

Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Breakout
Abstract Title	Acute Hepatitis A Infection Among Previously Vaccinated People Living with HIV: Implications for Postexposure Prophylaxis — Tennessee, 2017–2018

Abstract

BACKGROUND:

Partial vaccination, or one dose of hepatitis A virus (HAV) vaccine, effectively protects the general population against HAV infection for approximately 10 years. However, people living with HIV (PLWH) might not develop the same level of immunity after vaccination as immunocompetent people. Post exposure prophylaxis (PEP) with a dose of HAV vaccine and immune globulin (IG) is only recommended for PLWH who have not been vaccinated. The Tennessee Department of Health (TDH) sought to define the extent to which PLWH developed HAV infection during an HAV outbreak despite having received HAV vaccination.

METHODS: Confirmed HAV cases reported to TDH during an ongoing HAV outbreak during December 1, 2017–September 20, 2018 were reviewed for HIV coinfection. Data gathered from case report forms, surveillance databases, and medical records were used to evaluate HIV status and HAV vaccination history.

RESULTS:

Among 249 reported cases of HAV infection, 11 (4%) were in PLWH. Six (55%) of 11 coinfecting patients had received a partial or complete vaccination series before acute HAV infection. Two patients completed monovalent HAV vaccination before infection onset. A third patient had previously received a single dose of monovalent HAV vaccine and a post exposure prophylaxis dose of monovalent vaccine and immune globulin (IG), but developed infection 6 days later. Three patients were partially vaccinated with the combined hepatitis A and B vaccine.

CONCLUSIONS:

Previous vaccination may not reliably provide protection among PLWH. CDC guidelines recommend IG as post exposure prophylaxis for unvaccinated people who are immunocompromised. In response to these findings, TDH changed its outbreak PEP guidelines to recommend consideration of IG administration to all PLWH with high-risk HAV exposure (e.g., household member or sexual contact of a person with HAV) regardless of prior vaccination history or immune status.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Vaccine-Preventable Diseases; Hepatitis; HIV/AIDS
Consider for Different Presentation?	Yes
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Breakout
Abstract Title	Assessing the Effects and Enforcement of a Mandatory Hepatitis A Vaccination Ordinance for Food Handlers in Saint Louis County, MO

Abstract

BACKGROUND: In 1999, in response to multiple hepatitis A virus (HAV) outbreaks involving transmission by foodservice workers in the 1990s, Saint Louis County passed an ordinance (effective June 2000) mandating HAV vaccination for all county food handlers. Saint Louis County, Missouri's most populous county, is a commercial hub for the eastern part of the state. In the context of recent widespread and costly HAV outbreaks elsewhere in the country, we sought to examine the effectiveness of Saint Louis County's vaccination ordinance in preventing HAV outbreaks in Saint Louis County and the Saint Louis region, foodservice establishments' compliance with the ordinance, and the effort required to enforce it.

METHODS: We analyzed reported HAV cases from 1999 to 2017 among residents of Missouri's Eastern District (Saint Louis County plus eleven surrounding jurisdictions). We also analyzed food service establishment inspection data collected by the Saint Louis County Department of Public Health (DPH) Division of Environmental Services.

RESULTS: Fifteen cases of HAV infection were reported among food handlers in Missouri's Eastern District in 1999 and 5 cases in 2000. Between 2001 (the first full year since the vaccination ordinance was implemented) and 2017, five cases were reported among food handlers. Of these, three worked for establishments outside of Saint Louis County; workplaces were not documented for the other two. The Eastern District has not experienced a hepatitis A outbreak since 2000. Enforcement of the vaccination ordinance requires considerable oversight. Violations of the ordinance were cited in 1,751 (18.7%) of the 9,377 inspection records analyzed. A majority of these violations (n=1,321; 75.4%) were documented during routine inspections, considerably fewer (n=323; 18.4%) were documented during first follow-up inspections, and still fewer (n=93; 5.3%) were documented during second or third follow-up inspections. The inspection and violation data did not distinguish between violations resulting from unvaccinated workers and those resulting merely from deficient record-keeping.

CONCLUSIONS: Enforcing Saint Louis County's vaccination ordinance requires significant effort, but that enforcement is effective. The number of establishments found to be out of compliance decreases by at least 70% with each round of follow-up inspections. Nationally, recent HAV outbreaks have led to considerable morbidity and mortality, and response efforts have cost tens of millions of public dollars and strained vaccine supplies. While homelessness and injection drug use have driven these outbreaks, food handlers remain an important potential source of HAV transmission. Thus, mandatory food handler vaccination policies remain a viable opportunity for local jurisdictions' outbreak prevention efforts.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Vaccine-Preventable Diseases; Enteric Infectious Diseases; Hepatitis
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	10959
Abstract Type	Breakout
Abstract Title	Epidemiology of Measles, Mumps, and Rubella (MMR), Miami-Dade County, Florida 2008 – 2018

Abstract

BACKGROUND: In recent years, outbreaks of vaccine-preventable diseases among vaccinated populations have become increasingly common. The purpose of this report was to examine the epidemiology of measles, mumps, and rubella to determine whether outbreaks occurred among vaccinated populations within Miami-Dade County (MDC).

METHODS: Confirmed, probable, and suspect cases reported to the Florida Department of Health in MDC between January 1, 2008 and November 1, 2018 were obtained from Merlin, the Florida Department of Health surveillance system. Variables of interest included age (years), gender, race/ethnicity, pregnancy status, distribution of symptoms, vaccination history, age at receipt of the first two doses of the measles, mumps, rubella (MMR) vaccine, number of years since the receipt of the second MMR dose, and whether cases were outbreak associated. Analyses were performed with SAS statistical software, version 9.4.

RESULTS: Sixty cases met inclusion criteria, among which one (2%) was rubella, 8 (13%) measles, and 51 (85%) mumps. The majority of measles cases were between the ages of 1 – 18 (n=5); whereas, the majority of mumps and rubella cases were between the ages of 19 – 64 (n=37, n=1). The median age of measles cases was 5.5 years (range 1 to 34) compared to mumps cases which were a median age 27 years (range 1 to 81). There were no statistically significant differences between mumps and measles cases by age, gender, race/ethnicity, pregnancy status, or time since vaccination; however, origin of infection was significant. The majority of measles and mumps cases were acquired in Florida, 6 (75%) and 43 (84%), respectively. All measles cases were born after the measles vaccine became commercially available; whereas, 20% of mumps cases and the single rubella case was born before the respective vaccines became commercially available.

CONCLUSIONS: There were significant limitations concerning vaccination history data, as half (53%) of the cases had “unknown” vaccination history. One possible explanation is that 52% of MDC residents are foreign born, and as such, their vaccination history would not be captured in our system. Age differences between measles and mumps cases suggest that the current two dose recommendations may not provide lifelong protection later into adult life, particularly for mumps, which is consistent with the literature. Improved surveillance, with respect to obtaining accurate vaccination history among foreign born cases, is needed to make any further conclusions.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Surveillance; Vaccine-Preventable Diseases; Epidemiology
Consider for Different Presentation?	Yes
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Breakout
Abstract Title	HPV Vaccination Among Adolescents and Adults in South Carolina

Abstract

BACKGROUND: The CDC recommends the Human Papillomavirus (HPV) vaccine be routinely administered beginning at age 11 as it protects against both genital warts and cancers caused by HPV. Depending on what age immunization begins, either two or three doses are sufficient. Studies have shown that the prevalence of HPV infection has decreased since the vaccine was introduced in 2006. Although it has been available for 10+ years, immunization rates have not increased like other new vaccines. Using the Children's Health Assessment Survey (CHAS) and the Behavioral Risk Factor Surveillance System (BRFSS), demographic characteristics among adolescents and adults who received 1+ dose of the HPV vaccine were examined in SC.

METHODS: We obtained data about HPV vaccination status among adolescents (11–17 years) from CHAS (2012/2014/2016) and among adults (18–35 years) from BRFSS (2015–2017) in SC. For both surveys, the following characteristics were examined: age, race/ethnicity, sex, health insurance status, SC region; income was also examined among adults. The data were weighted to represent all adolescents and adults eligible for the vaccine. SAS 9.4 software was utilized to obtain weighted prevalence estimates and 95% confidence intervals via survey analysis procedures.

RESULTS: We found that 27% of adolescents ($\pm 4\%$) and 13% of adults ($\pm 1\%$) have received 1+ dose. Among both adolescents and adults, significantly more non-Hispanic blacks and females received the HPV vaccine compared to non-Hispanic whites and males, respectively. Adults with lower ($< \$15K$) annual household income had significantly higher HPV vaccination rates than those of higher ($\$50K+$) income ($15 \pm 3\%$ vs. $10 \pm 1\%$). There were no significant differences by health insurance status, SC region, or age.

CONCLUSIONS: The sex and racial/ethnic disparities found in the current study have been observed nationally for adolescents, but not for adults. For adolescents, the SC estimate from the 2016 National Immunization Survey Teen version (ages 13–17; 1+ dose: $44 \pm 7\%$) is lower than the current study because the age range is narrower. For ages 19–26, CDC national estimates range from 49% (females) to 14% (males) based on the 2016 National Health Interview Survey (no national estimates for 26+). While there is no Healthy People 2020 goal for HPV vaccination among adults, the goal for adolescents (13–15 years) is 80%, which SC falls far below. This has been acknowledged by key partners, and in 2019, targeted marketing around HPV vaccination will begin in places with high cervical cancer rates.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Cancer; Vaccine-Preventable Diseases; Children and Adolescents
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11429
Abstract Type	Breakout
Abstract Title	Interventions to Reduce Measles Exposures in Outpatient Healthcare Facilities — New York City, 2018

Abstract

BACKGROUND: Measles virus is highly contagious and remains airborne for 2 hours after an infected person's cough or sneeze. It causes rare but severe complications including pneumonia, miscarriage, and death. Because patients are infectious before rash onset, preventing measles exposures in healthcare facilities (HCF) is challenging. During September 30–December 10, 2018, New York City (NYC) experienced an ongoing measles outbreak; >2000 persons were exposed to measles in HCF settings. The NYC Department of Health and Mental Hygiene (DOHMH) recommended screening for measles symptoms or exposures, patient education, and alternative isolation procedures when negative pressure rooms were unavailable. We describe interventions taken for reducing measles exposures in outpatient HCFs.

METHODS: A standard questionnaire was used to survey infection control staff from all 17 outpatient HCFs that had measles exposures. HCF exposures occurred when patients with measles entered a facility through 2 hours after departure or appropriate isolation. The questionnaire was administered by telephone on December 10–12, 2018, and included 14 questions about measles screening practices, facility infrastructure, and procedures for seeing patients with suspected measles.

RESULTS: Fifteen (88%) of 17 HCFs responded to the survey. Among responding HCFs, 87% (13/15) instituted telephone-based screening for measles symptoms while scheduling appointments, 73% (11/15) screened at check-in, and 100% (15/15) posted signs about measles symptoms. No HCFs reported having a negative pressure room, and 60% (9/15) had written protocols to minimize measles exposures. Most HCFs, 87% (13/15), established alternative isolation procedures for potentially infectious patients, compatible with their clinic space and acceptable for staff, including separate entrances, examinations outside, after-hours examinations, and at home visits.

CONCLUSIONS: Most HCFs implemented DOHMH-recommended interventions. While negative pressure rooms are uncommon in outpatient settings, HCFs identified creative solutions to prevent healthcare-associated measles exposures. In a postelimination measles era, preventing HCF exposures can contribute to outbreak control.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Infection Control
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11222
Abstract Type	Breakout
Abstract Title	Investigating Negative Pertussis PCR Tests: Worth the Effort? An Evaluation of the Impact, Wisconsin, 2016-2018

Abstract

BACKGROUND: The Centers for Disease Control and Prevention (CDC) recommends performing Polymerase Chain Reaction (PCR) for pertussis within the first 3 weeks of cough for optimal sensitivity and has specific guidelines on specimen collection. In Wisconsin, both positive and negative results for pertussis PCR tests are reported to the Wisconsin Electronic Disease Surveillance System (WEDSS), an online system for reporting, investigation, and surveillance of communicable disease. While most states do not require follow up on negative PCR test results, Wisconsin encourages Local Health Departments (LHDs) to follow up on negative tests if the case is a known contact of a lab-confirmed pertussis case, is less than one year of age, is at high risk of complications (i.e. immunocompromised), or is symptomatic, as there are reasons this test could provide a false negative result, including timing of the test in relation to symptom onset and technique of specimen collection. However, the investigation of these suspect cases is resource-intensive for LHDs and the reporters. Therefore, we assessed the impact of following up on these negative PCR tests to determine if allocation of resources for these efforts continued to be worthwhile.

METHODS: Data regarding pertussis investigations in Wisconsin from January 1, 2016 through November 30, 2018 were collected using WEDSS and analyzed using SAS 9.4. Investigations with a positive or indeterminate PCR result, only tested by serology or culture, or untested, were excluded from the analysis. Case classification definitions from CDC were used for confirmed and probable. Descriptive statistics were performed for the sample.

RESULTS: From January 1, 2016 through November 30, 2018, 3,261 negative PCR tests were investigated in Wisconsin. Of these, 128 (3.9%) resulted in confirmed cases and 900 (28.3%) were probable. Of the probable cases, 315 (34.2%) were tested 22 days or later after cough onset. Follow up investigation of negative PCR tests have accounted for 98.7% of total probable cases and 7.5% of total confirmed cases of pertussis in Wisconsin from January 1, 2016 through November 30, 2018.

CONCLUSIONS: There were a significant amount of confirmed and probable cases determined from the investigation of negative PCR tests. However, time and resources should be taken into consideration when deciding how to prioritize follow up with negative PCR tests.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Vaccine-Preventable Diseases; Infectious Diseases
Consider for Different Presentation?	Yes
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Breakout
Abstract Title	Investigation Nuances and Challenges during Outbreak of Measles in Kansas – 2018

Abstract

BACKGROUND: On March 8, 2018, the Kansas Department of Health and Environment (KDHE) was notified of an infant who tested positive for measles. Investigation revealed an infant in the index case-patient's daycare had history of international travel and febrile rash illness. This primary case-patient sought medical advice prior to travel; however, no travel-related recommendations were made and despite presentation and history of travel, measles was never suspected upon return. Retrospectively, cases of measles were identified in infants at the daycare who had been misdiagnosed resulting in further transmission to both unvaccinated and vaccinated persons in other settings. Further complicating matters, a second unrelated measles outbreak was detected in a neighboring state that shares a large metropolitan area with Kansas.

METHODS: Case and contact investigations were conducted by affected jurisdictions and KDHE. Press releases alerting the public of locations where measles exposures may have occurred, and contacts couldn't be identified were published. Bi-daily calls with affected jurisdictions were conducted to streamline the investigation. Specimens were tested by real-time reverse-transcription polymerase chain reaction (RT-PCR) at KDHE or by measles-specific IgM at private laboratories or the Centers for Disease Control and Prevention (CDC). RT-PCR positive specimens were forwarded to CDC for genotyping.

RESULTS: Twenty-two cases of measles residing in three Kansas counties and one in a neighboring state were identified. Several infants diagnosed with other conditions delayed outbreak identification. Places of exposure included the daycare, healthcare settings, private homes, the community, and internationally. Five persons had a prodrome that lasted five days. Twelve case-patients were unvaccinated; nine were ineligible to receive vaccine. Awareness of the outbreak was enhanced through ten press releases detailing dates and times of exposure at 26 public locations. Eleven persons were positive for measles by RT-PCR, six by IgM, and five were epidemiologically linked. RT-PCR specimens were confirmed to be measles genotype B3.

CONCLUSIONS: This is the largest measles outbreak in Kansas in nearly 30 years. Although a major transmission setting was a daycare among an unvaccinated population, almost half with measles were vaccinated and exposed elsewhere. Several persons had a prodrome lasting longer than four days, so extending the infectious period could be considered when reliable prodrome history is available. With high prevalence of international travel, measles should be considered when assessing patients with febrile rash illness consistent with measles. Enhanced communication and coordination among jurisdictions was crucial due to the large numbers of exposure locations and identified contacts.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Infectious Diseases; Outbreaks; Vaccine-Preventable Diseases
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11501
Abstract Type	Breakout
Abstract Title	Measles Infection Identified in Vaccinated Persons Using Avidity and Plaque Reduction Neutralization Assay—Kansas, 2018

Abstract

BACKGROUND: In March 2018, the Kansas Department of Health and Environment (KDHE) and local partners investigated a measles outbreak in which 22 case-patients were identified; ten had been previously vaccinated. Measles in vaccinated persons may present typically or disease may be less severe with a milder rash and little to no fever. Despite utilizing highly sensitive tests on appropriately collected specimens, measles virus was not always detected in vaccinated symptomatic persons. Utilizing measles-specific immunoglobulin G (IgG) avidity and plaque reduction neutralization (PRN) helped determine whether vaccinated persons were truly infected with measles.

METHODS: Upon suspicion of measles infection, specimens were collected within four days of rash onset and tested at the Kansas Health and Environmental Laboratories (KHEL) using real-time reverse-transcription polymerase chain reaction (RT-PCR). Serum specimens were collected from persons with a known epidemiologic link who tested RT-PCR negative, RT-PCR positive, and persons who were outside of the four-day window from rash onset. These specimens were sent to CDC for measles-specific immunoglobulin M (IgM), IgG avidity, and PRN testing. Patients with a neutralizing antibody concentration $\geq 40,000$ mIU/mL were considered to have high titers to measles.

RESULTS: Ten case-patients reported vaccination. Eight were tested by RT-PCR at KHEL; four tested positive. Two persons were outside the timeframe for RT-PCR testing, but both tested IgM positive. Six serum specimens were sent to CDC; one that tested at the low end of detection by RT-PCR, four that tested RT-PCR negative, and one that was only IgM positive. Four adult specimens had high IgG avidity and high PRN titers indicating secondary vaccine failure but suggesting recent measles infection; one was IgM and RT-PCR positive, one was IgM positive, and two were IgM and RT-PCR negative. Another adult specimen had high IgG avidity, low PRN, and was IgM positive. This adult was considered to have recent measles infection, but PRN titers may have not yet become elevated. One child specimen had low avidity, was IgM positive, and was not tested by PRN indicating primary vaccine failure.

CONCLUSIONS: Vaccinated persons with known exposure to measles may present atypically. Despite collecting appropriate specimens for measles testing, RT-PCR was not adequate for identifying measles virus in some persons with measles. IgG avidity and PRN testing confirmed two cases that were previously IgM and RT-PCR negative. If there is a known measles exposure in a vaccinated person, utilizing IgG avidity and PRN testing could help identify recent measles infection.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Outbreaks; Vaccine-Preventable Diseases; Infectious Diseases
Consider for Different Presentation?	Yes
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Affiliation	State Public Health Agency

Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Breakout
Abstract Title	Pneumococcal Disease Outbreak at a State Correctional Facility — Alabama, 2018

Abstract

BACKGROUND: In September 2018, Alabama Department of Public Health was notified of 2 prison inmates with invasive pneumococcal disease. Pneumococcal disease outbreaks are rare, but can occur in institutional settings. We investigated to determine disease severity, risk factors, and intervention strategies.

METHODS: We identified cases using clinic records. A suspected case was defined as respiratory or meningitis symptoms in an inmate or close contact with onset between September 1–November 27, 2018. Probable cases were defined as suspected cases plus radiographically confirmed pneumonia or laboratory evidence of bacterial meningitis with negative testing or unknown etiology. Confirmed cases were defined as suspected cases plus a positive *Streptococcus pneumoniae* test. We performed medical chart review and patient interviews to explore risk factors. We conducted prospective pneumococcal disease surveillance among inmates in the prison clinic between October 5–November 27.

RESULTS: We identified 40 cases (3 confirmed, 2 probable, and 35 suspected) among approximately 1,300 inmates and none among employees. Median patient age was 39 years (range: 22–63 years). All patients with confirmed and probable pneumococcal disease were hospitalized and 1 died; diagnoses included meningitis (2), pneumonia (2), and septicemia with pneumonia (1). All patients with confirmed pneumococcal disease had *S. pneumoniae* serotype 12F, lived in dormitory X, and had symptom onset between September 14–25. Among all 40 patients, 85% reported substance use (cigarettes, alcohol, or illicit drugs) and 33% had medical conditions that increase pneumococcal disease risk. Starting September 29, inmates living in dormitory X (264) were offered pneumococcal disease prophylaxis; 93% received azithromycin and 78% received 23-valent pneumococcal polysaccharide vaccine, which protects against serotype 12F. No *S. pneumoniae* transmission was identified during prospective surveillance.

CONCLUSIONS: Close living quarters, substance use, and underlying medical conditions likely contributed to increased risk for pneumococcal disease. Timely prophylaxis may have interrupted pneumococcal transmission.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Outbreaks; Respiratory Diseases; Special/Vulnerable Populations
Consider for Different Presentation?	Yes
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Breakout
Abstract Title	Public Health Impact of Alternative Pertussis Case Classifications for PCR

Abstract

BACKGROUND: Pertussis has persisted at elevated rates in the United States despite high vaccination coverage. Pertussis cases require time-intensive public health follow-up including case finding, patient interviews, patient education, and prophylaxis of exposed contacts. The current national pertussis case definition requires that all PCR-positive cases meet clinical criteria of two weeks of cough along with paroxysms, whoop, or post-tussive vomiting. The goal of this project was to assess the potential impact to pertussis surveillance case counts and follow-up utilizing two alternatives for classifying PCR-positive pertussis cases.

METHODS: Pertussis cases reported January 1, 2014 – October 15, 2018 were identified from Arizona’s infectious disease surveillance system. Pertussis case reports aged >1 year with a PCR-positive result and no other reported laboratory testing were included. Cases were classified using three sets of criteria: national case definition, national case definition with any duration cough (option 1) and acute cough illness of any duration, with or without other symptoms (option 2).

RESULTS: Of 637 cases with only PCR-positive laboratory testing, 496 (78%) were classified as confirmed using the national case definition; 141 were ruled out. Of ruled-out cases: 44 (31%) had no available clinical information, 4 (2%) had no cough, 49 (34%) had cough of less than two weeks or unknown duration, 34 (24%) reported no case-defining symptoms, and 10 (7%) had incomplete information about case-defining symptoms. Thus, applying classification options 1 and 2, 49 and 93 additional cases, respectively, were classified as confirmed. Of the 564 cases with known cough duration, 211 (37%) had coughed for less than two weeks at the time of initial interview. These required additional follow-up by public health officials; most (162, 77%) were later confirmed as having two weeks of cough.

CONCLUSIONS: This analysis of PCR-positive pertussis cases in Arizona shows that these classification options have a relatively small impact on overall surveillance case counts. Even option 2 only increases the number of confirmed PCR-positive cases by 19%, or 11 to 27 additional confirmed cases per year. Importantly, these two classification options for PCR-positive cases could significantly reduce follow-up by public health officials and would mirror the follow-up for culture-positive cases. As diagnostic test utilization for pertussis continues to change, public health officials may receive more and more pertussis reports that include only PCR testing. The burden of disease continues to be high and public health agencies need to be able to adapt to these changing pressures and use limited resources wisely.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Program Evaluation; Surveillance; Vaccine-Preventable Diseases
Consider for Different Presentation?	Yes
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Lightning
Abstract Title	Taking a Closer Look at Non-Outbreak Associated Mumps Cases, Colorado, 2016-2018

Abstract

BACKGROUND: Colorado experienced an increase in reported mumps cases in 2016 through 2018, many of whom were associated with distinct communities and social networks. In addition, an overall increase of mumps cases in Colorado during that time that were not associated with outbreaks was also observed. While the recent mumps outbreaks both in Colorado and nationwide have been well-described, examining the characteristics of non-outbreak associated mumps cases could improve our ability to detect sporadic cases and prevent continued transmission of mumps in the community.

METHODS: Reported mumps cases were identified through Colorado's Electronic Disease Reporting System from January 1, 2016 to December 21, 2018. Cases from 2016-2018 that met the CSTE mumps confirmed and probable case definitions were analyzed using T-test, Chi-Square tests, and odds ratios (OR). An outbreak was defined as three or more cases linked by time and place. Standard mumps surveillance variables and investigation notes collected during the disease investigations were used to describe demographics and identify potential risk factors.

RESULTS: A total of 134 cases of mumps were reported in Colorado from 2016 to 2018; 76 (57%) were not associated with an outbreak. Non-outbreak associated cases had a higher mean age compared to outbreak associated cases (30.2 vs 23.5 years; $P=0.01$). Most non-outbreak cases were reported by a hospital or emergency department (37%) and primary care providers (37%). Among 95 cases that were tested, IgM detection was more commonly used among non-outbreak cases, and PCR was more often used among outbreak cases ($P<0.001$). Cases vaccinated with at least 1 dose of mumps containing vaccine were significantly less likely to be associated with an outbreak (OR=0.31; 95% CI: 0.13-0.73; $P=0.006$). The most commonly identified risk factors for disease among non-outbreak associated cases were contact with someone with mumps-like illness (24%) and domestic or international travel during exposure period (20%). Most outbreak-associated cases were linked to communities where international travel and group living was common.

CONCLUSIONS: Differences identified between non-outbreak and outbreak associated mumps cases in Colorado include age, vaccination history, risk factors, and laboratory testing. It is challenging to determine if the rise of non-outbreak associated cases is exclusively due to increased awareness about mumps or an actual increase in disease. Strong partnerships with health care providers to identify and test potential cases based on risk factors will help maintain the ability to detect mumps cases in the absence of an outbreak and prevent future outbreaks.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Vaccine-Preventable Diseases; Infectious Diseases; Epidemiology
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11265
Abstract Type	Lightning
Abstract Title	Varicella Outbreaks in Long-Term Care Facilities

Abstract

BACKGROUND: In 2018, the Illinois Department of Public Health (IDPH) investigated two outbreaks of primary varicella in long-term care facilities (LTCF) among staff and residents. Many long-term care residents will have birth prior to 1980 and be considered presumptively immune, and few will be able to provide documentation of disease or vaccination. These outbreaks occurred in non-traditional LTCF, and included residents with near life-long history of institutionalization.

METHODS: Clusters and outbreaks of varicella are required to be reported to IDPH. Since implementation of the current outbreak reporting system in 2014, no varicella clusters or outbreaks have been reported in LTCF until 2018.

Recommendations for controlling varicella in healthcare settings include: standard, contact, and airborne isolation precautions for cases; only personnel with presumptive evidence of immunity should be exposed to cases; and exposed, susceptible patients should be placed in airborne isolation and contact precautions from days 10 to 21 following exposure.

RESULTS: Outbreak A had six confirmed cases, with an age range of 19-74 years old (median 56.5), consisted of two health care workers (HCW) and four residents. All cases were unvaccinated with no disease history. Three cases were PCR confirmed, but were unable to be genotyped due to specimen availability. Outbreak B had six confirmed cases, with an age range of 21-53 years old (median 29.5), consisted of five residents and one HCW. All cases were either unvaccinated or had unknown status, with either no or unknown disease history. Two PCR confirmed cases were determined to be wild-type virus. The index case in either outbreak was not identified. Cases among residents in both outbreaks ranged in age from 21-74 years, with a median age of 53 years. Comparatively, the median age of varicella cases reported to IDPH in 2018 was 9 years old*.

CONCLUSIONS: Varicella outbreaks in LTCF can be challenging to manage. Recommended isolation precautions are difficult to implement in this setting due to residents with dementia or other mental health conditions, concerns of social isolation, facility capacity and design, and staffing challenges. Employee vaccination status may not be known or readily available, however facilities should consider having immunity status on record. Residents may be considered presumptively immune due to birth year, but are actually non-immune due to individual factors leading to institutionalization. Length of institutionalization should be considered when using birth year as presumptive evidence of immunity. *2018 data are preliminary and subject to change.

Submission Complete?	Yes
Committee	Infectious Disease
Topic	Vaccine-Preventable Diseases
Keywords	Vaccine-Preventable Diseases
Consider for Different Presentation?	No
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	11204
Abstract Title	Poster
Abstract Title	Disparities in Vaccination Coverage By Two Years of Age within States and Selected Local Areas in the United States: An Analysis of 2012-2015 Birth Cohorts

Abstract

BACKGROUND: Data from the National Immunization Survey-Child (NIS-Child) have shown national disparities in vaccination coverage by race/ethnicity, poverty level, health insurance type, and metropolitan statistical area (MSA) status. This study investigates the presence and magnitude of disparities in vaccination coverage for the 50 states and Washington, DC ('states').

METHODS: The NIS-Child is a random-digit-dialed telephone survey of parents/guardians of children aged 19-35 months, followed by a survey of the child's vaccination providers to assess vaccination history. Data from survey years 2013 to 2017 were combined to identify children in birth cohorts 2012-2015. Kaplan-Meier analysis was used to estimate vaccination coverage at age two years for: ≥ 1 dose MMR, ≥ 1 dose varicella, ≥ 3 doses DTaP ('DTaP3'), and ≥ 4 doses DTaP ('DTaP4'). T-tests were used to evaluate significance of differences in coverage within states by race/ethnicity, poverty level, insurance type, and MSA status.

RESULTS: In 47 states, children with household income $<133\%$ federal poverty level (FPL) had lower coverage for at least one vaccine than children with household income $\geq 400\%$ FPL; in 20 states, coverage was lower for all four vaccines. Median percentage point differences in coverage between the income groups ranged from 5.1 for DTaP3 to 13.1 for DTaP4. In 43 states, children with public insurance had lower coverage for at least one vaccine than children with private insurance (range of median percentage point differences: 3.6 for DTaP3 to 8.8 for DTaP4). In 17 of 18 states with adequate sample size, uninsured children had lower coverage for at least one vaccine compared with privately insured children (range of median percentage point differences: 13.9 for DTaP3 to 27.0 for DTaP4). Compared with non-Hispanic white children, non-Hispanic black children had lower coverage for at least one vaccine in 15 states (range of median percentage point differences: 0.9 for DTaP3 to 7.7 for DTaP4). Compared with children in MSA principal cities, children in non-MSAs had lower coverage for at least one vaccine in nine states, but had higher coverage for at least one vaccine in five states; children in MSA non-principal cities had lower coverage for at least one vaccine in six states, but had higher coverage for at least one vaccine in five states.

CONCLUSIONS: Vaccination coverage disparities exist in most states. Identifying these disparities can help immunization programs focus outreach efforts to ensure that vaccines are accessible for all children.

Submission Complete?	Yes
Committee Topic	Infectious Disease
Keywords	Vaccine-Preventable Diseases
Consider for Different Presentation?	Health Disparities; Immunization; Vaccine-Preventable Diseases
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	11316
Abstract Title	Poster
	Evaluation of Pertussis Carriage Among a Pediatric and Adolescent Population in Atlanta, Georgia

Abstract

BACKGROUND: Despite high vaccination coverage, pertussis disease rates have been increasing in the United States. While the cause is likely multifactorial, recent data suggest that acellular pertussis vaccines may not prevent bacterial carriage and subsequent transmission. We conducted a cross-sectional study to define the prevalence of *Bordetella pertussis* nasopharyngeal carriage among children seeking care at an emergency department (ED).

METHODS: A convenience sample of patients aged 6-59 months and 11-17 years presenting for any reason to a children's hospital ED in Atlanta, Georgia between December 1, 2017 - May 23, 2018 was enrolled. A nasopharyngeal swab was collected from each participant, and an in-person parent interview was conducted to collect information on demographics and risk factors; pertussis vaccination history was obtained via the state immunization registry. Specimens were tested using a multi-target real-time PCR assay for *B. pertussis* and other *Bordetella* species.

RESULTS: Of 398 enrolled participants, 72% (287/398) were aged 6-59 months (pediatric) and 28% (111/398) were aged 11-17 years (adolescent). Among pediatric participants, 39% (112/287) presented with fever, and 52% (148/287) with cough. Among adolescent participants, 27% (30/111) presented with upper respiratory infection symptoms, and 33% (37/111) with cough. PCR testing was indeterminate for 5 participants (2 pediatric and 3 adolescent) and negative for all others. Of participants with indeterminate results, 2 adolescent participants had cough at enrollment; none reported other symptoms of pertussis; 1 adolescent and 1 pediatric participant were completely vaccinated; 1 pediatric participant was unvaccinated; and 2 adolescent participants were incompletely vaccinated.

CONCLUSIONS: No pertussis carriage was found among nearly 400 pediatric and adolescent ED patients, although indeterminate PCR findings in 1.2% may indicate the presence of bacteria at low levels. Because pertussis incidence in Georgia is lower than the national average, further study in a setting with higher pertussis incidence is needed.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Respiratory Diseases; Vaccine-Preventable Diseases; Infectious Diseases
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11496
Abstract Type	Poster
Abstract Title	Factors Associated with Meningococcal Disease Mortality— United States, 2010–2017

Abstract

BACKGROUND: Meningococcal disease is a rare but serious infection. In the United States (US), the case fatality ratio (CFR) has ranged from 13.1%-19.4% each year during 2010 through 2017, higher than reported in many other developed countries. We assessed factors associated with meningococcal disease mortality in the US from 2010-2017.

METHODS: Meningococcal disease cases reported through the National Notifiable Diseases Surveillance System from 2010 to 2017 were included in the analysis with additional epidemiologic information provided by state health departments. Isolates were serogrouped using slide agglutination and real-time polymerase chain reaction, while clonal complex (CC) was determined using Sanger sequencing or whole genome sequencing, depending on year. The five most frequently identified serogroups and CCs in the sample were analyzed separately; all others were excluded (serogroup) or classified as “other” (CC). Patient age was analyzed as a continuous variable. CFRs were calculated using the proportion of cases with known outcome as the denominator. Odds ratios were calculated using multivariable logistic regression.

RESULTS: A total of 4229 meningococcal disease cases were reported from 2010 to 2017; outcome was known for 3584 (84.8%). Overall, 16.5% of cases were fatal, and no difference was observed in CFR by sex ($p=.27$), race ($p=.83$), ethnicity ($p=.88$), or outbreak association ($p=.52$). Median patient age was significantly higher for fatal cases (38 years vs 28 years, $p<.0001$). In bivariate analysis, CFR was significantly different by serogroup ($p<.0001$) and CC ($p=.0004$). CFR was significantly higher for serogroups C (22.4%), Y (16.6%), and W (18.7%) compared to serogroup B (12.8%). CFR was significantly higher for CC11 (23.1%) compared to other CCs (14.6%); however CC was only available for 1511 cases (35.7%). In multivariable analysis, CFR increased with patient age (OR 1.01, 95% CI 1.00-1.01), was significantly higher for serogroup C (OR 2.07, 95% CI 1.14-3.77) compared to serogroup B, and significantly lower for CC103 (OR 0.37, 0.17-0.82) compared to other CCs. **CONCLUSIONS:** In a multivariable logistic regression model, patient age, serogroup, and CC were significantly associated with fatal outcome for meningococcal disease cases. It will be important to continue monitoring changes in circulating CCs, along with serogroup and patient age, to better understand the variation in CFR over time in the US.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Vaccine-Preventable Diseases
Consider for Different Presentation?	Yes
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	11185
Abstract Title	Poster
Abstract Title	Updating the Advisory Committee on Immunization Practice Recommendations for Prevention of Human Rabies--United States 2018-Present
Abstract	BACKGROUND: Rabies is an acute, progressive encephalomyelitis transmitted to humans by exposure to infected animals; it is nearly always fatal but is preventable. The Advisory Committee on Immunization Practices (ACIP) develops guidance for the safe and effective use of vaccines among civilian populations in the United States (U.S.). ACIP recommendations for rabies were comprehensively updated in 2008, followed by an update to the post-exposure prophylaxis schedule in 2010; since then, data with direct relevance to the vaccination schedules and serologic monitoring recommendations have been published. In response, the World Health Organization (WHO) updated global recommendations in 2018, and we began the multi-year process of updating the ACIP recommendations. METHODS: The Centers for Disease Control and Prevention's (CDC's) Office of the Associate Director of Science sets rigorous standards and expectations for guideline development. Working group members and ACIP committee members are selected for their experience and expertise. Rabies vaccine working group members have expertise in immunobiologics, vaccine efficacy and safety, and clinical medicine; representatives from relevant professional societies and rabies subject matter experts are also included. We determined the scope of the update after reviewing data published since 2008, recently published WHO recommendations, and rabies questions for which CDC frequently consults. Frequent consultations with subject matter experts are ensuring useful and relevant updates. We identified systematic reviews, economic analyses, and literature searches needed to effectively inform discussions. Unpublished data from pharmaceutical companies are also being gathered. RESULTS: We formed a working group comprised of 15 experts including stakeholders from the U.S. Food and Drug Administration, National Association for State and Public Health Veterinarians, and clinical professional societies. The scope of the updates was determined to be primary vaccination schedules, serologic monitoring, safety and effectiveness of biologics, cost-effectiveness of some recommendations, and location of immunoglobulin administration. Data to inform intradermal vaccine efficacy and considerations for treatment among special populations (e.g., immunocompromised, pregnant persons, and children) will be considered. Systematic reviews addressing utility of various vaccine schedules and sites for rabies immune globulin administration and economic analyses of various vaccine schedules are ongoing. CONCLUSIONS: We are leading a comprehensive update of the ACIP recommendations for rabies based on established scientific standards. Steps are being taken to ensure this update is informed by unpublished data from multiple sources, ongoing evaluations that fill literature gaps, new global recommendations, and expert input. Updating these recommendations will take several years and result in new evidence-based recommendations.
Submission Complete?	Yes
Committee Topic	Infectious Disease
Keywords	Vaccine-Preventable Diseases
Consider for Different Presentation?	Evidence Based Practice; Vaccine-Preventable Diseases; Zoonotic Diseases
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Submission Type	Breakout/Quick/Lightning/Poster
ID	10917
Abstract Type	Quick
Abstract Title	Analysis of Pertussis PCR-Positive Patients Not Meeting the Case Definition—Florida, 2016–2018

Abstract

BACKGROUND: Since 2016, the Florida Department of Health (FDOH) has noted an increasing number of patients who test positive for pertussis by polymerase chain reaction (PCR) but who do not meet the pertussis case definition. These patients are recorded in Merlin, Florida’s reportable disease surveillance system, marked as “not a case” (NaC), and are not included in case counts. This analysis sought to identify patterns among pertussis PCR-positive patients who were not meeting the case definition to determine if FDOH should recommend updating the pertussis case definition to better reflect the burden of disease. Due to the complexity of the case definition, FDOH included only non-infant patients in this analysis.

METHODS: FDOH individually reviewed NaC patients entered into Merlin January 1, 2016—September 30, 2018 with a positive pertussis PCR result to determine the reason for not meeting the national pertussis surveillance case definition. To meet the case definition, these patients need a cough lasting at least 14 days and an additional symptom of paroxysmal cough, posttussive vomiting, or whoop. FDOH compared pertussis PCR-positive NaC patients to confirmed and probable (reported) pertussis cases during the same timeframe.

RESULTS: FDOH identified 106 pertussis PCR-positive NaC patients: 20 in 2016, 41 in 2017, and 45 in 2018. About one-third (34%) of patients did not have enough information in Merlin to evaluate the reason for not meeting the case definition. Among the 70 (66%) patients evaluated, the most common reason for not meeting the case definition was lack of both cough for at least 14 days and an additional symptom (31%), followed by lack of only cough for at least 14 days (29%), lack of only an additional symptom (27%), and lack of both any cough and additional symptom (13%). Compared to reported cases, pertussis PCR-positive NaC patients started treatment an average of 11 days earlier (20 days after onset compared to 9 days, $p<0.05$).

CONCLUSIONS: Pertussis PCR-positive NaC patients likely presented with milder symptoms due to earlier treatment and should be counted as cases. FDOH recommends changing the national pertussis surveillance case definition to require only a cough of any duration and a positive PCR result. This change would increase pertussis case counts to better reflect the true burden of disease. In Florida, 82% of PCR-positive NaC patients would meet the new case definition, but the overall impact would be minimal since FDOH investigates these patients regardless of meeting the case definition.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Surveillance; Vaccine-Preventable Diseases
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11382
Abstract Type	Quick
Abstract Title	Characterizing Potential Risk Factors for Serogroup B Meningococcal Disease Among College Students — United States, 2014–2017

Abstract

BACKGROUND: Among persons aged 18–24 years, college students are at increased risk of serogroup B meningococcal disease and since 2013, 11 serogroup B college outbreaks have been reported. The Advisory Committee on Immunization Practices recommends that serogroup B meningococcal (MenB) vaccine may be administered to adolescents aged 16–23 years and should be used for outbreak response. We assessed potential risk factors for serogroup B disease among college students to better define sub-populations of students at increased risk and inform targeted prevention and response measures.

METHODS: For all meningococcal disease cases in persons aged 18–24 years reported through the National Notifiable Diseases Surveillance System during 2014–2017, undergraduate college attendance and outbreak-association were ascertained by state health departments. Jurisdictions submitted additional risk factor information abstracted from existing public health case investigations to CDC. Incidence and risk ratios (RR) were calculated using data from the National Center for Education Statistics and U.S. census data. Proportions were used to describe characteristics of college students developing serogroup B disease.

RESULTS: Of 228 cases reported in persons aged 18–24 years, 122 (54%) were in undergraduate college students. Among these, 91 cases (75%) were due to serogroup B. Incidence of serogroup B meningococcal disease in undergraduates, including sporadic and outbreak-associated cases, increased from 0.116 to 0.276 cases per 100,000 population from 2014 to 2017. Average annual incidence of serogroup B disease was higher among students attending 4- vs. 2-year colleges (0.273 vs. 0.043 per 100,000, respectively; RR: 6.4 [95% CI: 2.9–16.1]). Among serogroup B cases, 80% of outbreak-associated and 58% of sporadic cases were in students aged 18–19 years; among 86% (78/91) of cases with known residence, 70% of outbreak-associated and 60% of sporadic cases were in students who lived on campus. Greek life participation for sporadic cases could not be assessed due to missing data; however, 56% of outbreak-associated cases were in students affiliated with Greek life.

CONCLUSIONS: Among undergraduate college students, serogroup B meningococcal disease incidence was highest in students attending 4-year colleges. The majority of cases occurred in students aged 18–19 years, students living on-campus, and, for outbreak-associated cases, students with Greek life affiliation. These data may be useful to inform priority groups for MenB vaccination during outbreaks and individual clinical decision-making for vaccination of adolescents.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Vaccine-Preventable Diseases; Infectious Diseases
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11065
Abstract Type	Quick
Abstract Title	Measles Contact Tracing in the Ridesharing Economy — Oregon, 2018

Abstract

BACKGROUND: On August 10, 2018, the Oregon Health Authority (OHA) was informed that a person with measles visited Oregon during her infectious period. On August 20, a secondary case of measles was reported. While in Oregon, both patients visited public places and used transportation ridesharing companies. To find exposed persons and prevent additional cases, state and local public health officials initiated an investigation, including identification of persons exposed through ridesharing.

METHODS: OHA defines measles-exposed persons as those spending time indoors within 10 meters of a measles patient and for ≤ 20 minutes of a measles patient having been at that location. Patients are infectious for 4 days before and after rash onset. We included ridesharing drivers and passengers who rode in the car ≤ 20 minutes after a patient. We obtained pick-up and drop-off times and locations from patient rideshare accounts, provided this information to rideshare companies, and negotiated release of drivers' and passengers' contact information for follow-up. We ascertained vaccination status of contacts and advised them how to seek care if they experienced measles symptoms.

RESULTS: Patients used two ridesharing companies. Contact by phone was unsuccessful. Information was obtained by visiting Company A's office. In addition to a visit, Company B required a letter citing OHA's legal authority. We obtained contact information for all 14 contacts (9 drivers and 5 passengers) 4 days after confirming patients' trips. Of 14 contacts, 1 driver was incompletely vaccinated; he was instructed to self-monitor and remained symptom-free. Other concerned drivers contacted OHA; their ride details indicated that they had not been exposed to either patient. Company B misinterpreted OHA information request and suspended 1 driver's account, considering him a public health threat.

CONCLUSIONS: No measles transmission through ridesharing was identified. Information available from ridesharing companies complemented traditional methods and proved essential to complete contact tracing.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Data Sharing; Motor Vehicles; Vaccine-Preventable Diseases
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11543
Abstract Type	Quick
Abstract Title	Measles Disease Activity, United States, 2018

Abstract

BACKGROUND: Measles is a highly infectious viral illness that can lead to serious complications. Measles was declared eliminated (i.e., interruption of sustained year-round endemic transmission) from the United States in 2000, yet the U.S. is continually challenged by measles introductions from countries where the disease remains endemic. We aimed to summarize U.S. measles epidemiology in 2018 in the context of prior post-elimination years (2001–2017).

METHODS: We reviewed demographic and epidemiological data from confirmed measles cases reported to the Centers for Disease Control and Prevention by state health departments in 2018. We analyzed the importation status, age, vaccination status, and U.S. residency of cases, and calculated overall and age-specific incidence rates by dividing the number of U.S.-resident cases by U.S. Census population estimates.

RESULTS: From January 1–December 31, 2018, 349 confirmed measles cases and 17 outbreaks (i.e., 3 or more cases linked in time and space; range: 3–109 cases per outbreak) were reported to CDC (incidence of 0.97 per million population), compared to a median of 72 cases (range: 37–667) and 4 outbreaks (range: 2–23) reported annually during 2001–2017 (incidence of 0.21 per million population, range: 0.08–2.06). Reported incidence was highest among infants aged 6–11 months and 12–15 months (18.8 and 16.0 per million population, respectively). Measles cases were reported in 26 states and Washington D.C.; 81 (23%) were internationally imported and 268 (77%) were U.S.-acquired. The median age of cases was 7 years (range: 4 months–62 years). Overall, 301 (86%) measles cases were unvaccinated or had an unknown vaccination status and 317 (91%) were U.S. residents. Outbreak-associated cases accounted for 287 (82%) of reported cases. Imported cases traveled to 26 different countries during their exposure periods. Israel, which has reported over 2,300 measles cases in 2018 (an increase from 16 cases in 2017), was the most common travel destination (18 importations), and these importations resulted in outbreaks in four separate jurisdictions.

CONCLUSIONS: There was an increase in measles cases and outbreaks in 2018, compared to recent years. Travel to countries experiencing measles outbreaks led to importations with subsequent spread within unvaccinated communities, with highest risk among infants too young to be vaccinated and unvaccinated toddlers around the recommended age for the first measles vaccine dose. Our findings emphasize the importance of prompt routine immunization, as well as vaccination prior to international travel, according to Advisory Committee on Immunization Practices recommendations.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Infectious Diseases; Vaccine-Preventable Diseases; Epidemiology
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11017
Abstract Type	Quick
Abstract Title	Pediatric Mumps during the 2015–2017 Mumps Resurgence in the United States

Abstract

BACKGROUND: Numerous mumps outbreaks occurred in the United States over the last decade, with outbreaks affecting young adults on college campuses being among the largest and most widely publicized. However, at least half of mumps cases and outbreaks occurred in other age-groups and settings. We describe reported mumps cases among children and adolescents during 2015 through 2017.

METHODS: The Centers for Disease Control and Prevention (CDC) analyzed reports of confirmed and probable mumps cases in persons aged ≤ 18 years (defined here as pediatric mumps) transmitted electronically through the Nationally Notifiable Diseases Surveillance System (NNDSS) by the 52 reporting jurisdictions.

RESULTS: Between January 1, 2015–December 31, 2017, 49 jurisdictions reported 4,886 pediatric mumps cases (35% of all US reported cases, 13,807); 8 jurisdictions reported >100 cases each, representing 82% of all pediatric cases. Overall, 29 (1%) cases were in infants <1 yr, 406 (8%) were in children aged 1–4 yrs, 1,408 (29%) in children aged 5–10yrs, 1,365 (28%) in adolescents aged 11–14yrs, and 1,678 (34%) in adolescents aged 15–18yrs. Most (3,548, 73%) cases did not travel outside the state during their exposure period; only 37 (1%) traveled outside the country. Cases in patients aged 1–4 yr were more frequently non-outbreak associated (38%) than those in patients <1 yr and 5–18 yrs (24% and 9%, respectively). Among 3,309 (68%) patients with known number of MMR doses received, 81% of those 5–18 yrs had ≥ 2 MMR doses, while 67% of those 1–4 yrs had ≥ 1 dose. Median time since last MMR dose for patients with 2 doses was 8 years (IQR: 4, 11 years). Four patients had meningitis and 1 had encephalitis; all were ≥ 10 years old and previously received 2 MMR doses. Of male mumps patients older than 10 years of age (2,113), 46 (2%) reported having orchitis; of these, 33 (72%) had 2 MMR doses. Sixty-four patients were hospitalized and there were no deaths.

CONCLUSIONS: About one-third of cases reported during the recent US mumps resurgence were in children and adolescents. The low rate of mumps complications compared with previous studies suggests mumps complications may not be adequately captured in national surveillance or identified by providers. Providers should remain vigilant that mumps can still occur among fully vaccinated pediatric patients, even those recently vaccinated.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Surveillance; Vaccine-Preventable Diseases; Children and Adolescents
Consider for Different Presentation?	Yes
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Quick
Abstract Title	Racial Disparities in Invasive <i>Haemophilus Influenzae</i> Disease Affecting American Indian and Alaska Native Populations — United States, 2008–2017

Abstract

BACKGROUND: Invasive *Haemophilus influenzae* (Hi) disease is caused by typeable (serotypes a, b, c, d, e, and f) and nontypeable strains. Hi serotype b (Hib) conjugate vaccines introduced during the 1980s decreased Hib incidence; however, Hib and non-Hib disease remain disproportionately high in American Indian and Alaska Native (AI/AN) populations compared to other racial groups. We describe current Hi disease racial disparities.

METHODS: We analyzed 2008–2017 Hi disease data from Active Bacterial Core surveillance, an active, population- and laboratory-based surveillance system conducted in 10 U.S. sites. Sterile-site isolates were serotyped via slide agglutination and real-time polymerase chain reaction. Case-fatality ratios (CFRs) were calculated using cases with known outcomes. Projected nationwide annual incidences per 100,000 population were standardized for race and age; unknown race was multiply imputed. Cases in AI/AN patients were compared to those in all other races (non-AI/AN) and incidence rate ratios (IRR) were calculated.

RESULTS: From 2008–2017, 7,389 cases of invasive Hi disease were reported; 2.4% were in AI/AN. Of 6,546 (88.6%) serotyped cases: 1.8% were Hib; 26.6% were non-b serotypes; and 71.6% were nontypeable. Median age was 24 and 65 years for AI/AN and non-AI/AN patients, respectively ($p < 0.0001$). CFRs were similar (AI/AN: 14.2% vs non-AI/AN: 13.9%, $p = 0.9$). Incidence was higher among AI/AN (3.1/100,000) than non-AI/AN (1.8/100,000; IRR: 1.8, 95% CI: 1.5–2.1). Disease burden and disparity were greatest among children aged <5 years (13.8/100,000 in AI/AN vs 2.8/100,000 in non-AI/AN; IRR: 4.9, 95% CI: 3.9–6.3), particularly for Hi serotype a (Hia, IRR: 16.7) and Hib (IRR: 29.0). Of 15 Hib cases in AI/AN children aged <5 years, Hib vaccine series was complete in 6 (40%).

CONCLUSIONS: Invasive Hi disease disproportionately affects AI/AN, particularly Hia and Hib in children aged <5 years. Additional Hia and Hib prevention strategies are needed to address these disparities.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Infectious Diseases; Health Disparities; American Indians / Alaska Natives
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11487
Abstract Type	Quick
Abstract Title	Response to an Outbreak of Measles Associated with an Imported Case, Texas, 2018

Abstract

BACKGROUND: Measles, a highly contagious viral disease, requires immediate public health follow-up to mitigate secondary cases. In January 2018, an imported case was reported to the Texas Department of State Health Services, Public Health Region 2/3 (DSHS PHR 2/3). Investigation of this case and five secondary cases identified multiple high risk contacts and public venues where exposures may have occurred leading to extensive public health prevention and control interventions.

METHODS: Investigation into the index case revealed six close contacts, of which four were high risk due to lack of vaccination and no history of disease, and visits to four public venues while contagious. Amongst the five secondary cases, four additional public venues were identified as requiring public health follow-up. All close contacts of cases and all venues were informed of the exposure and provided information regarding measles infection. DSHS PHR 2/3 issued a media release and health alerts regarding the measles outbreak to increase public awareness and promote case finding amongst other public health entities. Measles cases were classified according to CSTE definition. Diagnostic laboratory testing including serology and polymerase chain reaction were performed.

RESULTS: Six confirmed cases were identified during this outbreak with disease onsets ranging from 1/9/18-1/20/18. Of the six case-patients identified, one (16.7%) was an infant, one (16.7%) was 14-18 years of age, and four (66.8%) were adults. None of the six cases were immunized against measles nor had history of disease. Over half of the secondary cases (80%) were associated with the index case's household and one case (20%) was associated with exposure at a public venue. In total, there were eight venues requiring public health follow-up; two (25%) healthcare facilities, one (12.5%) church, one (12.5%) daycare, one (12.5%) high school, one (12.5%) university, one (12.5%) gym, and one (12.5%) movie theater.

CONCLUSIONS: In January 2018, five persons associated with exposure to an imported case of measles were diagnosed with the disease. The rise of vaccine exemptions and the high secondary attack rate of measles amongst susceptible contacts dictates immediate public health intervention. This outbreak had the potential to develop into a larger event given the public venues involved as well as the fact that measles is transmissible prior to rash onset. The prompt investigation into contacts and activities of cases along with the dissemination of information during this investigation demonstrates a successful public health response.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Infectious Diseases; Vaccine-Preventable Diseases; Epidemiology
Consider for Different Presentation?	Yes
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Submission Type ID	Breakout/Quick/Lightning/Poster
Abstract Type	Quick
Abstract Title	Serogroup B Meningococcal Vaccine Uptake Among People at Increased Risk for Serogroup B Meningococcal Disease Due to Underlying Medical Conditions – United States, 2018

Abstract

BACKGROUND: In February 2015, the Advisory Committee on Immunization Practices (ACIP) recommended serogroup B meningococcal vaccine (MenB) for individuals aged ≥ 10 years with complement deficiency (including eculizumab use), or anatomic or functional asplenia (including sickle cell disease). We used IBM MarketScan Treatment Pathways commercial claims data to estimate MenB vaccination coverage among people with these conditions. **METHODS:** We defined a cohort of people aged ≥ 10 years continuously enrolled from the date of MenB licensure (October 29, 2014) through April 30, 2018. Within this cohort, we identified individuals with at least one procedure code, one inpatient ICD-9/10 diagnosis code, or two outpatient ICD-9/10 codes (≥ 30 days apart) for sickle cell disease, congenital asplenia, partial or total splenectomy, complement deficiency, or eculizumab administration. For all conditions we required at least one code before January 1, 2018 to allow time for MenB receipt after diagnosis. For eculizumab, we also required at least one eculizumab administration code after January 30, 2018 to exclude patients no longer taking eculizumab. Individuals were classified as having received MenB if they had at least one MenB administration code at any time, and as having completed a MenB series if they had been vaccinated with an appropriate number and spacing of MenB doses according to ACIP recommendations. **RESULTS:** Of 3,565 individuals meeting the inclusion criteria, 206 (5.8%, 95% confidence interval [CI] 5.0–6.6%) had received at least one MenB dose. First-dose coverage was lowest in adults aged ≥ 24 years, with 69/2,903 (2.4%, 95% CI 1.9–3.0%) having received at least one dose. In contrast, 55/237 (23%, 95% CI 18.0–29.1%) of those aged 10–15 and 82/425 (19%, 95% CI 15.7–23.4%) of those aged 16–23 years had received at least one MenB dose. Overall 113/3,565 (3.2%, 95% CI 2.6–3.8%) people had completed a MenB series; series completion among those who received at least one MenB dose was similar across age groups. Results by underlying condition were similar to overall results except that higher vaccine uptake was observed among eculizumab recipients aged ≥ 24 years (N = 39; one dose: 15.4%, 95% CI 5.9–30.5%; complete series: 10.3%, 95% CI 3.9–25.1%). **CONCLUSIONS:** MenB coverage is low among individuals at increased risk for serogroup B meningococcal disease due to underlying conditions, especially for adults aged ≥ 24 years. Further evaluation is needed to develop strategies to increase MenB vaccination and series completion in individuals with these underlying conditions.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Special/Vulnerable Populations; Vaccine-Preventable Diseases; Immunization
Consider for Different Presentation?	Yes
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Submission Type	Breakout/Quick/Lightning/Poster
ID	11131
Abstract Type	Quick
Abstract Title	Unexpected Change in Pertussis Patterns — Maine, 2018

Abstract

BACKGROUND: Pertussis is a highly contagious vaccine-preventable respiratory disease caused by *Bordetella pertussis*. Since 2014, Maine has had one of the highest pertussis rates in the United States. For 2013–2017, Maine Center for Disease Control and Prevention (MCDCP) identified a median of 51 cases during September–October (range 13–67). During September–October 2018, case counts more than doubled. To better understand pertussis dynamics in Maine, we compared 2018 case reports with those reported during 2011–2017.

METHODS: Pertussis data reported during January 2011–October 2018 were retrieved from Maine’s National Electronic Disease Surveillance System Base System. Incidence rates were calculated by age groups (<1 years, 1 to 6 years, 7 to 10 years, 11 to 18 years, and >18 years) using U.S. Census Bureau data. Proportion of patients with vaccination appropriate for age was calculated based on CDC’s immunization schedule. Comparisons were made between 2018 and 2011–2017 aggregate estimates.

RESULTS: We identified 332 confirmed or probable pertussis cases during 2018. Highest incidence was among children aged <1 year (265.6/100,000 population) followed by children aged 1 to 6 years (131.7/100,000 population); these rates were higher than the 2011–2017 mean incidence for these age groups (156.1/100,000 population and 85.6/100,000 population, respectively). Pertussis incidence decreased in 2018 for all other age groups. Among patients, significantly more were appropriately vaccinated in 2018 versus the 2011–2017 mean (83.3% vs 61.1%, $P<0.05$). In 2018, 87.8% of children with pertussis aged <7 years were appropriately vaccinated, compared to the 2011–2017 mean of 68.8% ($P<0.05$).

CONCLUSIONS: Pertussis incidence among Maine children aged <6 years increased in 2018 despite improved vaccination among patients across age groups. MCDCP is investigating possible reasons for this increase, including non-compliance with vaccine storage recommendations, and potential blunting of the child’s immune response associated with maternal immunization.

Submission Complete?	Yes
Committee Topic	Infectious Disease Vaccine-Preventable Diseases
Keywords	Vaccine-Preventable Diseases
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Submission Type ID	Roundtable
Abstract Type	Roundtable
Abstract Title	Immunization Coverage in Urban and Rural Populations in Nigeria

Abstract

Key Objectives:

*To determine the immunization status and coverage of children in urban and rural populations of Nigeria. * To identify any disparity in immunization coverage in the urban and rural areas of Nigeria, and the factors responsible. *To establish and highlight the role of record keeping in the immunization system.*To recommend, based on findings, the best approaches to improve on the immunization coverage in both urban and rural populations equitably.

Brief Summary:

Immunization against childhood VPDs is an important public health intervention which averts an estimated 2-3million deaths annually.Despite this and disproportionately too, nearly one in five children miss out on basic vaccines.This study aimed to contribute towards achieving the GVAP by determining the immunization coverage of eight childhood VPDs in urban and rural populations in Nigeria. Retrospective, comparative and community-based study was conducted in Owerri Municipal Council and Ideato North LGAs of IMO State, south-east Nigeria as case studies for the urban and rural populations of Nigeria,respectively. This covered the period from 2013-2017. Modified WHO-EPI cluster sampling methods were used for household selection.After adjustment by using finite population correction formula and a design effect of 2.3, the effective sample size was 725children and their mothers/caregivers, 315 per LGA. Data was collected using a pre-tested, interviewer administered questionnaire , focused discussions and review of existing records in the NPI units, PHC departments of the LGAs of study. 590 correctly filled questionnaires, 295 per LGA were collected and analyzed. Factors associated with full immunization were identified and independent predictors investigated for. Significances of all the tests were decided at p-value of 0.05. 81.1% of the children were fully immunized by immunization card-plus history, with coverage of 129.4% from the review of records in the urban LGA while only 18.9% of the children in the rural area were fully immunized by immunization card-plus history, 0% from the review of records. Factors significantly associated with full immunization were maternal education level,technologies for data cataloging and transfer, area of residence, social class and maternal health-care utilization. Salient areas need improvement. It is vital that fully operational immunization information system be established and local programmatic interventions be strengthened to upgrade the awareness of the communities on immunization through information, education and communication, primary and maternal health care utilization, while working on advancing the economic status of the populace.This will ensure the GVAP is met, the gap bridged and is critical in the reduction of childhood morbidity and mortality.

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Committee Topic	Infectious Disease Vaccine-Preventable Diseases
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Consider for Different Presentation?	No
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