U.S. Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 74 / No. 31
August 21, 2025

Reoccurring *Salmonella* Cotham Outbreak Linked to Pet Bearded Dragons — United States, 2024

Lingzi Xiaoli, PhD[1]; Paula Huth, MPH[2]; Cassandra Sherman, MPH[3]; Danielle Wroblewski, MS[2]; Stacy Anderson[4]; Lindsey Ferraro, MPH[5]; Dee Jones, DVM[5]; Molly Slaughter, MPH[6]; Brenda Morningstar, MS[7]; Tonya Mackie[7]; Natalee Bowen[8]; Molly Leeper, MPH[1]; Katie Werner, MPH[1]; Katharine Benedict, DVM, PhD[1]; Kate Varela, DVM[1]

Abstract

In April 2024, CDC's PulseNet identified a cluster of seven *Salmonella* Cotham cases from five states. Isolates were highly related by whole genome sequencing (WGS), and one patient reported contact with a pet bearded dragon. CDC initiated a multistate investigation and as of December 10, 2024, an additional 19 cases had been identified, for a total of 26 confirmed cases from 13 states; state public health partners identified one probable case in an additional state for a total of 27 cases. Eighteen of 25 cases (72%) were among persons who reported contact with a bearded dragon or lizard. Children aged <5 years, especially infants, were disproportionately affected, accounting for 17 (65%) of the 26 confirmed cases; most had bearded dragons in the home without direct animal contact. WGS of two bearded dragon specimens collected in 2024 and three bearded dragon specimens collected during 2012–2014 confirmed genetic relatedness of this rare *Salmonella* strain and continued circulation among commercially sold bearded dragons. CDC implemented a One Health approach in response, working with pet industry representatives to disseminate information about biosecurity best practices to bearded dragon suppliers and retailers. Investigators contacted a common bearded dragon supplier identified in the traceback investigation to share biosecurity and prevention recommendations. CDC used social media and a website investigation notice to inform the public, recommending that caregivers prevent young children from indirect reptile contact by restricting reptiles from roaming freely, separating reptiles and supplies from food preparation areas, and washing hands and changing clothes after handling reptiles and before holding infants.

Investigation and Outcomes

Identification of First Seven Cases

In April 2024, CDC's PulseNet* (*1*), the national molecular subtyping network for enteric disease surveillance, identified a cluster of seven *S.* Cotham illnesses from five states; isolates from these cases were found by WGS to be highly related. *S.* Cotham, a rare *Salmonella* serotype, was linked to bearded dragons during a 2012–2014 outbreak involving 160 patients from 35 states (*2*). In the 2024 cluster of seven patients, one patient reported contact with a pet bearded dragon, indicating a potentially reoccurring *S.* Cotham strain (i.e., a strain causing acute outbreaks separated by periods when illnesses are not detected).† CDC initiated a multistate investigation to identify additional cases and exposures (*3*).

* Outbreak Detection | PulseNet | CDC
† Reoccurring, Emerging, and Persisting Enteric Bacterial Strains | Foodborne outbreaks | CDC

Continuing Education examination available at https://www.cdc.gov/mmwr/mmwr_continuingEducation.html

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

WGS Identification of Additional Cases and Animal Investigations

PulseNet data analysts monitored the PulseNet database for additional *S.* Cotham illnesses related by WGS. State and local health departments conducted initial routine interviews as patients with *S.* Cotham infection were identified. Those who reported recent reptile contact were reinterviewed by administration of a standardized supplemental questionnaire that collected additional information, including detailed reptile exposure information. The supplemental questionnaire included questions regarding reptile species, behavioral practices, ownership, and purchase location, which investigators used to gather bearded dragon retailer and supplier traceback information. Initial routine interviews and interviews with the supplemental questionnaire were attempted for the seven patients initially identified by PulseNet and any additional patients identified throughout the investigation. State and local health departments conducted animal and environmental sampling at patient residences for those who reported owning a bearded dragon and were willing to have their pet tested for *Salmonella*. In a collaborative effort, the U.S. Department of Agriculture's National Veterinary Services Laboratory performed WGS in 2024 of bearded dragon isolates collected during the 2012–2014 outbreak. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[§]

[§] 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.

As of December 10, 2024, when the investigation was closed, PulseNet had identified an additional 19 cases, for a total of 26 confirmed cases in 13 states (Table 1) using WGS, and state public health partners identified one probable[¶] case in an additional state for a total of 27 cases in 14 states.

Characteristics of Patients with Confirmed and Probable Cases

A confirmed case was defined as *S.* Cotham infection with a fecal, urine, or blood isolate related to outbreak cluster isolates, and isolation dates on or after January 11, 2024. Observed allele differences among isolates ranged from 0 to 13 and were based on core genome multilocus sequence typing (cgMLST), a WGS-based analysis method used to compare the genomes of bacterial strains (*4*). Confirmed case illness onset dates ranged from January 8 to October 31, 2024. Median patient age among 26 of the 27 cases with known ages was 1 year (range = ≤1–67 years). Seventeen of 26 patients (65%) with confirmed illness were children aged <5 years; 13 (50%) were infants aged <1 year. Ten of 24 patients (42%) with confirmed illness were hospitalized; hospitalization status was unknown for two patients with confirmed illness. Thirteen of 14 patients with confirmed illness who completed supplemental questionnaires reported gastrointestinal symptoms including diarrhea.

[¶] A probable case of *S.* Cotham infection is the occurrence of clinical signs consistent with salmonellosis on or after January 11, 2024, in a person with exposure to a bearded dragon, and polymerase chain reaction–confirmed *Salmonella* positive test result with no isolate available for WGS. In the probable instance, feces of the bearded dragon owned by this patient were tested and resulted in isolation of the *S.* Cotham outbreak strain.

The *MMWR* series of publications is published by the Office of Science, U.S. Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

Suggested citation: [Author names; first three, then et al., if more than six.] [Report title]. MMWR Morb Mortal Wkly Rep 2025;74:[inclusive page numbers].

TABLE 1. Demographic characteristics of patients* with *Salmonella* Cotham illnesses linked to bearded dragons, among patients aged ≤1–67 years — United States, 2024

Characteristic	No. (%)
Sex (n = 26)	
Female	17 (65)
Male	9 (35)
Race (n = 25)	
Black or African American	3 (12)
White	17 (68)
More than one race reported	2 (8)
No race reported	2 (8)
Unknown	1 (4)
Ethnicity (n = 26)	
Hispanic or Latino	7 (27)
Non-Hispanic	18 (69)
Unknown	1 (4)
State of residence (n = 27)	
Alabama	1 (4)
California	2 (7)
Colorado	1 (4)
Georgia	3 (11)
Iowa	1 (4)
Minnesota	1 (4)
New York	4 (15)
North Carolina	2 (7)
Ohio	4 (15)
Oklahoma	2 (7)
Pennsylvania	2 (7)
Tennessee	1 (4)
Texas	2 (7)
Washington	1 (4)
Hospitalization (n = 24)	
Yes	10 (42)
No	14 (58)

* Patients had confirmed (26) or probable (one) infection. A confirmed case was defined as a fecal, urine, or blood *Salmonella* Cotham isolate related to outbreak cluster isolates with isolation dates on or after January 11, 2024. A probable case was defined as the occurrence of clinical signs consistent with salmonellosis on or after January 11, 2024, in a person with exposure to a bearded dragon, and a polymerase chain reaction–confirmed *Salmonella* positive test result with no isolate available for whole genome sequencing. Age, sex, race, ethnicity, and hospitalization data were not available for the probable case. Race information was missing for one confirmed case, and hospitalization status was unknown for two confirmed cases.

A probable case of *S.* Cotham infection was defined as the occurrence of clinical signs consistent with salmonellosis on or after January 11, 2024, in a person with exposure to a bearded dragon, and polymerase chain reaction–confirmed *Salmonella* positive test result but with no isolate available for WGS; however, in the one identified probable case, feces of the bearded dragon owned by the patient was tested and resulted in isolation of the *S.* Cotham outbreak strain. Detailed demographic and illness outcome information were not available for the patient with probable infection.

Reptile Exposures

Detailed reptile exposure information was ascertained from the initial public health interview and supplemental questionnaire. In the initial interview, 18 of 25 patients (72%) reported a reptile in the household where they lived or visited within 7 days before illness onset; 11 of the 18 patients were aged <5 years. Reported reptile species included 17 bearded dragons and one lizard without species information that was associated with a patient aged <1 year. Of the 18 patients who reported a reptile in the household, nine proxies (i.e., parents or caregivers of patients aged <5 years) from separate families reported that their children did not have direct contact with the bearded dragon or lizard (i.e., did not pet, touch, or hold the reptile; did not feed the reptile by hand; and were not licked, scratched, or bitten by the reptile) but had contact with caregivers or household members who touched or held the bearded dragon or touched its enclosure (Table 2). Parent responses also indicated bearded dragon contact among children aged <5 years occurred via indirect animal contact, defined as exposure to contaminated areas where animals lived and roamed, contaminated objects or surfaces, or contact with a person (e.g., a parent or caregiver) who had contaminated hands or clothing, but not the animal itself.

Ten patients or their proxies who reported reptile exposure were reinterviewed with the supplemental questionnaire to obtain information on reptile ownership and practices, including one parent representing each of six patients aged <5 years from different households. Two of the six parents reported that the bearded dragon in each respective household was allowed to roam freely, with one specifying the reptile was allowed in bed. Four parents provided information on hand hygiene behaviors, with two parents reporting always washing their hands after handling bearded dragons and two reporting almost always. Two parents reported cleaning baby bottles and bearded dragon supplies in the same sink. All six parents of patients aged <5 years who were reinterviewed with the supplemental questionnaire reported they did not have prior knowledge of reptile-associated salmonellosis and were unaware that reptiles can transmit *Salmonella*.

Bearded Dragon Sampling Results and Supplier Traceback

Analysis of fecal, rectal, and environmental specimens collected from two bearded dragons and their habitat in the 2024 outbreak, representing two different patient households in Alabama and Minnesota, resulted in three *S.* Cotham isolates that matched the outbreak strain. WGS using PulseNet's predefined cgMLST allele scheme (*4*) demonstrated that five *S.* Cotham isolates obtained from individual bearded dragons during the 2012–2014 (three) and 2024 (two) investigations were closely genetically related (i.e., within 0–13 allele differences by cgMLST) to each other and to clinical isolates (26) collected during the 2024 investigation (Figure). Traceback information gathered through the supplemental questionnaire

TABLE 2. Bearded dragon reported in household, by age group and reported contact type, during *Salmonella* Cotham investigation — United States, 2024

		Bearded dragon in household			Contact type among persons with bearded dragon in household*		
Age group, yrs	No. (%)	No	Unknown	Yes	Direct†	Indirect§	Unknown¶
<1	13 (50)	6	—	7**	—	6	1
1–4	4 (15)	—	—	4	—	3	1
5–18	4 (15)	—	—	4	1	3	—
19–39	2 (8)	—	1	1	1	—	—
40–64	2 (8)	1	—	1	1	—	—
65–67	1(4)	—	—	1	1	—	—
Total	**26 (100)**	**7**	**1**	**18**	**4**	**12**	**2**

* Contact type for the 18 instances of known reptile exposure refers to how the reptile exposure occurred: direct, indirect, or unknown type, ascertained by information shared by the patient or proxy (i.e., parent or caregiver) during the initial public health interview or responses to the supplemental reptile exposure questionnaire.
† Direct contact refers to exposure to the saliva, blood, urine, mucous, feces, or other body fluids of an infected animal that occurs when people pet, touch, or hold an animal, feed an animal by hand, or are licked, scratched, or bitten by an animal.
§ Indirect contact is defined as exposure to areas where animals live and roam, or contaminated objects or surfaces, and not the animal itself. Indirect contact might also include contact with another person (e.g., a parent or caregiver) who has contaminated hands or clothing.
¶ The parents of two patients aged <1 year reported having a bearded dragon in the household during the initial interview but were lost to follow-up for reinterview with the supplemental reptile exposure questionnaire, and no additional information was available to determine if the patients had direct or indirect contact.
** The parent of one patient aged <1 year reported their infant was in a household with a lizard of unknown species.

indicated that recently purchased bearded dragons within the households of four 2024 patients shared a common bearded dragon supplier. This 2024 common supplier was not identified during the 2012–2014 investigation, and information was not available to determine whether this common supplier sourced bearded dragons or breeding stock from breeders that were identified during 2012–2014.

Discussion

This report describes an outbreak of illnesses of *S.* Cotham linked to bearded dragons 10 years after *S.* Cotham was first found to be associated with gastrointestinal illness from bearded dragon exposure (*2*). Epidemiologic, laboratory, and traceback evidence all support household exposure to pet bearded dragons as the *S.* Cotham source. During the 10 years since the 2012–2014 outbreak, the genetic diversity of *S.* Cotham might have been expected to expand; however, no other *S.* Cotham clusters were detected. Given that *S.* Cotham is a rare *Salmonella* serotype and known to be previously linked to reptile exposure, the close genetic relatedness among isolates collected during 2012–2014 and 2024 indicate a potential reoccurrence of the strain and common vehicle across both investigations. The reasons for reoccurrence of this strain in bearded dragons is unclear, underscoring the need for a better understanding of pet supply chains and the ecology of *Salmonella* in these environments.

Infants aged <1 year were disproportionately affected in this outbreak (50%) compared with a 10-year summary of multistate reptile- and amphibian-associated non-Cotham salmonellosis outbreaks in which 19% of patients were aged <1 year (*5*). Parent responses to reptile exposure questions indicated that most exposures among children aged <5 years occurred via indirect animal contact (Table 2). Caregivers can prevent young children from indirect reptile contact by restricting reptiles from roaming freely; separating reptiles and supplies from food preparation areas; and after handling reptiles, washing hands and changing clothes before holding infants and young children.

A multicomponent One Health** approach in response to this outbreak was implemented. Investigators alerted pet industry representatives to disseminate information about the outbreak and biosecurity best practices to their national network of bearded dragon suppliers and retailers. Investigators also contacted the common supplier to share biosecurity and

Summary

What is already known about this topic?

Bearded dragons have been linked to *Salmonella* outbreaks, including a 2012–2014 *Salmonella* Cotham outbreak involving 160 patients in 35 states.

What is added by this report?

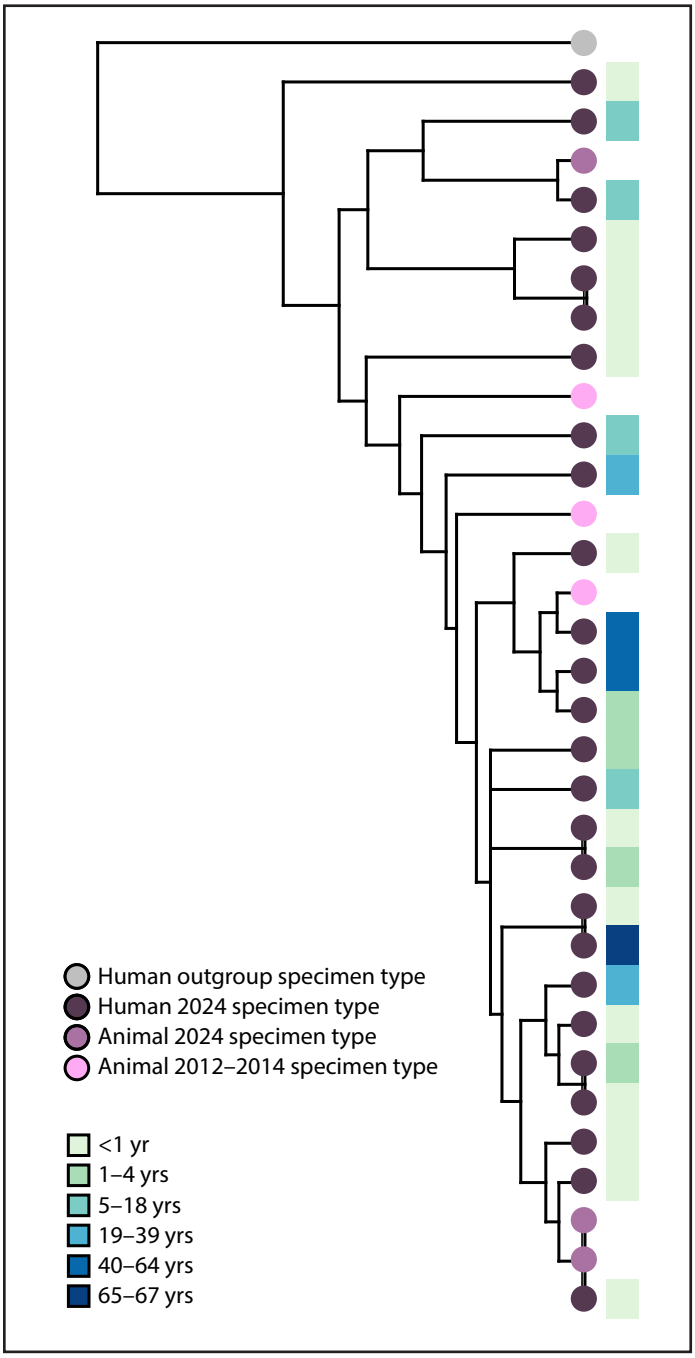
Twenty-seven cases (26 confirmed and one probable) of *S.* Cotham infection were identified during January 11–December 10, 2024. Eighteen reported cases were among persons with household exposure to bearded dragons; *S.* Cotham isolates from two bearded dragons kept in two patient households were closely genetically related to each other, to 2012–2014 isolates, and to clinical isolates from the 26 confirmed cases. Children aged <5 years, especially infants, were disproportionately affected.

What are the implications for public health practice?

Bearded dragons pose a continued risk for *Salmonella* infection. Owners might reduce the risk by limiting reptiles' free roaming and by washing hands and changing clothing after handling the reptile and before interacting with an infant or young child.

** One Health | CDC

FIGURE. Phylogenetic tree* of 32 genetically closely related *Salmonella* Cotham isolates belonging to two outbreaks linked to bearded dragons, by age group and specimen type — United States, 2012–2014 and 2024



Abbreviation: cgMLST = core genome multilocus sequence typing.

* This phylogenetic tree was constructed using the PulseNet 2.0 cgMLST allele scheme and annotated in iTOL (version 5). All outbreak-associated isolates are related to each other within 0–13 alleles by cgMLST, with the outgroup isolate differing by up to 42 alleles. The tree demonstrates overlap in genetic relatedness between the 2012–2014 outbreak and the 2024 outbreak. One *Salmonella* Cotham outgroup, distinct from the outbreak cluster based on its larger cgMLST allele differences, is included to root the tree and illustrate evolutionary differences in the outbreak isolates.

prevention recommendations including best practices for record keeping, cleaning and disinfection, employee education, and providing educational materials for customers (*6*). Pediatricians are encouraged to include a question on patient information forms that asks if reptiles are kept in the household to flag a conversation about *Salmonella* prevention (*6*) and to share educational handouts (e.g., Pet Patient Handout) with parents and caregivers of young children. Veterinarians are also encouraged to educate reptile owners about zoonotic disease risks and prevention measures. CDC used social media and a website investigation notice to inform the public, including an Instagram post that received 151,133 impressions and leveraged engagement from a popular television series, to uniquely reach a different audience than typical posts. Parents and caregivers can prevent young children from indirect reptile contact by restricting reptiles from roaming freely; separating reptiles and supplies from food preparation areas; and after handling reptiles, washing hands and changing clothes before holding infants and young children. Physicians, veterinarians, and pet industry professionals are encouraged to share infection risk information and prevention recommendations to help owners safely enjoy their pets without becoming ill (*3*,*6*).

Acknowledgments

All other outbreak states (California, Colorado, Georgia, Iowa, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Texas, and Washington); Amanda Fredal, Pet Supplies Plus; Amanda Ingram, Rachel Tulibagenyi, Alabama Department of Public Health; Heather Walz, Alabama Department of Agriculture and Industries.

Corresponding author: Kate Varela, kvarela@cdc.gov.

[1]Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [2]New York State Department of Health; [3]New York State Department of Health, Buffalo, New York; [4]Southeastern District Health Department, Dothan, Alabama; [5]Alabama Department of Public Health; [6]Minnesota Department of Health; [7]National Veterinary Services Laboratories, Animal and Plant Health Inspection Service, U.S. Department of Agriculture, Ames, Iowa; [8]ASRT Inc., Atlanta, Georgia.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Tolar B, Joseph LA, Schroeder MN, et al. An overview of PulseNet USA databases. Foodborne Pathog Dis 2019;16:457–62. PMID:31066584 https://doi.org/10.1089/fpd.2019.2637
2. Kiebler CA, Bottichio L, Simmons L, et al. Outbreak of human infections with uncommon *Salmonella* serotypes linked to pet bearded dragons, 2012-2014. Zoonoses Public Health 2020;67:425–34. PMID:32304287 https://doi.org/10.1111/zph.12701
3. CDC. *Salmonella* infection (Salmonellosis): *Salmonella* outbreak linked to pet bearded dragons–June 2024. Atlanta, GA: US Department of Health and Human Services, CDC; 2024. https://www.cdc.gov/salmonella/outbreaks/cotham-06-24/

4. Leeper MM, Tolar BM, Griswold T, et al. Evaluation of whole and core genome multilocus sequence typing allele schemes for *Salmonella enterica* outbreak detection in a national surveillance network, PulseNet USA. Front Microbiol 2023;14:1254777. PMID:37808298 https://doi.org/10.3389/fmicb.2023.1254777
5. Waltenburg MA, Perez A, Salah Z, et al. Multistate reptile- and amphibian-associated salmonellosis outbreaks in humans, United States, 2009-2018. Zoonoses Public Health 2022;69:925–37. PMID:36345968 https://doi.org/10.1111/zph.12990
6. Varela K, Brown JA, Lipton B, et al. A review of zoonotic disease threats to pet owners: a compendium of measures to prevent zoonotic diseases associated with non-traditional pets: rodents and other small mammals, reptiles, amphibians, backyard poultry, and other selected animals. Vector Borne Zoonotic Dis 2022;22:303–60. PMID:35724316 https://doi.org/10.1089/vbz.2022.0022

Rabies Outbreak in an Urban, Unmanaged Cat Colony — Maryland, August 2024

Sarah Ludmer, MSN/MPH[1,2]; David Crum, DVM[2]; Ryan Wallace, DVM[3]; Jeré Hutson, MPH[2]

Abstract

Exposure to a rabid animal is a life-threatening emergency because infection is almost always fatal if rabies postexposure prophylaxis (PEP) is not initiated promptly. In August 2024, the Maryland Department of Health was notified that an aggressive feral cat had been captured and euthanized and had subsequently received a positive test result for rabies. The cat was part of a group of approximately 20 local feral cats and kittens that was receiving no, or little, human care (i.e., an unmanaged cat colony). Cecil County (Maryland) Health Department and the Maryland Department of Health coordinated with Cecil County Animal Services, Cecil County Emergency Services, and CDC to identify and interview persons potentially exposed to the rabid cat, which included a novel use of reverse 911 messaging. Three persons were identified who had been exposed, and all received PEP. No human rabies cases occurred. Three additional cats from the colony were captured and euthanized; their rabies test results were negative. Unmanaged cat colonies pose public health risks, and extensive resources might be required to prevent negative health outcomes. Cat colony management, including activities to maintain high rabies vaccination coverage within colonies, can help to mitigate these risks. A better understanding of urban cat ecology and its role in rabies transmission and human exposure is needed.

Introduction

Exposure to a rabid animal is a life-threatening emergency; infection is almost always fatal if rabies postexposure prophylaxis (PEP), which includes wound care and vaccination (without or with rabies immunoglobulin, according to indications) is not initiated promptly. In the United States, cats are the most frequently reported rabid domestic animal. Each year, approximately 200–300 cats are reported to have rabies (*1*). In Maryland, feral cats accounted for 10% of all reported rabid animals in 2023.* While rabid cat identification is relatively high among domestic animals, over 90% of animal rabies cases occur among wild animals such as racoons, foxes, bats, and skunks (*1*). Fewer than 10 human rabies deaths are reported each year in the United States.†

Feral cats often live in colonies, groups usually comprising female cats and their kittens. Cat colonies can be managed or unmanaged. Managed colonies have a designated caretaker or a community program tending to the colony, providing veterinary services including spaying, neutering, and vaccination. Unmanaged colonies are typically either informally cared for by local residents or receive no human care.

Investigation and Results

Identification of Rabid Cat

On August 13, 2024, the Maryland Department of Health (MDH) was notified by the Cecil County (Maryland) Health Department (CCHD) that an aggressive feral cat from an unmanaged urban cat colony was found outside a hotel in northeast Maryland. Clinical signs were first observed on August 8, when the cat became aggressive and bit or scratched two local residents. The cat was captured on August 8 or 9 by local animal control and euthanized; 2 days later, the brain tissue tested positive at the state public health lab for rabies. A kitten from the same colony, which displayed similar behaviors, had been most recently seen by hotel staff members on August 13, suggesting that other cats in the colony might have also been rabid during this period.

Response Activities

CCHD and MDH coordinated with Cecil County Animal Services, Cecil County Emergency Services, and CDC to identify persons potentially exposed to the rabid cat and provide PEP if indicated. Because cats and other domestic animals can shed rabies virus for up to 10 days before onset of clinical signs (*2*), the potentially infectious period was determined to be July 29–August 13. Investigators initiated trapping activities and identified three groups of potentially exposed persons within this time frame: 1) hotel guests and staff members, 2) persons experiencing homelessness near the hotel, and 3) community members living near the hotel. This activity was reviewed by CDC, deemed not research, and conducted consistent with applicable federal law and CDC policy.§

Hotel Guests. To facilitate outreach to potentially exposed hotel guests, reservation records for hotel stays that occurred during the cats' infectious period were reviewed, and the name and contact information for the reservation holder were collected. Investigators collaborated with the rabies points of contact for health departments in U.S. states and Canada

* Laboratory Confirmed Animal Rabies in Maryland, 2023
† Rabies | Animal Rabies Surveillance in the U.S. | CDC

§ 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.

for out-of-town hotel guests who might have been exposed. Contacted U.S. states were asked to estimate the human resource investment associated with the response.

Hotel guests who were Maryland residents were contacted via telephone or certified letter by their local health department to determine their rabies exposure risk. Maryland investigators asked a series of questions to ascertain 1) whether exposure had occurred and 2) whether PEP was indicated, including identifying any interaction with the rabid cat; exposure to the animal through bites, scratches, or other interactions; and history of previous rabies vaccination. An email was sent to out-of-state rabies points of contact at the state health department to apprise them of the rabies risk and request that they conduct rabies exposure risk assessments for their residents who had stayed at the hotel. CDC contacted Canadian public health officials to inform them of potential exposures among Canadian residents who had stayed at the hotel.

Local Residents. A reverse 911[¶] message was sent to all Cecil County mobile telephone subscribers to aid in identification of potentially exposed persons who lived in the local area but who had not stayed at the hotel. The message included a description of the situation and advised recipients to contact CCHD immediately if they, or anyone they knew, might have been exposed to cats or kittens from the colony or if they were aware of another animal that might have been exposed.

Persons Experiencing Homelessness and Walk-In Health Centers. According to hotel staff members and the CCHD special populations team, which provides community-based support to marginalized community members, at least three persons experiencing homelessness were determined to have been staying near the hotel during the cat's infectious period. The CCHD special populations team worked to reach as many persons experiencing homelessness in the area as possible. The teams also notified nearby walk-in health centers and advised them to contact CCHD should any patients arrive with complaints of a recent animal bite or scratch. State partners were asked to provide estimates of the time needed to complete their outreach and investigations.

Identification of Exposed Persons

Review of hotel records identified 309 potentially exposed persons (hotel guests and staff members), including 107 (35%) Maryland residents from 10 local health jurisdictions and 202 (65%) persons from 27 U.S. states and Canada. MDH confirmed that 197 (63.8%) of these persons completed risk assessments. No additional exposures were identified among hotel guests. The two known persons with bite or scratch exposure received PEP[**] at a local emergency department on August 13.

CCHD received one phone call in response to the reverse 911 message; however, assessment revealed that no rabies exposure had occurred. Trusted community partners contacted two persons experiencing homelessness who were potentially exposed; one of these persons was determined to have been exposed on August 9 and received PEP on August 18. Thus, a total of three exposed persons were identified. None of the three persons have developed signs consistent with rabies to date. Among 29 jurisdictions involved, 17 (58.6%) provided personnel time estimates, totaling 450 hours.

Additional Public Health Response

Local officials determined that the rabid cat was part of an unmanaged colony of approximately 20 cats and kittens. Information from local residents indicated that community members were sporadically providing food or shelter to local feral cats and kittens. Thus, additional animal rabies cases among this colony might have occurred but were not reported.

Due to the concern for additional cats in the colony being rabid, Cecil County Animal Services assisted in the capture and testing of cats in the colony, although the size of the colony was not known. Three additional feral cats from the colony were captured within 3 weeks of identification of the index rabid cat. All three were euthanized and tested for rabies, and their test results were negative. In response to the reverse 911 message, residents living near the hotel reported frequently seeing and feeding feral cats in their area and at a nearby farm, providing insight into the potential size of the cat colony and what type of human care the cats received. The farm owners were contacted, via state dairy regulatory health personnel familiar to the farm owners, to determine whether residents or animals at the farm had been exposed and alert the owners to the situation; no exposures were identified.

Discussion

Each year, approximately 200–300 cats are reported to have rabies in the United States, making cats the most frequently reported rabid domestic animal (*1*). Feral cats are more likely to interact with wildlife that are reservoirs for rabies and are less likely than are owned pet cats to receive veterinary care. Therefore, feral cats pose a higher risk for human exposure to rabies than wildlife, given the higher likelihood that humans will approach cats (*3*,*4*). CDC estimates that PEP treatment

[¶] Reverse 911 messaging is a system used by emergency responders to send out alerts to residents in a specific geographic area by text message.

[**] PEP includes wound cleansing, and depending on previous vaccination status, human rabies immune globulin, and a series of doses of rabies vaccine. PEP should be administered as soon as possible after exposure and in accordance with CDC guidelines. Rabies Post-exposure Prophylaxis Guidelines | CDC

Summary

What is already known about this topic?

Cats are the most frequently reported rabid domestic animal in the United States, with approximately 200–300 reports each year.

What is added by this report?

In August 2024, identification of a rabid feral cat, initially thought to have potentially exposed 309 persons, led to administration of postexposure prophylaxis (PEP) to three persons.

What are the implications for public health practice?

Feral cats pose a rabies risk to local communities. Improved understanding of rabies transmission within cat colonies with subsequent human rabies exposure is needed. Public health engagement is required to educate the public about rabies prevention and health risks associated with feral cat populations and ensure prompt administration of rabies PEP when indicated.

associated with exposure to rabid or potentially rabid cats costs approximately $33 million each year (*3*,*5*).

In Maryland, 109 rabid cats have been reported since 2019. The CDC national rabies surveillance program, which receives reports of human and animal rabies cases from 54 state and territorial jurisdictions, does not track ownership status of cats (*1*). However, news reports and state records indicate that a substantial proportion of rabid cats are feral or cats in managed, urban colonies. Although cat rabies is a recognized problem in the United States, mass exposure events that necessitate large-scale, multistate contact tracing measures are rarely described in the literature. Improved understanding of urban cat ecology and the role of cats in rabies transmission and human exposure events is needed.

When cat colonies are managed, caretakers often attempt to maintain high rabies vaccination coverage and use sterilization programs to facilitate a natural phaseout of the colony (*6*). However, unmanaged cat colonies, such as the one described in this report, can pose public health risks and require extensive resources to prevent adverse human and animal health outcomes. These outcomes can persist indefinitely if natural breeding continues. Persons living in the vicinity of and engaging with the cat colony described in this report were at risk for bites, scratches, and rabies exposure. However, this interaction with the feral cat population also represents an opportunity to engage community members in a managed cat colony program, which could facilitate implementation of recommended strategies including spaying, neutering, and vaccination (*7*). Many jurisdictions have organizations or resources that provide guidance on proper cat colony management.

Outbreaks of deadly pathogens in urban environments potentially expose several population groups; this investigation required multiple outreach strategies, including accessing the international health regulations notification system,[††] special populations health care teams, trusted farming partners, and reverse 911 systems. Responses to rabid animal exposures also require substantial time from public health responders. Reverse 911 messaging helped provide public health responders with additional details related to the cat colony and additional potentially exposed groups, although it did not result in the identification of any additional exposed persons. Use of existing trusted community outreach partners and the commitment of CCHD staff members were crucial to ensuring that exposed persons, particularly those experiencing homelessness, received PEP.

Limitations

The findings in this report are subject to at least two limitations. First, not all states reported the total number of residents they had to reach to complete risk assessments or the results of those activities. Second, the human resource investment could only be estimated because not all states reported time estimates to MDH. Thus, both measures in this investigation are likely underestimated.

Implications for Public Health Practice

The U.S. feral cat population poses an ongoing risk to human health (*3*). Increased public education regarding the health risks posed by unmanaged cat colonies[§§] might reduce potential human exposure to rabies and other diseases.

[††] International Health Regulations (2005) | Third Edition | World Health Organization

[§§] Free-roaming Abandoned and Feral Cats | American Veterinary Medical Association

Acknowledgments

Tracy Anderson, Cole Aston, Crystal Benton, Rachel Churn, Rachelle Herman, Selena Lorden, Sharon Lubag, Bethany Otwell, Randy Schwandt, Cecil County Health Department.

Corresponding author: Sarah Ludmer, Sarah.Ludmer@maryland.gov.

[1]Division of Workforce Development, Public Health Infrastructure Center, CDC; [2]Maryland Department of Health, Baltimore, Maryland; [3]Division of High-Consequence Pathogens and Pathology, CDC.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Ma X, Boutelle C, Bonaparte S, et al. Rabies surveillance in the United States during 2022. J Am Vet Med Assoc 2024;262:1518–25. PMID:39059444 https://doi.org/10.2460/javma.24.05.0354
2. Rupprecht CE, Hanlon CA, Hemachudha T. Rabies re-examined. Lancet Infect Dis 2002;2:327–43. PMID:12144896 https://doi.org/10.1016/S1473-3099(02)00287-6
3. Fehlner-Gardiner C, Gongal G, Tenzin T, et al. Rabies in cats—an emerging public health issue. Viruses 2024;16:1635. PMID:39459967 https://doi.org/10.3390/v16101635
4. Roebling AD, Johnson D, Blanton JD, et al. Rabies prevention and management of cats in the context of trap-neuter-vaccinate-release programmes. Zoonoses Public Health 2014;61:290–6. PMID:23859607 https://doi.org/10.1111/zph.12070
5. Brunt S, Solomon H, Brown K, Davis A. Feline and canine rabies in New York State, USA. Viruses 2021;13:450. PMID:33802123 https://doi.org/10.3390/v13030450
6. Levy J, Wald D. Managing cat colonies. 5th International Symposium: non-surgical contraceptive methods of pet population control. Portland, OR: Alliance for Contraception in Cats & Dogs; 2013. https://www.humaneworld.org/sites/default/files/docs/managing-cat-colonies.pdf
7. Brown C, Slavinski S, Ettestad P, Sidwa TJ, Sorhage FE. Public veterinary medicine: public health: compendium of animal rabies prevention and control, 2016. JAVMA 2016;248:505–17. https://nasphv.org/Documents/NASPHVRabiesCompendium.pdf

Respiratory Syncytial Virus Immunization Coverage Among Infants Through Receipt of Nirsevimab Monoclonal Antibody or Maternal Vaccination — United States, October 2023–March 2024

Ellen O. Boundy, ScD[1,2]; Hannah Fast, MPH[1]; Tara C. Jatlaoui, MD[1,2]; Hilda Razzaghi, PhD[1,2]; LaTreace Harris, MPH[1]; Kimberly Nguyen, DrPH[1,2]; Jamie Mells, PhD[1,2]; Georgina Peacock, MD[1]; Carla L. Black, PhD[1]

Abstract

Respiratory syncytial virus (RSV) is the leading cause of infant hospitalization in the United States. A new RSV monoclonal antibody (nirsevimab) for infants and an RSV vaccine for pregnant women were recommended by the Advisory Committee on Immunization Practices in August and September 2023, respectively, to protect infants against RSV infection. Sufficient data have become available to allow estimates of infant RSV immunization coverage through administration of these products. Among infants born during October 2023–March 2024, infant RSV immunization coverage was estimated by summing the total number of infants who received nirsevimab and the number of women of childbearing age who received RSV vaccine, as reported to immunization information systems (IISs) in 33 U.S. states and the District of Columbia (DC), and dividing by the total number of live births, obtained from CDC Wide-ranging Online Data for Epidemiologic Research (WONDER) natality data. Across 33 states and DC, an estimated 29% of infants born during October 2023–March 2024 were immunized against RSV during the 2023–24 respiratory virus season, including 19% through infant receipt of nirsevimab and 10% through maternal RSV vaccination. Infant RSV immunization coverage through nirsevimab or maternal vaccination ranged from an estimated 11% to 53% by state. Among infants who received nirsevimab, 38% received it within the first week of life (0–6 days after birth). Continued efforts are needed to increase RSV immunization coverage among infants and pregnant women.

Introduction

Respiratory syncytial virus (RSV) is the leading cause of hospitalization among U.S. infants (*1*). On August 3, 2023, CDC's Advisory Committee on Immunization Practices (ACIP) recommended use of nirsevimab, a long-acting monoclonal antibody, for all infants aged <8 months born during or entering their first RSV season (October–March* for most of the continental United States) (*2*). On September 22, 2023, ACIP recommended administration of 1 dose of RSV vaccine (Abrysvo, Pfizer Inc.) to pregnant women at 32–36 gestational weeks during September–January (for most of the continental United States) to provide protection to infants aged <6 months through transplacental transfer of maternal antibodies (*3*). Only one of these products, either nirsevimab for the infant or vaccination for the mother, is recommended for each pregnant woman and her infant, except in rare instances (*3*). Since the approval of nirsevimab for infants and the maternal RSV vaccine, sufficient data have become available to allow estimates of infant RSV immunization coverage through administration of these products.

Immunization information systems (IISs) are confidential, population-based systems that collect immunization administration data from health care providers in a given U.S. jurisdiction.† Individual jurisdictions began submitting IIS data for all routine immunizations to CDC quarterly in 2023. These data include recipient demographic characteristics and administration information for each immunization provided, including information on child eligibility for the Vaccines for Children (VFC) program,§ which provides vaccines at no cost to uninsured and underinsured children through enrolled health care providers and includes coverage for nirsevimab.¶ In this report, data were analyzed to estimate the proportion of infants born during October 2023–March 2024 who received RSV immunization either through infant nirsevimab administration or maternal RSV vaccination during the 2023–24 respiratory virus season, among U.S. jurisdictions reporting IIS data to CDC. Several studies have reported on nirsevimab and maternal RSV vaccine use in the first season after their approval in a single U.S. hospital or state (*4*–*7*). This report is the first CDC analysis of RSV immunization coverage using a population-based data source for numerous states.

Methods

Data Source

IIS data were analyzed to assess 1) administration of nirsevimab during October 1, 2023–March 31, 2024, to infants born during this period and 2) administration of RSV vaccine

* Jurisdictions with RSV seasonality that differs from most of the continental United States are recommended to follow state, territorial, or local guidance on vaccination timing.

† Immunization Information Systems | CDC
§ About the Vaccines for Children Program | CDC
¶ CDC's Vaccines for Children Program Addendum: Special Considerations for Nirsevimab | CDC

(Abrysvo) during September 1, 2023–January 31, 2024, to women aged 18–49 years, according to recommended timelines (*2*,*3*). Women aged 18–49 years who received RSV vaccination were presumed to be pregnant because RSV vaccine is only recommended for women in this age group who are pregnant.

The total number of live births was obtained from CDC Wide-ranging Online Data for Epidemiologic Research (WONDER) natality data.** Data were collected from 36 jurisdictions (33 states, two localities [New York City and Philadelphia], and the District of Columbia [DC]) that submitted deidentified, line-level IIS data to CDC for immunizations received through March 31, 2024. IIS data from New York City and Philadelphia were combined with their state data from New York and Pennsylvania, respectively, for an analytic sample of 33 states and DC. Among these jurisdictions, two (Montana and Pennsylvania) have an opt-in consent policy both for children and adults that requires explicit consent to be provided for their data to be included in the IIS. Two other jurisdictions (New York and New York City) have opt-in consent policies only for adults aged ≥19 years. All other included jurisdictions have opt-out or mandatory inclusion policies.

Analysis

The overall and state-specific percentages of infants covered by one of the two RSV products were estimated by summing the number of infants who received at least 1 dose of nirsevimab and the total number of women aged 18–49 years who received at least 1 dose of RSV vaccine (as reported to the jurisdictional IIS) and dividing the total by the number of live births to women in this age group during October 2023–March 2024 (from CDC WONDER natality data), calculated by state. Percentages were also stratified by recipient characteristics, including age, month of immunization receipt, VFC program eligibility, and infant birth month. SAS software (version 9.4; SAS Institute) and Azure Databricks (Version 14.0, Databricks Runtime) were used to conduct all analyses. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.††

Results

Administration of Nirsevimab and Maternal RSV Vaccine

During the 2023–24 respiratory virus season, across 33 states and DC, 213,659 infants born during October–March received nirsevimab, and 119,879 women aged 18–49 years received RSV vaccine (Table) (Supplementary Table). The largest percentages of nirsevimab doses were administered to infants in December (20.6%), January (20.2%), and February (20.2%), and the largest percentages of maternal RSV vaccine doses were administered in December (31.6%) and January (36.2%).

TABLE. Number and percentage of infants immunized against respiratory syncytial virus through receipt of nirsevimab monoclonal antibody or maternal vaccination, by demographic characteristics — 33 states and District of Columbia,* October 2023–March 2024

Characteristic	No. (%)	
	Infants who received nirsevimab†	Pregnant women who received RSV vaccine§
Total, no.	**213,659**	**119,879**
Infant's age at nirsevimab receipt		
0–3 days	44,510 (20.8)	—
4–6 days	36,818 (17.2)	—
7 days–<1 mo	65,009 (30.4)	—
1 mo	33,160 (15.5)	—
2–5 mos	34,162 (16.0)	—
Mother's age at RSV vaccine receipt, yrs		
18–24	—	13,105 (10.9)
25–34	—	70,921 (59.2)
35–49	—	35,853 (29.9)
Immunization month and year		
Sept 2023	—	501 (0.4)
Oct 2023	9,096 (4.3)	10,235 (8.5)
Nov 2023	39,324 (18.4)	27,866 (23.2)
Dec 2023	44,095 (20.6)	37,938 (31.6)
Jan 2024	43,245 (20.2)	43,339 (36.2)
Feb 2024	43,142 (20.2)	—
Mar 2024	34,757 (16.3)	—
Vaccines for Children program eligibility¶		
Eligible	91,817 (43.0)	—
Ineligible	74,907 (35.1)	—
Unknown	46,935 (22.0)	—
Infant's birth month and year		
Oct 2023	47,020 (22.0)	—
Nov 2023	46,507 (21.8)	—
Dec 2023	40,941 (19.2)	—
Jan 2024	34,008 (15.9)	—
Feb 2024	27,377 (12.8)	—
Mar 2024	17,806 (8.3)	—

Abbreviation: RSV = respiratory syncytial virus.

* Includes Alaska, Arizona, Arkansas, California, Connecticut, Delaware, Florida, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nevada, New Mexico, New York, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

† Includes infants born during October 1, 2023–March 31, 2024, who received at least 1 dose of nirsevimab during October 1, 2023–March 31, 2024.

§ Includes women (defined in the Immunization Information Systems as persons whose sex was female) who were aged 18–49 years at the time of RSV vaccination and received the vaccine (Abrysvo) during September 1, 2023–January 31, 2024. These women were presumed to be pregnant because RSV vaccination is only recommended for women in this age group if they are pregnant.

¶ The Vaccines for Children program provides vaccines at no cost to uninsured and underinsured children through enrolled public and private health care providers.

Overall and State-Specific Percentages of Infants Immunized Through Nirsevimab or Maternal RSV Vaccination

Across 33 states and DC, 28.9% of infants born during October 2023–March 2024 were immunized through either

** CDC WONDER | Natality Information: Live Births | CDC

†† 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.

nirsevimab (18.5%) or maternal RSV vaccination (10.4%) (Figure 1) (Supplementary Table). By state, coverage ranged from 10.8% in Nevada to 53.1% in Vermont. Infant nirsevimab coverage ranged from 6.5% in Nevada to 34.9% in Alaska, and maternal RSV vaccination coverage ranged from 1.0% in Mississippi to 21.8% in Minnesota. Six states (Alaska, Connecticut, Maine, Minnesota, South Dakota, and Vermont) and DC reported that approximately one half of infants were immunized through either nirsevimab or maternal vaccination (range = 43.4%–53.1%), and four states (Florida, Mississippi, Nevada, and Oklahoma) reported that fewer than one fifth of infants were immunized (range = 10.8%–19.7%).

Nirsevimab Coverage During the Respiratory Virus Season

By infant birth month, nirsevimab coverage was 23.8% among infants born during October–November 2023 and decreased toward the end of the respiratory virus season to 9.2% among infants born in March 2024 (Figure 2). Among all infants who received nirsevimab, 38.1% of doses were administered within the first 6 days of life, 30.4% within 7 days–<1 month, and 31.5% at age ≥1 month. Infants born toward the end of the respiratory virus season who received nirsevimab were more likely to receive the antibodies within the first 3 days of life (45.5% of infants born in March) than were those born at the start of the season (6.2% of infants born in October).

Nirsevimab Coverage and VFC Program Eligibility

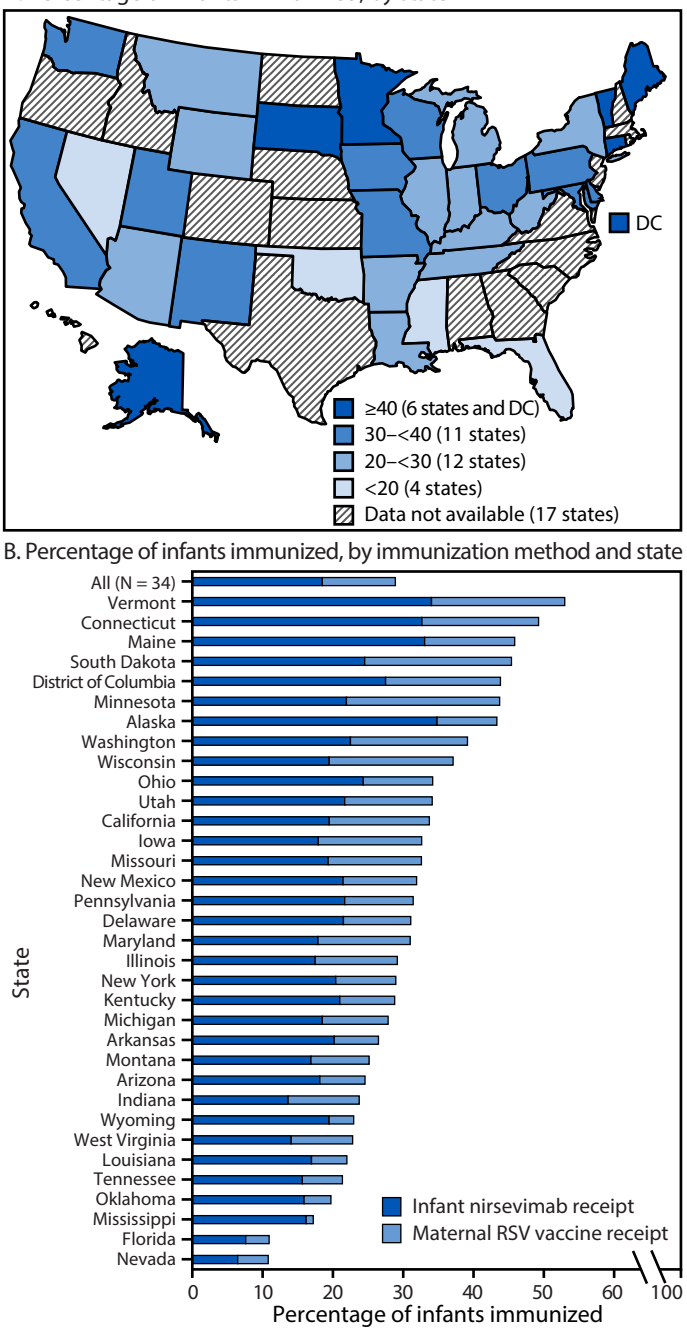
Among infants who received nirsevimab, 43.0% were eligible for the VFC program, 35.1% were not eligible, and 22.0% did not have VFC information available in IIS (Table). A lower percentage of infants who received nirsevimab within the first 3 days of life were eligible for the program (29.9%) than were those who received nirsevimab at age ≥1 month (50.3%) (Supplementary Figure).

Discussion

This report is the first analysis conducted at CDC to provide population-based estimates of the percentage of infants who were immunized against RSV in numerous U.S. states and to analyze the timing of immunization. IIS data from 33 states and DC found that during the first season after approval of nirsevimab for infants and an RSV vaccine for pregnant women, 28.9% of infants born during October 2023–March 2024 were immunized against RSV, either through receipt of nirsevimab or through maternal RSV vaccination. The percentages of infants covered varied widely by state, from 10.8% to 53.1%. Only 38.1% of infants who received nirsevimab received the antibodies within the first week of life (0–6 days after birth), the optimal timing for maximum protection.[§§]

[§§] RSV Immunization Guidance for Infants and Young Children | CDC

FIGURE 1. Percentage of infants* immunized against respiratory syncytial virus through receipt of nirsevimab† or maternal vaccination,§ by state (A) and method of immunization (B) — 33 states and District of Columbia, October 2023–March 2024



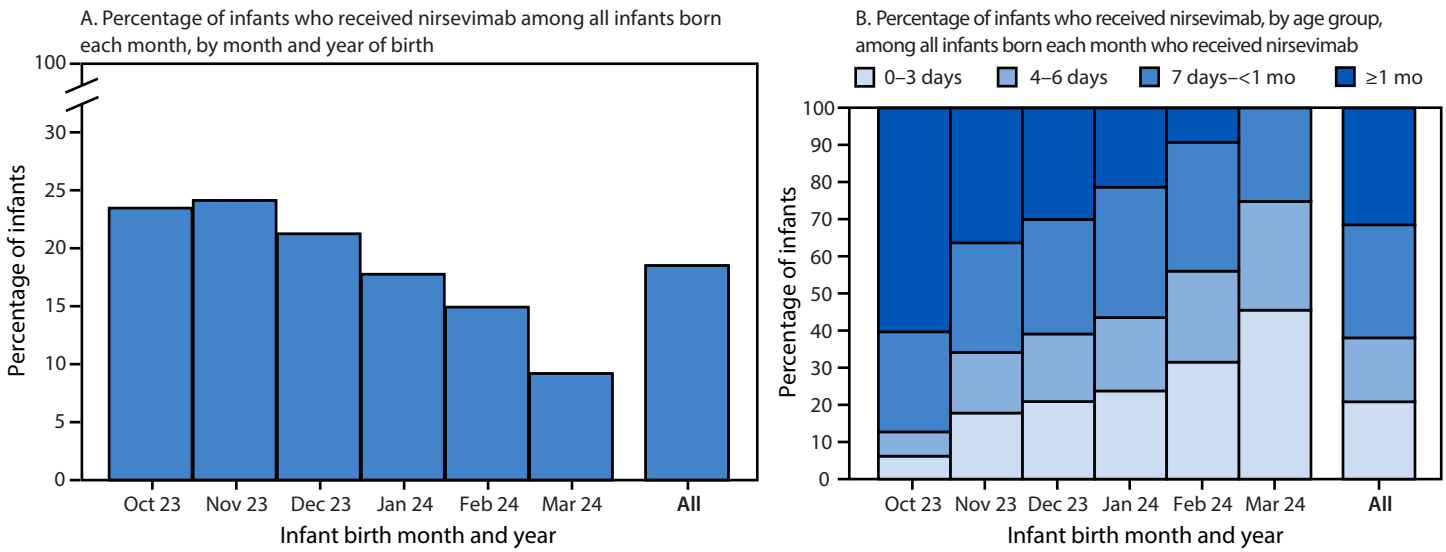
Abbreviations: DC = District of Columbia; RSV = respiratory syncytial virus.

* The denominator includes infants born during October 2023–March 2024 to mothers aged 18–49 years. Although infants born to younger and older mothers were not included for calculations of infant protection from RSV, nirsevimab doses received by these infants could not be identified and removed from the numerator.

† Calculated as the number of infants who received at least 1 dose of nirsevimab during October 1, 2023–March 31, 2024, divided by the number of infants born during October 2023–March 2024 to mothers aged 18-49 years.

§ Calculated as the number of women aged 18–49 years who received at least 1 dose of RSV vaccine (Abrysvo) during September 1, 2023–January 31, 2024, divided by the number of infants born during October 2023–March 2024 to mothers aged 18–49 years.

FIGURE 2. Percentage of infants immunized against respiratory syncytial virus through receipt of nirsevimab,* by month and year of birth (A) and age at immunization (B) — 33 states and District of Columbia,† October 2023–March 2024



* Calculated as the number of infants who received at least 1 dose of nirsevimab during October 1, 2023–March 31, 2024, divided by the number of infants born each month during October 2023–March 2024 to mothers aged 18–49 years.

† Includes Alaska, Arizona, Arkansas, California, Connecticut, Delaware, Florida, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nevada, New Mexico, New York, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming.

An analysis of data from an internet panel survey conducted by CDC during March 26–April 11, 2024, estimated that approximately double the percentage (55.8%) of U.S. infants received protection against RSV through maternal RSV vaccination and nirsevimab during the 2023–24 season as the percentage estimated in this report (*8*). Differences between the findings of that study and those in this report might be due to an overestimation of coverage in the survey (from self-selection bias, recall bias, or limited sample size) or an underestimation in IIS-based estimates of infant protection in some states because of jurisdictional policies and variation in reporting by immunization providers that might limit the capture of all immunizations administered.¶¶ Some RSV immunization providers, including birthing hospitals (those with more than one birth within the previous year or at least one registered maternity bed) and outpatient obstetric health care providers who administer immunizations less frequently, might not participate in their jurisdictional IIS, which might limit the data that were used in this report. Several other recent studies (*4–6*,*9*) also reported higher immunization coverage estimates than those in this report; however, most of those analyses were from a single institution or health care network with targeted interventions to promote RSV immunization. A population-based study in Wisconsin using IIS data reported coverage estimates similar to those in this report (36.2%) (*7*).

Several factors might have contributed to low RSV immunization coverage during the 2023–24 respiratory virus season. First, although nirsevimab was recommended in August 2023, supply issues limited its availability in some areas, particularly at the beginning of the season (*10*). Second, lack of familiarity among patients and providers about nirsevimab for infants and maternal RSV vaccine, as well as the complexity of the related pediatric and maternal recommendations, might have contributed to limited acceptance or delayed administration. Third, cost concerns might have also played a role. Private health insurers are allowed a 1-year grace period before they are required to cover ACIP-recommended vaccines under the Affordable Care Act.*** In addition, because nirsevimab might have been too expensive for some hospitals to include as part of routine newborn care, they might have opted not to stock it. Finally, this report only included immunizations administered during the ACIP-recommended months for most geographic areas (*2*,*3*); some doses might have been administered outside those months. Preliminary data from the 2024–25 respiratory virus season suggest RSV immunization coverage among infants aged <8 months through maternal vaccination or

¶¶ Immunization Information Systems Policy and Legislation | CDC

*** How to Pay for Vaccines | Adult Vaccines | CDC

nirsevimab increased to 57% nationally.[†††] Receipt of nirsevimab among infants during the first week of life was more common toward the end of the season, potentially indicating improvements in supply, administration in birthing hospitals, and increased familiarity with nirsevimab use, among other factors. Continued monitoring of when infants receive nirsevimab will be important during the upcoming respiratory virus season. Nirsevimab coverage by birth month decreased across the season, which might reflect shorter duration of eligibility to receive nirsevimab or increased opportunities for maternal vaccination among infants born later in the season.

The findings in this report indicate wide variation in both nirsevimab and maternal RSV vaccine use across U.S. states and DC. Differences in age at receipt of nirsevimab were also found according to infants' VFC eligibility status, with VFC-eligible infants less likely to receive nirsevimab within 3 days of birth, the period in which most infants are likely to be in a hospital after their birth. This might be an indication of a limited number of birthing hospitals being accredited as VFC providers. Despite ACIP approval occurring shortly before the respiratory virus season and challenges around nirsevimab supply and insurance reimbursement, in six states and DC in this analysis, ≥40% of infants were covered by one of the RSV immunization products. Another monoclonal antibody (clesrovimab) was also recently approved for use by the Food and Drug Administration and recommended by ACIP for infants aged <8 months who are not immunized through maternal vaccination, allowing additional options to provide infant immunization against RSV in upcoming seasons.[§§§] This baseline information from the first season after RSV immunization product approval can be used by pediatric and obstetric health care providers and public health professionals to guide focused immunization strategies for future respiratory virus seasons.

Summary

What is already known about this topic?

Respiratory syncytial virus (RSV) is the most common cause of hospitalization among U.S. infants. In 2023, a long-acting monoclonal antibody for infants (nirsevimab) and a maternal vaccine were recommended to prevent RSV among infants. In the same year, data from state- and jurisdiction-level immunization information systems (IISs) became available at CDC.

What is added by this report?

Cross-sectional analysis of data from IISs representing 33 states and the District of Columbia found that 29% of infants born during October 2023–March 2024 were immunized against RSV through receipt of nirsevimab or through maternal RSV vaccination during pregnancy in the 2023–24 respiratory virus season, the first season that these products were available. State-specific immunization coverage from nirsevimab or maternal vaccination ranged from 11% to 53%.

What are the implications for public health practice?

Continued efforts are needed to increase infant RSV immunization coverage and reduce associated morbidity. IISs are population-based data sources that can be used to monitor jurisdiction-level coverage.

Limitations

The findings in this report are subject to at least seven limitations. First, although adult women who received RSV vaccine (Abrysvo) were assumed to be pregnant, IIS data do not include pregnancy status. Therefore, inclusion of vaccinated women who were not pregnant would have resulted in an overestimation of coverage. Second, because maternal and infant records could not be linked through the deidentified IIS data reported to CDC, determining whether some infants received immunization coverage both through nirsevimab and maternal vaccination was not possible. The proportion of infants receiving immunization coverage was estimated by summing the total number of adult women who received RSV vaccine and the number of infants who received nirsevimab then dividing the total by the total number of live births. This might have led to overestimation of the numerator for infant coverage if a mother and infant collectively were immunized through both methods; however, this is only recommended in rare instances and has not been reported frequently in other studies (*5*,*7*,*9*). Third, IIS data do not identify multiple pregnancies (which account for approximately 3% of live births[¶¶¶]) or stillbirths (approximately 0.6% of births[****]). Thus, IIS dose data might not fully align with the denominator of live births by state. Fourth, although infants born to mothers aged <18 and >49 years were not included in the denominator for calculations of infant coverage, nirsevimab doses received by these infants could not be identified and removed from the numerator. This might have resulted in an overestimate of the percentage of infants covered; however, this is likely to represent a small number because births to adolescents and women aged ≥50 years represent a small proportion of total live births. Fifth, each jurisdiction's IIS data might not include all doses administered because of consent and provider reporting policies, particularly among adult populations. This might

[†††] The estimates in the following reference for the 2024–25 season include infants born April 2024–March 2025; therefore, the period is not strictly comparable to that in the current report, which includes infants born October 2023–March 2024. Implementation and Uptake of Nirsevimab and Maternal Vaccine for Infant Protection from RSV | CDC

[§§§] ACIP Recommendations | ACIP | CDC

[¶¶¶] Multiple Births | National Center for Health Statistics | CDC

[****] Data and Statistics on Stillbirth | Stillbirth | CDC

have led to an underestimation of numerators for estimates of infant coverage. Sixth, 22% of infant records were missing VFC eligibility status, limiting the ability to fully interpret those data. Finally, because these results are from 33 states and DC, they might not be generalizable to the entire U.S. population.

Implications for Public Health Practice

Additional efforts are needed to increase infant protection against severe RSV through maternal or infant immunization. Continued work is also needed to increase birthing hospital enrollment in VFC and improve obstetric provider reporting of immunizations to the IIS. IISs provide timely, population-based data that can be used to estimate state-level infant RSV immunization coverage and monitor trends. Preliminary data from the 2024–25 season suggest increases in RSV immunization coverage, and the recent ACIP recommendation for an additional monoclonal antibody, clesrovimab, could increase access to RSV protection for infants in the 2025–26 respiratory virus season.[††††]

[††††] Child Immunization Schedule Addendum | Vaccines & Immunizations | CDC

Acknowledgment

U.S. jurisdictional Immunization Information Systems staff members.

Corresponding author: Ellen O. Boundy, lwz9@cdc.gov.

[1]Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC; [2]U.S. Public Health Service Commissioned Corps, Rockville, Maryland.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

References

1. Suh M, Movva N, Jiang X, et al. Respiratory syncytial virus is the leading cause of United States infant hospitalizations, 2009–2019: a study of the national (nationwide) inpatient sample. J Infect Dis 2022;226(Suppl 2):S154–63. PMID:35968878 https://doi.org/10.1093/infdis/jiac120
2. Jones JM, Fleming-Dutra KE, Prill MM, et al. Use of nirsevimab for the prevention of respiratory syncytial virus disease among infants and young children: recommendations of the Advisory Committee on Immunization Practices—United States, 2023. MMWR Morb Mortal Wkly Rep 2023;72:920–5. PMID:37616235 https://doi.org/10.15585/mmwr.mm7234a4
3. Fleming-Dutra KE, Jones JM, Roper LE, et al. Use of the Pfizer respiratory syncytial virus vaccine during pregnancy for the prevention of respiratory syncytial virus-associated lower respiratory tract disease in infants: recommendations of the Advisory Committee on Immunization Practices—United States, 2023. MMWR Morb Mortal Wkly Rep 2023;72:1115–22. PMID:37824423 https://doi.org/10.15585/mmwr.mm7241e1
4. Blauvelt CA, Zeme M, Natarajan A, et al. Respiratory syncytial virus vaccine and nirsevimab uptake among pregnant people and their neonates. JAMA Netw Open 2025;8:e2460735. PMID:39969879 https://doi.org/10.1001/jamanetworkopen.2024.60735
5. Jacobson KB, Watson AJ, Merchant M, Fireman B, Zerbo O, Klein NP. Uptake of maternal RSV vaccination and infant nirsevimab among infants born October 2023 to March 2024. JAMA Netw Open 2025;8:e2453696. PMID:39775810 https://doi.org/10.1001/jamanetworkopen.2024.53696
6. Puckett L, Kushner LE, Bio L, Cornell S, Wood M, Schwenk HT. Successful implementation of nirsevimab and factors influencing uptake in neonatal care. Hosp Pediatr 2025;15:99–107. PMID:39568114 https://doi.org/10.1542/hpeds.2024-008070
7. Kemp M, Capriola A, Schauer S. RSV immunization uptake among infants and pregnant persons—Wisconsin, October 1, 2023–March 31, 2024. Vaccine 2025;47:126674. PMID:39756214 https://doi.org/10.1016/j.vaccine.2024.126674
8. Razzaghi H, Garacci E, Kahn KE, et al. Maternal respiratory syncytial virus vaccination and receipt of respiratory syncytial virus antibody (nirsevimab) by infants aged <8 months—United States, April 2024. MMWR Morb Mortal Wkly Rep 2024;73:837–43. PMID:39325675 https://doi.org/10.15585/mmwr.mm7338a2
9. Irving SA, Crane B, Weintraub ES, et al. Infant respiratory syncytial virus immunization coverage in the Vaccine Safety Datalink: 2023–2024. Pediatrics 2025;155:e2024070240. PMID:40324788 https://doi.org/10.1542/peds.2024-070240
10. Rahmat ZS, Ahmad S, Malikzai A. CDC changes recommendations due to severe nirsevimab shortage during the 2023–2024 RSV season. Pediatr Pulmonol 2024;59:1108–9. PMID:38240360 https://doi.org/10.1002/ppul.26841

The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the U.S. Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format. To receive an electronic copy each week, visit *MMWR* at *https://www.cdc.gov/mmwr/index.html*.

Readers who have difficulty accessing this PDF file may access the HTML file at https://www.cdc.gov/mmwr/index2025.html. Address all inquiries about the *MMWR* Series to Editor-in-Chief, *MMWR* Series, Mailstop V25-5, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30329-4027 or to mmwrq@cdc.gov.

ISSN: 0149-2195 (Print)