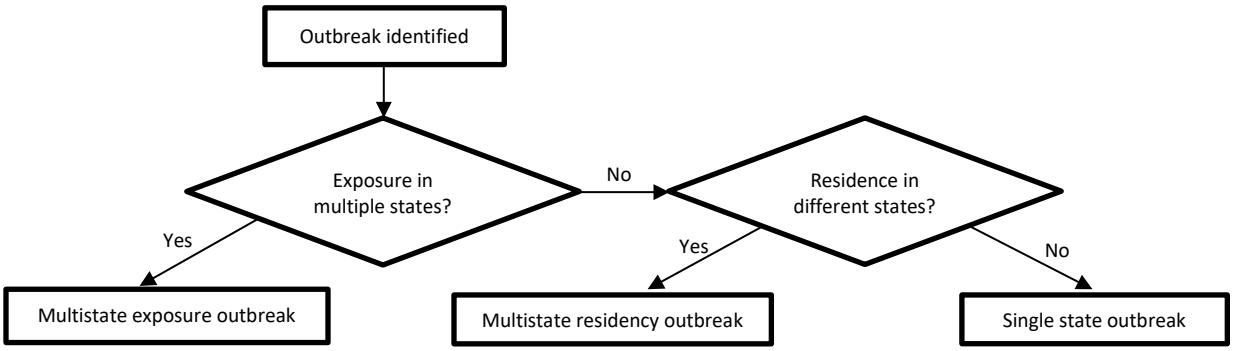
Appendix B: Reporting Multistate Exposure and Residency Outbreaks

Introduction

This appendix is intended to establish a uniform process for reporting multistate exposure and multistate residency outbreaks through CDC's National Outbreak Reporting System (NORS).

Multistate exposure outbreaks—regardless of the mode of transmission—are outbreaks caused by exposures that occurred in more than one state. One example is the 2011 outbreak of *Listeria monocytogenes* infections linked to cantaloupes. The fruit were grown in Colorado but were consumed in states throughout the country. These outbreaks are commonly referred to as "multistate outbreaks" in NORS annual reports and published summaries of outbreak surveillance data.

Multistate residency outbreaks are those where exposures occurred in a single state, but case-patients resided in multiple states. For example, people travel from all over the United States to attend a three-day conference in Chicago. There, they had direct contact with a person infected with norovirus, and many of the conference attendees subsequently become ill.



Multistate clusters occur when ≥2 similar illnesses are detected in multiple states or territories, but investigation findings are insufficient to establish that a common exposure occurred. Multistate clusters **should not** be reported through NORS. However, if illness in a subset of the case-patients could be attributed to a common exposure, the sub-cluster might be reportable as an outbreak. For example, 20 infections of a pathogen with a highly related whole genome sequencing (WGS) strain were reported among residents of three states. No common exposures were identified, except for four case-patients in one state who reported swimming at the same pool within the same week. An environmental health inspection of the pool found that chlorine levels had been below accepted levels during the time period in question, further supporting the hypothesis that transmission was waterborne. The four case-patients linked to the pool should be reported through NORS as a single state outbreak. Additional examples are provided throughout these guidelines.

Who Reports a Multistate Outbreak through NORS

When either a multistate exposure or multistate residency outbreak investigation is closed, only one NORS outbreak report should be submitted for all cases in the outbreak.

The lead investigating agency (**Table 1**) is responsible for completing the NORS report or for identifying another agency to assume reporting responsibilities. The reporting agency (**Table 1**) should be identified before the close of a multistate outbreak investigation.

Occasionally, a reporting site might enter a NORS report before the investigation is determined to be a multistate outbreak that will be reported through NORS by CDC or the reporting agency. In this scenario, the reporting site should delete the single-state report so the cases are not counted twice in the NORS database.

Multistate exposure foodborne and animal contact outbreak investigations are typically coordinated by CDC; it is anticipated that most NORS reports will be completed by CDC's Outbreak Response and Prevention Branch (ORPB). In instances where a state or other health department coordinates a multistate exposure outbreak investigation, that agency is responsible for completing the NORS report or identifying another reporting agency. Multistate exposure outbreaks due to other modes of transmission are typically investigated and reported by state and local health departments.

Multistate residency outbreaks are usually investigated and reported by state and local health departments from the site in which exposure occurred, regardless of the outbreak's primary mode of transmission.

Once finalized, multistate outbreak reports should be shared by the lead investigating agency with all jurisdictions that have cases in their state or where exposure occurred. For multistate outbreak reports completed by CDC, states will be granted read-only access to those NORS reports. State and local reporting agencies should use the "Set sharing rules" feature in NORS to electronically share multistate outbreak reports with appropriate jurisdictions.

CDC's NORS Foodborne and Animal Contact team (NORS-Foodborne@cdc.gov) can assist with identifying points of contact and resolving any data discrepancies for multistate foodborne and animal contact outbreaks. Other questions regarding multistate exposure and multistate residency outbreaks can be directed to NORSAdmin@cdc.gov.

Table 1. Agency type, definition, and responsibilities for multistate outbreak reporting through NORS.

Agency Type	Definition and Multistate Outbreak Reporting Responsibilities
Lead Investigating Agency	Federal, state, territorial, or local agency responsible for coordinating outbreak investigation efforts across multiple jurisdictions. The agency is also generally responsible for reporting multistate outbreaks through NORS (see "Reporting Agency").
Participating Investigating Agency	Federal, state, territorial, or local agency not responsible for coordinating investigation efforts across multiple jurisdictions; case-patients may either be exposed or reside within the agency's jurisdiction.
Reporting Agency	Federal, state, territorial, or local agency that assumes responsibility for completing the NORS outbreak report; typically, the Lead Investigating Agency assumes this role.

Reporting Multistate Outbreaks in NORS

The reporting agency (usually the Lead Investigating Agency; see Table 1) should create ONE outbreak report representing cases in all states and territories involved in the outbreak.

Report multistate outbreaks following standard NORS reporting guidance but remember that you are entering data for all case-patients involved in the outbreak, regardless of residency.

The following sections and data fields are especially critical when reporting multistate outbreaks:

General Section/Investigation Methods & Dates — Enter the "Date first case became ill," regardless of the case-patient's state of residency.

General Section / Geographic Location

Multistate Exposure Outbreak:

- Exposure occurred in multiple states — check box indicating that outbreak resulted from a common exposure that occurred in multiple states.
- Add States — select all states involved in the outbreak; this would include all states where exposure occurred and all states where case-patients resided.
- Case Counts — enter individual state-by-state case counts in the Case Count field next to the associated state name.
    - Enter the number of case-patients that resided in each state; for most multistate exposure outbreaks, the state of residence will be the same as the state of exposure. If exposure occurred in a state, but no case-patients resided in that state, enter "0" for the case count.

Multistate Residency Outbreak:

- Exposure occurred in a single state, but some or all case-patients resided in another state or multiple states — check box indicating that outbreak resulted from a common exposure that occurred in one state, but case-patients resided in multiple states.
- Add States — select all states involved in the outbreak; this would include all states where exposure occurred and all states where case-patients resided.
- Case Counts — enter individual state-by-state case counts in the Case Count field next to the associated state name
    - Enter the number of cases that resided in each state. For the exposure state, enter only the number of cases that resided in the state (not the total number of cases exposed); if exposure occurred in a state, but no case-patients resided in that state, enter "0" for the case count.

General Section/Primary Cases — Enter the total number of primary cases in all states involved in the outbreak.

Etiology Section — The fields below are essential for verifying multistate outbreak reports in the NORS database; please enter data for these fields when available:

- Etiology
    - Genus
    - Species
    - Subtype (e.g., serotype, genotype)

- Isolates
    - CDC system (PulseNet, CaliciNet, CryptoNet, Other, Unknown, None)
    - State lab: sample ID
    - CDC lab: sample ID (e.g., PulseNet key, CaliciNet key, CryptoNet key)
    - CDC lab: outbreak ID (e.g., PulseNet outbreak code, CaliciNet outbreak number, CryptoNet outbreak number)
    - PFGE pattern (Enzyme 1, Enzyme 2)
    - Sequencing information (e.g., allele code, sequenced region)
    - Source/sample type (e.g., environmental sample)
    - Subtype information (e.g., serotype, genotype)

Sharing Multistate Outbreak Reports

Multistate outbreak reports should be shared with all jurisdictions that have cases in their state or where exposure occurred using the NORS "set sharing rules" feature.

Step 1: Select "Set sharing rules" in the report panel on the right side, or by clicking the three dots on the top right corner of the report.

Step 2: Select each agency the report should be shared with, specify whether you would like those users to have view or edit access, and click "Add".

Step 3: Make sure to add all participating investigating agencies to grant them access to the NORS report and close the window once you have finished sharing with all relevant agencies.

Reports that you have shared, or that have been shared with you, will also be indicated in the "Shared" column on the Reports page. The number of agencies the report has been shared with will also be reflected in the "Sharing" section of the report panel.

Viewing Multistate Outbreak Reports Entered by Other Agencies

If a multistate outbreak report has been shared with your agency, you can view the report in the NORS interface but may not be able to make changes to the report.

Step 1: From the NORS home page, select "Reports".

Step 2: Under "Agency", select the agency that granted read access; completing the other data fields, if known, will further narrow the search results. Alternatively, under "Shared", select all shared reports to filter to only shared reports.

Step 3: Select the report of interest to view it.

If you identify discrepancies in case counts or are unable to locate a report, please contact the reporting agency or email NORSAdmin@cdc.gov.

Additional Guidance for Multistate Foodborne and Animal Contact Outbreaks

In addition to the data fields mentioned above, it is important to report the vehicle(s) implicated, if determined, and types of supporting evidence for multistate foodborne and animal contact outbreaks.

Definitions and examples of types of evidence regularly used to implicate vehicles in foodborne and animal contact outbreak investigations are provided in **Table 2**. All scenarios require judgment about the strength of evidence.

Table 2. Types of evidence used to implicate vehicles in foodborne and animal contact outbreaks.

Type of evidence	Definition and Examples
Epidemiologic	A food or animal exposure occurs more often in case-patients than in controls, or more often in case-patients than expected in the general population. Multiple unrelated case-patients report a common exposure venue, such as eating at the same restaurant, shopping at the same grocery store, or attending the same event before becoming ill.
Laboratory	The pathogen, or pathogen subtype, causing human illness is isolated from a food item, food worker, or from an animal to which case-patients were exposed. The pathogen or pathogen subtype causing illness is found in a restaurant, production facility, or farm suspected to be a source of the outbreak.
Traceback and/or environmental investigation	A common point of contamination is identified through reviewing records collected from restaurants, stores, or other venues where sick people ate, shopped, or visited, or through an environmental investigation or assessment conducted at a restaurant, production facility, or farm.

Outbreak Vehicle Classification

NORS currently distinguishes between confirmed, suspected, and undetermined vehicles for foodborne and animal contact outbreaks. Definitions and examples of each of these three categories as they pertain to multistate exposure and multistate residency outbreaks are provided below.

Confirmed vehicle: Evidence confirms a source of infection (see **Table 2** for types of evidence). For multistate exposure outbreaks, at least two types of evidence are needed to confirm that the case-patients were exposed to a common vehicle. Similarly, for multistate residency outbreaks where exposure occurred in multiple venues or across multiple counties, two types of evidence are needed to confirm the vehicle. For multistate residency outbreaks that are point-source clusters linked to a meal or single event, at least one type of evidence is needed.

> ***Example 1:*** All patients interviewed during a multistate exposure outbreak of *Salmonella* serotype Virchow infections reported eating a meal replacement powder. Consumption of the powder was much higher than the 3% expected in the general population. Seventy percent of case-patients reported purchasing the product from an online retailer, and the product consumed by them was traced to one production period in a single manufacturing facility. This is a *foodborne* outbreak with a *confirmed* vehicle. Two types of evidence are needed to have a confirmed vehicle in this example because it is a multistate exposure outbreak. "Epidemiologic" and "Traceback and/or environmental investigation" should be selected for "Reason(s) confirmed or suspected."
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> ***Example 2:*** Three unrelated children from two neighboring states visited the same county fair event on the same day. Within a week, the children were hospitalized with *E. coli* O157 infection. All three

went to a calf petting zoo, but other common exposures at the county fair were reported as well. Specimens from the calves tested positive for the outbreak strain. This is an *animal contact* outbreak with a *confirmed* vehicle. Since it is a multistate residency outbreak linked to a single event, only one type of evidence is needed to confirm the vehicle. "Laboratory" should be selected for "Reason(s) confirmed or suspected."

Suspected vehicle: At least one type of evidence provides considerable but not conclusive proof that a food or animal is the source of infection.

Example 1: During a multistate exposure outbreak of *E. coli* O157 infections, most case-patients interviewed reported eating at a major pizza chain, far more than expected. Twelve restaurants in different states in the Midwest were implicated. The only statistically significant food exposure among patients was "skillet dough." Ingredient traceback did not identify a common source and food testing did not yield the outbreak strain. This is a *foodborne* outbreak with a *suspected* vehicle. Two types of evidence are needed to have a confirmed vehicle in a multistate exposure outbreak. "Epidemiologic" should be selected for "Reason(s) confirmed or suspected."

Example 2: Thirty ill persons from six different states were infected with *Salmonella* Enteritidis during a two-month period. Isolates from these people were highly related to one another by WGS. The clinical isolates were also highly related to contemporaneous raw chicken isolates in PulseNet. During interviews, 65% of ill persons reported eating chicken, but further information such as brand or purchase location was unavailable, and a case-control study was not done. This is a *foodborne* outbreak with a *suspected* vehicle of chicken. Two types of evidence are needed to have a confirmed vehicle in a multistate exposure outbreak. "Laboratory" should be selected for "Reason(s) confirmed or suspected."

Example 3: Twenty-five infections of *Salmonella* serotype Poona were reported among residents in ten states during a four-month period. Most case-patients interviewed reported contact with small turtles or their environments in the week before they became ill. Traceback did not identify a common breeder or point of sale, and animal testing did not yield the outbreak strain. This is an *animal contact* outbreak with a *suspected vehicle.* Two types of evidence are needed to have a confirmed vehicle in a multistate exposure outbreak. "Epidemiologic" should be selected for "Reason(s) confirmed or suspected."

Undetermined vehicle: Information gathered in the investigation strongly suggests a common foodborne or animal vehicle based on a shared venue or experience, but a source is not identified.

Note: If multiple vehicles were suspected, but none confirmed, do not select "Food vehicle undetermined" or "Animal vehicle undetermined." Instead, enter information for each suspected vehicle.

Example 1: During a multistate exposure outbreak of *E. coli* O26 infections, 83% of case-patients interviewed reported eating at different locations of a Mexican food restaurant chain before illness began, which was significantly higher than 7% reported in the general population. Multiple restaurant clusters were identified. Analytic studies were unable to implicate a single menu item or food ingredient. Food and environmental testing did not yield the outbreak strain. This would be considered a multistate exposure *foodborne* outbreak with an *undetermined* vehicle. "Epidemiologic" should be selected for "Reason(s) foodborne, but undetermined vehicle."

Example 2: Twelve people in three states report vomiting and diarrhea after visiting a petting zoo. No other common venues or exposures were identified among the ill persons, and other modes of transmission were ruled out. No animal type was associated with illness and no animals tested positive for the outbreak pathogen. This is a multistate residency *animal contact* outbreak with an *undetermined* vehicle. "Epidemiologic" should be selected for "Reason(s) animal contact, but undetermined vehicle."

Multistate Clusters

Multistate clusters occur when ≥2 similar illnesses are reported among persons residing in multiple states or territories, but information gathered is unable to identify a shared food, animal, venue, or experience. Multistate clusters should not be reported through NORS (see the **Decision Tree** on page 8).

However, once a multistate investigation is closed, if evidence is sufficient to identify a common exposure among a subset of case-patients, and those case-patients were determined NOT to be part of a multistate exposure outbreak, the agency with a sub-cluster is responsible for reporting through NORS as a single state or multistate residency outbreak (see examples below). Only case-patients involved in the sub-cluster should be included in the report.

Example 1: Thirty infections of a pathogen with isolates highly related by WGS were reported among residents of five states. Five case-patients in one state reported eating alfalfa sprouts at the same vegetarian restaurant; however, a common exposure was not identified among the remaining twenty-five case-patients residing in other states. The five case-patients linked to the restaurant should be reported through NORS as a *single state foodborne outbreak.*

Example 2: Thirty infections of a pathogen with isolates highly related by WGS were reported among residents of five states. Seven case-patients from two states reported contact with goats at the same farm; this farm was not a common setting of exposure among the remaining twenty-three case-patients residing in other states. The seven case-patients linked to the goat farm should be reported through NORS as a *multistate residency animal contact outbreak*.

Examples are not exhaustive; CDC's NORS Foodborne and Animal Contact team (NORS-Foodborne@cdc.gov) can assist with determining whether a cluster meets the definition of an outbreak and should be reported through NORS.

Decision Tree: Foodborne or animal contact outbreak type, vehicle classification, and NORS reporting.