

Hospital-based Wastewater Surveillance of Influenza and COVID-19 in a New York City Hospital System, 2024-2025

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Background

- Hospital-based wastewater surveillance provides a facility-specific method to monitor seasonal respiratory viruses.
- It may complement community wastewater and inpatient clinical data.
- Wastewater strength could vary across hospitals, requiring PMMoV normalization for comparability.

Objectives

- Evaluate the sensitivity of hospital wastewater for detection of COVID-19 and Influenza activity in 4 NYC Hospitals between 05/2024 and 05/2025.
- Compare performance across pathogens.
- Assess wastewater alignment with inpatient case trends.

Methods

Wastewater Sampling & Testing

Hospital Wastewater Collection
Samples are collected weekly from 3 NYC Health + Hospitals facilities. Collected from hospital sewage outflow.



Passive Sampling Method
Proprietary solid binding matrix Deployed for 24 hours



Laboratory Testing
Targets: SARS-CoV-2, Influenza A and B

Clinical Data

- 7-day rolling averages of daily inpatient admissions for COVID-19 and influenza
- Case detection defined as ≥ 1 , ≥ 5 , and ≥ 10 cases per week

Analysis

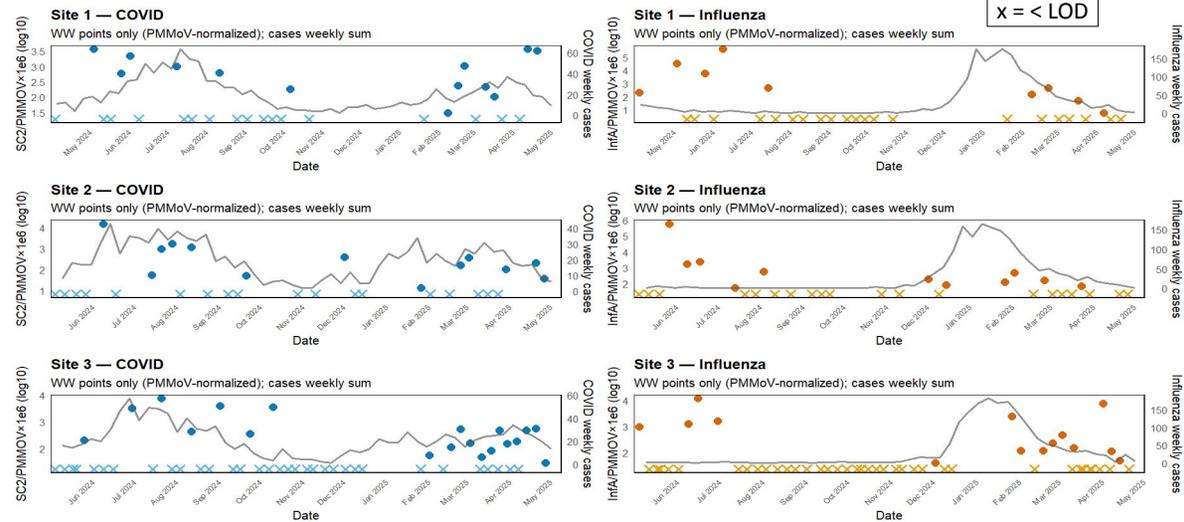
- Viral concentrations normalized using PMMoV
- Sensitivity calculated as $TP / (TP + FN)$
- Specificity calculated as $TN / (TN + FP)$

Results

Table 1: Sensitivity and specificity of wastewater varied by pathogens (when aggregated across hospitals)

Target	Minimum # cases detected	True Positive	False Positive	True Negative	False Negative	Sensitivity	Specificity	Wastewater	Inpatient Cases	Classification
Sars-CoV-2	≥ 1	46	—	—	63	0.422	—	Detected the virus	Present	True Positive (TP)
Sars-CoV-2	≥ 5	44	2	10	53	0.454	0.833	Did not detect the virus	Present	False Negative (FN)
Sars-CoV-2	≥ 10	42	4	18	45	0.483	0.818			
Influenza A	≥ 1	34	—	—	65	0.343	—	Detected the virus	NOT Present	False Positive (FP)
Influenza A	≥ 5	23	11	41	24	0.489	0.789			
Influenza A	≥ 10	20	14	46	19	0.513	0.767	Did not detect the virus	NOT Present	True Negative (TN)
Influenza B	≥ 1	20	—	—	79	0.202	—			
Influenza B	≥ 5	12	8	44	35	0.255	0.846			
Influenza B	≥ 10	11	9	51	28	0.282	0.850			

Figure 1: Wastewater vs. Clinical Case Trends by Hospital Site



Conclusions

- Hospital wastewater surveillance can complement clinical surveillance by providing an additional signal of respiratory virus activity.
- Sensitivity was higher for SARS-CoV-2 than for influenza targets.
- Wastewater peaks were observed without corresponding increases in inpatient cases, suggesting hospital wastewater may capture transmission dynamics not reflected in clinical data alone.
- Correlations between wastewater signals and cases could not be assessed due to infrequent sampling.
- Future directions include assessing whether more frequent sampling (at least 2-3 times per week) may improve the interpretation of wastewater trends.

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