Infectious Diseases in New Mexico

2015 Annual Report

New Mexico Department of Health
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Contents

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Contributors

The Risks of Healing: A Case Report of Salmonellosis Associated with Consumption of Rattlesnake Blood

Nicole West, MPH

Influenza Deaths in New Mexico, 2013-2014 Season

Deandra Ingram, MPH

Validation of *Clostridium difficile* Infection (CDI) Reporting by Acute Care Hospitals in New Mexico

Shamima Sharmin, MBBS, MSc, MPH

Ebola Virus Disease (EVD): New Mexico's Experience with Contact Monitoring of Returning Travelers

David Selvage MHS, PA-C and Paul Ettestad DVM, MS

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Introduction

The New Mexico Department of Health (NMDOH) tracks outbreaks and conducts investigations to protect the health of New Mexicans and for reporting to the Centers for Disease Control and Prevention (CDC). In addition to outbreaks of notifiable diseases, suspected foodborne or waterborne illness, acute illness of any type involving many people in the same geographical area, and any illness of public health significance also are investigated under the New Mexico (NM) Administrative Code 7.4.3.13.

This report highlights some of the infectious diseases occurring in NM during 2014. These chapters cover a range of topics including influenza deaths and foodborne illness. Appendix A provides a summary of notifiable disease rates in NM during 2014. Appendices B through E provide additional information including a glossary, acronym definitions, methods, and notifiable diseases in NM for 2014.

This report has been prepared by NMDOH staff. Significant contributions from within NMDOH were provided by Infectious Disease Epidemiology Bureau (IDEB) and Public Health Division (PHD) staff. Gratitude goes to the public health nurses (PHN), laboratorians, and regional epidemiologists whose efforts are critical to ongoing surveillance and investigation of infectious diseases in NM. The cooperation and active assistance from other organizations (e.g., healthcare providers, educational institutions) and individuals (e.g., infection preventionists) statewide also have been vitally important in conducting investigations and monitoring infectious diseases throughout the state.

The Risks of Healing: A Case Report of Salmonellosis Associated with Consumption of Rattlesnake Blood

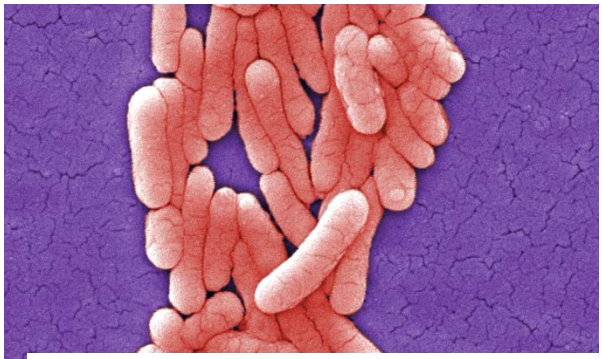
Nicole West, MPH

Highlights

- Salmonellosis represents a major burden of disease, both as a foodborne and zoonotic disease
- An immunocompromised man became infected with *Salmonella* after consuming rattlesnake blood in a healing ceremony
- Improved education and communication are required to convey risks to vulnerable populations

Background

Salmonellosis represents a major burden of infectious disease in New Mexico and across the United States. Infection with the rod-shaped, Gram-negative bacilli *Salmonella* can cause diarrhea, vomiting, fever, and abdominal cramps, typically lasting several days. In severe cases, the bacteria may invade other tissues such as the blood, bone, joints, or nervous system.



Salmonella sp. (Photo credit CDC Image Library)

Invasive infections are uncommon but can be fatal. Children under five years of age, adults over the age of 65 years, and immunocompromised individuals are at the greatest risk for invasive infections.[1] Every year, non-typhoidal species of *Salmonella* cause an estimated one million illnesses in the United States (US).[2] Of the foodborne pathogens, *Salmonella* is also the leading cause of both hospitalizations and deaths in the US, resulting in an estimated 19,000 hospitalizations and 380 deaths annually.[2]

Although salmonellosis is most commonly spread via foodborne transmission, it is also an important enteric zoonotic disease. Reptile contact is the cause of an estimated 70,000 *Salmonella* infections every year, approximately 7% of all cases of salmonellosis in the United States.[3]

Case Investigation

On July 22, 2014, the Infectious Disease Epidemiology Bureau (IDEB) of the New Mexico Department of Health (NMDOH) received a laboratory report indicating that *Salmonella* was isolated from the blood of a 70-year-old man from northern New Mexico. The man had been hospitalized and medical records were obtained by NMDOH. From these, it became clear that the man had been fighting a protracted battle with metastatic prostate cancer and was being treated with chemotherapy. He had suffered from nausea, vomiting, and diarrhea starting on July 13, 2014. He was hospitalized the evening of July 16th and died shortly thereafter.

Initially, the cause of death was unclear. The case's Stage IV cancer was a likely cause, but his septic *Salmonella* infection also was a possibility. Eventually, the hospital discharge and death summary were obtained which listed the preliminary cause of death as severe sepsis due to Gram-negative bacteria species.

On July 29th, serotype results were received from the NMDOH Scientific Laboratory Division (SLD). The *Salmonella* isolated from the man's blood was identified as *Salmonella enterica* IIIa subspecies *arizonae* (serovar IIIa 21:g,z51:*), a serotype common among reptiles.[4] This discovery came as contact was made with the case's next of kin. Family members, including the man's wife and grown children, were interviewed using a standard questionnaire for foodborne illness and were specifically asked about potential reptile exposures.

Family members reported that the man had partaken in a healing ceremony on July 12th, during which he drank rattlesnake blood. His symptoms began the next day. As he had received a chemotherapy injection on July 11th, the man attributed the nausea, vomiting, and diarrhea to the chemotherapy treatment, which commonly causes these symptoms. Although multiple family members also participated in the healing ceremony, none reported any illness.

Although the healer who led the ceremony was never identified, one family member volunteered that some of the rattlesnake blood remained and had been kept in the freezer. This was collected and brought to SLD for testing. The rattlesnake blood was cultured in the laboratory and *Salmonella arizonae* was identified. The human and snake bacterial isolates were a match via pulsed-field gel electrophoresis (PFGE).

Conclusions

To our knowledge, this is the first reported case of a *Salmonella* infection following consumption of rattlesnake blood. There have been prior cases reported of immunocompromised individuals becoming infected after ingesting other rattlesnake preparations, including several reports of human immunodeficiency virus (HIV) positive people becoming infected with *Salmonella arizonae* after eating rattlesnake meat or capsules containing powdered rattlesnake.[5,6] Other individuals with weakened immune systems due to lupus, cancer, diabetes, and arthritis or the treatment thereof have also had serious infections following the ingestion of rattlesnake capsules or dried, raw rattlesnake meat.[6,7] In Mexico and other parts of Central America, consumption of various snake products is a traditional folk remedy utilized for a number of maladies.[6] However, those who are most vulnerable (including people whose immune systems may already be weakened from other conditions) that are using these folk remedies, may have unwittingly put themselves at greater risk.

In light of the fact that individuals will continue to seek out alternative forms of treatment, the onus is on healthcare providers and public health professionals to communicate the potential risks. The challenge is that many patients may not discuss their use of alternative medicine with their health care provider,[8] and, as a covert and disperse population, this group may be hard to identify and provide with direct messaging. Therefore, healthcare providers and public health professionals must be proactive in their messaging to warn of the increased risks of infection and serious sequelae facing people with weakened immune systems. Inquiries regarding alternative forms of care sought should be made without judgment, but with a sincere view to assist the patient in understanding the full complement of benefits and risks that accompany any form of treatment, be it conventional or alternative. These broadened communication efforts should also include others who can serve as educators and increase the number of potential points of client contact. Veterinarians, for instance, may be more cognizant of the risk of zoonotic disease that reptiles pose to immunocompromised individuals and can help educate pet owners.[9] Improved communication, education, and collaboration between multiple individuals and groups of the health promotion community can help to prevent illness in the most vulnerable populations.

Acknowledgements

I would like to thank Carol Conroy (NMDOH Epidemiology and Response Division), Kevin Aicher (NMDOH Public Health Division), and Paul Torres (NMDOH Scientific Laboratory Division), all of whom contributed significantly to this investigation.

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Influenza Deaths in New Mexico, 2013-2014 Season

Deandra Ingram, MPH

Highlights

- Thirty-eight deaths occurred during the 2013-2014 influenza season in New Mexico
- One pediatric death (7-year-old) occurred
- The highest death rate occurred in those 85 years and older
- Influenza is a vaccine-preventable disease and may be treated with antiviral medication

Background

Influenza (flu) is an illness caused by a virus which spreads through droplets in the air when an infected person coughs, sneezes, or speaks.[1] The virus attacks the respiratory system, often resulting in a rapid onset of fever, aching muscles, and nasal congestion. A short incubation period of 2 to 3 days, high infectivity, and a long duration of viral shedding contributes to the rapid spread of influenza with resulting outbreaks.[2] Influenza and its complications can result in death, especially in those at highest risk including:

- Pregnant women (any trimester)
- Children younger than 5 years old, but especially children younger than 2 years old
- People age 50 years and older
- People of any age with certain chronic medical conditions like asthma, diabetes, and lung or heart disease and those who are immunocompromised from medication or disease
- People who live in nursing homes and other long-term care facilities
- American Indians and Alaska Natives
- People who are morbidly obese

This report focuses on influenza deaths of New Mexico residents during the 2013-2014 influenza season. Death rates, age groups, comorbidities, and influenza test results will be highlighted along with county of residence and month of death.

Influenza Deaths in New Mexico

Influenza deaths were identified based on a person's death certificate listing influenza as a cause of the death. Information was collected for each case using the death certificate and the medical record as data sources. Information included signs and symptoms,

clinical management, comorbidity, and influenza vaccination status. Denominators for calculation of death rates were obtained from the New Mexico Indicator-Based Information System (NM-IBIS).[3]

New Mexico's 2013-2014 influenza season spanned September 29, 2013 through May 17, 2014 (based on Morbidity and Mortality Weekly Report [MMWR] weeks 40-20). There were 38 deaths during the 2013-2014 influenza season in New Mexico. One death occurred in June, 2014 and was included in both the case count and analysis for the 2013-2014 season. The first death occurred on December 26, 2013 and the last on June 5, 2014. As shown in Table 1, the overall death rate was 1.8 per 100,000 population. The death rate (15.1/100,000 population) was greatest among those 85 years and older. One pediatric death in a 7-year-old with a history of severe asthma occurred during the 2013-2014 season.

Twenty-one of the deaths were in men (55%). Cases lived in 12 of the 33 counties in the state with the highest number of deaths (12) occurring in Bernalillo County.

Table 1. Influenza Death Rates by Age Group, New Mexico, 2013-2014 Influenza Season

Age Ranges (years)	Deaths	Total Population	Death Rates (per 100,000)
0-4	0	146,050	0.0
5-17	1	377,755	0.3
18-44	7	723,495	1.0
45-64	13	553,988	2.3
65-74	8	169,032	4.7
75-84	4	91,693	4.4
85+	5	33,147	15.1
All	**38**	**2,095,159**	**1.8**

As mentioned previously, people with existing chronic conditions are at greater risk of dying from an influenza infection. An underlying health condition or a comorbid condition is documented in 71% of the influenza deaths (Figure 1). Respiratory conditions were the most common (28.9%). Comorbid conditions included congestive heart failure, chronic obstructive pulmonary disease, renal failure, and leukemia. More than one comorbid condition was noted in 18% of influenza deaths.

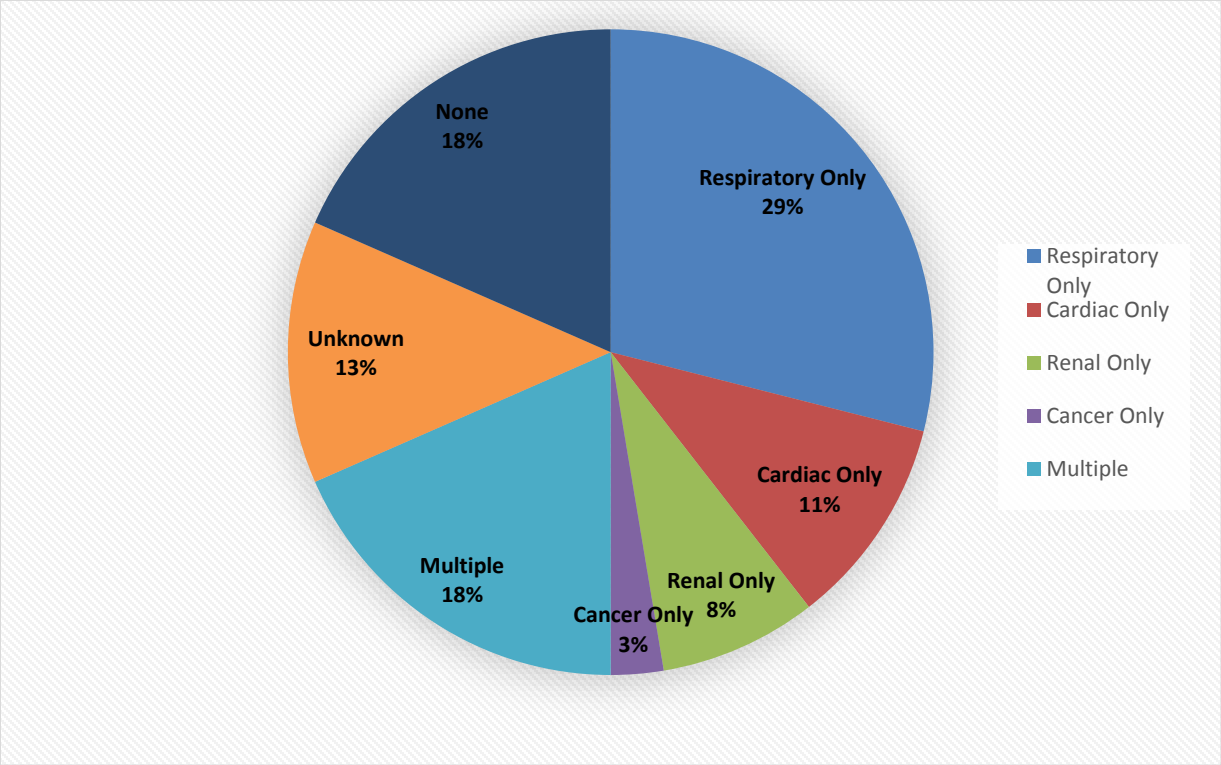

Figure 1. Comorbid Conditions Associated with Influenza Deaths, New Mexico, 2013-2014 Influenza Season (N = 38)

Influenza viruses may be described by type, subtype, strain, or lineage. Human Influenza virus types include A, B, and C. However, only A and B are responsible for causing seasonal epidemics of influenza almost every year in New Mexico and the United States. These virus types are further divided into subtypes based on different proteins on the virus surface. During the 2013-2014 influenza season, 67% of influenza-related deaths had tested positive for influenza according to their medical record. There were no known deaths from influenza B. Of those that were positive for influenza A, 52% were subtype 2009 H1N1, 44% were not subtyped, and 3% were H3. (Figure 2). Influenza testing was not performed or documented in 25% of cases.

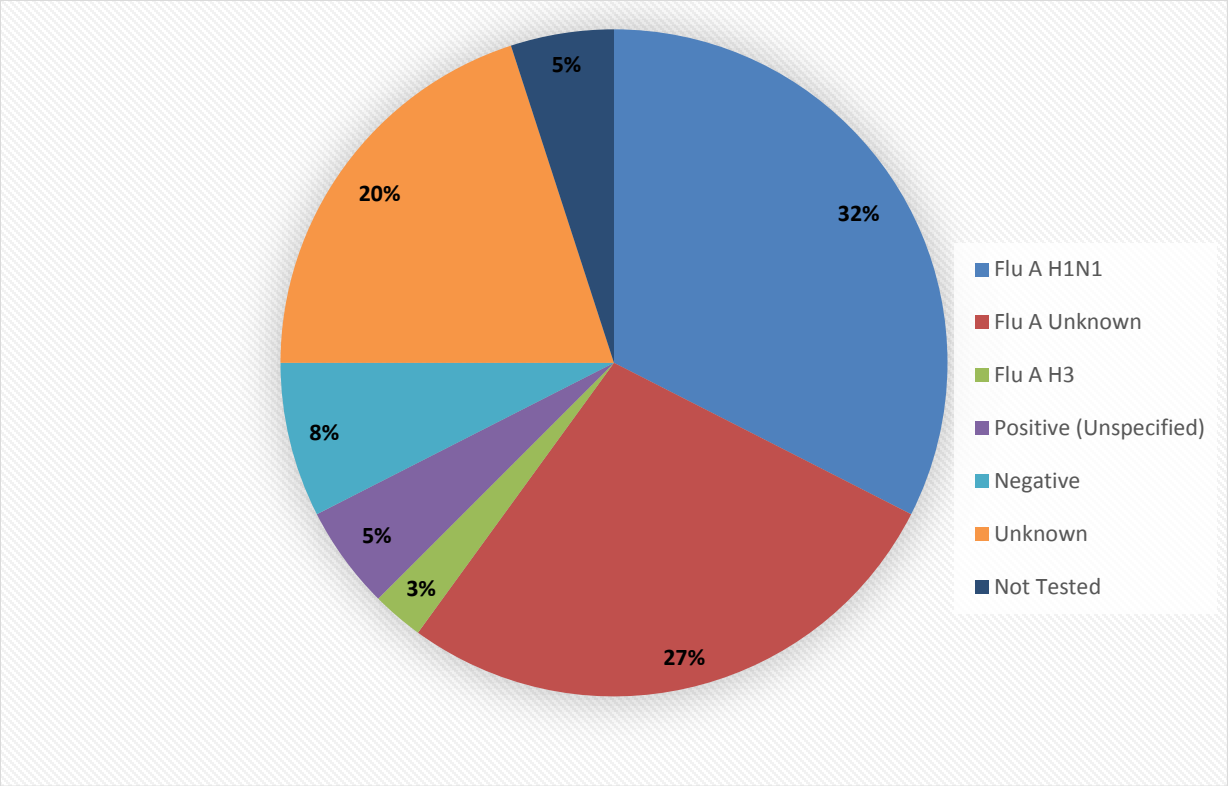

Figure 2. Type of Influenza Virus for Influenza Deaths, New Mexico, 2013-2014 Influenza Season (N=38)

Influenza deaths peaked in January (Figure 3). This peak coincides with influenza-like illness reported by outpatient clinics in New Mexico. Overall, the time period from January 2014 to March 2014 accounted for 87% of all deaths during the 2013-2014 New Mexico influenza season.

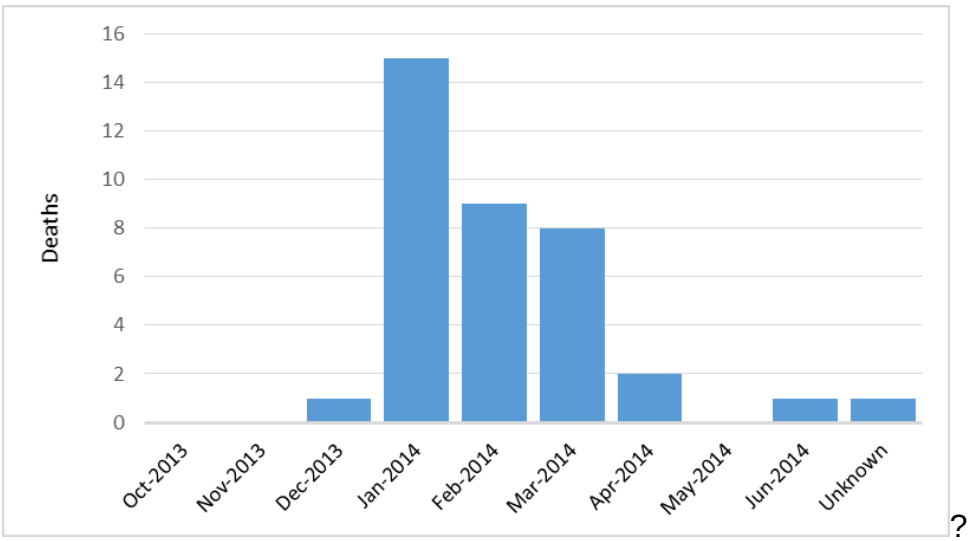

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Figure 3. Month of Death, Influenza deaths, New Mexico, 2013-2014 Influenza Season

Not surprisingly, the number of influenza deaths by county corresponded with population size. The greatest number of deaths, 12 (31.5%), was reported in Bernalillo County which is the most densely populated county in the state, and was followed by Santa Fe County (6 deaths) and Doña Ana County (4 deaths) (Figure 4).

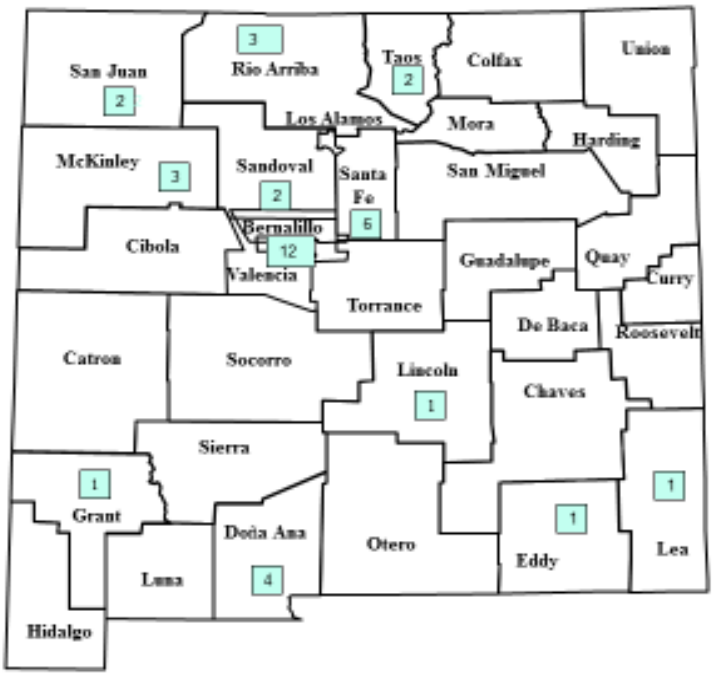

Figure 4. Number of Influenza Deaths by County, New Mexico, 2013-2014 Influenza Season

Influenza is a vaccine-preventable disease. Of the 38 deaths reported, 21 (55%) had unknown or undocumented vaccination status in the medical record. Of the 17 people with known vaccination status, only 7 (41%) had received a vaccination for the 2013-2014 season.

Prompt treatment with prescription antiviral medications (e.g., Tamiflu®) is recommended to decrease the severity and duration of symptoms. Of the 32 cases who were hospitalized before death, 23 (71.9%) were treated with antiviral medications during the course of their illness. For six (16%) of the 38 influenza deaths, treatment with antiviral medications was not documented in their medical records.

Discussion

In spite of missing information for some of the influenza deaths, this analysis shows that it will be useful to continue to obtain specific information related to potential risk factors associated with influenza-related deaths for future influenza seasons. As more data are collected during subsequent seasons, it will provide a more in-depth profile of influenza deaths in New Mexico.

Being unvaccinated, older age, and having comorbid conditions were common factors for individuals dying from influenza illness during the 2013-2014 influenza season. There were more deaths this season (38) than during both the 2012-2013 and 2011-2012 season combined (26). Additionally, a higher rate of hospitalization was observed during the 2013-2014 season (36.2 per 100,000 population) compared to the previous 2012-2013 season (28.9 per 100,000). Overall crude death rates for the 2012-2013 and 2011-2012 were 1.0 per 100,000 and 0.3 per 100,000 respectively compared to this year's 1.8 per 100,000 population.

Although the majority of deaths occurred in older adults, the death rate among the 85+ age group was over three times higher than in the 65-74 age group (15.1/100,000 and 4.7/100,000, respectively). The United States population is growing older and therefore more vulnerable to developing severe complications, including death, from seasonal influenza.[4]

From the 2011-2012 season to the 2013-2014 season, adults with cardiovascular disease, in particular have continued to be hospitalized more often with influenza complications than adults with no known comorbid condition. This same trend has occurred in adults with chronic lung disease and renal disease throughout these three seasons.

Influenza deaths reported here were limited to those with a cause of death of influenza on the death certificate. Influenza is a factor in many additional deaths, particularly pneumonia deaths where influenza precedes pneumonia.

Influenza is unpredictable and severity varies from one season to the next. Severity of influenza illness is impacted by many other non-patient factors, including viral subtypes, how much vaccine is available, when vaccine is available, vaccination rates, and how well the influenza vaccine is matched to influenza viruses that are causing illness.[4] In New Mexico, based on laboratory surveillance of all reported influenza cases, the H1N1 strain of influenza A was the most prevalent during the 2013-2014 season.

Conclusions

Though the number of deaths associated with this review of influenza mortality in New Mexico for the 2013-2014 season was not overwhelming, the results of this report demonstrate the substantial health impact of seasonal influenza and underscore the need to ensure vaccination of people at increased risk of serious influenza complications, especially people 65 years and older.

Relying on timely and accurate documentation and reporting of influenza deaths in the medical records and death certificates is a limitation of this report. Equally critical is the accurate documentation of influenza vaccination status. Even with these factors impacting the analysis it is clear that efforts to increase vaccination coverage, particularly among older age groups, may help reduce the burden of influenza deaths statewide. Nationally, the 2013-2014 influenza season was characterized as "moderately severe,"

with the H1N1 pandemic strain of the virus predominating in the United States for the first time since the 2009 pandemic. According to CDC, from October 2013 to May 2014 influenza vaccination resulted in an estimated 7.2 million fewer illnesses and 90,068 fewer hospitalizations in the United States.[5] Adults aged 20 to 64 years continue to have the lowest influenza vaccination coverage.[4] Targeted efforts to also increase influenza vaccination among this group would likely decrease incidence and subsequent deaths from influenza in New Mexico.

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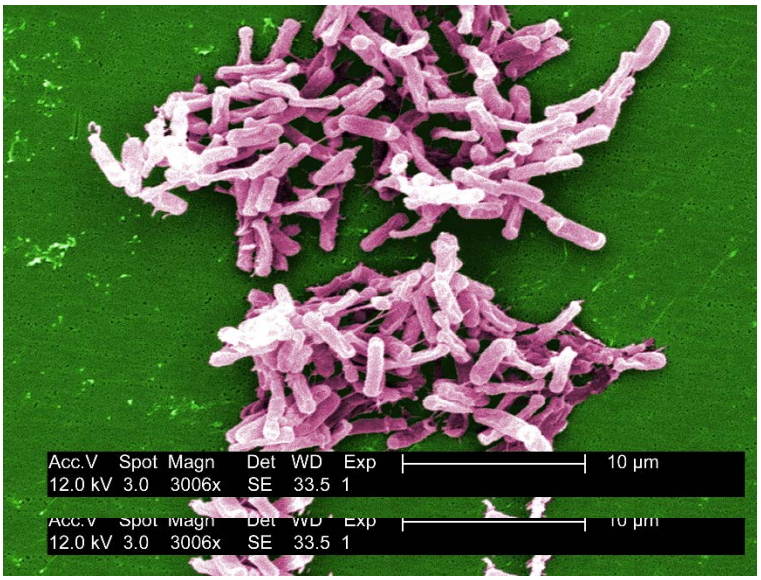
Validation of *Clostridium difficile* Infection (CDI) Reporting by Acute Care Hospitals in New Mexico

Shamima Sharmin, MBBS, MSc, MPH

Highlights

- Healthcare-associated infections (HAI) may occur during hospitalization
- *Clostridium difficile* infection (CDI) has become the most common HAI pathogen
- Validation of CDI reporting by 19 acute care facilities was conducted in New Mexico
- The validation determined 84% sensitivity, 90% specificity, 98% positive predictive value, and 46% negative predictive value for CDI reporting
- Validation of CDI reporting provides the necessary information to improve reporting of these infections by acute care hospitals, monitor the impact of prevention strategies, and ultimately eliminate HAI

Background



Photograph: *C. difficile* stool sample culture by Janice Haney Carr, CDC

Healthcare-associated infections (HAI) are recognized as a complication of modern medicine and are a source of significant morbidity and mortality among hospitalized individuals.[1,2] Among the HAI, *Clostridium difficile* infection (CDI) incidence has increased markedly in the past decade and has now become the most common HAI pathogen.[3] *Clostridium difficile* infection causes diarrheal illness that can be mild to very severe. Typically, mild cases have watery diarrhea and abdominal pain for several days. However, this infection can be life-threatening and it is associated with 14,000 deaths in the United States annually. Those most at risk of infection are older adults who take antibiotics and receive medical care in a hospital. Additionally, CDI is likely to increase health care costs: a recent source estimates the attributable cost of CDI to be $3,427 to $9,960 per infection for acute care hospitals.[3]

Beginning in February 2012, acute care hospitals in New Mexico (NM) were required to report laboratory-identified CDI to the New Mexico Department of Health (NMDOH).

Reporting is done using the National Healthcare Safety Network (NHSN). NHSN is a web-based reporting system maintained by the Centers for Disease Control and Prevention (CDC). This system provides a mechanism for reporting by acute care facilities and allows HAI to be monitored using this national database. The goal is to use these data to monitor prevention strategies and to decrease and ultimately eliminate HAI in acute care facilities throughout the United States.

NMDOH not only recognizes the importance of obtaining surveillance data, but also the importance of validating surveillance data. Data validation is a process to assure high quality, accurate, and reliable surveillance data and to identify and correct reporting errors. In 2014, NMDOH initiated CDI validation using the Centers for Disease Control and Prevention 2013 External Validation of NHSN Patient Safety Component Data Toolkit (2013 Toolkit).[4] The toolkit provides a standardized process and data collection instruments to ensure meaningful validation across and within states.

Methods

Acute care facilities participating in the CDI validation reporting project in New Mexico were selected based on the "Targeted Top Tertile Plus 5% Plan" in accordance with the CDI Validation 2013 Toolkit. NM had 32 facilities sorted into tertiles based on the expected/predicted number of CDI events, which resulted in 11 top tertile facilities being selected. This selection algorithm was then applied to the second tertile resulting in seven additional facilities being selected. A 5% random sample from the remaining facilities resulted in one facility being selected, for a total of 19 facilities. Facility infection preventionists (IP) were surveyed on CDI patient surveillance and laboratory protocols regarding unformed stool testing for *C. difficile*. NMDOH also collected information about the facility-specific application of NHSN definitions and rules, as well as surveillance and laboratory software systems.

After the facilities were selected, patients with positive laboratory tests for *C. difficile* were selected randomly. First, a list of positive *C. difficile* laboratory results on unformed stool specimens was obtained from each selected facility. The list of patients with CDI was obtained electronically by 12 facilities (63%) and manually by four facilities. Three facility IPs could not identify the source of this information (16%). Consistent with CDC recommendations, each facility laboratory reported having a policy to perform CDI toxin stool tests only on unformed stool.

The original list from each facility was then stratified into two lists based on whether it was the first CDI during the current episode of care for the patient (List A) or not the first CDI (List B). From list A, a random sample of 20 positive laboratory specimens was obtained from each facility. Using list B, although the number varied by facility, up to 15 positive test results were randomly selected. The selected positive test results from both lists from each facility were then evaluated to determine whether the CDI should have been reported to NHSN.

The CDC 2013 Toolkit Medical Record Abstraction Tools were used to review the records. This required information such as: inpatient admission date, first inpatient bed location, inpatient CDI toxin-positive specimen collection dates, and transfer locations and dates. Medical record reviews were conducted by the NMDOH HAI Epidemiologist, HAI student intern, and a NMDOH contractor who was an infection preventionist. Reviewers were blinded as to whether the hospitals had reported the CDI to NHSN.

After the review was complete, CDI that were initially identified as discordant (reported to NHSN by facilities but determined not to meet reporting criteria and vice versa) were discussed with the IP at each facility by the HAI Epidemiologist and the HAI Program Manager. This discussion focused on identifying reasons for the discordance.

Summary data from medical record reviews, NMDOH CDI determinations, CDI events in NHSN, and reasons for CDI reporting discrepancies were entered into an Excel spreadsheet. The mean and median times for medical record reviews were determined. Sensitivity, specificity, and positive and negative predictive values also were calculated.

Results

Medical record reviews were completed both on-site and remotely. Electronic medical records (EMR) were reviewed for most facilities, although some facilities chose to provide paper charts. Among the 19 facilities in this validation study, 15 facilities (79%) granted access to EMR for chart reviews, three facilities (16%) with EMR did not provide direct access but printed out necessary entries, and one facility (5%) provided paper charts (Figure).

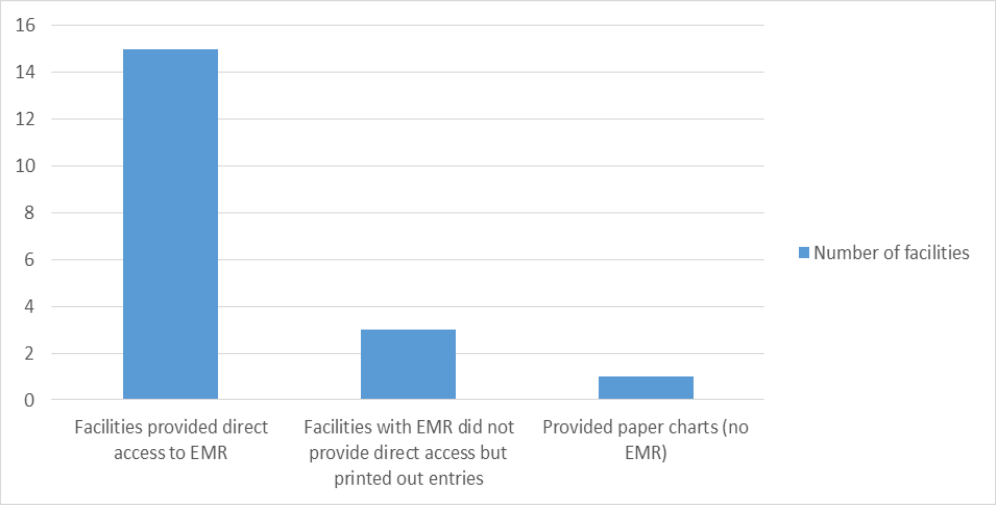


Figure. Number of Facilities providing Access to Electronic Medical Records for Review, New Mexico

Three hundred seventy-nine patients with laboratory confirmed CDI from 19 acute care facilities were included in the CDI validation. The median bed size of facilities participating

in the validation was 186 beds (range 26-723 beds). The median time for medical record review was 9 minutes (range 4-60 minutes).

CDI validation identified 58 discordant cases among the 379 patients with CDI hospitalized in the 19 facilities. Two hundred and seventy-five events were 'true positives' (that both acute care facilities and NMDOH HAI staff agreed to be reportable) and 46 events were 'true negatives' (agreed to be non-reportable by facilities and NMDOH). Discrepancies were categorized into under-reported CDI (53) and over-reported CDI (5) (Table).

Table. Comparison of original facility determination and NMDOH CDI determinations

	Determination by NMDOH		
Original facility determination	Reportable CDI	Not reportable CDI	Total
Reportable CDI	275	5	280
Not reportable CDI	53	46	99
Total	328	51	379

Under-reported CDI were those NMDOH determined to be true CDI (thus reportable) but that facilities had not entered into NHSN. Reasons for under-reporting CDI events included facility system issues resulting in the IP not being alerted to a positive *C. difficile* laboratory test. Another reason for not reporting a CDI was misinterpretation of reporting rules by the facility IP (e.g., not reporting a CDI when it had been more than 14 days since the last CDI positive specimen from the patient in same location). However, for the majority of unreported cases a reason could not be determined.

Over-reported CDI cases were entered in NHSN by facilities but were determined by NMDOH to be non-reportable. These CDI cases were either duplicate (CDI toxin-positive specimens collected from the same patient in same location within 14 days of prior specimen collection in an episode of care) or emergency department cases not from the same calendar day as hospital admission.

After validation, the facilities entered previously unidentified CDI into NHSN and removed previously reported CDI that were determined not to be reportable. Final determinations resulted in 84% sensitivity, 90% specificity, 98% positive predictive value, and 46% negative predictive value.

Results from IP interviews revealed that many of the facilities did not obtain line lists directly from the facility's laboratory information management system (LIMS) which is the recommended method of identifying HAI, including CDI. Only five facilities (29%) obtained their lists from their LIMS. Four facilities (23%) retrieved line lists using other surveillance software and six lists (35%) came from a combination of LIMS and surveillance software.

Two facility lists (12%) came from the quality department and one (1%) from the infection log maintained by the facility's IP.

Discussion

External validation of HAI reporting by acute care facilities through the NHSN provides the opportunity to ensure accurate and reliable reporting. Written feedback was provided to each acute care facility participating in the validation, which included facility-specific system issues that could be addressed to improve accuracy and/or ease of data collection for future reporting.

Major challenges encountered during the CDI validation project included failure to obtain a searchable file of positive stool test results from each facility's LIMS. In addition, not all facilities provided access to the full medical record or there were discrepancies in medical record numbers, admission dates, and/or specimen collection locations. External validation of CDI data is important to improve reporting of these infections by acute care facilities.

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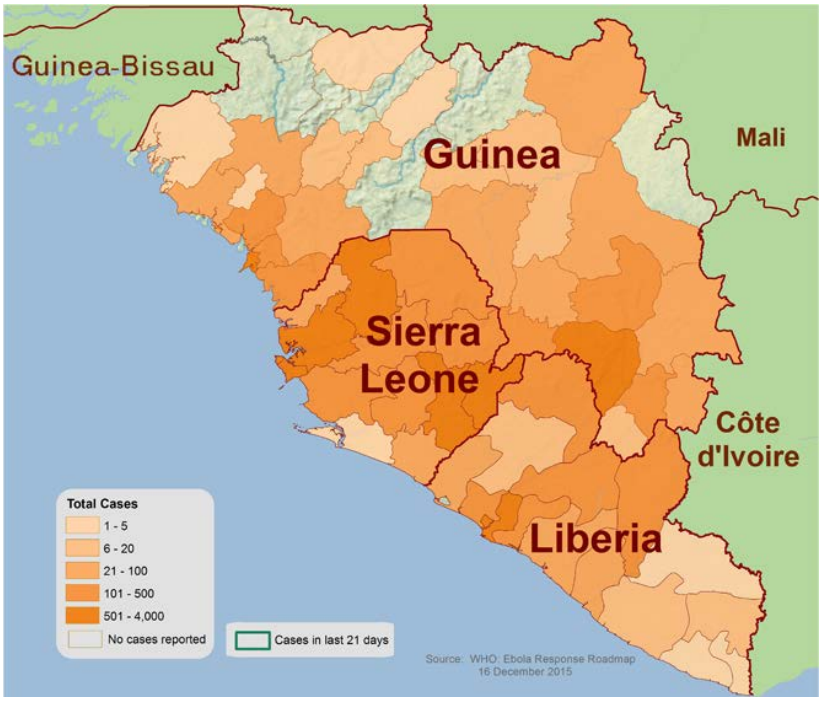
Ebola Virus Disease (EVD): New Mexico's Experience with Contact Monitoring of Travelers

David Selvage MHS, PA-C and Paul Ettestad DVM, MS

Highlights

- Ebola virus disease (EVD) is one of many viral hemorrhagic fevers
- In 2014, the largest Ebola virus disease outbreak in history began in West Africa
- As part of its EVD response plan, the New Mexico Department of Health (NMDOH) developed a system for monitoring travelers coming to New Mexico from countries with EVD cases
- During October 2014 to December 2015, NMDOH monitored 86 travelers, none of whom developed EVD

Background



In 2014, the largest Ebola virus disease (EVD) outbreak in history began. As of December 16, 2015, 24,797 EVD cases and 8,764 deaths have occurred, with the vast majority of cases and deaths occurring in three West African countries: Guinea, Liberia and Sierra Leone. All three countries are characterized by extreme poverty, political instability, and poor public health infrastructure.

The 2014 outbreak marks the first time since the discovery of the Ebola virus in 1976 near the Ebola River in the Democratic Republic of the Congo that multiple countries–including developed countries–were affected. As a result of appeals from West African governments and aid organizations, as well as fears of EVD spreading beyond West Africa, on August 8, 2014 the World Health Organization (WHO) declared the EVD outbreak a Public Health Emergency of International Concern (PHEIC). This declaration prompted health agencies around the world to prepare for a potential international public health disaster.

EVD is one of many viral hemorrhagic fevers. It is caused by infection with the Ebola virus, of which there are multiple subtypes. The incubation period is 2 to 21 days, but

averages 8 to 10 days. Symptoms include fever, severe headache, muscle pain, weakness, diarrhea, vomiting, abdominal pain and hemorrhage. There is no widely available Food and Drug Administration (FDA) approved treatment. Generally, treatment consists of supportive care. Unfortunately, the average case fatality rate is about 50%. Given that about half of those infected with the Ebola virus die and the public's lack of understanding of how it is transmitted there is considerable fear associated with this disease–especially the potential for it to spread to the United States.

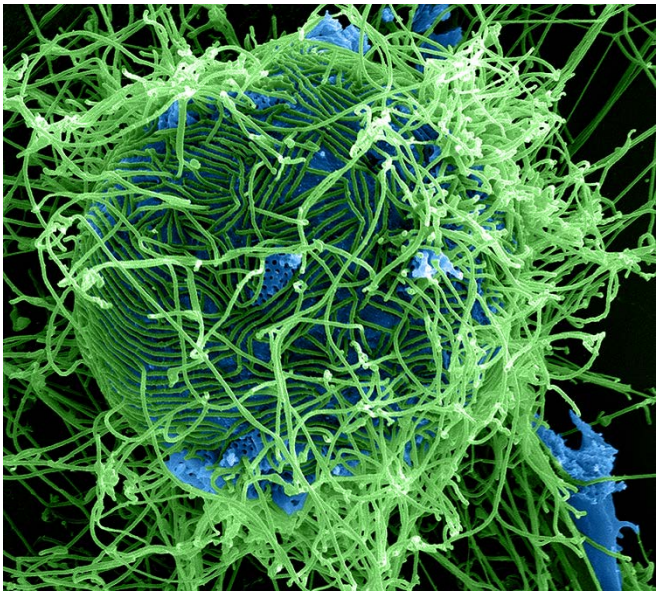


Photo by: National Institute of Allergy and Infectious Diseases, 2014. Digitally colorized scanning electron micrograph showing Ebola virus particles (blue) emerging from an infected cell

Despite the fear and panic created by EVD, it is not easily transmitted. Transmission of Ebola virus depends on direct contact through mucus membranes or broken skin with infected body fluids, possibly during sex from infected semen, from sharp contaminated objects (e.g., needles and syringes), or from vector species such as infected bats or monkeys. Ebola is not spread through the air, by water, or in food. The natural reservoir host is not known although many researchers believe bats are the most likely reservoir. Furthermore, the mechanism by which the virus first infects a human from an animal reservoir has not been completely described.

In West Africa, common practices and conditions increase the risk of exposure. The killing, preparation and consumption of "bush meat" (wild game killed for food) may expose people to infected animals. Traditional burial practices and ceremonial behaviors following an EVD death increase the risk of transmission from highly contagious corpses. High density living conditions increase the risk of exposure to family members when there is an infected individual in a home and a mobile population increases the chance of spread to surrounding areas. Inadequate infection control practices in healthcare facilities and the absence of personal protective equipment (PPE) during patient care put healthcare providers at tremendous risk when caring for patients with EVD. All of these factors contributed to the rapid spread of EVD beginning in early 2014. Following the

WHO PHEIC declaration in August 2014, developed countries including the United States began to prepare for the possibility of EVD infection spreading around the world.

EVD in the United States

The United States remained unaffected and unprepared until September 30, 2014 when the Centers for Disease Control and Prevention (CDC) confirmed EVD in a man who had travelled from Liberia to Dallas, Texas. The man was asymptomatic when he departed Liberia, but developed symptoms several days after arriving in Dallas. He sought care at a Dallas hospital and based on his travel history and symptoms CDC recommended testing for EVD. The patient was isolated and his contacts were identified and monitored by local public health authorities.

The patient died from EVD on October 8, 2014 and two healthcare workers who had cared for the patient subsequently developed EVD. A fourth EVD patient, also a healthcare worker but unrelated to the Dallas EVD cases, was diagnosed in New York City in late October 2014 after returning from a volunteer medical service in Guinea. These EVD cases occurring in the United States increased the public's fear associated with EVD. It also inadvertently revealed the shortcomings of United States hospitals' infection control practices and national standards for use of personal protective equipment when dealing with EVD and similar diseases.

Contact Monitoring

On December 16, 2014, President Obama signed into law an appropriation bill allocating emergency funding to assist with EVD preparedness and response. States subsequently received funding through the Centers for Disease Control and Prevention (CDC) cooperative agreements to conduct a variety of activities including active contact monitoring of individuals returning from EVD affected countries. The New Mexico Department of Health (NMDOH) developed a state-specific EVD Response Plan, including monitoring of returning travelers who had been to EVD affected countries.

In early October, 2014, travelers returning from or originating in the West African countries of Guinea, Liberia, or Sierra Leone (and Mali for a brief period) to the United States began to be routed through CDC quarantine stations in five airports (New York JFK, Washington-Dulles, Newark Liberty, Chicago-O'Hare, and Atlanta Hartsfield-Jackson) for entry screening for EVD exposure. These returning travelers were categorized into three categories of risk (low, some, and high) based on the level of risk of the activities or work performed while they were in the involved countries in West Africa. The initial symptom and risk category information obtained by the quarantine stations was communicated to the respective state health department of the traveler's final destination through a CDC-sponsored, secure notification system called Epi-X.

In response to the need for contact monitoring, all state health departments developed systems for contacting travelers within 24 hours of arrival to conduct an initial interview

and establish ongoing communication and monitoring. Given the potentially long incubation period of EVD, returning travelers were monitored for 21 days.

New Mexico's Experience

As part of its EVD response plan, the Infectious Disease Epidemiology Bureau (IDEB) developed a system for active contact monitoring. IDEB received returning traveler notification through Epi-X after the traveler had been screened upon entry to the United States. Information in the Epi-X notification included the traveler's contact information, arrival details, name(s) of country or countries visited in West Africa, temperature and symptoms of illness, and the traveler's responses to risk assessment questions. Upon receipt of Epi-X notification, an epidemiologist from IDEB contacted the returning traveler to verify the accuracy of the information received and to initiate 21 day monitoring. Arrangements for ongoing communication and daily reporting of temperature readings and twice-daily symptom monitoring were established with the returning traveler. Returned travelers in the "some risk" or "high risk" categories required daily direct active monitoring: either watching the person take his or her temperature in person or via electronic device using software such as Skype or FaceTime.

Contact monitoring began in New Mexico in October 2014 and averaged about six returning travelers per month (Figure) through September 2015. In October 2015, a group of 12 native Guineans arrived in New Mexico for a 4-week training.

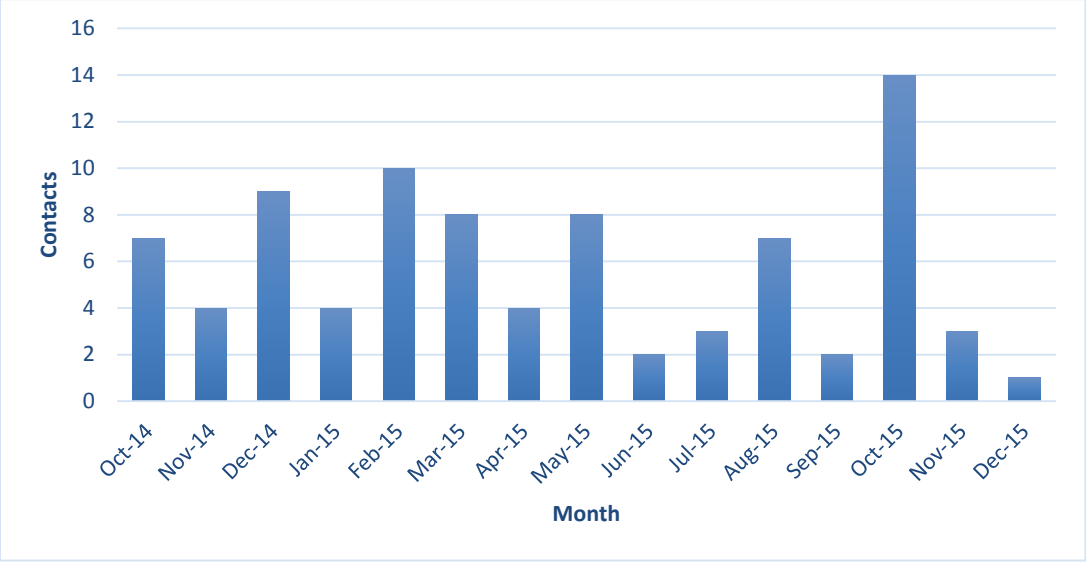


Figure. EVD Monitored Travelers by Month and Year, New Mexico

Characteristics of the 86 travelers are shown in the Table. Sixty-five percent were male. The age of travelers ranged from 1 to 71 years, with the median age being 42 years. Thirty travelers were from Sierra Leone, 28 were from Liberia, 25 were from Guinea, and three were from Mali. Over 70% of travelers arriving in New Mexico were United States citizens returning home. Of the travelers who were residents of West Africa, over 70% were Guineans.

Almost 60% of travelers were United States government employees or government contractors assigned to perform various administrative duties related to the EVD outbreak response. A small number (10%) were medical volunteers.

Based on risk assessment questions administered by the IDEB epidemiologist, the vast majority of travelers (91%) were categorized as “low risk” and the remainder were classified as “some risk.” There were no travelers considered “high risk.” One traveler did become ill during contact monitoring, but EVD was quickly ruled out. None of the returned travelers required testing or to assess if they were infected with EVD assessment for EVD infection.

Table. Monitored Traveler Select Characteristics, New Mexico, October 2014 – December 2015

	Number	Percent
Monitored travelers	86	100%
Age group (years)		
1-20	3	4%
21-40	35	41%
41-60	43	50%
>=61	3	4%
Unknown	2	2%
Gender		
Male	56	65%
Female	30	35%
Country visited		
Sierra Leone	30	35%
Liberia	28	33%
Guinea	25	29%
Mali	3	4%
Citizenship status		
United States	62	72%
Native to country visited	24	28%
Worker category		
Government contractor	33	38%
Resident	23	27%
Government employee	17	20%
Medical volunteer	9	10%
Other	4	5%
Risk category		
Low risk	79	92%
Some risk	7	8%
High risk	0	0%

Conclusions

The contact monitoring system developed by IDEB worked well and accomplished its intended purpose. IDEB was fortunate in that the number of travelers returning to the

state at any given time was relatively small. If New Mexico were impacted on a larger scale, resources from other divisions of NMDOH would need to be mobilized. IDEB was not required to coordinate assessment or testing of anyone during the period reviewed. It is not known how the introduction of an ill traveler with possible EVD would have impacted the ability of IDEB to conduct routine but essential public health activities or continue additional contact monitoring functions. Though the number of travelers to New Mexico was lower than some other states, this contact monitoring revealed that the amount of travel between New Mexico and other parts of the world makes the potential introduction of any number of emerging infections into the state a real possibility at any given time.

Recommendations

Based on the EVD experience, IDEB makes the following recommendations for possible future contact monitoring events:

1. Develop contact monitoring modules that are modifiable and scalable to suit the event or pathogen (e.g., highly pathogenic avian influenza).
2. Develop a web-enabled platform for contact monitoring of potentially exposed health care workers that can be used by infection control staff at hospitals and accessed by epidemiologists at IDEB.
3. Work with hospitals throughout New Mexico to assure that they have protocols in place and that medical staff receive adequate training to be ready in the event a patient with a highly pathogenic emerging disease presents to their facility.

Appendix A: Summary of Select Notifiable Diseases, New Mexico, 2014

	Number	Rate (per 100,000 population)
Foodborne Diseases		
Botulism, foodborne	0	0.0
Botulism, infant	1	0.05
Botulism, wound	1	0.05
Campylobacteriosis	376	18.0
Cholera	0	0.0
Cryptosporidiosis	86	4.1
Cyclosporiasis	0	0.0
Giardiasis	101	4.8
Hepatitis A, acute	8	0.4
Listeriosis	9	0.4
Salmonellosis	329	15.8
Shiga toxin-producing *Escherichia coli* (STEC)	47	2.3
Shigellosis	63	3.0
Typhoid fever (*Salmonella typhi*)	0	0.0
Vibrio parahaemolyticus	1	0.05
Vibrio species, non-toxigenic	0	0.0
Yersiniosis	1	0.05
Vaccine Preventable Diseases		
Measles (Rubeola)	1	0.05
Mumps	2	0.10
Pertussis	370	17.7
Tetanus	0	0.0
Varicella (Chickenpox)	75	3.6
Bacterial Invasive Diseases		
Group A *Streptococcus*, invasive	179	8.6
Group B *Streptococcus*, invasive	202	9.7
Haemophilus influenzae, invasive	50	2.4
Necrotizing fasciitis	14	0.67
Neisseria meningitides (meningococcal disease)	2	0.1
Streptococcus pneumoniae, invasive	299	14.3
Zoonotic Diseases		
Brucellosis	0	0.0
Dengue virus infection	0	0.0

Lyme disease	0	0.0
Hantavirus pulmonary syndrome	6	0.29
Malaria	3	0.14
Plague	2	0.10
Tularemia, human	5	0.24
Rabies, animal	12	0.58
West Nile virus neuroinvasive disease	19	0.91
West Nile virus non-neuroinvasive disease	5	0.24
Bloodborne Diseases		
Hepatitis B virus infection, chronic	119	5.7
Hepatitis B virus infection, acute	2	0.10
Hepatitis C virus infection, chronic or resolved*	2685	128.4
Hepatitis C virus infection, acute	16	0.77
Respiratory Diseases		
Coccidioidomycosis	39	1.9
Legionellosis	8	0.38

Appendix B: Glossary

Acute	Rapid onset of illness.
Antiviral	Medication that may decrease symptoms and shorten time sick when infected with a virus.
Asymptomatic	Person who is infected but not ill.
Bacteria	Plural of bacterium (unicellular microorganisms).
Case	Person or animal identified as having a particular disease, infection, or condition under investigation.
Chronic	Long-term or ongoing disease.
Contagious	Disease that can be spread by direct or indirect contact.
Enteric	Relating to the small intestine.
Epidemiology	Methodology focusing on causes, patterns, and prevention of disease or injury within a population.
Foodborne	Type of illness associated with eating contaminated food.
Genotype	Genetic makeup of an organism.
Gram-negative	Bacteria that do not stain dark blue/purple by a Gram stain.
Healthcare associated	Infection acquired while a person is hospitalized.
Hemorrhagic	Accompanied by abnormal bleeding.
Immunocompromised	Immune system is compromised or absent and not able to fight infectious diseases.
Incidence	The number of new cases of a specific disease occurring in a population during a specified time period.
Incubation period	The interval of time between the infection and the onset of symptoms of disease.
Infectivity	Pathogen's capacity to spread and cause infection in other people.
Invasive	Disease that spreads to surrounding body tissues.
Pathogen	Biological agent causing disease.
Pulsed field gel electrophoresis	Laboratory test to identify microorganisms based on DNA patterns.
Outbreak	Occurrence of illness or disease in a specific population or location and time period that is greater than expected.

Reservoir	Long term host or source of pathogen.
Risk factor	Anything that increases a person's chance of developing a disease.
Sepsis	Life-threatening complication of infection due to the body fighting the infection through inflammatory responses.
Serotype	Variation within a subspecies of bacteria or virus.
Surveillance	Ongoing, systematic collection, analysis, and interpretation of health data.
Symptomatic	Showing signs and/or symptoms of disease or injury.
Transmission	Spread of infectious diseases or pathogens.
Virus	Small infectious agent replicating only inside living cells.
Zoonotic	Transmitted by animals to humans.

Appendix C: Acronyms

AIDS	Acquired immunodeficiency syndrome
CD4	White blood cell that is part of the immune system
CDC	Centers for Disease Control and Prevention
CDI	*Clostridium difficile* infection
CSTE	Council of State and Territorial Epidemiologists
DNA	Deoxyribonucleic acid
EMR	Electronic medical record
Epi-X	Epidemic Information Exchange
EVD	Ebola virus disease
FDA	Food and Drug Administration
HAI	Healthcare associated infection
HIV	Human immunodeficiency virus
HUS	Hemolytic uremic syndrome
IDEB	Infectious Disease Epidemiology Bureau
IP	Infection Preventionist
MMWR	Morbidity and Mortality Weekly Report
NM	New Mexico
NMDOH	New Mexico Department of Health
NMEDSS	New Mexico Electronic Data Surveillance System
PFGE	Pulsed field gel electrophoresis
PHEIC	Public Health Emergency of International Concern
PHN	Public Health Nurse
SLD	Scientific Laboratory Division
RNA	Ribonucleic acid
US	United States
WHO	World Health Organization

Appendix D: Methods

Standard Council of State and Territorial Epidemiologists (CSTE) case definitions are used by NMDOH to classify the infectious diseases in this report.

Rates were calculated for January 1, 2014 through December 31, 2014 and displayed as numbers of cases per 100,000 population. The numerators represent the number of reported cases that were confirmed or, for some diseases, the number of confirmed plus probable cases. The data source used to obtain the numerators was the New Mexico (NM) National Electronic Data Surveillance System (NMEDSS NM denominators were based on 2013 population estimates from the Geospatial and Population Studies (GPS) program, University of New Mexico. All data are considered provisional.

Appendix E: New Mexico Notifiable Diseases

NOTIFIABLE DISEASES OR CONDITIONS IN NEW MEXICO

7.4.3.13 NEW MEXICO ADMINISTRATIVE CODE

ALL REPORTS INCLUDING ELECTRONIC LABORATORY REPORTS OF NOTIFIABLE CONDITIONS MUST INCLUDE:

1. The disease or condition being reported;
2. Patient's name, date of birth/age, gender, race/ethnicity, address, patient's telephone numbers, and occupation;
3. Physician or licensed healthcare professional name and telephone number; and
4. Healthcare facility or laboratory name and telephone number, if applicable.

Laboratory or clinical samples for conditions marked with [*] are required to be sent to the Scientific Laboratory Division.

EMERGENCY REPORTING OF DISEASES OR CONDITIONS

The following diseases, confirmed or suspected, require **immediate reporting** by telephone to Epidemiology and Response Division at 505-827-0006. If no answer, call 1-866-885-6485.

Infectious Diseases

Anthrax*	*Haemophilus influenzae* invasive infections*	Rubella (including congenital)
Avian or novel influenza*	Measles	Severe Acute Respiratory Syndrome (SARS)*
Bordetella species*	Meningococcal infections, invasive*	Smallpox*
Botulism (any type)*	Plague*	Tularemia*
Cholera*	Poliomyelitis, paralytic and non-paralytic	Typhoid fever*
Diphtheria*	Rabies	Yellow fever

Other Conditions

Acute illnesses or conditions of any type involving large numbers of persons in the same geographic area	Severe smallpox vaccine reaction	Suspected waterborne illness or conditions in two or more unrelated persons*
Illnesses or conditions suspected to be caused by the intentional or accidental release of biologic or chemical agents*	Suspected foodborne illness in two or more unrelated persons*	Other illnesses or conditions of public health significance

Infectious Diseases in Animals

Anthrax	Rabies
Plague	Tularemia

ROUTINE REPORTING OF DISEASES OR CONDITIONS

Infectious Diseases (Report case within 24 hours to Epidemiology and Response Division at 505-827-0006; or contact the local health office)

Brucellosis	Hemolytic uremic syndrome	Relapsing fever
Campylobacter infections*	Hepatitis A, acute	Rocky Mountain spotted fever
*Clostridium difficile**	Hepatitis B, acute or chronic	Salmonellosis*
Coccidioidomycosis	Hepatitis C, acute or chronic	Shigellosis*
Colorado tick fever	Hepatitis E, acute	St. Louis encephalitis infections
Cryptosporidiosis	Influenza-associated pediatric death	*Streptococcus pneumoniae* invasive infections*
Cysticercosis	Influenza, laboratory confirmed hospitalization only	Tetanus
Cyclosporiasis	Legionnaires' disease	Trichinellosis
Dengue	Leptospirosis	Toxic shock syndrome
E. coli 0157:H7 infections*	Listeriosis*	Varicella
E. coli , shiga-toxin producing (STEC) infections*	Lyme disease	*Vibrio* infections*
Encephalitis, other	Malaria	West Nile Virus infections
Giardiasis	Mumps	Western equine encephalitis infections
Group A streptococcal invasive infections*	Necrotizing fasciitis*	*Yersinia* infections*
Group B streptococcal invasive infections*	Psittacosis	
Hantavirus pulmonary syndrome	Q fever	

Infectious Diseases in Animals (Report case within 24 hours to Epidemiology and Response Division at 505-827-0006; or contact the local health office).

Arboviral, other
Brucellosis
Psittacosis
West Nile Virus infections

Tuberculosis* or Other Nontuberculous Mycobacterial Infections (including *Mycobacterium avium* complex or leprosy)
Report suspect or confirmed cases within 24 hours to Tuberculosis Program, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110; or call 505-827-2473.

Sexually Transmitted Diseases
Report to Infectious Disease Bureau - STD Program, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110, Fax 505-476- 3638; or call 505-476-3636.

Chancroid
Chlamydia trachomatis infections
Gonorrhea
Syphilis

HIV (Human Immunodeficiency Virus) and AIDS (Acquired Immunodeficiency Syndrome)
Report to HIV and Hepatitis Epidemiology Program, 1190 St. Francis Dr., N1350, Santa Fe, NM 87502, fax 505-476-3544 or call 505-476-3515.

All CD4 lymphocyte tests (count and percent)
All confirmed positive HIV antibody tests
(screening test plus confirmatory test)
All HIV genotype tests
All positive HIV cultures
All tests for HIV RNA or HIV cDNA (viral load tests)
All tests to detect HIV proteins
Opportunistic infections, cancers and any other test or condition indicative of HIV or AIDS

Occupational Illness and Injury
Report to Epidemiology and Response Division, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110; or call 505-827-0006.

Asbestosis
Coal worker's pneumoconiosis
Hypersensitivity pneumonitis
Mesothelioma
Noise induced hearing loss
Occupational asthma
Occupational burn hospitalization
Occupational injury death
Occupational pesticide poisoning
Occupational traumatic amputation
Silicosis
Other illnesses or injuries related to occupational exposure

Health Conditions Related to Environmental Exposures and Certain Injuries
Report to Epidemiology and Response Division, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110; or call 505-827-0006

Environmental Exposures
All pesticide poisoning
Arsenic in urine greater than 50 micrograms/liter
Carbon monoxide poisoning
Infant methemoglobinemia
Lead (all blood levels)
Mercury in urine greater than 3 micrograms/liter or Mercury in blood greater than 5 micrograms/liter
Uranium in urine greater than 0.2 mcg/liter or 0.2 mcg/gram creatinine
Other suspected environmentally-induced health conditions

Injuries
Drug overdose
Firearm injuries
Traumatic brain injuries

Adverse Vaccine Reactions
Report to Vaccine Adverse Events Reporting System, http://www.vaers.hhs.org. Send copy of report to Immunization Program Vaccine Manager, NM Department of Health,
P.0. Box 26110, Santa Fe, NM 87502-6110; fax 505-827-1741.

Healthcare-associated infections
Central line-associated bloodstream infections (CLABSI) events
Clostridium difficile infections

Cancer

Report to NM DOH designee: New Mexico Tumor Registry, University of New Mexico School of Medicine, Albuquerque, NM 87131. Report all malignant and in situ neoplasms and all intracranial neoplasms, regardless of the tissue of origin.

Human Papillomavirus (HPV)

Report to NM DOH designee: Laboratories report the following tests to the New Mexico HPV Pap Registry, 1816 Sigma Chi Rd NE, Albuquerque, NM 87106, phone 505-272-5785 or 505-277-0266.

Papanicolaou test results (all results)	Cervical, vulvar and vaginal pathology results (all results)	HPV test results (all results)

Birth Defects Report to Epidemiology and Response Division, NM Department of Health, P.O. Box 26110, Santa Fe, NM 87502-6110; or call 505-827-0006.

All birth defects diagnosed by age 4 years, including:

Defects diagnosed during pregnancy	Defects found in chromosome testing on amniotic fluid, chorionic villus sampling and products of conception for Trisomy 13, Trisomy 18 and Trisomy 21
Defects diagnosed on fetal deaths	

Genetic and Congenital Hearing Screening

Report to Children's Medical Services, 2040 S. Pacheco, Santa Fe, NM 87505; or call 505-476-8868.

Neonatal screening for congenital hearing loss (all results)	Suspected or confirmed congenital hearing loss in one or both ears	All conditions identified through statewide newborn genetic Screening program

For details online of 7.4.3 NMAC see:

http://www.nmcpr.state.nm.us/nmac/parts/title07/07.004.0003.htm