

Background: Respiratory Syncytial Virus (RSV)

Respiratory Syncytial Virus (RSV) is an enveloped, single-stranded RNA virus that infects the respiratory tract. RSV is the most common cause of bronchiolitis and pneumonia in children younger than one-year-old, and almost all children will have had an RSV infection by their second birthday (CDC, 2022). RSV also affects adults, causing an estimated 6,000-10,000 deaths among adults 65 years and older, and millions of infections in the U.S. across all age groups each year (CDC, 2022). Among children under five years, RSV infection resulted in over 57,000 hospitalizations and two million outpatient visits each year in the U.S. from 2014-2017 (Rose et al., 2018). Critically, the 2022 RSV season showed much higher rates of RSV than observed in the past five years, and an earlier seasonal peak than expected from years prior.

There are two subgroups of RSV: RSV-A and RSV-B. Each of these subgroups (or strains) exhibit genome-wide divergence, meaning that the two subgroups are genetically different across their genomes. Both strains circulate, and which is dominant has varied over time (Pandya et al., 2019). Although a vaccine for RSV does not currently exist, immunoprophylaxis – a weekly shot of monoclonal antibodies – may be recommended for high-risk children during the RSV season.

RSV Transmission

In most regions in the U.S., RSV begins to circulate in the fall and peaks in the winter. There may be regional distinctions in the timing and severity of RSV outbreaks. Children frequently come into contact with the virus outside of the home, such as in schools or daycares, and then can spread the virus to other family members via airborne or surface transmission of the virus. When someone with an RSV infection coughs or sneezes, viral particles are spread through the environment and onto surfaces. Coming into contact with viral particles by inhaling them, or touching them and then touching one's face, are the primary modes of transmission.

Not all people infected with RSV will be tested clinically. One study reported unclear and variable RSV testing practices for children and infants in emergency departments and outpatient settings (Movva et al., 2022). In the majority of hospitals that admit older adults for lower-respiratory tract infections, less than 25% test those patients for RSV (Rozenbaum et al., 2023). Additionally, severity of symptoms may vary by age. Very young and old people tend to experience the most severe infections. Since milder symptoms resemble those of influenza or SARS-CoV-2, infections may be misdiagnosed. More severe infections can develop into pneumonia and bronchiolitis prompting more serious treatment (such as a respirator to help with breathing).

Role of Wastewater in RSV Monitoring

Currently, positive RSV tests from participating clinical laboratories report weekly RSV test positivity to the National Respiratory and Enteric Virus Surveillance System (NREVSS). The Respiratory Syncytial Virus Hospitalization Surveillance Network also reports lab-confirmed hospitalizations. However, similarly to Influenza A/B, current monitoring methods likely underestimate the true disease burden of RSV. Due to reporting delays,

data from most recent weeks is incomplete. In addition, test positivity data also are aggregated at the national, regional, and state level where applicable, since not all U.S. states submit data (CDC, 2023). Importantly, wastewater data can not only reflect regional trends, but also can track trends at more granular geographic scales, noting how and when disease spreads over time and space with flexibility and granularity. These data can not only provide insight on disease spread for the general public, but can also allow public health officials to effectively guide hospital and immunoprophylaxis resource distribution.

Particularly in the wake of the end of the Public Health Emergency, which ended May 11, 2023, tracking these distinct respiratory viruses through wastewater data is critical. Public health professionals framed the 2022-2023 season as a “triple-demic” of RSV, influenza, and SARS-CoV-2 respiratory infections. With these viruses circulating simultaneously and potentially shifting in severity and duration, understanding the full impact and community-level activity of each of these pathogens is critical to adapting the public health response to prevent infection.

Biobot and RSV

Biobot began testing for RSV in wastewater data in 2023. Wastewater monitoring can clarify shifts in the seasonal and regional distributions of RSV transmission and infection. With more comprehensive data across respiratory pathogens, local and statewide public health responses can more accurately respond to and prepare for annual viral threats.

More Information

- ➔ For the CDC's estimates of national RSV trends, [see here](#).
- ➔ For more information on the 2022 surge in RSV, [see here](#).