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Surveillance for Acute Flaccid Myelitis — United States, 2018–2022

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Abstract

Acute flaccid myelitis (AFM) is a serious neurologic condition primarily affecting children; AFM can cause acute respiratory failure and permanent paralysis. AFM is a rare but known complication of various viral infections, particularly those of enteroviruses (EVs). Increases in AFM cases during 2014, 2016, and 2018 were associated with EV-D68 infection. This report examines trends in confirmed AFM cases during 2018–2022 and patients' clinical and laboratory characteristics. The number of AFM cases was low during 2019–2022 (28–47 cases per year); the number of cases remained low in 2022 despite evidence of increased EV-D68 circulation in the United States. Compared with cases during the most recent peak year (2018), fewer cases during 2019–2021 had upper limb involvement, prodromal respiratory or febrile illness, or cerebrospinal fluid pleocytosis, and more were associated with lower limb involvement. It is unclear why EV-D68 circulation in 2022 was not associated with an increase in AFM cases or when the next increase in AFM cases will occur. Nonetheless, clinicians should continue to suspect AFM in any child with acute flaccid limb weakness, especially those with a recent respiratory or febrile illness.

Introduction

Acute flaccid myelitis (AFM) is a serious neurologic condition that causes paralysis often requiring intensive care and mechanical ventilation and can lead to severe sequelae and disability. Many pathogens can cause AFM. Laboratory and surveillance data suggest that enteroviruses (EVs), particularly EV-D68, are a common cause; EV-D68 was associated with peaks in U.S. AFM cases during 2014, 2016, and 2018 (*1*). Since 2014, CDC has conducted surveillance for AFM, including laboratory testing and typing of EV-positive samples to better understand the demographic and clinical characteristics and possible causes of AFM. This report updates AFM surveillance data since 2018, the most recent reported peak year for AFM.

Methods

As part of national surveillance for AFM, U.S. health departments report cases of acute flaccid limb weakness with any spinal cord gray matter lesion on magnetic resonance imaging to CDC. Health departments complete and submit a patient summary form, which includes demographic and clinical information and important elements from the patient's medical record. In addition, health departments and clinicians submit available cerebrospinal fluid (CSF), respiratory, serum, and stool specimens for laboratory testing. At CDC, specimens are tested

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for EV/rhinovirus (EV/RV) using real-time polymerase chain reaction*; EV/RV–positive specimens are molecularly typed using protocols that have been previously described† (*2*,*3*). For surveillance purposes, confirmed AFM is defined as acute flaccid limb weakness accompanied by magnetic resonance imaging demonstrating a spinal cord lesion largely restricted to gray matter and spanning one or more vertebral segments (*4*).

Case reports have been used to describe trends in confirmed AFM cases since surveillance began in August 2014. For this study, patient summary forms, medical records, and laboratory data were analyzed to describe patient and case characteristics in 2018, the most recent peak year, through 2022. Reported EV/RV data include laboratory results that were documented in records sent to CDC as well as results of testing performed at CDC. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.§

* EVs and RVs are closely related picornaviruses. Most available real-time reverse transcription–polymerase chain reaction tests for EV amplify a viral region that is highly conserved among EVs and RVs. Therefore, these tests do not distinguish among EVs and RVs, and additional testing, such as typing through sequencing, is needed to identify the specific virus that has been detected.

† All stool specimens submitted to CDC from persons with suspected AFM are tested for EV/RVs and poliovirus; any suspected AFM cases with specimens that test positive for poliovirus are considered polio cases and not AFM cases.

§ 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.

Results

Characteristics of Patients with Confirmed AFM

During 2018, 2019, 2020, 2021, and 2022, a total of 238, 47, 33, 28, and 47 confirmed AFM cases, respectively, were reported to CDC (Figure) (Table 1). The proportion of patients with confirmed AFM aged <18 years decreased from 94% in 2018 to 81% in 2022. Among patients aged <18 years, the median age was lower in 2018 (5.1 years) than that during 2019 (6.3 years), 2020 (8.0), 2021 (8.0), and 2022 (7.1). During 2018, 92% of patients with confirmed AFM experienced a prodromal respiratory or febrile illness, 84% had upper limb involvement compared with 56% with lower limb involvement, and 87% had CSF pleocytosis. These features were still common among patients with confirmed AFM during 2019–2022; however, compared with 2018, a lower proportion of patients with confirmed AFM during 2019–2021 had a prodromal respiratory or febrile illness (57%–64%), upper limb involvement (58%–74%), or CSF pleocytosis (42%–49%). In 2022, the proportion of patients with a prodromal respiratory or febrile illness (79%), upper limb involvement (74%), and CSF pleocytosis (68%) was lower than that in 2018 but higher than the proportions during 2019–2021. In addition, during 2019–2021, a higher proportion of patients had lower limb involvement (74%–93%) than patients during 2018 (56%) and 2022 (64%) did.

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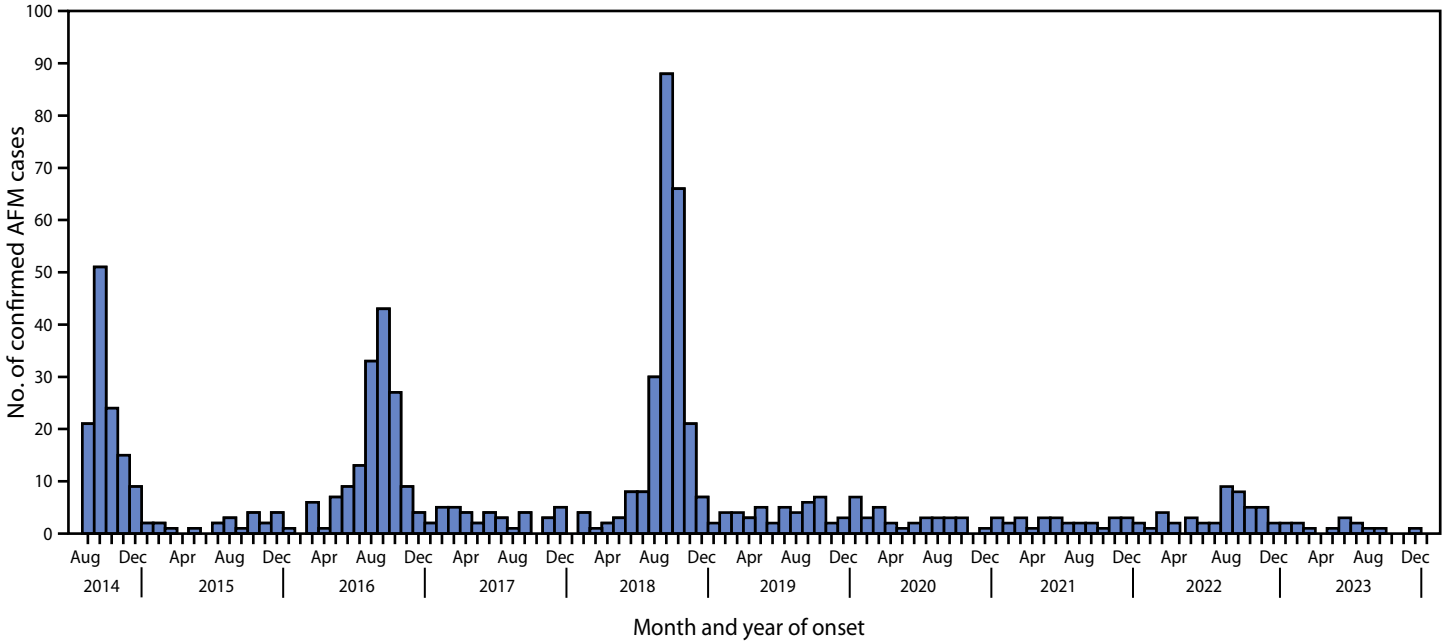
FIGURE. Confirmed cases of acute flaccid myelitis, by month and year of onset (N = 741) — United States, August 2014–January 2024*



Abbreviation: AFM = acute flaccid myelitis.
* As of January 26, 2024.

During all years, nearly all (98%–100%) patients with confirmed AFM were hospitalized (Table 1). The majority were hospitalized within 1 day of onset of weakness, and an emergency department was the most common location of the first medical encounter after the onset of weakness (56%–73% of patients). More than one half of patients (51%–75%) were admitted to an intensive care unit during hospitalization, 18%–34% of all patients required some form of respiratory support, and 15%–28% of all patients received mechanical ventilation.

Detection of EV/RV in Patients with Confirmed AFM

EV/RVs were detected in specimens from at least one anatomic site in 50% of patients who were tested for EV/RV in 2018, 39% in 2019, 28% in 2020, 43% in 2021, and 50% in 2022 (Table 2). In 2018, the most common EV detected among patients with confirmed AFM was EV-D68 (37), with the majority of detections identified from respiratory specimens. In contrast, EV-D68 was detected in one patient in 2019 and no patients during 2020–2022. In addition, EV-A71 was detected among 13 patients in 2018, two in 2019, one each in 2020 and 2021, and two in 2022.

Discussion

The biannual peak pattern of AFM cases observed during 2014–2018 did not persist in 2020 or 2022. In 2020, nonpharmaceutical interventions for prevention of COVID-19 likely reduced the number of EV-D68 and other respiratory infections, which could have led to fewer cases of AFM (*5*–*8*). However, during the summer of 2022, sentinel surveillance among persons aged <18 years with acute respiratory illness detected increases in EV/RV and EV-D68 respiratory infections at levels not seen since 2018, suggesting that EV-D68 was widely circulating and causing respiratory illness in the United States during 2022 (*7*).

None of the patients with confirmed AFM since 2019 has received a positive EV-D68 test result, and only 39%–50% received a positive EV/RV test result. Diagnosing EV/RV infection among patients with AFM is challenging for several reasons. Respiratory specimens have the highest yield for detecting EV-D68, but because samples are typically collected at hospitalization several days to weeks after the start of a prodromal respiratory illness, the virus might no longer be present at the time of specimen collection (*1*–*3*). In addition, although most laboratories can test for EV/RV, further characterization (e.g., typing) is not available in most settings. CDC routinely performs EV/RV testing and, if results are positive, performs EV typing on specimens from patients with suspected AFM. Only 71% of confirmed cases during 2018–2022 had at least one specimen (respiratory, serum, cerebrospinal fluid, or stool) sent to CDC (CDC, unpublished data, 2018–2022); EV-D68 or other specific EVs might have been present in specimens that were not tested.

Historically, the clinical characteristics of confirmed AFM cases have varied among peak years (2016 and 2018) and

TABLE 1. Demographic and clinical characteristics of patients with confirmed acute flaccid myelitis — United States, 2018–2022*

Characteristic	Year, no. (%)				
	2018 N = 238	2019 N = 47	2020 N = 33	2021 N = 28	2022 N = 47
Age group, yrs					
<18	223 (94)	43 (92)	30 (91)	23 (82)	38 (81)
Median age, all patients, yrs (IQR)	5.3 (3.3–8.2)	6.6 (2.9–12.8)	9.2 (3.1–14.5)	9.3 (5.2–16.1)	11.0 (5.8–14.3)
Median age <18, yrs (IQR)	5.1 (3.2–7.6)	6.3 (1.6–11.4)	8.0 (2.8–11.9)	8.0 (4.6–13.2)	7.1 (5.1–11.7)
Sex					
Female	100 (42)	32 (68)	16 (48)	16 (57)	21 (45)
Male	138 (58)	15 (32)	17 (52)	12 (43)	26 (55)
Race and ethnicity†					
AI/AN	0 (—)	0 (—)	0 (—)	0 (—)	0 (—)
Asian	8 (3)	2 (4)	3 (9)	0 (—)	3 (6)
Black or African American	21 (9)	7 (15)	4 (12)	2 (7)	5 (11)
NH/OPI	1 (—)	0 (—)	0 (—)	0 (—)	0 (—)
White	125 (53)	18 (38)	12 (36)	11 (39)	27 (57)
Hispanic or Latino	47 (20)	12 (26)	9 (27)	10 (36)	6 (13)
Multiracial	4 (2)	1 (2)	0 (—)	1 (4)	1 (2)
Unknown	32 (13)	7 (15)	5 (15)	4 (14)	5 (11)
U.S. Census Bureau region§					
Northeast	41 (17)	3 (6)	6 (18)	8 (29)	10 (21)
Midwest	61 (26)	7 (15)	7 (21)	4 (14)	8 (17)
South	80 (34)	18 (38)	12 (36)	10 (36)	13 (28)
West	56 (24)	19 (40)	8 (24)	6 (21)	16 (34)
Limbs affected					
Upper	200 (84)	35 (74)	19 (58)	18 (64)	35 (74)
Lower	133 (56)	35 (74)	27 (82)	26 (93)	30 (64)
Illness during the 4 weeks before onset of limb weakness					
Any illness	223 (94)	32 (68)	21 (64)	20 (71)	39 (83)
Any respiratory illness	187 (79)	23 (49)	15 (45)	13 (46)	29 (62)
Any fever	174 (73)	14 (30)	13 (39)	8 (29)	22 (47)
Any respiratory illness or fever	218 (92)	27 (57)	21 (64)	16 (57)	37 (79)
Any gastrointestinal illness	80 (34)	12 (26)	3 (9)	9 (32)	12 (26)
Timing of preceding illness, median days before limb weakness¶ (IQR)					
Any illness	5 (3–8)	4 (3–7.5)	5.5 (2–11.5)	6 (2.5–11)	5.5 (2.8–8.2)
Any respiratory illness	5 (3–8)	5 (3–14)	6 (2.5–13.5)	4.5 (3–8)	6 (4–8)
Any fever	3 (1–5)	3 (2–5.8)	2 (1–5.5)	2.5 (1.8–15)	3 (1–8.2)
Any respiratory illness or fever	5 (3–7)	4 (2.5–7)	5.5 (2–11.5)	4.5 (2.8–9.8)	5.5 (3–8)
Any gastrointestinal illness	2 (1–6)	3.5 (2–8)	4 (0–14)	2 (0–7)	1.5 (0–9.2)
CSF microscopic examination, no./No. (%)					
CSF pleocytosis	183/210 (87)	21/43 (49)	13/27 (48)	11/26 (42)	28/41 (68)
Median WBC count, cells/mm^3 (IQR)**	95 (43–163)	107 (41.5–209.5)	36 (9–72)	38 (13–94)	56.5 (26.2–77)

See table footnotes on the next page.

nonpeak years (2015 and 2017), suggesting that AFM caused by EV-D68 might have a different clinical profile than AFM of other etiologies (*9*). Cases reported during 2019–2021 appeared similar to those reported during nonpeak years, with a lower proportion of antecedent respiratory illness or fever, upper limb involvement, and CSF pleocytosis, and a higher proportion of lower limb involvement, compared with cases in 2018. However, cases reported during 2022, when EV-D68 was circulating, did not follow this pattern: 2022 cases had a higher proportion of antecedent respiratory illness or fever, upper limb involvement, and CSF pleocytosis compared with cases during nonpeak years (2019 and 2021) and a lower proportion compared with cases during 2018.

Despite apparently increased EV-D68 circulation and EV-D68–associated respiratory disease among children, the reason why an increase in AFM cases did not occur in 2022 is unclear; possibly, EV-D68 viruses circulating in 2022 were less neurotropic or less likely to cause neurologic disease than were viruses circulating during 2014, 2016, and 2018. Another possibility is that infection with respiratory viruses including other RV/EVs, SARS-CoV-2, or respiratory syncytial virus that were frequently circulating in 2022 affected immune responses to EV-D68 and provided protection against neurologic disease (*6*). Data to support either of these hypotheses are lacking, and investigations are ongoing.

TABLE 1. (*Continued*) Demographic and clinical characteristics of patients with confirmed acute flaccid myelitis — United States, 2018–2022*

Characteristic	Year, no. (%)				
	2018 N = 238	2019 N = 47	2020 N = 33	2021 N = 28	2022 N = 47
Hospitalization and clinical care					
Hospitalized	233 (98)	46 (98)	33 (100)	28 (100)	46 (98)
Timing of hospitalization relative to onset of limb weakness, no./No. (%)					
Before	24/233 (10)	6/46 (13)	1/33 (3)	0/28 (—)	3/46 (7)
After	208/233 (89)	40/46 (87)	32/33 (97)	28/28 (100)	43/46 (93)
Unknown	1/233 (—)	0/46 (—)	0/33 (—)	0/28 (—)	0/46 (—)
Days from onset of weakness to hospitalization (among those hospitalized after onset of weakness), no./No. (%)					
Median (IQR)	1 (0–2)	1 (0–1)	1 (1–1)	1 (0–1)	1 (1–3)
0–1	135/208 (65)	33/40 (82)	27/32 (84)	23/28 (82)	26/43 (60)
2–3	52/208 (25)	5/40 (12)	4/32 (12)	3/28 (11)	11/43 (26)
4–7	10/208 (5)	2/40 (5)	0/32 (—)	1/28 (4)	4/43 (9)
>7	11/208 (5)	0/40 (—)	1/32 (3)	1/28 (4)	2/43 (5)
Treatment					
Steroids, no IVIG	55 (23)	14 (30)	8 (24)	2 (7)	11 (23)
IVIG, no steroids	54 (23)	12 (26)	6 (18)	8 (29)	10 (21)
Both steroids and IVIG	81 (34)	15 (32)	14 (42)	17 (61)	25 (53)
Plasma exchange	32 (13)	10 (21)	11 (33)	7 (25)	12 (26)
Admitted to ICU	129 (54)	24 (51)	20 (61)	21 (75)	24 (51)
Respiratory support	65 (27)	16 (34)	6 (18)	8 (29)	11 (23)
Mechanical ventilation	55 (23)	13 (28)	5 (15)	7 (25)	9 (19)
Location of first medical encounter after onset of weakness					
Emergency department	134 (56)	32 (68)	24 (73)	19 (68)	30 (64)
Primary care provider	49 (21)	4 (9)	4 (12)	2 (7)	4 (9)
Urgent care provider	16 (7)	4 (9)	1 (3)	3 (11)	2 (4)
Weakness onset during inpatient hospitalization	24 (10)	6 (13)	1 (3)	0 (—)	3 (6)
Unknown or other	15 (6)	1 (2)	3 (9)	4 (14)	8 (17)
Days from onset of weakness to first medical encounter (excluding those hospitalized before onset of weakness), no./No. (%)					
Median (IQR)	0 (0–1)	0 (0–1)	0 (0–0)	0 (0–1)	0 (0–1)
0–1	161/213 (76)	36/41 (88)	31/32 (97)	25/28 (89)	33/44 (75)
2–3	33/213 (15)	3/41 (7)	0/32 (—)	2/28 (7)	6/44 (14)
4–7	4/213 (2)	0/41 (—)	0/32 (—)	1/28 (4)	2/44 (5)
>7	3/213 (1)	2/41 (5)	0/32 (—)	0/28 (—)	0/44 (—)
Unknown	12/213 (6)	0/41 (—)	1/32 (3)	0/28 (—)	3/44 (7)

Abbreviations: AI/AN = American Indian or Alaska Native; CSF = cerebrospinal fluid; ICU = intensive care unit; IVIG = intravenous immunoglobulin; NH/OPI = Native Hawaiian or other Pacific Islander; WBC = white blood cell.

* Table includes updated demographic and clinical information and supersedes previously published data. https://doi.org/10.15585/mmwr.mm7044a2

† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

§ https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

¶ Timing calculated among cases with the prodromal illness or symptom and documented valid dates of onset.

** Median cells/mm^3 was calculated among cases with CSF pleocytosis (>5 WBC/mm^3).

Limitations

The findings in this report are subject to at least three limitations. First, this analysis was based on AFM cases reported to CDC and might underestimate the actual number of AFM cases in the United States. Second, clinical information is collected from a patient summary form typically completed by a health department and clinical records, which might contain incomplete data. Finally, 29% of cases did not have any specimens sent to CDC on which EV typing could be performed, limiting the ability to identify the specific EV associated with AFM.

Implications for Public Health Practice

Current trends do not indicate when the next increase of AFM might be expected. Nonetheless, clinicians should be alert to the possibility of AFM among children with acute flaccid limb weakness and report to health departments when they suspect cases. In addition, to better understand causes for AFM, including the role of EVs and EV-D68, it is important that sufficient laboratory samples be collected to facilitate testing and typing of EVs.

TABLE 2. Enterovirus/rhinovirus results from respiratory, stool, cerebrospinal fluid, and serum specimens collected from patients with confirmed acute flaccid myelitis — United States, 2018–2022*

Specimen source	Year, no. (%)				
	2018 N = 238	2019 N = 47	2020 N = 33	2021 N = 28	2022 N = 47
Any source†					
All patients with results	224 (94)	44 (94)	32 (97)	28 (100)	44 (94)
Patients with positive results	112 (50)	17 (39)	9 (28)	12 (43)	22 (50)
EV/RV type results§					
EV-D68	37	1	0	0	0
EV-A71	13	2	1	1	2
RVs	10	1	3	3	3
Other typed EVs¶	8	2	0	2	2
Unknown or not typed	46	11	5	6	15
Respiratory†					
All patients with results	195 (82)	40 (85)	29 (88)	27 (96)	37 (79)
Patients with positive results	97 (50)	14 (35)	8 (28)	9 (33)	18 (49)
EV/RV type results§					
EV-D68	37	1	0	0	0
EV-A71	11	0	0	0	0
RVs	10	1	3	3	3
Other typed EVs¶	1	0	0	0	0
Unknown or not typed	40	12	5	6	15
Stool					
All patients with results	112 (47)	24 (51)	15 (45)	14 (50)	26 (55)
Patients with positive results	25 (22)	7 (29)	2 (13)	3 (21)	6 (23)
EV/RV type results§					
EV-D68	3	0	0	0	0
EV-A71	2	2	1	1	2
RVs	0	0	0	0	0
Other typed EVs¶	7	2	0	2	2
Unknown or not typed	13	3	1	0	2
Cerebrospinal fluid					
All patients with results	191 (80)	40 (85)	30 (91)	27 (96)	37 (79)
Patients with positive results	9 (5)	0 (—)	0 (—)	1 (4)	1 (3)
EV/RV type results§					
EV-D68	2	0	0	0	0
EV-A71	1	0	0	0	0
RVs	0	0	0	0	0
Other typed EVs	0	0	0	0	0
Unknown or not typed	6	0	0	1	1
Serum					
All patients with results	109 (46)	30 (64)	23 (70)	21(75)	24 (51)
Patients with positive results	4 (4)	0 (—)	1 (4)	2 (10)	0 (—)
EV/RV type results§					
EV-D68	1	0	0	0	0
EV-A71	0	0	1	0	0
RVs	0	0	0	0	0
Other typed EVs¶	2	0	0	1	0
Unknown or not typed	1	0	0	1	0

Abbreviations: EV = enterovirus; RV = rhinovirus.

* Table includes updated laboratory information and supersedes previously published data. https://doi.org/10.15585/mmwr.mm7044a2

† Some patients had multiple positive specimens. In addition, respiratory coinfection with two EV/RV types was detected in two cases in 2018 (EV-D68 and Echovirus 6 in one case and EV-D68 and RV-A2 in the other case).

§ Percentage not calculated.

¶ Other EVs identified in confirmed AFM patients included Echovirus 11 (one patient each in 2018, 2019, and 2021), Echovirus 6 (one patient in 2018), Coxsackievirus A6 (one patient each in 2021 and 2022), Coxsackievirus A8 (one patient in 2019), Coxsackievirus A16 (one patient each in 2018 and 2022), and one patient each in 2018 for Coxsackievirus A2, A4, A9, and B3 and Echovirus 18.

Summary

What is already known about this topic?

Acute flaccid myelitis (AFM) is a serious neurologic condition that has been associated with enterovirus-D68 (EV-D68) infection. Biannual increases in cases were observed in the United States during 2014, 2016, and 2018.

What is added by this report?

The number of AFM cases has remained low since 2018, including during 2022, when an increase in EV-D68 respiratory disease was observed.

What are the implications for public health practice?

Why increased EV-D68 circulation in 2022 was not associated with an increase in AFM cases or when AFM will peak again is unknown. Clinicians should remain alert for cases of AFM to provide timely clinical care, report cases to public health departments, and collect appropriate specimens.

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Early Estimates of Updated 2023–2024 (Monovalent XBB.1.5) COVID-19 Vaccine Effectiveness Against Symptomatic SARS-CoV-2 Infection Attributable to Co-Circulating Omicron Variants Among Immunocompetent Adults — Increasing Community Access to Testing Program, United States, September 2023–January 2024

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Abstract

On September 12, 2023, CDC's Advisory Committee on Immunization Practices recommended updated 2023–2024 (updated) COVID-19 vaccination with a monovalent XBB.1.5–derived vaccine for all persons aged ≥6 months to prevent COVID-19, including severe disease. During fall 2023, XBB lineages co-circulated with JN.1, an Omicron BA.2.86 lineage that emerged in September 2023. These variants have amino acid substitutions that might increase escape from neutralizing antibodies. XBB lineages predominated through December 2023, when JN.1 became predominant in the United States. Reduction or failure of spike gene (*S*-gene) amplification (i.e., *S*-gene target failure [SGTF]) in real-time reverse transcription–polymerase chain reaction testing is a time-dependent, proxy indicator of JN.1 infection. Data from the Increasing Community Access to Testing SARS-CoV-2 pharmacy testing program were analyzed to estimate updated COVID-19 vaccine effectiveness (VE) (i.e., receipt versus no receipt of updated vaccination) against symptomatic SARS-CoV-2 infection, including by SGTF result. Among 9,222 total eligible tests, overall VE among adults aged ≥18 years was 54% (95% CI = 46%–60%) at a median of 52 days after vaccination. Among 2,199 tests performed at a laboratory with SGTF testing, VE 60–119 days after vaccination was 49% (95% CI = 19%–68%) among tests exhibiting SGTF and 60% (95% CI = 35%–75%) among tests without SGTF. Updated COVID-19 vaccines provide protection against symptomatic infection, including against currently circulating lineages. CDC will continue monitoring VE, including for expected waning and against severe disease. All persons aged ≥6 months should receive an updated COVID-19 vaccine dose.

Introduction

On September 12, 2023, CDC's Advisory Committee on Immunization Practices recommended that all persons aged ≥6 months receive the updated 2023–2024 (updated) monovalent COVID-19 vaccine (*1*). Most persons aged ≥5 years are recommended to receive 1 updated dose. These vaccines contain a component from the SARS-CoV-2 Omicron XBB.1.5 lineage and unlike previous COVID-19 vaccines, do not contain the ancestral SARS-CoV-2 strain. During the period of analysis, XBB lineages predominated early, many with evolutionarily advantageous amino acid changes in the spike gene (*S*-gene). In September 2023, the divergent JN.1 lineage was detected in the United States. JN.1 has more than 30 mutations in the spike protein compared with XBB.1.5, including a change (L455S) similar to one found in circulating XBB lineages (L455F).* JN.1 accounted for 69% (range = 65%–73%) of SARS-CoV-2 infections nationally by the 2-week period ending January 6, 2024.† Results of spike gene (*S*-gene) amplification in real-time reverse transcription–polymerase chain reaction (RT-PCR) can be used to distinguish certain SARS-CoV-2 lineages over time (*2*). Detection of *S*-gene target presence (SGTP) by a widely used commercial test was noted in most lineages that circulated in 2023, including XBB lineages,§ whereas *S*-gene target failure (SGTF), resulting from a mutation in the *S*-gene, is detected in JN.1 and other BA.2.86 lineages.¶ Vaccine effectiveness (VE) of receipt of updated COVID-19 vaccine in preventing symptomatic SARS-CoV-2 infection was assessed in adults aged ≥18 years, by time since dose and by SGTF and SGTP as a proxy for likely JN.1 versus other lineages. Whereas the goal of the U.S. COVID-19 vaccination program is to prevent severe disease, VE against symptomatic infection can provide useful insights into protection early after introduction of updated vaccines and during the emergence of new lineages, such as JN.1.

* https://www.cdc.gov/respiratory-viruses/whats-new/SARS-CoV-2-variant-JN.1.html
† https://covid.cdc.gov/covid-data-tracker/#variant-proportions
§ XBB sublineages representing >1% of all sequenced variants include HV.1, JD.1.1, HK.3, JG.3, and EG.5 (last updated January 9, 2024).
¶ SGTF lineages are defined by the presence of a deletion at positions 69–70 in the spike protein.

Methods

Overall Assessment of VE

Increasing Community Access to Testing (ICATT) is a CDC program that provides access to no-cost SARS-CoV-2 testing at pharmacies nationwide to persons who are uninsured,** prioritizing socially vulnerable areas.†† ICATT VE methods have been described§§ (*3*). Tests conducted at participating CVS Pharmacy and Walgreen Co. (Walgreens) locations during September 21, 2023–January 14, 2024, among adults who reported ≥1 symptom of COVID-19 were included in the test-negative design study. For the full analysis, case-patients were persons who received a positive nucleic acid amplification test (NAAT) result; control patients were those who received a negative NAAT result. Tests among persons fulfilling any of the following criteria were excluded from analyses: 1) self-reported immunocompromising condition¶¶; 2) reported receipt of Novavax as the most recent dose and reported receipt of <2 total COVID-19 vaccine doses***; 3) reported receipt of a Janssen (Johnson & Johnson) COVID-19 vaccine dose after May 12, 2023†††; 4) receipt of the most recent dose <7 days before the date of testing or during September 1–12, 2023; 5) receipt of a COVID-19 vaccine <2 months before date of testing for those who did not receive an updated COVID-19 vaccine dose; or 6) registration for testing with a version of the questionnaire that only reported month and year of the most recent vaccine dose rather than calendar date. In addition, tests from persons reporting receipt of a positive SARS-CoV-2 test result during the preceding 90 days§§§ were excluded. Type of most recent vaccine dose (original monovalent, bivalent, or updated monovalent) was determined by the reported date of receipt of the dose.¶¶¶

VE against symptomatic disease was calculated by comparing odds of receipt versus nonreceipt of the updated COVID-19 vaccine among case- and control patients. Secondary analyses examined alternative reference groups, including 1) receipt of a bivalent dose and 2) being either unvaccinated or having received only original COVID-19 vaccines. Odds ratios (ORs) were estimated using multivariable logistic regression****; VE was calculated separately based on SGTF or SGTP status as (1 – OR) x 100%.

Analysis of VE by SGTF and Time Since Vaccination

A subanalysis of VE by SGTF status and time since last dose included RT-PCR tests performed by one pharmacy chain during October 27, 2023–January 12, 2024, and analyzed at a commercial laboratory that used the TaqPath COVID-19 Combo Kit (Thermo Fisher Scientific). Quantitative results were reported as cycle threshold (Ct) values for each of three SARS-CoV-2 gene targets (*S, N*, and *ORF1ab*). Only specimens with Ct values available for both *N* and *ORF1ab* were

** ICATT vendors also report data for tests administered to people with medical insurance. Tests for persons with and without health insurance are included in this analysis.

†† The Social Vulnerability Index (SVI) is a composite measure that uses U.S. Census Bureau data on 16 social factors to rank social vulnerability by U.S. Census Bureau tract. The scale is from 0 to 1; higher SVIs represent more vulnerable communities. Tests with missing SVI data (<1% of total) were excluded from all analyses. https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html

§§ At test registration, adults report information on COVID-19 vaccination history, current COVID-19–like illness symptoms, history of previous positive SARS-CoV-2 test results, and underlying medical conditions. At Walgreens, comprising 95% of tests meeting inclusion criteria, test registrants who reported receiving COVID-19 vaccines were asked to report the total number of doses received and for the most recent dose, the manufacturer and the date of receipt as part of test registration. At CVS Pharmacy, comprising 5% of tests meeting inclusion criteria, test registrants' vaccination status was ascertained from a visit with a nurse practitioner or physician associate.

¶¶ Test registration forms asked persons to report whether they had an immunocompromising condition and provided the following examples: immunocompromising medications, solid organ or blood stem cell transplant, HIV, or other immunocompromising conditions.

*** Persons aged ≥12 years without immunocompromise and receiving updated Novavax COVID-19 vaccination are recommended to receive 2 updated COVID-19 vaccine doses if previously unvaccinated and 1 updated dose if previously vaccinated with any COVID-19 vaccine. https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us-appendix.html

††† On May 12, 2023, CDC removed guidance for use of Janssen COVID-19 vaccine because the vaccine was no longer available in the United States. https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us-appendix.html

§§§ Tests from persons reporting a positive SARS-CoV-2 test result during the preceding 90 days were excluded to avoid analyzing multiple tests for the same illness episode or reinfections within a relatively short time frame. https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/testing.html

¶¶¶ Persons were assumed to have received only original monovalent COVID-19 vaccine doses if they reported receiving their last dose before September 2, 2022, or if they reported receiving 1 or 2 total doses before April 18, 2023; persons were assumed to have received a bivalent dose and no updated monovalent dose if they reported receiving >2 total doses with their last dose during September 2, 2022–April 18, 2023, or reported receiving any number of doses with their last dose during April 19–September 12, 2023; persons reporting receipt of a dose after September 12, 2023, were assumed to have received an updated monovalent dose because these were the only authorized COVID-19 doses in the United States during that period. https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us-appendix.html

**** Multivariable logistic regression models were controlled for age (as a continuous variable), gender, race and ethnicity, SVI of the testing location (<0.5 versus ≥0.5), pharmacy contractor, underlying conditions (presence versus absence), U.S. Department of Health and Human Services region of testing location, and date of testing. The following underlying conditions were included on the test registration questionnaire: heart conditions, high blood pressure, overweight or obesity, diabetes, current or former smoker, kidney failure or end stage renal disease, cirrhosis of the liver, and chronic lung disease (such as chronic obstructive pulmonary disease, moderate to severe asthma, cystic fibrosis, or pulmonary embolism).

included in the SGTF subanalysis. SARS-CoV-2–positive specimens with either null or reduced amplification of the *S*-gene (Ct for *S*-gene >4 cycles from the average of *N* and *ORF1ab* Ct values) were considered to have SGTF (*2*,*4*), an indication of a particular deletion in the SARS-CoV-2 spike protein, which currently indicates an infection with BA.2.86, JN.1, and their sublineages. SARS-CoV-2–positive specimens without SGTF were considered to exhibit SGTP, which likely indicates infection with previously dominant XBB.1.5 lineages (Supplementary Figure; https://stacks.cdc.gov/view/cdc/145936).

For the SGTF and SGTP subanalysis, overall VE (regardless of time since dose) and VE during the 7–59 days after an updated dose were not calculated because the emergence of JN.1 parallels time since dose; statistical power for SGTF (likely JN.1) during the 7–59 days was therefore limited. Analyses were conducted using R software (version 4.1.2; R Foundation). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[††††]

Results

Overall VE

Among 9,222 NAAT results for persons with COVID-19–like illness symptoms eligible for the full analysis, 3,295 (36%) were positive for SARS-CoV-2 (Table 1). Among 1,125 persons who had received updated COVID-19 vaccine ≥7 days earlier, more control patients (844; 14%) reported having received the vaccine than did case-patients (281; 9%). Among those who received updated vaccine, the median interval since the last dose was 60 days (IQR = 32–79 days) for case-patients and 51 days (IQR = 28–73) for control patients. Among the 8,097 persons who reported that they had not received an updated vaccine dose, 2,435 (30%) were unvaccinated. Among the remaining 5,662 (70%) who were vaccinated but had not received an updated vaccine dose, the median interval since the last dose was 378 days (IQR = 321–413 days) for case-patients and 363 days (IQR = 254–402 days) for control patients. In the full analysis, VE for persons aged 18–49 years was 57% (95% CI = 48%–65%) and for persons aged ≥50 years was 46% (95% CI = 31%–58%) (Table 2). Overall VE was 58% (95% CI = 48%–65%) among those who received testing 7–59 days after receipt of updated vaccine and 49% (95% CI = 36%–58%) among those who received testing 60–119 days after receipt of updated vaccine.

[††††] 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.

VE by SGTF Status

In the subanalysis, 679 tests with *S*-gene target results from eligible persons were available, including 258 (38%) exhibiting SGTF (likely JN.1 lineages) and 421 (62%) with SGTP (likely non-JN.1 lineages) (Table 3). Because of recent emergence of JN.1 in the United States, VE was imprecise for tests with SGTF during the 7–59 days after receipt of updated vaccine. VE during the 60–119 days since receipt of updated vaccine was 49% (95% CI = 19%–68%) for tests with SGTF (median interval since dose = 80 days) and 60% (95% CI = 35%–75%) for tests with SGTP (median interval since dose = 73 days).

Secondary VE Analyses

Secondary analyses showed similar VE estimates for receipt of updated vaccine compared with those who previously received only original monovalent doses and those who received original monovalent and bivalent doses. (Supplementary Table; https://stacks.cdc.gov/view/cdc/145937).

Discussion

This report provides early estimates of effectiveness of updated monovalent XBB.1.5 COVID-19 vaccines against symptomatic SARS-CoV-2 infection and the first estimates of VE against symptomatic infection with the JN.1 lineage. These preliminary estimates from pharmacy testing conducted during September 2023–January 2024 showed updated monovalent COVID-19 vaccine provided protection for JN.1 and other circulating lineages.

VE against symptomatic infection provides helpful information about the range of protection provided by updated vaccines and against emerging lineages. An important strength of ICATT SARS-CoV-2 testing data is the ability to distinguish JN.1 from XBB lineages, allowing for comparison of VE during the same period after vaccination. Monitoring the potential impact on VE of JN.1 is critical because of the spike mutations in JN.1 (as compared with XBB lineages), which might be associated with increased immune escape[§§§§] (*5*). Recent laboratory data show that the updated vaccines elicit neutralizing antibodies against emerging XBB lineages and JN.1 (*6*). Although point estimates during the 60–119 days after vaccination were lower for SGTF than SGTP results in this analysis, CIs overlapped, indicating no statistically significant difference. These data provide reassurance that updated vaccines are providing protection against JN.1 and XBB lineages.

These early estimates include the period only through 119 days since vaccination, a relatively brief postvaccination

[§§§§] JN.1 is a sublineage of BA.2.86, defined by the spike substitution L455S. Changes at this amino acid position have conferred immune escape advantages to other lineages and might be associated with increased immune escape.

TABLE 1. Characteristics of patients with SARS-CoV-2 tests conducted at national pharmacy testing locations (N = 9,222) — Increasing Community Access to Testing program, United States, September 2023–January 2024

Characteristic	Full analysis (all eligible NAATs), no. (column %)			Subanalysis (eligible TaqPath COVID-19 Combo Kit tests only),* no. (column %)			
	Total no. of tests	SARS-CoV-2–negative (control patients) n = 5,927	SARS-CoV-2–positive (case-patients) n = 3,295	Total no. of tests	SARS-CoV-2–negative (control patients) n = 1,520	SGT presence (likely non-JN.1) n = 421	SGT failure (likely JN.1) n = 258
All tests (row %)	**9,222 (100)**	**5,927 (64)**	**3,295 (36)**	**2,199 (100)**	**1,520 (69)**	**421 (19)**	**258 (12)**
Age group, yrs							
18–49	**7,155 (78)**	4,673 (79)	2,482 (75)	**1,694 (77)**	1,187 (78)	306 (73)	201 (78)
50–64	**1,547 (17)**	916 (15)	631 (19)	**363 (17)**	238 (16)	88 (21)	37 (14)
≥65	**520 (6)**	338 (6)	182 (6)	**142 (6)**	95 (6)	27 (6)	20 (8)
Gender							
Female	**5,581 (61)**	3,656 (62)	1,925 (58)	**1,341 (61)**	966 (64)	233 (55)	142 (55)
Male	**3,586 (39)**	2,228 (38)	1,358 (41)	**836 (38)**	535 (35)	187 (44)	116 (45)
Other	**55 (1)**	43 (1)	12 (0.4)	**22 (1)**	21 (1)	1 (0.2)	0 (—)
Race and ethnicity†							
Black or African American	**1,465 (16)**	1,002 (17)	463 (14)	**273 (12)**	223 (15)	27 (6)	23 (9)
White	**3,578 (39)**	2,277 (38)	1,301 (39)	**1,003 (46)**	622 (41)	245 (58)	136 (53)
Hispanic or Latino	**2,662 (29)**	1,717 (29)	945 (29)	**512 (23)**	400 (26)	68 (16)	44 (17)
Other	**815 (9)**	487 (8)	328 (10)	**226 (10)**	147 (10)	52 (12)	27 (10)
Unknown	**702 (8)**	444 (7)	258 (8)	**185 (8)**	128 (8)	29 (7)	28 (11)
HHS testing site region§							
1	**316 (3)**	201 (3)	115 (3)	**143 (7)**	96 (6)	24 (6)	23 (9)
2	**999 (11)**	463 (8)	536 (16)	**368 (17)**	151 (10)	126 (30)	91 (35)
3	**519 (6)**	351 (6)	168 (5)	**135 (6)**	86 (6)	35 (8)	14 (5)
4	**1,775 (19)**	1,260 (21)	515 (16)	**413 (19)**	399 (22)	39 (9)	35 (14)
5	**1,286 (14)**	823 (14)	463 (14)	**298 (14)**	213 (14)	59 (14)	26 (10)
6	**2,048 (22)**	1,403 (24)	645 (20)	**358 (16)**	327 (22)	20 (5)	11 (4)
7	**225 (2)**	141 (2)	84 (3)	**29 (1)**	25 (2)	3 (1)	1 (0.4)
8	**207 (2)**	136 (2)	71 (2)	**36 (2)**	27 (2)	6 (1)	3 (1)
9	**1,593 (17)**	971 (16)	622 (19)	**396 (18)**	236 (16)	107 (25)	53 (21)
10	**254 (3)**	178 (3)	76 (2)	**23 (1)**	20 (1)	2 (0.5)	1 (.04)
SVI, mean (SD)¶	**0.6 (0.3)**	0.6 (0.3)	0.6 (0.3)	**0.5 (0.3)**	0.5 (0.3)	0.5 (0.3)	0.5 (0.3)
Self-reported history of SARS-CoV-2–positive test result							
None	**3,699 (40)**	2,267 (38)	1,432 (43)	**807 (37)**	545 (36)	169 (40)	93 (36)
Positive >90 days before current test	**5,523 (60)**	3,660 (62)	1,863 (57)	**1,392 (63)**	975 (64)	252 (60)	165 (64)
SARS-CoV-2 test type							
Rapid NAAT**	**5,338 (58)**	3,438 (58)	1,900 (58)	**NA**	NA	NA	NA
Laboratory-based NAAT††	**3,884 (42)**	2,489 (42)	1,395 (42)	**2,199 (100)**	1,582 (100)	421 (100)	258 (100)
At least one self-reported chronic underlying condition							
No	**5,966 (65)**	3,844 (65)	2,122 (64)	**1,389 (63)**	955 (63)	280 (67)	154 (60)
Yes	**3,256 (35)**	2,083 (35)	1,173 (36)	**810 (37)**	565 (37)	141 (33)	104 (40)

See table footnotes on the next page.

period, with no substantial waning. Because consistent patterns of waning VE were observed after original monovalent and bivalent COVID-19 vaccination, waning of VE is expected with more time since updated vaccination, especially against less severe outcomes such as symptomatic infection. Additional analyses conducted at longer intervals since authorization of updated vaccines are needed for continued monitoring of expected waning and to determine how well vaccines are working to prevent severe disease.

Limitations

The findings in this report are subject to at least five limitations. First, vaccination status, previous infection history, and underlying medical conditions were self-reported and might be subject to recall bias. Self-reported frequency of previous infections >90 days before testing differed by vaccination status and SGTF status, but statistical power was not adequate for stratification of results. Further, previous infection is likely underreported (*7*). Previous infection provides some protection against repeat infection (*8*) and U.S. adults have a high

TABLE 1. (*Continued*) Characteristics of patients with SARS-CoV-2 tests conducted at national pharmacy testing locations (N = 9,222) — Increasing Community Access to Testing program, United States, September 2023–January 2024

Characteristic	Full analysis (all eligible NAATs), no. (column %)			Subanalysis (eligible TaqPath COVID-19 Combo Kit tests only),* no. (column %)			
	Total no. of tests	SARS-CoV-2–negative (control patients) n = 5,927	SARS-CoV-2–positive (case-patients) n = 3,295	Total no. of tests	SARS-CoV-2–negative (control patients) n = 1,520	SGT presence (likely non-JN.1) n = 421	SGT failure (likely JN.1) n = 258
Self-reported most recent COVID-19 vaccine dose received before test date[§§,¶¶]							
Unvaccinated	**2,435 (26)**	1,705 (29)	730 (22)	**430 (20)**	333 (22)	68 (16)	29 (11)
Original monovalent	**4,493 (49)**	2,669 (45)	1,824 (55)	**1,140 (52)**	749 (49)	245 (58)	146 (57)
Bivalent	**1,169 (13)**	709 (12)	460 (14)	**402 (18)**	264 (17)	85 (20)	53 (21)
Updated dose, ≥7 days earlier	**1,125 (12)**	844 (14)	281 (9)	**227 (10)**	174 (11)	23 (5)	30 (12)
Updated dose, 7–59 days earlier	**634 (7)**	494 (8)	140 (4)	**NA**	NA	NA	NA
Updated dose, 60–119 days earlier	**491 (5)**	350 (6)	141 (4)	**227 (10)**	174 (11)	23 (5)	30 (12)
Updated dose product manufacturer[¶¶]							
Moderna	**472 (5)**	356 (6)	116 (4)	**91 (4)**	72 (5)	7 (2)	12 (5)
Novavax	**49 (1)**	43 (1)	6 (0.2)	**5 (0.2)**	4 (0.3)	0 (—)	1 (0.4)
Pfizer-BioNTech	**604 (7)**	445 (8)	159 (5)	**131 (6)**	98 (6)	16 (4)	17 (7)
None	**8,097 (88)**	5,083 (86)	3,014 (91)	**1,972 (90)**	1,346 (89)	398 (95)	228 (88)
Self-reported total no. of COVID-19 vaccine doses							
0 (unvaccinated)	**2,435 (26)**	1,705 (29)	730 (22)	**430 (20)**	333 (22)	68 (16)	29 (11)
1	**780 (8)**	461 (8)	319 (10)	**186 (8)**	116 (8)	39 (9)	31 (12)
2	**2,655 (29)**	1,618 (27)	1,037 (31)	**605 (28)**	415 (27)	116 (28)	74 (29)
3	**1,843 (20)**	1,090 (18)	753 (23)	**552 (25)**	354 (23)	132 (31)	66 (26)
4	**878 (10)**	581 (10)	297 (9)	**271 (12)**	180 (12)	52 (12)	39 (15)
5	**438 (5)**	339 (6)	99 (3)	**102 (5)**	83 (5)	8 (2)	11 (4)
≥6	**193 (2)**	133 (2)	60 (2)	**53 (2)**	39 (3)	6 (1)	8 (3)

Abbreviations: HHS = U.S. Department of Health and Human Services; ICATT = Increasing Community Access to Testing program; NA = not applicable; NAAT = nucleic acid amplification test; SGT = spike gene target; SVI = Social Vulnerability Index.

* Tests included in the subanalysis represent a subset of those included in the full analysis.

† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

§ Regions are defined by HHS and include only states and territories with ICATT sites. U.S. Virgin Islands (Region 2) and American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, and Palau (Region 9) were not included because they did not have pharmacies participating in ICATT. https://www.hhs.gov/about/agencies/iea/regional-offices/index.html.

¶ SVI is a composite measure that uses U.S. Census Bureau data on 16 social factors to rank social vulnerability by U.S. Census Bureau tract. The scale is from 0 to 1; higher SVIs represent more vulnerable communities. Tests with missing SVI data (<1% of total) were excluded from all analyses. https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html

** Rapid NAAT was performed on-site on self-collected nasal swabs using ID Now (Abbott Diagnostics Scarborough, Inc.), Xpert Xpress (Cepheid), and Accula (Thermo Fisher Scientific).

†† Laboratory-based NAAT was performed on self-collected nasal swabs at contracted laboratories using a variety of testing platforms.

§§ Persons were assumed to have received only original monovalent COVID-19 vaccine doses if they reported receiving their last dose before September 2, 2022, or if they reported receiving 1 or 2 total doses before April 18, 2023; persons were assumed to have received a bivalent dose and no updated dose if they reported receiving >2 total doses with their last dose during September 2, 2022–April 18, 2023, or receiving any number of doses with their last dose during April 19–September 12, 2023; persons reporting receipt of a dose after September 12, 2023, were assumed to have received an updated dose because these were the only authorized COVID-19 doses in the United States. https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us-appendix.html

¶¶ "Updated" refers to 2023–2024 monovalent COVID-19 vaccine.

prevalence of infection-induced SARS-CoV-2 immunity.[¶¶¶¶] Thus, VE in this analysis reflects the current situation among U.S. adults and can be interpreted as the incremental benefit of receipt of updated COVID-19 vaccine beyond existing vaccination-induced, infection-induced, or hybrid immunity. Second, test registration questionnaires did not ask registrants about the number of updated vaccine doses received; therefore, the analysis might have included some persons who received >1 updated dose. Third, these estimates are derived from a population choosing to be tested for SARS-CoV-2 and are potentially subject to selection biases related to these factors. In addition, updated vaccination coverage to date has been low (approximately 22% as of January 13, 2024[*****]) among persons aged ≥18 years and varies by age, which could bias results if persons being vaccinated earlier are systematically different from those vaccinated later. Thus, residual confounding might be present and could affect these early estimates. Fourth, this

¶¶¶¶ https://covid.cdc.gov/covid-data-tracker/#nationwide-blood-donor-seroprevalence-2022

***** https://www.cdc.gov/vaccines/imz-managers/coverage/covidvaxview/interactive/adult-coverage-vaccination.html

TABLE 2. Effectiveness of updated 2023–2024 monovalent COVID-19 vaccine against symptomatic SARS-CoV-2 infection among adults aged ≥18 years, by interval since last dose and age group — Increasing Community Access to Testing program, United States, September 2023–January 2024

Age group, yrs/COVID-19 vaccination dosage pattern	Total no. of tests	SARS-CoV-2–positive test results, no. (row %)	Median days (IQR) since last dose among vaccinated	VE* (95% CI)
≥18				
No updated dose (Ref)	**8,097**	3,014 (37)	670 (422–843)	Ref
Received updated dose	**1,125**	281 (25)	52 (29–75)	54 (46–60)
7–59 days earlier	**634**	140 (22)	32 (19–46)	58 (48–65)
60–119 days earlier	**491**	141 (29)	79 (68–90)	49 (36–58)
18–49				
No updated dose (Ref)	**6,475**	2,332 (36)	681 (429–852)	Ref
Received updated dose	**681**	150 (22)	53 (30–74)	57 (48–65)
7–59 days earlier	**381**	69 (18)	32 (19–46)	64 (53–73)
60–119 days earlier	**300**	81 (27)	77 (67–89)	48 (31–60)
≥50				
No updated dose (Ref)	**1,623**	682 (42)	583 (398–787)	Ref
Received updated dose	**444**	131 (30)	50 (29–77)	46 (31–58)
7–59 days earlier	**253**	71 (28)	32 (21–45)	45 (26–60)
60–119 days earlier	**191**	60 (31)	81 (70–91)	47 (24–62)

Abbreviations: Ref = referent group; VE = vaccine effectiveness.

* VE = (1 − adjusted odds ratio) x 100. Odds ratios were calculated using multivariable logistic regression, adjusting for age (as a continuous variable), gender, race and ethnicity, Social Vulnerability Index of the testing location (<0.5 versus ≥0.5), pharmacy contractor, underlying conditions (presence versus absence), U.S. Department of Health and Human Services region of testing location, and date of testing. Previous analyses from this platform included local SARS-CoV-2 incidence in regression models; however, this variable is no longer available since the end of the public health emergency declaration in May 2023.

TABLE 3. Effectiveness of updated 2023–2024 monovalent COVID-19 vaccine against symptomatic SARS-CoV-2 infection among adults aged ≥18 years with samples tested at a commercial laboratory with spike gene target testing available, by interval since last dose and spike gene target status (N = 2,199) — Increasing Community Access to Testing program, United States, October 2023–January 2024

		SARS-CoV-2–negative test results		SARS-CoV-2–positive test results (n = 679)					
				SGT presence (likely non-JN.1)			SGT failure (likely JN.1)		
COVID-19 vaccination dosage pattern	Total no. of tests N = 2,199	No. (row %) n = 1,520	Median (IQR) days since last dose among vaccinated	No. (row %) n = 421	Median (IQR) days since last dose among vaccinated	VE* (95% CI)	No. (row %) n = 258	Median (IQR) days since last dose among vaccinated	VE* (95% CI)
No updated dose (Ref)	**1,972**	1,346 (68)	637 (398–805)	398 (20)	672 (402–800)	Ref	228 (12)	674 (412–816)	Ref
Updated dose, 60–119 days earlier†	**227**	174 (77)	80 (69–90)	23 (10)	73 (68–82)	60 (35–75)	30 (13)	80 (69–90)	49 (19–68)

Abbreviations: Ref = referent group; SGT = spike gene target; VE = vaccine effectiveness.

* VE = (1 − adjusted odds ratio) x 100. Odds ratios were calculated using multivariable logistic regression, adjusting for age (as a continuous variable), gender, race and ethnicity, Social Vulnerability Index of the testing location (<0.5 versus ≥0.5), pharmacy contractor, underlying conditions (presence versus absence), U.S. Department of Health and Human Services region of testing location, and date of testing. Previous analyses from this platform included local SARS-CoV-2 incidence in regression models; however, this variable is no longer available since the end of the public health emergency declaration in May 2023.

† Overall VE, regardless of time since dose, and VE during the 7–59 days since vaccination were not calculated for the subanalysis based on SGT presence or SGT failure. Because of the timing of JN.1 spread in the United States, JN.1 VE estimates would be inherently weighted as longer time since dose and non-JN.1 VE estimates as shorter time since dose, biasing overall estimates of VE by lineage. Similarly, because of the timing of JN.1 spread, statistical power for VE for JN.1 lineages during the 7–59 days after receipt of vaccination was limited.

analysis used a subset of data with SGTF status as a proxy for infection with a JN.1 lineage. Although SGTF identifies other BA.2.86 lineage viruses, JN.1 represents the majority of these and was the primary lineage increasing in proportion during the analytic period. Finally, this analysis did not control for time since receipt of the most recent dose before the updated dose; however, because of waning effectiveness of previous doses, particularly against symptomatic infection†††††† (*9*), this limitation likely had a minimal effect on results.

†††††† https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2023-09-12/05-COVID-Link-Gelles-508.pdf

Implications for Public Health Practice

Updated monovalent COVID-19 vaccines provided 54% (95% CI = 46–60%) protection against symptomatic SARS-CoV-2 infection in persons recently vaccinated compared with those who did not receive an updated vaccine dose. Vaccination provided protection for infections caused by JN.1 and infections caused by XBB-related lineages. Waning of effectiveness is expected with additional elapsed time since vaccination, especially against less severe disease. CDC will continue to monitor trends in VE. All persons aged ≥6 months should stay up to date with COVID-19 vaccination, including receiving a dose of updated vaccine.

Summary

What is already known about this topic?

In September 2023, CDC's Advisory Committee on Immunization Practices recommended updated 2023–2024 (monovalent XBB.1.5) COVID-19 vaccination for all persons aged ≥6 months to prevent COVID-19, including severe disease. Many variants co-circulated during fall 2023; the JN.1 lineage became predominant in January 2024. Few estimates of updated 2023–2024 vaccine effectiveness (VE) are available.

What is added by this report?

Receipt of updated COVID-19 vaccine provided approximately 54% increased protection against symptomatic SARS-CoV-2 infection compared with no receipt of updated vaccine. Vaccination provides protection against JN.1 and other circulating lineages.

What are the implications for public health practice?

All persons aged ≥6 months should receive updated 2023–2024 COVID-19 vaccine. CDC will continue monitoring COVID-19 VE, including against severe disease and for expected waning.

Acknowledgments

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Notes from the Field

Severe *Vibrio vulnificus* Infections During Heat Waves — Three Eastern U.S. States, July–August 2023

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Vibrio vulnificus, a waterborne and foodborne pathogen, lives in estuarine environments and thrives in warmer waters. *V. vulnificus* can infect open wounds through contact with salt water, brackish water, or raw seafood; infections can also occur after consuming raw or undercooked seafood. In the United States, 150–200 *V. vulnificus* infections are reported to CDC annually, approximately 20% of which are fatal.* During June–August 2023, widespread heat waves and above-average sea surface temperatures occurred in the United States (*1*). During July–August 2023, public health officials in three eastern U.S. states (Connecticut, New York, and North Carolina) were notified of *V. vulnificus* infections associated with exposure to coastal waters and seafood, most of which were severe and led to septic shock or death. This report describes *V. vulnificus* infections among residents of these three states during the 2023 heat waves.

Investigation and Outcomes

After being notified of positive *Vibrio* clinical test results through routine disease surveillance, public health officials in all states interview patients using the Cholera and Other *Vibrio* Illness Surveillance case report form,† which collects information on underlying conditions, clinical outcomes, and exposures occurring before illness onset. For cases involving raw oyster consumption, investigators contact retail facilities, collect oyster harvest tags, and notify relevant state and federal authorities after reports of possibly contaminated raw shellfish shipped from out of state. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.§

Characteristics of Cases

During July–August 2023, 11 persons infected with *V. vulnificus* were reported to health officials in North Carolina (seven), Connecticut (two), and New York (two) (Figure). The median patient age was 70 years (range = 37–84 years). Seven patients were male. One North Carolina patient was lost to follow-up. Among 10 patients with information available, all but one had at least one underlying condition, most commonly diabetes (three), cancer (three), heart disease (three), history of alcoholism (three), and hematologic disease (two). Six patients experienced either septic shock (four) or died (five); three experienced both. All of the patients who died had at least one underlying condition.

Likely Routes of *V. vulnificus* Exposure

Waterborne transmission of *V. vulnificus* resulting from wound exposure to marine or estuarine water along the U.S. Atlantic coast during July 7–August 22, 2023 was the most likely route of infection in six cases. Waterborne cases occurred among residents of North Carolina (three), New York (two), and Connecticut (one). Two additional cases in North Carolina residents likely resulted from exposure to a cut on the hand while handling raw seafood during food preparation. Among the two remaining cases with exposure information, one resulted from a foodborne exposure of a Connecticut resident who reported consuming raw oysters in another state and did not report any relevant water or environmental exposures and the second patient, a North Carolina resident, reported both wound exposure to brackish water and raw oyster consumption.

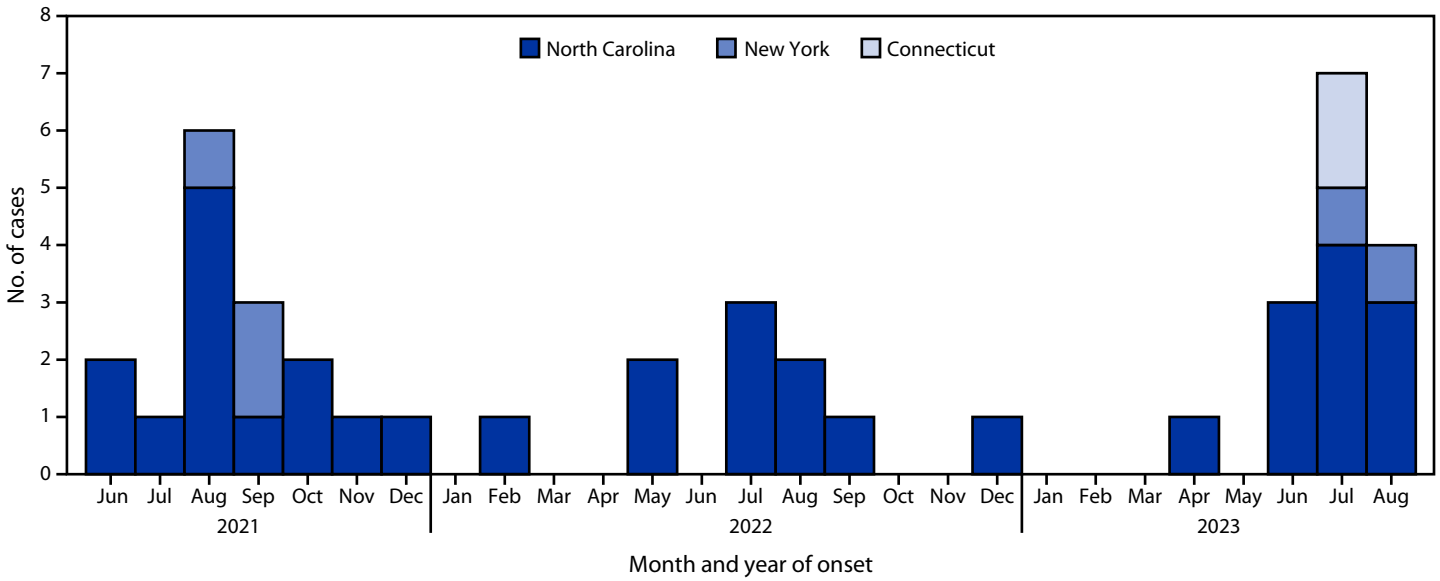
Preliminary Conclusions and Actions

Connecticut, New York, and North Carolina public health officials rapidly identified cases of *V. vulnificus* infection and initiated investigations. All three state health departments issued press releases informing the public about *V. vulnificus* infections, and CDC issued a Health Advisory Notice.¶ A notable feature of these cases, beyond their severe clinical outcomes, is that they occurred in the wake of record-breaking U.S. heat waves (*2*). Although these cases reported during July–August cannot be solely attributed to the heat waves, the relationship between vibriosis incidence and environmental conditions favorable to *Vibrio* growth, namely elevated water surface temperatures and low salinity, is well-documented (*3*,*4*). Whereas North Carolina reported 10–13 cases per year during 2021–2023, Connecticut reported no *V. vulnificus* infections during all of 2021–2022, and New York reported three cases in 2021 and none in 2022 (Figure). As coastal water temperatures increase, *V. vulnificus* infections are expected to

* https://www.cdc.gov/vibrio/wounds.html
† https://www.cdc.gov/vibrio/surveillance.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.

¶ https://emergency.cdc.gov/han/2023/han00497.asp

FIGURE. Number of *Vibrio vulnificus* infections, by illness onset date and patient state of residence (N = 41) — Connecticut, New York, and North Carolina, June 2021–August 2023



become more common (*5*). Persons can take steps to prevent illness by avoiding wound contact with brackish water, salt water, and raw seafood, and by thoroughly cooking oysters and other seafood before eating.

Summary

What is already known about this topic?

Vibrio vulnificus, a waterborne and foodborne pathogen, can infect open wounds through contact with salt water, brackish water, or raw seafood. Infections can also occur after consuming raw or undercooked seafood.

What is added by this report?

During July–August 2023, 11 cases of severe *V. vulnificus* infection were reported among residents of three eastern U.S. states after a period of heat waves and elevated sea surface temperatures. Patients reported multiple routes of exposure; four patients experienced septic shock; five patients died.

What are the implications for public health practice?

Avoiding open wound contact with brackish water, salt water, and raw seafood; and thoroughly cooking oysters and other seafood before eating can prevent infection and illness.

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Notes from the Field

Dengue Outbreak — Peru, 2023

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Dengue, a mosquitoborne viral disease, is endemic to Peru, with highest seasonal transmission usually occurring between November and May (*1*). All four dengue viruses (DENV 1–4) have circulated in Peru, most commonly DENV-1 and DENV-2 (*2*). Historically, departments (the first level administrative subdivision) in the north have reported the highest dengue incidence, whereas incidence in the Lima metropolitan area on the central Pacific coast (population approximately 11 million) has been low.

Epidemiologic Findings

In March 2023, the mean weekly number of dengue cases in Peru increased sharply (Figure), from 2,182 during epidemiologic weeks 1–10 (corresponding to January 1–March 11) to 8,787 during weeks 11–20 (March 12–May 20). As of the end of week 30 (July 29), the 222,620 cases in 2023 were approximately 10 times the average number during the same period during the previous 5 years (21,841 cases) and 3.5 times the number during the same period in 2017 (64,431 cases), the year of the largest previous national dengue outbreak. A nationwide epidemiologic alert to notify health care providers of the risk of dengue outbreaks was issued on April 21. CDC employees were deployed to Peru at the end of May to collaborate on the outbreak investigation. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.*

During January 1–July 29, a total of 83,254 probable† and 139,366 confirmed§ dengue cases were reported, making this the largest dengue outbreak on record in Peru. Several departments¶ with the highest numbers of cases (located in coastal northwestern Peru), including Piura (67,697), Lambayeque (28,235), and La Libertad (20,289) (Supplementary Table, https://stacks.cdc.gov/view/cdc/147148), also reported high dengue incidence during the 2017 outbreak and were affected by extreme rainfall in early March 2023 related to Cyclone Yaku.** Case counts in Lima (32,009) were much higher than those reported during previous years, including in neighborhoods that have not historically reported dengue cases. The highest age-specific incidence (807 cases per 100,000 population) was reported among persons aged 12–17 years; 55% of cases occurred in females.

Mortality

Overall, 381 dengue-related deaths were reported (case fatality ratio [CFR] = 0.17%). More than one half of all deaths (204, 54%) occurred among persons aged ≥60 years, who also experienced the highest CFR (0.90%), and nearly one third of dengue-related deaths (109, 29%) occurred in persons aged 30–59 years (CFR = 0.13%). Persons aged <30 years with dengue experienced the fewest number of deaths (68, 18%) and the lowest CFR (0.06%).

The largest number of deaths occurred in Piura (130 deaths, CFR = 0.19%), followed by Lambayeque (115, CFR = 0.41%), and Ica (52, CFR = 0.32%). Dengue-related deaths were reported in 16 (64%) of 25 jurisdictions.

Diagnostic Testing

Molecular and serologic diagnostic testing, including real-time reverse transcription–polymerase chain reaction nonstructural protein 1 antigen, and immunoglobulin M enzyme-linked immunosorbent assay testing were conducted through a network of 49 public health laboratories. These laboratories conducted more than 200,000 tests in 2023. Among 14,462 cases with DENV serotype available in 2023, DENV-2

* 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.

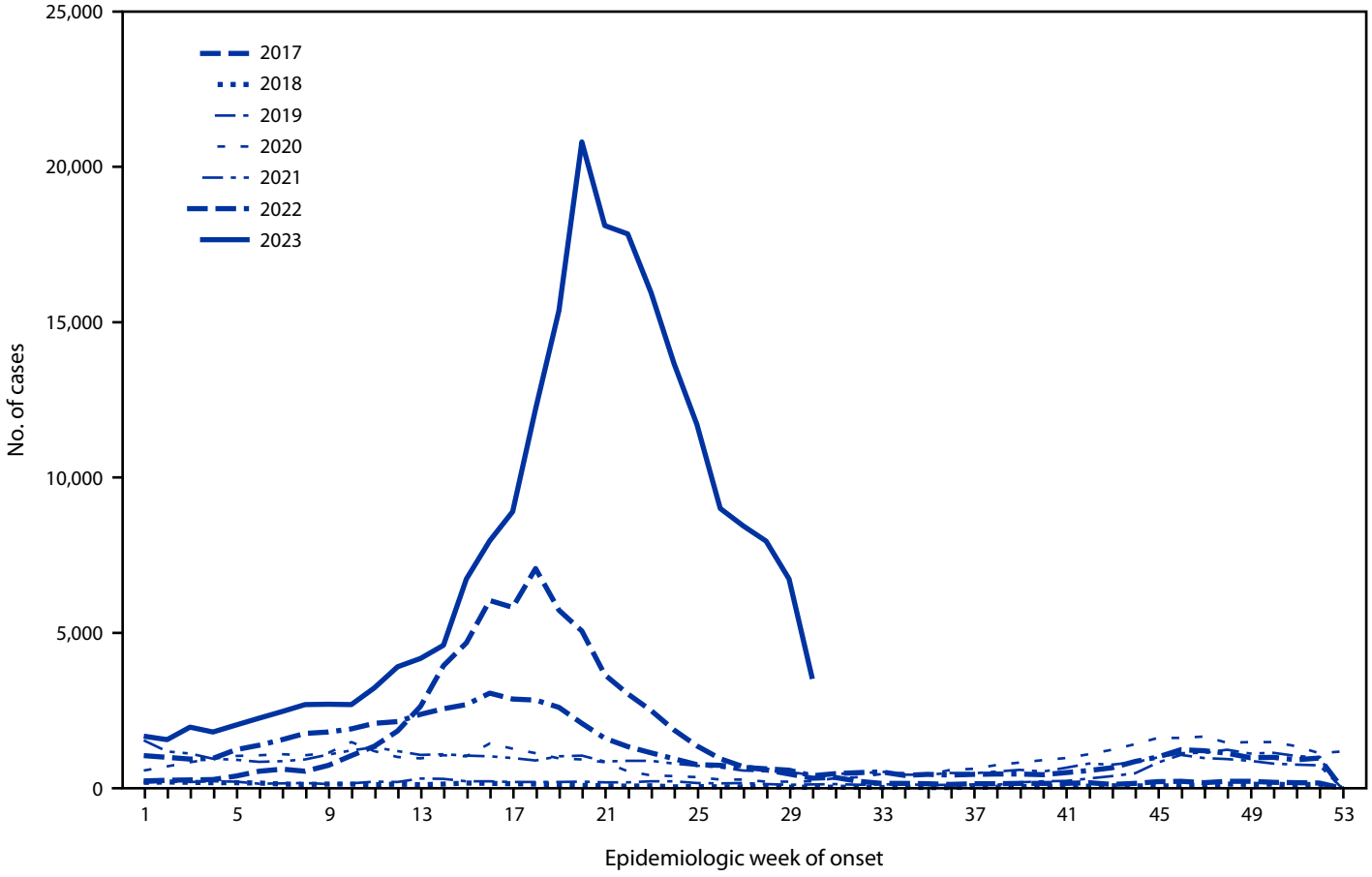
† Probable cases are defined as a febrile illness lasting ≤7 days in a person who resides in or has visited areas with dengue virus transmission or *Aedes aegypti* infestation within 14 days before the onset of symptoms and who has at least two of the following signs and symptoms: ocular or retro-orbital pain, myalgia, headache, arthralgia, lower back pain, rash, and nausea or vomiting. In addition, probable cases have no laboratory test result or epidemiologic linkage to other dengue cases.

§ Confirmed cases have the same symptom and exposure criteria as do probable cases but have received at least one positive result from one or more of the following tests: 1) virus isolation by cell culture, 2) real-time quantitative reverse transcription–polymerase chain reaction, 3) enzyme-linked immunosorbent assay (ELISA) nonstructural protein 1 antigen, 4) detection of immunoglobulin M (IgM) antibodies for dengue in a single sample by ELISA (for areas with endemic dengue), and 5) IgM evidence of seroconversion in paired samples (in areas where there is no dengue transmission and cases must have an epidemiologic investigation).

¶ https://www.dge.gob.pe/sala-situacional-dengue/#grafico01

** https://www.reuters.com/business/environment/heavy-rainfall-peru-slammed-infrastructure-losses-seen-323-mln-2023-03-22/

FIGURE. Weekly number of dengue cases reported nationwide,* by epidemiologic week† — Peru, January 1, 2017–July 29, 2023



* Population = 34 million.
† Epidemiologic weeks begin on Sunday and end on Saturday. 2023 data are shown through epidemiologic week 30.

was the most common serotype identified (7,105, 49%), followed by DENV-1 (7,038, 49%), and DENV-3 (319, 2%).††

Preliminary Conclusions and Actions

The Ministry of Health of Peru, in collaboration with regional health offices and international partners, implemented a broad, integrated surveillance and response strategy, including increased targeted larvicidal treatments of standing water and insecticide spraying in affected neighborhoods. Clinical surveillance units with dedicated personnel with training in dengue clinical management were established in outbreak areas, and hospitals implemented triage tents for febrile patients; in-person and online trainings were available to clinicians nationwide.

Dengue is a growing health threat globally, with multiple factors potentially contributing to the increasing incidence and expansion into new areas including rapid urbanization, increased travel, and climate change (*3*). Dengue outbreaks can be abrupt and strain health care systems, requiring rapid recognition of transmission and intensive preparedness and efforts to strengthen response capacity at the primary care level. Additional interventions and resources, including vaccines and effective and scalable vector control methods, are increasingly critical to reducing dengue morbidity and mortality (*4*). Public health agencies can prepare for and respond to dengue outbreaks by evaluating and supporting implementation of effective vector control methods and vaccines, strengthening dengue surveillance, and reinforcing clinical management training to improve patient outcomes.

†† https://app.powerbi.com/view?r=eyJrIjoiOTQ0MzllOTItNWNkNC00MzE3LWJiM2QtZGUyYjU0NWFjYjUyIiwidCI6ImI0NzYxY2VlLTlkYWQtNDc3MS05ZjQ3LTVmYjc4Y2MxYjRhYSIsImMiOjR9&pageName=ReportSection73939390533a7a82da04 (accessed Jan 26, 2024).

Summary

What is already known about this topic?

Dengue, a mosquitoborne viral disease, is endemic to Peru, with the annual number of cases ranging between 4,698 and 68,290 from 2017 to 2022.

What is added by this report?

In March 2023, a sharp increase in dengue cases in Peru occurred. In the first 30 weeks of the year, 222,620 cases (exceeding the previous 5-year average by a factor of approximately 10) and 381 dengue-associated deaths were reported. The Lima metropolitan area experienced a substantially higher incidence compared with historical levels, when few locally acquired cases were observed.

What are the implications for public health practice?

Dengue outbreaks can be abrupt and can strain health care systems, necessitating rapid outbreak detection in addition to intensive preparedness and efforts to strengthen response capacity at the primary care level.

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Notes from the Field

Cluster of Severe Illness from Neptune's Fix Tianeptine Linked to Synthetic Cannabinoids — New Jersey, June–November 2023

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Tianeptine is an atypical tricyclic antidepressant with pharmacologic effects that include enhancement of serotonin reuptake and mu-opioid receptor agonism. The Food and Drug Administration has not approved tianeptine for use in the United States; however, it is readily purchased in elixir formulations online or at gas stations informally referred to as "gas station heroin" (*1*–*3*). This report describes an uncharacteristic spike in tianeptine ingestions in New Jersey during June–November 2023, with severe associated clinical effects with synthetic cannabinoid receptor agonists (SCRAs) identified in samples of the ingested products.

Investigation and Outcomes

Exposure calls involving tianeptine exposure identified in the New Jersey Poison Information and Education System's Toxicall database during June 17–November 6, 2023, were retrospectively reviewed. Specialists in Poison Information record clinical and demographic information into Toxicall from exposure calls made by hospitals, health care providers, and the public. This study was reviewed and approved by the Rutgers Human Research Protection Program Institutional Review Board.* During this period, the center received 20 exposure calls from health care facilities regarding tianeptine use in 17 unique patients. These patients, who were distributed throughout the state, were aged 28–69 years. Overall, 14 patients reported ingesting tianeptine in the form of Neptune's Fix, a flavored elixir shot, consisting of tianeptine and kavain (*Piper methysticum* root, prepared with water and reported to promote relaxation) sold in small colorful bottles. Nine patients reported previous use of tianeptine, and six reported coingesting other substances, including alprazolam (a benzodiazepine), kratom (leaves from the *Mitragyna speciosa* tree, which have opioid-like effects), tramadol (a synthetic opioid analgesic), trazodone (a serotonin reuptake inhibitor antidepressant medication), and gabapentin (an anticonvulsant sometimes used for neuropathic pain). All patients were described as having altered mental status upon evaluation. Other clinical effects included tachycardia (11 patients), hypotension (10), seizure (eight), prolonged QT interval (seven), prolonged QRS duration (four), and cardiac arrest (one); prolonged QT intervals and prolonged QRS durations are associated with an increased risk for ventricular arrhythmia (*4*). Among the 20 encounters, 13 of the 17 patients were admitted to an intensive care unit, and seven of the 17 underwent endotracheal intubation. There were no deaths.

Six samples of Neptune's Fix from two reported cases were analyzed at the Center for Forensic Science Research and Education (https://www.cfsre.org) using an Agilent Technologies (https://www.agilent.com) gas chromatograph mass spectrometer and a Sciex (https://www.sciex.com) liquid chromatograph quadrupole time-of-flight mass spectrometer. Results were compared against an in-house database containing more than 1,100 targets, including recreational drugs, therapeutics, and novel psychoactive substances and were qualitatively confirmed by comparison to standard reference materials. All bottles were labeled as containing kavain and tianeptine; analysis identified variable compositions, including the presence of the two SCRAs methyl 3,3-dimethyl-2-(1-(pent-4-en-1-yl)-1H-indazole-3-carboxamido)butanoate (MDMB-4en-PINACA) and N-(1-amino-3,3-dimethyl-1-oxobutan-2-yl)-1-(pent-4-en-1-yl)-1H-indazole-3-carboxamide(ADB-4en-PINACA) (Table).

Preliminary Conclusions and Actions

These cases represent a marked increase in the number of reports of tianeptine exposure in New Jersey compared with the poison center's average of two or fewer cases per year. Subsequently, the Food and Drug Administration issued a warning against using Neptune's Fix or any tianeptine product.† Analytical confirmatory testing revealed variable product composition and that SCRAs accounted for the highest percentages of cannabinoids in these substances. The severity of reported effects might reflect SCRA toxicity, the effects of polysubstance ingestion, or both. MDMB-4en-PINACA and ADB-4en-PINACA belong to the latest generation of structurally distinct synthetic cannabinoids. The clinical toxicity of MDMB-4en-PINACA remains poorly characterized; however, it demonstrates high potency in vitro and has been identified in postmortem forensic toxicology testing, suggesting the potential for substantial clinical effects (*5*). It is important for members of the public and health care professionals to be aware that tianeptine is an unregulated drug sold under several product names (e.g., Neptune's Fix, Pegasus, and Zaza) that

*45 C.F.R. part 46.101(c); 21 C.F.R. part 56.

†https://www.fda.gov/drugs/drug-safety-and-availability/fda-warns-consumers-not-purchase-or-use-neptunes-fix-or-any-tianeptine-product-due-serious-risks

can produce adverse effects and dependence. Readily purchased tianeptine products might be adulterated with SCRAs or other drugs and can produce severe clinical effects.

TABLE. Substances identified in six samples of Neptune's Fix obtained from two patients reported to the New Jersey Poison Information and Education System's Toxicall database — New Jersey, June 17–November 6, 2023

Patient and sample description	Compounds identified*
Patient A	
Neptune's Fix, open bottle	Kavain Tianeptine
Neptune's Fix, closed bottle	ADB-4en-PINACA† CBD MDMB-4en-PINACA† THC Tianeptine
Neptune's Fix, open bottle	Kavain Tianeptine
Neptune's Fix, open bottle	ADB-4en-PINACA† CBD MDMB-4en-PINACA† THC Tianeptine
Patient B	
Neptune's Fix, open bottle	Kavain Tianeptine
Neptune's Fix, open bottle	Kavain Tianeptine

Abbreviations: ADB-4en-PINACA = N-(1-amino-3,3-dimethyl-1-oxobutan-2-yl)-1-(pent-4-en-1-yl)-1H-indazole-3-carboxamide; CBD = cannabidiol; MDMB-4en-PINACA = methyl 3,3-dimethyl-2-(1-(pent-4-en-1-yl)-1H-indazole-3-carboxamido) butanoate; THC = tetrahydrocannabinol.

* Samples were analyzed at the Center for Forensic Science Research and Education (https://www.cfsre.org) using an Agilent Technologies (https://www.agilent.com) gas chromatograph mass spectrometer and a Sciex (https://www.sciex.com) liquid chromatograph quadrupole time-of-flight mass spectrometer.

† Synthetic cannabinoid receptor agonist.

Summary

What is already known about this topic?

Tianeptine, an antidepressant not approved for use in the United States by the Food and Drug Administration, is readily purchased in elixir formulations online or at gas stations and convenience stores.

What is added by this report?

Twenty cases of tianeptine ingestion associated with severe clinical effects were reported in New Jersey during June–November 2023, representing a sharp increase from the poison center's baseline of two or fewer exposure calls per year.

What are the implications for public health practice?

It is important for members of the public and health care professionals to be aware that readily purchased tianeptine products might be adulterated with synthetic cannabinoid receptor agonists or other drugs and can produce severe adverse effects.

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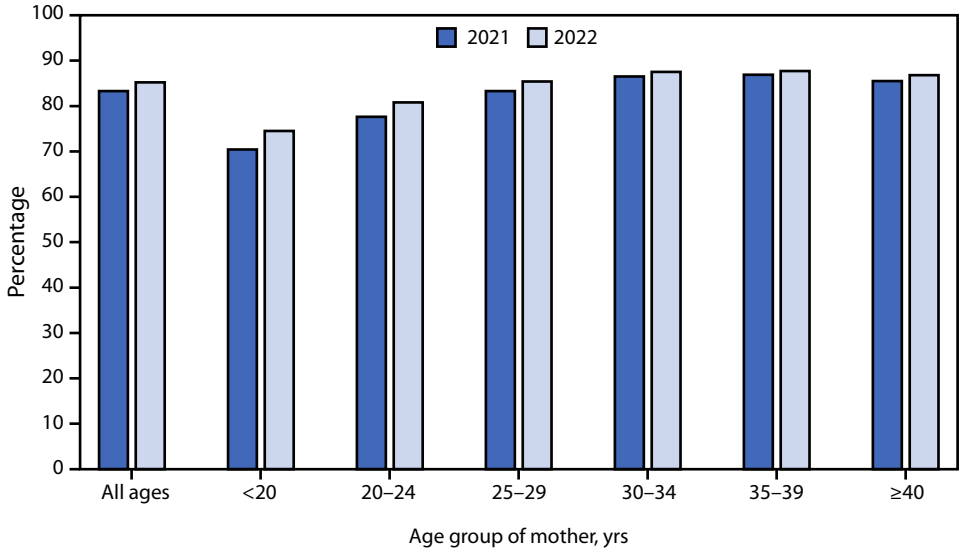
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Newborns Breastfed Between Birth and Discharge* from Hospital, by Maternal Age — National Vital Statistics System, 49 States† and the District of Columbia, 2021 and 2022



* Breastfed between birth and discharge from hospital is defined as a newborn who received breast milk or colostrum during the period between birth and discharge from the hospital.
† California does not report breastfeeding on birth certificates; approximately 11% of U.S. births in 2022 were to residents of California.

Among 49 states and the District of Columbia, the percentage of newborns breastfed between birth and discharge from the hospital increased from 83.3% in 2021 to 85.2% in 2022. Increases were observed for each maternal age group; the largest increases occurred among younger maternal age groups (70.4% to 74.5% among mothers aged <20 years and 77.6% to 80.8% among mothers aged 20–24 years). Despite the recent increases in initiation of breastfeeding at birth among younger mothers, older mothers were still more likely to breastfeed their newborns (86.8% of those aged ≥40 years versus 74.5% of mothers aged <20 years).

Source: National Center for Health Statistics, National Vital Statistics System, Natality Data, 2021 and 2022. https://www.cdc.gov/nchs/nvss/births.htm

Reported by: Michelle J.K. Osterman, MHS, MOsterman@cdc.gov.

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