

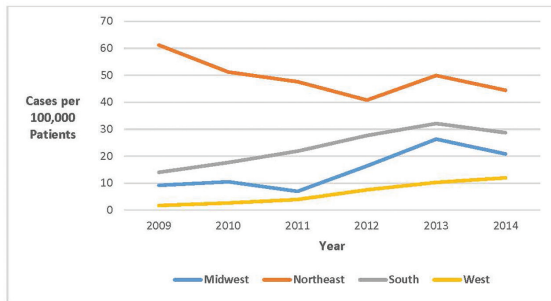
Background. Tick-borne diseases are increasing in incidence in the United States; however, limited data exist on regional trends of associated hospitalizations. Using a nationally distributed dataset of US hospital-based medical records, we aimed to assess trends in incidence of hospitalizations from tick-borne disease by geographic region.

Methods. Data were examined from 156 US hospitals from 2009 to 2014 to identify hospitalizations with tick-borne disease. Cases were described and Poisson regression used to estimate the annual percent change (APC) and associated 95% confidence intervals (CI) in incidence by region over time.

Results. Overall, 2,543 hospitalized patients with tick-borne disease were identified (average annual incidence = 28.4 cases/100,000 hospitalized persons), including 1,613 (63%) with Lyme disease, 379 (15%) tick-borne fever, 293 (12%) ehrlichiosis, 93 (4%) babesiosis, 43 (2%) rickettsiosis, and 122 (4%) multiple tick-related diagnoses. Tick-borne diseases varied significantly by region, with Lyme disease more frequent in those residing in the Northeast (68%) than the South (57%) or West (42%) and tick-borne fever more common in the West (28%) vs. the South (18%), Midwest (14%), and Northeast (13%) ($P < 0.0001$). Significant increases in tick-borne disease hospitalizations were identified across nearly all US regions, ranging from 15% per year in the South (95% CI=8–24%) to 45% per year in the West (34–58%), with the exception of the Northeast, where incidence declined by 6% per year (0.04–11%). Lyme disease hospitalizations showed similar trends, with the greatest increase in the South (APC = 53%, 95% CI = 33–76%) and a decrease in the Northeast (APC = 13%; 3%–23%). Hospitalizations with tick-borne fever increased in the Midwest (APC = 49%; 8–206%) and Northeast (APC = 18%; 4–34%); with ehrlichiosis increased in the West (APC = 231%; 75–306%); and with babesiosis increased in the South (APC = 50%; 12–201%) and the Midwest (APC = 21%; 5–39%).

Conclusion. Incidence of hospitalizations from tick-borne disease is increasing throughout much of the nation, except in the Northeast where decreases in Lyme disease were observed. While hospitalizations with tick-borne diseases remain rare, the increases noted are substantial and may reflect rising incidence of these diseases within the represented states.

Figure 1. Regional trends in incidence of hospitalizations associated with a tick-borne disease diagnosis in the United States from 2009–2014.



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1721. An Outbreak of Botulism Associated With Nacho Cheese Sauce From a Gas Station in California

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Background. Foodborne botulism is rare with 0–6 cases reported annually in California. During April 24–28, 2017, 4 hospitalized patients with suspect foodborne botulism were reported to the California Department of Public Health (CDPH) from 2 adjacent California counties. In collaboration with local public and environmental health, CDPH conducted an investigation to determine the magnitude of the outbreak, identify potential sources, and implement control measures.

Methods. A case was defined as clinical botulism in a visitor to or resident of Sacramento County with illness onset during April 20 to May 5, 2017. Case-patients or their proxies were interviewed. Patient specimens and suspect food items were tested for the presence of botulinum toxin and toxin-producing *Clostridium botulinum*; *C. botulinum* isolates underwent whole genome sequencing (WGS) at the CDPH laboratory.

Results. In April–May 2017, a total of 10 patients were hospitalized with laboratory-confirmed botulism. Median age was 34 years (range 16–57); 7 were male, and 8 were Latino. All patients required intensive care, 7 required ventilator support, and 1 died. Nine patients confirmed visiting Gas Station A in the week before illness onset; 8 reported consuming nacho cheese sauce served from a dispenser there. Inspection of Gas Station A on May 5 indicated that the cheese in the dispenser had a best by date of

April 11; the dispenser was removed that day, before all patients were identified. The remaining pouch of nacho cheese sauce was laboratory confirmed to have botulinum toxin type A and toxin-producing *C. botulinum*. *C. botulinum* isolates from 3 patients clustered with the cheese isolate by WGS.

Conclusion. Contaminated nacho cheese sauce served at a local gas station was the source of the largest outbreak of foodborne botulism reported to date in California. No other botulism cases associated with this commercial cheese sauce were identified elsewhere in the United States; although the mechanism of contamination is unclear, the cheese was likely contaminated locally. Intensive public health investigation and intervention, before all cases were identified and *C. botulinum* toxin was detected in the product, likely prevented additional cases and possible deaths

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1722. The Changing Epidemiology of Candidemia in the United States: Injection Drug Use as an Emerging Risk Factor for Candidemia

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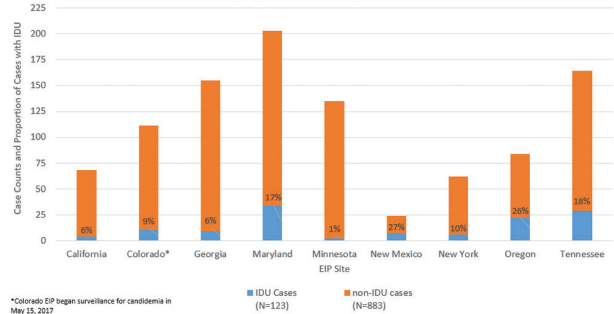
Background. Known risk factors for candidemia include diabetes, malignancy, antibiotics, total parenteral nutrition (TPN), prolonged hospitalization, abdominal surgery, and central venous catheters. Injection drug use (IDU) is not a common risk factor. We used data from CDC Emerging Infections Program's candidemia surveillance to assess prevalence of IDU among candidemia cases and compare IDU and non-IDU cases.

Methods. Active, population-based candidemia surveillance was conducted in 45 counties in 9 states during January–December 2017. Data from 2014 to 2016 were available from 4 states and were used to look for trends. A case was defined as blood culture with *Candida* in a surveillance area resident. We collected clinical information, including IDU in the past 12 months. Differences between IDU and non-IDU cases were tested using logistic regression.

Results. Of 1,018 candidemia cases in 2017, 123 (12%) occurred in the context of recent IDU (1% in Minnesota and 27% in New Mexico) (Figure 1). In the 4 states with pre-2017 data, the proportion of IDU cases increased from 7% in 2014 to 15% in 2017, with the proportion in Tennessee nearly tripling from 7% to 18% (Figure 2). IDU cases were younger than non-IDU cases (median 34 vs. 62 years, $P < 0.001$). Compared with non-IDU cases, IDU cases were less likely to have diabetes (16% vs. 35%; OR 0.4, CI 0.2–0.6), malignancies (7% vs. 30%; OR 0.2, CI 0.1–0.3), abdominal surgery (6% vs. 19%; OR 0.3, CI 0.1–0.6), receive TPN (6% vs. 27%; OR 0.2, CI 0.1–0.4) and were more likely to have hepatitis C (96% vs. 47%; OR 16.1, CI 10.4–24.9), be homeless (13% vs. 1%; OR 17.8, CI 7.1–44.6), and have polymicrobial blood cultures (33% vs. 17%; OR 2.4, CI 1.6–3.6). Median time from admission to candidemia was 0.5 vs. 3 days and in-hospital mortality was 7% vs. 28% for IDU and non-IDU cases, respectively.

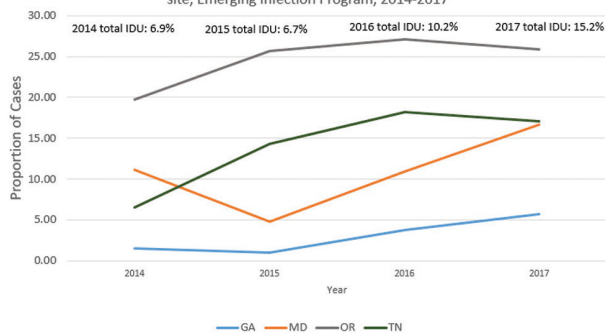
Conclusion. In 2017, 1 in 8 candidemia cases had a history of IDU, including a quarter of cases in some sites. The proportion of such cases increased since 2014. IDU cases lacked many of the typical risk factors for candidemia, suggesting that IDU may be an independent risk factor. Given the growing opioid epidemic, further study is necessary to elucidate how people who inject drugs acquire candidemia and design effective interventions for prevention.

Figure 1. Candidemia cases associated with injection drug use by site, Emerging Infections Program, 2017



*Colorado EP began surveillance for candidemia in May 15, 2017

Figure 2. Proportion of candidemia cases associated with injection drug use by site, Emerging Infection Program, 2014–2017



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1723. Mumps Attack Rates Following Administration of a Third Dose of MMR Vaccine to School-Aged Children, Arkansas, 2016–2017

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Background. During the 2016–2017 school year, the largest mumps outbreak in the United States since 2006 occurred in Arkansas with nearly 3,000 cases. As part of outbreak response, a third dose of measles–mumps–rubella vaccine (MMR3) was offered at 27 schools with mumps attack rates ≥ 5 cases/1,000 students. We compared attack rates after vaccination clinics among students who received MMR3 and students with 2 MMR vaccine doses.

Methods. We obtained information on school enrollment and student immunization status from school registries, and mumps case status from Arkansas's National Electronic Disease Surveillance System database. We included students aged 6–21 years who had previously received ≥ 2 doses of MMR vaccine. We used Arkansas's Immunization Information System to identify students who received MMR3.

We included schools with at least 1 mumps case after their vaccination clinic. We calculated mumps attack rates by 2- and 3-dose MMR vaccine recipients. Observation time started 14 days after each clinic to allow for development of an immune response to MMR3, and continued to the end of the 2016–2017 school year. Observation time varied by school as schools held clinics on different dates.

Results. A total of 18 schools (10 elementary, 8 middle/junior high) with 10,275 students who had previously received ≥ 2 doses of MMR (85% of total enrolled) met inclusion criteria. Median number of students per school was 553. Median student age was 11 years (range, 6–18) and 1,525 students received MMR3. MMR3 uptake varied by school (median, 12%; range, 2–33%; interquartile range, 7–22%). A total of 12 mumps cases occurred among MMR3 recipients and 122 cases among 2-dose recipients. School-specific attack rates ranged from 0 to 23 cases/1,000 students among 3-dose recipients, and 2–41 cases/1,000 students among 2-dose recipients. Mumps attack rates within each school were lower for 3-dose recipients vs. 2-dose recipients in all but one school ($P < .05$). The differences in attack rates between 2- and 2-dose recipients ranged from –5 to 23 cases/1,000 students (median, 5/1,000).

Conclusion. Mumps attack rates were lower in 3-dose vs. 2-dose MMR vaccine recipients after MMR3 vaccination clinics, supporting a benefit of MMR3 for persons in outbreak settings. Further analysis is needed to determine impact of MMR3 on duration and size of mumps outbreaks.

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1724. Characteristics of the Ongoing Measles Outbreak in Greece in the Context of the Recent European-wide Epidemic and Public Health Measures

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Background. Measles is a highly contagious disease which still remains a cause of severe complications, including deaths worldwide, despite the existence of safe and effective vaccines. In the last 3 decades, the incidence of measles in Greece has constantly declined with only sporadic clusters or outbreaks (last outbreak in 2010–2011). We describe the characteristics of the ongoing measles outbreak and the Public Health response.

Methods. All measles cases are reported through the mandatory notification system (EU case definition 2012) to the Department of Surveillance and Intervention of the Hellenic Centre for Disease Control and Prevention. For laboratory confirmation patient sera were tested for IgM antibodies and pharyngeal swabs for the presence of measles virus RNA with RT-PCR. Sequencing of the measles nucleoprotein gene was applied in positively tested serological samples.

Results. From 9 May 2017 to 26 April 2018, 2,659 cases were reported in all 13 regions in Greece; 1,605 (60.4%) were laboratory confirmed. Most cases ($n = 1,595$; 60%) were Roma (73% children <10 years) followed by nonminority Greek nationals ($n = 781$; 29.4%, of whom 57% young adults 25–44 years), highlighting the immunity gap in Roma population. The vast majority of cases (80.5%) were unvaccinated. Ninety-four (3.5%) cases were healthcare workers (HCW); all were partially or not vaccinated. Genotype B3 was identified by molecular testing in all 88 cases tested. Severe complications were reported in 429 (16.1%) patients, most frequently pneumonia (43.8%) and hepatitis (21.2%). Three deaths were recorded in an 11-month-old immunocompromised Roma infant, a 17-year-old unvaccinated Roma, and a 35 year olds partially vaccinated individual from the general population. Extensive vaccination in refugee/migrant hosting sites prevented the emergence of a large number of cases. Mitigation efforts focused on closing the immunization gap in Roma population through emergency vaccination and raising awareness among HCWs to prevent further spread.

Conclusion. The current outbreak highlights the need to achieve high vaccination coverage with 2 doses of MMR vaccine in the general population (children, adolescents, and young adults) and in hard-to-reach vulnerable populations like Roma and refugees.

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1725. Addressing Presenteeism: Variability in Facility Healthcare Personnel Work Restriction Policy Monitoring and Enforcement

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Background. Presenteeism, or working while ill by healthcare personnel (HCP) experiencing influenza-like illness (ILI), increases the likelihood of illness transmission to coworkers and patients. The CDC recommends that HCP with ILI not work until they are afebrile for at least 24 hours. Operationally, hospital policies and practices may not facilitate HCP staying home when ill.

Methods. In March 2018, the Emerging Infections Network surveyed their national network of infectious diseases physicians with hospital epidemiology responsibilities or interests to describe institutional experiences with and policies for HCP working with ILI.

Results. Of the 715 (51%) ID physicians, 367 responded. Of the 367, 135 were not aware of institutional policies and opted out of the rest of the survey. Of the remaining 232 respondents, 206 (89%) reported that their inpatient facility had institutional policies regarding work restrictions for HCP with influenza or ILI, but only 63% said that this policy was communicated to staff at least annually. Work restrictions were most often enforced for staff by sending ill HCP home and by encouragement to call in sick if necessary, while work restrictions for physicians-in-training and attending physicians were most often not enforced or variably enforced. A majority of respondents (53%) reported that adherence to work restrictions was not monitored. Ninety-six percent reported that lab confirmed influenza in patients was tracked by their facility, while 37% reported tracking patient ILI. For employees, 47% reported tracking of laboratory-confirmed influenza and 23% reported tracking ILI. For independent physicians, 13% reported tracking laboratory-confirmed influenza and 5% reported tracking ILI. Sixty-three percent reported that antiviral prophylaxis was provided to at least some employees after occupational exposures, while 9% reported provision of antiviral prophylaxis after nonoccupational (e.g., household) exposures.

Conclusion. Most institutions have policies to prevent HCP from working while ill. However, the dissemination, monitoring, and enforcement of these policies is highly variable. Improving communication about work restriction policies, as well as monitoring and enforcement of these policies, may help prevent the spread of infections from HCP to patients.

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1726. A Random Forest Prediction Model Accurately Identifies Periods at Increased Risk for Positive Legionella Cultures in a Hospital Water Distribution System

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