Announcements

- Register for the Epi-Tech Trainings:
  1. Log-on or Request log-on ID/password: https://tiny.army.mil/r/zB8A/CME
  2. Register for Epi-Tech Surveillance Training:

  Confirm attendance: https://tiny.army.mil/r/dVrGO/EpiTechFY14

  - Please enter your name/service and e-mail into the chat box to the left or email the disease epidemiology program at: USAPHC.Disease.Epidemiology@us.army.mil
  - You will receive a confirmation email within the next 48 hours with your attendance record

- Please mute your phones and DO NOT place us on hold. Press *6 to mute your phone.

Epidemiologic Review of Pertussis

Epi-Tech Training
25 February 2014

Robert Cosgrove, MPH
ORISE Epidemiologist
U.S. Army Public Health Command

Outline

- Description of disease
- Complications
- Disease progression
- Background information (Army, Navy, Air Force)
- Laboratory criteria and case definitions
- Civilian Trends
- Outbreak Determination
- Initiating an outbreak response
- Patient Information
- Case Contact Tracing
- Outbreak response
- Example Outbreak

Clinical Description

- Pertussis (also known as whooping cough) has a very high rate of infectivity caused by the bacteria *Bordetella pertussis*.
- These bacteria attach to the cilia that line part of the upper respiratory system.
- The bacteria releases toxins, which damage the cilia and cause inflammation.
- Symptoms: paroxysms of coughing, inspiratory “whoop” and post-tussive vomiting.

Vaccination Recommendations

- DTaP:
  - 2, 4, 6 months
  - 15 through 18 months
  - 4 through 6 years
- Tdap:
  - 7 – 10
  - 19 and older
  - Pregnant women
  - Healthcare personnel
- Advisory Committee on Immunization Practices: Advisory Committee on Immunization Practices

Disease Description

- **Mode of transmission:** Transmission occurs via the respiratory tract route, when infectious respiratory droplets which have been expelled into the air and are inhaled by close contacts or if there is direct contact with respiratory secretions. Humans are the only known reservoir for pertussis.

- **Epidemiology:** Peaks are every 3 - 4 years. Vaccination is the most effective way to prevent and limit the size of outbreaks. Neither vaccination nor natural infection provide life long immunity. Immunosenescence, waning immunity, and lack of vaccination contributes to the increase of cases and outbreaks.

- **Incubation Period:** 7 to 10 days (5 – 21 day range)

Complications Associated with Pertussis

Most common cause of associated-death:

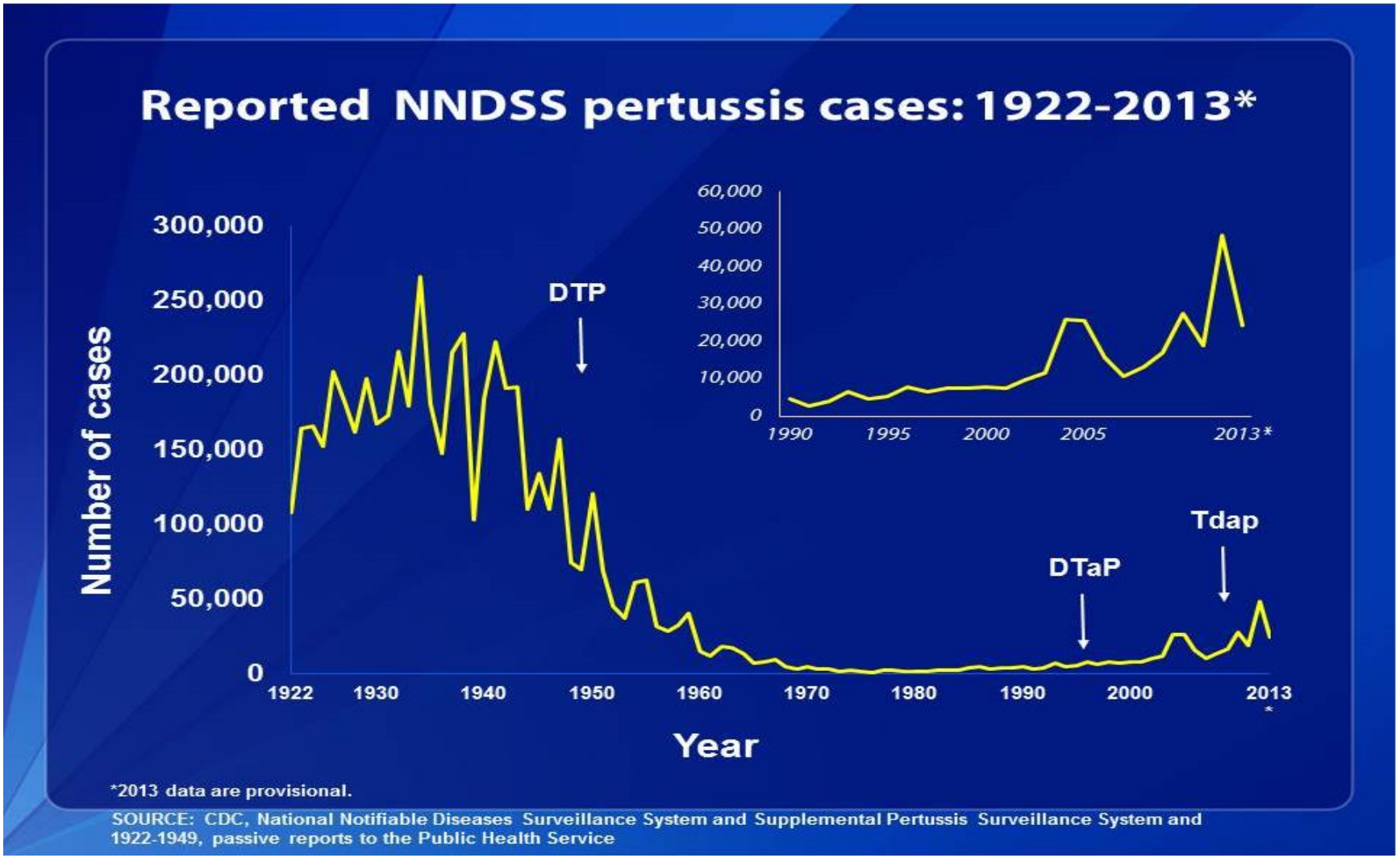
1. Secondary bacterial pneumonia
2. Neurologic complications such as seizures and encephalopathy

Less serious complications:

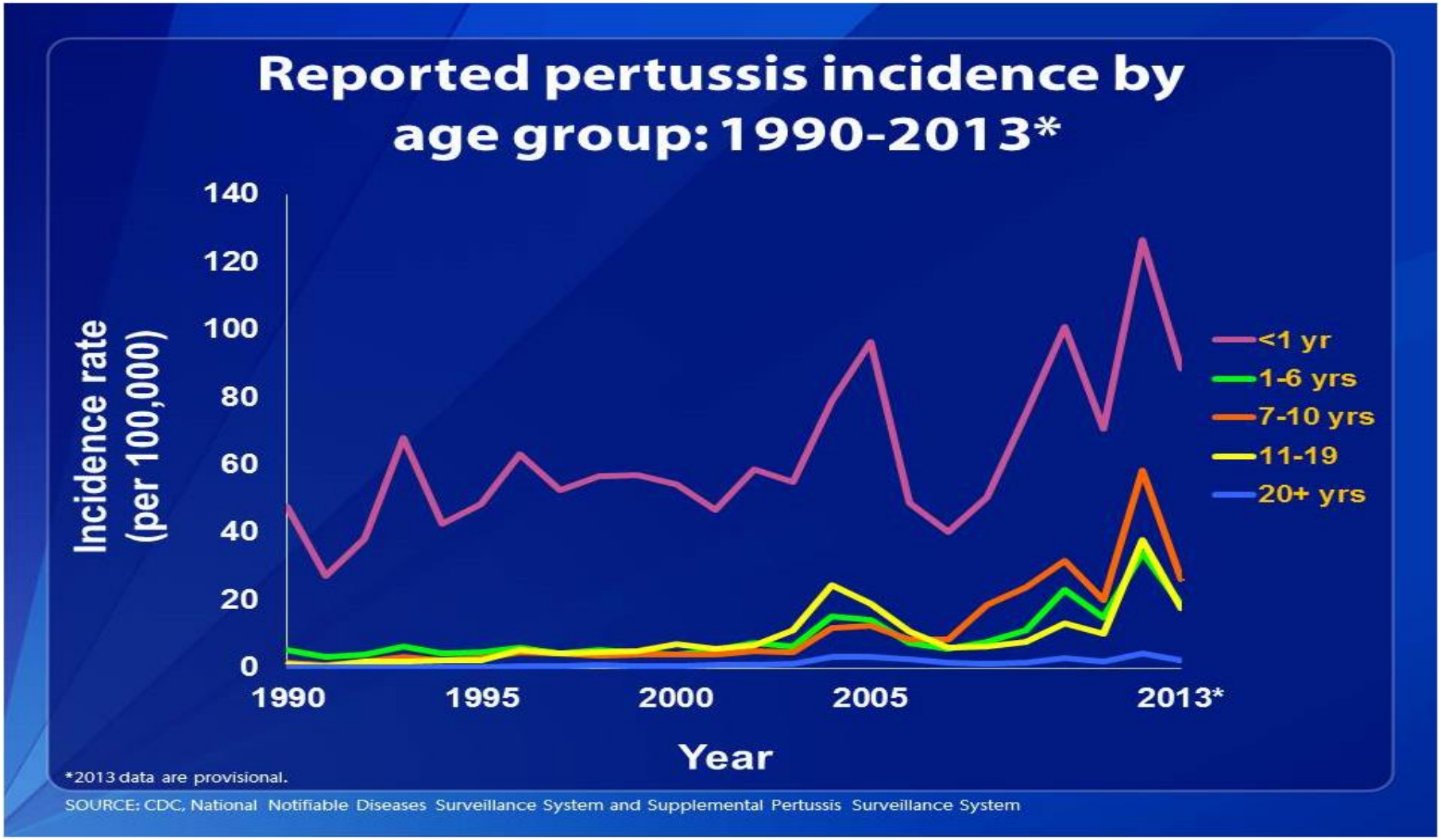
1. Otis media, anorexia, dehydration
2. Pneumothorax, epistaxis, subdural hematomas, hernias, rectal prolapse (pressure associated)

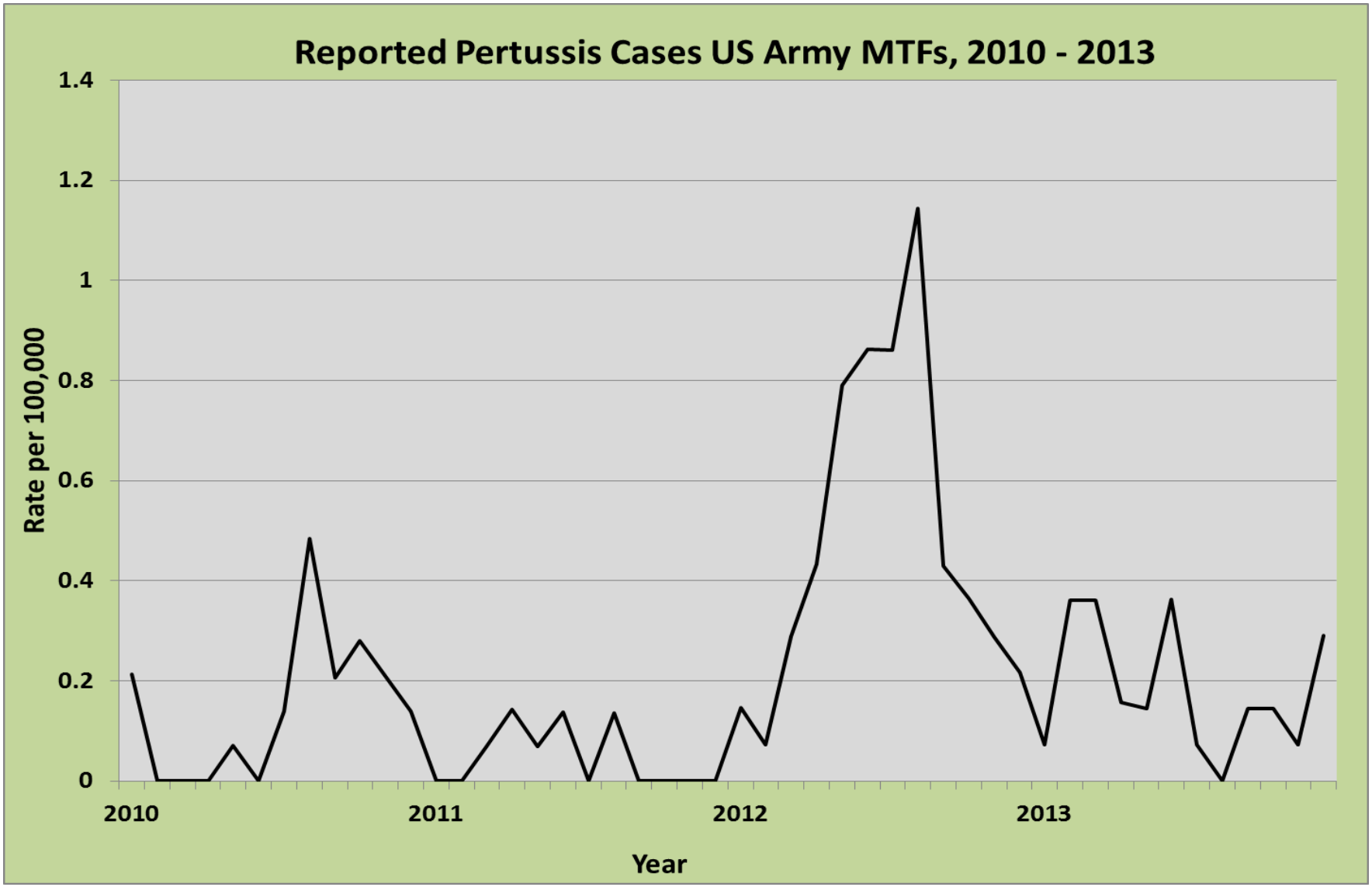
- According to CDC studies:
  - <5% of teens and adults are hospitalized
  - Secondary pneumonia was diagnosed in only 2% of those patients

Number of Reported Cases, United States 1922-2013

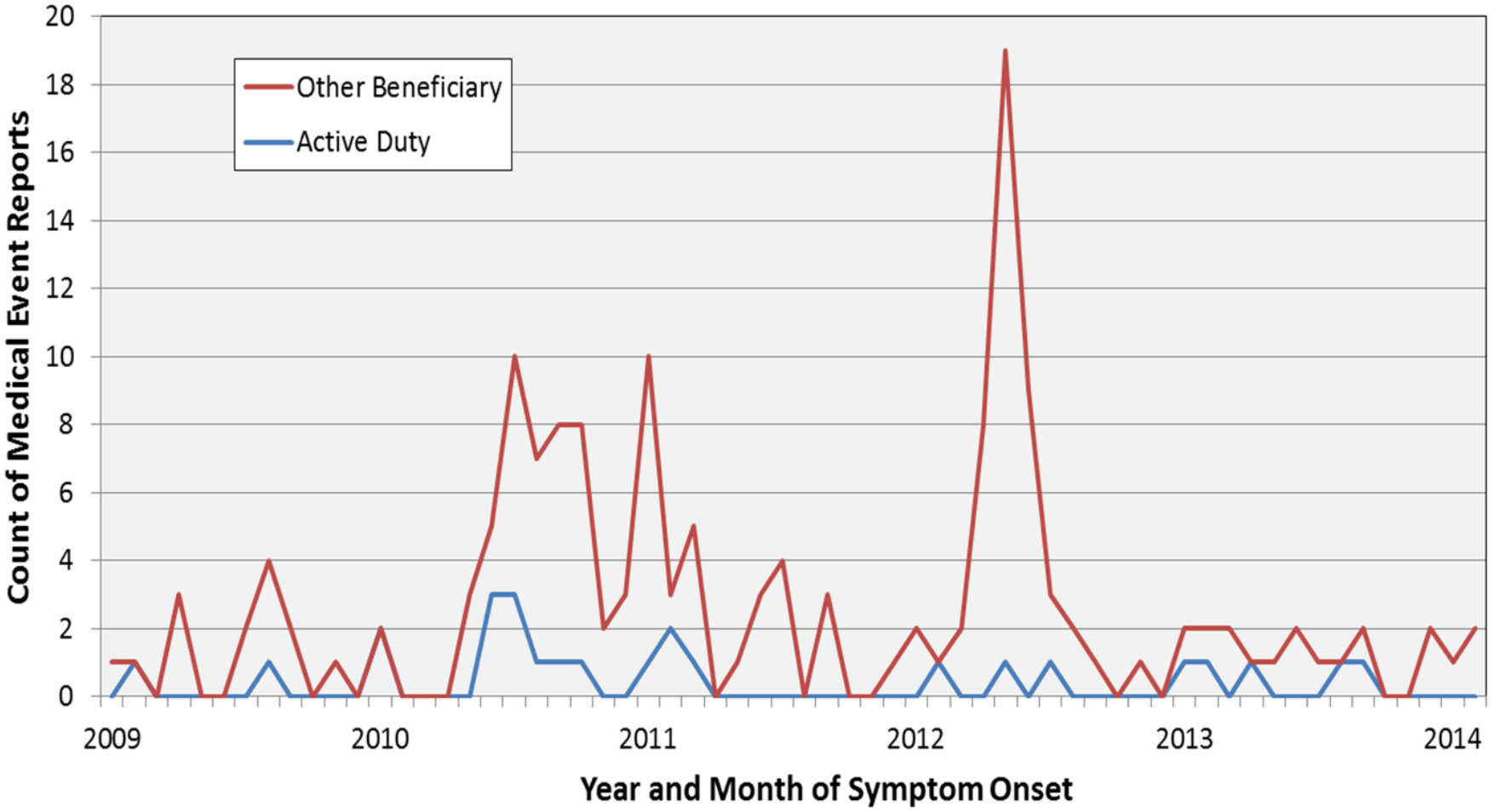


National Incidence Rates

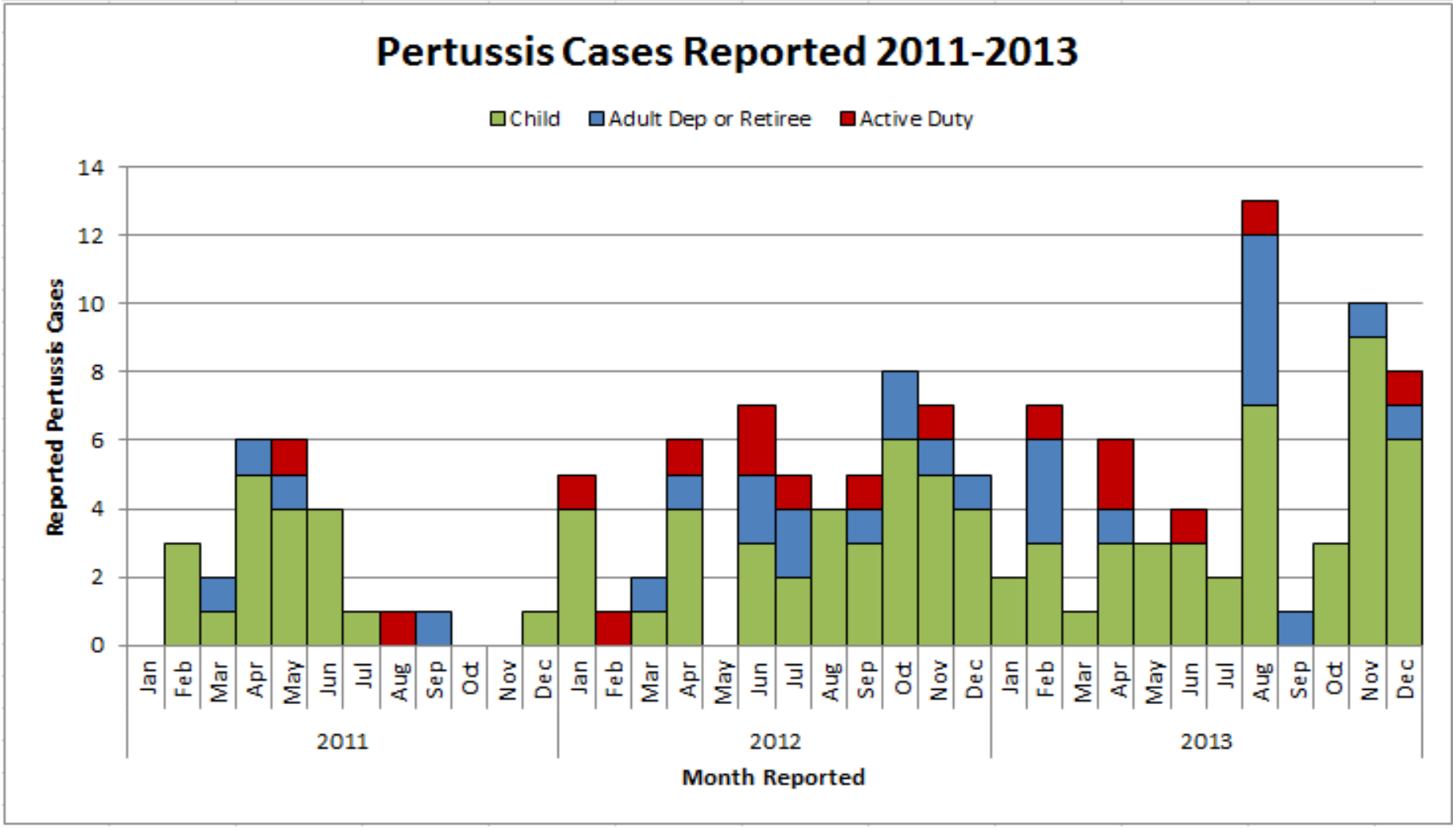



Reported Pertussis Cases US Army MTFs, 2010 - 2013
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Rate per 100,000
2010
2011
2012
2013
Year

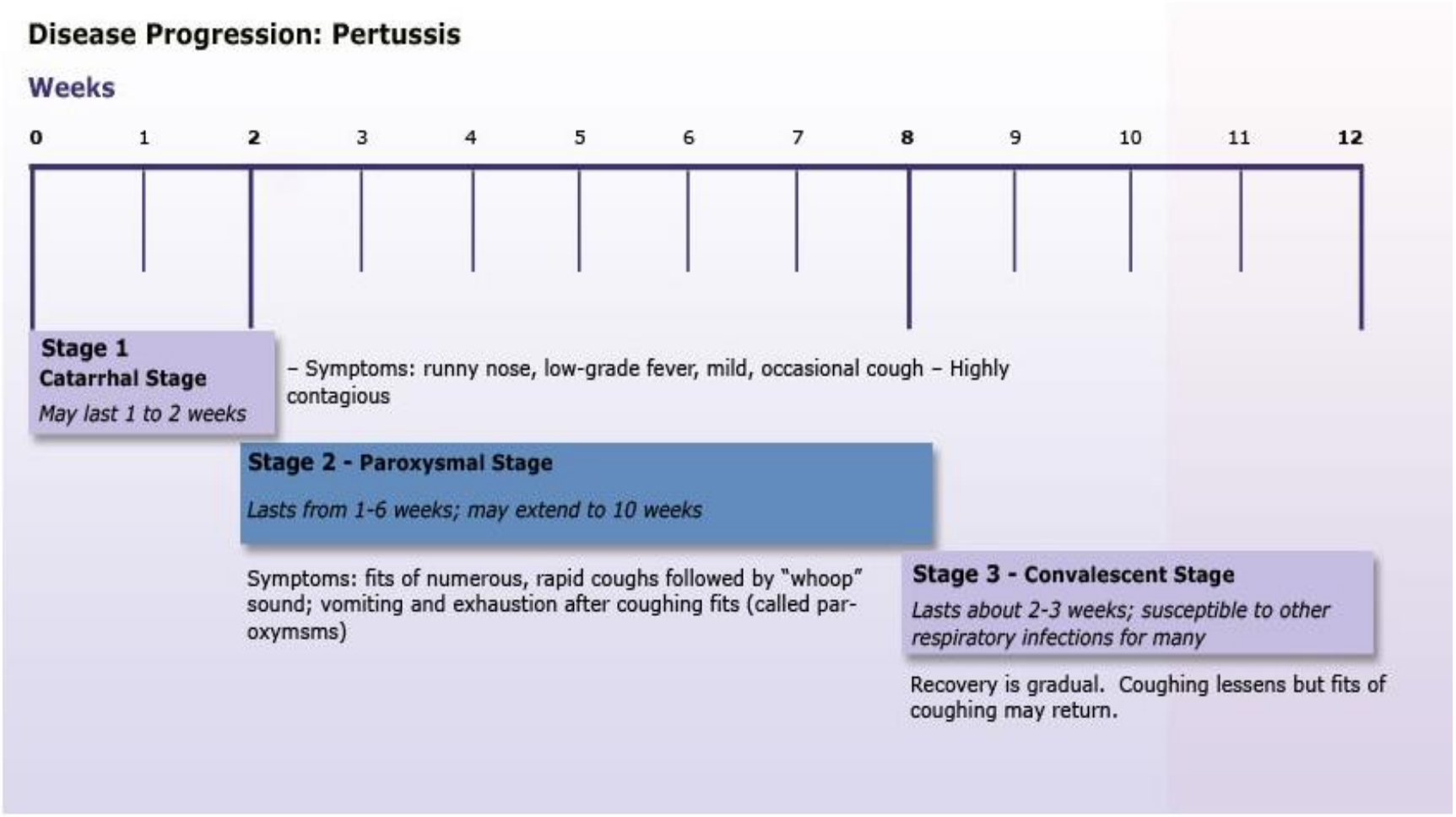
Reported Pertussis Cases in US Navy Military Treatment Facilities by Beneficiary Category and Month, 2009-2014



Reported Medical Events in Annual Pertussis Cases: Air Force



Incubation Period and Disease Progression



Laboratory Criteria & Case Definitions

- **Lab Criteria:** Isolation of *B. pertussis* from a clinical specimen (culture), positive Direct Florescent Antibody (DFA), or PCR.

- **Probable:** In the absence of a more likely diagnosis, a cough illness lasting longer than 2 weeks, with at least one of the following symptoms: paroxysms of coughing, inspiratory “whoop” or post-tussive vomiting AND the absence of lab confirmation and no epidemiological link to a confirmed case.

- **Confirmed:** A case that is laboratory confirmed, or a clinically case that is epi-linked to a confirmed case.

- Notes:
  - Epi-link: known contact of a confirmed or probable case
  - Every pertussis case should be interviewed

Civilian Pertussis Trends (CDC)

- 2012
  - 48,277 cases
  - Rates for infants exceeds all other age groups
  - Second highest is 7 – 10 year olds
  - 18 reported deaths (majority <3 months)
  - 49 states reported increases from 2011 – 2012
  - Cases from 2013 – present are decreasing

➢ Center for Disease Control and Prevention: http://www.cdc.gov/pertussis/outbreaks/trends.html

Outbreak Determination and First Response

- An outbreak is defined as an unusual increase above what is expected. You can export these cases from DRSi

- If you suspect an outbreak:
  - Confirm diagnosis of reported cases
  - Institute surveillance for additional cases (e.g. health departments, ER logs, CHCS ad-hoc searches)
  - Notify your respective Public Health Service Hub (e.g. USAPHC, NMCPHC, USAFSAM) and enter the outbreak in the “Outbreak Module” in DRSi
  - Consider quarantining the ill
  - Consider isolating the exposed

Initiating an Outbreak Investigation

- Identify case
- Collect nasopharyngeal swabs or aspirate for culture and start treatment.
- Identify and recommend chemoprophylaxis to close contacts and high risk contacts
- Implement outbreak control measures appropriate for the setting
- Initiate active surveillance and continue for at least 42 days after cough onset of last case

Example of Pertussis Questionnaire

Pertussis Surveillance Worksheet *Appendix 11*

NAME (Last, First) | Hospital Record No.
Address (Street and No.) | City | County | Zip | Phone
Reporting Physician/Nurse/Hospital/Clinic/LabPhone | Address | Phone

DETACH HERE and transmit only lower portion if sent to CDC

CDC NETSS id | County | State | Zip

Birth Date (Month, Day, Year)

Age (Unk= 999)

Age Type
0 – 0-120 years
1 – 0-11 months
2 – 0-52 weeks
3 – 0-28 days
9 – Age Unknown

Race
N – Native Amer./Alaskan Native
A – Asian/Pacific Islander
B – African American
W – White
O – Other
U – Unknown

Ethnicity
H – Hispanic
N – Not Hispanic
U – Unknown

Sex
M – Male
F – Female
U – Unknown

Event Date (Month, Day, Year)

Event Type
1 – Onset Date
2 – Diagnosis Date
3 – Lab Test Done
4 – Reported to County
5 – Reported to State or MMWR Report Date
9 – Unknown

Outbreak Associated (999 – Unknown)

Reported (Month, Day, Year)

Report Status
1 – Confirmed
2 – Probable
3 – Suspect
9 – Unknown

CLINICAL DATA

Any Cough? Y – Yes, N – No, U – Unknown
Cough Onset (Month, Day, Year)
Paroxysmal Cough? Y – Yes, N – No, U – Unknown
Whoop? Y – Yes, N – No, U – Unknown
Posttussive Vomiting? Y – Yes, N – No, U – Unknown
Apnea? Y – Yes, N – No, U – Unknown
Final Interview Date (Month, Day, Year)
Cough at Final Interview? Y – Yes, N – No, U – Unknown
Duration of Cough at Final Interview (Days) 0–150, 999 – Unknown

COMPLICATIONS

Chest X-ray for Pneumonia P – Positive, N – Negative, X – Not Done, U – Unknown
Seizures Due to Pertussis Y – Yes, N – No, U – Unknown
Acute Encephalopathy Due to Pertussis Y – Yes, N – No, U – Unknown
Hospitalized? Y – Yes, N – No, U – Unknown
Days Hospitalized? 0-998, 999 – Unknown
Died? Y – Yes, N – No, U – Unknown

TREATMENT

Were Antibiotics Given? Y – Yes, N – No, U – Unknown
1 – Erythromycin (incl. pediazole, ilosone)
2 – Cotrimoxazole (bactrim/septra)
3 – Clarithromycin/azithromycin
4 – Tetracycline/Doxycycline
5 – Amoxicillin/Penicillin/Ampicillin/Augmentin/Ceclor/Cefixime
8 – Other
9 – Unknown

Date Started First Antibiotic (Month, Day, Year)
Days First Antibiotic Actually Taken 0-998, 999 – Unknown
Second Antibiotic Received See Choices for First Antibiotic Given
Date Started Second Antibiotic (Month, Day, Year)
Days Second Antibiotic Actually Taken 0-998, 999 – Unknown

LABORATORY

Was Laboratory Testing for Pertussis Done? Y – Yes, N – No, U – Unknown

Test	Result	Date Specimen Taken (Month / Day / Year)
Culture		
DFA		
Serology 1		
Serology 2		
PCR		

RESULT CODES
P = Positive, N = Negative, E = Pending, I = Indeterminate, X = Not Done, S = Parapertussis, U = Unknown

VACCINE HISTORY

Vaccinated? (Received any doses of diphtheria, tetanus, and/or pertussis containing vaccines) Y – Yes, N – No, U – Unknown

Vaccination Date (Month / Day / Year)	Vaccine Type*	Vaccine Manuf*	Lot Number

Vaccine Type Codes
W = DTP Whole Cell
A = DTaP
H = DTaP-Hib
D = DT or Td
T = DTP-Hib
P = Pertussis Only
X = Tdap
Y = DTaP-IPV-Hep B
N = DTaP-IPV-Hib
K = DTaP-IPV
O = Other
U = Unknown

Vaccine Manufacturer Codes
C = Sanofi Pasteur
L = Wyeth
S = GlaxoSmithKline
M = Massachusetts Health Department
I = Michigan Health Department
N = North American Vaccine
O = Other
U = Unknown

*Record for each dose

Date of Last Pertussis-Containing Vaccine Prior to Illness Onset (Month, Day, Year)
Number of Doses of Pertussis-Containing Vaccine Prior to Illness Onset 0-6, 9 – Unknown

Reason Not Vaccinated With ≥ 3 Doses of Pertussis Vaccine
1 = Religious Exemption
2 = Medical Contraindication
3 = Philosophical Exemption
4 = Previous Pertussis Confirmed by Culture or MD
5 = Parental Refusal
6 = Age Less Than 7 Months
7 = Other
9 = Unknown

EPIDEMIOLOGIC INFORMATION

Date First Reported to a Health Department (Month, Day, Year)
Date Case Investigation Started (Month, Day, Year)
Outbreak Related? Y – Yes, N – No, U – Unknown
Epi-Linked? Y – Yes, N – No, U – Unknown
Outbreak Name (Name of outbreak this case is associated with)

If patient <12 months old:
What was the mother's age at infant's birth:
What was the weight of the infant at birth:
lb oz OR kg g

Transmission Setting (Where did this patient acquire pertussis)?
1 = Day Care
2 = School
3 = Doctor's Office
4 = Hospital Ward
5 = Hospital ER
6 = Hosp. Outpatient Clinic
7 = Home
8 = Work
9 = Unknown
10 = College
11 = Military
12 = Correctional Facility
13 = Church
14 = International Travel
15 = Other

Setting (Outside Household) of Further Documented spread From This Case
Use same codes as for Transmission Settings, except:
7 – >1 Setting Outside Household
16 – No Documented Spread Outside Household

Number of Contacts in Any Setting Recommended Antibiotics 0-998, 999 – Unknown

CS116643 11/06

Contact Investigation

- All household members, other close contacts, and high risk contacts should be interviewed.
  - Close Contact is defined as: direct face-to-face contact with a symptomatic case, or a shared confined space that is in close proximity for a prolonged period of time.
  - High Risk Contact is defined as: infants < than 1 years old, patients with a lung disease, cystic fibrosis or are immune compromised, pregnant women, healthcare workers, or childcare personnel.

Initiate Active Surveillance

- Confirm diagnoses
- Case contact investigation
- Who to notify: every close contact of a pertussis case
- Initiate an ICD9 ad-hoc search in CHCS
- Reaffirm suspected increases in clinic entry logs
- Contact investigation form: http://www.cdc.gov/vaccines/pubs/surv-manual/appx/appendix11-2-pertussis-wrsht.pdf

Case Contact Tracing

Pertussis Investigation Worksheet - Contacts By Location

Name of Primary Case: _____ Nickname / Alias: _____

Case Number: _____ Interviewer Name: _____

Location of exposure:

Number	Date of Initial Interview / Date of Follow-up	Name (Last, First)	Birthdate or Age	Gender	Location / Address / Phone / Occupation / School	Date First Exposure / Date Final Exposure	Hihg Risk Contact	Coughing	DTaP/Tdap up-to-date	Provider Information (For Medical Assessment Referrals)	Results of Collected Laboratory Specimen	Antibiotic Prophylaxis	Restrictions or Exclusions
1							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:
2							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:
3							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:
4							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:
5							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:
6							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:
7							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:
8							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:
9							YES – NO	YES – NO	YES – NO		Not Collected Positive Negative	Type: Started: Completed:	Date ends:

Treatment vs Prophylaxis

- Who gets treated?
  - Persons with symptoms compatible with pertussis
  - Acute cough AND an exposure to case
  - Acute cough AND PCR positive
  - Contact with a culture positive case

- Who gets prophylaxis?
  - All close contacts to case (especially in high risk settings e.g. hospitals, households with infants)
  - Persons > 1 year within 3 weeks of exposure
  - Additional contacts may be warranted depending on setting

Post-exposure Antimicrobial Prophylaxis

- According to the CDC: only persons at a high risk of developing severe pertussis and persons with close contact with those at high risk of developing severe pertussis.
  - All household contacts
  - Twenty-one days of exposure to an infectious pertussis case who are at high risk of severe illness or have contact with the following persons.
    a. Infants and women in third trimester
    b. Persons with preexisting health conditions (e.g. severe asthma)
    c. Contacts of close contacts (e.g. daycare workers)
    d. All contacts in high risk settings (e.g. maternity nurses)

School-Associated Pertussis Outbreak – Yavapai County, AZ, Sep 2002 – Feb 2003

- On 21 Sep a 13 yr. old child was culture confirmed with *B. pertussis.* The child attended school during the illness.
- On 22 Sep a second culture-case was reported from the same classroom was reported.
- An investigation was implemented and 5 additional cases were identified (two in the same classroom, two 8th graders, and one parent of an ill student).
- In comparison, during the previous 10 years, an average of four pertussis cases were reported annually from this county.

Control Measures are Implemented

- Public health officials implemented an aggressive control strategy:
  1. Exclusion of any coughing student or staff member from school through the fifth day of treatment
  2. Letters were given to inform parents to notify their providers
  3. Contact YCHD for specimen collection
  4. To stay home and away from others (especially infants, young children, and pregnant women)
  5. Specimens were forwarded to the state for analysis
  6. The state forwarded the specimens to the CDC for PFGE profiling (gene analysis for an insertion element and toxin subunit)

Accelerated Immunizations Initiated

- 24 Oct the county and state recommended the following:
  - Recommendations were made for an accelerated pertussis vaccination (DTaP) schedule for infants (2, 4, 6 weeks).
  - Other vaccinations recommended according to the childhood immunization schedule also were administered schedule.

Results

- Total cases (n = 485) from six communities with a population of 83,550.
  - 218 confirmed (16 by isolation, 202 by epi-link)
  - 267 probable cases
  - 203 were associated with schools
  - 113 students (56%)
    - 8 staff (4%)
    - 82 family members (40%)
    - Highest AR (10%) was the 8th grade middle school (n=198)
    - No infants were hospitalized
  - The outbreak peaked in mid-October and lasted 6 months, last culture positive result was 10 Jan

Laboratory Findings

- 1,047 nasopharyngeal swabs were sent to the state and 569 were sent to the CDC
- 11 (2%) were PCR positive 462 (81%) were negative and 96 could not be tested
- All specimens were profiled genetically by PFGE
  - Profile 10 (63%); epi-linked from middle and high school
  - Profile 160 (25%)
  - Profile 13 (6%)
  - Profile 55 (6%)

➢ Center for Disease Control and Prevention: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5310a4.htm

Summary

- Pertussis is an endemic disease in the US, with peaks every 3-5 yrs. with frequent outbreaks reported
- The highlights are to recognize the clinical signs and symptoms to adequately implement control measures when needed.
- Although outbreaks are difficult to identify and manage, the purpose is to reduce the risk of the extent an outbreak has on a population.
- Active screening for symptomatic patients should be considered during an outbreak setting, especially in schools, daycares, and hospitals etc.
- Encourages timely vaccination, medical evaluations, and treatment.

Available Resources

- **Treatment information**: http://www.cdc.gov/pertussis/clinical/treatment.html
- **Diagnostic testing**: http://www.cdc.gov/pertussis/clinical/diagnostic-testing/index.html
- **Fact Sheet**: http://www.cdc.gov/pertussis/fast-facts.html
- **Clinical complicati**ons: http://www.cdc.gov/pertussis/clinical/complications.html
- **For general information about pertussi**s: http://www.cdc.gov/vaccines/pubs/surv-manual/chpt10-pertussis.html
- **Investigation form**: http://www.cdc.gov/vaccines/pubs/surv-manual/appx/appendix11-2-pertussis-wrsht.pdf

Contact Information

- **Army: USAPHC – Disease Epidemiology Program**

  Aberdeen Proving Ground – MD

  Comm: (410) 436-7605 DSN: 584-7605

  usaphc.disease.epidemiology@us.army.mil

- **Navy: Contact your cognizant NEPMU**

  NEPMU2: COMM: (757) 950-6600; DSN: (312) 377-6600

  Email: NEPMU2NorfolkThreatAssessment@med.navy.mil

  NEPMU5: COMM: (619) 556-7070; DSN (312) 526-7070

  Email: ThreatAssessment@med.navy.mil

  NEPMU6: COMM: (808) 471-0237; DSN: (315) 471-0237

  Email: NEPMU6ThreatAssessment@med.navy.mil

- **Air Force: Contact your MAJCOM PH or USAFSAM/PHR**

  USAFSAM / PHR / Epidemiology Consult Service

  Wright-Patterson AFB, Ohio

  Comm: (937) 938-3207 DSN: 798-3207

  episervices@wpafb.af.mil

Questions?