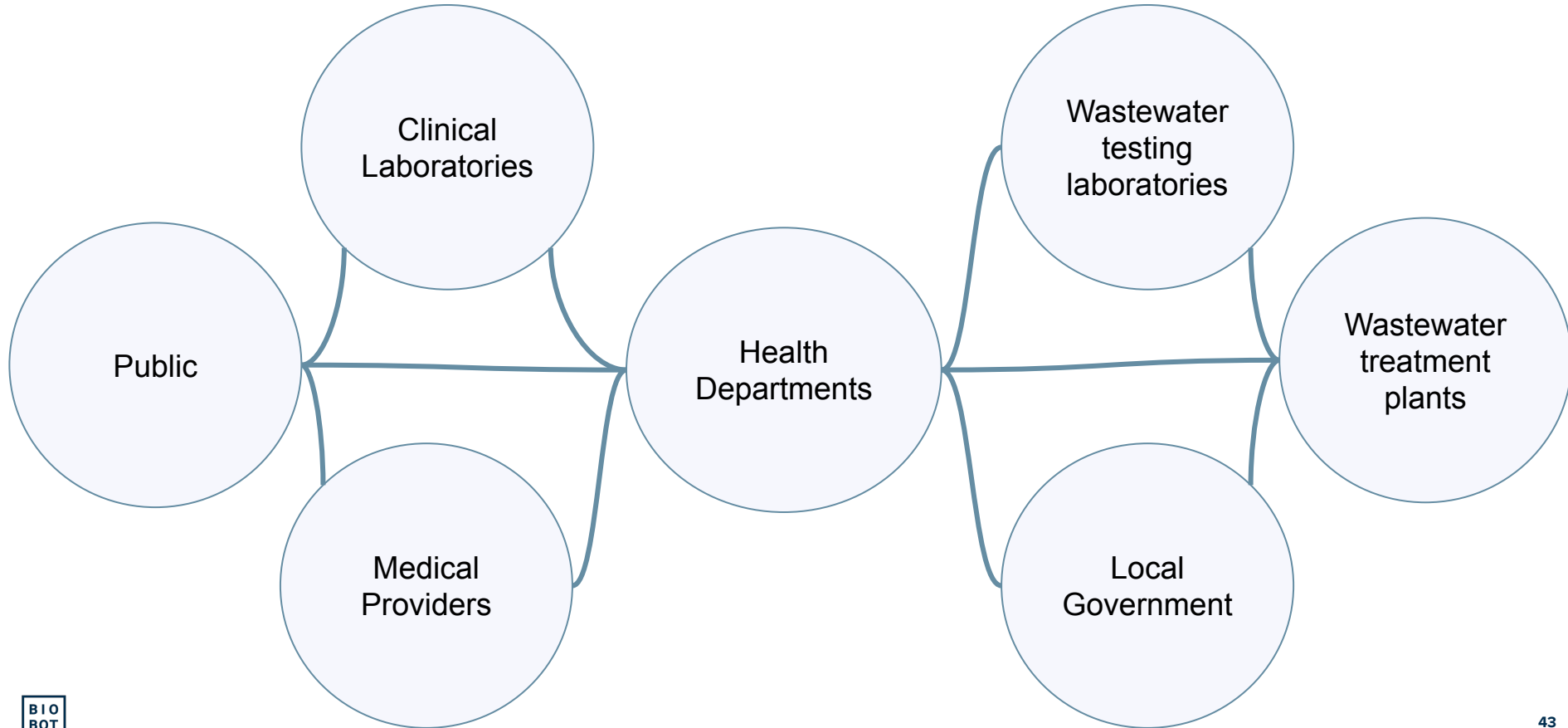
Increase in Norovirus detected in a community's wastewater - potential actions:

- Health department issues alerts to medical care providers
  - Encouraging them to test for norovirus if they have symptomatic patients
  - Remind facilities (nursing homes, etc.) to report outbreaks
- Health department notifies licensed food service establishments
  - Reinforce employee hand hygiene messages
  - Remind employees to staying home from work while sick
- Community notified through a press release
  - Encourage the public to seek testing if symptomatic
  - Encourage schools / daycares to be vigilant about cleaning high-touch surfaces

# Wrapping it all up

A microscopic view of plant cells, showing various shapes and sizes of cells with thick, dark cell walls. The cells are arranged in a somewhat organized pattern, with some larger cells and many smaller ones. The background is a dark, muted green color.

# Public health isn't just the health department



# Wastewater treatment plants can have multiple roles in promoting and preserving public health

## Upstream public health benefits of sampling at wastewater treatment plants

- Monitor the health of the community
- Can be used for both pathogens and chemicals
- Provides a window into the community's health that no other single sample can provide



## Downstream public health benefits of wastewater treatment

- Keeping water safe for recreational activities
- Preserving the safety/health of shellfish and other marine organisms
- Reduce pollutants in the environment

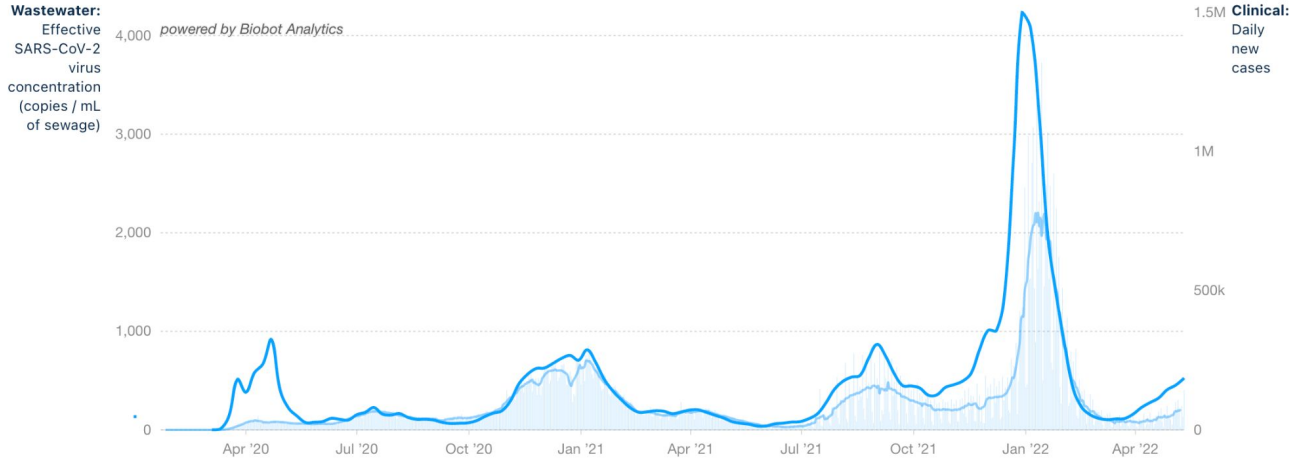
# Making data accessible for public benefit

Most recent data: May 11, 2022

Wastewater Clinical cases daily avg Clinical daily cases

Show cases

Total results Last 6 months Last 6 weeks



Sources: Wastewater data from Biobot Analytics, Inc.; Clinical data from USAFacts



> About the data

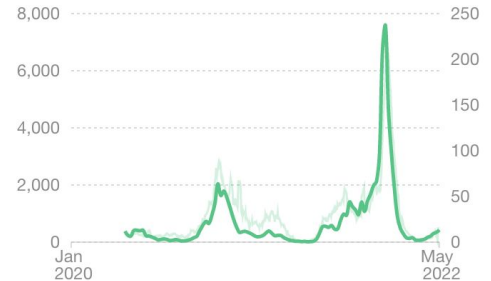
<https://biobot.io/data/>

## Variant Overview

Week of April 27, 2022

| Region     | Omicron  |       | Delta |
|------------|----------|-------|-------|
|            | BA.1&1.1 | BA.2  |       |
| Nationwide | 5.4%     | 94.3% | 0.3%  |
| Midwest    | 4.2%     | 95.8% | 0.0%  |
| Northeast  | 3.9%     | 95.9% | 0.2%  |
| South      | 6.7%     | 92.5% | 0.8%  |
| West       | 8.8%     | 90.9% | 0.3%  |

### Dauphin County, PA



BA.2: 99.6% | BA.1 & 1.1: 0% | Delta: 0%

The background is a deep blue color with intricate, organic, and cellular patterns. These patterns resemble biological structures like cells or tissues, with various shades of blue and white, creating a textured, almost microscopic appearance. The patterns are more prominent on the left side and fade slightly towards the right.

**Questions?**