

Carbapenemase-Producing Organism Whole-Genome Sequencing in the Antimicrobial Resistance Laboratory Network Northeast Region: Laboratory Information Management System Integration and Data Visualization

Catharine Prussing¹, Kailee Cummings¹, Shannon Morris¹, Devin Akerley¹, Quillan Brady¹, Charles MacGowan¹, James Levin¹, Nicole Dagata², Krisandra Allen², Alok Mehta³, Kimberlee Musser¹, Elizabeth Nazarian¹

¹Wadsworth Center, NYSDOH, Albany, NY; ²Center for Genomic Pathogen Surveillance/Digital Epidemiology Services, Oxford, England; ³NYS Office of Information Technology Services, Albany, NY



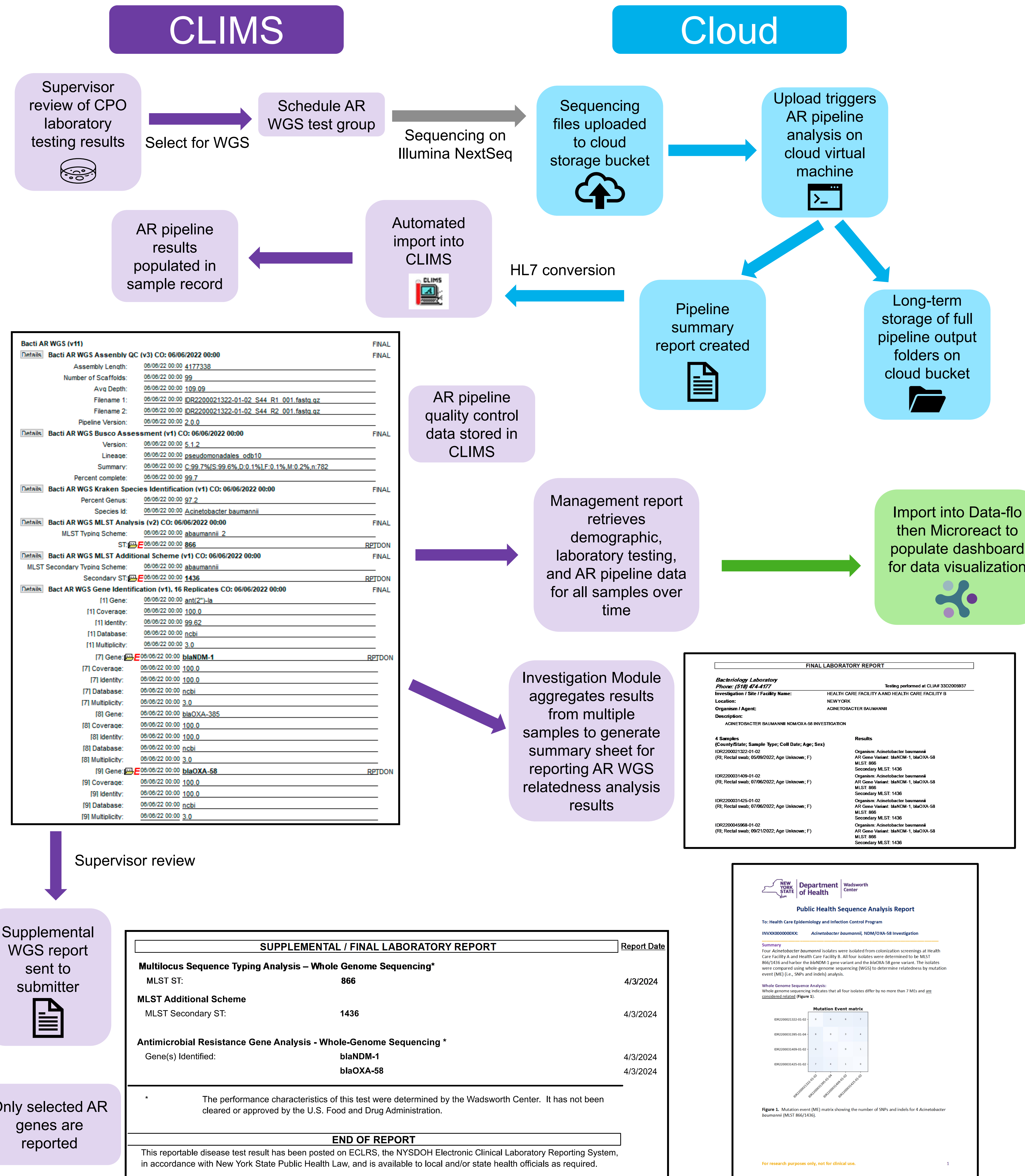
Background

- As the Northeast Regional Laboratory for the Antimicrobial Resistance Laboratory Network, the Wadsworth Center (WC) has been conducting whole-genome sequencing (WGS) on carbapenemase-producing organisms (CPOs) since 2017
- WGS data are analyzed using an in-house developed Antimicrobial Resistance (AR) pipeline, which assigns multi-locus sequence type (MLST) and identifies AR genes at the variant level
- The AR pipeline was approved in 2022 by New York State's Clinical Laboratory Evaluation Program to be used for Clinical Laboratory Improvement Amendments (CLIA) compliant clinical reporting
- Nearly 4,000 CPOs from the Northeast Region have been sequenced and analyzed using the AR pipeline at WC
- AR pipeline results are stored in CLIMS, WC's in-house laboratory information management system (LIMS)

Conclusions

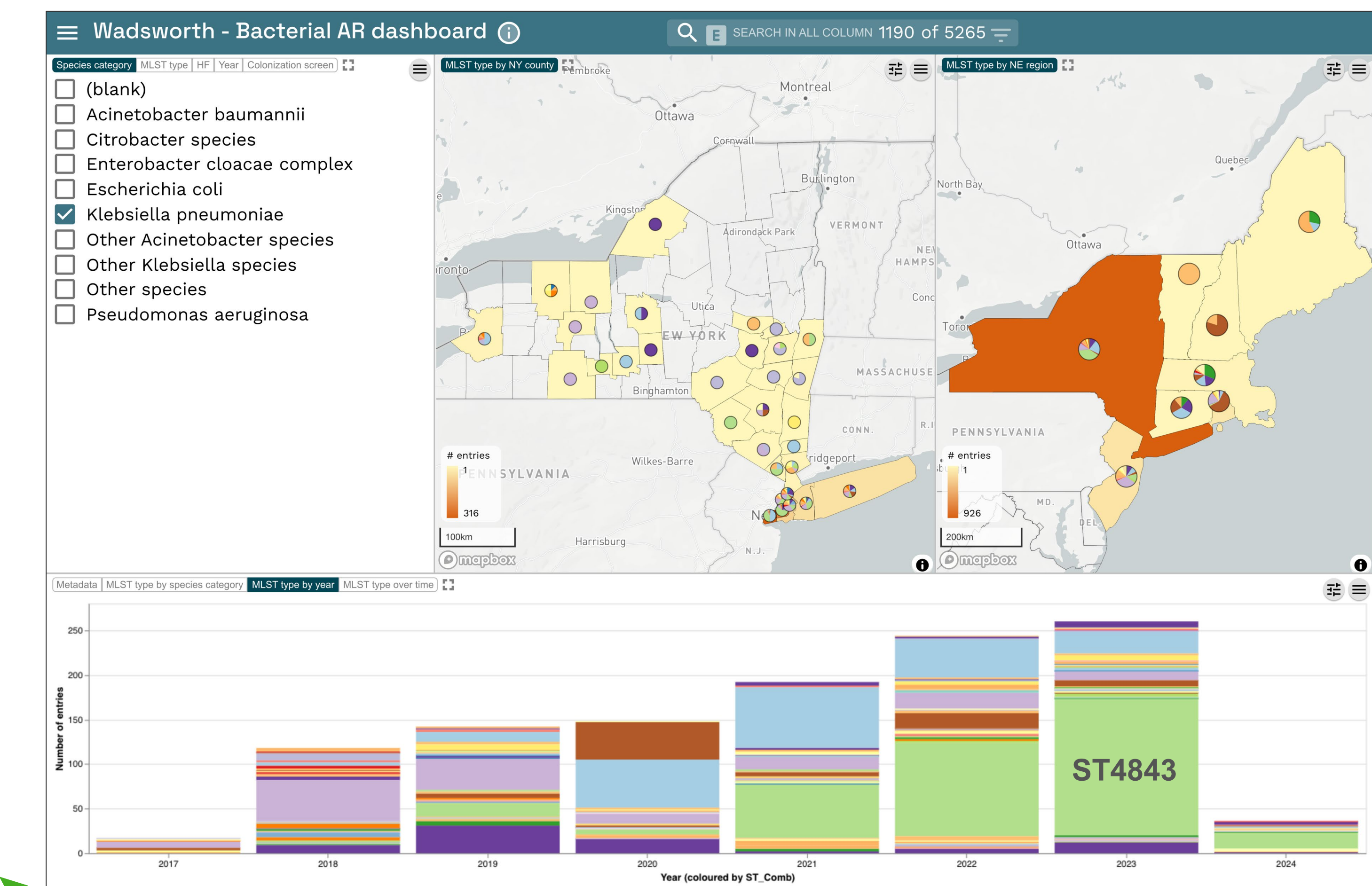
- Integration of AR pipeline output into CLIMS allows for:
 - Efficient sample and workflow management with an audit trail
 - Integration of CLIA compliant AR pipeline results into clinical reports
 - Aggregation of AR pipeline results into investigation reports to support epidemiological investigations
 - The ability to query and summarize AR pipeline output in combination with demographic and other laboratory testing data stored in CLIMS
 - Data visualization of trends in MLST and AR gene variants
- Future plans:
 - Create a direct connection between CLIMS and Data-flo to allow for real-time updating of Microreact dashboard
 - Integrate relatedness analysis results into Microreact dashboard
 - Share data visualizations and dashboard views with healthcare-associated infection (HAI) epidemiologists

AR Pipeline Workflow and LIMS Integration



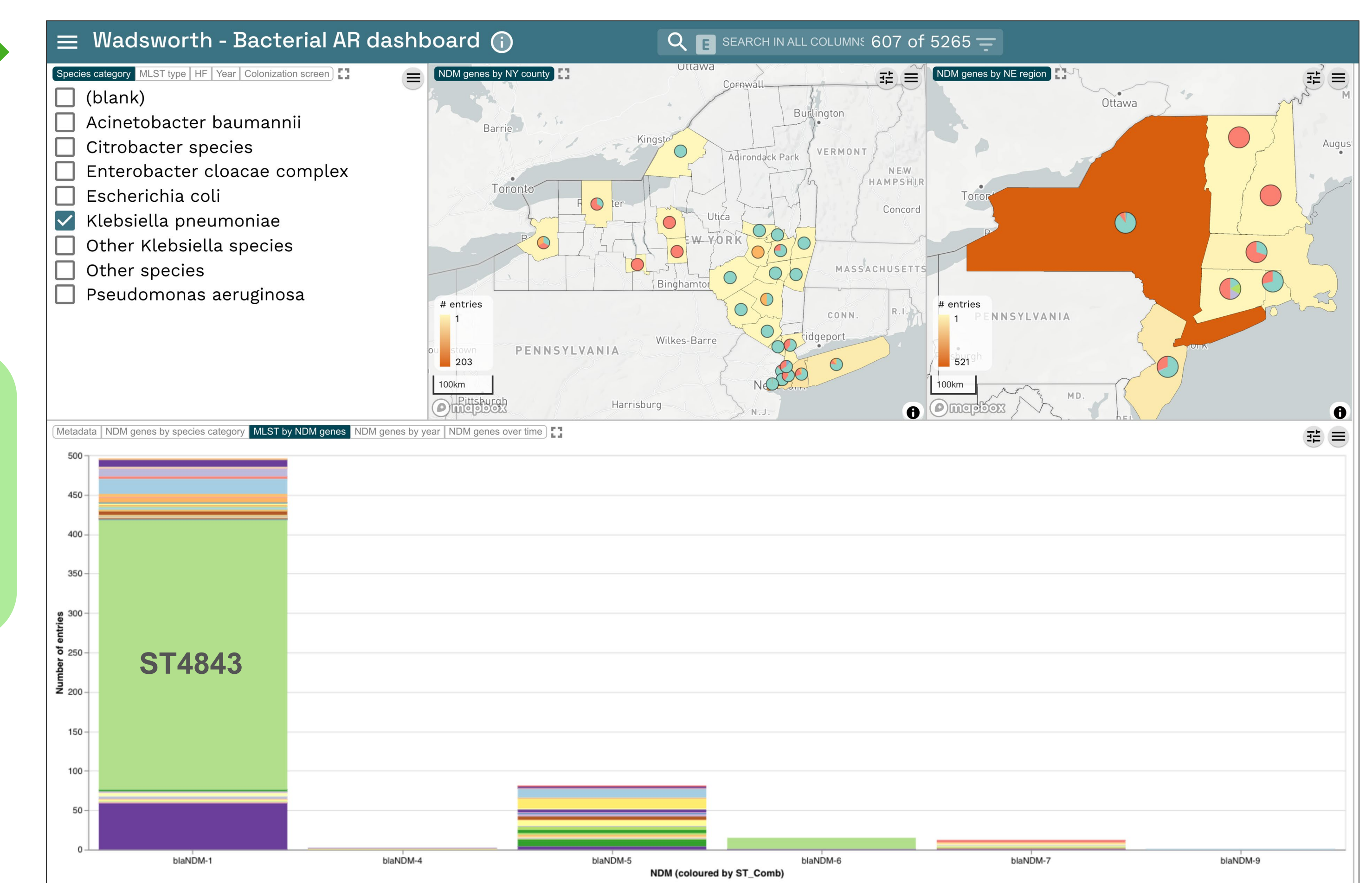
Microreact Dashboard Visualization of AR WGS Results

Data-flo/Microreact



Interactive dashboard allows for filtering, searching, and animating data along a timeline

Visualize trends in MLSTs by organism across New York counties and Northeast Region states, and over time



Visualize trends in carbapenemase gene variants by New York counties, Northeast Region states, species, MLST, and over time

Acknowledgements

- We thank the Wadsworth Center Advanced Genomic Technologies Cluster for conducting sequencing, and epidemiology and public health laboratory colleagues from the Northeast Region for their collaboration.
- This work was supported by the New York State Department of Health, Cooperative Agreement Number NU50CK000423 funded by the Centers for Disease Control and Prevention (CDC), and Cooperative Agreement U60OE000103 funded by CDC through the Association of Public Health Laboratories.