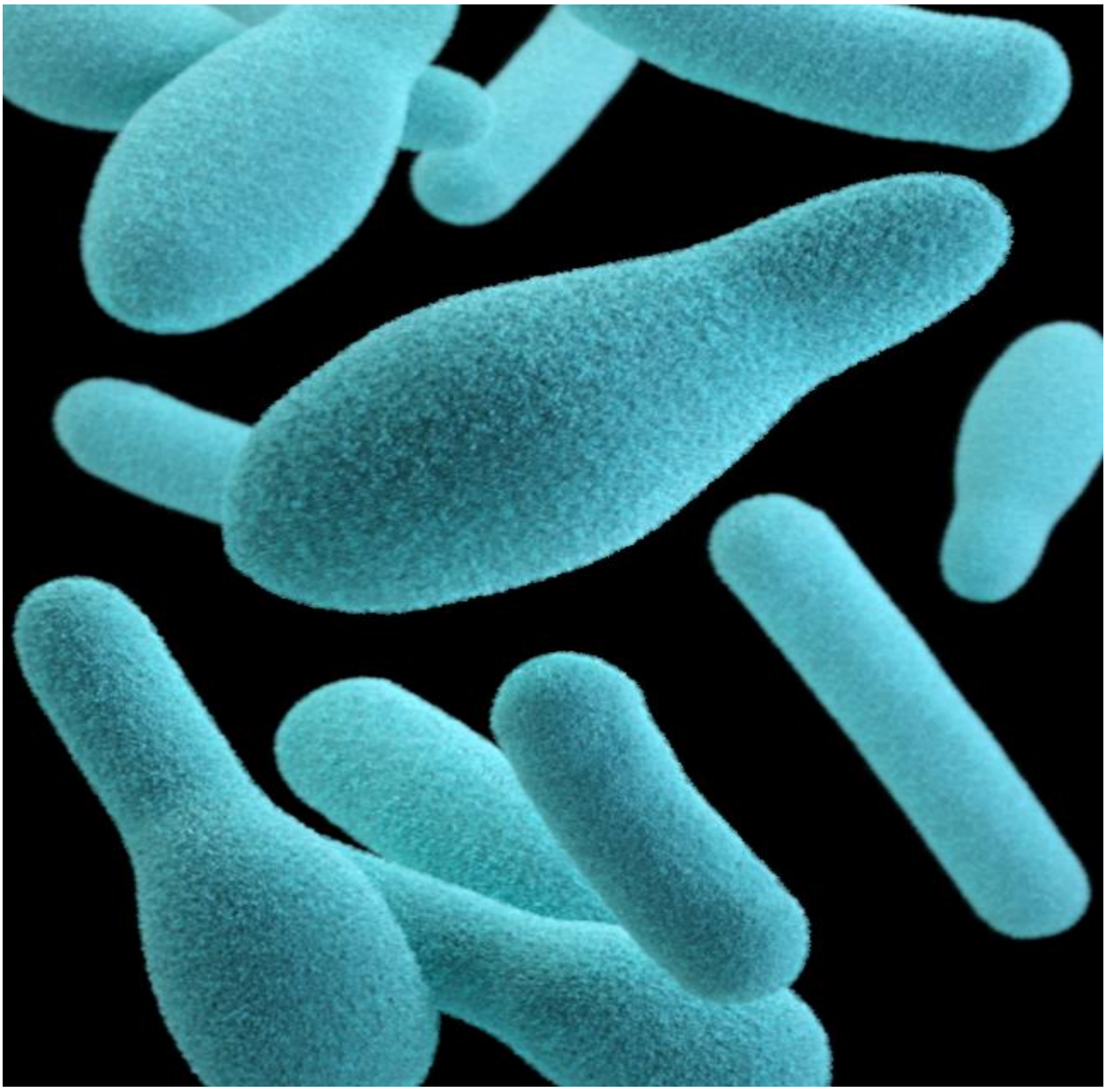
Infectious Diseases in New Mexico 2016 Annual Report



Three-dimensional computer-generated image of *Clostridium* sp. organisms, CDC.

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Infectious Diseases in New Mexico 2016 Annual Report

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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 a more than expected number of people in the same geographical area, and illnesses of public health significance are investigated under the authority of the New Mexico Administrative Code (NMAC) 7.4.3.13.

This report highlights some of the infectious diseases occurring in New Mexico. These chapters cover a range of topics including wound botulism, pertussis, Legionnaires' disease and group A streptococcal infections. Appendix A provides a summary of notifiable disease rates in New Mexico during 2016. Appendices B through D provide additional information including acronym definitions, methods, and notifiable diseases or conditions in New Mexico for 2016.

This report has been prepared by NMDOH staff and CDC staff assigned to NMDOH. Significant contributions from within NMDOH were provided by Epidemiology and Response Division, Public Health Division and Scientific Laboratory Division staff.

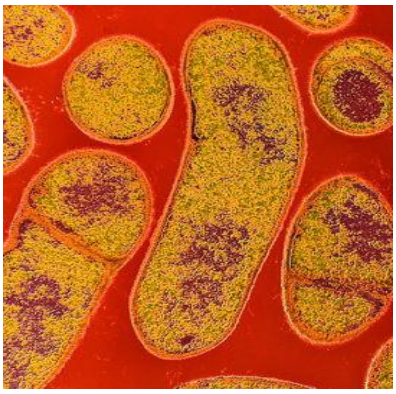
Gratitude goes to the public health nurses, laboratorians, and regional epidemiologists whose efforts are critical to ongoing surveillance and investigation of infectious diseases in New Mexico. The cooperation and active assistance from other organizations (e.g., healthcare providers, educational institutions) and individuals (e.g., infection preventionists) statewide have been vitally important in conducting investigations, and monitoring, preventing and controlling infectious diseases throughout the state.

Wound Botulism Outbreak, New Mexico, 2016

Nicole Middaugh, ScD, MS

Highlights

- Wound botulism is caused by toxin produced from a wound infected with *Clostridium botulinum.*
- Users of injection drugs are at increased risk for wound botulism.
- Death can result from respiratory failure or the consequences of long-term paralysis. About 5% die. Recovery takes weeks to months. Those who survive may have fatigue and shortness of breath for years.



Clostridium botulinum (Photo credit, CDC)

Background

Wound botulism, caused by the bacterium *Clostridium botulinum*, is a rare but serious disease that causes descending paralysis and, if untreated, frequently causes death. Wound botulism occurs when *C. botulinum* spores are introduced into a wound or abscess, such as from subcutaneous or intradermal injection of drugs ("skin popping"). Under the anaerobic conditions present in a wound, the spores multiply, germinate, and secrete toxin. The toxin causes neuromuscular impairment by blocking the release of acetylcholine, the principal neurotransmitter at the neuromuscular junction. There are seven toxins (A through F); however, only types A, B, E and F result in human disease. First observed among injection drug users in New York in 1982, several outbreaks of wound botulism have occurred across the country.

In June and July 2016, three cases of wound botulism occurred among injection drug users in two neighboring counties in New Mexico. All three cases had engaged in skin popping and were users of black tar heroin, and two cases shared needles. All cases presented to local emergency departments complaining of neurologic symptoms including diplopia and trouble swallowing.

Outbreak Investigation Results

On July 1, 2016, NMDOH was called by a neurologist at a tertiary hospital requesting heptavalent botulinum antitoxin (BAT) for a 33-year-old female. The patient initially presented at a regional hospital emergency department (ED) with shortness of breath and trouble swallowing, and was discharged home the same evening. Four days later, the patient returned to the ED with continued symptoms and double vision. The patient experienced respiratory arrest while in the hospital, required intubation and mechanical ventilation, and was transferred to the tertiary hospital for advanced care.

On July 1, because of clinical signs and symptoms consistent with botulism, a history of skin popping and black tar heroin use, and presence of a right hip abscess, wound botulism was suspected. NMDOH contacted the Centers for Disease Control and Prevention (CDC) botulism consultancy service to arrange BAT and specimen testing. The patient was given BAT and penicillin approximately five days after her initial presentation at the regional hospital. Botulinum toxin type A was detected by mouse bioassay in serum collected from the patient on July 1, 2016.

Health Alert Network (HAN)
NMDOH issued a health alert network (HAN) message to clinicians and hospitals throughout New Mexico on July 12, 2016, warning about the potential for black tar heroin to be contaminated with *C. botulinum*, and recommending that clinicians consider the diagnosis of botulism in persons who inject drugs—particularly skin popping of black tar heroin—who present with clinical signs and symptoms suggestive of botulism. NMDOH also collaborated with the NMDOH Harm Reduction Program to distribute information to participants of New Mexico syringe exchange services regarding potential signs and symptoms consistent with botulism, and urging persons with apparent signs or symptoms to seek immediate medical attention.

Case 2. On July 14, NMDOH received a call from a regional ED physician about a 36-year-old male who presented one hour prior with complaints of feeling weak, unable to keep his head up, blurry vision, and difficulty speaking and swallowing. The patient reported experiencing symptoms for three days. The physician reported having had read the NMDOH HAN regarding wound botulism. As a result, the physician obtained a detailed history that included black tar heroin use and skin popping. The patient also reported being an intimate partner of the index case mentioned above, and having shared heroin with her in the recent past.

Because of his neurologic signs and symptoms, black tar heroin use, and connection to the index case, the patient was transferred to a tertiary hospital where specimens were collected for botulism testing, and BAT was ordered immediately. Nine hours after the patient presented at the initial regional ED, he received BAT. Botulinum toxin type A was detected by mass spectrometry in serum collected from the patient on July 14, 2016.

Case 3. On July 4, NMDOH received a report of a patient with Guillain-Barré syndrome, Miller-Fischer variant, in an intubated 36-year-old male who had a history of illicit substance use. On June 23, 2016, the patient had presented to a local hospital with complaint of a "spider bite", trouble swallowing, double vision, and lip and tongue swelling. The patient had an indurated area on the side of the right buttock with reddish-purple discoloration but no visible abscesses. The patient was discharged home with antibiotics but was brought by emergency medical services to another hospital after being found unresponsive at home the next morning. The patient was intubated shortly after arrival due to respiratory failure initially attributed to a drug overdose. Ten days later, the patient was transferred to a tertiary hospital after inability to wean from mechanical ventilation due to global paralysis and significant upper and lower extremity weakness.

After an extensive workup that included a nerve conduction study and needle electromyography (EMG), the patient was diagnosed with Miller-Fischer variant of Guillain-Barré syndrome. The differential diagnosis included botulism; however, botulinum toxin testing was not conducted. The patient was treated with intravenous immunoglobulin (IVIG) and was transferred to a long-term care facility five days later.

Because of the patient's constellation of clinical signs and symptoms, including paralysis, and failure to improve after IVIG treatment, NMDOH interviewed the patient as a potential third case in the outbreak. The patient confirmed using black tar heroin by skin popping and knowing the index case. NMDOH worked with the physicians and CDC to obtain previously drawn (July 4) and new (July 17) serum samples to test for botulism. The July 4 serum samples was positive for

botulinum toxin type A by mass spectrometry. CDC subject matter experts did not recommend administration of antitoxin after those results were obtained given the amount of time that had elapsed since exposure; however, after more time elapsed with no improvement in signs and symptoms, NMDOH requested testing of the July 17 serum sample which was positive for botulinum toxin type A. A full body computed tomography (CT) scan was performed that revealed two occult abscesses deep in the patient's right and left buttocks. Incision and drainage was performed on the right-sided abscess; pus from the abscess and serum were collected for testing, and BAT was requested and administered. Cultures of the abscess collected August 6 were positive for *C. botulinum* type A 43 days after the last possible exposure to black tar heroin. *C. botulinum* type A was not detected by mouse assay in serum drawn at the same time the abscess was cultured.

Summary of Case Presentations, Treatment, and Mechanical Ventilation
Time from hospital presentation to receiving BAT was five days in Case 1, nine hours in Case 2, and 43 days in Case 3. Mechanical ventilation was required for 30 days for Case 1 and 110 days for Case 3. Case 2, who received BAT nine hours after presentation, did not require mechanical ventilation and was discharged three days after presentation. Case 1 and Case 3 were discharged to home after requiring inpatient physical rehabilitation.

Patient interviews helped determine that the source of wound botulism most likely was from a batch of black tar heroin. Cases noted the heroin had changed in either consistency (more tarry), smell, and/or strength. One case stated the dealer noticed a change in the product, and two of the cases shared heroin but did not share needles. Cases reported neither licking needles nor cleaning the skin prior to injecting.

Discussion

The New Mexico Department of Health investigated three confirmed cases of wound botulism among injection drug users in July 2016. All cases regularly used black tar heroin via skin popping, and all presented to an emergency department with cranial nerve findings, including double vision and trouble swallowing. All three cases had occult or visible abscesses. Two of the cases were discharged home the same day, despite having a known drug history and acute neurologic signs and symptoms. Two of the three cases returned to emergency departments within two days with progression of symptoms that required intubation and mechanical ventilation. The lengths of time from initially presenting to an emergency department to receiving BAT were five days (Case #1), nine hours (Case #2), and 43 days (Case #3). The length of time from presentation to receiving BAT was directly proportional to the amount of time spent on mechanical ventilation.

Upon learning of the first case of wound botulism, NMDOH issued a Health Alert Network (HAN) alert to healthcare providers, emergency department staff, and Harm Reduction Programs across the state to: a) alert healthcare providers to recognize signs and symptoms indicative of wound botulism; and b) alert heroin users of the potential danger so that they could either not use black tar heroin and/or recognize symptoms and obtain medical attention immediately. Due to information provided in the HAN, the emergency department physician who first saw Case 2 recognized the neurologic signs and symptoms as consistent with botulism, and injection drug use as a risk for botulism in case #2 and contacted NMDOH within an hour of the patient presenting to the ED. Case #2 was the only patient in this outbreak who did not require mechanical ventilation.

Wound botulism is a serious and often life-threatening illness. When treated promptly and appropriately, the likelihood that lifesaving interventions such as mechanical ventilation will be required are reduced. This outbreak is similar to an outbreak in California in 1995 during which wound botulism was attributed to skin popping and black tar heroin use. The range of time from acute onset of symptoms to receiving BAT in this 2016 outbreak was from a minimum of nine hours up to a maximum of 43 days. After wound botulism was suspected, thorough examinations and testing for occult abscesses were not performed.

Recommendations

Communication to healthcare providers through one NMDOH HAN helped reduce the time from symptom onset until a patient received BAT in one case. Additional information sharing and educational approaches would help assure that future patients receive prompt and appropriate interventions. NMDOH recommends that all healthcare providers maintain a high index of suspicion for wound botulism in patients who present with symptoms and physical examination suggestive of bilateral descending paralysis, and take drug use histories. A thorough physical examination and possibly imaging studies should be performed to identify small or occult abscesses that can harbor *C. botulinum.* Any identified abscesses should be widely debrided and irrigated when possible, ideally after the administration of BAT.

Epidemiologic and Social Determinants of *Bordetella pertussis* Infection in New Mexico

Sarah Shrum, MPH
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Marisa Bargsten, MPH

Highlights

- Pertussis is a highly contagious respiratory infection that continues to cause frequent outbreaks.
- Infants <12 months of age who become infected are at risk for complications, hospitalization, and death.
- In this analysis, higher incidence of pertussis was associated with higher income and less crowdedness, contrary to previous findings on infectious disease and poverty.

Background

Pertussis, commonly known as whooping cough, is a highly contagious respiratory disease characterized by a prolonged paroxysmal cough, frequently accompanied by an inspiratory "whoop", post-tussive vomiting, or apnea (among infants). In recent years, the United States has reported elevated rates of pertussis, and New Mexico has experienced even higher incidence rates than the national rate since 2011, when New Mexico became one of seven sites nationally to participate in enhanced population-based surveillance as part of the Emerging Infections Program (EIP). Risk factors for pertussis infection include having limited or no immunity (e.g., no or incomplete vaccination), age, and among infants, Hispanic ethnicity. There have been no comprehensive analyses of neighborhood level risk factors and pertussis incidence.

Increased attention is being turned toward analyzing risk factors for infectious diseases at the geographic level[1] and several studies have demonstrated the usefulness of identifying neighborhood-level risk factors for infectious diseases.[2-4] Using area–based socioeconomic measures allows for a more direct understanding of how socioeconomic risk factors affect disease transmission and/or infection.[5-6] The purpose of this analysis was to identify socioeconomic and demographic characteristics to describe populations at risk of pertussis infection in New Mexico and inform strategies for prevention.

Methods

All probable and confirmed cases (n=2128), as defined by the Council of State and Territorial Epidemiologist (CSTE) case definition, reported to the New Mexico Department of Health (NMDOH) between 2012-2015 were included in this analysis. Cases were geocoded per the NMDOH address-geocoding protocol and procedures, aggregated to the census tract level using ArcGIS 10.3.1 software, and linked to census-level demographic data from the American Community Survey (ACS) 2009-2014 and 2010 US Census Summary File 1. Most cases were geocoded, n=2049 (96.3%), and the 79 cases that were excluded due to inability to geocode were not significantly different by age, race/ethnicity or sex.

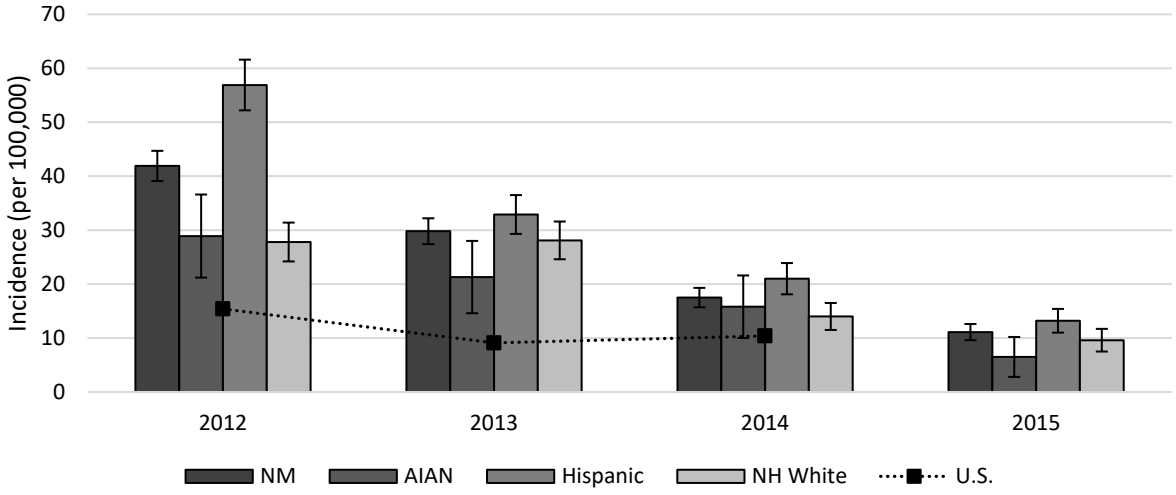
Incidence rates with 95% confidence intervals were calculated by age group and year of infection. X^2 tests were performed on categorical demographic and clinical variables (age, sex, pregnant,

urbanicity [assigned as metropolitan, small metropolitan, mixed urban-rural, and rural per NMDOH classifications], and vaccination status, both overall and stratified by race/ethnicity). White refers to non-Hispanic White. Based upon the methodology described by the Public Health Disparities Geocoding Project,[5] direct age-adjusted incidence rates with 95% inverse gamma confidence intervals were calculated for social determinants including poverty, female head of household, educational attainment, and household crowdedness. Poverty level was divided into four categories: <9.9% of census tract residents below poverty threshold; 10-<19.9%; 20-<29.9%; and 30% or more. This differs from federal definitions for high poverty areas,[6] but these were chosen because they better represent New Mexico's high poverty environment. Crowding was defined as the percentage of households with more than one occupant per room. Neighborhood crowding and female head of household variables were divided using quartiles for distribution in New Mexico.

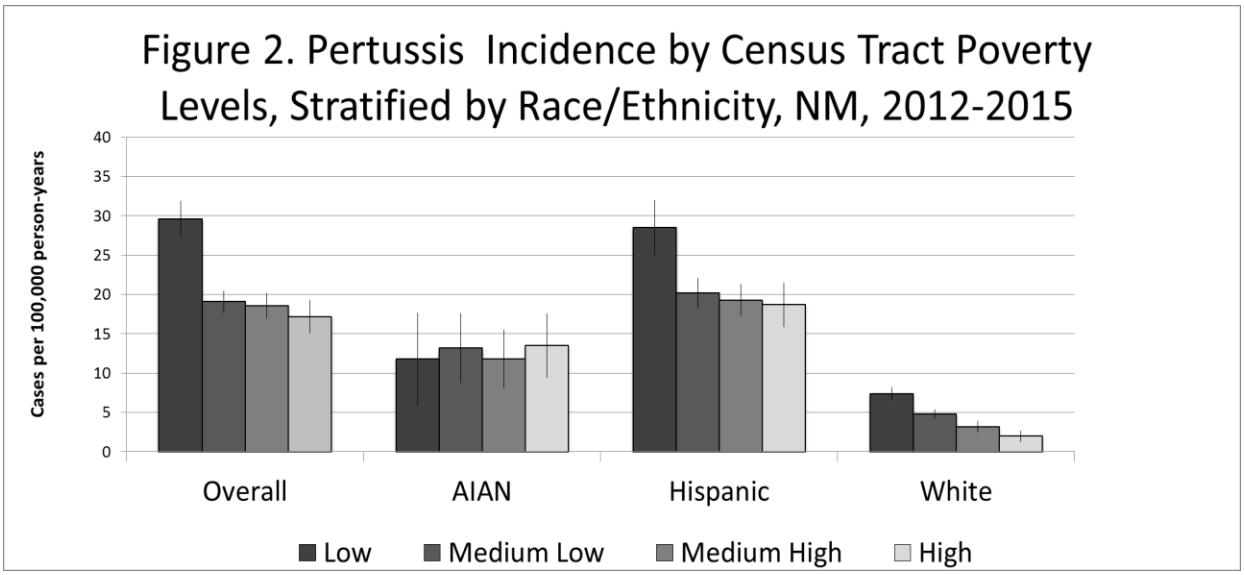
Results

The overall incidence of pertussis among cases reported to NMDOH decreased from the recent peak of 42.8 per 100,000 in 2012 to 11.7 per 100,000 in 2015 (Figure 1). Across all years, children (0-17 years) had significantly higher rates than adults (68.7 vs. 10.9 per 100,000), and infants had greater than twice the overall rate (140.2 vs. 68.7 per 100,000).

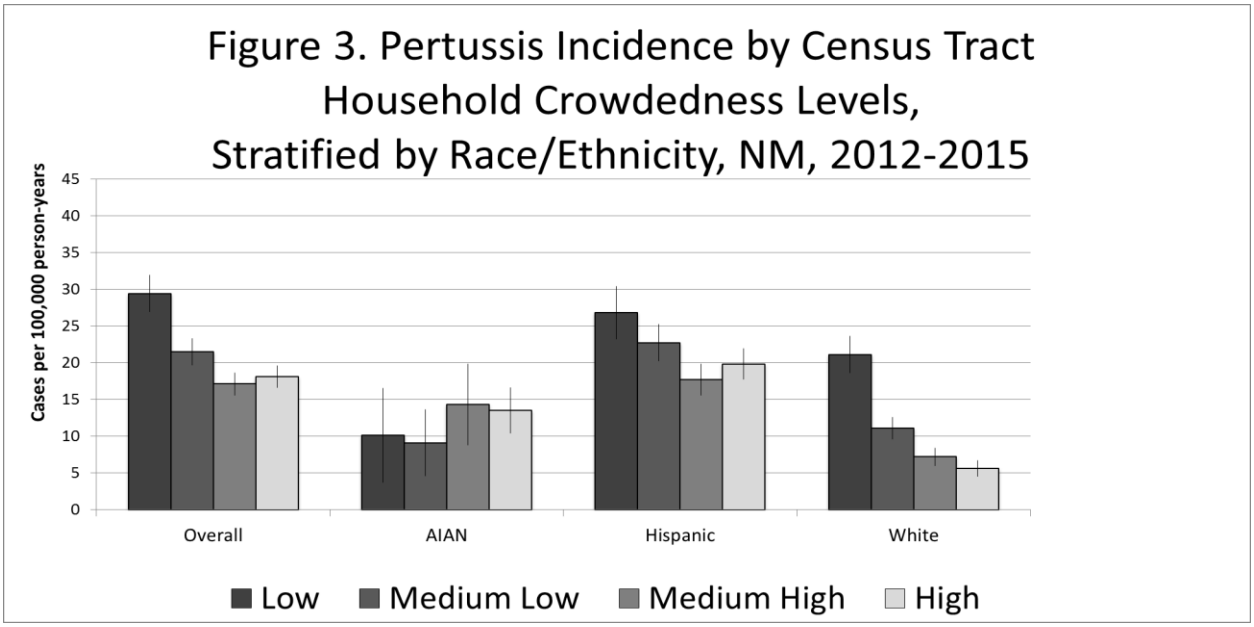
Figure 1. Pertussis Incidence by Year, Stratified by Race/Ethnicity, NM, 2012-2015



American Indian/Alaska Native (AIAN) pertussis cases had a significantly larger mean household size compared to Hispanics and Whites (5.5 household members vs. 4.8 and 4.1 (p=0.05)) and were more likely than Whites to be up to date on pertussis vaccination (65% vs. 53%). White cases were more than twice as likely as AIAN and Hispanics to be unvaccinated (13% vs 1.6% and 5%, respectively).



Overall incidence decreased with higher poverty levels (Figure 2). Those in the lowest poverty category had a higher incidence of disease (29.6 per 100,000 person-years), although the next three poverty categories had similar overall rates and overlapping confidence intervals (19.1, 18.6, and 17.2 per 100,000 person-years for medium low, medium high, and high poverty categories, respectively). In crowdedness categories, the highest overall incidence (29.4 per 100,000 person-years) is in the lowest crowding categories. Trends among female head of household show a mixed picture by race/ethnicity. Urban residents had higher rates than rural residents, except among American Indians/Alaska Natives.



Discussion

This was an exploratory analysis to determine if there were neighborhood level risk factors associated with pertussis cases in New Mexico. Overall, incidence was higher among groups with less poverty and crowding, particularly for White and Hispanic populations. There was higher incidence among urban than rural residents, although AIAN did not conform to this trend. These results contrast with previous studies suggesting a positive relationship between increased percentages of the population living below poverty and incidence of infectious disease,[2-4] and a similar relationship between poverty and death in New Mexico.[7]

The lack of association between poverty and pertussis incidence may be a result of a variety of causes. One such factor may be differential usage of medical systems. If those in lower socioeconomic strata are less likely to seek care, it may artificially underestimate the rates of pertussis incidence. Lower rates may also be due to differences in provider practices. If providers who serve low socioeconomic status (SES) communities are less likely to perform lab-confirmation or inquire about epidemiological linkage, there may be under-ascertainment of cases compared to providers who serve higher SES neighborhoods. Although no information is available on pertussis testing specifically, previous studies have shown that patient socioeconomic status affects providers' ordering practices for other types of laboratory testing.[8] Previous studies on infectious diseases have also shown that rural residence is a risk factor for delaying care.[9] An additional contributor may be that there are differences in vaccination practices by socioeconomic status – those in lower socioeconomic strata may be less likely to be vaccine exemptors, for example.

This study has several limitations. Neighborhood characteristics may not apply to individuals represented in this study; it is important not to infer individual characteristics. These variables do, however, provide valuable insight into the types of neighborhoods which are disproportionately affected by pertussis in New Mexico. 2010 Census data was used instead of New Mexico Indicator Based Information System (NMIBIS) population denominators to allow this methodology to potentially be replicated across national Emerging Infections Program (EIP) sites. The decennial census is recommended by both the Harvard Public Health Geocoding Protocol and the Council of State and Territorial Epidemiologists (CSTE) geocoding guidelines,[5] however experience in New Mexico shows that NMIBIS denominators more accurately reflect New Mexico's population. In addition, census tracts were classified as metro, small metro, mixed urban/rural, and rural per NMDOH classifications of the counties within which they fell, not per the census tract level.

Recommendations

Future studies should examine the diagnosing and testing practices of practitioners in New Mexico, to determine whether rates differ by socioeconomic status of the patient. If those in high poverty census tracts are either not seeking care as frequently, or are being underdiagnosed by providers, this represents an opportunity for intervention. Education about symptoms and potential consequences of pertussis may help people better understand when to seek care. Targeted education of providers may help patients get the care they need and promote lab-confirmation of cases, all of which will promote health and improve surveillance.

This study suggests new and interesting information about the burden of pertussis in New Mexico: mainly, that the association of pertussis burden to neighborhood level poverty and crowdedness

may be different than what has been previously reported elsewhere. Further monitoring and analysis is necessary to determine whether these findings are accurate or are an artifact of differential practices or data gathering. Further study is needed to determine key areas for planning and prevention.

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False Positive Urine Antigen Testing Identified in a Cluster of Legionnaires' Disease, Chaves County, New Mexico, 2016

Sandra Pena, MPH
David Selvage, MHS, PA-C

Highlights

- Legionellosis is a respiratory illness caused by the *Legionella* bacterium.
- *Legionella* is ubiquitous in natural, freshwater environments. Sporadic cases and outbreaks are frequently associated with water systems in buildings where conditions allow for *Legionella* growth.
- *Legionella* urine antigen testing (UAT) is the most common means of diagnosis. Culture remains the 'gold standard' for confirmation of the diagnosis. Culture is 100% specific, but has variable sensitivity.

Legionella bacteria (Photo credit CDC.gov)

Background

Legionella was first discovered after an outbreak in 1976 among people who went to a Philadelphia convention of the American Legion. Those who were affected suffered from a type of pneumonia that was later named Legionnaires' disease. Epidemiologists from Pennsylvania and the Centers for Disease Control and Prevention (CDC) isolated the new pathogen, *Legionella pneumophila*, and identified a novel environmental source, the building's cooling system.

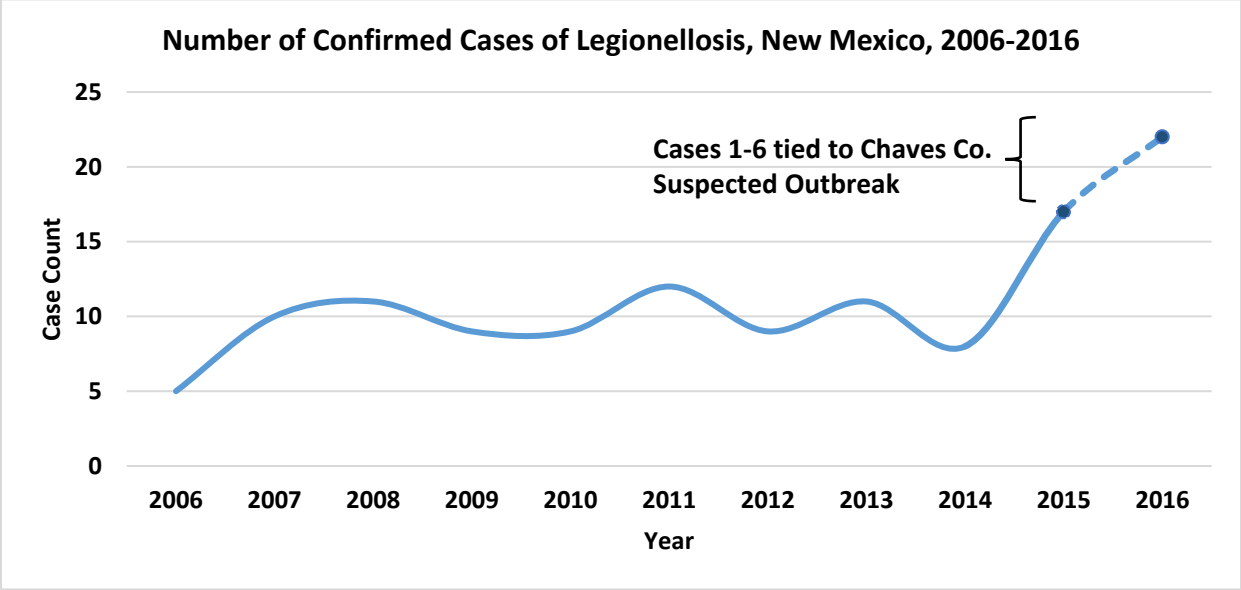
The first identified cases of Pontiac fever, a less severe form of legionellosis, occurred in 1968 in Pontiac, Michigan, among people who worked at and visited the city's health department. It wasn't until *Legionella* was discovered after the 1976 outbreak in Philadelphia that public health officials determined that the same bacterium causes both diseases. Later that same year legionellosis became a nationally notifiable condition and remains so to this day.

Legionella pneumophila serotype 1 accounts for approximately 90% of confirmed cases of legionellosis in the United States. Most cases are diagnosed with a urine antigen test (UAT) which detects *L. pneumophila* serogroup 1. Culture of lower respiratory secretions is more difficult to conduct both in terms of obtaining adequate clinical specimens and in performing the culture technique on selective growth media. UATs are reported to have very high specificity with variable sensitivity[1].

Epidemiology

The incidence of legionellosis has been on the rise nationally. The rate of legionellosis nationally rose from 0.4/100,000 population in 2000 to 1.6/100,000 in 2014, representing a four-fold increase. The reasons for this are not clear. This may be due to a true increase in cases, which may be attributed to an increasing at-risk population, aging water systems, and/or possibly due to improved

detection and reporting[2]. People at increased risk for Legionnaires' disease are individuals over the age of 50, current and previous smokers, individuals with underlying chronic respiratory illness and/or individuals with weakened immune systems. Sporadic cases and outbreaks have been associated with contaminated water systems in buildings, hot tubs, water displays, fountains, and cooling towers. Identified outbreaks are only a small portion of all cases[2]. In nationally identified outbreaks, potable water was the most common source, and the highest case counts have been seen in health facilities given the susceptibility of those exposed[2].



In New Mexico, annual case rates between 2006 and 2015 fluctuated between 0.2 and 0.8/100,000 population. Rates in New Mexico are highest in persons over 45 years of age. Most cases are single, sporadic cases. Clusters of cases associated with hotels and healthcare facilities have been identified. While the healthcare setting is known to be a higher risk environment, there have not been any healthcare-associated outbreaks identified in the past five years. When these cases occur, the New Mexico Department of Health (NMDOH) works with its environmental health partners to assess environmental risk factors and provide remediation recommendations.

Outbreak Investigation

In late November, 2016, NMDOH received reports of three cases of Legionnaires' disease in Chaves County. After reviewing surveillance data for the county from the previous three years, an additional two cases were identified in October 2016, three cases in 2015, and no cases in 2014.

Due to the increase in cases, an investigation was initiated. Cases from October 2016 forward were interviewed using a standardized questionnaire. Cases' residences were not closely clustered geographically, nor did they all receive water from the same water source. Interviews identified that most cases had visited a central area within Roswell, the largest municipality in Chaves County. Four healthcare facilities within the central area were identified where cases had visited

(three outpatient facilities where two cases each visited and one emergency department/inpatient facility where three cases visited) in the 14 days before their illness onset.

An environmental assessment of this area was completed to look for possible outdoor exposures. Interior facility assessments for the four healthcare facilities were conducted. Where potential outdoor exposures existed and indoor locations where ≥2 cases had visited were identified, NMDOH collected environmental samples to measure water temperature, chlorine levels, and perform bacterial culture for *Legionella* spp. The environmental assessment and sampling did not identify a source. Investigation did identify conditions that promote *Legionella* growth in facilities (median total chlorine 0.07 ppm [range 0–0.48] and median hot water temperature 103.5 ^{o}F [range 49–131]) within healthcare facilities. *L. anisa* was cultured from a water heater and two sinks within the health facilities sampled.

In response, NMDOH requested that all Chaves County hospitals test all patients diagnosed with pneumonia for *Legionella* with UAT and culture. Hospital A started UAT testing by urine antigen card (BinaxNOW™ *Legionella* Urinary Antigen Card, Alere Inc., Orlando, Florida) on site and continued to send samples to the commercial reference laboratory that used an immunoassay (Binax™ *Legionella* Urine Antigen Enzyme Immunoassay, Alere Inc., Orlando, Florida).

In total, between October 4 and December 4, 2016, 10 patients had a positive UAT at the commercial laboratory. Four of ten cases were tested both by the in-hospital and commercial laboratory UAT. All four were negative on the in-hospital UAT and positive on the commercial laboratory UAT. One of these four cases had been tested because of the ongoing outbreak, but was not diagnosed as having pneumonia. Additionally, two of these four cases also had a sputum sample obtained. The sputum cultures overgrew with other pathogens; *Legionella* was not isolated, and polymerase chain reaction (PCR) testing for *Legionella* was negative.

The commercial laboratory and Food and Drug Administration (FDA) were notified of these findings. Hospital A, which was using the commercial laboratory where unconfirmed positive results had occurred, switched to an alternative commercial laboratory. Following the change in laboratories, the rate of Legionnaires' disease returned to expected number for Chaves County. NMDOH provided the results of environmental testing to the facilities and entities involved so that corrective action could be taken.

Discussion

Based on negative repeat UAT testing performed at the in-hospital laboratory, an alternate commercial laboratory and the CDC, NMDOH believes that the last 4 cases in the chronological series were false-positives. None of these cases could be confirmed by repeat or alternate testing on the originally positive specimens.

Of the remaining 6 cases in the series, there remains uncertainty about case status since parallel testing at the in-hospital laboratory or alternate commercial laboratory was not performed or, for 3 of the cases, UAT performed at CDC was delayed due to delays collecting and submitting a second clinical specimen. All the original urine specimens on these 6 cases had been discarded by the time repeat testing was considered; and the probability of obtaining a positive test by UAT even on a confirmed case declines the further out from symptom onset the specimen is collected.

The lack of parallel testing for the first 6 cases didn't occur because the investigation team assumed the results of UAT from the original laboratory were reliable until it was discovered that case #8 in the series had a positive UAT without clinical or radiological evidence of pneumonia. At that point, collective suspicion that the positive test results from the original commercial laboratory might, in fact, represent a pseudo-outbreak caused by problems with either the test platform or the laboratory procedure was aroused. Given the vagaries introduced by test performance at the original commercial laboratory, NMDOH concludes that as many as 6 or as few as none of the first 6 cases in the series may have had Legionnaires' disease. In summary, due to the issues with the UAT at the original commercial laboratory, combined with conflicting test results performed by an alternate commercial laboratory, the in-hospital laboratory and the CDC, it is impossible to determine with certainty exactly what percentage of the first 6 cases included in this investigation represent true cases of Legionnaires' disease.

This investigation highlights the importance of maintaining clinical suspicion even with positive confirmatory testing that has high specificity. False positive results have been previously identified in some select lots of UATs[3]. However, the UAT utilized in this previous report used a different processing method. This investigation highlights the potential pitfalls of non-cultured based test methods and the importance of confirming infectious disease outbreaks using culture when possible. Culture continues to play a vital role in outbreak investigations to confirm the diagnosis and potentially link cases to environmental isolates. PCR for diagnosis of Legionnaires' disease is not commercially available yet; however, it may be able to provide an additional diagnostic tool to UAT and culture in the future. This investigation highlighted the need for systematic response efforts to *Legionella*, which includes procedures for environmental specimen collection, case information sharing, and ongoing evaluation of water management plans in healthcare facilities to prevent conditions that promote the growth of *Legionella* in water systems.

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Invasive Group A Streptococcal Infection in New Mexico, 2010–2015

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Highlights

- Group A *Streptococcus* is the bacterium that causes "strep throat," and when it invades the blood or other normally sterile sites in the body it can cause serious illness and death.
- Certain underlying medical conditions can put people at greater risk of serious illness.
- American Indians/Alaska natives have higher rates of invasive disease than other racial and ethnic groups in New Mexico.

Background

The Emerging Infections Program (EIP) was established by the Centers for Disease Control and Prevention (CDC) in 1995 in response to the 1994 Morbidity and Mortality Weekly Report, Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States .[1] As part of this national EIP surveillance network, the New Mexico Emerging Infections Program (NM EIP), along with nine other U.S. states, conducts active, laboratory- and population-based surveillance for select infectious diseases. The EIP Active Bacterial Core surveillance (ABCs) program conducts statewide surveillance for five invasive bacterial diseases of public health significance: *Haemophilus influenzae, Neisseria meningitidis, Streptococcus pneumoniae*, group B *Streptococcus* and group A *Streptococcus*.

Group A *Streptococcus*, also known as *Streptococcus pyogenes*, is a bacterium that generally causes mild infections such as "strep throat" and impetigo; however, if bacteria invade normally sterile body sites and tissue (e.g., blood, cerebrospinal fluid, muscle), severe and life-threatening infections such as pneumonia, streptococcal toxic shock syndrome (STSS), and necrotizing fasciitis (NF) can occur.[2] These are considered invasive group A *streptococcus* (GAS) infections and are reportable public health conditions in New Mexico. GAS infections of wounds are also reportable if accompanied with a clinical diagnosis of NF or STSS. Both NF and STSS are extremely dangerous infections that require immediate medical intervention. NF is a disease in which the bacteria spread quickly as they destroy muscle, fat and skin tissue, and STSS results in a sudden decrease in blood pressure which can lead to failure of vital organs such as the kidneys, lungs, and liver.

CDC estimates there are approximately 11,000–13,000 cases of invasive GAS and 1,100–1,600 GAS-related deaths each year in the U.S. Approximately 6%–7% of all invasive GAS cases result in NF or STSS, and 25% of NF cases and 30%–70% of STSS cases result in death.[3]

Methods

Clinical microbiology laboratories in New Mexico were regularly audited by NM EIP staff to identify invasive GAS cases among New Mexico residents. A case is defined as the isolation of GAS from a normally sterile site or from a wound when there is a clinical diagnosis of STSS or NF. Basic demographics, underlying illnesses, and risk factor information were obtained through

a standardized medical chart review on all laboratory-confirmed invasive GAS cases. Intensive care unit (ICU) included specialty units such as medical intensive care units (MICUs), surgical ICU (SICU), and cardiac care unit (CCU). GAS isolates were requested for additional testing at the NMDOH Scientific Laboratory Division (SLD). New Mexico incidence rates were computed using New Mexico's Indicator-Based Information System (NM-IBIS) population estimates for 2010 – 2015. Race and ethnicity is presented as a single construct with five major categories: American Indian or Alaska Native (AIAN), Asian or Pacific Islander, Black, Hispanic, and White. Hispanic ethnicity is considered Hispanic regardless of race. If Hispanic ethnicity information is missing, cases are categorized as the reported race. Incidence rates are expressed as cases per 100,000 population. Case fatality rates were calculated using outcome at the time of discharge from hospital, emergency department, or clinic. National EIP rates were calculated by averaging the CDC EIP rates for cases and deaths from 2010 – 2015. National EIP surveillance catchment areas include ten EIP sites, including New Mexico. The chi-square test was used to assess statistical significance of the analysis; p-values < 0.05 were determined to be significant.

Results

Nine hundred and fourteen culture-confirmed cases of invasive GAS infections were identified in New Mexico from January 1, 2010 through December 31, 2015. The median age of cases in New Mexico was 51 years (range, 0 days to 100 years); 60% were male. Two hundred and ninety-seven (32.5%) of cases were White; 275 (30.1%) were AIAN; 274 (30.0%) were Hispanic; 13 (1.4%) were Black; 4 (0.4%) were Asian/Pacific Islanders; and 51 (5.6%) of were of unknown race. Eight hundred and sixty (94.0%) of GAS cases were hospitalized with an average length of stay of 11 days (range, 0 days to 64 days). ICU status was known for 858 (94.0%) of cases. Of those, 356 (41.0%) were admitted to an ICU. At the time of infection, 782 (85.6%) were living in a private residence and 62 (6.7%) were living in a long-term care facility.

The most common pre-existing underlying medical conditions identified among GAS cases in NM were diabetes (32%), smoking (20%), and alcohol abuse (17%) (Table 1). One hundred and forty-two (16%) patients with invasive GAS had a recent history (≤14 days) of penetrating trauma and 92 (10%) had a history of blunt trauma.

Table 1: Underlying conditions reported among invasive GAS cases, NM, 2010 – 2015

Pre-existing Underlying Medical Condition	Cases	Percent
Diabetes mellitus	294	32%
Smoking	182	20%
Alcohol abuse	158	17%
Obesity	145	16%
Atherosclerotic cardiovascular disease (ASCVD)/coronary heart disease (CAD)	100	11%
IVDU	92	10%
Heart Failure/congestive heart failure (CHF)	91	10%
Chronic liver disease/cirrhosis	82	9%
Emphysema/chronic obstructive pulmonary disease (COPD)	75	8%
Asthma	60	7%
Chronic skin breakdown	58	6%

Solid organ malignancy	43	5%
Other drug use	43	5%
Chronic kidney disease	42	5%
Dialysis	36	4%
Cerebral vascular accident (CVA)/ transient ischemic attack (TIA)/ stroke	35	4%
Dementia	29	3%
Immunosuppressive therapy (steroids, chemotherapy, radiation)	27	3%
Seizure/seizure disorder	25	3%
Plegias/paralysis	17	2%
Other conditions where <1% of total cases	46	5%

*Some patients had more than one pre-existing underlying medical condition

GAS was most frequently isolated from blood (79%), joint fluid (9%), and muscle (7%). The most common types of invasive GAS-related infections were cellulitis (45%), bacteremia without focus (19%), and septic shock (17%) (Table 2). GAS cases where a type of infection (e.g., cellulitis, pneumonia) was not identified at the time of discharge were categorized as having bacteremia without focus.

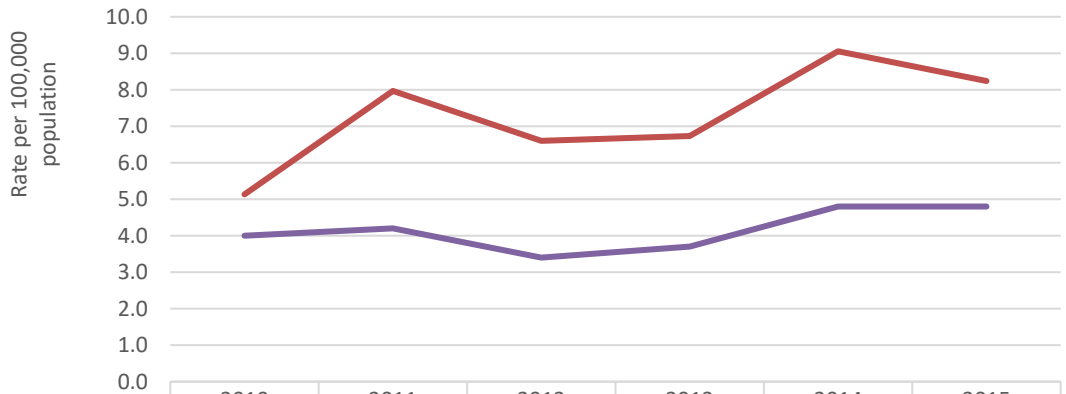
Table 2. Clinical syndrome in patients with invasive GAS, NM, 2010 – 2015

Clinical Syndrome	Cases*	Percent
Cellulitis	411	45%
Bacteremia without focus	178	19%
Septic Shock	153	17%
Pneumonia	151	17%
Necrotizing Fasciitis (NF)	103	11%
Septic arthritis	73	8%
Internal abscess	69	8%
Osteomyelitis	52	6%
Empyema	24	3%
Endocarditis	12	1%
Peritonitis	11	1%
Streptococcal Toxic Shock Syndrome (STSS)	7	1%
Other (e.g. meningitis, endometritis, puerperal sepsis)	96	10%

*Some patients had more than one type of clinical syndrome diagnosed

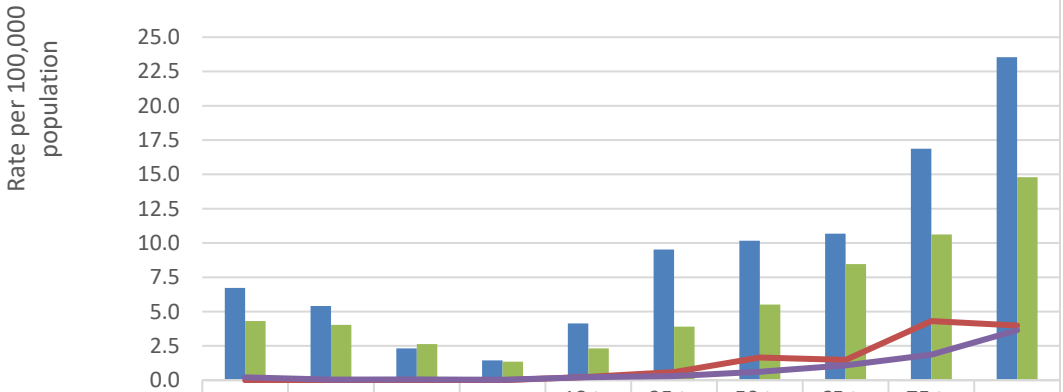
The overall incidence rate of invasive GAS infection among New Mexico residents from 2010–2015 was 7.3 per 100,000 population. This was higher than the national EIP incidence rate of 4.2 per 100,000 population during the same time period (Figure 1). Incidence rates were bimodal, peaking among children under the age of one year (6.7 per 100,000 population) with a second, higher peak among individuals over the age of 84 years (23.5 per 100,000 population) (Figure 2). Outcome was known for 913 (99.9%) of New Mexico cases with a case fatality rate (CFR) of 0.8 per 100,000 population. The national EIP CFR was 0.4 per 100,000 population.

Figure 1: Invasive GAS incidence rates by year, NM and National ABCs, 2010—2015



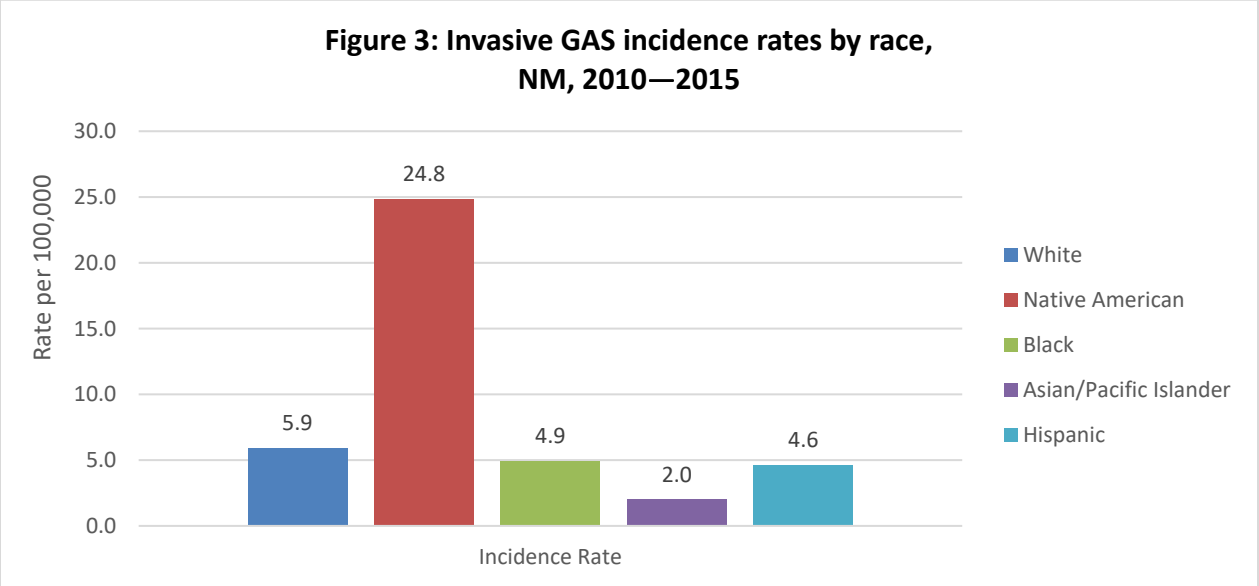
	2010	2011	2012	2013	2014	2015
NM Rate	5.1	8.0	6.6	6.7	9.1	8.2
National ABCs Rate	4.0	4.2	3.4	3.7	4.8	4.8

Figure 2: Invasive GAS incidence and case fatality rates by age group, NM and National ABCs, 2010 – 2015



	<1	1	2 to 4	5 to 17	18 to 34	35 to 49	50 to 64	65 to 74	75 to 84	85 plus
NM Incidence Rate	6.7	5.4	2.3	1.4	4.1	9.5	10.2	10.7	16.9	23.5
National ABCs Incidence Rate	4.3	4.0	2.6	1.4	2.3	3.9	5.5	8.5	10.6	14.8
NM Death Rate	0.0	0.0	0.0	0.0	0.2	0.6	1.6	1.5	4.3	4.0
National ABCs Death Rate	0.2	0.0	0.1	0.0	0.2	0.3	0.6	1.1	1.9	3.6

The CFR was highest among individuals in the 75 to 84-year age group in New Mexico and among those 85+ years of age nationally (4.3 per 100,000 population and 3.6 per 100,000 population, respectively). AIAN had the highest incidence rate of 24.8 per 100,000 population in New Mexico (Figure 3).



Discussion

The incidence of invasive GAS continues to be of public health interest worldwide. According to the World Health Organization, approximately 663,000 people suffer from an invasive GAS infection and approximately 163,000 die every year from a GAS-related infection.[5] In the U.S., incidence rates have not changed in recent years while they have steadily risen in New Mexico. From 2010 – 2015, NM incidence rates had a notable increase over time, almost two-fold those estimated by the national EIP. Moreover, the case fatality rate in New Mexico was twice that of the national EIP rate. The distribution of illness among the age groups was similar in both populations; though, New Mexico had a disproportionately larger burden in the 35-49 year and 50-64-year age groups. New Mexico data showed AIAN were at greater risk of developing invasive GAS infections. Of concern are the high incidence rates among AIAN, infants under the age of one year, and the significantly higher NM rates among individuals over the age of 35 years when compared to national EIP rates. Further study regarding the risk factors for increased incidence of invasive GAS among these groups is needed.

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Appendix A: Summary of Select Notifiable Disease, New Mexico, 2016

	Number	Rate (per 100,000 population)*
Foodborne Diseases		
Botulism, foodborne	0	0
Botulism, infant	0	0
Botulism, wound	4	0.2
Campylobacteriosis	527	25.1
Cholera	0	0
Cryptosporidiosis	74	3.5
Cyclosporiasis	1	0.1
Giardiasis	81	3.9
Hepatitis A, acute	4	0.2
Listeriosis	3	0.1
Salmonellosis	339	16.1
Shiga toxin-producing *Escherichia coli* (STEC)	48	2.3
Shigellosis	234	11.1
Typhoid fever (*Salmonella typhi*)	0	0
Vibrio parahaemolyticus	1	0.1
Vibrio species, non-toxigenic	1	0.1
Yersiniosis	4	0.2
Vaccine Preventable Diseases		
Measles (Rubeola)	0	0
Mumps	21	0.1
Pertussis	158	7.5
Tetanus	0	0
Varicella (Chickenpox)	58	2.8
Bacterial Invasive Diseases		
Group A *Streptococcus*, invasive	212	10.1
Group B *Streptococcus*, invasive	248	11.8
Haemophilus influenzae, invasive	52	2.5
Necrotizing fasciitis	10	0.5
Neisseria meningitides (meningococcal disease)	2	0.1
Streptococcus pneumoniae, invasive	301	14.3
Zoonotic Diseases		
Brucellosis	1	0.1
Dengue virus infection	5	0.2

Lyme disease	1	0.1
Hantavirus pulmonary syndrome	8	0.4
Malaria	2	0.1
Plague	4	0.2
Tularemia, human	7	0.3
Rabies, animal	4	N/A
West Nile virus neuroinvasive disease	6	0.3
West Nile virus non-neuroinvasive disease	0	0
Bloodborne Diseases		
Hepatitis B virus infection, chronic	114	5.4
Hepatitis B virus infection, acute	1	0.1
Hepatitis C virus infection, chronic or resolved*	3114	148.3
Hepatitis C virus infection, acute	36	1.7
Respiratory Diseases		
Coccidioidomycosis	24	1.1
Legionellosis	22	1.1

*****All rates rounded to the tenths.

Appendix B: Acronyms

ABCs	Active Bacterial Core surveillance
ACS	American Community Survey
AIAN	American Indian/Alaska Native
CCU	Cardiac Care Unit
CDC	Centers for Disease Control and Prevention
CSTE	Council of State and Territorial Epidemiologists
CT	Computerized Tomography
ED	Emergency Department
EIP	Emerging Infections Program
EMG	Electromyography
FDA	Food and Drug Administration
GAS	Group A *Streptococcus*
HAN	Health Alert Network
HBAT	Human Botulism Antitoxin
ICU	Intensive Care Unit
IDEB	Infectious Disease Epidemiology Bureau
LTACH	Long-term Acute Care Hospital
MICU	Medical Intensive Care
NF	Necrotizing Fasciitis
NMAC	New Mexico Administrative Code
NMDOH	New Mexico Department of Health
NMEDSS	New Mexico Electronic Disease Surveillance System
NM IBIS	New Mexico Indicator-Based Information System
PHD	Public Health Division
PHN	Public Health Nurse
SES	Socioeconomic Status
SICU	Surgical Intensive Care Unit
SLD	Scientific Laboratory Division
STSS	Streptococcal Toxic Shock Syndrome
UAT	Urine Antigen Test
VIGIV	Varicella Immunoglobulin Intravenous

Appendix C: 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, 2016 through December 31, 2016 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 and probable cases. The data source used to obtain the numerators was the New Mexico Electronic Disease Surveillance System (NM-EDSS). Denominator data are based on 2015 population estimates available in the New Mexico Indicator-based Information System (NM-IBIS).

Appendix D: 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.

Infectious Diseases

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

Other Conditions

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

Infectious Diseases in Animals

Anthrax
Plague
Rabies
Tularemia

ROUTINE REPORTING OF DISEASES OR CONDITIONS

Infectious Diseases (Report case within 24 hours to Epidemiology and Response Division by fax at 505-827-0013 or by phone at 505-827-0006; or contact the local health office)

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

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*.

Report suspect or confirmed cases to NM department of health tuberculosis program by fax at 505-827-0163 or by phone at 505-827-2471 or 505-827-2473: active disease within 24 hours; infection within 72 hours.

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 micrograms/liter or 0.2 micrograms/gram creatinine

Other suspected environmentally-induced health conditions

Injuries
Drug overdose
Traumatic brain injuries
Firearm injuries
Fracture due to fall among older adults

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
Acute care hospitals only report through NHSN and confer rights to NM department of health.
Central line-associated bloodstream infections (CLABSI) events
Clostridium difficile infections

Report all infections, including non-healthcare-associated, within 24 hours to epidemiology and response division by fax at 505-827-0013 or by phone at 505-827-0006.
carbapenem-resistant enterobacteriaceae*;
carbapenem-resistant pseudomonas aeruginosa*.

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

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

newborn critical congenital heart defects screenings (all results)

For details online of 7.4.3 NMAC see: http://www.nmcpr.state.nm.us/nmac/parts/title07/07.004.0003.htm

List of Notifiable Diseases/Conditions in New Mexico revised June 15, 2016