

Wastewater Surveillance and the COVID-19 Pandemic

Presentation to the Santa Ana Regional Water Quality Control Board

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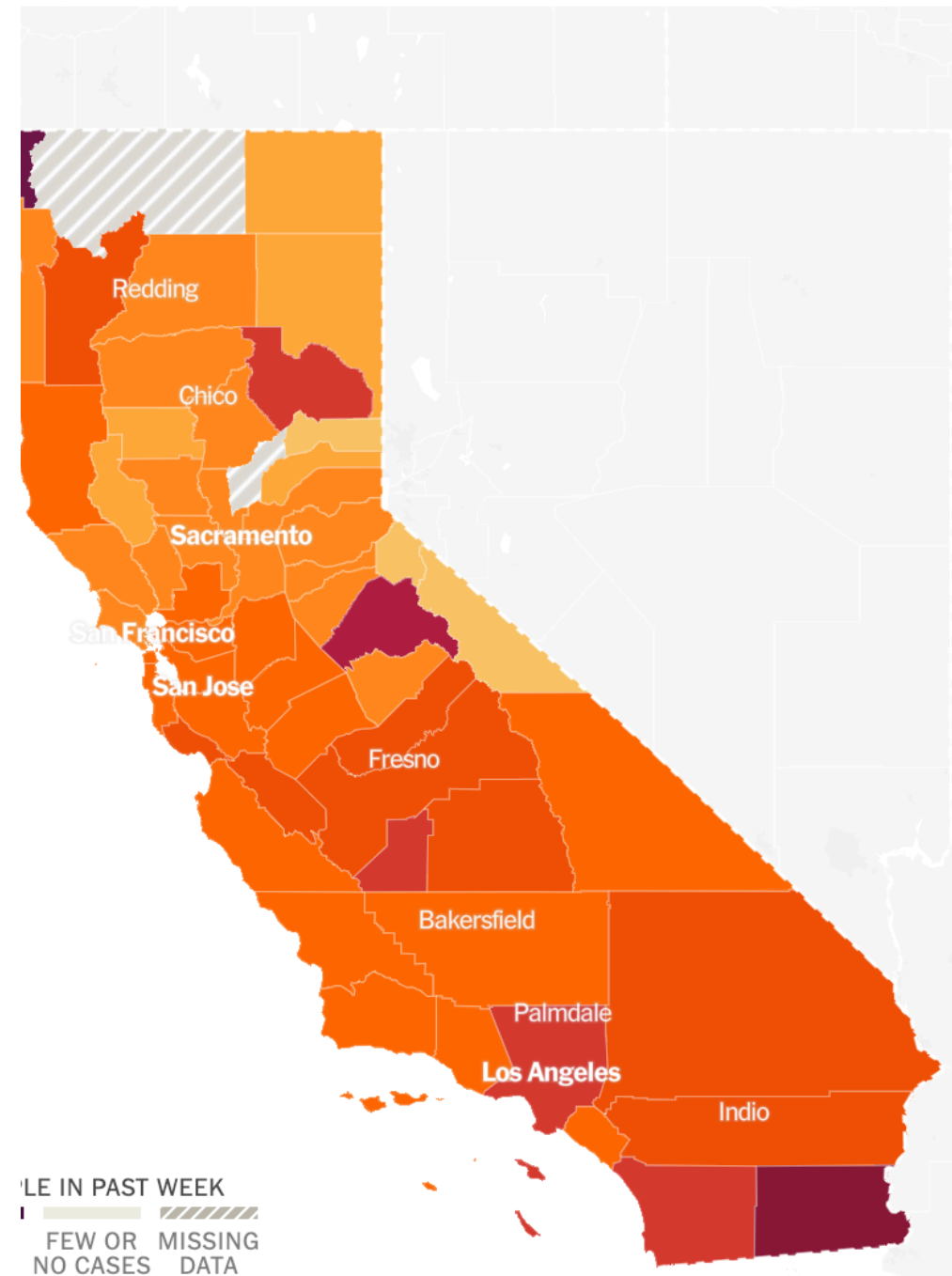
Southern California Coastal Water Research Project

Wastewater Surveillance and COVID-19

- Why measure COVID-19 viruses in wastewater
- How the COVID -19 wastewater monitoring program developed
- Where wastewater based COVID-19 monitoring is headed

Background

- During the COVID-19 pandemic, we needed information about the spread of the virus
- Initially, clinical testing was our primary source of information about COVID-19
- This testing allowed us to track the spread of the virus



Clinical Testing Limitations

- The data is biased
 - In the beginning of the pandemic, testing was only for those feeling ill
- The data stream is fading
 - Reported tests have declined since home tests became widely available

Measuring viruses in wastewater has advantages

- It is an unbiased sample
 - Everybody poops
- Gift that keeps on giving
 - Don't have to worry about running out of sewage
- It is more cost-effective
 - You don't need tens of thousands of individual tests

Impediments to adopting wastewater monitoring

- Research scientists had to get their technical house in order
- Wastewater utilities had to be convinced to collect samples
- Health departments had to be convinced to use a new data source
- Needed clear and timely mechanism for communication

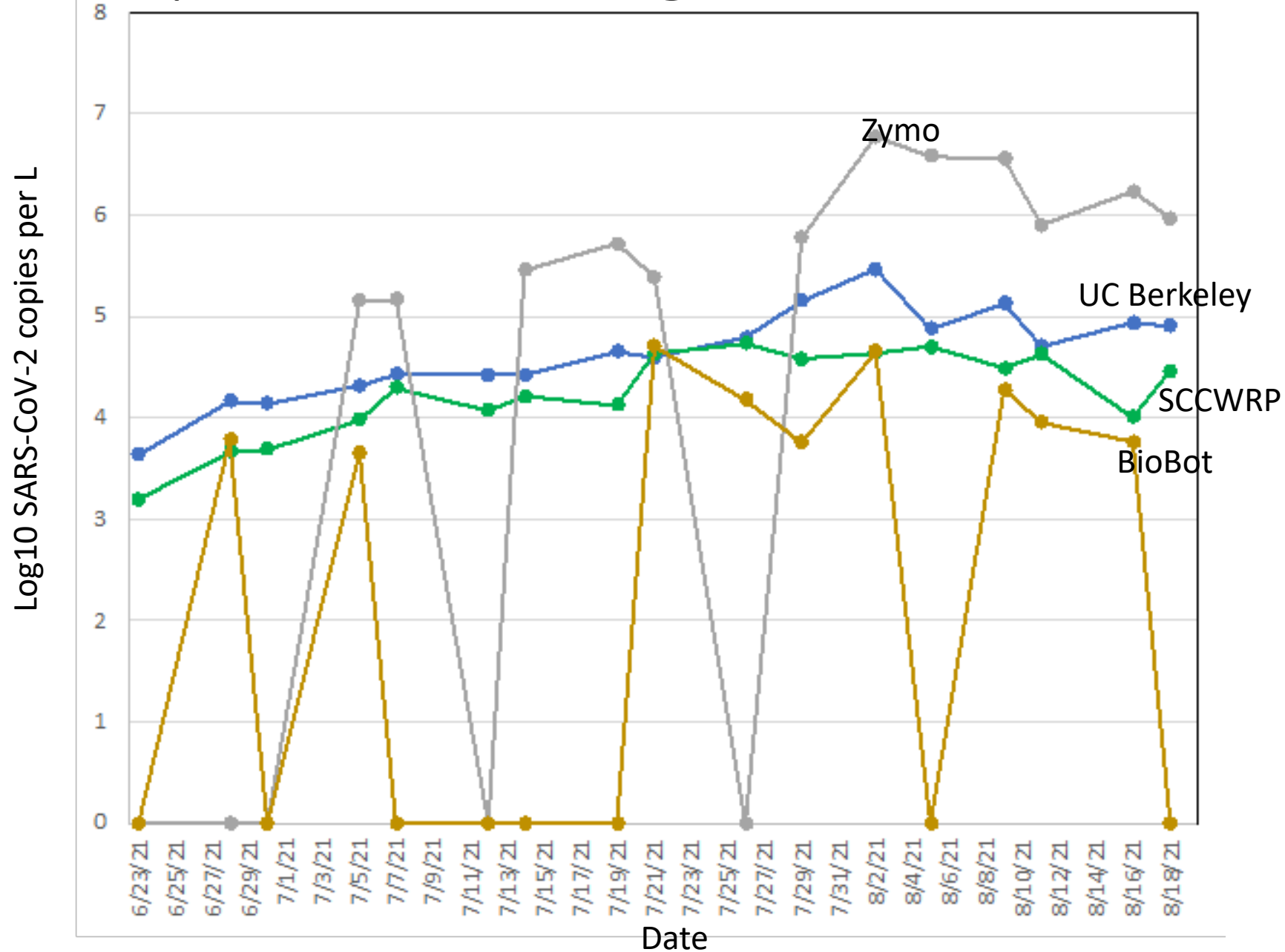
Getting scientists' technical house in order

- What to sample
 - Solids or influent
- How to process the samples
 - Finding balance between cost and sensitivity
- How often to sample
 - Daily or weekly

What did scientists do?

- Performed method comparison studies
- Created Standard Operating Procedures
 - Spelling out how to process samples
- Determined the limits of detection for the methods
- Shared the methods and technology across the scientific community

Method Comparison at a Large Urban Treatment Plant



Getting wastewater utilities on board

- Wastewater utilities stepped up in a big way
- More than 40 California wastewater utilities sampled early in the pandemic
- Many continue to sample without compensation

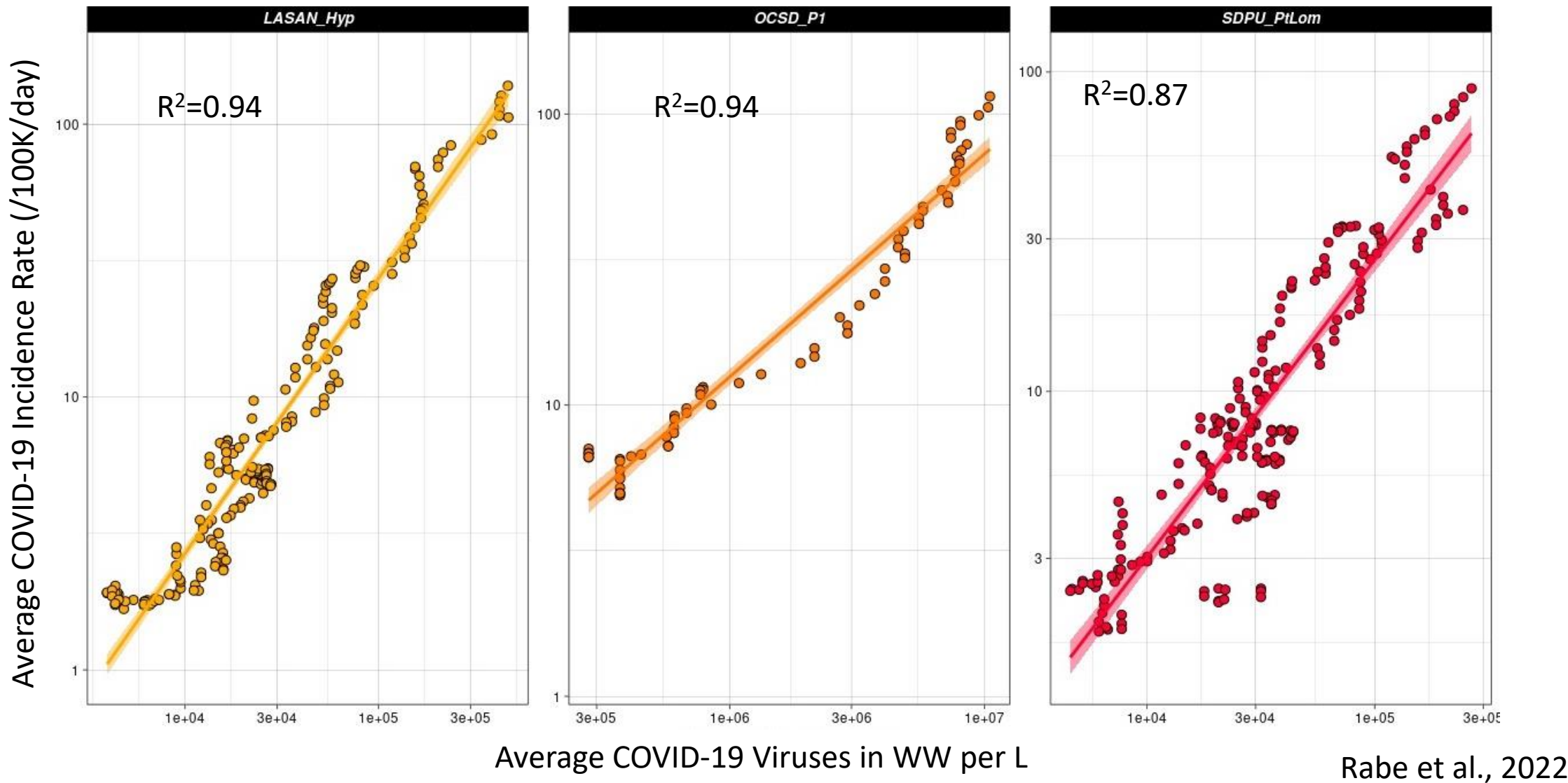
Getting health departments on board

- Health departments understood the limitations of clinical data
- Wastewater was an unknown data source
 - Wanted to be sure they could trust and use the data
- They didn't even know the players

What did the wastewater surveillance community do?

- Set up communication between agencies and researchers
 - State Water Board and California Department of Public Health collaborated for National Wastewater Surveillance System pilot program
- California Water Quality Monitoring Council created the Wastewater Based Epidemiology Committee
 - Built trust and increased communication
- Scientists generated comparisons between COVID viruses in wastewater and clinical case counts
 - Won the public health agencies' trust

COVID in wastewater vs clinical case rates



Coordinating data flows and communication

- Needed to communicate the wastewater results across different disciplines and to the public
 - Most scientists are not experts at communication
- Scientists worked with visualization experts to create dashboards to convey data
 - Public health experts, google, design experts

Dashboard example

Number of weeks
shown in graph

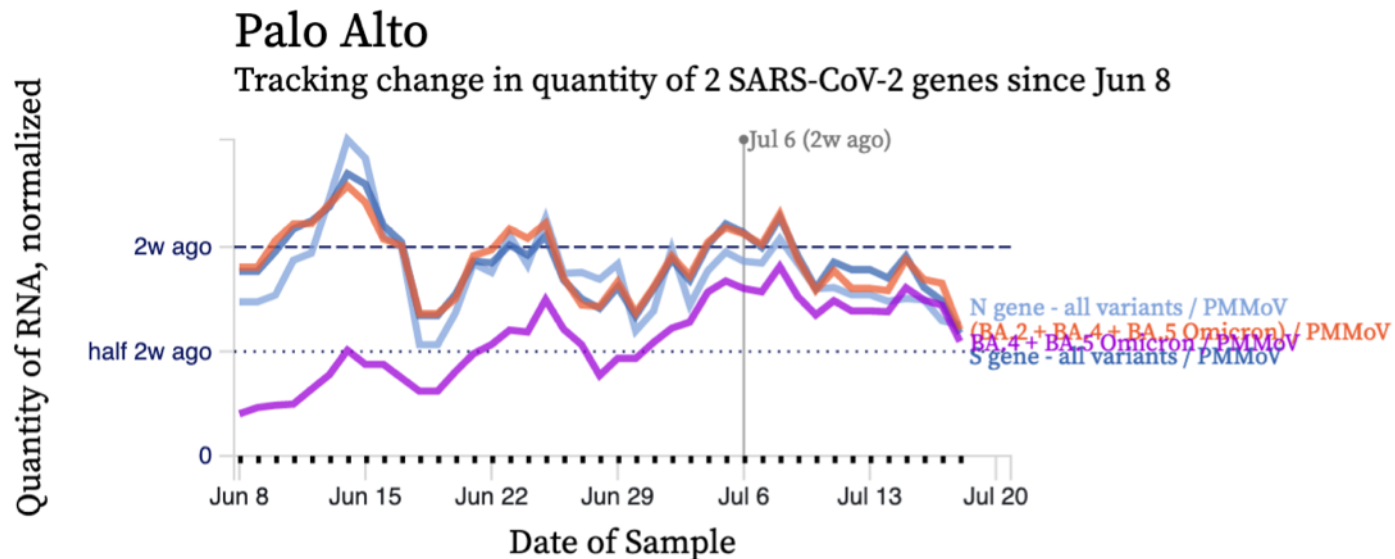
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genes found in all
SARS-CoV-2
variants

☒ N gene - all variants / PMMoV ☒ S gene - all variants / PMMoV

variants

☐ BA.1 Omicron / PMMoV ☒ (BA.2 + BA.4 + BA.5 Omicron) / PMMoV
☐ BA.4 Omicron / PMMoV ☒ BA.4 + BA.5 Omicron / PMMoV



Where wastewater based COVID-19 monitoring is headed

- Transferring the technology from research labs to public health labs
- Tracking COVID-19 variants in wastewater
- Applying these new technologies for the long term

Technology transfer from research labs to public health labs

- California now has a public health wastewater based epidemiology laboratory
 - Successfully transitioned from research laboratories to a state laboratory
 - Intercalibration studies conducted to ensure a smooth transition
- The lab is processing samples from 16 facilities three days per week
 - Looking to expand to more facilities

Tracking COVID variants in wastewater

- Wastewater also provides an opportunity to analyze COVID variants
- Now able to detect variants in wastewater before they show up in clinical samples

New technologies, new opportunities

- The same technologies used to measure COVID in wastewater can work on other constituents
- Other viruses or bacteria
 - Respiratory viruses
 - Potential epidemic pathogens
 - Antimicrobial resistance
- Chemicals
 - Pharmaceuticals
 - Drugs

Wastewater Surveillance and COVID-19

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Questions?

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Extra Slides

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