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Mycoplasma pneumoniae Infections in Hospitalized Children — United States, 2018–2024

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Abstract

Mycoplasma pneumoniae is a common bacterial cause of respiratory infection and a leading cause of childhood community-acquired pneumonia (CAP). Increases in *M. pneumoniae* infection occur every 3–5 years. In the United States, *M. pneumoniae* prevalence decreased during and immediately after the COVID-19 pandemic. Information from 42 U.S. children's hospitals that provided information to the Pediatric Health Information System, a database of clinical and resource use information, was used to identify discharge diagnostic codes for 2018–2024 indicating *M. pneumoniae* infection. *M. pneumoniae*–associated CAP incidence among children aged ≤18 years was significantly higher in 2024 (12.5 per 1,000 hospitalizations) than during 2018–2023 (2.1). During the study period, an *M. pneumoniae* diagnostic code was listed in 11.5% of pediatric CAP hospitalizations, peaking at 53.8% in July 2024. Among pediatric *M. pneumoniae* CAP cases, the highest percentage occurred among children aged 6–12 years (42.6%), followed by children aged 2–5 years (25.7%) and 13–18 years (21.1%). The lowest occurred among those aged 12–23 months (6.4%) and 0–11 months (4.2%). *M. pneumoniae* infections in 2024 were not more severe than 2018–2023 infections, as assessed by length of hospitalization and percentage of patients admitted to an intensive care unit. The increase in *M. pneumoniae* infections in the United States in 2024 might be higher than previous periodic increases because the susceptible population was larger after sustained low incidence during and immediately after the COVID-19 pandemic. Health care providers should be aware of the periodicity of *M. pneumoniae* CAP and consider testing for this pathogen as a cause of respiratory illness among children of all ages.

Introduction

Mycoplasma pneumoniae is a common cause of bacterial respiratory infections, including community-acquired pneumonia (CAP). Most *M. pneumoniae* infections are mild, although some patients develop pneumonia requiring hospitalization (*1*). *M. pneumoniae* infections affect all age groups; however, the highest percentages of cases have historically been reported among children and adolescents aged 5–17 years. Previous studies have estimated that *M. pneumoniae* accounts for approximately 10%–30% of hospitalized pediatric CAP cases (*1*,*2*). No vaccine is available to prevent *M. pneumoniae* infection. Macrolide antibiotics such as azithromycin, clarithromycin, and erythromycin are the first-line treatment for infection.* Macrolide-resistant *M. pneumoniae* infections are widespread in some regions of the world but remain relatively uncommon in the United States, accounting for <10% of cases (*3*,*4*).

* CDC | Clinical care of *Mycoplasma pneumoniae* infection

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Historically, *M. pneumoniae* infections have increased approximately every 3–5 years, which mathematical modeling suggests is due, in part, to changes in predominant strain types and associated increases in susceptible populations resulting from waning immunity after infection (*1*,*5*). During the COVID-19 pandemic, *M. pneumoniae* infections were rarely detected (*6*). In 2023, *M. pneumoniae* infections increased in other countries but remained low in the United States (*7*). *M. pneumoniae* infections in the United States began to increase sharply in April 2024, as indicated by an increase in the percentage of positive test results and syndromic surveillance data from emergency departments.† This report describes the epidemiology of *M. pneumoniae* and characterizes infections among patients aged ≤18 years (referred to as children in this report) discharged from pediatric hospitals during 2024 compared with previous years.

Methods

Population and Data Source

The Pediatric Health Information System (PHIS)§ contains clinical and resource use data for patients aged ≤18 years. Children treated at one of 42 U.S. children's hospitals that consistently contributed data to PHIS were eligible for inclusion. The PHIS database was queried for *International Classification of Diseases, Tenth Revision* (ICD-10) discharge diagnostic codes indicating CAP¶ and *M. pneumoniae* infection.** Data were used to identify the total number of CAP cases, *M. pneumoniae*–associated CAP cases, and CAP cases with administration of an antimicrobial agent effective against *M. pneumoniae*†† during January 2018–December 2024. ICD-10 codes used to identify *M. pneumoniae* CAP were validated by comparing discharge diagnosis codes with laboratory results at one hospital (Primary Children's Hospital, Salt Lake City, Utah).

† CDC | *Mycoplasma pneumoniae* infections have been increasing

§ Children's Hospital Association | Leverage your data with CHA's Pediatric Health Information System

¶ Influenza due to identified novel influenza A virus with pneumonia (J09.X1); influenza due to other identified influenza virus with pneumonia (J10.00–10.01 and J10.08); influenza due to unidentified influenza virus with pneumonia (J11.00 and J11.08); viral pneumonia, not elsewhere classified (J12.0–12.3 and J12.8–12.9); pneumonia due to *Streptococcus pneumoniae* (J13); pneumonia due to *Haemophilus influenzae* (J14); bacterial pneumonia, not elsewhere classified (J15.0–15.9); pneumonia due to other infectious organisms, not elsewhere classified (J16.0 and J16.8); pneumonia in diseases classified elsewhere (J78); bronchopneumonia, unspecified organism (J18.0–18.2 and J18.8–18.9); acute respiratory distress syndrome (J80); Legionnaires disease (A48.1); and acute bronchitis due to *M. pneumoniae* (J20.0).

** Pneumonia due to *M. pneumoniae* (J15.7); acute bronchitis due to *M. pneumoniae* (J200); *Mycoplasma* infection, unspecified site (A493); and *M. pneumoniae* as the cause of diseases classified elsewhere (B960).

†† Antibiotics considered effective against *M. pneumoniae*, with *Current Procedural Terminology* codes and exclusions, include azithromycin (122421, excluding ophthalmic 1224214568000 and 1224214568064); clarithromycin (122425); doxycycline (123115, excluding topical 1231154041000, 1231154042000, and 1231154045652); minocycline (123131); levofloxacin (123215, excluding inhalation 1232154242272 and excluding ophthalmic 1232154565000, 1232154565064, 1232154565114, and 1232154569000); and moxifloxacin (123225, excluding ophthalmic 1232254539000, 1232254539591, 1232254539861, 1232254539941, 1232254565000, 1232254565074, and 1232254565114).

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Analysis

To determine whether the severity of *M. pneumoniae* infections during 2018–2023 (before, during, and immediately after the COVID-19 pandemic) differed from the severity of infections in 2024, as measured by intensive care unit admission and length of hospital stay, the number and rate (cases per 1,000 hospitalizations) of *M. pneumoniae* cases during 2018–2024, 2018–2023, and 2024 were analyzed. The number and percentage of cases during each period were reported by age group, sex, race and ethnicity, and characteristics of hospitalization. Chi-square and Wilcoxon rank-sum tests were used to compare demographic and clinical characteristics of patients with infections during 2018–2023 and 2024, with p-values <0.05 considered statistically significant. Statistical testing was performed using SAS (version 9.4; SAS Institute). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[§§]

Results

Prevalence of CAP-Associated Pediatric Hospitalizations

Among 5,631,734 hospitalized children, 141,955 (2.5%) received a CAP diagnosis (Figure 1), including 111,064 (2.3%) of 4,760,521 during 2018–2023 and 30,891 (3.5%) of 871,213 in 2024. Seasonal increases in CAP occurred annually during the fall and winter, except during 2020–2021. The annual number of CAP cases ranged from 10,221 in 2020 to 30,891 in 2024.

Percentage of Pediatric CAP Cases with an *M. pneumoniae* Diagnostic Code

Overall, among all hospitalized pediatric patients with CAP, an *M. pneumoniae* diagnostic code was listed for 16,353 of 141,955 (11.5%); 94.4% of identified *M. pneumoniae* infections had a CAP diagnosis. *M. pneumoniae* accounted for <5% of total hospitalized CAP cases annually during 2021–2023, then increased to 33% in 2024, peaking at 53.8% in July 2024 (Figure 1). Among 16,353 *M. pneumoniae*–related hospital discharges (representing 4.45 per 1,000 hospitalizations), a total of 6,055 (2.12 per 1,000) occurred during 2018–2023, and 10,298 (12.49 per 1,000) occurred in 2024 (Table).

Demographic and Clinical Characteristics of Children Hospitalized with *M. pneumoniae* and CAP

The number of hospital discharges for *M. pneumoniae*–associated CAP decreased in early 2020, remained low through 2023, and increased in all age groups in 2024 (Figure 2). The highest total number and proportion of *M. pneumoniae* CAP cases occurred among children aged 6–12 years (6,959; 42.6%), followed by those aged 2–5 years (4,210; 25.7%) and 13–18 years (3,448; 21.1%); the lowest proportion was among children aged 12–23 months (1,046; 6.4%) and 0–11 months (690; 4.2%) (Table). The peak monthly proportion of CAP cases attributed to *M. pneumoniae* was highest among children aged 13–18 years (67.2%), followed by those aged 6–12 years (60.8%), 2–5 years (53.4%), 0–11 months (52.0%), and 12–23 months (44.8%) (Figure 2). In 2024, compared with 2018–2023, the proportion of CAP attributed to *M. pneumoniae* increased the most among children aged 12–23 months (increased 8.5 times), followed by 0–11 months (8.1 times), 2–5 years (7.7 times), 13–18 years (4.5 times), and 6–12 years (4.1 times). Compared with 2018–2023, the length of hospital stay in 2024 was shorter (2 days [range: 1–4 days] versus 3 days [range: 2–6 days]), and the percentage of patients admitted to an intensive care unit was lower (19.5% versus 26.0%). Forty-four (0.3%) deaths occurred among children with *M. pneumoniae* CAP, including 29 (0.5% of *M. pneumoniae* CAP cases) during 2018–2023 and 15 (0.1%) in 2024. The median age of patients who died from *M. pneumoniae* CAP was 12 years (IQR: 2.0–16.5 years).

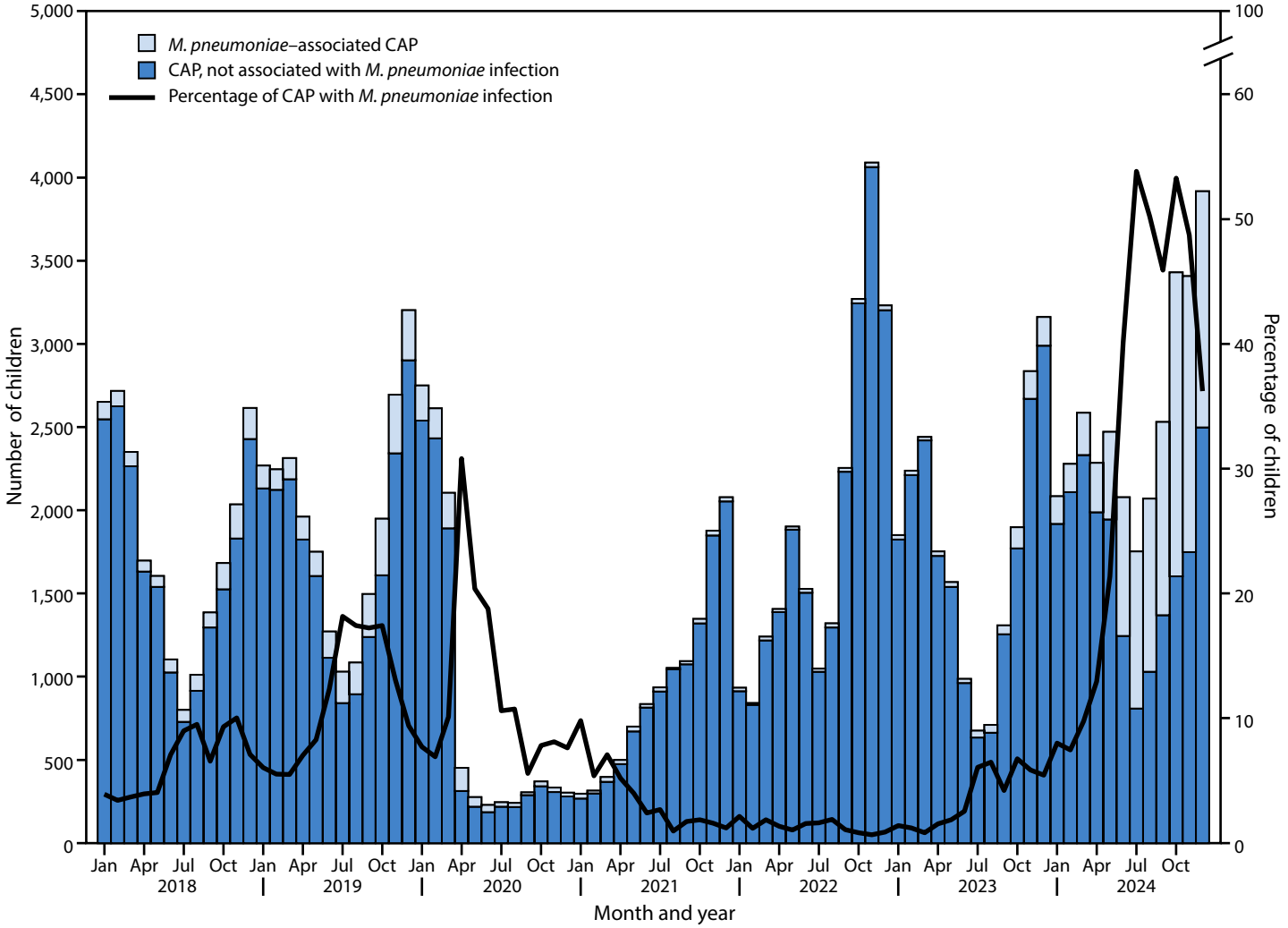
ICD-10 codes used for identifying *M. pneumoniae* CAP were validated by comparing discharge diagnosis codes with laboratory results from one hospital (Primary Children's Hospital, Salt Lake City, Utah) for 2018–2024. A positive polymerase chain reaction test result for *M. pneumoniae* was recorded for 86% of discharges coded as *M. pneumoniae* pneumonia; 14% of cases did not have an *M. pneumoniae*–specific test result code recorded. Code J15.7 (pneumonia due to *Mycoplasma pneumoniae*) was recorded for 84% of discharges coded as *M. pneumoniae* CAP. During the study period in all 42 hospitals, 22.0% of all CAP inpatients and 95.9% of *M. pneumoniae* CAP inpatients received an antibiotic typically considered effective against *M. pneumoniae* (i.e., a macrolide antibiotic); the proportion of *M. pneumoniae* CAP patients who received these antibiotics was slightly higher in 2024 (96.2%) than during 2018–2023 (95.4%) (Table).

Discussion

Consistent with recently reported trends worldwide (*6*,*7*), analyses of data from 42 U.S. children's hospitals indicate that discharges for *M. pneumoniae* CAP decreased in early 2020, remained low through 2023, and increased in all age groups in 2024. During July–December 2024, *M. pneumoniae* ICD-10 codes were listed for approximately one half of CAP hospitalizations at U.S. children's hospitals, the highest level

[§§] 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE 1. Hospitalized children with community-acquired pneumonia, associated and not associated* with *Mycoplasma pneumoniae*, by month — Pediatric Hospital Information System,† United States, 2018–2024



Abbreviation: CAP = community-acquired pneumonia.
* The number of CAP cases that were not associated with *M. pneumoniae* infection was calculated by subtracting the number of *M. pneumoniae* CAP cases from the total number of CAP cases.
† Forty-two hospitals.

in 6 years. Increases in *M. pneumoniae* CAP were not observed during annual seasonal increases in overall CAP during 2021–2023.

Increases in *M. pneumoniae* infection occur approximately every 3–5 years, likely due to variations in strain predominance (*5*). The 2024 increase in the United States and other countries was higher than most previously reported periodic increases (*1*,*2*). Surveillance data and mathematical modeling suggest that this increase might reflect increased population susceptibility after low levels of *M. pneumoniae* circulated worldwide during and immediately after the COVID-19 pandemic (*7*–*9*). Despite the increased population susceptibility, pediatric *M. pneumoniae* infections requiring hospitalization in 2024 did not appear to be more severe than those during the previous 5 years.

Historically, the highest percentage of *M. pneumoniae* infections have been reported among children aged 5–17 years (*1*,*10*). In this study, children aged 6–12 years similarly accounted for the highest number and percentage of *M. pneumoniae* CAP cases. However, comparing 2024 with 2018–2023, the proportion of CAP attributed to *M. pneumoniae* increased the most among children aged <5 years. In addition, although the number of *M. pneumoniae* infections among children aged <2 years was lower than that in older children and adolescents, *M. pneumoniae* accounted for approximately one half of CAP among children aged 0–11 months and 12–23 months at peaks in November and July 2024, respectively.

TABLE. Demographic and clinical characteristics of children hospitalized with *Mycoplasma pneumoniae*–associated community-acquired pneumonia — Pediatric Hospital Information System, United States, 2018–2024

Characteristic	2018–2024 Rate* (95% CI): 4.45 (4.38–4.52) No. (%)	2018–2023 Rate* (95% CI): 2.12 (2.07–2.18) No. (%)	2024 Rate* (95% CI): 12.49 (12.26–12.74) No. (%)	p-value†
Total	**16,353 (100)**	**6,055 (100)**	**10,298 (100)**	**<0.001**
Age group, yrs				
<1	690 (4.2)	285 (4.7)	405 (3.9)	<0.001
1	1,046 (6.4)	384 (6.3)	662 (6.4)	
2–5	4,210 (25.7)	1,491 (24.6)	2,719 (26.4)	
6–12	6,959 (42.6)	2,474 (40.9)	4,485 (43.6)	
13–18	3,448 (21.1)	1,421 (23.5)	2,027 (19.7)	
Sex				
Female	7,192 (44.0)	2,726 (45.0)	4,466§ (43.4)	0.07
Male	9,159 (56.0)	3,329 (55.0)	5,830§ (56.6)	
Race and ethnicity				
Asian, non-Hispanic	843 (5.2)	308 (5.1)	535 (5.2)	<0.001
Black or African American, non-Hispanic	2,027 (12.4)	750 (12.4)	1,277 (12.4)	
Hispanic or Latino	4,192 (25.6)	1,553 (25.6)	2,639 (25.6)	
White, non-Hispanic	8,223 (50.3)	2,959 (48.9)	5,264 (51.1)	
Other	1,068 (6.5)	485 (8.0)	583 (5.7)	
Clinical characteristics and outcomes				
Length of hospitalization stay, median (IQR)	2 days (1–4 days)	3 days (2–6 days)	2 days (1–4 days)	<0.001
CAP diagnosis¶	15,440 (94.4)	5,549 (91.6)	9,891 (96.0)	<0.001
Admitted to intensive care unit	3,586 (21.9)	1,577 (26.0)	2,009 (19.5)	<0.001
Received antibiotics for *M. pneumoniae***	15,682 (95.9)	5,774 (95.4)	9,908 (96.2)	0.008
Died††	44 (0.3)	29 (0.5)	15 (0.1)	<0.001

Abbreviation: CAP = community-acquired pneumonia.

* Number of cases per 1,000 hospitalizations.

† Chi-square (for categorical variables) and Wilcoxon rank-sum (for continuous variables) tests were used to compare demographic and clinical characteristics of patients with infections during 2018–2023 and 2024.

§ Missing values (2) in 2024.

¶ Influenza due to identified novel influenza A virus with pneumonia (J09.X1); influenza due to other identified influenza virus with pneumonia (J10.00–10.01 and J10.08); influenza due to unidentified influenza virus with pneumonia (J11.00 and J11.08); viral pneumonia, not elsewhere classified (J12.0–12.3 and J12.8–12.9); pneumonia due to *Streptococcus pneumoniae* (J13); pneumonia due to *Haemophilus influenzae* (J14); bacterial pneumonia, not elsewhere classified (J15.0–15.9); pneumonia due to other infectious organisms, not elsewhere classified (J16.0 and J16.8); pneumonia in diseases classified elsewhere (J78); bronchopneumonia, unspecified organism (J18.0–18.2 and J18.8–18.9); acute respiratory distress syndrome (J80); Legionnaires disease (A48.1); and acute bronchitis due to *M. pneumoniae* (J20.0).

** Antibiotics considered effective against *M. pneumoniae*, with *Current Procedural Terminology* codes and exclusions, include azithromycin (122421, excluding ophthalmic 1224214568000 and 1224214568064); clarithromycin (122425); doxycycline (123115, excluding topical 1231154041000,1231154042000, and 1231154045652); minocycline (123131); levofloxacin (123215, excluding inhalation 1232154242272 and excluding ophthalmic 1232154565000, 1232154565064, 1232154565114, and 1232154569000); and moxifloxacin (123225, excluding ophthalmic 1232254539000, 1232254539591, 1232254539861, 1232254539941, 1232254565000, 1232254565074, and 1232254565114).

†† The median age of children with *M. pneumoniae* CAP who died was 12.0 years (IQR: 2.0–16.5 years).

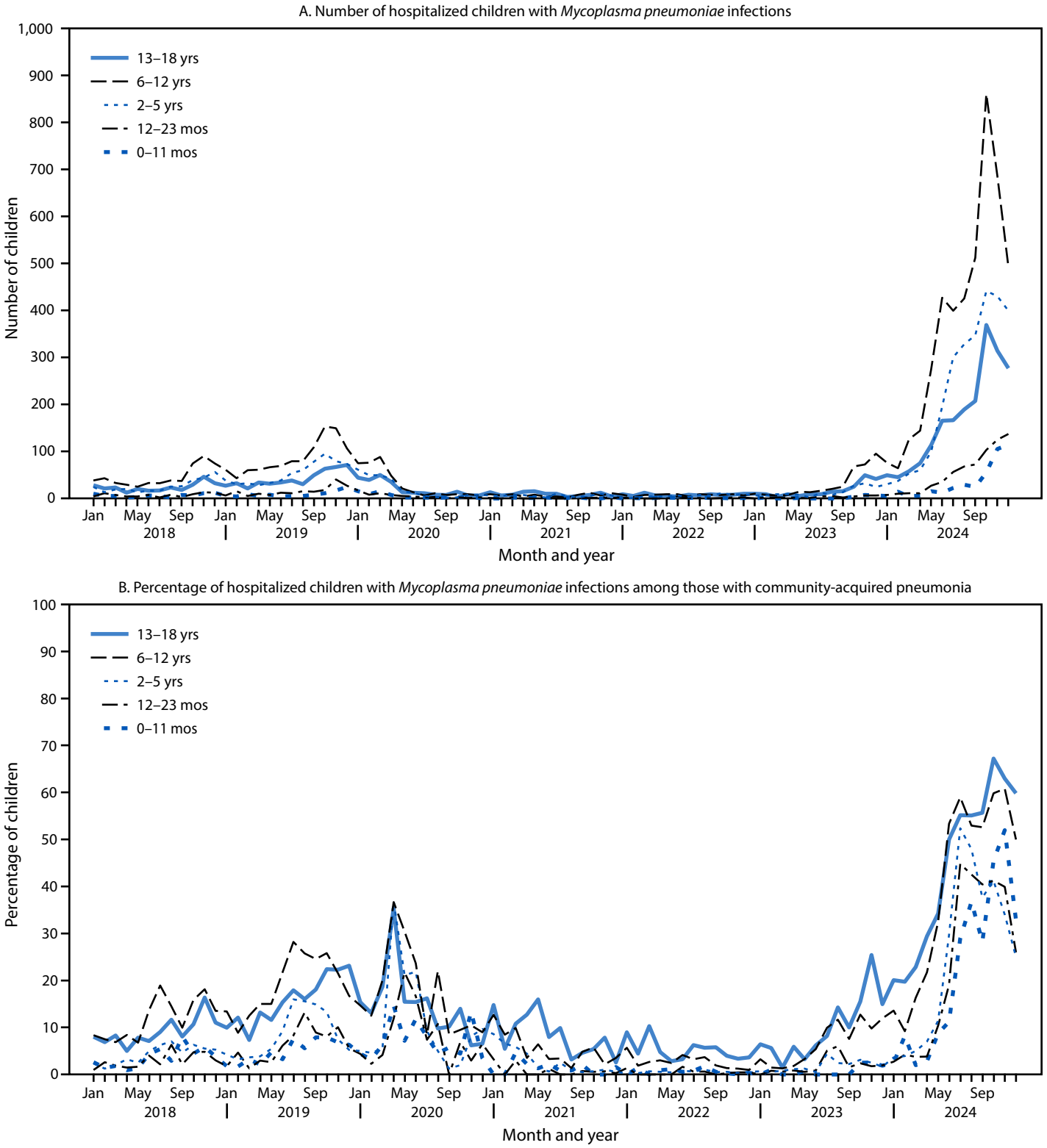
These findings suggest that during periodic increases in *M. pneumoniae* infections, this pathogen might account for a substantial proportion of CAP among children of all ages, including those aged <5 years. Widespread use of multiplex laboratory tests for detection of respiratory pathogens could contribute to improved recognition of infections, including *M. pneumoniae* infections, in younger patients. The high percentage of patients with an *M. pneumoniae*–associated ICD-10 code with confirmatory laboratory evidence at one reporting site suggests that discharge code data at children's hospitals can be used to accurately track infection trends over time.

Health care providers should be aware of increases in *M. pneumoniae* CAP, which might occur in summer and fall when circulation of other common respiratory pathogens is low (*1*). Because *M. pneumoniae* infection cannot be identified based on physical examination alone, providers should consider and test for this pathogen as a cause of respiratory illness among children of all ages, especially during periods of high transmission. Confirmation of *M. pneumoniae* infection by laboratory testing helps guide patient treatment because first-line antibiotic treatment of *M. pneumoniae* CAP differs from that for CAP of other bacterial etiologies.

Limitations

The findings in this report are subject to at least four limitations. First, passively collected resource use data are subject to possible biases from test ordering and medical coding practices. A limited evaluation at a single hospital indicated that most *M. pneumoniae*–associated discharges were supported

FIGURE 2. Number of hospitalized children with *Mycoplasma pneumoniae* infections (A) and percentage of children with *M. pneumoniae* infections among those with community-acquired pneumonia (B), by month and age group — Pediatric Hospital Information System,* United States, 2018–2024



* Forty-two hospitals.

Summary

What is already known about this topic?

Mycoplasma pneumoniae is a common cause of community-acquired pneumonia (CAP) in school-aged children. In the United States, *M. pneumoniae* infection prevalence decreased during the COVID-19 pandemic and remained low through 2023.

What is added by this report?

The number of hospital discharges of children with *M. pneumoniae*–associated CAP from U.S. pediatric hospitals increased sharply in 2024, accounting for approximately one half of hospitalized children with CAP. This number included children aged <5 years, a group in which *M. pneumoniae* infections have historically been less commonly reported. Data on length of hospitalization and intensive care unit admissions indicate that *M. pneumoniae* infections in 2024 were not more severe than 2018–2023 infections.

What are the implications for public health practice?

Increased awareness among health care providers might improve diagnosis and could guide treatment of *M. pneumoniae* infections among children of all ages, especially during periodic increases in *M. pneumoniae* circulation and among children requiring hospitalization.

by laboratory testing; however, this might not be generalizable to all facilities and might result in an underestimation of cases. Second, coinfections and underlying conditions were not evaluated, which might affect comparison of clinical characteristics between study periods. Third, laboratory results for characterization of *M. pneumoniae*, including antimicrobial susceptibility testing, were not available for cases included in this analysis, which could also affect study period comparisons. Finally, because most *M. pneumoniae* infections are mild, cases requiring hospitalization likely accounted for a small proportion of infections during the study period.

Implications for Public Health Practice

Increased awareness among health care providers might improve diagnosis and could guide treatment of *M. pneumoniae* infections among children of all ages, especially during periodic increases in *M. pneumoniae* circulation and among children requiring hospitalization. In addition, ongoing surveillance of *M. pneumoniae* infections is important to detect periodic increases and improve mathematical modeling to predict the timing and magnitude of future increases. Characterization of circulating *M. pneumoniae* strains is needed to monitor predominant genotypes, emergence of variants, and antimicrobial resistance patterns.

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Notes from the Field

Increase in New Delhi Metallo-β-Lactamase–Producing Carbapenem-Resistant Enterobacterales — New York City, 2019–2024

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Enterobacterales comprise a large group of gram-negative bacteria, including *Escherichia coli* and *Klebsiella* species; infections with these organisms often require treatment with a class of broad-spectrum antibiotics known as carbapenems. Numerous mechanisms can result in the emergence of carbapenem-resistant Enterobacterales (CRE), including the production of enzymes (carbapenemases) that render the antibiotics ineffective in killing bacteria. CRE cause health care–associated infections resulting in substantial morbidity and mortality; carbapenemase-producing CRE are particularly concerning because carbapenemase genes are easily spread via plasmid-mediated genetic elements.* *Klebsiella pneumoniae* carbapenemase (KPC) has been the predominant carbapenemase among Enterobacterales in the United States since 1996 (*1*). Another carbapenemase, New Delhi metallo-β-lactamase (NDM), is less common in the United States, confers resistance to antimicrobials commonly used to treat KPC-positive CRE (e.g., the combination antibiotic ceftazidime-avibactam) (*2*), and has previously been associated with returning international travelers (*3*). The prevalence of NDM-positive CRE has increased in New York City (NYC) health care settings, including long-term care facilities (LTCFs) (*4*). The NYC Health Department observed a notable and sustained increase in NDM-positive CRE cases from 2019 to 2024, indicating that local treatment recommendations might need to be modified in response to changing carbapenemase epidemiology. This report describes trends in carbapenemase epidemiology in NYC during 2019–2024.

Investigation and Outcomes

Data Source

In 2018, the NYC Health Code was amended to mandate that laboratories electronically report CRE among NYC residents to the NYC Health Department, including organism identification, antimicrobial susceptibility testing and, when available, carbapenemase test results.† In NYC, carbapenemase testing (including for KPC, NDM, oxacillinases, imipenemase, and Verona integron–encoded metallo-β-lactamase)§ is increasingly performed internally by clinical laboratories; public health laboratories establish isolate submission protocols for clinical laboratories that do not have carbapenemase testing capabilities and routinely conduct carbapenemase testing on CRE isolates.¶ To evaluate trends in carbapenemase epidemiology, the frequency of detected carbapenemases among CRE cases (clinical specimens collected from NYC residents that tested positive for *E. coli*, *K. pneumoniae*, *Klebsiella aerogenes*, *Klebsiella oxytoca*, or *Enterobacter cloacae* and were carbapenem-resistant or tested positive for a carbapenemase)** diagnosed during 2019–2024 was determined, and patient and isolate characteristics were described. This activity was designated nonhuman subjects research (i.e., public health surveillance) by the NYC Health Department and did not require institutional review board assessment.

During 2019–2024, among 7,114 CRE cases reported in NYC, 3,293 (46%) had accompanying carbapenemase test results, with proportions ranging from 40% (444 of 1,105) in 2021 to 54% (751 of 1,378) in 2024. From 2019 to 2024, the number of NDM-positive CRE cases increased from 58 to 388, while the number of CRE cases with KPC-positive results remained relatively stable (range = 277–332 annually). In 2024, NDM surpassed KPC as the most frequently reported carbapenemase among CRE cases (Figure). Based on patient's street address at the time of diagnosis, 30% of 1,069 NDM-positive CRE cases occurred among residents of LTCFs††; this proportion peaked at 38% (36 of 96) in 2021 and was 25% (96 of 388) in

* Antibiotic Resistance Threats in the United States 2019 | CDC

† NYC Department of Health: Reportable Diseases and Conditions: Article 11

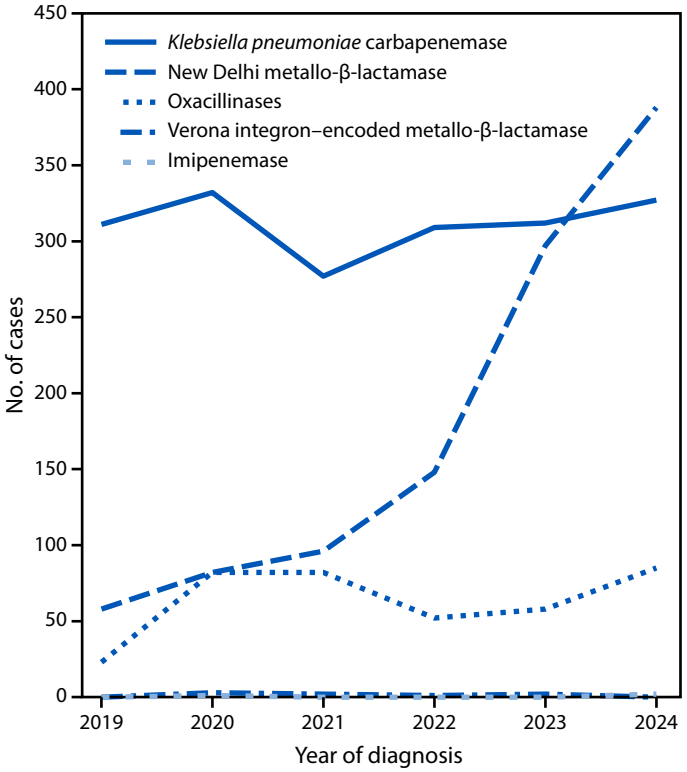
§ Carbapenemase testing includes molecular and phenotypic methods, indicating presence of a carbapenemase gene or the production of a carbapenemase enzyme, in accordance with the 2023 Council of State and Territorial Epidemiologists (CSTE) carbapenemase-producing organism case definition. National Notifiable Diseases Surveillance System Carbapenemase-producing organisms, screening. 2023 Case Definition | CDC

¶ Clinical laboratories are not required to submit isolates to public health laboratories for carbapenemase testing; public health laboratories coordinate with clinical laboratories to establish isolate submission protocols for laboratories that are unable to conduct carbapenemase testing.

** If multiple organisms and at least one carbapenemase were detected in a single specimen, then each organism was counted separately and considered to harbor all detected carbapenemases. Clinical specimens collected from the same person that tested positive for *E. coli*, *K. pneumoniae*, *K. aerogenes*, *K. oxytoca*, or *E. cloacae* and that had unique organism-carbapenemase combinations were counted separately, and a single such case was only counted once during the study period, in alignment with the 2023 CSTE carbapenemase-producing organisms case definition.

†† LTCF residency status was determined by matching the patient's street address at the time of report to a geocoded list of known facilities and by searching for selected key words (e.g., nursing home) in the patient's address. Detailed information regarding where the infection occurred or for cases not in LTCFs was not available.

FIGURE. Number of carbapenem-resistant Enterobacterales cases with a detected carbapenemase,* by carbapenemase type† and diagnosis year — New York City, 2019–2024



Abbreviations: CRE = carbapenem-resistant Enterobacterales; NYC = New York City.

* Among 7,114 CRE cases reported in NYC, 3,293 (46%) had carbapenemase results, with proportions ranging from 40% (444 of 1,105) in 2021 to 54% (751 of 1,378) in 2024.

† Verona integron–encoded metallo-β-lactamase was detected in one case in 2020 and two cases in 2024. Imipenemase was detected in three cases in 2020, two in 2021, one in 2022, and two in 2023.

2024. During 2019–2024, age-adjusted NDM-positive CRE incidences[§§] increased annually citywide, from less than one per 100,000 residents in 2018–2021 to 1.5 in 2022, 2.9 in 2023, and 3.8 in 2024. Among NDM-positive CRE cases, *K. pneumoniae* was the most frequently reported organism (68%); urine was the most common initial specimen source (43%) (Supplementary Table).

Preliminary Conclusions and Actions

The reasons for the increase in NDM-positive CRE since 2019 are not fully understood. The increase in the proportion of NDM-positive CRE among persons without known LTCF exposure suggests the possibility of community transmission beyond health care settings where CRE transmission has previously been identified (*4*,*5*). However, ascertainment of the settings where these infections were acquired was not possible with the available disease data. Although incomplete carbapenemase testing and reporting, possibly due to limited resources and complex reporting requirements, contributed to incomplete ascertainment of NDM-positive CRE incidence in NYC, the relatively stable prevalence of other reported carbapenemases suggests that the increase in NDM incidence is not solely attributable to increased carbapenemase testing and reporting by clinical laboratories.

Given the reported increase of NDM, providers treating NYC residents at risk for CRE could consider empiric therapy effective against NDM-producing CRE, such as cefiderocol or ceftazidime/avibactam plus aztreonam, particularly for patients with severe CRE infection, and modify therapy as needed based on carbapenemase or susceptibility test results.[¶¶] Other jurisdictions should be aware of the potential for similar increases in NDM-positive CRE cases. The NYC Health Department is implementing prospective whole genome sequencing of CRE isolates to improve CRE cluster detection, including NDM-positive CRE, and better understand local transmission.

Summary

What is already known about this topic?

Enterobacterales, a large group of gram-negative bacteria, can acquire resistance to broad-spectrum carbapenem antibiotics through mechanisms that include production of enzymes (carbapenemases). Although the most common carbapenemase in the United States is *Klebsiella pneumoniae* carbapenemase (KPC), the incidence of New Delhi metallo-β-lactamase (NDM) has been increasing.

What is added by this report?

In New York City, the annual number of NDM-positive carbapenem-resistant Enterobacterales (CRE) cases increased from 2019 (58 cases) to 2024 (388). In 2024, the number of NDM-positive CRE cases surpassed KPC-positive CRE cases.

What are the implications for public health practice?

In New York City, NDM has become the most common carbapenemase. Infections with KPC- and NDM-positive CRE might require different antibiotics. Providers should be aware of predominant carbapenemases within their clinical settings when initiating antibiotic treatment for patients with CRE infections.

[§§] Incidences were calculated by county of residence and diagnosis year, using intercensal population estimates updated in 2022 (for 2019) and 2024 (for 2020–2024) with a base file from the 2020 U.S. Census Bureau standard population. Patients were grouped into eight age categories (0–17, 18–24, 25–34, 35–44, 45–54, 55–64, 65–74, and ≥75 years), and age-adjusted rates were calculated using direct standardization and weighting to the U.S. Census Bureau 2000 standard population.

[¶¶] IDSA 2024 Guidance on the Treatment of Antimicrobial Resistant Gram-Negative Infections

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Notes from the Field

Parvovirus B19 Activity — United States, January 2024–May 2025

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Summary

What is already known about this topic?

Parvovirus B19 (B19) is a respiratory virus that can cause adverse fetal outcomes in pregnant women and persons who are immunocompromised or have chronic hemolytic blood disorders. After relatively low rates during the COVID-19 pandemic years of 2021–2023, B19 activity in 2024 exceeded that of prepandemic years.

What is added by this report?

Data from the National Syndromic Surveillance Program indicated that the proportion of sera specimens positive for B19 antibodies during January–May 10, 2025, was higher than during the same period in 2024, suggesting a sustained increase in B19 transmission.

What are the implications for public health practice?

Health care providers should have a heightened suspicion of and consider providing testing for B19 infection among groups at high risk for severe outcomes, including pregnant women with compatible symptoms or exposure to B19. Among pregnant women, health care providers should remain vigilant for fetal complications related to B19 infection. Pregnant women and persons at increased risk for complications from B19 infection might consider using additional prevention strategies (e.g., wearing a mask around other persons).

Parvovirus B19 (B19) is a respiratory virus primarily transmitted through the air by persons with symptomatic or asymptomatic infection. B19 infection causes mild illness in most persons but can result in adverse fetal outcomes in pregnant women or severe disease in persons who are immunocompromised or have chronic hemolytic blood disorders. No antiviral medication exists to treat B19 infection. B19 activity typically peaks in the second quarter of the year (April–June). After low rates during the COVID-19 pandemic (2021–2023), B19 activity in 2024 exceeded prepandemic years, and CDC released a Health Advisory in August 2024 (*1*,*2*).

Investigation and Outcomes

To determine whether increased B19 activity continued from 2024 into 2025, CDC analyzed data on serum B19-specific immunoglobulin M (IgM) antibodies, a marker of recent infection. Data were obtained from CDC's National Syndromic Surveillance Program (NSSP)* and originated from tests conducted by a large commercial laboratory. IgM antibodies were assayed using an enzyme immunoassay approved by the Food and Drug Administration; an index value >1.1 indicates antibody detection. Laboratory test data were consistently received from all 10 U.S. Department of Health and Human Services' regions† during the study period. Region 2 (New Jersey, New York, Puerto Rico, and the U.S. Virgin Islands) was overrepresented compared with the U.S. population.

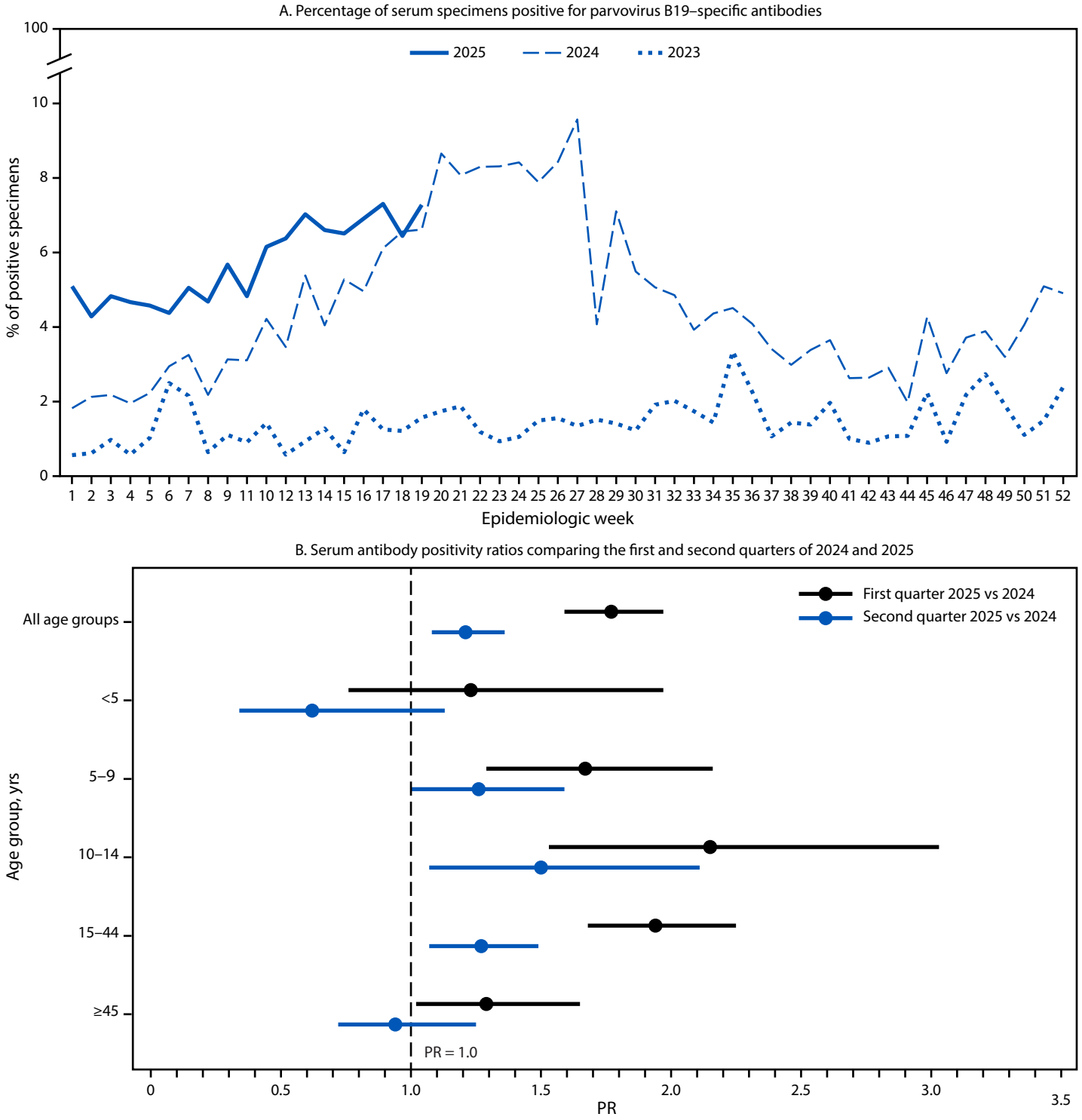
The weekly number and proportion of positive IgM test results among children and adults submitted to NSSP during January 1, 2023–May 10, 2025, were summarized by week. Positivity ratios (PR) were calculated by dividing the proportion of positive IgM test results in the first two quarters of 2025 by the proportion of positive IgM test results in the same quarters of 2024. PRs with 95% CIs were examined overall and by age group; 95% CIs that excluded the value of 1.0 were considered statistically significant. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.§

In 2024, the proportion of positive IgM test results increased from 3.3% during mid-February (week 7) to a peak of 9.6% in late June (week 27) and then decreased to a low of 2.0% during late October (week 44) (Figure). The proportion of positive IgM test results increased from 2.8% in mid-November 2024 (week 46) to 7.3% in early May 2025 (week 19). The number of weekly IgM tests performed in 2025 (mean = 1,401; 95% CI = 1,333–1,469) was similar to 2024 (mean = 1,328; 95% CI = 1,278–1,377). The proportion of tests ordered for females and males was almost equal for all age groups except 15–44 years (93% female) and ≥45 years (66% female).

Compared with 2024, the proportion of positive IgM test results in 2025 was significantly higher in both the first (PR = 1.8; 95% CI = 1.6–2.0) and second quarter (PR = 1.2; 95% CI = 1.1–1.4) (Figure). Except for children aged <5 years, PRs of all age groups were significantly higher in the first quarter of 2025 than in 2024, with the highest estimate in children and adolescents aged 10–14 years (PR = 2.2; 95% CI = 1.5–3.0). In the second quarter, PRs among those aged 10–14 years and 15–44 years were significantly higher in 2025 than in 2024.

* National Syndromic Surveillance Program | CDC
† Regional Offices | U.S. Department of Health and Human Services
§ 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE. Percentage of serum specimens positive for parvovirus B19–specific antibodies,* by epidemiologic week (A), and serum antibody positivity ratios† comparing the first and second quarters of 2024 and 2025,§ by age group (B) — National Syndromic Surveillance Program,¶ 2023–2025



Abbreviations: IgM = immunoglobulin M; PR = positivity ratio.

* IgM antibodies.

† PR is the percentage of all IgM antibody–positive test results during a specified period divided by the percentage of all IgM antibody–positive test results during the comparison period. PRs with 95% CIs were examined overall and by age group; 95% CIs that excluded 1.0 were considered statistically significant.

§ With 95% CIs indicated by bars.

¶ The National Syndromic Surveillance Program is a collaboration among CDC, local and state health departments, and federal, academic, and private sector partners. National Syndromic Surveillance Program | CDC

Preliminary Conclusions and Actions

B19 IgM test data for persons receiving testing through May 10, 2025, indicate increased, sustained B19 transmission, particularly among persons aged 10–14 and 15–44 years, which includes women of reproductive age. These estimates might be an undercount because they relied on clinician testing; parvovirus B19 infection, especially mild infection, is likely far more prevalent than represented in these data. Early identification of B19 infection can prompt early detection and treatment of severe anemia, helping to reduce adverse fetal outcomes and severe disease in persons who are immunocompromised or have chronic hemolytic blood disorders. For this reason, health care providers should consider testing 1) pregnant women who might have been exposed to B19 and 2) persons at increased risk for severe disease and who have signs and symptoms including fever, rash, arthropathy, or unexplained anemia with low reticulocyte count (*3*). Health care providers caring for pregnant patients should remain vigilant for signs of reduced fetal movement or evidence of hydrops, which could be associated with B19 infection (*4*,*5*). Pregnant women and persons at increased risk for complications from B19 infection might consider using additional prevention strategies, such as wearing a mask around other persons.

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