SARS-COV-2 WASTEWATER SURVEILLANCE IN A US JAIL: CORRELATION, FEASIBILITY & NEXT STEPS

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BACKGROUND

- Incarcerated persons have relatively high rates of pre-existing conditions and a high risk for acquisition and transmission of SARS-CoV-2.[1]
- Traditional diagnostic methods are not effective in rapidly identifying cases of asymptomatic infections in crowded, rapidly churning environments.[2]
- Persons with COVID-19 shed SARS-CoV-2 in stool.[3]
- Wastewater- Based Surveillance (WBS) is a highly sensitive, noninvasive, low-cost method for population level COVID-19 surveillance.[3]

METHODS

Wastewater testing

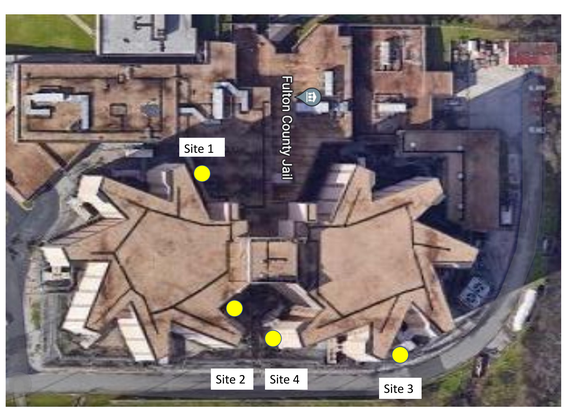
- Samples were collected weekly via Moore Swabs, processed at Emory University Center for Global Safe WASH, at 3-4 sites around the jail property.
- Results presented as Cycle threshold (Ct) Values, lower value is stronger signal.
- Dye testing was conducted to understand flow of wastewater.

Diagnostic testing

- Jail (capacity~2,600, average daily population ~2,700) administered rapid antigen (BinaxNOW, Clearview) tests at intake and as needed among residents with symptoms.
- Emory conducted 16 mass PCR-testing (Northwell Laboratory) events.

Analysis

- Spearman's Correlation Coefficient was calculated to examine the correlation between weekly data:
  - WBS results between collection sites on jail property
  - Diagnostic test statistics
  - WBS and diagnostic test results

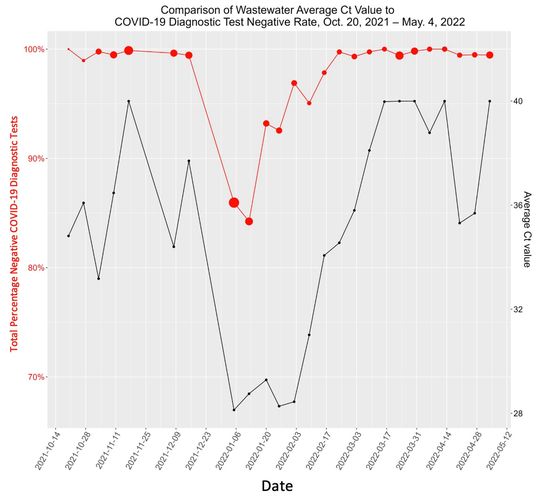


Wastewater based surveillance for SARS-Cov-2 in the context of a jail is a feasible and reliable strategy for monitoring presence of SARS-CoV-2.

Spearman's r= -0.67

RESULTS

- Site 3 was sufficiently representative of the entire jail's Wastewater from dye test results and high Spearman's correlation coefficients of Ct values.
- Efficiency of testing increased from collecting 44 tests on Oct 20, 2021 to 591 on Jan 5, 2022.
- The total percentage of positive diagnostic tests peaked in the week of Dec 28, 2021 at 29.5%. The test positivity averaged 3.4% (SD= 6.6%) over the study period.
- The total COVID-19 diagnostic test positivity rate had a strong negative correlation with the wastewater Ct values combined over time (Spearman's r= -0.67, p-value <0.01).



Spearman Correlation Coefficients for Wastewater and Diagnostic Test results

Diagnostic Tests	% Positive PCR[1] R (p-value)	% Positive Rapid Antigen[2] R (p-value)	Total % Positive Tests[3] R (p-value)
% Positive PCR	1.00	0.91 (<0.01)	0.78 (<0.01)
% Positive Rapid Antigen		1.00	0.97 (<0.01)
Total % Positive Tests			1.00
Wastewater and Diagnostic Correlation	**% Positive PCR**	**% Positive Rapid**	**Total % Positive Tests**
Wastewater Ct Values	-0.54 (0.048)	-0.64 (<0.01)	-0.67 (<0.01)

[1] Number of positive PCR tests in one week over the total number of PCR tests administered for the same week
[2] Number of positive rapid tests in one week over the total number of rapid tests administered for the same week
[3] Total number of positive diagnostic tests (PCR + rapid) in one week over the total number of diagnostic tests administered for the same week

CONCLUSIONS

- The number of PCR tests administered each sampling period increased over time. Methods were sustainable week after week.
- We documented two surges in COVID-19 prevalence: weeks of 8/17/2021 (19.7%) and 12/28/2021 (29.5%), aligning with the Delta and Omicron variants, respectively.
- The WBS results strongly correlate with the COVID-19 diagnostic test positivity rates (r= -0.67) among jail residents. This correlation contributes to credibility of results, as they are not perfectly correlated.
- Logistic regression between Diagnostic test positivity and Ct value results performed and similar results were found.
- This study demonstrated the efficiency and feasibility of conducting WBS for SARS-CoV-2 on a regular basis in a jail setting.

Limitations include:

- Diagnostic testing not always randomly distributed.
- Diagnostic tests were counted by the week .

Next Steps:

- Exploring the feasibility and reliability of WBS testing in a jail setting for other viruses such as HIV.

References

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