VACCINE-PREVENTABLE DISEASES (VPDS): CURRENT TRENDS

Adult Immunization Conference
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I, Steve Fleming, have been asked to disclose any significant relationships with commercial entities that are either providing financial support for this program or whose products or services are mentioned during our presentations.

I have no relationships to disclose.

I may/will discuss the use of vaccines in a manner not approved by the U.S. Food and Drug Administration.

But in accordance with ACIP recommendations.
Today’s Topics

Current trends: VPD Epidemiology in Massachusetts and the USA

- MDPH Epidemiologists – Our Roles
- Healthcare Providers – Your Roles
- Impact of Vaccines on VPD Morbidity
- Mumps
- Influenza
- Invasive meningococcal disease
COLLABORATIONS IN DISEASE SURVEILLANCE

REPORTING AND CONTROL

Healthcare Provider

LBOH 1

School

MDPH

LBOH 2

Sports Team

Adult Immunization Conference 2018
# VPDs In MA: Comparison of 2017 with Pre-vaccine Era

<table>
<thead>
<tr>
<th>Disease</th>
<th>Maximum No. of Annual Cases in Pre-vaccine Era (year)</th>
<th>2017 Cases</th>
<th>2017 Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>12,641 (1899)</td>
<td>0</td>
<td>-100.00</td>
</tr>
<tr>
<td>Measles&lt;sup&gt;2&lt;/sup&gt;</td>
<td>52,866 (1952)</td>
<td>0</td>
<td>-100.00</td>
</tr>
<tr>
<td>Mumps&lt;sup&gt;2&lt;/sup&gt;</td>
<td>18,709 (1957)</td>
<td>191</td>
<td>-98.98</td>
</tr>
<tr>
<td>Pertussis</td>
<td>13,333 (1937)</td>
<td>374</td>
<td>-97.19</td>
</tr>
<tr>
<td>Polio</td>
<td>3,950 (1955)</td>
<td>0</td>
<td>-100.00</td>
</tr>
<tr>
<td>Rubella&lt;sup&gt;2&lt;/sup&gt;</td>
<td>34,148 (1943)</td>
<td>1</td>
<td>-100.00</td>
</tr>
<tr>
<td>Tetanus</td>
<td>45 (1925)</td>
<td>0</td>
<td>-100.00</td>
</tr>
<tr>
<td>Hib (&lt; 5 yrs of age)</td>
<td>147 (1987)</td>
<td>2</td>
<td>-98.64</td>
</tr>
<tr>
<td>Chickenpox&lt;sup&gt;2&lt;/sup&gt;</td>
<td>23,768 (1953)</td>
<td>385</td>
<td>-98.38</td>
</tr>
</tbody>
</table>

1 2017 data are preliminary as of March 6, 2018, and are subject to change.
2 Includes probable and confirmed cases to better reflect disease burden.
Make Sure You’re Protected against Measles before International Travel

Before any international travel—

- Infants 6 months through 11 months of age should receive one dose of MMR vaccine.†
- Children 12 months of age and older should receive two doses of MMR vaccine separated by 28 days.
- Teenagers and adults who do not have evidence of immunity* against measles should get two doses of MMR vaccine separated by at least 28 days.

† Infants who get one dose of MMR vaccine before their first birthday should get two more doses at 12 through 15 months of age and another dose at least 28 days later.

* Acceptable presumptive evidence of immunity against measles includes at least one of the following: written documentation of adequate vaccination, laboratory evidence of immunity, laboratory confirmation of measles, or birth in the United States before 1957.

Get Vaccinated and Prevent Measles

Measles is still common in many parts of the world.
Mumps
Number of Reported Mumps Cases, United States – 1968 - 2017

Source: National Notifiable Diseases Surveillance System (passive surveillance); 2017 data as of October 7, 2017. Presented by Dr. Mona Marin, CDC, ACIP Meeting 10-25-17
### Mumps in Massachusetts 2016 - 2017

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumps</td>
<td>7</td>
<td>15</td>
<td>9</td>
<td>4</td>
<td>6</td>
<td>71</td>
<td>5</td>
<td>6</td>
<td>258</td>
<td>191</td>
<td>8</td>
</tr>
</tbody>
</table>

#### Confirmed and Probable Mumps Cases by Cluster Type - MA 2016-2017 (N=449)

- 2016: 258 cases*
- 2017: 191 cases*

*includes confirmed and probable to better reflect the burden of disease. 2017 data are preliminary and subject to change.
In recent years outbreaks largely confined to universities and other close contact settings, including teams, clubs, schools, other work places, prisons and the Marshallese community.

- Median age 21
- Half of the outbreaks had <10 cases; half of the outbreaks occurred in colleges/universities
- A small number of outbreaks (13%) with ≥50 cases accounted for 83% of all outbreak related cases
- Current 2-dose schedule sufficient for control in general population
- But not in intense exposure settings with increased force of infection

Source: National Notifiable Disease Surveillance System (passive surveillance); 2017 data as of October 7, 2017. CDC. MMWR 2018;67(1):33. Presented by Dr. Mona Marin, CDC, ACIP Meeting 10-25-17
Mumps outbreaks have been increasing in recent years

- In part due to **waning immunity of the 2 dose series** in the settings of an increased force of infection (close, prolonged contact). 2 dose vaccine effectiveness: 88% (range of 31-95%). 2 dose schedule sufficient for control in general population.

- Data limited and insufficient at this time to fully characterize the impact of MMR3 on reducing the size or duration of an outbreak. Studies are ongoing.

- Data do support use of a third dose of a mumps-containing vaccine for **improving an individual’s** protection against mumps disease and its complications during an outbreak.

_A substantial increase in the number of mumps outbreaks and outbreak-associated cases has occurred in the United States since late 2015 (J.A). To address this public health problem, the Advisory Committee on Immunization Practices (ACIP) reviewed the available evidence and determined that a third dose of measles, mumps, rubella (MMR) vaccine is safe and effective in preventing mumps. During its October 2017 meeting, ACIP recommended a third dose of a mumps vaccine containing vaccine† for persons previously unvaccinated with 2 doses who are identified by public health authorities as being part of a group or population at increased risk for acquiring mumps because of an outbreak. The purpose of the recommendation is to improve protection of persons in outbreaks, especially against severe disease and neurologic sequelae. Despite this recommendation, mumps outbreaks continue to be reported throughout the United States, particularly in settings where persons have close, prolonged contact (e.g., child care centers and close-shift communities). To assist state and local health departments in responding to mumps outbreaks, CDC issued guidance on use of a third dose of MMR vaccine in the 2017 Manual for the Surveillance of Vaccine Preventable Diseases. The guidance was based on limited data. Additional evidence on effectiveness and safety of the third dose of MMR vaccine recently became available and was presented to ACIP during 2017. This report summarizes the evidence, recommendations by ACIP regarding use of a third dose of MMR vaccine for prevention of mumps outbreaks._

CDC. MMWR 2018;67(1):33.

^Recommendation of the Advisory Committee on Immunization Practices for Use of a Third Dose of Mumps Virus-Containing Vaccine in Persons at Increased Risk for Mumps During an Outbreak

**Mumps Vaccine During Outbreaks**

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A Third Dose:

- CDC reviewed three studies regarding the use of a 3rd dose.
- All studies reported lower attack rates among persons who received the third dose during the outbreak compared with persons who had received 2 doses before the outbreak.
- Incremental vaccine effectiveness of 2 doses vs. 3 doses ranged from 61% to 88%, with one estimate statistically significant at 78.1% VE (CI = 60.9 - 87.8%).
- This study also found students who had received MMR2 ≥13 years prior had a 9-fold increased risk.

- Appears safe

- Duration of protection is unknown
  - Limited immunologic evidence suggest antibody titers decline within 1 year after the 3rd dose.

- 3rd dose should be deployed strategically in certain outbreaks as determined by public health authorities

CDC. MMWR 2018;67(1):33. Adult Immunization Conference 2018
Persons previously vaccinated with 2 doses of a mumps virus–containing vaccine who are identified by public health authorities as being part of a group or population at increased risk for acquiring mumps in certain outbreak settings should receive a 3rd dose of a mumps virus–containing vaccine to improve an individual’s protection against mumps disease and related complications.

Factors to be considered:
- Size of target population
- Mumps incidence/number of cases
- MMR3 vaccine coverage needed to impact the outbreak
- Timing of MMR3 vaccination
- Social networks
- Intensity and duration of close contact

Call MDPH Division of Epidemiology and Immunization at 617-983-6800 for consultation.
Influenza-like illness activity in Massachusetts was widespread at high intensity, for the week ending February 3, 2018.
Influenza Season 2017 - 2018

- Severe season
- A lot of media attention
- Started building early but did not peak early (mid-February)
- Influenza A/H3N2 predominated
- A/H3N2 tends to impact older adults disproportionately
- Record year for hospitalizations nationally
- Resources taxed and stressed (hospital beds, EDs, provider offices, vaccines, antivirals, IV bags, rapid tests)
- Moderate to low vaccine effectiveness based on interim estimates (36% overall, 25% against H3N2, 67% against H1N1, and 42% against B strains.)
- Better performance than expected
- 1 pediatric flu-related death in MA*

*data are preliminary and subject to change
Overall hospitalization rates (all ages) as well as the 3 adult age groups are the highest ever recorded in the CDC surveillance system, breaking the previously recorded highs recorded during 2014-2015; a high severity H3N2-predominant season.
Vaccine Strain Selection: 2018-2019 Influenza Season

Vaccine Strain Selection: 2018-2019 Influenza Season – U.S.

Influenza Vaccine Composition: The World Health Organization (WHO) has recommended two new vaccine viruses for the 2018-2019 influenza season.

2017-2018

- A/Michigan/45/2015 (H1N1)pdm09-like virus
- A/Hong Kong/4801/2014 (H3N2)-like virus
- B/Brisbane/60/2008-like (B/Victoria lineage) virus
- B/Phuket/3073/2013-like (B/Yamagata lineage) virus.

2018-2019

- A/Michigan/45/2015 (H1N1)pdm09-like virus
- A/Singapore/INFIMH-16-0019/2016 (H3N2)-like virus
- B/Colorado/06/2017-like virus (B/Victoria lineage)
- B/Phuket/3073/2013-like virus (B/Yamagata lineage)

Invasive Meningococcal Disease (IMD)

Epidemiology of Meningococcal Disease Among College Students – United States, 2014-2016. Sarah Meyer, MD, MPH, Division of Bacterial Diseases, Centers for Disease Control and Prevention.

Epidemiology of Meningococcal Disease Among College Students – United States, 2014-2016. Sarah Meyer, MD, MPH, Division of Bacterial Diseases, Centers for Disease Control and Prevention.
Incidence of meningococcal disease – United States, 1996-2016

Source: National Notifiable Diseases Surveillance System

Presented by Dr. Sarah Meyer, ACIP Meeting 2-22-17
Data are current as of 12/13/2017 and are subject to change.

MDPH, 2017
Incidence of meningococcal disease among adolescents and young adults by serogroup, 2014-2016 (United States)

Source: National Notifiable Diseases Surveillance System (NNDSS) data with additional serogroup data from Active Bacterial Core surveillance (ABCs) and state health departments
Unknown serogroup and other serogroups excluded
Summary: Epidemiology of Meningococcal Disease in the U.S.

- Rates of disease have declined from approximately 1 to 0.1 cases per 100,000 population in the past 20 years.
  - Decline seen in all serogroups, including serogroup B.
  - **Outbreaks are rare** (only 2-3 out of every 100 cases).
  - In recent years, several serogroup B outbreaks in universities and serogroup C outbreaks among MSM and other communities have been reported.

- Incidence of serogroup B meningococcal disease in college students is low (20 cases per year out of nearly 9 million students 18-21 enrolled in college, with 2-4 outbreaks reported annually); however, college students aged 18-21 years are at increased risk compared to non-college students.

- Incidence of serogroups C, W, and Y disease in this age group is even lower and similar in college students and non-college students, likely in part due to the adolescent MenACWY program.
<table>
<thead>
<tr>
<th>State of University</th>
<th>Cases (deaths)</th>
<th>Outbreak Period</th>
<th># Undergraduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohio</td>
<td>13 (1)</td>
<td>Jan 2008 – Nov 2010</td>
<td>24,000</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>4</td>
<td>Feb – Mar 2009</td>
<td>10,000</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>2</td>
<td>Nov 2011</td>
<td>5,000</td>
</tr>
<tr>
<td>New Jersey</td>
<td>9 (1)</td>
<td>Mar 2013 – Mar 2014</td>
<td>5,000</td>
</tr>
<tr>
<td>California</td>
<td>4*</td>
<td>Nov 2013</td>
<td>18,000</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>2</td>
<td>Jan – Feb 2015</td>
<td>4,000</td>
</tr>
<tr>
<td>Oregon</td>
<td>7 (1)</td>
<td>Jan – May 2015</td>
<td>20,000</td>
</tr>
<tr>
<td>California</td>
<td>2**</td>
<td>Jan – Feb 2016</td>
<td>5,000</td>
</tr>
<tr>
<td>New Jersey</td>
<td>2</td>
<td>Mar – Apr 2016</td>
<td>35,000</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>3</td>
<td>Oct 2016</td>
<td>30,000</td>
</tr>
<tr>
<td>Oregon</td>
<td>5</td>
<td>Nov 2016 – Nov 2017</td>
<td>25,000</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>3</td>
<td>Oct 2017 – Feb 2018</td>
<td>30,000</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>2***</td>
<td>Nov 2017</td>
<td>3,600</td>
</tr>
</tbody>
</table>

†Where CDC consulted; ††1 additional associated case identified after retrospective case review; †‡1 additional patient with inconclusive laboratory results; †§Cases were close contacts

Preliminary Data Dr. Sarah Meyer, CDC, March 2018
Every cluster is unique, with a wide range in number of cases, population size and characteristics, and duration. This creates challenges in applying guidance for the control of outbreaks.

Achieving high vaccine uptake has been challenging, especially at large universities (>20,000), with even lower coverage for 2\(^{nd}\) or 3\(^{rd}\) doses.

Outbreaks create significant anxiety and major logistical/financial challenges.

Further study needed with regard to vaccine effectiveness and duration of protection.

<table>
<thead>
<tr>
<th><strong>MenACWY</strong></th>
<th><strong>MenB</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Complement deficiency, or taking eculizumab (Soliris)</td>
<td>Complement deficiency, or taking eculizumab (Soliris)</td>
</tr>
<tr>
<td>Anatomic/Functional asplenia</td>
<td>Anatomic/Functional asplenia</td>
</tr>
<tr>
<td>Outbreak setting</td>
<td>Outbreak setting</td>
</tr>
<tr>
<td>Microbiologist</td>
<td>Microbiologist</td>
</tr>
<tr>
<td>HIV Infection</td>
<td></td>
</tr>
<tr>
<td>Traveler to hyperendemic area</td>
<td></td>
</tr>
<tr>
<td>First year college student</td>
<td></td>
</tr>
<tr>
<td>Military Recruit</td>
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</tbody>
</table>
MA College Requirement for Meningococcal Vaccine

New for fall of 2018:

- All newly enrolled full-time students 21 years of age and younger will be required to show documentation of a dose of MenACWY vaccine administered on or after their 16th birthday, regardless of housing status.
- Meningococcal B vaccine does not fulfill this requirement.
- Previously was “One dose for newly enrolled full-time residential students.”
Invasive Meningococcal Disease in Massachusetts: Recent Outbreaks

Invasive Meningococcal Disease serogroup B at UMASS Amherst and Smith College
Fall 2017 – Spring 2018

Meningitis Outbreak Declared At UMass Amherst

IMD serogroup C Among People
Experiencing Homelessness, Greater Boston, 2016 - 2018

Vaccination for homeless in Boston underway after infection leaves One dead

Immunization Update 2018
Questions?