Introduction to Invasive Meningococcal Disease (IMD) Investigation and Follow-Up for LBOHs

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Learning Objectives Today

• At the conclusion of this webinar, participants will be able to:
  • Describe meningococcal disease **morbidity and mortality** and current epidemiology
  • Follow the **US immunization recommendations** for use of the monovalent (B) and quadrivalent (A,C,W,Y) meningococcal vaccines
  • Understand **key steps and control measures** when working on Invasive Meningococcal Disease (IMD) Investigations
  • Know the **key MAVEN variables** to collect when working on IMD investigations
Agenda

• Invasive Meningococcal Disease (IMD)
  • Background on Meningitis and IMD
    • National and State Trends of IMD
  • Symptoms
  • Transmission

• Prevention and Control of IMD
  • Vaccine Recommendations
  • Testing & Reporting
  • Control Measures
  • Invasive Meningococcal Disease Investigations
  • Key MAVEN Variables

• Resources
Background on Meningitis and Invasive Meningococcal Disease (IMD)
Meningitis vs. Bacterial Meningitis
What's the Difference?

**Meningitis**

- Refers to any kind of inflammation of the meninges—the three membranous tissue layers that cover the brain and spinal cord.
- Infectious causes include bacteria, viruses, fungi, etc.
- There are **TWO MAIN TYPES** of meningitis:
  - **Viral Meningitis** (most common type, most cases are mild and rarely fatal).
  - **Bacterial Meningitis** (rare in comparison, but extremely dangerous and can be fatal)
- **Non-Infectious Meningitis**: There are also non-infectious causes of meningitis, such as brain or spinal cord injury and surgical procedures.
  - Certain immune conditions (lupus, cancers) can also cause it.

**Bacterial Meningitis**

- Bacterial meningitis is serious. Some people with the infection die and death can occur in as little as a few hours. However, most people recover from bacterial meningitis.
- Those who do recover can have permanent disabilities, such as brain damage, hearing loss, and learning disabilities.

We are most concerned about identifying and preventing the spread of bacterial meningitis.
Bacterial Meningitis

BACTERIAL CAUSES

• **Several types of bacteria** can cause meningitis. Leading causes in the United States include:
  • *Streptococcus pneumoniae*
  • Group B *Streptococcus*
  • *Neisseria meningitidis*
  • *Haemophilus influenzae*
  • *Listeria monocytogenes*
  • *Escherichia coli*
  • *Mycobacterium tuberculosis*, which causes tuberculosis or TB, is a less common cause of bacterial meningitis (called TB meningitis).

PREVENTION THROUGH VACCINATION

• **Vaccines** are the most effective way to protect against certain types of bacterial meningitis. There are vaccines for 4 types of bacteria that can cause meningitis:
  • Meningococcal vaccines help protect against *N. meningitidis*
  • Pneumococcal vaccines help protect against *S. pneumoniae*
  • *Haemophilus influenzae* serotype b (Hib) vaccines help protect against Hib
  • *Bacille Calmette-Guérin vaccine* helps protect against tuberculosis disease, but is not widely used in the United States

Meningitis caused by Bacteria can be deadly and requires immediate medical attention. Vaccines are available to help protect against some kinds of bacterial meningitis.
Neisseria meningitidis

• **Bacteria:** *Neisseria meningitidis* is a gram-negative, diplococcus (a round organism which is generally oriented in pairs), for which humans are the only reservoir.
  
  • *Neisseria meningitidis* is also known as *meningococcus*.
  
  • About 1 in 10 people have these bacteria in the back of their nose and throat without being ill (asymptomatic). This is called being ‘a carrier’:
    
    • Carriage rates in settings such as university dormitories, military barracks, and other institutional settings can be much higher.
  
  • When the bacteria invade the body, it can cause illness.

• **Illness:** *Meningococcal Disease* refers to any illness caused by *Neisseria meningitidis*.
  
  • Meningococcal Disease is sometimes called **Invasive Meningococcal Disease or IMD.**

  • These illnesses are often severe, can be deadly, and include infections of the lining of the brain and spinal cord (*meningitis*) and bloodstream.
  
  • These infections may stay in the bloodstream and cause a severe systemic infection called *meningococcemia* that can lead to sepsis, shock, and even death.

  • *Meningitis* and *Meningococcemia* (the two most common types of IMD) will be discussed in greater detail shortly.
Neisseria meningitidis Serogroups

• The first description of the clinical presentation of invasive meningococcal disease (IMD) occurred over 200 years ago and still is of concern in the twenty-first century.

• *N. meningitidis* is classified into 13 Serogroups (Types):
  - Five serogroups (A, B, C, W135, and Y) of *Neisseria meningitidis* cause most disease worldwide.
  - Three of these serogroups (B, C, and Y) cause most of the illness seen in the United States.
  - Rates of meningococcal disease have declined in the United States since the 1990s and remain low.
Meningococcal disease is also seasonal: the number of cases generally peaks each year in January, February, and March.
MA Department of Public Health
Bureau of Infectious Disease and Laboratory Sciences

Serogroup of Confirmed and Probable Cases of IMD* in MA.

*Data as of 23FEB2023 and are subject to change.
Signs and Symptoms of Invasive Meningococcal Disease
Signs and Symptoms of Invasive Meningococcal Infections

• Early symptoms of meningococcal disease can be like the flu or other viral infections, but the symptoms can progress very quickly, and meningococcal disease can be deadly within a matter of just hours. The symptoms vary depending on the illness.

• Meningitis and Meningococcemia are the two most common (and very serious) types of meningococcal disease.

Septicemia = A bloodstream infection

‘Meningococcal’ Septicemia = Meningococcemia

National Meningitis Association (NMA)
Meningococcal Meningitis

• In Meningococcal Meningitis, the bacteria infect the lining of the brain and spinal cord and cause swelling.

• The most common symptoms include:
  • Fever
  • Headache
  • Stiff neck

• There are often additional symptoms, such as
  • Nausea
  • Vomiting
  • Photophobia (eyes being more sensitive to light)
  • Altered mental status (confusion)

• Newborns and babies may not have the classic symptoms listed above, or it may be difficult to notice those symptoms in babies. Instead, babies may be slow or inactive, irritable, vomiting, feeding poorly, or have a bulging anterior fontanelle (the soft spot of the skull). In young children, doctors may also look at the child’s reflexes for signs of meningitis.
Meningococcal Septicemia (aka Meningococccemia)

- Doctors call septicemia (a bloodstream infection) caused by *Neisseria meningitidis* either meningococcal septicemia or meningococcemia. When someone has meningococcal septicemia, the bacteria enter the bloodstream and multiply, damaging the walls of the blood vessels. This causes bleeding into the skin and organs.

- Symptoms may include:
  - Fever and chills
  - Fatigue (feeling tired)
  - Vomiting
  - Cold hands and feet
  - Severe aches or pain in the muscles, joints, chest, or abdomen (belly)
  - Rapid breathing
  - Diarrhea
  - In the later stages, a dark purple rash
Clinical Manifestations of Invasive Disease

- About 10 to 15 in 100 people with meningococcal disease will die. Up to 1 in 5 survivors will have long-term disabilities, such as:
  - Loss of limb(s), Deafness, Nervous system problems, & Brain damage

Timeline (in Hours): Progression of Meningococcal Disease, Patients Ages 15-16 Years

Early symptoms are non-specific

Meningococcal-specific symptoms appear at about 12-15 hours after symptom onset

Transmission of *Neisseria meningitidis* Bacteria

- Kissing and sexual contact
- Sharing utensils and drinks
- Sharing smokes
- Very close contact (3-6 feet)
Transmission

- **Transmission**: People spread *Neisseria meningitidis* bacteria to other people by sharing respiratory and throat secretions (saliva or spit).

- Generally, it takes close (for example, coughing or kissing) or lengthy contact to spread these bacteria. Humans are the only host.

- Sometimes the bacteria spread to people who have had close or lengthy contact with a patient with meningococcal disease. Those at increased risk of getting sick include:
  - People in the same household
  - Roommates
  - Anyone with direct contact with the patient’s oral secretions, such as a kissing partner

- Close contacts of someone with meningococcal disease should receive antibiotics (prophylaxis) to help prevent them from getting the disease, even if they have been vaccinated.

- State and local health partner in the identification and follow-up of contacts, which will be discussed shortly.
Meningococcal Vaccines
Prevention: Vaccination

There are two types of meningococcal vaccines licensed in the United States:

- Meningococcal conjugate (MenACWY) vaccines (quadrivalent)
- Serogroup B meningococcal (MenB) vaccines (monovalent)

MenACWY vaccines provide no protection against serogroup B disease, and meningococcal serogroup B vaccines (MenB) provide no protection against serogroup A, C, W, or Y disease.

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Serogroups</th>
<th>Year Licensed</th>
<th>Approved Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menactra</td>
<td>A, C, W, Y</td>
<td>2005</td>
<td>9 mos.–55 years*</td>
</tr>
<tr>
<td>Menveo</td>
<td>A, C, W, Y</td>
<td>2010</td>
<td>2 mos.–55 years*</td>
</tr>
<tr>
<td>MenQuadfi</td>
<td>A, C, W, Y</td>
<td>2020</td>
<td>2 years and older</td>
</tr>
<tr>
<td>Trumenba</td>
<td>B</td>
<td>2014</td>
<td>10–25 years*</td>
</tr>
<tr>
<td>Bexsero</td>
<td>B</td>
<td>2015</td>
<td>10–25 years*</td>
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*May be given to adults at increased risk older than the FDA-approved upper age limit (see ACIP recommendations, Table 11, page 41, www.cdc.gov/mmwr/volumes/69/rr/pdfs/rr6909a1-H.pdf)
Prevention: Vaccination with MenACWY

- MenACWY is a recommended vaccination as part of the ACIP Routine Childhood and Adolescent Vaccination Schedule:
  - A single dose at age 11 or 12 years with a booster dose at age 16 years.
  - People age 2 months or older at increased risk for meningococcal disease have additional recommendations.

- MenACWY is also part of the MA School Vaccination Requirements.
  - Grade 7 through 9 entry: 1 dose of MenACWY for all students.
  - Grade 11 and 12 entry: 1 booster dose of MenACWY received on or after 16 years of age. (1 or more doses of MenACWY are acceptable as long as 1 dose was received on or after 16 years of age.)

https://www.mass.gov/info-details/school-immunizations
Prevention: Vaccination with MenB

• MenB is not currently a universal requirement as part of the [MA School Immunization Requirements](https://www.immunize.org/askexperts/experts_meningococcal_b.asp), although some colleges have required it for students following outbreaks in recent years.

• For adolescents and young adults not otherwise at increased risk for meningococcal B disease, ACIP recommends that a MenB series may be administered to people 16 through 23 years of age (preferred age 16 through 18 years) on the basis of shared clinical decision-making.
  
  • The shared clinical decision-making recommendation allows the clinician and patient to decide together based upon the risks and benefits of vaccination for the individual patient.

• MenB is routinely recommended for certain high risk groups, which include people with certain immune disorders and functional or anatomic asplenia, as well as microbiologists who work with meningococcal isolates in a laboratory. For a complete list, see ACIP’s [MenB Vaccination Recommendations](https://www.immunize.org/askexperts/experts_meningococcal_b.asp).
Invasive Meningococcal Disease (IMD): Let’s Summarize

- Having meningitis (or even bacterial meningitis) doesn’t always mean you have meningococcal disease. And having meningococcal disease doesn’t necessarily mean you have meningitis.
  - There are many causes of meningitis (inflammation), including bacteria, viruses, and also non-infectious causes.
  - Bacterial Meningitis is rare, but most severe/concerning.
- The **BACTERIA** we are looking for: *Neisseria meningitidis* aka meningococcus.
  - Five serogroups (A, B, C, W135, and Y) cause most worldwide disease.
- The **ILLNESS** it causes: Invasive Meningococcal Disease (IMD) aka Meningococcal Disease
  - The **Two** most common **Outcomes** of Invasive Meningococcal Disease:
    - Spinal Cord/Brain Infection = Meningococcal Meningitis
    - Bloodstream Infection = ‘Meningococcal’ Septicemia or Meningococcemia
- There are 2 **VACCINE** Types Available:
  - Quadrivalent Meningococcal conjugate (MenACWY) vaccines (MA School Required)
  - Monovalent Serogroup B meningococcal (MenB) vaccines
Testing for Neisseria meningitidis bacteria
Specimens for Neisseria meningitidis bacteria

- Invasive meningococcal disease can be difficult to diagnose because the signs and symptoms are often similar to those of other illnesses (often caused by other bacteria or viruses). If a doctor suspects meningococcal disease, they will collect samples of blood or cerebrospinal fluid (fluid near the spinal cord) to identify *Neisseria meningitidis* bacteria. Doctors then send the samples to a laboratory for testing.

- The appropriate specimen type depends on symptoms the patient presents with.
  - If the patient presents with symptoms of meningitis (spinal cord/brain infection), then CSF is appropriate.
  - If the patient presents with symptoms of meningococcemia (blood infection), then blood is appropriate.
  - Some providers may collect both specimen types.

- Lab tests performed may include culture, PCR, gram stain, and bacterial antigen screen.

- If *Neisseria meningitidis* bacteria is identified in an invasive specimen source, it is Invasive Meningococcal Disease, and MDPH Epis will request the sample be forwarded to the State Public Health Laboratory for serotyping.

- If a DIFFERENT bacteria or virus is identified, MDPH Epis will change the MAVEN Event to the appropriate disease, and follow-up will be adjusted accordingly.
Challenges for Detecting *Neisseria meningitidis* bacteria

- Culture testing requires live bacteria to show growth. If a patient was treated with antibiotics prior to specimen collection, this may affect the culture results.

- For a clinically compatible case with no growth (but provider still suspects infection with *Neisseria meningitidis* bacteria):
  - PCR can be performed at MA SPHL (CSF specimens only) and /or CDC (serum specimens). *(MDPH Epi can help facilitate this.)*

**INVESTIGATION NOTE:** When discussing a suspect case with a provider, it is important to ask if antibiotics were administered before specimens were obtained as this may result in no growth and indicate additional testing.
Invasive Meningococcal Disease Testing: Notes for LBOH

- Invasive Meningococcal Disease (IMD) is an Immediate Disease. All suspected cases of Meningococcal Disease should be reported to public health by the provider as they begin testing to ensure the proper specimens are collected and public health is ready to implement appropriate control measures and follow-up as soon as possible.

- Most MAVEN Events for Meningococcal Disease will be created by an MDPH Epi as Suspect Meningitis Unknown Type Events while the test results are pending. Test results are typically available within 24-48 hours, but follow-up activities may be initiated sooner in highly suspect situations.

- When test results are in, the MAVEN Event Type will be updated appropriately by the MDPH Epi.

- Partner with MDPH. Be sure to be in communication with the assigned epi to receive the results and to ensure appropriate and timely local response as needed.

Meningitis MAVEN Events

Meningitis - Unknown Type

**Bacterial**
- *Neisseria meningitidis*
- Invasive Meningococcal Disease *PEP*
- Other Bacteria
  - *H. influenzae*
  - *Streptococcus pneumoniae*
  - *Streptococcus pyogenes* (iGAS)
  - *Staphylococcus Aureus*
  - Invasive Bacterial Infection Other

**Viral**
- Viral (Aseptic)Meningitis
  - Powassan
  - Varicella
  - Enterovirus

SUSPECT MAVEN Events prior to test results start as “Meningitis - Unknown Type.”

CONFIRMED IMD cases are changed to “Meningococcal Disease” MAVEN Events.
Invasive Meningococcal Disease Control Measures

MENINGOCOCCAL Meningitis KILLS WITHIN HOURS

THOUSANDS DIE in years with large outbreaks.

1 in 10 people die within 2 days even when antibiotics are available.

1 in 5 survivors are left with permanent disabilities such as paralysis, blindness, hearing loss, seizures, and intellectual disability.

https://www.cdc.gov/meningococcal/pubs-tools/multimedia.html
IMD Control Measures

- It is not necessary to confirm a case by laboratory methods to proceed with prevention and control measures.

- In fact, it is usually very important to move forward with identification and treatment of close contacts before lab confirmation is available, based on clinical findings and lab results which point in the direction of IMD.

- Chemoprophylaxis should be considered for anyone who was exposed to the case in the seven days prior to the case’s date of onset, even if vaccinated.

- Prophylaxis is not indicated more than two weeks after exposure.

**LBOH:** Your role in follow-up will be to work with the MDPH Epi and assist in rapid identification of close contacts for prophylaxis.
Who is a Close Contact?

• **Timeframe:** Seven days prior to symptom onset through 24 hours after case initiates antibiotics.

• A close contact is defined as any member of the case’s household or other individual who may have had **intimate contact with the case’s saliva and/or oral/nasal secretions.**

• Organism is spread through large droplets.

• Higher risk of transmission if case was coughing or sneezing (large droplets)

The case is often quite ill and not able to communicate. Contact identification involves talking with family or close friends.
Identifying Close Contacts

- Consider kissing, sharing food, sharing smoking/vaping materials, sharing water bottles, etc.
- Household members have a dramatically elevated risk of acquiring disease and daycare attendees & schoolchildren have elevated rates of secondary disease.
  - Attack rate for household contacts is 500-800 times the rate for the general population, we generally err on the side of caution in these cases.
- Healthcare workers may have been exposed via intubation, suctioning, etc.
Additional Considerations for Close Contacts

• **Adults:**
  - Consider their occupation (ex: Food handler), carpooling, sports teams, parties, visitors, and family members

• **Children:**
  - Think about schools, daycares, before/after school programs, sports teams, babysitters, friends/family/visitors

• **Health Care Workers:**
  - Think about suctioning, intubation, mouth-to-mouth resuscitation and the level of PPE worn by the HCW
  - This also includes EMTs/Ambulance transport teams

• **Airline Passengers:**
  - Control measures for passengers exposed to a case on a plane is determined by symptoms of case and/or length of flight
  - Consult with MDPH

• **Daycare/ Schools/Community Residential Programs:**
  - Consult with MDPH regarding identifying close contacts of a case that attended one of these settings during their infectious period
Contact Notifications: Partner with MDPH

• MDPH Epidemiologist and LBOH will work together to notify contacts.
  • Family members/Schools/Daycares/Emergency Medical Services

• Healthcare Workers are typically handled by Infection Control at the facilities.
Sample Letters: MDPH Will Provide As Needed

• Identified close contacts of IMD case

Dear Parent or Guardian:

A camp attendee at the New Art Center has been diagnosed with bacterial meningitis, a serious infectious illness caused by Neisseria meningitidis. The camper is being treated and is recovering. These bacteria that cause meningitis can spread between persons if they are in close contact that involves an exchange of saliva (spt). This can happen through activities such as:

- coughing,
- kissing,
- sharing cigarettes or lipstick,
- sharing food or sharing eating or drinking utensils such as cups or water bottles, or
- sharing closed space for longer than a brief period (i.e., car or dorm room).

There are safe and effective antibiotics that can reduce the risk of infection in people who have had close contact with the ill person.

We believe that your camper may have had close contact with the ill camper.

Although the chances of your camper developing a serious illness (such as meningitis or sepsis) are very small, to ensure your camper’s health, please take the following steps:

1. Call your camper’s health care provider. Tell your provider that your camper has been identified as having close contact with the ill camper. Show your health care provider this letter for clarification of your contact with the ill camper.

2. The Massachusetts Department of Public Health recommends that your camper take an approved antibiotic to help eliminate the germ and to lower the risk of spreading the disease to others (even if your camper has received the meningococcal vaccine). Your camper’s health care provider can prescribe this treatment.

3. The preventive antibiotic treatment is not always 100% effective; therefore, it is very important for you to monitor your camper’s health carefully during the next 3 weeks for signs of illness such as:

- fever,
- headache,
- stiff neck,
- vomiting, or
- a skin rash with fine red “freckles” or purplish spots.

Those who are NOT identified as close contacts

Dear Parent or Guardian:

An employee at the [SCHOOL NAME] has been diagnosed with bacterial meningitis, a serious infectious illness caused by Neisseria meningitidis. The employee is being treated and is recovering. These bacteria that cause meningitis can spread between persons if they are in close contact that involves an exchange of saliva (spt). This can happen through activities such as:

- Coughing
- Sneezing
- Kissing
- Sharing cigarettes or lipstick
- Sharing food or sharing eating or drinking utensils such as cups or water bottles, or
- Sharing closed space for longer than a brief period (i.e., car or dorm room).

There are safe and effective antibiotics that can reduce the risk of infection in people who have had close contact with the ill person.

It is likely that your child DID NOT have close contact with this employee.

Although the chances of your child developing a serious illness (such as meningitis or sepsis) are very small, to ensure your child’s health, please take the following steps:

1. Monitor your child’s health carefully during the next 3 weeks for signs of illness such as:

- Fever
- Headache
- Stiff neck
- Mental confusion
- Lethargy (feeling very tired)
- Vomiting
- Skin rash with fine red “freckles” or purples spots

Control Measures: Notifying Contacts
Contacts of Persons with IMD

- Individuals should be referred to PCPs for appropriate antibiotics.
  - Antibiotic regimens vary by age and underlying conditions of recipients but are typically a single dose administered orally or intramuscularly.

- **NO QUARANTINE** required for identified close contacts.

- **INCUBATION PERIOD** for IMD is relatively short – typically 2-4 days, but it can range from 1-10 days post exposure.
General PEP Recommendations

1) LABORATORY-CONFIRMED CASE
   (growth of *N. meningitidis* from a sterile site, or detection of *N. meningitidis* using PCR from a sterile site)
   OR
   No laboratory confirmation but physician gives clinical diagnosis of “meningococcal meningitis” or “meningococcemia”

   *Recommendations:* PEP for household contacts and non-household close contacts for anyone exposed to case seven days prior to case’s onset through 24 hours after case initiates antibiotics.

2) No laboratory confirmation, clinically compatible with meningococcal disease, in physician’s differential diagnosis as a suspect case

   These are situations where the symptomatology and laboratory results are not clear and the physician cannot decide based on the evidence available.

   *Recommendations:* PEP of household contacts only.

3) Diagnosis of VIRAL MENINGITIS or meningitis from other causes based on laboratory results or physician’s clinical impression. *Recommendations:* No PEP but reinforce handwashing & cough etiquette if viral etiology
IMD INVESTIGATIONS
Who investigates?

• How a case is investigated will vary considerably based on how MDPH is notified of a case or by the availability of local board of health (LBOH) staff to investigate.

• Typically, MDPH Epidemiologists take the lead with consultation from the LBOH and BIDLS Medical Directors.

• University and college health services may also play a critical role.
Meningitis MAVEN Events

Meningitis - Unknown Type

- Bacterial:
  - *Neisseria meningitidis*
    - Invasive Meningococcal Disease *PEP*
  - Other Bacteria:
    - *H. influenzae*
    - *Streptococcus pneumoniae*
    - *Streptococcus pyogenes (iGAS)*
    - *Staphylococcus Aureus*
    - Invasive Bacterial Infection Other

- Viral:
  - Viral (Aseptic) Meningitis
    *No PEP, reinforce handwashing*
    - Powassan
    - Varicella
    - Enterovirus

SUSPECT MAVEN Events prior to test results start as “Meningitis - Unknown Type.”

CONFIRMED IMD cases are changed to “Meningococcal Disease” MAVEN Events.
Goals of Case Investigation

1. Rapidly determine likelihood that patient’s illness is due to IMD.

2. Identify close contacts and advise chemoprophylaxis to eliminate carriage and prevent infection.

3. Ensure that isolates are sent to MA SPHL for serotyping and molecular characterization. (Done by MDPH Epidemiologist)

4. Collect key MAVEN variables to help CDC address key and pressing epidemiology and vaccine policy questions, and to monitor the impact of meningococcal vaccines on disease burden in the United States.
Key Steps in Meningococcal Disease Investigations

- **Step 1: Determine how high *Neisseria meningitidis* is on the differential.**
  - Questions to be asked of reporting provider (typically handled by MDPH Epi during initial report to MDPH).
    - Symptoms and onset date?
    - Has the patient been diagnosed with IMD? If so, based on what factors?
    - If IMD is one of several considerations on physician’s differential, is it high or low on the differential?
    - What are the results of any lab testing?
    - Did case take any antibiotics prior to specimen collection?
    - Travel history?
    - Does case reside in or attend a congregate or supervised care setting (homeless shelter/college/university/childcare)?
    - What specimens have been collected and when?

- **Step 2: Determine if chemoprophylaxis of close contacts is warranted.**
  - Typically involves sharing the information obtained in Step 1 with a BIDLS Medical Director to inform next steps.
  - MDPH Epi and LBOH will discuss a plan of action as needed.
    - If PEP is warranted: identify close contacts, reach out to them, advise PEP, and provide guidance on how they can get PEP

- **Step 3: Complete MAVEN Question Packages.**
Outbreaks

- Multiple cases of the **same serogroup** of IMD within a **defined population** may necessitate a vaccine campaign.

- Outbreaks have occurred in college settings and other congregate living settings (e.g. correctional facilities) as well as within the MSM community and the homeless population.

- If you suspect a case may be connected to a larger outbreak, notify MDPH.

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**Meningococcal Disease Outbreak among Gay, Bisexual Men in Florida, 2021-23**

There is a large, ongoing outbreak of meningococcal disease in Florida, primarily among gay and bisexual men. Vaccines offer the best protection during the outbreak.

*En Español: Enfermedad meningocócica en la Florida, 2021-23*

**Who Should Get Vaccinated**

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**TO:** Healthcare Providers

**FROM:** Larry Madoff, MD, Director, Division of Epidemiology and Immunization
Catherine M. Brown, DVM, MSc, MPH, State Epidemiologist

**DATE:** January 22, 2019

**RE:** Update: Invasive Meningococcal Disease among People Experiencing Homelessness

In January 2018, the Massachusetts Department of Public Health (MDPH) reported that two people experiencing homelessness in Greater Boston had been diagnosed with invasive meningococcal disease (IMD) serogroup C. Since that time, there have been three additional cases of IMD serogroup C among people in this population, and one additional case in a person with close connections to the homeless community. The most recent onset was December 2018. Cases have ranged in age from 33-59 and five of the six have been male. None of the cases appear to have received quadrivalent meningococcal vaccine (MenACWY) prior to becoming ill. The results of genetic sequencing demonstrate that all six isolates have similar molecular profiles.
Outbreak of Serogroup B Invasive Meningococcal Disease at the Five College Consortium in Massachusetts, 2017-2018

• Three outbreak-associated cases were identified between October 2017-February 2018.

• The first two cases were students at College A, and the third at College B.

• An outbreak was declared following the completion of WGS on the second case indicating strong genetic relatedness between the two cases.

• This result spurred mass vaccination clinics at College A and a recommendation of MenB vaccine administration to Five College Consortium students cross-registered at College A or spending a significant amount of time at College A.

• Following the identification of a third case at College B of the same strain who had attended an off-campus social gathering consisting of primarily College A students, mass vaccination clinics were established across all five colleges.
Key MAVEN Variables

• For confirmed cases of Invasive Meningococcal Disease (*Neisseria meningitidis*), CDC requires enhanced reporting (Data completion) for several priority variables.

  • These variables are critical in tracking national outbreaks and trends in this disease.

• These will be completed in partnership with the MDPH Epi and LBOH.
Demographic Question Package

- **Key Variables:**
  - Employer Name
  - **Occupation**
  - Race
  - Ethnicity
  - Hispanic, Latinx, or Spanish origin
  - **Current Housing Status**
Clinical Question Package

- **Key Variables:**
  - **Symptom information:**
    - Headache, Fever, Stiff Neck, Rash, Photophobia, Nausea, Vomiting, Diarrhea, Sore Throat etc.
    - **If symptom does not apply, please enter “no” or “unknown” as opposed to leaving it blank.**
  - **Type of Infection**
    - Meningitis, Septic Shock, Bacteremia (meningococcemia) with/without focus etc.
  - **Hospitalization**
  - **Final Patient Outcome**
Clinical Question Package (Continued)

• Key Variables:
  • **History of taking Eculizumab (Soliris)**
    • This is a medication that can result in increased risk for meningococcal disease.
    • Please note this in the clinical question package under Medication (Treatment and Medication section).
Vaccine and IG Information Question Package

**Key Variables:**

- **Vaccination History**
  - Specific vaccine formulation and dates should be included.
  - MIIS should be checked when vaccine records are unavailable. If applicable, Primary Care Physicians can also be a good resource.
    - If they have been vaccinated, but we don't know with what vaccine, enter “Unknown vaccine or immune globulin administered.”
    - If we don't know if they have ever been vaccinated, please enter “Vaccination history unknown.”
    - If case has never been vaccinated enter “No vaccine administered.”

**Do not leave this question blank.**
Risk/Exposure/Control & Prevention Question Package

• Key Variables:
  • Did the case have sex with
    • If case is a male, please ask who they have sex with.
    • If MSM (men who have sex with men) be sure to indicate “Male” for this question.
  • Travel History (2 weeks prior to symptoms)
  • Employed or attend a supervised care setting?
    • Ex. Child care, correctional facility, long term care facility, etc.
  • Employed or attend K-12 school?
  • Attend college or university?
  • If case stayed in a shelter in 10 days prior to symptom onset (Please indicate this in the MAVEN notes.)
Risk/Exposure/Control & Prevention Question Package (Continued)

- **Key Variables:**
  - **Does the case currently attend college or university?**
    - Answer Yes/No/Unknown
    - Answer for all cases age **15-24**
    - If yes, please indicate by writing in the MAVEN notes if case is a **member of Greek life (fraternity or sorority)** and if they **live on campus** at time of disease onset.
Meningitis-related Disease Events in MAVEN

- Remember, there are multiple infectious and non-infectious causes for a patient presenting with meningitis, however bacterial meningitis caused by *Neisseria meningitidis* requires immediate investigation and follow-up. The following are meningitis-related events as they may appear in MAVEN:

  - **Meningitis Unknown Type:** An MDPH Epi will create this Event Type when a new suspect IMD case is under investigation and test results are pending. This event type will ideally be changed appropriately based upon final test results.
    - **LBOH workflows:** LBOH Notification for Immediate Disease, LBOH Case Report Forms (CRF) are pending, and LBOH Needs final review

  - **Meningococcal Disease:** Once a suspect case is confirmed to be *Neisseria meningitidis*, MDPH Epi will update the Event Type to this. (If confirmed right away, the MAVEN Event may begin as Meningococcal Disease as well.)
    - **LBOH Workflows:** LBOH Notification for Immediate Disease, LBOH Case Report Forms (CRF) are pending, and LBOH Needs final review

  - **Invasive Bacterial Infection (other):** If the suspect case is determined to be bacterial, but not caused by *N. meningitidis* or another reportable species (ex, *H. influenzae* or *Streptococcus pneumoniae*), then MDPH Epi will adjust to this Event Type. Additional follow-up is not typically needed.
    - **LBOH Workflows:** LBOH Notification but no follow-up required

  - **Viral Meningitis (aseptic):** Meningitis from viral causes (importantly not *N. meningitidis*) will be updated to this Event Type. Additional follow-up is not required.
    - **LBOH Workflows:** -- LBOH Notification but no follow-up required

Remember: Acknowledging Admin QP Step 1 moves a new event out of any initial Notification Workflows at that time, even if the Event Type is later changed.
Specimens requested for *Neisseria meningitidis* testing are CSF and/or blood
- Lab tests performed may include culture, PCR, gram stain, and bacterial antigen screen.
- Positive specimens from a hospital lab are forwarded to the State Lab for serotyping surveillance (but follow-up should not be delayed for serotyping results which do not affect clinical treatment of the case nor follow-up for their contacts).

Most MAVEN Events for Invasive Meningococcal Disease (IMD) will be created by an MDPH Epi as Suspect Meningitis Unknown Type Events while the test results are pending.
- Typically, MDPH Epidemiologists take the lead with consultation from the LBOH and BIDLS Medical Directors.

Move forward ASAP with chemoprophylaxis of close contacts while lab testing is pending.
- Chemoprophylaxis should be considered for anyone who was exposed to the case in the seven days prior to the case’s date of onset (through 24 hours after antibiotics are initiated), even if vaccinated.
- Prophylaxis for contacts is not indicated more than two weeks after exposure.
- Individuals should be referred to PCPs for appropriate antibiotics.

Close contact is defined as any member of the case’s household or other individuals who may have had intimate contact with the case’s saliva and/or oral/nasal secretions.
- **NO QUARANTINE** required for identified close contacts.
- MDPH Epidemiologist and LBOH will work together to notify contacts.

Complete key variables in MAVEN question packages for Confirmed/Probable Meningococcal Disease cases in conjunction with the assigned MDPH Epi.
Resources

- CDC Manual for Surveillance of Vaccine-Preventable Diseases, Chapter 8: Meningococcal Disease, January 5, 2022


- Mass.gov Fact Sheet on Meningococcal Disease


- MDPH Epidemiology Line (1-617-983-6800)
Questions?

*Neisseria meningitidis*