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Syndromic Surveillance and Case Identification for Varicella Among Recent Immigrants, New York City, 2023

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Abstract

Objectives: To determine utility of syndromic surveillance in improving varicella case detection during an outbreak among recent immigrants to New York City (NYC).

Methods: During March–August 2023, the NYC health department received varicella reports from routine sources and syndromic surveillance from emergency department visits with varicella

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Conflicts of Interest: Note: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC.

Human Participant Protection: This activity was reviewed by the Centers for Disease Control and Prevention (CDC), deemed not research, and was conducted consistent with applicable federal law and CDC policy. § The NYC Health Department also reviewed this activity and determined it to be non-research public health surveillance (IRB: 23–075). § See e.g., 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

as a chief complaint or discharge diagnosis. Reports were reviewed to determine if individuals met criteria for confirmed or probable varicella cases and if cases were outbreak-associated. Positive predictive value (PPV) and timeliness of syndromic surveillance reports were calculated and compared with routine surveillance reports.

Results: The health department received 639 unique varicella reports. Of 513 varicella cases, 247 (48.1%) were from syndromic surveillance alone, 194 (37.8%) from routine sources alone, and 72 (14.0%) from both sources. PPV was higher for syndromic surveillance (89.1%) versus routine surveillance (74.7%). Among 310 outbreak-associated cases, 139 were identified through syndromic surveillance (44.8%); syndromic surveillance was the only reporting source for 75 (24.2%). Syndromic surveillance was more timely than routine reporting (median: 3 days [range: 1–27] vs 5 days [range: 0–52]).

Conclusions: NYC syndromic surveillance improved varicella case detection during this outbreak.

Varicella (chickenpox) is a vaccine-preventable disease, but outbreaks still occur because of incomplete vaccination coverage globally.¹ Varicella is a contagious viral infection characterized by a generalized rash that can include complications, such as pneumonia.² Before availability of a vaccine in the United States beginning in 1995, the majority of persons acquired varicella during childhood and developed lifelong immunity.² Since a vaccine has been available, varicella incidence in the United States has declined by >97%.³ In New York state, 2 doses of varicella vaccine are required to attend school.⁴ Until December 20, 2023, providers were required to report varicella outbreaks, but individual cases of varicella were not reportable to public health departments in New York.⁵

During October 2022, the New York City (NYC) Health Department identified a varicella outbreak among persons residing in temporary housing who recently immigrated to NYC, primarily from Central and South American countries that do not have routine or have disrupted varicella immunization programs. Approximately 900 varicella cases were identified as of March 2024.⁶ Outbreak control measures included contact tracing, recommendations for isolation and quarantine, vaccine administration, and provision of guidance to exposure settings. We evaluated utility of emergency department (ED) syndromic surveillance data as a supplemental tool for identifying any new cases and outbreak-associated cases.

METHODS

The NYC Health Department routinely received reports of varicella during this outbreak from NYC shelters and residential facilities, schools, field investigations, healthcare facilities, and laboratories (defined as “routine sources”). After receiving a varicella report, NYC Health Department staff conducted patient interviews and reviewed medical, laboratory, and immunization records to determine if the person’s illness met the Council of State and Territorial Epidemiologists definition of a confirmed or probable case (referred to as “case”).⁷ Cases were investigated to determine whether they were associated with this outbreak among recently arrived immigrants, defined as occurring in a person who

arrived to the United States and NYC since June 2022 or with an epidemiologic link to an outbreak-associated case.

During this outbreak, NYC syndromic surveillance from ED visit data⁸ was added as a supplemental surveillance tool on March 1, 2023. This was done to identify additional cases that might not have been proactively reported to the NYC Health Department through routine reporting sources. Syndromic surveillance data included ED visits with a varicella discharge diagnosis code (i.e., B01) or mentions of varicella or pox in the chief complaint.

Reports of varicella identified by syndromic surveillance and by routine reporting sources during March 1–August 31, 2023, were included in the evaluation. Number and proportion of all cases and of outbreak-associated cases identified by report source (i.e., syndromic surveillance only, routine surveillance only, or both reporting sources) were calculated. We calculated the positive predictive value (PPV), defined as proportion of varicella reports classified as cases, separately for syndromic surveillance and routine surveillance reports. Non-outbreak-associated cases were included in PPV calculation to enhance generalizability beyond this outbreak. The percentage increase in case ascertainment resulting from cases identified only through syndromic surveillance was calculated separately for all varicella cases and for outbreak-associated cases. Timeliness (median time from rash onset to Health Department receipt of first report) for outbreak-associated cases was calculated and compared by reporting source (i.e., syndromic surveillance first vs routine surveillance first).

RESULTS

The NYC Health Department received 639 unique varicella reports during March 1–August 31, 2023, from syndromic surveillance and routine reporting sources (Figure). Of the 639 reports from all sources, 513 were classified as varicella cases, including 247 (48.1%) reported from syndromic surveillance alone (increasing case ascertainment by 93%), 194 (37.8%) from routine reporting sources alone, and 72 (14.0%) from both sources.

For reports from syndromic surveillance, 319 of 358 were classified as cases (PPV = 89.1%), compared with 266 of 356 reports from routine surveillance that were classified as cases (PPV = 74.7%). Among 310 outbreak-associated cases, 139 (44.8%) were reported by syndromic surveillance (75 reported only by syndromic surveillance, increasing ascertainment of outbreak cases by 32%, and 64 reported by both routine sources and syndromic surveillance) (Figure). Time from varicella rash onset to Health Department receipt of first report for outbreak-associated cases was shorter for syndromic surveillance (median: 3 days [range: 1–27 days]), compared with those reported by routine reporting sources first (median: 5 days [range: 0–52 days]).

DISCUSSION

NYC syndromic surveillance demonstrated its utility in varicella surveillance during an outbreak. It improved completeness of overall case ascertainment by over 90%, identifying 247 cases that were not reported through routine surveillance, and increased detection of outbreak-associated cases by ~30%. Additional effort to determine outbreak association was not resource intensive. Approximately 90% of reports from syndromic surveillance

were classified as cases, which makes resources spent on investigation of syndromic reports worthwhile. As of 2020, there were 39 states with case-based varicella reporting.⁹ Because case-based varicella reporting by providers was not required in New York state until after the evaluation period,⁴ the possibility exists that syndromic surveillance was the sole source of reports for a greater proportion of cases compared with states with case-based varicella reporting. However, provider reporting for communicable diseases is often incomplete, despite case-base reporting requirements.¹⁰ In addition, syndromic surveillance increased the timeliness of case identification.

A limitation of ED-based syndromic surveillance is that it would only identify patients who sought ED-level care (e.g., cases involving more severe symptoms or patients without health insurance). Because most persons with varicella do not require ED-level care, we would not expect syndromic surveillance to identify all outbreak-associated cases. The proportion of outbreak-associated cases identified by syndromic surveillance during the evaluation period (45%) might be higher in this recently arrived immigrant population, compared with other populations. This is because many persons in this outbreak do not have existing connections to primary care on arrival to NYC or might be more likely to be uninsured, so they might be more likely to seek healthcare in an ED setting. Future evaluations should assess demographic and social characteristics of cases captured by syndromic surveillance versus routine sources to characterize differences between types of patients captured. A limitation of this analysis is that routine surveillance report documentation might have been incomplete, particularly when the report was already identified by syndromic surveillance. Syndromic surveillance was timelier, and populated into our database automatically, whereas other sources (e.g., provider phone call) required manual entry. Thus, percentage of outbreak-associated cases identified only by syndromic surveillance might be overestimated.

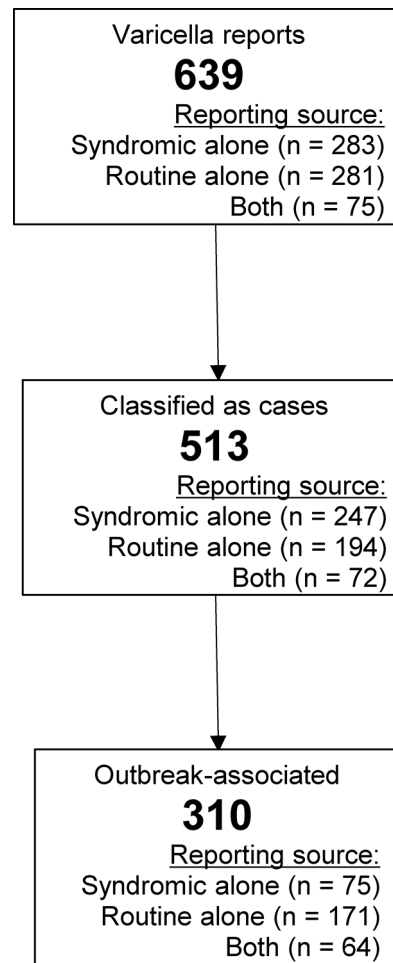
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Public Health Implications

Syndromic surveillance allowed for earlier and more complete identification of cases associated with the varicella outbreak. Identification of outbreak-associated cases facilitated implementation of control measures, including contact tracing, recommendations for isolation and quarantine, vaccine administration, and provision of guidance to exposure settings. Timely varicella reporting is important because post-exposure prophylaxis includes varicella vaccination within five days of exposure. Although investigating reports of varicella is resource-intensive, reports received through syndromic surveillance were predominantly classified as cases and additional effort to determine outbreak association was minimal. Syndromic surveillance might be valuable for jurisdictions regardless of whether they have case-based varicella surveillance, as NYC has demonstrated in this report, given improved timeliness and under-reporting of varicella even in jurisdictions with case-based surveillance. This might also serve as a model for using syndromic surveillance for other vaccine-preventable diseases in NYC and other jurisdictions.



FIGURE—. Varicella Reports Received by the New York City Health Department by Case Classification, Outbreak Association, and Reporting Source — New York City, March 1–August 31, 2023

Routine reporting sources included residential facilities, schools, field investigations, healthcare facilities, and laboratory reports. Cases included confirmed or probable cases classified based on the Council for State and Territorial Epidemiologists case definitions. Outbreak-associated cases were defined as those occurring in persons who arrived in the United States and New York City since June 2022, or with an epidemiologic link to an outbreak-associated case.