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Laboratory-Confirmed Influenza Hospitalizations During Pregnancy or the Early Postpartum Period — Suzhou City, Jiangsu Province, China, 2018–2023

Jinghui Sun, MPH[1,2]; Yuanyuan Zhang, MD[2]; Suizan Zhou, PhD[3]; Ying Song, MD[3]; Suping Zhang, PhD[2]; Jie Zhu, MS[4]; Zhiyuan Zhu, MS[4]; Rui Wang, MPH[5]; Hong Chen, MPH[6]; Liling Chen, MD[1,2]; Haibing Yang, PhD[2]; Jun Zhang, MD[7]; Eduardo Azziz-Baumgartner, MD[3]; W. William Schluter, MD[3]

Abstract

Pregnancy is associated with increased risk for severe illness and complications associated with influenza infection. Insufficient knowledge about the risk for influenza among pregnant women and their health care providers in China is an important barrier to increasing influenza vaccination coverage and treating influenza and its complications among pregnant women. Improved influenza incidence estimates might promote wider vaccine acceptance and higher vaccination coverage. In Suzhou, active population-based surveillance during October 2018–September 2023 estimated that the annual rate of hospitalization for acute respiratory or febrile illness (ARFI) among women who were pregnant or <2 weeks postpartum was 11.1 per 1,000 live births; the annual rate of laboratory-confirmed influenza-associated ARFI (influenza ARFI) hospitalization in this group was 2.1 per 1,000 live births. A majority of hospitalized pregnant or early postpartum patients with ARFI (82.6%; 2,588 of 3,133) or influenza ARFI (85.5%; 423 of 495) were admitted to obstetrics wards rather than respiratory medicine wards. Only one (0.03%) pregnant or postpartum ARFI patient had received influenza vaccination, and 31.3% of pregnant or postpartum women hospitalized for influenza ARFI received antiviral treatment; the lowest percentage of hospitalized women with influenza ARFI who received antiviral treatment was among women admitted to obstetrics and gynecology wards (29.6% and 23.1%, respectively), compared with 54.1% of those admitted to a respiratory medicine ward. These findings highlight the risk for influenza and its associated complications among pregnant and postpartum women, the low rates of influenza vaccination among pregnant women, and of antiviral treatment of women with ARFI admitted to obstetrics and gynecology wards. Increasing awareness of the prevalence of influenza ARFI among pregnant women, the use of empiric antiviral treatment for ARFI, and the infection control in obstetrics wards during influenza seasons might help reduce influenza-associated morbidity among pregnant and postpartum women.

Introduction

Worldwide, approximately 200 million women become pregnant each year.* Among women of reproductive age who acquire influenza, those who are pregnant are most likely to experience severe influenza-associated illness (*1*). Despite recommendations by public health agencies, including those in China (*2*), that pregnant women receive an influenza vaccine,

* https://population.un.org/wpp

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in multiple countries where these vaccines are manufactured, licensed, and widely available, influenza vaccination coverage in this population is typically low (*3*,*4*). Insufficient information about the risk for influenza among pregnant women might contribute to reduced demand for vaccines, and passive sentinel surveillance often underestimates risk because of lack of clarity about catchment areas, insufficient testing, and underreporting (*5*). To estimate the risk for influenza illness in pregnant and postpartum women and to document the proportion of these women who were vaccinated against influenza or received antiviral medications during hospitalization for influenza, analysis of population-based surveillance of influenza hospitalizations among pregnant and early postpartum women was conducted in Suzhou, China.

Methods

Data Source

The data in this analysis were derived from active population-based surveillance of influenza-associated hospitalizations conducted in Suzhou (population approximately 13 million), a prefecture-level city in China's southern Jiangsu Province, during October 2018–September 2023. The population under surveillance included all pregnant women who sought care in Suzhou and who also were found in the medical record information system, which includes all medical institutions in Suzhou. Cases of acute respiratory or febrile illness (ARFI) among female patients of reproductive age were identified using *International Classification of Diseases, Tenth Revision* codes.[†] Inclusion criteria also included documentation of body temperature ≥99.1°F (≥37.3°C) at the time of admission. A wide range of codes and a low temperature threshold were used to capture as many illnesses as possible that were compatible with influenza infection. Pregnancy status was recorded, and nasopharyngeal swabs were collected from all pregnant women and those with a live birth within the preceding 2 weeks (early

[†] The *International Classification of Diseases, Tenth Revision* codes to identify ARFI included the following: A41 (sepsis, unspecified), B34 (viral infection, unspecified), B95.3 (*Streptococcus pneumoniae*), B96.0 (*Mycoplasma pneumoniae*), B96.1 (*Klebsiella pneumoniae*), B96.3 (*Haemophilus influenzae*), B97.0 (Adenovirus), B97.2 (Coronavirus), B97.3 (Retrovirus), B97.4 (respiratory syncytial virus), B97.8 (other viral agents), B99.x01 (other unspecified infectious diseases), J00–J06 (acute upper respiratory infectious), J09–J18 (influenza and pneumonia), J20–J22 (other acute lower respiratory infections), J35 (chronic diseases of the tonsils and adenoids), J36 (peritonsillar abscess), J39 (other diseases of the upper respiratory tract), J40 (bronchitis, not acute or chronic), J45 (asthma), J46 (status asthmaticus), J80 (acute respiratory distress syndrome), J81 (pulmonary edema), J84 (pulmonary fibrosis, unspecified), J86.9 (pyothorax without fistula), J90 (pleural effusion), J96 (respiratory failure, not classified elsewhere), J98 (other respiratory disorders), O75.1 (shock during or after labor and delivery), O75.2 (pyrexia during labor, not elsewhere classified), O86.4 (pyrexia of unknown origin following delivery), O98.5 (other viral diseases complicating pregnancy, childbirth, and the puerperium), O98.8 (other maternal infectious and parasitic diseases complicating pregnancy, childbirth, and the puerperium), O99.5 (diseases of the respiratory system complicating pregnancy, childbirth, and the puerperium), R04–R07 (hemorrhage from respiratory passages, cough, abnormalities of breathing, pain in throat and chest), R09 (other symptoms and signs involving the circulatory and respiratory system), R50 (fevers of unknown or other origins), R57.9 (shock, unspecified), R65 (systemic inflammatory response syndrome), and R68.8 (other general symptoms and signs).

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postpartum) who were hospitalized with ARFI. Laboratory-confirmed influenza-associated ARFI (influenza ARFI) was defined as ARFI with influenza RNA detected by reverse transcription–polymerase chain reaction (RT-PCR) testing of a nasopharyngeal swab.[§] Data on live births were obtained from the Suzhou Bureau of Statistics.[¶]

Data Analysis

The annual ARFI hospitalization rate (ARFI hospitalizations per 1,000 live births) was calculated as the annual number of pregnant or postpartum women hospitalized with ARFI divided by the annual number of live births and multiplied by 1,000. Similarly, the annual influenza ARFI hospitalization rate (influenza ARFI hospitalizations per 1,000 live births) was calculated as the annual number of pregnant or postpartum women hospitalized with influenza ARFI divided by the annual number of live births and multiplied by 1,000. To estimate the total ARFI and influenza ARFI rates (with 95% CIs) among pregnant women in Suzhou, the ratio and 95% CI of influenza hospitalizations to total influenza illnesses (i.e., those that were and were not medically attended) from a 2022 cohort study (*3*) in Suzhou (3.2%; 95% CI = 1.5%–4.9%) was applied, using bootstrapping. This study was reviewed and approved by the Institutional Review Board of the Chinese Center for Disease Control and Prevention.

Results

Participants and Laboratory Testing

A total of 3,329 pregnant and postpartum women in Suzhou were hospitalized with ARFI[**] during the analysis period, 3,133 (94.1%) of whom had a nasopharyngeal specimen collected (Table 1). Among those who received testing, 495 (15.8%) received a diagnosis of influenza ARFI. Nearly two thirds of patients (325; 65.7%) were infected with an influenza A virus, including 163 (32.9%) with subtype A(H3N2) and 162 (32.7%) with subtype A(H1N1)pdm09. Approximately one third (167; 33.7%) of patients were infected with an influenza B virus, with Victoria lineage virus infection accounting for 157 (94.0% of all influenza B cases and 31.7% of all influenza ARFI cases among pregnant and postpartum women). Among the pregnant and postpartum influenza ARFI patients, 53 (10.7%) cases occurred during the first trimester of pregnancy, 40 (8.1%) during the second trimester, 392 (79.2%) during the third trimester, and 10 (2.0%) during the early postpartum period.

[§] https://ivdc.chinacdc.cn/cnic/fascc/201802/P020180202290930853917.pdf
[¶] https://tjj.suzhou.gov.cn
[**] Excluding those seen only in emergency departments but not admitted.

Hospitalization Rates

Among the 495 hospitalized pregnant or postpartum women with influenza ARFI, 479 (96.8%) cases occurred during periods when influenza detection exceeded the epidemic threshold (Figure). Influenza ARFI hospitalization rates among pregnant and postpartum women were highest during 2018–2019 (3.4 per 1,000 live births), and lowest during 2020–2021 (0.05 per 1,000 live births). Reported influenza cases in this group of women during 2020–2021, following implementation of COVID-19 nonpharmaceutical interventions (NPIs),[††] were markedly lower than that during other years ($p<0.05$) and never reached the epidemic threshold. When influenza ARFI hospitalizations among pregnant or postpartum women during 2020–2021 were excluded from the analysis, the average maternal influenza ARFI hospitalization rate for the remaining four influenza seasons was 2.1 per 1,000 live births. The annual average ARFI hospitalization rate was 11.1 per 1,000 live births, including during 2020–2021 (Table 1).

Characteristics of Hospitalized Pregnant or Postpartum Influenza ARFI Patients

Among the 3,329 pregnant or postpartum women who were hospitalized with ARFI, including 495 (14.9%) with influenza ARFI, information on the type of hospital facility was available for 3,133 (94.1%) with ARFI, including all 495 with influenza ARFI (15.8% of the 3,133 with available information). Overall, 2,680 (85.5%) ARFI patients and 423 (85.5%) influenza ARFI patients were admitted to grade III medical institutions, the highest acuity treatment level, which typically treat the most severe cases of illness in China's three-tier health care system[§§] (Table 2). A majority of pregnant and postpartum women with ARFI or influenza ARFI were admitted to obstetrics wards (2,588; 82.6% and 423; 85.5%, respectively), rather than to a respiratory medicine ward (299; 9.5% and 37; 7.5%, respectively). Among influenza ARFI patients admitted to obstetrics wards, 371 (87.7%) were in their third trimester.

Among all 3,329 pregnant women with ARFI, only one (0.03%) had received an influenza vaccination, and this vaccinated patient received a negative test result for influenza. Fewer than one third of pregnant or postpartum patients with influenza ARFI (155; 31.3%) received influenza antiviral drug

[††] NPIs to contain COVID-19 in China included three major groups: 1) the restriction of intercity population movement; 2) the identification and isolation of cases, contact tracing, and quarantine of exposed persons; and 3) the reduction of inner-city travel and contact to increase social distance (e.g., school and workplace closures and cancellation of mass gatherings). https://www.nature.com/articles/s41586-020-2293-x
[§§] https://www.semanticscholar.org/paper/The-Different-Classification-of-Hospitals-Impact-on-Li-Du/937ebf09b1ee8dfbfc18e57ca429d3db8f018325

TABLE 1. Influenza acute respiratory or febrile illness hospitalization rate and dominant influenza viruses among pregnant or postpartum women* — Suzhou, China, 2018–2023

Metric	Analysis period					
	Oct 2018–Sep 2019	Oct 2019–Sep 2020	Oct 2020–Sep 2021	Oct 2021–Sep 2022	Oct 2022–Sep 2023	Overall
No. of ARFI hospitalizations	965	570	431	464	899	**3,329**
No. of live births	68,487	61,916	66,068	53,296	49,724	**299,491**
Annual ARFI hospitalizations per 1,000 live births (95% CI)	14.1 (13.2–15.0)	9.2 (8.5–10.0)	6.5 (5.9–7.2)	8.7 (7.9–9.5)	18.1 (16.9–19.3)	**11.1 (10.7–11.5)**
No. of sampled and tested ARFI hospitalizations (%)	878 (91.0)	526 (92.3)	417 (96.8)	452 (97.4)	860 (95.7)	**3,133 (94.1)**
No. of influenza ARFI hospitalizations (%)	233 (26.5)	99 (18.8)	3 (0.7)	77 (17.0)	83 (9.7)	**495 (15.8)**
Annual influenza ARFI hospitalizations per 1,000 live births (95% CI)	3.4 (3.0–3.9)	1.6 (1.3–2.0)	0.05 (0.01–0.13)	1.4 (1.1–1.8)	1.7 (1.3–2.1)	**2.1 (1.9–2.3)†**
Estimated total annual ARFI cases per 1,000 live births (95% CI)§,¶	440.3 (303.7–933.9)	287.8 (196.7–616.9)	203.8 (141.1–440.3)	272.2 (188.7–589.4)	565.0 (391.4–1,204.7)	**347.5 (240.3–731.5)**
Estimated total annual influenza ARFI cases per 1,000 live births (95% CI)§,¶	106.3 (72.6–236.3)	50.0 (33.4–116.4)	1.6 (0.5–7.2)	45.0 (29.4–107.8)	52.2 (34.3–123.3)	**65.9 (45.2–142.4)†**
Dominant influenza viruses**	A(H1N1)pdm09	B/Victoria	B/Victoria	A(H3N2) and B/Victoria	A(H1N1)pdm09 and A(H3N2)	**A(H1N1)pdm09, A(H3N2) and B/Victoria**

Abbreviations: ARFI = acute respiratory or febrile illness; influenza ARFI = laboratory-confirmed influenza-associated acute respiratory or febrile illness.

* <2 weeks postpartum.

† Because influenza activity during 2020–21 did not achieve epidemic levels, these data were excluded from the calculation of the average. The start of each influenza epidemic period was defined as the first day of 3 consecutive influenza reporting weeks in which the percentage of specimens testing positive for any influenza virus infection exceeded 5%. The end of each influenza epidemic period was defined as the day before the first of 3 consecutive influenza reporting weeks during which the percentage of specimens testing positive for influenza was <5%.

§ The total annual ARFI or influenza ARFI rates were estimated through observed hospitalization rates divided by the percentage of hospitalizations among the total number of pregnant or postpartum women with ARFI or influenza ARFI. The percentages of hospitalizations among the total number of pregnant or postpartum women with ARFI or influenza ARFI were assumed the same and equal to the percentage of hospitalizations among the total number of pregnant or postpartum women with influenza (3.2%; 95% CI = 1.5%–4.9%). https://pubmed.ncbi.nlm.nih.gov/34323381

¶ Including cases that were and were not medically attended, outpatients, and inpatients.

** Dominant influenza viruses were defined as those 1) accounting for ≥70% of all isolates during the season or 2) accounting for 40%–70% of all isolates and the second most common virus accounted for <30%. Subtype/lineage was considered as codominant with the most common virus if it accounted for ≥30% of all isolates.

treatment before or during hospitalization. Among 423 women with influenza ARFI hospitalized in an obstetrics ward, 125 (29.6%) received antiviral drug treatment; the highest percentage of women with influenza ARFI admitted to an obstetrics ward who received antiviral treatment were those admitted to a grade III facility (115 of 361 [31.9%]). Among 37 pregnant or postpartum women with influenza ARFI admitted to a respiratory medicine ward, 20 (54.1%) received antiviral treatment. Among 495 influenza ARFI patients, nine (1.8%) were admitted to an intensive care unit; no mechanical ventilation or death cases were reported during hospitalization.

Estimated Total Influenza ARFI Incidence

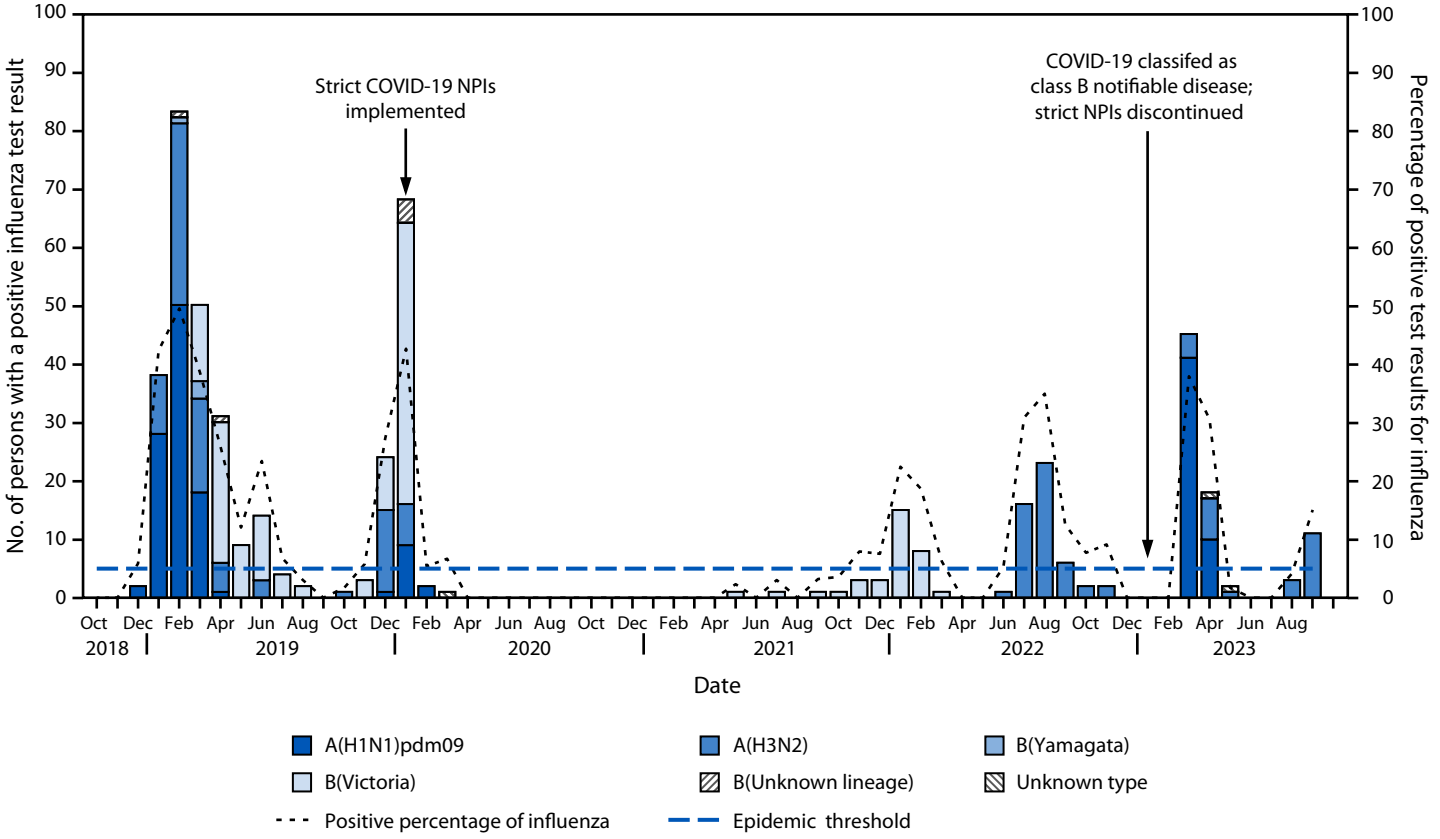
Estimated total annual influenza ARFI incidence among pregnant and postpartum women, including inpatients or outpatient cases that were and were not medically attended was 65.9 per 1,000 live births. Total annual ARFI incidence was 347.5 cases per 1,000 live births (Table 1).

Discussion

Analysis of active population-based surveillance data for hospitalized pregnant or early postpartum women in Suzhou, China found an annual influenza ARFI hospitalization rate of 2.1 per 1,000 live births. A majority of patients were admitted to obstetrics hospital wards, which are not typically included in respiratory disease surveillance. Influenza ARFI incidence among pregnant and postpartum women, including cases that were and were not medically attended, was estimated to be approximately 70 per 1,000 live births. Only one pregnant woman hospitalized with ARFI had documentation of receipt of influenza vaccination. Fewer than one third of those hospitalized for influenza ARFI were treated with antiviral medications; among patients admitted to obstetrics and gynecology wards, fewer than one third received antiviral medications, compared with approximately one half of those who were admitted to respiratory medicine wards.

The annual influenza ARFI hospitalization rate provided important information about influenza-associated inpatient care needs of pregnant or early postpartum women in China. The sentinel influenza surveillance systems in China, which

FIGURE. Dates of hospitalization of pregnant or postpartum* women, distribution of identified influenza virus subtypes, and implementation of COVID-19 control measures — Suzhou, China, 2018–2023†



Abbreviation: NPI = nonpharmaceutical intervention.

* Less than 2 weeks postpartum.

† Three classes (class A, class B, and class C) of notifiable infectious diseases in 41 categories are listed in China. Plague and cholera are listed as class A infectious diseases. Severe acute respiratory syndrome, AIDS, and tuberculosis are among the class B infectious diseases. Class C infectious diseases include influenza and mumps. https://doi.org/10.1016/j.ijid.2016.04.010

mainly target respiratory medicine wards, have no data collected on pregnancy status or no defined catchment population, given that a majority of sentinel hospitals are large referral hospitals. The clinical diagnosis–based nationally notifiable disease reporting system in China does not report pregnancy status and is subject to significant undertesting and underreporting (*6*). Comparison of influenza hospitalization rates across countries is challenging because of differences in health care–seeking behavior and health care systems. However, the annual rate of community influenza ARFI is more easily compared. The total annual rate of community influenza ARFI among pregnant and early postpartum women (65.9 per 1,000 live births), estimated using data from a 2022 cohort study in Suzhou (*3*), was equivalent to approximately 0.7 cases per 100 person-months (6.6 per 100 person-years). This rate is comparable to recent estimates from community-based prospective cohorts from El Salvador and Panama (5.0 per 100 person-years) (*7*), Kenyan cohorts (0.9–1.2 per 100 person-months) (*8*), the China respiratory illness surveillance among pregnant women cohort (0.7–2.1 per 100 person-months) (*3*), and pregnancy and influenza multinational epidemiologic cohorts from India, Peru, and Thailand (0.7–0.9 per 100 person-months) (*9*), with slight differences possibly attributed to seasonal and geographic variations in this population.

A majority of hospitalized pregnant and postpartum women with ARFI or influenza ARFI were admitted to obstetrics wards, highlighting the importance of including maternity and postnatal wards and departments in sentinel surveillance to estimate influenza ARFI incidence. These estimates suggest that relying on traditional respiratory medicine ward surveillance would have missed approximately 85% of influenza hospitalizations among pregnant or postpartum patients. A strength of this evaluation is that it covered all hospitals in Suzhou and provided testing for influenza by RT-PCR for all pregnant or postpartum patients with ARFI. The methods described here could be used in other settings to accurately

TABLE 2. Distribution of hospital facilities and wards that cared for pregnant or postpartum* patients with acute respiratory or febrile illness and receipt of antiviral treatment, by hospital grade and ward — Suzhou, China, 2018–2023

	Institution grade,† no. (%)§							
	Total		Grade I		Grade II		Grade III	
Hospital ward	Total admitted	Received antiviral treatment	Total admitted	Received antiviral treatment	Total admitted	Received antiviral treatment	Total admitted	Received antiviral treatment
ARFI patients								
Total	**3,133 (100)¶**	**331 (10.6)**	**24 (100)**	**0 (—)**	**429 (100)**	**25 (5.8)**	**2,680 (100)**	**306 (11.4)**
Obstetrics	**2,588 (82.6)**	**258 (10.0)**	13 (54.2)	0 (—)	348 (81.1)	20 (5.7)	2,227 (83.1)	238 (10.7)
Respiratory medicine	**299 (9.5)**	**57 (19.1)**	1 (4.2)	0 (—)	23 (5.4)	4 (17.4)	275 (10.3)	53 (19.3)
Gynecology	**173 (5.5)**	**7 (4.0)**	10 (41.7)	0 (—)	54 (12.6)	1 (1.9)	109 (4.1)	6 (5.5)
Others	**73 (2.3)**	**9 (12.3)**	0 (—)	0 (—)	4 (0.9)	0 (—)	69 (2.6)	9 (13.0)
Influenza ARFI patients								
Total	**495 (100)****	**155 (31.3)**	**1 (100)**	**0 (—)**	**71 (100)**	**14 (19.7)**	**423 (100)**	**141 (33.3)**
Obstetrics	**423 (85.5)**	**125 (29.6)**	0 (—)	0 (—)	62 (87.3)	10 (16.1)	361 (85.3)	115 (31.9)
Respiratory medicine	**37 (7.5)**	**20 (54.1)**	0 (—)	0 (—)	4 (5.6)	3 (75.0)	33 (7.8)	17 (51.5)
Gynecology	**26 (5.3)**	**6 (23.1)**	1 (100)	0 (—)	5 (7.0)	1 (20.0)	20 (4.7)	5 (25.0)
Others	**9 (1.8)**	**4 (44.4)**	0 (—)	0 (—)	0 (—)	0 (—)	9 (2.1)	4 (44.4)

Abbreviations: ARFI = acute respiratory or febrile illness; influenza ARFI = laboratory-confirmed influenza-associated acute respiratory or febrile illness.

* <2 weeks postpartum.

† Hospitals in China are classified into three grades. The lowest is the grade I hospital, which includes primary hospitals and health centers that directly provide prevention, medical care, and rehabilitation services to communities with a certain population. A grade II hospital is a regional hospital that provides comprehensive medical and health services to multiple communities and undertakes certain teaching and research tasks. The highest rank is the grade III hospital, which is a large-scale general hospital with more than 500 beds that integrates medical service, education, and research functions.

§ Percentages in Total admitted columns are column percentages; percentages in Received antiviral treatment columns are percentages of the total number of patients hospitalized in each grade and ward type (e.g., among 348 patients hospitalized in grade II obstetrics wards, 20 (5.7%) received antiviral treatment).

¶ Number of patients (i.e., 94% of 3,329) who had a nasopharyngeal swab collected and for whom information on hospitalization ward was available.

** The 495 influenza ARFI patients were a 15.8% subset of the 3,133 ARFI patients.

estimate the morbidity associated with severe influenza among pregnant women. Accurate estimates can help guide vaccination efforts in groups at risk for severe illness, as well as treatment of pregnant and postpartum women with influenza.

Based on influenza vaccine effectiveness data (*10*), approximately 40% of maternal influenza hospitalizations would have been vaccine-preventable; however, pregnant women were rarely vaccinated. Influenza vaccination coverage among the approximately 18 million pregnant women in China each year¶¶ is 0.04% (95% CI = 0.02%–0.08%), in part because awareness about the risk for influenza illness is low coupled with a lack of demand for influenza vaccination (*3,5*). This study confirmed that influenza vaccination coverage among hospitalized pregnant or postpartum women in Suzhou is low. Educating obstetricians about the risks associated with influenza in pregnancy and encouraging them to provide a strong influenza vaccination recommendation for women who are or will be pregnant during the influenza season could help prevent severe influenza morbidity.

The study further found that fewer than one third of pregnant or postpartum patients in Suzhou were treated with influenza antiviral medication even after the diagnosis of influenza; these percentages were lowest among pregnant and postpartum women hospitalized in obstetrics and gynecology wards. Cost and limited availability of the medications, as well as concerns about potential side effects of treatment or risk to the fetus might also have contributed to low antiviral drug treatment for influenza in this population, although multiple observational studies of treatment with oral oseltamivir or zanamivir during pregnancy have not shown a risk to the fetus.*** In addition to addressing safety concerns, cost-benefit evaluation of antiviral drug treatment for persons at increased risk for influenza complications who seek care at, for example, urgent care centers, might also help increase use of antiviral drugs and limit the occurrence of severe illness. The study findings warrant educating health care providers, especially those working in obstetrics wards, about treatment with antivirals for pregnant or postpartum women with influenza.

These estimates could also be incorporated into vaccine and antiviral cost-benefit analyses to help health authorities assess the return on investment, particularly when compared with more familiar traditional Chinese medicines and supportive care, and to assess the costs and benefits of NPIs (e.g., maintaining good respiratory hygiene, avoiding close contact with persons who have signs or symptoms of influenza-like illness, and minimizing gatherings in crowded places). Implementation of such NPIs during the COVID-19 pandemic might have reduced the risk for infection and spread of influenza.

¶¶ https://www.unfpa.org/data/sowmy/CN

*** https://www.cdc.gov/flu/professionals/antivirals/avrec_ob.htm

Summary

What is already known about this topic?

Pregnancy is associated with increased risk for severe illness and complications attributable to influenza infection. Information about the incidence of influenza hospitalization among pregnant and early postpartum women in China is limited.

What is added by this report?

Population-based data from a large city in southern China estimated the annual influenza hospitalization rate to be 2.1 per 1,000 live births. Among hospitalized pregnant and postpartum women with influenza, 86% were admitted to obstetrics rather than respiratory medicine wards; fewer than one third received antiviral treatment. Influenza vaccination coverage among hospitalized pregnant and postpartum women with influenza was <0.1%.

What are the implications for public health practice?

Increasing vaccination coverage among pregnant women can reduce influenza-associated morbidity. Raising awareness about early detection, treatment, and infection control of influenza in obstetrics wards is needed to reduce the adverse impact of influenza on pregnant women.

Limitations

The findings in this report are subject to at least two limitations. First, the study was conducted in a single large city, and the findings might not be generalizable to the rest of China. The study site is economically developed, and health-seeking behavior might vary in other parts of the country. However, it is expected that other, less developed areas with insufficient supplies of vaccine, testing kits, or antiviral drugs, would also experience substantial influenza illnesses and would be less likely to use these specific tools for early detection and protection of pregnant women against influenza. Therefore, these findings might underestimate the incidence of influenza ARFI among pregnant and postpartum women in other parts of the country. Second, the study design did not allow for the inclusion of patients with influenza who might have died or had a fetal loss associated with the hospitalization, which might have underestimated the severe impact of failure to vaccinate and treat pregnant women with influenza.

Implications for Public Health Practice

The population-based active surveillance outlined in this report underscores the substantial risk for influenza illness among pregnant and postpartum women in China and the potential benefit to pregnant women of offering annual influenza vaccination in prenatal care facilities. Influenza in pregnant women is associated with higher morbidity and mortality. In addition, pregnant women with influenza-like illness might not seek care in respiratory clinics or wards. Increasing awareness of when to seek care for suspected influenza illness, the benefits of early detection and treatment, and infection control in facilities, including prenatal care clinics or wards, could help reduce maternal morbidity during influenza epidemics. Receipt of annual influenza vaccination by pregnant women can prevent influenza-associated morbidity and hospitalization (*10*).

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Corresponding author: Liling Chen, liling_chen@163.com.

[1]School of Public Health, Nanjing Medical University, Nanjing, Jiangsu Province, China; [2]Suzhou Center for Disease Control and Prevention, Suzhou City, Jiangsu Province, China; [3]Influenza Division, National Center for Immunization and Respiratory Diseases, CDC; [4]Suzhou Health and Family Planning Statistics Information Center, Suzhou City, Jiangsu Province, China; [5]School of Public Health, Xuzhou Medical University, Xuzhou, Jiangsu Province, China; [6]Chinese Center for Disease Control and Prevention, Beijing, China; [7]Suzhou No.5 People's Hospital, Suzhou City, Jiangsu Province, China.

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Influenza and COVID-19 Vaccination Coverage Among Health Care Personnel — National Healthcare Safety Network, United States, 2023–24 Respiratory Virus Season

Jeneita Bell, MD[1]; Lu Meng, PhD[1]; Kira Barbre, MPH[1,2]; Emily Wong, MPH[1]; Brynn Lape-Newman, MPH[1,3]; Wilson Koech, PhD[1,2]; Minn M. Soe, MBBS[1]; Austin Woods[1,4]; David T. Kuhar, MD[1]; Matthew J. Stuckey, PhD[1]; Heather Dubendris, MSPH[1,3]; Theresa Rowe, DO[1]; Megan C. Lindley, MPH[5]; Elizabeth J. Kalayil, MPH[1,3]; Jonathan Edwards, MStat[1]; Andrea Benin, MD[1]; Hannah E. Reses, MPH[1]

Abstract

The Advisory Committee on Immunization Practices (ACIP) recommends that health care personnel receive an annual influenza vaccine. In September 2023, ACIP recommended that everyone aged ≥6 months receive a 2023–2024 COVID-19 vaccine. Health care facilities, including acute care hospitals and nursing homes, report vaccination of health care personnel against influenza and COVID-19 to CDC's National Healthcare Safety Network (NHSN). During October 2023–March 2024, NHSN defined up-to-date COVID-19 vaccination as receipt of a 2023–2024 COVID-19 vaccine. This analysis describes influenza and 2023–2024 COVID-19 vaccination coverage among health care personnel working in acute care hospitals and nursing homes during the 2023–24 respiratory virus season (October 1, 2023–March 31, 2024). Influenza vaccination coverage was 80.7% among health care personnel at acute care hospitals and 45.4% among health care personnel at nursing homes. Coverage of 2023–2024 COVID-19 vaccination was 15.3% among health care personnel at acute care hospitals and 10.5% among health care personnel at nursing homes. Respiratory viral diseases including influenza and COVID-19 pose risks to health care personnel in U.S. health care settings, and vaccination of health care personnel is an effective strategy for maintaining a healthy workforce and improving health care system resiliency.

Introduction

Health care personnel are at risk for work-related exposure to respiratory viral diseases, including influenza and COVID-19 (*1*). Vaccination of health care personnel helps maintain a healthy workforce (*2*) and reduces the risk for staffing shortages (*3*). The Advisory Committee on Immunization Practices (ACIP) recommends that health care personnel receive an annual influenza vaccine (*4*). In September 2023, ACIP recommended a 2023–2024 COVID-19 vaccine for all persons aged ≥6 months (*5*). The Centers for Medicare & Medicaid Services (CMS) monitors the implementation of these recommendations by requiring health care facilities, including nursing homes and acute care hospitals, to report influenza* and COVID-19† vaccination coverage among health care personnel§ to CDC's National Healthcare Safety Network (NHSN). This study examined influenza and 2023–2024 COVID-19 vaccination coverage among health care personnel working in acute care hospitals and nursing homes during the 2023–24 respiratory virus season.

Methods

Data Collection

Acute care hospitals and nursing homes report data to NHSN according to surveillance protocols for influenza and COVID-19 vaccination. Acute care hospitals and nursing homes began reporting COVID-19 vaccination among health care personnel in 2021. Acute care hospitals were required to report influenza vaccination among health care personnel beginning in 2013¶; skilled nursing facilities were required to report influenza vaccination among health care personnel beginning with the 2022–23 respiratory virus season. To determine influenza vaccination coverage, facilities report the total number of health care personnel working in the facility for ≥1 day during a respiratory virus season (October 1–March 31)** and the total number of health care personnel who 1) reported receipt of influenza vaccination, 2) had a medical contraindication to influenza vaccination, 3) declined vaccination, and 4) had unknown vaccination status. The protocol for COVID-19 vaccination coverage includes parallel data fields for COVID-19; however, data collection occurs at a different cadence. Nursing homes and acute care hospitals report on schedules mandated by their respective regulatory programs at CMS. Nursing homes submit COVID-19 vaccination coverage weekly††; acute care facilities

* https://www.cdc.gov/nhsn/faqs/vaccination/faq-influenza-vaccination-summary-reporting.html
† https://www.cdc.gov/nhsn/pdfs/hps/covidvax/2024-hcp-combined-protocol-508.pdf
§ https://www.cdc.gov/nhsn/pdfs/covid19/covidvax-staff-toi-508.pdf
¶ https://www.cdc.gov/nhsn/pdfs/cms/vaccination/operational-guidance-ach-hcp-flu-508.pdf
** https://www.govinfo.gov/content/pkg/FR-2011-08-18/pdf/2011-19719.pdf
†† https://www.federalregister.gov/documents/2021/05/13/2021-10122/medicare-and-medicaid-programs-covid-19-vaccine-requirements-for-long-term-care-ltc-facilities-and

submit ≥1 week of data per month.[§§] Both types of facilities report COVID-19 vaccination coverage data among health care personnel who were eligible to work in the facility for ≥1 day during the reporting week. Because vaccination coverage data reported to NHSN are aggregated at the facility level, information on the percentage of health care personnel who were up to date with both influenza and 2023–2024 COVID-19 vaccination was not available.

Data Analysis

To determine health care personnel vaccination coverage during the 2023–24 respiratory virus season, analyses were conducted using influenza and up-to-date COVID-19 vaccination coverage data (specifically, up-to-date COVID-19 vaccination coverage data from the week ending March 31, 2024, or the last submitted week of data) reported to NHSN from acute care hospitals and nursing homes in all 50 U.S. states. NHSN defined up-to-date COVID-19 vaccination as the receipt of ≥1 dose of a 2023–2024 COVID-19 vaccine.[¶¶] Facilities that reported data for both vaccine types were included in the analysis. Pooled mean vaccination coverage with influenza and COVID-19 was calculated as the number of health care personnel who reported receipt of each recommended vaccine divided by the number of health care personnel working in all facilities. Health care personnel reported to have a medical contraindication to receiving an influenza (0.89% of all health care personnel) or COVID-19 (0.71% of all health care personnel) vaccination were subtracted from the denominator of the vaccination coverage calculation for the corresponding vaccine. Coverage with each vaccine was calculated for health care personnel working at each facility type (nursing home and acute care hospital). Results were further stratified by employment category (employee, licensed independent practitioner, and student/trainee or volunteer); urban-rural classification (rural or urban)[***]; county-level social vulnerability index (SVI) tertile[†††]; facility size tertile[§§§]; state; and U.S. region.[¶¶¶] Vaccination coverage for each vaccine type in each facility type was calculated for each U.S. state; results were categorized into levels based on the overall quintile distribution of coverage across both vaccines and both facility types. Counties in a lower SVI tertile are less socially vulnerable than are those in an upper SVI tertile. All analysis was conducted 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

Influenza Vaccination Coverage: Acute Care Hospitals

Among approximately 8.8 million health care personnel working in 4,114 acute care hospitals, influenza vaccination coverage was 80.7% overall (Table 1); coverage was lowest (65.7%) among licensed independent practitioners. Vaccination coverage was highest in the Mountain region (84.5%) and lowest in the Pacific region (74.3%). Acute care hospitals in 38 states reported influenza vaccination coverage of ≥75% among health care personnel (Figure) (Supplementary Table; https://stacks.cdc.gov/view/cdc/166705).

Influenza Vaccination Coverage: Nursing Homes

Among approximately 2.1 million health care personnel working in 14,294 nursing homes, influenza vaccination coverage was 45.4% overall; coverage was highest among students/trainees and volunteers (58.1%) and was lowest among employees (44.5%) (Table 1). Vaccination coverage was highest in the Northeast region (58.6%) and lowest in the South region (38.1%). Nursing homes in five states reported influenza vaccination coverage of ≥75% among health care personnel (Figure) (Supplementary Table; https://stacks.cdc.gov/view/cdc/166705).

Coverage with COVID-19 Vaccination: Acute Care Hospitals

Among approximately 8.0 million health care personnel working in 4,112 acute care hospitals, 2023–2024 COVID-19 vaccination coverage was 15.3% overall (Table 2); coverage was lowest (12.7%) among licensed independent practitioners. Vaccination coverage was highest in large-sized facilities (16.1%) and in urban (15.6%) and high SVI (19.9%) areas. Coverage was highest in the Pacific region (20.9%) and lowest in the Mountain region (9.3%). Acute care hospitals in 12 states reported 2023–2024 COVID-19 vaccination coverage of ≥20% among health care personnel (Figure) (Supplementary Table; https://stacks.cdc.gov/view/cdc/166705).

[§§] https://www.federalregister.gov/documents/2021/08/13/2021-16519/medicare-program-hospital-inpatient-prospective-payment-systems-for-acute-care-hospitals-and-the?form=MY01SV&OCID=MY01SV

[¶¶] https://www.cdc.gov/nhsn/pdfs/hps/covidvax/UpToDateGuidance-508.pdf

[***] https://www.cdc.gov/nchs/data-analysis-tools/urban-rural.html

[†††] https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

[§§§] Facility-size tertile was calculated separately for acute care hospitals and nursing homes and was based on the distribution of the total number of staff members per facility.

[¶¶¶] *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *Mountain*: Colorado, Idaho, Montana, Nevada, Utah, and Wyoming; *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Pacific*: Alaska, California, Hawaii, Oregon, and Washington; *South*: Alabama, Arizona, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

[****] 45 C.F.R. part 46, 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.

TABLE 1. Pooled mean influenza vaccination coverage among health care personnel working at acute care hospitals and nursing homes, by facility type — National Healthcare Safety Network, United States, October 1, 2023–March 31, 2024*

Characteristic	Acute care hospitals				Nursing homes			
	No. of facilities	No. of HCP	No. of vaccinated HCP	Coverage % (95% CI)†	No. of facilities	No. of HCP	No. of vaccinated HCP	Coverage % (95% CI)†
Total	**4,114**	**8,827,687**	**7,124,797**	**80.7 (80.7–80.7)**	**14,294**	**2,141,284**	**971,963**	**45.4 (45.3–45.5)**
Staff member type								
Employee	4,113	6,560,940	5,487,078	83.6 (83.6–83.7)	14,294	1,942,270	863,430	44.5 (44.4–44.5)
Licensed independent practitioner	3,749	1,290,268	847,676	65.7 (65.6–65.8)	11,621	105,820	54,396	51.4 (51.1–51.7)
Student/trainee or volunteer	3,503	976,479	790,043	80.9 (80.8–81.0)	4,399	93,194	54,137	58.1 (57.8–58.4)
Facility size§								
Small	1,371	447,184	346,806	77.6 (77.4–77.7)	4,802	358,030	162,539	45.4 (45.2–45.6)
Medium	1,371	1,674,424	1,285,596	76.8 (76.7–76.8)	4,714	611,336	267,944	43.8 (43.7–44.0)
Large	1,372	6,706,079	5,492,395	81.9 (81.9–81.9)	4,778	1,171,918	541,480	46.2 (46.1–46.3)
Urbanicity¶								
Urban	2,917	8,000,649	6,466,545	80.8 (80.8–80.9)	10,376	1,698,189	779,250	45.9 (45.8–46.0)
Rural	1,197	827,038	658,252	79.6 (79.5–79.7)	3,918	443,095	192,713	43.5 (43.3–43.6)
Social vulnerability index**								
Low	1,242	2,557,867	2,112,743	82.6 (82.6–82.6)	4,893	703,749	336,549	47.8 (47.7–47.9)
Medium	1,359	3,223,133	2,572,998	79.8 (79.8–79.9)	4,776	761,881	337,303	44.3 (44.2–44.4)
High	1,512	3,046,079	2,438,500	80.1 (80.0–80.1)	4,623	675,527	298,002	44.1 (44.0–44.2)
Region††								
Midwest	1,053	2,134,165	1,781,857	83.5 (83.4–83.5)	4,613	612,962	241,100	39.3 (39.2–39.5)
Mountain	203	410,762	347,067	84.5 (84.4–84.6)	498	70,392	39,673	56.4 (56.0–56.7)
Northeast	580	1,697,515	1,412,808	83.2 (83.2–83.3)	2,348	464,122	272,044	58.6 (58.5–58.8)
Pacific	467	1,153,258	856,882	74.3 (74.2–74.4)	1,527	231,530	128,564	55.5 (55.3–55.7)
South	1,811	3,431,987	2,726,183	79.4 (79.4–79.5)	5,308	762,278	290,582	38.1 (38.0–38.2)

Abbreviation: HCP = health care personnel.

* Each facility reported summary influenza vaccination data among HCP working in the facility for ≥1 day during October 1, 2023–March 31, 2024. Coverage with 2023–2024 COVID-19 vaccination was reported to the National Healthcare Safety Network each week; data from the week ending March 31, 2024, or the last submitted week of data, were used for analysis.

† 95% CIs were calculated using the mid-P method.

§ Facility size was calculated separately for acute care hospitals and nursing homes and was based on the tertile distribution of the total number of staff members per facility.

¶ https://www.cdc.gov/nchs/data-analysis-tools/urban-rural.html

** https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

†† *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *Mountain*: Colorado, Idaho, Montana, Nevada, Utah, and Wyoming; *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Pacific*: Alaska, California, Hawaii, Oregon, and Washington; *South*: Alabama, Arizona, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

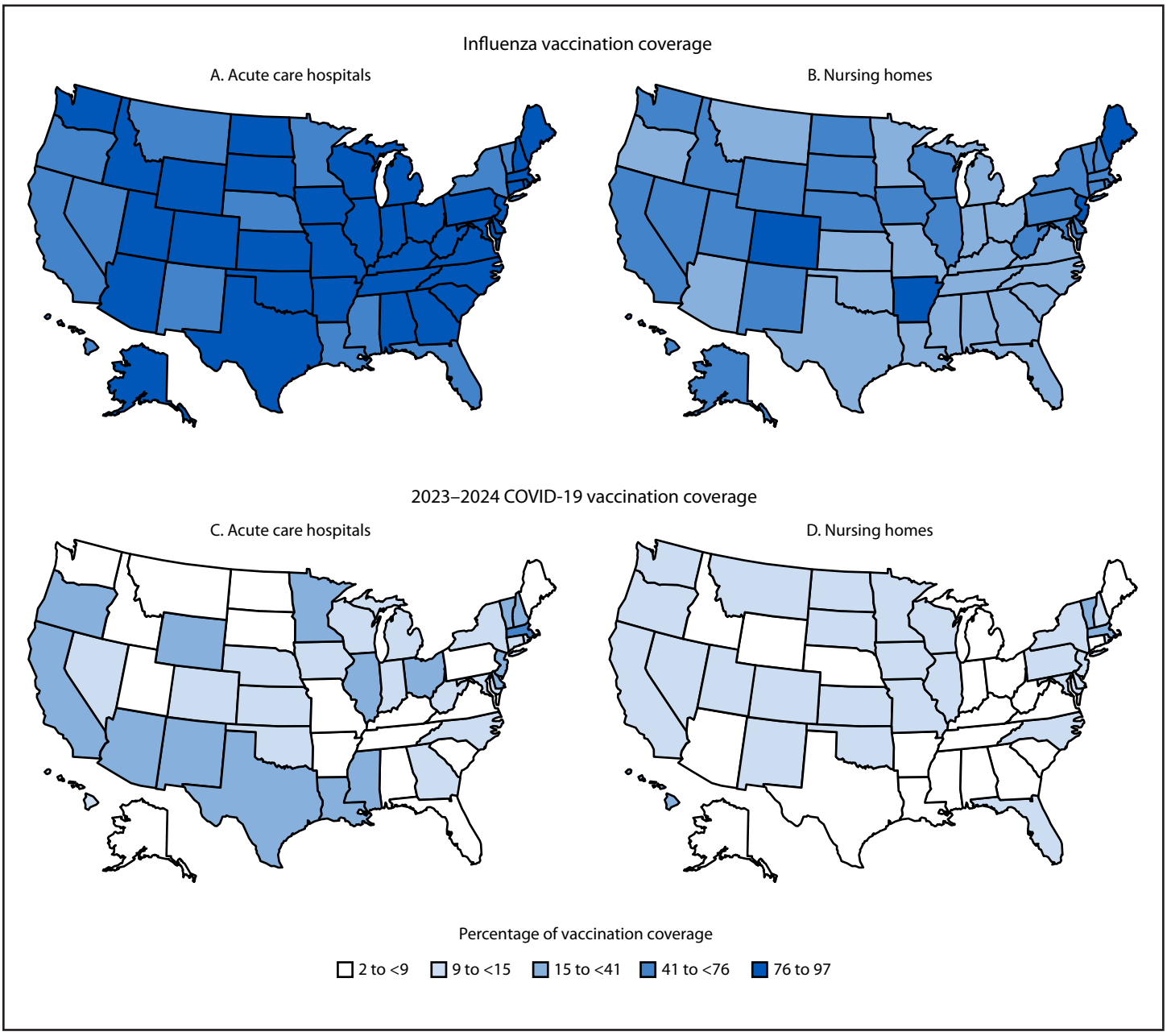
Coverage with 2023–2024 COVID-19 Vaccination: Nursing Homes

Among approximately 1.8 million health care personnel working in 14,281 nursing homes, 2023–2024 COVID-19 vaccination coverage was 10.5% overall (Table 2); coverage was highest among licensed independent practitioners (18.8%) and lowest among employees (10.0%). Vaccination coverage was highest among those working in the Pacific region (14.2%) and lowest among those working in the South region (8.6%). Nursing homes in two states reported vaccination coverage of ≥20% among health care personnel (Figure) (Supplementary Table; https://stacks.cdc.gov/view/cdc/166705).

Discussion

During the 2023–24 respiratory virus season, fewer than one in six health care personnel working in acute care hospitals and nursing homes reported receipt of a 2023–2024 COVID-19 vaccine, and fewer than one half of health care personnel working in nursing homes had received an influenza vaccine. Coverage with influenza and 2023–2024 COVID-19 vaccination was higher among health care personnel in acute care hospitals than among those in nursing homes. Although characteristics associated with vaccination varied by vaccine and facility type, coverage was generally higher in urban than in rural areas and lower in the South.

FIGURE. Percentage of pooled mean influenza vaccination coverage and 2023–2024 COVID-19 vaccination coverage among health care personnel working at acute care hospitals (A and C) and nursing homes (B and D), by facility type and state — National Healthcare Safety Network, United States, October 1, 2023–March 31, 2024*



* Each facility reported summary influenza vaccination data among health care personnel working in the facility for ≥1 day during October 1, 2023–March 31, 2024. Coverage with 2023–2024 COVID-19 vaccination was reported to the National Healthcare Safety Network each week; data from the week ending on March 31, 2024, or the last submitted week of data, were used for analysis. State-level vaccination coverage results were categorized into levels based on the overall quintile distribution of coverage across both vaccines and both facility types.

Coverage with COVID-19 vaccination among health care personnel in nursing homes decreased from 22.8% during the 2022–23 respiratory virus season to 10.5% during the 2023–24 respiratory virus season (*6*). During the same period, COVID-19 vaccination coverage among health care personnel in acute care hospitals decreased from 17.8% to 15.3%. Compared with vaccination during the 2022–23 respiratory virus season, influenza vaccination among health care personnel in acute care hospitals remained stable at approximately 81%; this percentage remains well below the 91% coverage reported for the 2019–20 season, indicating that influenza vaccination

TABLE 2. Pooled mean 2023–2024 COVID-19 vaccination coverage among health care personnel working at acute care hospitals and nursing homes, by facility type — National Healthcare Safety Network, United States, October 1, 2023–March 31, 2024*

Characteristic	Acute care hospitals				Nursing homes			
	No. of facilities	No. of HCP	No. of vaccinated HCP	Coverage % (95% CI)†	No. of facilities	No. of HCP	No. of vaccinated HCP	Coverage % (95% CI)†
Total	**4,112**	**7,958,264**	**1,215,283**	**15.3 (15.2–15.3)**	**14,281**	**1,783,878**	**187,529**	**10.5 (10.5–10.6)**
Staff member type								
Employee	4,107	6,084,708	966,371	15.9 (15.9–15.9)	14,278	1,663,089	165,774	10.0 (9.9–10.0)
Licensed independent practitioner	3,490	1,256,858	159,264	12.7 (12.6–12.7)	10,334	84,276	15,875	18.8 (18.6–19.1)
Student/trainee or volunteer	3,131	616,698	89,648	14.5 (14.4–14.6)	3,340	36,513	5,880	16.1 (15.7–16.5)
Facility size§								
Small	1,370	435,181	66,880	15.4 (15.3–15.5)	4,798	339,502	37,839	11.1 (11.0–11.3)
Medium	1,371	1,587,262	192,435	12.1 (12.1–12.2)	4,708	527,747	59,966	11.4 (11.3–11.4)
Large	1,371	5,935,821	955,968	16.1 (16.1–16.1)	4,775	916,629	89,724	9.8 (9.7–9.8)
Urbanicity¶								
Urban	2,916	7,203,900	1,124,506	15.6 (15.6–15.6)	10,366	1,416,806	158,896	11.2 (11.2–11.3)
Rural	1,196	754,364	90,777	12.0 (12.0–12.1)	3,915	367,072	28,633	7.8 (7.7–7.9)
Social vulnerability index**								
Low	1,242	2,296,349	315,278	13.7 (13.7–13.8)	4,887	588,459	66,178	11.2 (11.2–11.3)
Medium	1,358	2,912,226	352,632	12.1 (12.1–12.1)	4,770	635,212	63,125	9.9 (9.9–10.0)
High	1,511	2,749,110	547,184	19.9 (19.9–20.0)	4,622	560,081	58,217	10.4 (10.3–10.5)
Region††								
Midwest	1,053	1,865,337	307,453	16.5 (16.4–16.5)	4,609	507,102	48,856	9.6 (9.6–9.7)
Mountain	203	367,061	33,971	9.3 (9.2–9.3)	498	53,921	6,811	12.6 (12.4–12.9)
Northeast	580	1,596,904	284,339	17.8 (17.7–17.9)	2,348	405,581	50,696	12.5 (12.4–12.6)
Pacific	467	1,083,448	226,271	20.9 (20.8–21.0)	1,527	194,093	27,592	14.2 (14.1–14.4)
South	1,809	3,045,514	363,249	11.9 (11.9–12.0)	5,299	623,181	53,574	8.6 (8.5–8.7)

Abbreviation: HCP = health care personnel.

* Each facility reported summary influenza vaccination data among HCP working in the facility for ≥1 day during October 1, 2023–March 31, 2024. Coverage with 2023–2024 COVID-19 vaccination was reported to the National Healthcare Safety Network each week; data from the week ending March 31, 2024, or the last submitted week of data, were used for analysis.

† 95% CIs were calculated using the mid-P method.

§ Facility size was calculated separately for acute care hospitals and nursing homes and was based on the tertile distribution of the total number of staff members per facility.

¶ https://www.cdc.gov/nchs/data-analysis-tools/urban-rural.html

** https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

†† *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *Mountain*: Colorado, Idaho, Montana, Nevada, Utah, and Wyoming; *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Pacific*: Alaska, California, Hawaii, Oregon, and Washington; *South*: Alabama, Arizona, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

coverage among health care providers remains persistently below the levels during the prepandemic period (*7*).

This study identified a marked decrease in COVID-19 vaccination coverage among health care personnel in nursing homes from the 2022–23 respiratory virus season to the 2023–24 respiratory virus season. CMS's regulatory requirement for vaccination of health care personnel against COVID-19 expired in June 2023†††† and, in fall 2023, COVID-19 vaccines were commercialized.§§§§ These two events might have affected vaccination campaigns and on-site access to COVID-19 vaccines in nursing homes, and commercialization of the vaccine increased costs for facilities and health care personnel. In addition, a recent survey of health care personnel indicated that, although personnel believe that COVID-19 is a serious health threat, they have low confidence in the effectiveness, safety, and benefit of COVID-19 vaccination (*8*). In one study, health care personnel who felt sufficiently informed about the COVID-19 vaccine were 10 times more likely to receive COVID-19 vaccination and four times more likely to recommend the vaccine to their patients (*9*). This finding suggests that if vaccines are readily available, education might play an important role in improving vaccine confidence and vaccination coverage.

Among health care personnel working in acute care hospitals, coverage with both COVID-19 and influenza vaccination was lowest among licensed independent practitioners. This finding underscores ongoing challenges with vaccination of nonemployee health care personnel and documentation of vaccination that occurs outside of the facility (*10*). Like findings in previous studies, the current findings highlight the need to further

†††† https://www.cms.gov/files/document/qso-23-02-all-expired.pdf

§§§§ https://www.hhs.gov/coronavirus/commercialization/index.html

investigate barriers to vaccination among health care personnel and identify additional strategies to address these challenges. For example, a recent study found that multifaceted campaigns that include on-site vaccination are effective at increasing vaccination coverage among health care personnel (*10*).

Limitations

The findings in this report are subject to at least four limitations. First, influenza and COVID-19 vaccination coverage were reported separately using different definitions of total health care personnel working in the facility. The proportion of health care personnel who were included in the coverage calculations for both seasonal influenza vaccination coverage and weekly COVID-19 vaccination coverage is unclear. This lack of clarity limits the direct comparability of coverage with the two vaccines; therefore, statistical comparisons between influenza and COVID-19 vaccination coverage were not conducted. Second, this report includes data reported by facilities on behalf of health care personnel, which might have resulted in underestimates of vaccination acquired outside the health care facility. Third, vaccination coverage could not be stratified by recent history of SARS-CoV-2 infection. CDC recommendations state that persons might consider delaying an updated vaccine by 3 months after experiencing SARS-CoV-2 infection.¶¶¶¶ Therefore, some personnel might have declined vaccination against COVID-19 after a recent infection with SARS-CoV-2. Finally, this analysis was conducted using aggregate data reported to NHSN at the facility level; therefore, vaccination coverage could not be stratified by person-level covariates that might potentially enable an assessment of differences in coverage by factors such as age, race and ethnicity, or job category.

Implications for Public Health Practice

Although the COVID-19 public health emergency has ended, thousands of COVID-19–related hospitalizations and hundreds of COVID-19–associated deaths still occur weekly.***** Influenza vaccination among health care personnel has not returned to 2019 levels, and the number of COVID-19 vaccinations has continued to decline each season, underscoring the ongoing challenge of promoting vaccination among health care personnel during the postpandemic period. Studies are needed to identify effective strategies to improve vaccination at a time when health care personnel are susceptible to low vaccine confidence. Also, improving confidence about the safety and effectiveness of vaccines among health care personnel through, for example, providing additional education about the safety and effectiveness of vaccination to health care personnel (*9*), has various benefits beyond increased vaccination coverage, such as decreased risk for staffing shortages (*3*) and increased patient vaccination (*9*). Respiratory viral diseases including influenza and COVID-19 pose risks to health care personnel in U.S. health care settings, and vaccination of health care personnel is an effective strategy for maintaining a healthy workforce (*1*,*2*) and improving health care system resiliency (*3*).

Summary

What is already known about this topic?

The Advisory Committee on Immunization Practices (ACIP) recommends annual influenza vaccination for health care personnel. In September 2023, ACIP recommended receipt of a 2023–2024 COVID-19 vaccine for all persons aged ≥6 months.

What is added by this report?

During the 2023–24 respiratory virus season, influenza vaccination coverage was 80.7% among acute care hospital personnel and 45.4% among nursing home personnel. Coverage with 2023–2024 COVID-19 vaccination was 15.3% among acute care hospital personnel and 10.5% among nursing home personnel.

What are the implications for public health practice?

Respiratory viral diseases pose risks for health care personnel in U.S. health care settings, and vaccination is an effective strategy for maintaining a healthy workforce and improving health care system resiliency.

Corresponding author: Jeneita Bell, hqp8@cdc.gov.

[1]Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [2]Goldbelt C6, Chesapeake, Virginia; [3]Lantana Consulting Group, East Thetford, Vermont; [4]Chenega Enterprise Systems & Solutions, LLC, Chesapeake, Virginia; [5]Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC.

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¶¶¶¶ https://www.cdc.gov/covid/vaccines/stay-up-to-date.html

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Statewide Outbreak of *Neisseria meningitidis* Serogroup Y, Sequence Type 1466 — Virginia, 2022–2024

Meredith Robinson, MS[1]; Jenny Crain, MS, MPH[1]; Brittany Kendall, MPH[1]; Victoria Alexander, MPH[1]; Elena Diskin, MPH[1]; Dawn Saady, MS[1]; Corryn Hicks[1]; Angela Myrick-West, MPH[1]; Paige Bordwine, MPH[1]; Denise Sockwell, MSPH[1]; Emily Craig, MS[2]; Amy Rubis, MPH[3]; Lucy McNamara, PhD[3]; Shalabh Sharma, MS[3]; Rebecca Howie, PhD[3]; Daya Marasini, PhD[3]; Henju Marjuki, PhD[3]; Ana Colón, MPH[1]

Abstract

Invasive meningococcal disease (IMD) is a severe illness that can have devastating effects; outbreaks are uncommon in the United States. Vaccination is the preferred control measure for IMD outbreaks when a defined population at risk (e.g., college students or persons experiencing homelessness) can be identified. In August 2022, the Virginia Department of Health (VDH) began investigating an IMD outbreak in Virginia's Eastern Health Planning Region, prompted by the detection of four confirmed cases within 8 weeks. Clinical isolates available from three cases were characterized as *Neisseria meningitidis* serogroup Y, sequence type 1466. A subsequent statewide investigation identified 36 genetically related cases, including seven deaths (case fatality rate = 19.4%) as of March 1, 2024. A majority of patients (63.9%) were in an age group (30–60 years) not generally considered at increased risk for IMD; 78.0% were non-Hispanic Black or African American. No common exposures, affiliations, or risk factors were identified, and a defined population could not be identified for vaccination. VDH recommended quadrivalent (serogroups A, C, W, and Y) meningococcal conjugate vaccination of a subset of close contacts of patients based on IMD risk factors and age range similar to that of patients with identified cases. IMD outbreaks might affect populations without established IMD risk factors. Lack of a well-defined population at risk might prompt exploration of novel control strategies, such as selective vaccination of close contacts.

Introduction

Invasive meningococcal disease (IMD), caused by the bacterium *Neisseria meningitidis*, is a serious illness that manifests primarily as meningitis or meningococcemia (a bloodstream infection) (*1*). The Advisory Committee on Immunization Practices (ACIP) recommends routine meningococcal vaccination for some persons based on age and disease risk (*2*). In an outbreak setting, CDC recommends offering vaccination to a defined target group considered to be at increased risk based on a common affiliation, geographic community, or shared characteristics (*3*). In August 2022, the Virginia Department of Health (VDH) began investigating an IMD outbreak in Virginia's Eastern Health Planning Region.

Investigation and Results

Initial Cases

On August 12, 2022, VDH learned of two patients with IMD hospitalized in the Virginia Eastern Health Planning Region. *N. meningitidis* serogroup Y (NmY) was identified in blood specimens from both patients. Two additional NmY IMD cases were reported in the Eastern Region during June–July 2022; in contrast, during the preceding 10 years, the Eastern Region averaged only one IMD case per year, and Virginia averaged eight IMD cases per year statewide. No common exposures, epidemiologic linkages, or specific risk factors were identified among the four cases. All available *N. meningitidis* isolates were sent to CDC for antimicrobial susceptibility testing and whole genome sequencing (WGS). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.*

Case Finding and Reporting

On September 2, 2022, CDC notified VDH that the three available isolates from the four initial cases, and a fourth isolate from a fifth case identified on August 9, 2022, were the same sequence type (ST) 1466, within clonal complex (CC) 174 (*4*). With this confirmation of genetic relatedness among clinical isolates, outbreak-specific case definitions were established. A confirmed outbreak case was defined as identification of *N. meningitidis* (NmY ST1466 and within 33 single nucleotide polymorphisms of another outbreak case, or *N. meningitidis* untyped, and not known to be ciprofloxacin- or penicillin-resistant) via culture or polymerase chain reaction in a specimen from a normally sterile body site in a resident of or visitor to the Eastern Region with onset of IMD symptoms (fever, headache, nausea, vomiting, photophobia, or stiff neck) after June 1, 2022. A probable outbreak case was defined as one identified through epidemiologic linkage, in which *N. meningitidis* was not detected, but all other confirmed outbreak case definition criteria were met. Based on these case

* 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.

definitions, VDH conducted active case finding by monitoring syndromic surveillance[†] and reviewing medical records of patients with suspected meningitis or meningococcemia.

During November 9, 2022–July 14, 2023, seven NmY ST1466 cases were identified in the Southwest Region (five) and Central Region (two) among patients without a history of travel to the Eastern Region. As a result, the regional criterion was removed from the outbreak case definition in August 2023.

Case Characteristics

During June 12, 2022–March 1, 2024, a total of 36 confirmed and one probable IMD outbreak cases were identified (Figure) (Table). The probable case occurred in an unvaccinated health care provider who became symptomatic 5 days after providing direct care to a patient with a confirmed outbreak case. The health care provider received postexposure prophylaxis (PEP) before specimen collection and specimens were negative for *N. meningitidis* by polymerase chain reaction testing and culture. Confirmed outbreak cases were identified among four of VDH's five health planning regions, including the Eastern Region (25), Southwest Region (six), Central Region (three), and Northern Region (two). The majority of patients (58%) primarily lived in urban areas.

Overall, 28 (78%) of the 36 patients with confirmed cases were non-Hispanic Black or African American (Black) and 21 (58%) were male; the median patient age was 47 years (range = 16–82 years). A majority of cases (64%) occurred in persons aged 30–60 years. All patients required hospitalization. Seven patients died (case fatality rate [CFR] = 19.4%) from IMD complications. Among the fatal cases, the median patient age was 41 years (range = 33–56 years); three cases (43%) occurred in patients with one or more underlying health condition. Meningococcemia without other clinical syndromes was the most common clinical reason for seeking care, identified among 24 patients (Table). Clinical symptoms of meningococcemia included fever, nausea, vomiting, diarrhea, and muscle aches. Five patients had HIV infection, one with HIV treatment documented. One patient was receiving immunosuppressive medication after organ transplantation. Ten patients had diabetes. Thirty-five patients had no evidence of previous meningococcal vaccination against NmY (e.g., Menactra, MenQuadfi, or Menveo), including four patients aware of their HIV diagnosis for whom vaccination is routinely recommended. One patient had received 1 dose of meningococcal polysaccharide vaccine (Menomune-A/C/Y/W) 16 years before symptom onset.

Approximately two thirds of patients (23; 64%) were current or former tobacco smokers. Fourteen patients were current or former substance users. Five patients cited employment in the construction industry; however, no common employer or work site was identified. No common affiliations, exposures, or risk factors other than shared demographic characteristics were identified. The average social vulnerability index score[§] of patients' residential U.S. Census Bureau tracts was 0.63 (range = 0.05–1) overall and 0.73 for fatal cases, compared with 0.4 for all Virginia residents (*5*).

Isolate Characteristics

Isolates from 34 confirmed cases were available for WGS; all were characterized as NmY: ST1466/CC174 with a recent common ancestor sharing a fine-typing[¶] genetic profile: PorA (P1.21,16), FetA (F3–7), and PorB (3–35) (*4*). In contrast to some recently identified ciprofloxacin- and penicillin-resistant NmY strains (*6*), genotypic resistance markers were absent, and ciprofloxacin and penicillin sensitivity was inferred. Before this outbreak, IMD cases caused by NmY ST1466 were uncommon in the United States.

Public Health Response

VDH declared a community outbreak of NmY in the Eastern Region on September 2, 2022, and disseminated a clinician letter on September 23, encouraging health care providers to maintain a high index of suspicion for IMD and to ensure that eligible patients were up to date with routine quadrivalent (serogroups A, C, W, and Y) meningococcal conjugate (MenACWY) vaccination (*2*). VDH also sent a letter to HIV health care providers emphasizing the increased risk for IMD among persons with HIV infection and that MenACWY vaccine is recommended for persons aged ≥2 years with HIV infection (*2*). On March 6, 2023, VDH issued a press release and launched an outbreak response website[**] to raise public awareness. A statewide outbreak was declared on August 30, 2023, via a news release, and additional communications were distributed to health care providers and the public. Virginia residents were advised to ensure that they were up to date with recommended

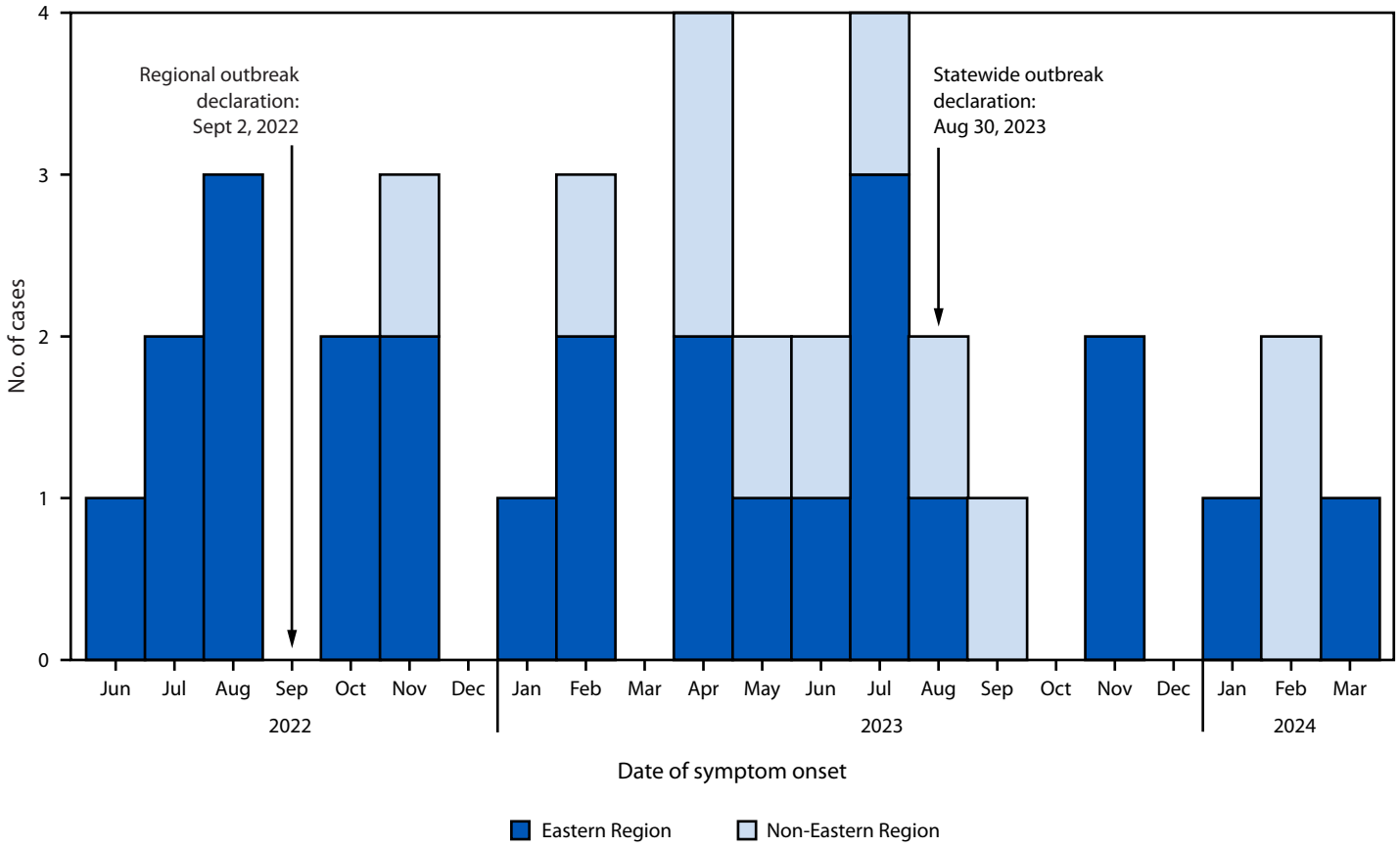
[†] Syndromic surveillance was conducted through the Virginia Electronic Surveillance System for the Early Notification of Community-based Epidemics. https://www.vdh.virginia.gov/surveillance-and-investigation/syndromic-surveillance/

[§] Social vulnerability refers to the resilience of communities (the ability to survive and thrive) when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks. Socially vulnerable populations are especially at risk during public health emergencies because of factors such as socioeconomic status, household characteristics, racial and ethnic minority status, or housing type and transportation. The social vulnerability index is measured from 0–1; the higher the number, the more vulnerable the population.

[¶] Fine typing refers to mapping of specific genes common to the same sequence type or clonal complex below the serogrouping level, facilitating verification that the isolates share the same genetic profile.

[**] https://www.vdh.virginia.gov/surveillance-and-investigation/meningococcal-disease-outbreak-response

FIGURE. Invasive meningococcal disease associated with an outbreak of *Neisseria meningitidis* serogroup Y, sequence type 1466 (N = 36) — Virginia, 2022–2024



meningococcal vaccinations and to not delay seeking care if they experienced IMD symptoms. In consultation with CDC, VDH evaluated options for vaccination of a defined population (*3*,*7*,*8*); however, no common affiliation or shared characteristics could be identified among cases that would guide delineation of a feasible population for vaccination.

Management of Close Contacts

VDH conducted standard public health interviews with patients to identify close contacts. A close contact was defined as a person who experienced lengthy contact[††] with a person with a confirmed case, or exposure to the patient's oral secretions, within 10 days of the patient's symptom onset. Per established recommendations, VDH emphasized the need for timely receipt of PEP, consisting of a short course of a recommended antibiotic (e.g., rifampin, ciprofloxacin, or ceftriaxone), for all close contacts (*3*). One probable case was identified in a health care contact; no additional cases occurred among identified close contacts.

Vaccination Strategy

In December 2022, VDH issued a recommendation to local health departments in the Eastern Region to offer 1 dose of MenACWY vaccine, in addition to antimicrobial PEP, to a subset of close contacts of persons with IMD (*3*). Vaccination was recommended for close contacts if 1) they had established risk factors for IMD (e.g., HIV infection) and were not up to date with routine MenACWY vaccination as recommended by ACIP (*2*), or 2) they were aged 30–60 years and had not received a dose of MenACWY vaccine within the preceding 5 years. This recommendation was expanded statewide in August 2023 and revised to include all close contacts aged ≥11 years because additional cases were identified among patients outside the 30–60-year age range. No additional cases were reported among identified close contacts following this recommendation. Limited data are available on MenACWY vaccine administration during this outbreak; however, based on anecdotal reports from local health department staff members, vaccine acceptance was low among all indicated groups.

[††] Persons in the same household, roommates, or anyone with direct contact with the patient's oral secretions.

TABLE. Epidemiologic and clinical characteristics of laboratory-confirmed meningococcal disease cases (N = 36)* — Virginia, June 12, 2022–March 1, 2024

Characteristic	No. (%)
Age group, yrs	
Median (IQR)	47 (16–82)
0–29	4 (11.1)
30–59	23 (63.9)
≥60†	9 (25.0)
Sex	
Female	15 (41.7)
Male	21 (58.3)
Race	
Black or African American, non-Hispanic	28 (77.8)
White, non-Hispanic	8 (22.2)
Meningococcal vaccination status	
Unvaccinated	35 (97.2)
Received 1 dose§	1 (2.8)
Received 2 doses	0 (—)
Outcome	
Survived	29 (80.6)
Died	7 (19.4)
Infection type	
Meningococcemia	24 (66.7)
Meningitis	3 (8.3)
Septic arthritis	2 (5.6)
Meningococcemia and septic arthritis	2 (5.6)
Pericarditis	1 (2.8)
Meningococcemia and meningitis	1 (2.8)
Meningococcemia and myocarditis	1 (2.8)
Meningococcemia and pneumonia	1 (2.8)
Meningitis and pneumonia	1 (2.8)
Immunosuppression status	
HIV-positive	5 (13.9)
Other immunosuppression¶	1 (2.8)
No medical record evidence of immunosuppression	30 (83.3)
Diabetes	
Yes	10 (27.8)
No or unknown	26 (72.2)
History of, or current cigarette smoking	
Yes	23 (63.9)
No or unknown	13 (36.1)
History of, or current marijuana use	
Yes	12 (33.3)
No or unknown	24 (66.7)
History of, or current cocaine use	
Yes	5 (13.9)
No or unknown	31 (86.1)
History of, or current injection drug use**	
Yes	2 (5.6)
No or unknown	34 (94.4)

* One contact who provided direct patient care met the probable case definition but was excluded from the overall outbreak case count.
† Seven patients were aged ≥65 years and two were aged 60–64 years.
§ Patient not known to have HIV infection–acquired *Neisseria meningitidis* serogroup Y infection 16 years after receipt of 1 Menomune polysaccharide A/C/Y/W vaccine dose.
¶ Medical record documentation of immunosuppression because the patient was taking organ transplant antirejection medication.
** Self-reported or medical record evidence of use of heroin, methamphetamines, or both.

Discussion

Several features of this ongoing outbreak are unusual for NmY disease in the United States. A majority of patients (86%), including six patients with fatal cases, did not have typical meningitis symptoms. CFR (19.4%) was higher than the national average CFR for NmY during 2017–2022 (6.5%–17.2%), although NmY-associated CFRs ≤27% were reported during 2015–2016.[§§] The relatively high CFR in this outbreak might represent random variation, or reflect a hypervirulent strain or delays in diagnosis and treatment due to atypical disease symptoms. Further, residence of patients in areas of higher social vulnerability might have been associated with challenges in accessing medical care, increasing the likelihood of poor outcomes. In addition, although NmY commonly affects adults aged ≥65 years, in this outbreak, the median patient age was 47 years, and approximately three quarters of patients were aged <65 years, although a substantial proportion had underlying conditions that might have increased their risk for IMD.

Although common exposures and affiliations were not identified, this outbreak disproportionately affected Black persons. In the Southwest Region, for example, 83% of outbreak patients were Black compared with 12% of the region's residents (*9*). This finding might reflect carriage of NmY ST1466 among contacts of a shared social network. In addition, the disproportionate impact of NmY ST1466 on Virginia's HIV-positive population is consistent with reports of a national increase in IMD among persons with HIV infection (*10*). In 2016, ACIP recommended routine administration of MenACWY vaccine for persons with HIV infection (*2*). Previous reports have identified low rates of MenACWY vaccination among U.S. patients with a new diagnosis of HIV infection (*10*), highlighting a need for strategies that might improve vaccine acceptance, such as provider education.

Lack of a well-defined population at risk during this outbreak posed a challenge to implementing vaccination as an outbreak control strategy. Although antimicrobial chemoprophylaxis of close contacts of patients with meningococcal disease is important for preventing secondary cases, CDC does not routinely recommend vaccination of close contacts. In this outbreak, selective vaccination of close contacts (in addition to antimicrobial prophylaxis) was recommended in an effort to prevent additional cases among a population presumed to be at risk. Unfortunately, low vaccine acceptance precluded evaluation of the impact of this intervention on outbreak progression.

§§ https://www.cdc.gov/meningococcal/php/surveillance/index.html#cdc_generic_section_5-data-reporting

Summary

What is already known about this topic?

Meningococcal disease is a serious illness; U.S. outbreaks are uncommon. Vaccination of a defined population at risk (e.g., college students or persons experiencing homelessness) is recommended during outbreaks.

What is added by this report?

In a Virginia outbreak, 36 cases of serogroup Y meningococcal disease occurred during August 2022–March 2024; seven (19.4%) patients died. Most patients were aged 30–60 years, an age group not generally at increased risk for meningococcal disease. Patients lacked common exposures or affiliations. Vaccination was recommended for close contacts within the patient age range.

What are the implications for public health practice?

Occurrence of meningococcal disease outbreaks in populations without well-defined risk groups might prompt exploration of novel control strategies, such as selective vaccination of close contacts.

Implications for Public Health Practice

A rapid public health response, guided by a comprehensive epidemiologic investigation, is necessary for controlling meningococcal disease outbreaks. Especially in outbreaks in which no common exposures, epidemiologic linkages, or specific risk factors among cases are identified, determination of genetic relatedness among isolates through WGS can be critical to guiding decisions about outbreak declaration and control strategies. The unique epidemiology of this outbreak demonstrates the potential for uncommon strains of *N. meningitidis* to spread in populations not previously considered at high risk for meningococcal infection. Lack of a well-defined outbreak group might prompt exploration of novel control strategies, such as selective vaccination of close contacts.

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Corresponding author: Meredith Robinson, Meredith.robinson@vdh.virginia.gov.

[1]Virginia Department of Health; [2]Division of Consolidated Laboratory Services, Virginia Department of General Services; [3]National Center for Immunization and Respiratory Diseases, CDC.

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Routine Vaccination Coverage — Worldwide, 2023

Camille E. Jones, PhD[1,2]; M. Carolina Danovaro-Holliday, MD[3]; George Mwinnyaa, PhD[4]; Marta Gacic-Dobo, MSc[3]; Lauren Francis, MSc[4]; Jan Grevendonk, MBA[3]; Yoann Nedelec[4]; Aaron Wallace, PhD[3]; Samir V. Sodha, MD[2]; Ciara Sugerman, PhD[2]

Abstract

In 2020, the World Health Assembly endorsed the Immunization Agenda 2030 (IA2030), a 10-year strategy to reduce vaccine-preventable disease (VPD)–associated morbidity and mortality. IA2030 goals include improving equitable vaccination coverage, halving the number of unimmunized (zero-dose) children, and increasing the introduction of new and underutilized vaccines. The COVID-19 pandemic disrupted health systems worldwide, hindering years of childhood vaccination achievements and putting global public health goals at risk. This report presents trends in World Health Organization (WHO) and UNICEF routine vaccination coverage estimates through 2023 across the 194 WHO member countries. During 2022–2023, global coverage with the first and third doses of diphtheria-tetanus-pertussis–containing vaccine (DTPcv) (89% and 84%, respectively) and the first dose of measles-containing vaccine (83%) stagnated and remained lower than prepandemic levels. The 31 WHO member countries with fragile, conflict-affected, and vulnerable (FCV) settings include approximately one half of the world's 14.5 million children who did not receive the first DTPcv dose. The introduction of new and underutilized vaccines, such as a second MCV dose in the African Region, has improved countries' overall protection against VPDs. Accelerating country-specific routine immunization and catch-up vaccination programs to reach unvaccinated and incompletely vaccinated children, especially those living in FCV settings, is critical to reducing morbidity and mortality associated with VPDs.

Introduction

In 1974, the World Health Organization (WHO) launched the Expanded Programme on Immunization, which focused on delivering vaccines during the first year of life to protect every child against diphtheria, tetanus, pertussis, poliomyelitis, measles, and tuberculosis (*1*,*2*). Now referred to as the Essential Programme on Immunization, the program includes many additional antigens and vaccine doses recommended through childhood and adolescence.* In 2020, the World Health Assembly endorsed the Immunization Agenda 2030 (IA2030), the 2021–2030 overarching global vision and strategy to reduce morbidity and mortality from vaccine-preventable diseases (VPDs) across the life course and leave no one behind (*3*). Goals of this strategy include improving equitable vaccination coverage, halving the number of zero-dose children (children who have not received the first dose of a diphtheria-tetanus-pertussis–containing vaccine [DTPcv]), and increasing introductions of new and underutilized vaccines. Progress was adversely affected by the COVID-19 pandemic, as impeded access to health services resulted in global declines in immunization coverage and a nearly 40% increase in the number of zero-dose children (*4*), increasing immunity gaps worldwide. This report updates a previous report (*5*) and presents global, regional,† and national routine vaccination§ coverage trends during 2010–2023 across the 194 WHO member countries, highlighting trends before and during the COVID-19 pandemic, and through 2023.

Methods

Vaccination Coverage Estimates

WHO and UNICEF Estimates of National Immunization Coverage (WUENIC) are produced annually at national, regional, and global levels by reviews of country-level data, including administrative and survey-based coverage¶ (*6*,*7*). Data on vaccines routinely provided by national immunization programs are reviewed. Coverage estimates are produced for vaccines recommended during the first year of life, including Bacille Calmette-Guérin (BCG), first and third doses of DTPcv (DTPcv1 and DTPcv3), hepatitis B birth dose (HepB-BD) and third dose (HepB3), first dose of measles-containing vaccine (MCV1), rubella-containing vaccine (RCV), rotavirus vaccine last dose, first and second doses of inactivated poliovirus

* WHO recommends additional vaccines based on region or population risk group. https://www.who.int/publications/m/item/table1-summary-of-who-position-papers-recommendations-for-routine-immunization

† https://www.who.int/about/who-we-are/regional-offices

§ Routine vaccination refers to the part of the health system that facilitates vaccination service delivery to all eligible persons. This term also describes the process to regularly deliver vaccines according to the national vaccination schedule. https://iris.who.int/bitstream/handle/10665/204500/9789241510103_eng.pdf?sequence%20=%201

¶ Administrative coverage is calculated as doses administered during routine immunization visits within a specified target group divided by the estimated target population. Survey-based coverage is calculated as the proportion of persons in a target age group who received a vaccine dose. During surveys, a representative sample of households is visited, and caregivers of children in a specified target age group are interviewed. Vaccination dates are transcribed from home-based or health facility records. When documented evidence was unavailable, dates were recorded based on caregiver recall.

vaccine (IPV1 and IPV2), third dose of *Haemophilus influenzae* type b vaccine (Hib3), third dose of pneumococcal conjugate vaccine (PCV3), and third dose of polio vaccine (Pol3),** as well as yellow fever and meningococcal A vaccines in at-risk countries. Data on vaccines administered beyond the first year of life are also reviewed, including second dose of MCV (MCV2) and first and last doses of human papillomavirus vaccine (HPV, first and HPV, last).††

Indicators of Program Performance and Service Utilization

Children who did not receive DTPcv1 are considered zero-dose children, reflecting poor access to immunization and other health services (*3*). Children who receive DTPcv1 but not DTPcv3 are considered incompletely vaccinated.§§ DTPcv3 coverage by age 12 months is a historical indicator of routine immunization program performance, and dropout before completing the DTPcv series or from DTPcv1 to MCV1 reflects underuse of services among children with access and a lack of continuity in primary health care services. Trends in DTPcv and MCV were assessed from 2010 to 2023 across WHO region and World Bank economic classification,¶¶ and were evaluated among countries with fragile, conflict-affected, or vulnerable (FCV) settings.*** This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.†††

Results

Diphtheria-Tetanus-Pertussis–Containing Vaccines

During 2010–2019, global coverage with DTPcvs remained relatively unchanged: DTPcv1 coverage was 89% in 2010 and 90% in 2019; DTPcv3 coverage increased from 83% in 2010 to 86% in 2019 (Table). During the COVID-19 pandemic, global coverage with DTPcv1 and DTPcv3 declined, reaching 86% and 81%, respectively, by 2021. By 2023, coverage had partially recovered (DTPcv1 = 89%; DTPcv3 = 84%) but still had not reached the 2019 prepandemic levels. By 2023, the Region of the Americas was the only region in which coverage was improved compared with 2019 (DTPcv1 increased to 91% from 89% in 2019; DTPcv3 increased to 86% from 84% in 2019).

From 2019 to 2023, DTPcv coverage decreased in countries in every World Bank economic classification. The decline was most notable in low-income countries, where DTPcv3 decreased by 7 percentage points (75% in 2019 to 68% in 2023); countries in all other income groups returned to within 1 percentage point of 2019 coverage levels.

Before the COVID-19 pandemic, the global number of zero-dose children decreased 19%, from 15.8 million in 2010 to 12.8 million in 2019. In 2023, a total of 14.5 million children worldwide had not received DTPcv1. The 10 countries with the largest numbers of zero-dose children included, in descending order, Nigeria (2,134,000), India (1,592,000), Ethiopia (917,000), Democratic Republic of the Congo (839,000), Sudan (701,000), Indonesia (662,000), Yemen (580,000), Afghanistan (467,000), Angola (411,000), and Pakistan (396,000); together, these 10 countries accounted for 59% of the world's zero-dose children.

The global DTPcv1-to-DTPcv3 dropout rate§§§ increased from 5% in 2019 to 6% in 2021 and remained at 6% in 2023. However, the dropout rate in low-income countries was higher than that in all other income levels and increased from 9% in 2019 to 13% in 2023 (Figure 1).

Measles-Containing Vaccines

Globally, MCV1 coverage increased from 84% in 2010 to 86% in 2019 (Table). During the COVID-19 pandemic, MCV1 coverage declined to 81% in 2021, then partially

** Pol3 is defined as the percentage of surviving infants who received the third dose of a polio-containing vaccine. Doses may be administered as either oral poliovirus vaccine or IPV. https://www.who.int/teams/immunization-vaccines-and-biologicals/immunization-analysis-and-insights/global-monitoring/immunization-coverage/who-unicef-estimates-of-national-immunization-coverage

†† Vaccines provided during the first year of life versus after the first year of life are based on WHO routine immunization schedule recommendations (https://cdn.who.int/media/docs/default-source/immunization/immunization_schedules/table_1_april_2024_english.pdf?sfvrsn%20=%202e112cea_2&download%20=%20true). The age at which a specific vaccine is delivered might vary among different country routine immunization schedules based on the country-specific disease incidence associated with each vaccine.

§§ Incompletely vaccinated children might also be referred to as undervaccinated children.

¶¶ Economic classification based on gross national income (GNI) per capita, calculated in U.S. dollars (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups). For the current 2025 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of ≤$1,145 in 2023; lower-middle–income economies are those with a GNI per capita of $1,146–$4,515; upper-middle–income economies are those with a GNI per capita of $4,516–$14,005; high-income economies are those with a GNI per capita of >$14,005.

*** FCV is a broad term describing settings experiencing a range of situations, including humanitarian crises, protracted emergencies, and armed conflicts. The 31 countries listed as FCV in 2023 included Afghanistan, Bangladesh, Burkina Faso, Burma, Burundi, Cameroon, Central African Republic, Chad, Colombia, Democratic Republic of the Congo, El Salvador, Ethiopia, Guatemala, Haiti, Honduras, Iraq, Lebanon, Libya, Madagascar, Mali, Mozambique, Niger, Nigeria, Somalia, South Sudan, the Palestinian Territories, Sudan, Syria, Ukraine, Venezuela, and Yemen. https://gho.unocha.org/

††† 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.

§§§ DTPcv1-to-DTPcv3 dropout rate = [(number of children vaccinated DTPcv1) – (number of children vaccinated DTPcv3)] / (number of children vaccinated DTPcv1) x 100%.

TABLE. Coverage with first and third doses of diphtheria-tetanus-pertussis–containing vaccine and measles-containing vaccine by World Health Organization Region, World Bank economic classification, and World Bank–defined fragile, conflict-affected, and vulnerable settings — worldwide, 2010 and 2019–2023

		Vaccination coverage (%)										
		WHO region*						Income classification†				Countries with FCV settings
Year/Vaccine	Global	AFR	AMR	EMR	EUR	SEAR	WPR	Low	Lower-middle	Upper-middle	High	
2010												
DTPcv1	**89**	80	97	83	96	88	97	81	84	96	98	79
DTPcv3	**83**	71	94	74	94	82	96	72	77	94	96	71
MCV1	**84**	72	93	76	93	83	97	72	79	93	94	71
MCV2	**41**	4	67	51	80	15	87	8	13	85	83	13
2019												
DTPcv1	**90**	83	89	88	98	94	97	82	90	94	97	81
DTPcv3	**86**	77	84	84	95	91	96	75	86	91	95	75
MCV1	**86**	71	87	82	96	94	96	70	86	93	94	70
MCV2	**71**	33	72	75	92	83	93	34	69	85	93	39
2020												
DTPcv1	**88**	82	88	86	97	88	96	81	86	92	97	80
DTPcv3	**83**	74	81	80	94	86	95	73	82	88	94	72
MCV1	**83**	69	86	82	94	88	95	68	83	90	94	69
MCV2	**71**	39	73	75	91	80	93	35	71	84	92	46
2021												
DTPcv1	**86**	81	87	87	97	86	94	78	85	90	97	77
DTPcv3	**81**	73	81	80	94	83	93	69	81	86	95	69
MCV1	**81**	67	85	80	95	87	92	64	81	89	94	66
MCV2	**71**	40	77	75	91	79	91	35	71	84	92	45
2022												
DTPcv1	**89**	81	90	87	97	94	96	78	90	94	98	78
DTPcv3	**84**	73	83	81	95	92	95	68	86	91	95	69
MCV1	**83**	68	84	80	94	94	93	63	85	92	94	66
MCV2	**73**	44	76	75	91	86	92	37	75	86	92	46
2023												
DTPcv1	**89**	83	91	85	97	92	94	78	89	93	97	78
DTPcv3	**84**	74	86	79	95	90	92	68	85	90	94	70
MCV1	**83**	70	85	79	95	91	92	64	85	90	94	67
MCV2	**74**	49	75	73	91	85	90	42	77	82	91	50

Abbreviations: AFR = African Region; AMR = Region of the Americas; DTPcv = diphtheria-tetanus-pertussis–containing vaccine; DTPcv1 = first DTPcv dose; DTPcv3 = third DTPcv dose; EMR = Eastern Mediterranean Region; EUR = European Region; FCV = fragile, conflict-affected, and vulnerable; GNI = gross national income; MCV1 = first measles-containing vaccine dose; MCV2 = second measles-containing vaccine dose; SEAR = South-East Asia Region; WHO = World Health Organization; WPR = Western Pacific Region.

* Countries included are WHO member countries.

† Economic classification is based on GNI per capita, calculated in U.S. dollars (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups). For the current 2025 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of ≤$1,145 in 2023; lower-middle–income economies are those with a GNI per capita of $1,146–$4,515; upper-middle–income economies are those with a GNI per capita of $4,516–$14,005; high-income economies are those with a GNI per capita of >$14,005.

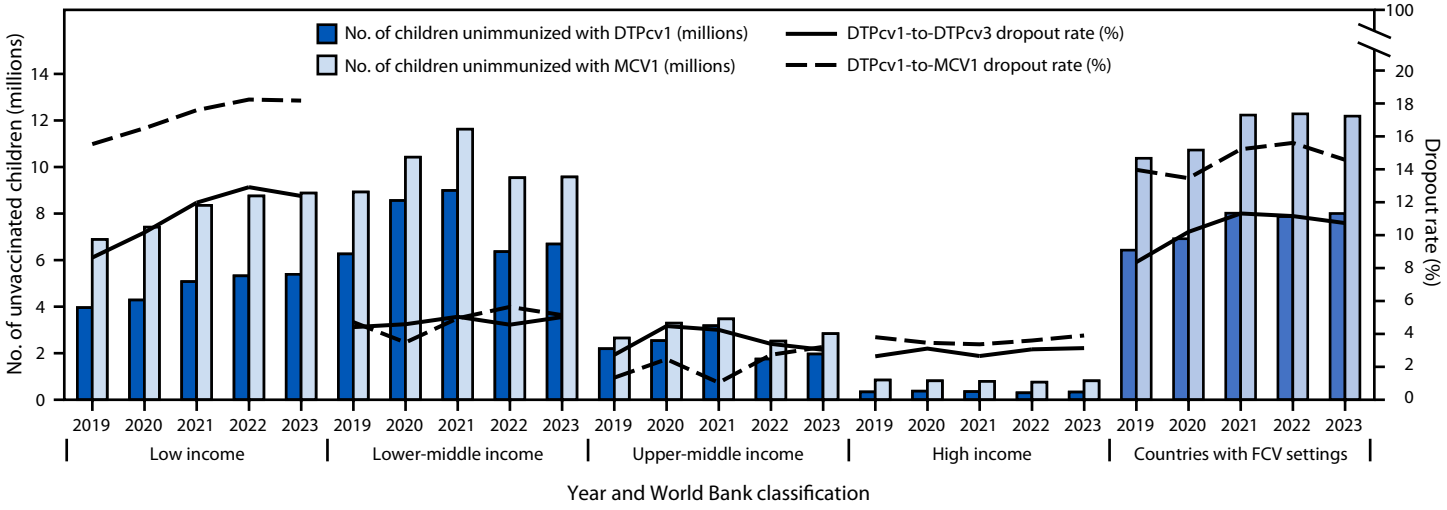
recovered, reaching 83% in 2023. From 2010 to 2019, 42 countries introduced MCV2 into their immunization schedules,¶¶¶ and total global MCV2 coverage increased from 41% in 2010 to 71% in 2019. Most MCV2 introductions occurred in the African Region (26 countries), resulting in a regional increase in MCV2 coverage from 4% in 2010 to 33% in 2019. During 2020–2023, 10 additional countries in the African Region introduced MCV2, and regional coverage increased to 49% in 2023.

From 2019 to 2023, the number of children who were not immunized against measles worldwide increased 15%, from 19.3 million to 22.2 million. Global DTPcv1-to-MCV1 dropout rate**** decreased from 6% in 2010 to 5% in 2019, then increased to 7% in 2023. In the African Region, the DTPcv1-to-MCV1 dropout rate increased from 10% in 2010 to 15% in 2019 and remained unchanged in 2023 (Figure 2). Among low-income countries, DTPcv1-to-MCV1 dropout increased from 10% in 2010 to 16% in 2019 and to 18% in 2023 (Figure 1).

¶¶¶ https://immunizationdata.who.int/global/wiise-detail-page/vaccination-schedule-for-country_name

**** DTPcv1-to-MCV1 dropout rate = [(number of children vaccinated DTPcv1) – (number of children vaccinated MCV1)] / (number of children vaccinated DTPcv1) x 100%.

FIGURE 1. Estimated number of children who did not receive the first doses of diphtheria-tetanus-pertussis-containing vaccine and measles-containing vaccine, and dropout from the first to third dose of diphtheria-tetanus-pertussis–containing vaccine and from the first dose of diphtheria-tetanus-pertussis–containing vaccine to the first dose of measles-containing vaccine, by World Bank economic classification* and World Bank-defined fragile, conflict-affected, and vulnerable settings† — worldwide, 2019–2023



Abbreviations: DTPcv = diphtheria-tetanus-pertussis–containing vaccine; DTPcv1 = first DTPcv dose; DTPcv3 = third DTPcv dose; FCV = fragile, conflict-affected, and vulnerable; GNI = gross national income; MCV1 = first measles-containing vaccine dose.

* Economic classification is based on GNI per capita, calculated in U.S. dollars (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups). For the current 2025 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of ≤$1,145 in 2023; lower-middle–income economies are those with a GNI per capita of $1,146–$4,515; upper-middle–income economies are those with a GNI per capita of $4,516–$14,005; high-income economies are those with a GNI per capita of >$14,005.

† FCV is a broad term describing a range of situations, including humanitarian crises, protracted emergencies, and armed conflicts. The 31 countries listed as FCV in 2023 included Afghanistan, Bangladesh, Burkina Faso, Burma, Burundi, Cameroon, Central African Republic, Chad, Colombia, Democratic Republic of the Congo, El Salvador, Ethiopia, Guatemala, Haiti, Honduras, Iraq, Lebanon, Libya, Madagascar, Mali, Mozambique, Niger, Nigeria, Somalia, South Sudan, the Palestinian Territories, Sudan, Syria, Ukraine, Venezuela, and Yemen. https://gho.unocha.org/

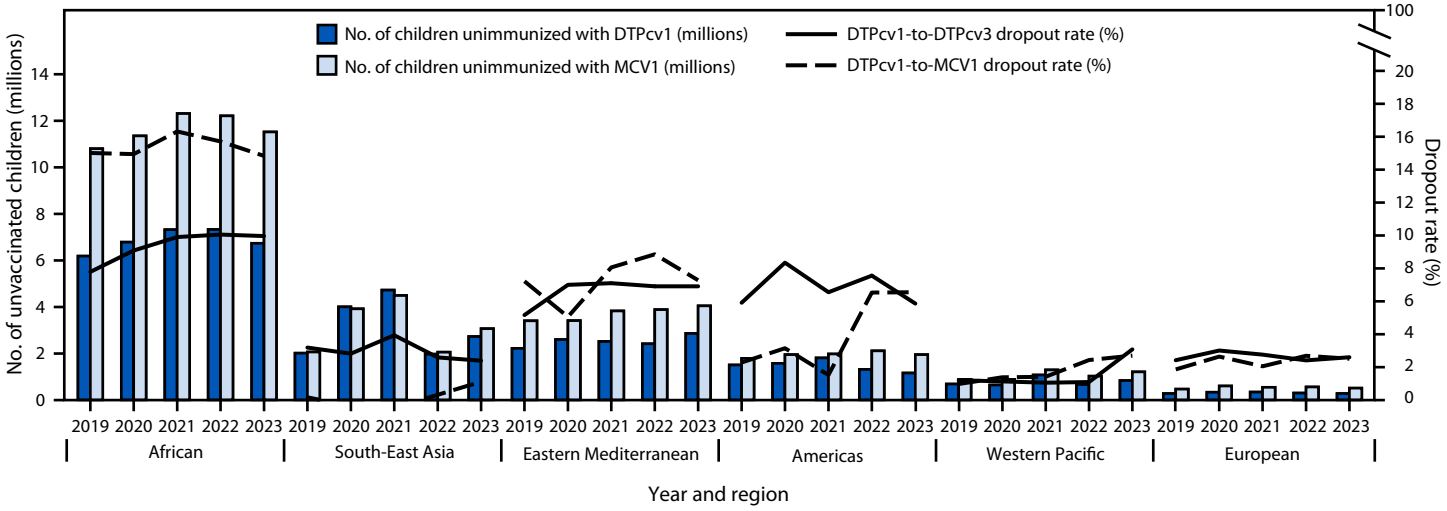
Other Vaccines

From 2019 to 2021, global coverage with the following vaccines decreased: BCG (from 89% to 85%); HepB birth dose and third dose HepB (from 43% to 41%, and from 86% to 81%, respectively); Hib3 (from 74% to 72%); IPV1 (from 83% to 80%); Pol3 (from 83% to 81%); and RCV (from 69% to 66%) (Supplementary Table, https://stacks.cdc.gov/view/cdc/166709). In 2023, global IPV1 coverage returned to its 2019 level (83%). Despite an interruption in vaccine introductions in 2020 (*8*), many vaccine introductions took place during 2019–2023, including HepB-BD (nine countries) and rotavirus vaccine (17 countries). IPV2 was introduced in 58 oral poliovirus vaccine–using countries during 2019–2023; by 2023, global coverage with IPV2 was 42% (Table). HPV vaccination was introduced in 73 countries during 2010–2019 and 30 countries during 2020–2023. Global first-dose HPV coverage (HPV, first) among girls increased from 17% in 2019 to 27% in 2023, and full HPV coverage (HPV, last) from 13% in 2019 to 20% in 2023.

Countries with Fragile, Conflict-Affected, and Vulnerable Settings

In 2023, the United Nations Office for the Coordination of Humanitarian Affairs defined 31 WHO countries as having FCV settings, representing a range of situations, including humanitarian crises, protracted emergencies, and armed conflicts. Among these countries, DTPcv1 and DTPcv3 coverage declined from 81% and 75%, respectively, in 2019 to 78% and 70%, respectively, in 2023 (Table). In countries with FCV settings, MCV1 coverage declined from 70% in 2019 to 66% in 2021 and 2022 and to 67% in 2023. By 2023, 59% of children who did not receive DTPcv1 and 55% of those who did not receive MCV1 lived in FCV countries. The number of zero-dose children increased by 25%, from 6.4 million in 2019 to 8.0 million in 2021 and then remained stagnant through 2023 (Figure 1). Similarly, DTPcv1-to-DTPcv3 dropout increased from 8% in 2019 to 11% in 2021 and remained at 11% in 2023. The number of children who were not immunized against measles increased 17%, from 10.4 million in 2019 to 12.2 million in 2021 and remained unchanged in 2023.

FIGURE 2. Estimated number of children who did not receive the first doses of diphtheria-tetanus-pertussis–containing vaccine and measles-containing vaccine, and dropout from the first to third dose of diphtheria-tetanus-pertussis–containing vaccine and from the first dose of diphtheria-tetanus-pertussis–containing vaccine to the first dose of measles-containing vaccine, by World Health Organization region* — worldwide, 2019–2023



Abbreviations: DTPcv = diphtheria-tetanus-pertussis–containing vaccine; DTPcv1 = first DTPcv dose; DTPcv3 = third DTPcv dose; MCV1 = first measles-containing vaccine dose.
* Based on World Health Organization regional classifications. https://www.who.int/about/who-we-are/regional-offices

DTPcv1-to-MCV1 dropout increased from 14% in 2019 to 15% in 2023; in the 163 non-FCV countries, the DTPcv1-to-DTPcv3 and DTPcv1-to-MCV1 dropout rates in 2023 were each only 4%.

Discussion

After the COVID-19 pandemic and the resulting worldwide disruptions of health systems, countries that have been faced with declines in childhood immunization coverage have not yet recovered; these countries are, therefore, susceptible to higher VPD incidences. Most unimmunized children in 2023 lived in 31 countries with FCV settings.

Strategies such as periodic intensification of routine immunization and routine catch-up vaccination activities will be required to build resilience and mitigate impacts to the health system and are critical components of the ongoing Big Catch-Up strategy for immunization recovery (*4*). This strategy includes catching up children who missed vaccination during 2019–2022, restoring vaccination coverage rates for the current birth cohort to at least 2019 levels, and strengthening primary health care immunization systems. Country-level planning tailored to local contexts is needed, particularly within the varying conditions of humanitarian crises, protracted emergencies, and armed conflicts defining FCV settings.

Although coverage with well-established vaccines, such as DTPcv, stagnated before the COVID-19 pandemic and has been slow to return to prepandemic levels, new vaccine introductions have improved the mean coverage with all WHO-recommended vaccine antigens.[††††] National and subnational introduction of new and underutilized vaccines helps to strengthen the impact of routine immunization programs and supports the IA2030 priority objective of strengthening immunization policies and service delivery throughout life (*3*).

Limitations

The findings in this report are subject to at least six limitations. First, because the COVID-19 pandemic disrupted survey implementation, estimates in some countries are less informed by survey data than they were in years before the pandemic. Second, data quality limitations in some countries might have resulted in inaccurate administrative coverage estimations (*7*). Third, selection and recall bias might affect survey-based coverage estimates (*7*). Fourth, inaccuracies in population estimates could result in inaccurate estimates of

[††††] Breadth of protection is defined as the mean coverage for all WHO-recommended vaccine antigens by country. The numerator is the sum of the coverage for the following antigens at the level of interest: diphtheria, tetanus, pertussis, hepatitis B, Hib, MCV1, MCV2, pneumococcus, oral poliovirus vaccine, IPV, rubella, rotavirus, and HPV. The denominator is the number of all antigens included for the indicator calculation, regardless of whether the antigen has been introduced at the level of interest (denominator equals 13). https://www.who.int/data/gho/indicator-metadata-registry/imr-details/7771

Summary

What is already known about this topic?

The COVID-19 pandemic interrupted health systems worldwide, negatively affecting immunization programs; recovery has been uneven.

What is added by this report?

During 2022–2023, global immunization coverage plateaued at 89% with the first dose and 84% with the third dose of diphtheria-tetanus-pertussis–containing vaccine and 83% with the first dose of measles-containing vaccine. Coverage with these vaccines remains lower than 2019 prepandemic levels. Countries with fragile, conflict-affected, and vulnerable settings experienced disproportionate challenges in reaching unvaccinated and incompletely vaccinated children.

What are the implications for public health practice?

Strategies for strengthening routine immunization, catch-up vaccination, and new and underutilized vaccine introductions can improve the overall breadth of protection and support countries' prevention of vaccine-preventable disease outbreaks.

zero-dose and incompletely vaccinated children. Fifth, coverage estimates do not include statistical uncertainty. Finally, although the WUENIC estimates characterize coverage among eligible cohorts vaccinated each year, data do not correct for doses administered late (for example, through catch-up vaccination activities, including those part of the Big Catch-Up global initiative) (*4*).

Implications for Public Health Practice

Since the launch of the Expanded Programme on Immunization, much progress has been made in increasing immunization coverage; however, the COVID-19 pandemic-associated disruptions in health systems augmented existing gaps and introduced new gaps in immunization coverage worldwide. Progress toward recovery has been uneven across countries, with low-income countries, the African Region, and FCV settings having the most urgent need for action. Locally driven, country-specific strategies are needed to effectively strengthen routine immunization systems and provide catch-up vaccination to unvaccinated and incompletely vaccinated children to reduce the morbidity and mortality associated with VPDs worldwide.

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Corresponding author: Camille E. Jones, uqv2@cdc.gov.

[1]Epidemic Intelligence Service, CDC; [2]Global Immunization Division, Center for Global Health, CDC; [3]Department of Immunization, Vaccines and Biologicals, World Health Organization, Geneva, Switzerland; [4]Division of Data Analytics, Planning and Monitoring, UNICEF, New York, New York.

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Notes from the Field

Trichophyton mentagrophytes Genotype VII — New York City, April–July 2024

Jason Zucker, MD[1,*]; Avrom S. Caplan, MD[2,*]; Shauna H. Gunaratne, MD[1]; Stephanie M. Gallitano, MD[3]; John G. Zampella, MD[2]; Caitlin Otto, PhD[4]; Rachel Sally, MD[2]; Sudha Chaturvedi, PhD[5,6]; Brittany O'Brien, MS[5]; Gabrielle C. Todd, PhD[5]; Priyanka Anand, MD[7,8]; Laura A.S. Quilter, MD[7]; Dallas J. Smith, PharmD[9]; Tom Chiller, MD[9]; Shawn R. Lockhart, PhD[9]; Meghan Lyman, MD[9]; Preeti Pathela, DrPH[10]; Jeremy A.W. Gold, MD[9]

Trichophyton mentagrophytes genotype VII (TMVII) is an emerging dermatophyte fungus, causing tinea that can be spread through sexual contact (*1*). TMVII can cause pruritic, annular, scaly lesions on the trunk, groin, genitals, or face; might be mistaken for eczema, psoriasis, or other dermatologic conditions; and frequently requires oral antifungal therapy.[†] Some patients experience inflamed, painful, and persistent lesions that can lead to scarring or secondary bacterial infection. TMVII infections have been reported among men who have sex with men in France since March 2021 and previously in men who traveled to Southeast Asia for sex tourism (*1*,*2*). In June 2024, a TMVII case in the United States was reported in a man who developed genital lesions after traveling to several countries in Europe and to California and who had sexual contact with multiple men while traveling (*3*). Clinicians subsequently alerted public health officials of additional patients in the United States who had laboratory-confirmed TMVII infection.

Investigation and Outcomes

During April–July 2024, four additional patients received a clinical diagnosis of tinea. Samples were collected for fungal culture; following growth, TMVII was identified using Sanger sequencing of the internal transcribed spacer region of the ribosomal gene. Antifungal susceptibility testing was performed using previously described methods (*3*). For each patient's isolate, the minimum inhibitory concentrations of terbinafine and itraconazole were 0.0039 mg/mL and <0.03 mg/mL, respectively, suggesting susceptibility to these drugs. Patients were treated for presumed TMVII infection before laboratory confirmation and antifungal susceptibility results were available. Data on demographic characteristics, potential exposures, clinical course, and current infection status were obtained as part of clinical care. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[§]

All four patients were cisgender men aged 30–39 years who reported recent sexual contact with other men. Patients A and D reported sexual contact with each other; patients B and C had no known epidemiologic link to anyone with known TMVII infection. Patient D was a sex worker. Patient B reported travel to Europe; the other patients reported no recent international travel history. Each patient was screened for other concomitant sexually transmitted infections and received negative test results.

Patient A had no underlying medical conditions and was taking HIV preexposure prophylaxis. He was initially evaluated for a rash on his buttocks. He completed 2 weeks of topical clotrimazole followed by 1 week of topical terbinafine with no improvement. He then was prescribed oral terbinafine (250 mg daily) for a planned 2–4-week course. At last follow-up, the rash was improving.

Patient B had HIV infection and had inconsistent adherence to antiretroviral therapy. He was initially evaluated for a pruritic rash on the corner of his mouth. He completed 1 week of topical clotrimazole with complete resolution of his rash.

Patient C had HIV infection that was well-controlled on antiretroviral medication. He was initially evaluated for a rash on his knee, buttocks, and groin and was prescribed oral terbinafine (250 mg daily) with a planned 4-week course. The rash was improving at last follow-up.

Patient D was taking HIV preexposure prophylaxis and dabrafenib/trametinib for a history of cancer. He was initially evaluated for a pruritic rash on his knee, trunk, arm, and penile shaft (Figure). He completed <1 week of oral terbinafine (250 mg daily) and was switched to itraconazole (200 mg twice daily), topical luliconazole, and topical ketoconazole. The rash was improving at last follow-up.

Preliminary Conclusions and Actions

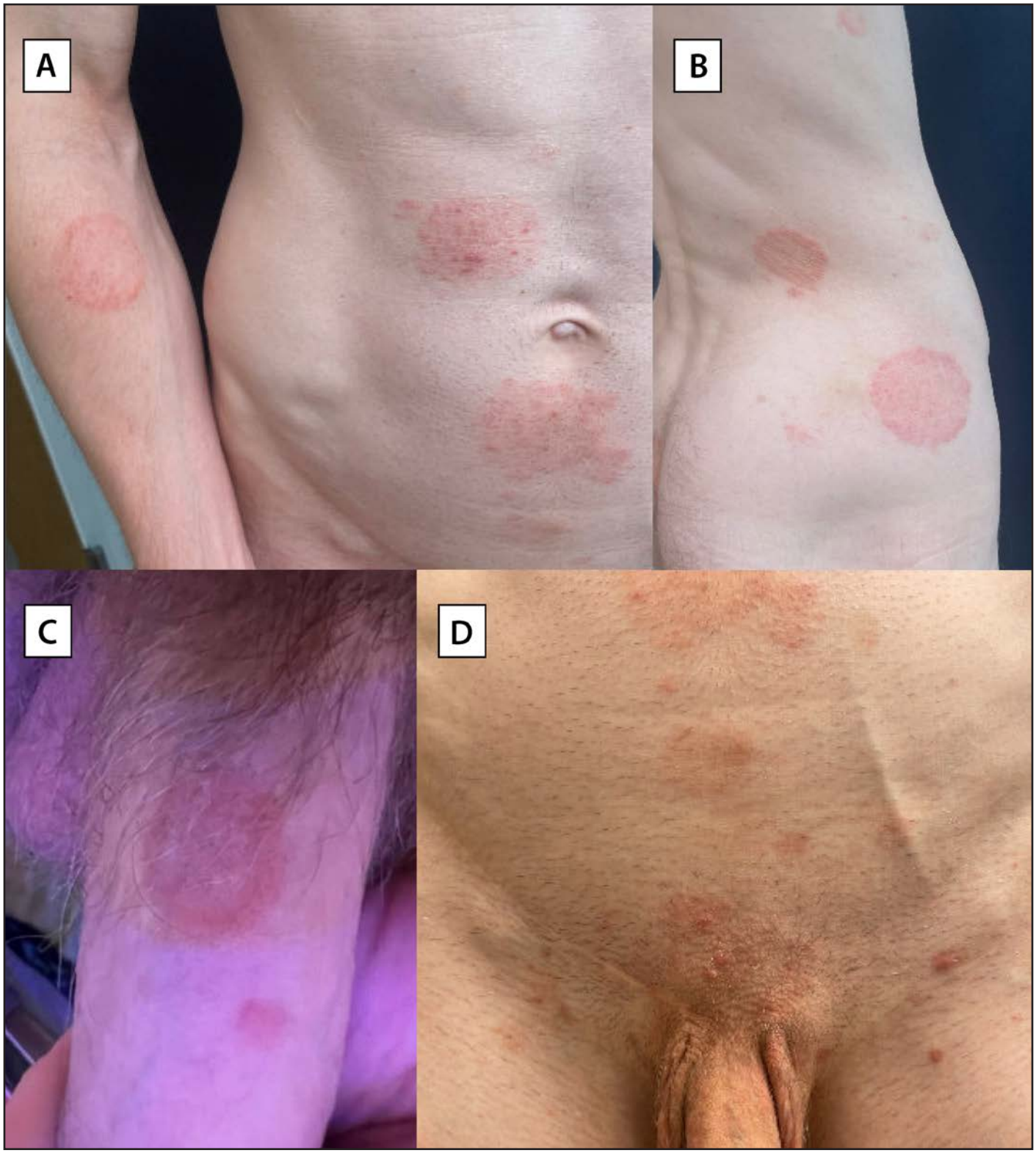
Health care providers should be aware that TMVII can spread through sexual contact and cause lesions on the genitals,

[*] These authors contributed equally to this report.

[†] Typically, dermatophyte infections of the skin, also called tinea or ringworm, are mild conditions that can be treated with topical antifungals and do not affect the genitals. TMVII might have a predilection for anogenital skin. TMVII is distinct from *Trichophyton indotineae*, another emerging dermatophyte fungus that can also cause severe tinea but 1) affects the genitals less frequently; 2) is generally resistant to terbinafine, the first-line therapy for TMVII infection; and 3) in the United States, is usually associated with travel and immigration involving Southeast Asia. https://www.cdc.gov/ringworm/aboutemergingringworm/index.html

[§] 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. Dermatology evaluation of a patient with *Trichophyton mentagrophytes* genotype VII rash, showing tinea corporis* (A and B), tinea genitalis† (C), and tinea corporis and tinea pubogenitalis (D)§ — New York City, April–July 2024



Photos/Avrom S. Caplan (used with patient's permission)
* Annular, scaly plaques on the right arm and trunk.
† Annular, scaly plaque on the penis.
§ Scaly plaques on trunk and genital area, with scattered erythematous papulonodules likely indicating follicular involvement of dermatophytosis.

buttocks, face, trunk, or extremities.[¶,**] Point-of-care testing with direct microscopy can help confirm tinea (*4*); however, TMVII identification requires fungal culture and DNA sequencing. Clinicians should initiate empiric therapy based on epidemiologic and clinical features, especially given the insensitivity of fungal cultures (*5*) and that confirmation of TMVII infection might take weeks. Current evidence suggests that oral terbinafine (250 mg daily) is an effective first-line option for TMVII infections. Some patients have also been successfully treated with itraconazole with adjuvant topical antifungal therapy. Patients might require oral antifungal therapy for up to 3 months and should take the treatment until lesions have fully resolved (*1*,*3*). Some patients might respond to topical antifungals alone, but these are not recommended as monotherapy for tinea involving hair follicles (*4*).

Health care providers should advise patients with TMVII infection about the importance of avoiding skin-to-skin contact with affected areas and not sharing personal items until symptom resolution. Topical corticosteroid products, including combination antifungal-corticosteroid products, can worsen tinea infection and should be avoided in treating TMVII and other dermatophyte infections (*4*). Public health surveillance, health care provider and patient education and awareness, and increased access to dermatophyte identification and antifungal susceptibility testing could help detect, monitor, and prevent the spread of TMVII.

¶ Health care providers who suspect TMVII infection can contact their state and local health departments for assistance (https://www.cdc.gov/public-health-gateway/php/index.html) and can request consultation for the evaluation and management of challenging sexually transmitted infection cases from the National Network of STD Clinical Prevention Training Centers STD Clinical Consultation Network, which is supported by CDC's Division of STD Prevention (https://www.stdccn.org/render/Public). Public health officials concerned about potential cases of antifungal-resistant ringworm or unusual clusters of cases can email FungalOutbreaks@cdc.gov for assistance.

** Information about TMVII infection recognition, diagnosis, and treatment is available online (https://www.aad.org/member/clinical-quality/clinical-care/emerging-diseases/dermatophytes/other-emerging-dermatophytes), including information on laboratories that perform confirmatory testing (https://www.aad.org/member/clinical-quality/clinical-care/emerging-diseases/dermatophytes/recognizing-trichophyton-indotineae). Information on these websites was developed as a collaboration between CDC and The American Academy of Dermatology Emerging Diseases Task Force (https://www.aad.org/member/clinical-quality/clinical-care/emerging-diseases).

Summary

What is already known about this topic?

Trichophyton mentagrophytes genotype VII (TMVII), an emerging fungus, causes genital tinea that can be spread through sex and might require prolonged treatment. The first U.S. case was reported in June 2024.

What is added by this report?

Four additional TMVII infections were diagnosed during April–July 2024 in New York City among men who have sex with men. Tinea occurred on the face, buttocks, or genitals and was successfully treated with antifungal medications.

What are the implications for public health practice?

Health care providers should be aware that TMVII is an emerging infection spread through sex.

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Corresponding author: Avrom S. Caplan, avrom.caplan@nyulangone.org.

[1]Division of Infectious Diseases, Columbia University Irving Medical Center, New York, New York; [2]The Ronald O. Perelman Department of Dermatology, NYU Grossman School of Medicine, New York, New York; [3]Department of Dermatology, Columbia University Irving Medical Center, New York, New York; [4]Department of Pathology, NYU Grossman School of Medicine, New York, New York; [5]Wadsworth Center, New York State Department of Health; [6]Department of Biomedical Sciences, School of Public Health, University at Albany, Albany, New York; [7]Division of STD Prevention, National Center for HIV, Viral Hepatitis, STD, and TB Prevention, CDC; [8]Epidemic Intelligence Service, CDC; [9]Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [10]New York City Department of Health and Mental Hygiene, New York, New York.

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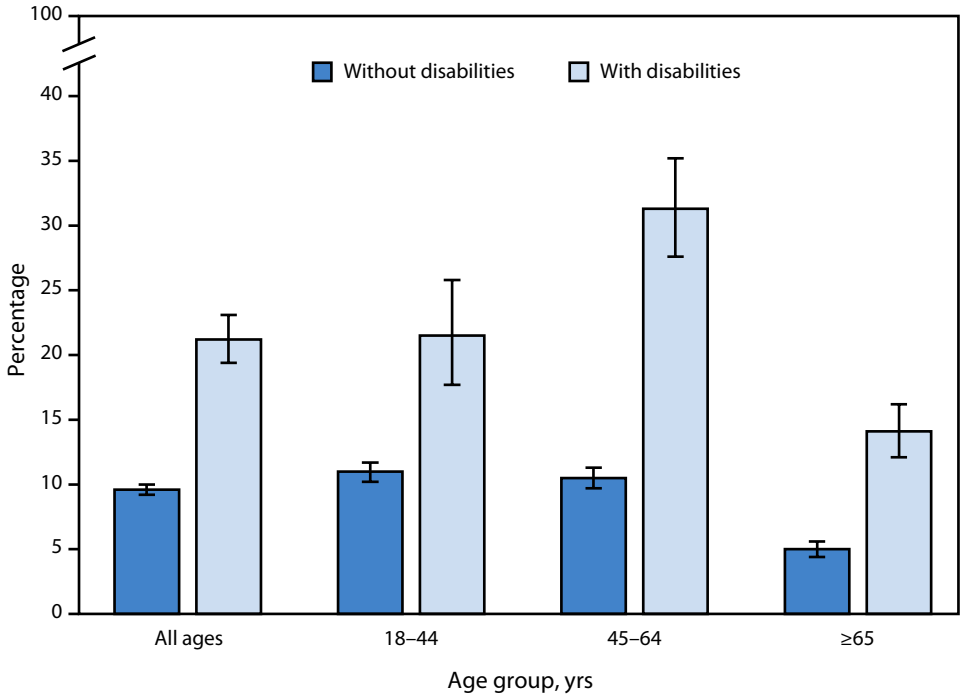
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥18 Years Who Were in Families Having Problems Paying Medical Bills in the Past 12 Months,† by Disability Status§ and Age Group — United States, 2023



* With 95% CIs indicated by error bars. Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population.

† "Problems paying medical bills" is based on a positive response to the question, "In the past 12 months, did you/anyone in the family have problems paying or were unable to pay any medical bills? Include bills for doctors, dentists, hospitals, therapists, medication, equipment, nursing home, or home care."

§ "Disability status" is based on a response of "a lot of difficulty" or "cannot do at all" to any one of the six questions of the Washington Group Short Set on Functioning asking about difficulties in the following functional domains: seeing, hearing, walking or climbing steps, communicating, remembering or concentrating, and self-care.

In 2023, the percentage of adults aged ≥18 years who were in families having problems paying medical bills in the past 12 months was higher among those with disabilities (21.2%) compared with those without disabilities (9.6%). This pattern was observed across all age groups.

Supplementary Table: https://stacks.cdc.gov/view/cdc/164154

Source: National Center for Health Statistics, National Health Interview Survey, 2023. https://www.cdc.gov/nchs/nhis.htm

Reported by: Natalie A.E. Young, PhD, nyoung2@cdc.gov; Julie D. Weeks, PhD; Nazik Elgaddal, MS.

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