

## Wastewater Surveillance for SARS-CoV-2 Variants

President Biden declared May 11, 2023, the end of the COVID-19 public health emergency. FDA is working to conclude its work on the Wastewater Surveillance for SARS-CoV-2 Variants project, as well. Although the work to identify COVID-19 variants in wastewater is ending, FDA will continue to apply the methods developed for the wastewater surveillance project to foodborne pathogen surveillance. FDA thanks all participating laboratories for their contributions to this project. Links to publications with our findings will be added to this page once available.

NOTE: As of June 30th, 2023, FDA will no longer update the COVID-19 wastewater dashboard. However, all underlying data will remain publicly available through links at this site and through our BioProject at the National Center for Biotechnology Information (NCBI).

Studies have shown that SARS-CoV-2 (COVID-19) variants of concern from wastewater can be identified 1-2 weeks prior to being detected in clinical samples from the same area, making wastewater surveillance useful for detecting and monitoring SARS-CoV-2 in the population. Accordingly, through the American Rescue Plan Act of 2021, Congress provided temporary funding for FDA to develop the capacity to sequence SARS-CoV-2 RNA from wastewater samples and to conduct a sampling and sequencing project through 2022. By monitoring population-level variants over time, GenomeTrakr labs are providing information about the evolution of the virus, which is critical to evaluating the effectiveness of FDA-regulated COVID-19 vaccines, therapeutics, and diagnostics. Geographic regions with high percentages of agricultural and food facility workers, whose health is critical for stability of the U.S. food supply chain, are of interest. Resulting sequence data are being submitted in real time to public repositories where active monitoring for circulating variants of concern takes place.

Beyond the COVID-19 application, the project provides the participating laboratories with experience extracting genomic information from wastewater samples and working with a broader network of laboratories in response to a national emergency.

The software FDA developed to analyze sequences obtained from wastewater samples has been adopted by other public health partners, including the CDC. FDA will continue its SARS-CoV-2 wastewater sequencing efforts, including further developing its sequencing methods and analysis tools, and updating public repositories of genomic information, until the funding for the project expires.

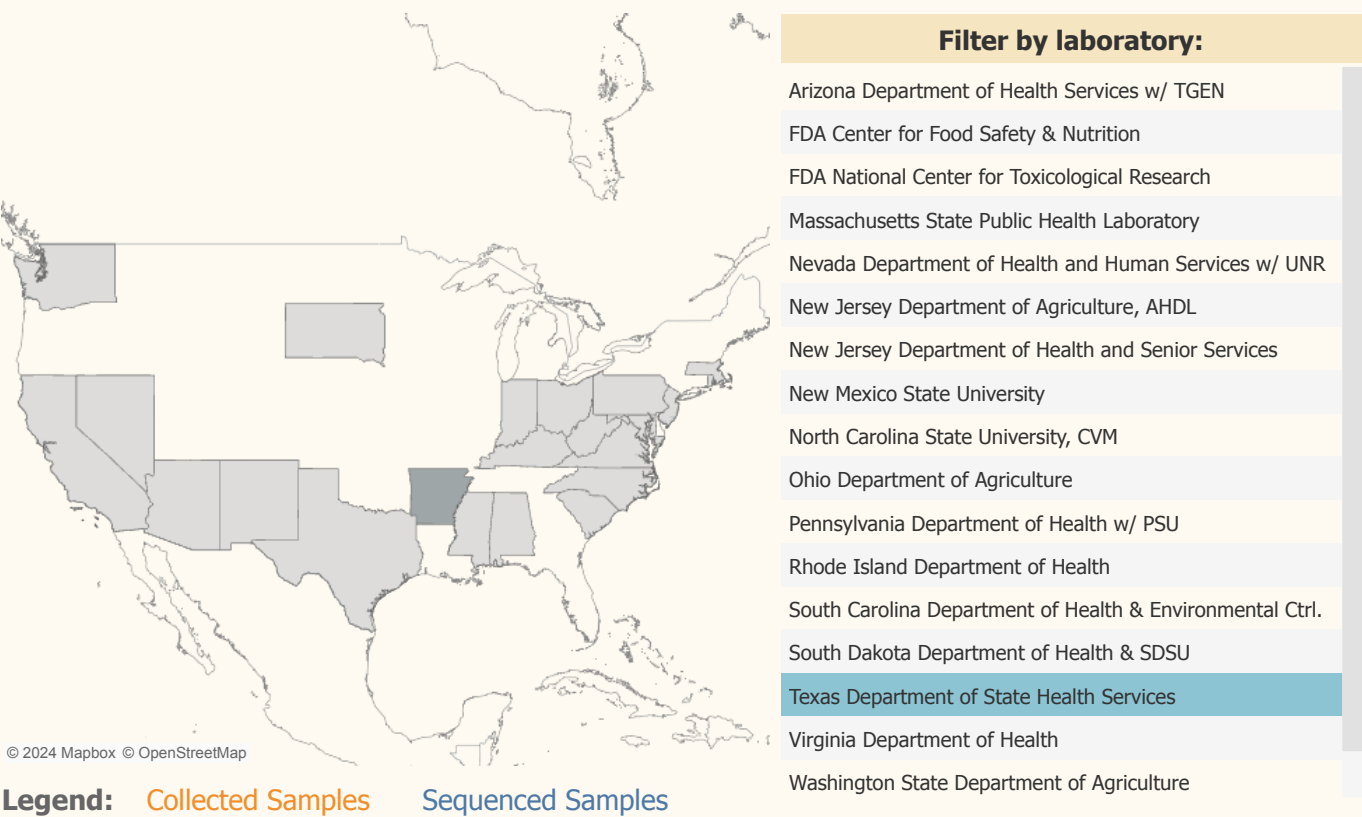
### Status

To facilitate the sharing of information about progress on this sequencing effort, FDA has developed a dashboard that graphically presents information from and about the project. Individuals can make selections on the dashboard to display: the number of samples collected and the number of samples sequenced, both nationwide and by individual laboratories in each state; the names of the states from which the samples were collected; the names of the labs that conducted the sequencing; and the changes in the relative abundance of variants and their sublineages detected over time. Sequencing records generated during pilot testing of the methods and sequencing records with data insufficient for variant detection have been omitted from the dashboard.

Wastewater Surveillance for SARS-CoV-2 Variants: Laboratory Data Submitted to NCBI Project PRJNA757291

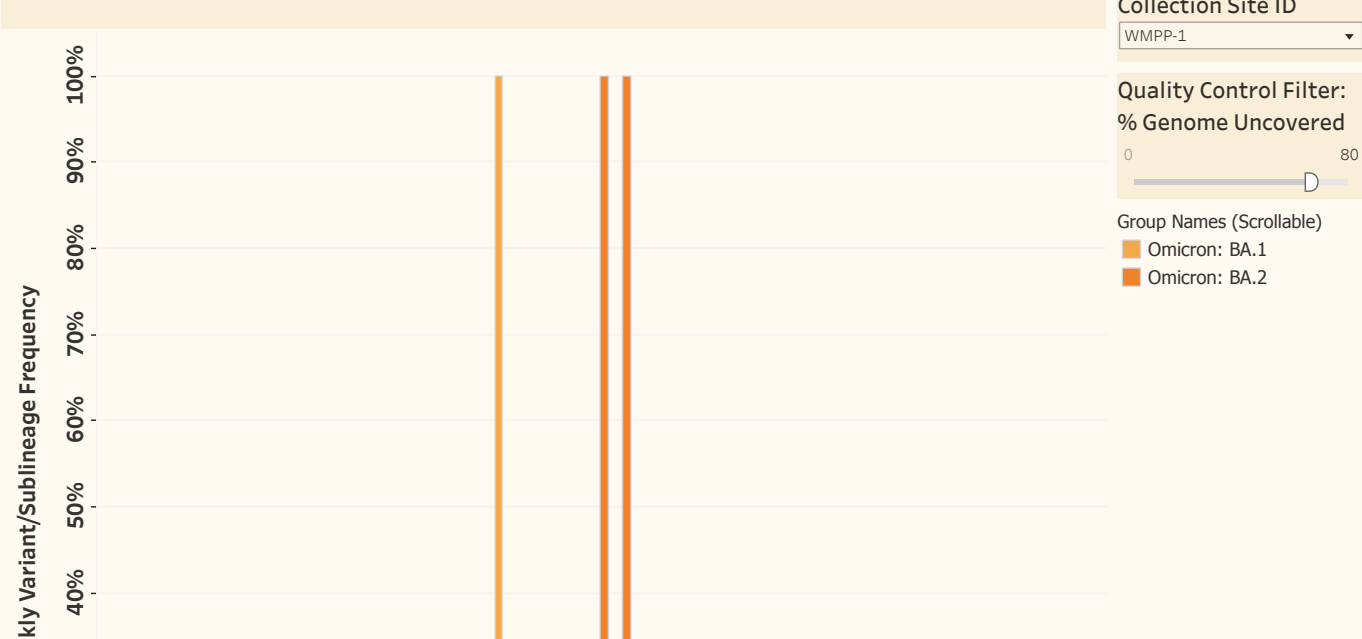
Wastewater Samples Collected for Identification of SARS-CoV-2 Variants by Participant Laboratories†

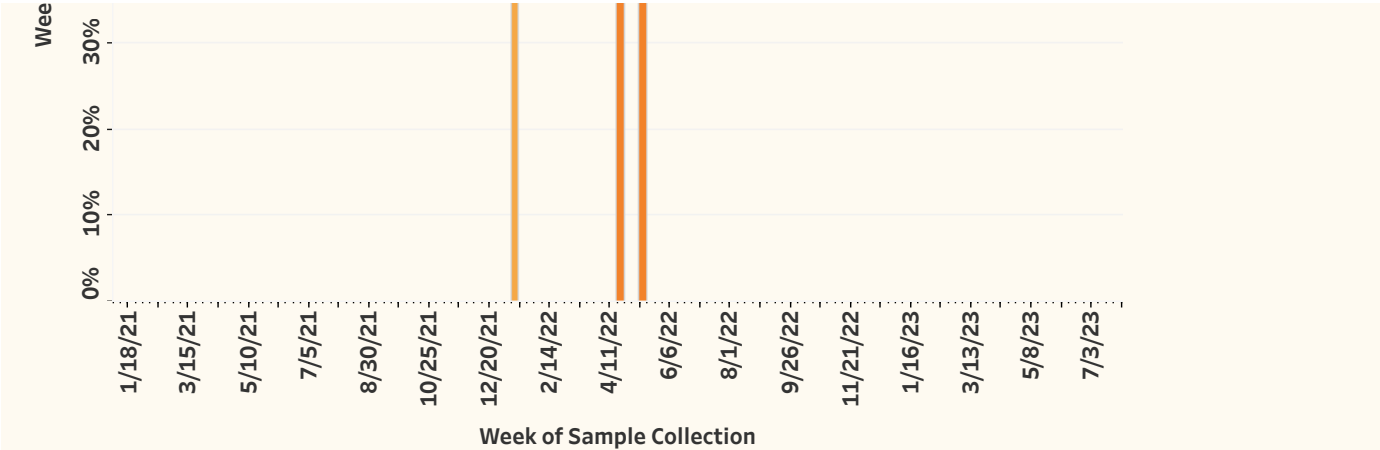
States containing a laboratory that has been funded by the project are highlighted in light gray while those with funding outside this project are in dark gray. Laboratories that have submitted sample records are marked with circles. The size of the circle is proportional to the number of records submitted. Hover over laboratory circles to see names of labs and numbers of samples collected and sequenced.



Relative Abundance of Variants and Sublineages Over Time‡

Mouse over bars to see the name and relative abundance of a sublineage or group of sublineages over time. The color of the bar corresponds to variant and/or sublineage. See the legend for more information. Use the filters at the right side of the pane to limit the view to specific states, laboratories, or collection sites.





Methods:

- All variant data was processed with C-WAP <https://github.com/CFSAN-Biostatistics/C-WAP> which includes the estimation of relative abundances of SARS-CoV-2 sublineages via the bioinformatics package Freyja <https://github.com/andersen-lab/Freyja>
- Sublineages of World Health Organization Variants of Concern (VoC) that are not of current clinical significance have been grouped together
- *Others* is used as a catch-all term for known sublineages that were estimated to be present below 1% in a given sequencing run record
- *Null* is term used for errors generated by Freyja

Sample Collection and Sequencing Over Time by Laboratory

Bar size is proportional to the number of samples collected during a week. Sequencing is performed on all samples containing sufficient levels of SARS-CoV-2 RNA.

Legend

† For assistance with keyboard navigation and instructions for acquiring data in a format that can be read by a screen reader, please navigate to:

[https://help.tableau.com/current/pro/desktop/en-us/access\\_keyboard\\_navigation.htm](https://help.tableau.com/current/pro/desktop/en-us/access_keyboard_navigation.htm) ([https://help.tableau.com/current/pro/desktop/en-us/access\\_keyboard\\_navigation.htm](https://help.tableau.com/current/pro/desktop/en-us/access_keyboard_navigation.htm))  
[⌵](http://www.fda.gov/about-fda/website-policies/website-disclaimer) (<http://www.fda.gov/about-fda/website-policies/website-disclaimer>). Individuals using assistive technology may still have difficulty fully accessing the information in the interactive dashboard and may gain alternative access to the information by visiting *NCBI's SRA Run Selector* (<https://www.ncbi.nlm.nih.gov/Traces/study/>) page, entering PRJNA757291 in the accession search box at the top of the page, and clicking the search button. Once the search results display, scroll to the "Select" section of the page, and in the "Download" column click on "Metadata." The metadata will download to your computer. This data is not confidential and is free for public use. Individuals with disabilities who require further assistance may contact [covidtrkr@fda.hhs.gov](mailto:covidtrkr@fda.hhs.gov) (<mailto:covidtrkr@fda.hhs.gov>).

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[https://help.tableau.com/current/pro/desktop/en-us/access\\_keyboard\\_navigation.htm](https://help.tableau.com/current/pro/desktop/en-us/access_keyboard_navigation.htm) ([https://help.tableau.com/current/pro/desktop/en-us/access\\_keyboard\\_navigation.htm](https://help.tableau.com/current/pro/desktop/en-us/access_keyboard_navigation.htm))  
[⌵](http://www.fda.gov/about-fda/website-policies/website-disclaimer) (<http://www.fda.gov/about-fda/website-policies/website-disclaimer>). Individuals using assistive technology may still have difficulty fully accessing the information in the interactive dashboard and may gain alternate access to the information [by downloading it here](https://github.com/CFSAN-Biostatistics/WW-SC2-variant-estimations) (<https://github.com/CFSAN-Biostatistics/WW-SC2-variant-estimations>) [⌵](http://www.fda.gov/about-fda/website-policies/website-disclaimer) (<http://www.fda.gov/about-fda/website-policies/website-disclaimer>). This data is not confidential and is free for public use. Individuals with disabilities who require further assistance may contact [covidtrkr@fda.hhs.gov](mailto:covidtrkr@fda.hhs.gov) (<mailto:covidtrkr@fda.hhs.gov>).

## Additional Resources

The following resources contain information related to the SARS-CoV-2 project, including protocols and analysis software developed by FDA's Center for Food Safety and Applied Nutrition and utilized by the labs sequencing SARS-CoV-2 variants from wastewater samples.

- [GenomeTrakr Umbrella for SARS-CoV-2 Wastewater Data](https://www.ncbi.nlm.nih.gov/bioproject/PRJNA757291) (<https://www.ncbi.nlm.nih.gov/bioproject/PRJNA757291>) – Genomic information and associated metadata collected as part of this project
- [SARS-CoV-2 Wastewater Protocols](https://www.protocols.io/workspaces/genometrkr1/publications?categories=wastewater-surveillance) (<https://www.protocols.io/workspaces/genometrkr1/publications?categories=wastewater-surveillance>) [⌵](http://www.fda.gov/about-fda/website-policies/website-disclaimer) (<http://www.fda.gov/about-fda/website-policies/website-disclaimer>) – Protocols developed and/or optimized for this project covering methods for collecting and testing wastewater samples, sequencing SARS-CoV-2 from the samples, and submitting the sequence data and associated metadata for public access
- [CFSAN Wastewater Analysis Pipeline \(C-WAP\) Tool](https://github.com/CFSAN-Biostatistics/C-WAP) (<https://github.com/CFSAN-Biostatistics/C-WAP>) [⌵](http://www.fda.gov/about-fda/website-policies/website-disclaimer) (<http://www.fda.gov/about-fda/website-policies/website-disclaimer>) – Developed for analyzing SARS-CoV-2 sequence data obtained from wastewater samples

## Participating Laboratories

- Arizona Department of Health Services with the Translational Genomics Research Institute
- California Department of Public Health
- Indiana State Department of Health
- Kentucky Cabinet for Health and Family Services
- Massachusetts State Public Health Laboratory
- Nevada Department of Health and Human Services with the University of Nevada - Reno
- New Jersey Department of Agriculture, Animal Health Diagnostic Laboratory
- New Jersey Department of Health and Senior Services
- New Mexico State University, Food Safety Laboratory
- North Carolina State University, College of Veterinary Medicine
- Animal Disease Diagnostic Laboratory, Ohio Department of Agriculture
- Pennsylvania Department of Health with Pennsylvania State University
- Rhode Island Department of Health
- South Carolina Department of Health and Environmental Control
- South Dakota Department of Health with South Dakota State University

- Texas Department of State Health Services
- Virginia Department of Health
- Washington State Department of Agriculture
- Washington State Department of Health Public Health Laboratories
- West Virginia Department of Agriculture
- FDA-CFSAN Gulf Coast Seafood Laboratory