

Emerging Infections Program Healthcare-Associated Infections–Community Interface Report: Extrapulmonary Nontuberculous Mycobacteria (ENTM), 2023

Surveillance Catchment Areas:

Colorado (5 county Denver area); Minnesota (statewide); New York (1 Rochester county); Oregon (statewide).

Population:

The surveillance area represents 13,639,344 persons.

Source: U.S. Census Bureau, Population Division, Vintage 2023 Special Tabulation

Case Definition:

An ENTM case was defined as:

- the first identification during 2023 of an NTM species from a non-pulmonary body site (e.g., specimens other than sputum, tracheal aspirate, bronchoalveolar lavage, and lung), excluding stool and rectal swabs, in a resident of the surveillance area, or
- subsequent identification of a different NTM species during 2023 from a different non-pulmonary body site in a resident of the surveillance area.

Mycobacterial species excluded from surveillance were: *Mycobacterium tuberculosis* complex (causes tuberculosis); *Mycobacterium leprae* and *Mycobacterium lepromatosis* (cause leprosy); *Mycobacterium ulcerans* (causes Buruli ulcer); and *Mycobacterium gordonae* and *Mycobacterium paragordonae* (most often non-pathogenic).

Cases were considered prevalent if:

- medical records indicated ENTM disease of the same species and/or from the same body site was present in the 12 months prior to ENTM identification in 2023, or
- NTM was detected in at least one extrapulmonary specimen of the same species and/or from the same body site in 2022, within 12 months before the date of initial ENTM specimen collection in 2023.

Cases were otherwise considered incident.

If medical records and specimen information from the 12 months before the date of the initial ENTM specimen collection were not available, the case is not classified as either incident or prevalent.

Methods:

Case finding was conducted through active, laboratory-based, and population-based approaches. Emerging Infections Program (EIP) site personnel routinely contacted microbiology laboratories serving residents of the surveillance area to identify cases.

A standardized case report form was completed for each case through review of medical records. Medical records were reviewed for information on demographic characteristics, clinical features and syndrome, and potentially relevant exposures. Exposures were captured if they occurred in the year before or on the date of index specimen collection. Exposures determined to be related to the diagnosis or management of ENTM disease were excluded. In addition, information about whether the exposure occurred at the site of the NTM infection was also captured.

A convenience sample of ENTM isolates was sent to CDC for characterization. The characterization of isolates from 2023 is in process as of the date of this report.

Rates of ENTM infection among all patients were calculated using special tabulation U.S. Census population estimates for 2023.

Bayesian Improved Surname Geocoding (BISG) was used to impute missing race/ethnicity¹. BISG uses surname and geocoded home address to estimate a patient's probability of membership in each of five racial/ethnic groups: Hispanic or Latino (any race), non-Hispanic Asian and/or Native Hawaiian/Pacific Islander, non-Hispanic Black or African American, non-Hispanic White, and non-Hispanic other (including American Indian/Alaska Native and multiracial). Race/ethnicity was considered missing if a patient had unknown ethnicity (regardless of reported race) or if a patient had unknown race and was not Hispanic or Latino. Probabilities for patients with known race/ethnicity were set to 1 for reported race/ethnicity and 0 for all other racial/ethnic groups. Race/ethnicity-stratified case counts were then calculated by summing the probabilities for each racial/ethnic group. Case rates were calculated using race/ethnicity-stratified U.S. Census population estimates for 2023. The U.S. census categorizes individuals reported as both non-Hispanic Asian and Native Hawaiian/Pacific Islander as "non-Hispanic multiracial"², whereas the BISG method does not distinguish between these two racial/ethnic groups and categorizes these individuals as "non-Hispanic Asian and/or Native Hawaiian/Pacific Islander". Therefore, a small proportion of patients with missing race/ethnicity who were multiracial may have been imputed as non-Hispanic Asian and/or Native Hawaiian/Pacific Islander using the BISG method.

ENTM surveillance data undergo regular data cleaning to ensure accuracy and completeness. Cases from 2023 with complete case report form data as of March 25, 2026, were included in this analysis. Because data can be updated as needed, analyses of datasets generated on a different date may yield slightly different results.

Results:**Table 1. ENTM (N=228) Cases by Incident Status, Emerging Infections Program, 2023**

Incident Status	No.	Rate^a
Incident	225	1.6
Prevalent ^b	3	0.02
TOTAL ^c	228	1.7

^a Cases per 100,000 population for EIP areas (crude rates).

^b Excluded from further analysis.

^c Total rate represents overall prevalence.

Table 2. Incident ENTM (N=225) Case Counts by Race/Ethnicity (Reported and BISG-imputed), Emerging Infections Program, 2023

Race/Ethnicity^a	No. (%)	Rate^b
Hispanic or Latino, any race	23 (10.2)	1.3
Not Hispanic or Latino - White	166 (73.8)	1.7
Not Hispanic or Latino - Black or African American	16 (7.1)	2.0
Not Hispanic or Latino – Asian or Native Hawaiian/Other Pacific Islander	12 (5.3)	1.6
Not Hispanic or Latino – Asian only	7 (3.1)	1.0
Not Hispanic or Latino ^a – Native Hawaiian/Other Pacific Islander only	1 (0.4)	3.6
Not Hispanic or Latino – American Indian/Alaska Native or Multiracial	8 (3.6)	1.6
Not Hispanic or Latino – American Indian/Alaska Native only	3 (1.3)	2.5
Not Hispanic or Latino – Multiracial only	3 (1.3)	0.8

^a The bolded rows include both reported and imputed race/ethnicity. Race/ethnicity was imputed for cases with missing race/ethnicity (n = 38 [16.9%]) using BISG, as described in the methods section. Among cases with non-missing race/ethnicity, there were 20 Hispanic or Latino (any race), 140 non-Hispanic White, 13 non-Hispanic Black or African American, 8 non-Hispanic Asian or Native Hawaiian/Other Pacific Islander, and 6 non-Hispanic American Indian/Alaska Native or multiracial. Non-bolded rows are sub-groups of bolded rows above them. Case counts for non-bolded rows were calculated using reported (i.e., non-missing) data only. Missing data for these racial/ethnic groups were not separately imputed because BISG combines each of these groups with another racial/ethnic group.

^b Cases per 100,000 population for EIP areas (crude rates).

Table 3. Incident ENTM (N=225) Cases and Rates by Sex, Emerging Infections Program, 2023

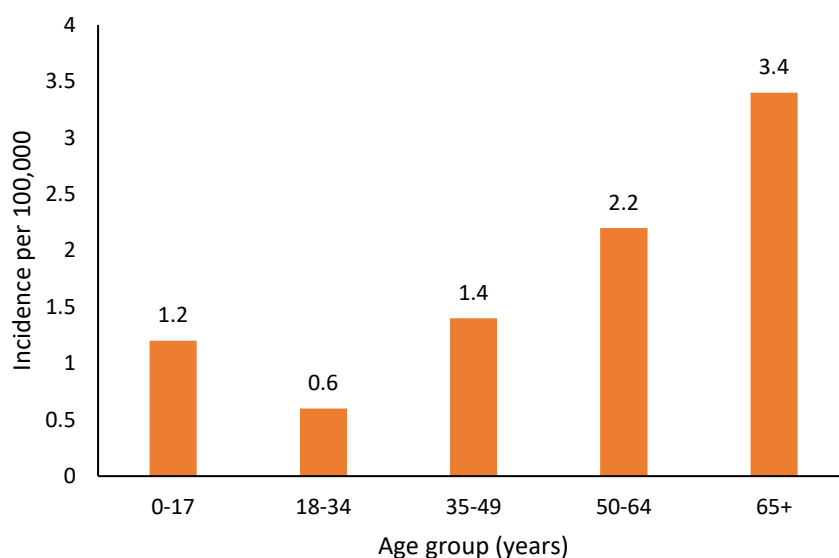
Sex	No. (%)	Rate^a
Male	111 (49.3)	1.6
Female	114 (50.7)	1.7

^a Cases per 100,000 population for EIP areas (crude rates).

Table 4. Incident ENTM (N=225) Cases by Age Group, Emerging Infections Program, 2023

Age Group (years)	No.	%
0-17	34	15.1
18-34	18	8.0
35-49	38	16.9
50-64	54	24.0
65+	81	36.0

Figure 1. Rate^a of Incident ENTM (N=225) Cases by Age Group, Emerging Infections Program, 2023



^a Incidence (no. per 100,000 population per year) calculated using 2023 special tabulation U.S. Census Data.

Table 5. Incident ENTM (N=225) Cases by Species Identified from Index Specimen^a at Clinical Laboratories, Emerging Infections Program, 2023

Slowly Growing NTM Species	No.	%
<i>M. arupense</i>	1	0.4
<i>M. avium</i> complex - <i>M. avium</i>	36	16.0
<i>M. avium</i> complex - <i>M. intracellulare</i> subsp. <i>chimaera</i>	2	0.9
<i>M. avium</i> complex - <i>M. intracellulare</i> subsp. <i>intracellulare</i>	10	4.4
<i>M. avium</i> complex, not otherwise specified	27	12.0
<i>M. celatum</i>	1	0.4
<i>M. florentinum</i>	1	0.4
<i>M. haemophilum</i>	5	2.2
<i>M. kansasii</i>	4	1.8
<i>M. lentiflavum</i>	1	0.4
<i>M. malmoense</i>	1	0.4
<i>M. marinum</i>	12	5.3
<i>M. saskatchewanense</i>	1	0.4
Total	102	45.3

Rapidly Growing NTM Species	No.	%
<i>M. abscessus</i> ^b	29	12.9
<i>M. chelonae</i> complex ^c	59	26.2
<i>M. fortuitum</i> complex ^c	30	13.3
<i>M. gilvum</i>	2	0.9
<i>M. goodii</i>	1	0.4
<i>M. iranica</i>	1	0.4
<i>M. llatzerense</i>	1	0.4
<i>M. mageritense</i>	1	0.4
<i>M. mucogenicum</i> complex ^c	3	1.3
<i>M. mucogenicum</i>	1	0.4
<i>M. neoaurum</i>	2	0.9
<i>M. wolinskyi</i>	1	0.4
Total	131	58.2

Other, Not Characterized NTM	No.	%
Not TB ^d , not characterized further	2	0.9
Total	2	0.9

^a 9 had more than one species isolated.^b Subspecies identification not reported to CDC.^c Species identification not reported to CDC.^d TB=*Mycobacterium tuberculosis* complex.

Table 6. Incident ENTM (N=225) Cases by Source of Index Specimen, Emerging Infections Program, 2023

Index Specimen Source ^a	No.	%
Blood	27	12.0
Bone	3	1.3
Central venous catheter specimen	3	1.3
Joint/Synovial fluid	12	5.3
Lymph node	31	13.8
Non-surgical wound	25	11.1
Peritoneal fluid	5	2.2
Pleural fluid	6	2.7
Sinus	7	3.1
Skin	28	12.4
Soft tissue	46	20.4
Surgical wound	17	7.6
Urine	3	1.3
Other	14	6.2

^a 2 cases had 2 index specimen sources.

Table 7. Location of Incident ENTM (N=225) Cases at Time of Incident Specimen Collection, Emerging Infections Program, 2023

Location of Incident Specimen Collection	No.	%
Outpatient setting or emergency department	123	54.7
Acute care hospital	102	45.3
Long-term care facility	0	0.0
Long-term acute care hospital	0	0.0
Other	0	0.0
Unknown	0	0.0

Table 8. Selected Clinical Characteristics of Incident ENTM (N=225) Cases, Emerging Infections Program, 2023

Charlson Comorbidity Index^a	No.	%
0	91	40.4
1	41	18.2
≥2	93	41.3

Underlying Conditions^a	No.	%
Connective tissue disease ^b	17	7.6
Diabetes mellitus	55	24.4
Immunocompromising condition or immunosuppressive medication ^c	78	34.7
Malignancy	37	16.4
Skin condition ^d	22	9.8

Immunocompromising condition / immunosuppressive medication^c	No.	%
Immunocompromising condition ^e	31	13.8
Immunosuppressive medication	69	30.7

Infection Type^f	No.	%
Abscess, not skin	17	7.6
Bacteremia	16	7.1
Bursitis	3	1.3
Catheter site infection	2	0.9
Disseminated infection	20	8.9
Internal surgical site infection	14	6.2
Lymphadenitis	31	13.8
Osteomyelitis	8	3.6
Septic arthritis	6	2.7
Skin and soft tissue infection ^g	58	25.8
Other	11	4.9
No infection ^h	84	37.3
Unknown	6	2.7

Outcomes	No.	%
Surgery to manage NTM	61	27.1
Death within 90 days of index specimen collection	18	8.0

^a Some case patients had more than one underlying condition.

^b 9 cases with connective tissue disease had rheumatoid arthritis.

^c Immunocompromising conditions are defined as HIV infection, solid organ transplant, hematopoietic stem cell transplant, and primary immunodeficiency. Immunosuppressive medications are defined as B-cell depletion agents (e.g., rituximab), corticosteroids (intravenous, intramuscular, or oral), Janus kinase (JAK) inhibitors, tumor necrosis factor (TNF)- α inhibitors, azathioprine, cyclophosphamide, mycophenolate, and tacrolimus.

^d 2 cases with a skin condition had a surgical wound.

^e 14 cases had HIV, including 11 with documentation of AIDS or CD4 counts < 200. 18 cases had another immunocompromising condition.

^f Some case patients had more than one infection type.

^g Includes cellulitis, chronic ulcer/wound, skin abscess, surgical incision infection, traumatic wound, and other skin/soft tissue infections.

^h Patients may not have an infection associated with their NTM culture for several reasons, including that the patient had no infection diagnosed and the NTM identified was considered a contaminant, or if the patient's infection was attributed to another organism.

Table 9. Selected Exposures and Risk Factors in the Year Before Index Specimen Collection, Incident ENTM Cases with a Clinically Documented NTM Infection, Emerging Infections Program, 2023

Exposures in the Past Year for Cases with Localized Infections ^b (n=110)	Cases with Exposure No. (%)	Cases with Exposure at the Site of Infection ^a No. (%)
Bird	2 (1.8)	--
Construction ^c	2 (1.8)	--
Dental procedure	3 (2.7)	0 (0)
Fish-related exposures ^d	7 (6.4)	--
Gardening or landscaping	10 (9.1)	--
Hot tub	1 (0.9)	--
Injection drug use	2 (1.8)	0 (0)
Injection or infusion ^e	49 (44.5)	6 (5.5)
Livestock/wildlife	2 (1.8)	--
Medical device	28 (25.4)	16 (14.5)
Nail salon	2 (1.8)	1 (0.9)
Neti pot	0 (0)	0 (0)
Surgical procedure	22 (20.0)	17 (15.5)

Exposures in the Past Year for Cases with Localized Infections ^b (n=110)	Cases with Exposure No. (%)	Cases with Exposure at the Site of Infection ^a No. (%)
Swimming pool	3 (2.7)	--
Tattoo ^f	4 (3.6)	4 (3.6)
Trauma	16 (14.5)	15 (13.6)
Other	3 (2.7)	1 (0.9)
None of the above	29 (26.4)	63 (57.3)
Unknown	2 (1.8)	3 (2.7)

^a Cells with "--" indicate fields where exposure at site of infection is not applicable.

^b Excludes incident cases with no infection type (n=84), unknown infection type (n=6), and cases either with bloodstream infection and no other infection types documented, or with disseminated infection (25).

^c Persons who work in construction or persons who lived or worked in a building undergoing renovations.

^d Fish-related exposures include fish tank and saltwater fishing.

^e As of the 2022 report this category no longer includes injection drug use, which is now reported separately.

^f Tattoo exposures were associated with two known outbreaks.

Summary:

Surveillance data from 2023 represent the second full year of population-based surveillance for ENTM infections through the Emerging Infections Program (a surveillance pilot was conducted for six months during 2019–2020)³. The crude annual incidence rate of ENTM in 2023 was 1.6 per 100,000 persons, which is similar to the incidence rate in 2022 (1.4 per 100,000 persons). The incidence generally increased with increasing age and ranged from 0.8 among non-Hispanic or Latino persons of multiple race to 3.6 per 100,000 in non-Hispanic or Latino Native Hawaiian/Other Pacific Islander. *M. avium* complex was the most frequently isolated species group, followed by *M. chelonae* complex. Skin and soft tissue infections were the most commonly reported infection type. Indicative of the severity of infections, 27% cases required surgery and 8% died within 90 days of the incident specimen collection. Among patients with localized ENTM infections, medical record documentation indicated that the most common exposures at the infection site were surgery, trauma, a medical device, or injection/infusion. Four cases were identified as part of two tattoo-associated outbreaks.

References:

¹ Using the Census Bureau's Surname List to Improve Estimates of Race/ethnicity and Associated Disparities (<https://thecre.com/insurance/wp-content/uploads/2010/06/CFPB-Paper.pdf>)

² Population Estimates Categorical Variables 2023 (<https://www.census.gov/data/developers/data-sets/popest-popproj/popest/popest-vars/2023.html>)

³ Grigg C, Jackson KA, Barter D, et al. Epidemiology of Pulmonary and Extrapulmonary Nontuberculous Mycobacteria Infections at 4 US Emerging Infections Program Sites: A 6-Month Pilot. Clin Infect Dis. 2023 Aug 22; 77(4):629-639. doi: 10.1093/cid/ciad214.

Citation:

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