Update on Recent Outbreaks Pertussis and Measles United States and FSM, 2014

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Program Manager’s Meeting
July 11, 2014
U.S. Pertussis Update, 2014

- Reported pertussis increasing across the country

- California declared a statewide pertussis epidemic in June

- As of July 4, 2013:
  - 27 states have reported increases in pertussis compared with 2013
  - Largest increases seen in Ohio, Idaho, Wyoming, Oklahoma, Rhode Island, South Dakota, Colorado, California, and Delaware
  - 5 pertussis-related deaths reported through NNDSS; 3 additional deaths occurred in California (2 were patients with pertussis onset in 2013)
Pertussis Incidence by State, 2014*

2014 incidence = 3.82
(n=11,999)

*2014 data are preliminary and reflect data submitted to NNDSS through July 4, 2014.
Source: CDC National Notifiable Disease Surveillance System, 2014
2012 Census projections used for population estimates; Incidence is per 100,000 population
Figure 2. Pertussis cases by month of onset -- California, 2009-2014*

*Reported to CDPH as of 7/8/2014

Graph obtained from the California Department of Public Health, July 8, 2014.
Pertussis cases by age — United States, 2014*

n = 11,999

*2014 data are preliminary and represent cases reported to NNDSS through July 4, 2014.
Source: CDC National Notifiable Disease Surveillance System, 2014
DTaP effectiveness (California, 2010\textsuperscript{1}) and Tdap effectiveness (Washington, 2012\textsuperscript{2}) by time since last dose\textsuperscript{*}

\textsuperscript{*}Accounting for clustering by county and provider

\textsuperscript{1}JAMA. 2012;308:2126-2132.

\textsuperscript{2}CDC, unpublished data.
Pertussis Vaccination Recommendations

- Despite waning immunity, pertussis vaccines continue to be our best tool for preventing disease

- All infants and children should complete the ACIP-recommended 5-dose series of DTaP according to schedule

- Adolescents and adults should receive one dose of Tdap according to ACIP recommendations

- Pregnant women should receive a single dose of Tdap during the third trimester of every pregnancy
High DTaP coverage among children and increasing Tdap coverage among adolescents* but adult Tdap coverage** remains low.

*CDC National Immunization Survey: DTaP among children aged 19 through 35 months, Tdap coverage among adolescents aged 13 through 17 years. Coverage among adults aged 19 through 64 years from National Health Information Survey.
Web Resources

- Provider Resources for Vaccine Conversations with Parents
  - [www.cdc.gov/vaccines/conversations](www.cdc.gov/vaccines/conversations)
  - Materials created by CDC, AAP, and AAFP

- CDC Pertussis Website
  - [www.cdc.gov/pertussis/](www.cdc.gov/pertussis/)
Pregnancy and Whooping Cough

Get Vaccinated Against Whooping Cough While Pregnant

Pregnant women should get a whooping cough vaccine since vaccines are the best way to prevent this disease. There are 2 different whooping cough vaccines. Both vaccines combine protection against whooping cough, tetanus, and diphtheria, but they are for different age groups:

- **Tdap**: for everyone 11 years and older, including pregnant women
- **DTaP**: for children 2 months through 6 years of age

Whooping cough vaccine is recommended during each of your pregnancies

The Centers for Disease Control and Prevention (CDC) now recommends that pregnant women receive the whooping cough vaccine for adolescents and adults (called Tdap vaccine) during each pregnancy. This replaces the original recommendation that pregnant women get the vaccine only if they had not previously received it.

You should get the whooping cough vaccine while pregnant to pass protection to your baby

After receiving a whooping cough vaccine, your body will create protective antibodies (proteins produced by the body to fight off diseases) and pass some of them to your baby before birth through the placenta and breast milk. Early, short-term protection is critical. Your baby will not get
Measles
Measles Annual Disease Burden U.S. Decade Prior to Vaccine (1950s)

- 3-4 million estimated and ~ 500,000 reported cases
- 48,000 hospitalizations
- 4,000 encephalitis cases
- 450-500 deaths
Measles Cases, United States, 1962-2014*

*2014 case count preliminary as of July 3
Measles Elimination* in the U.S.

• Declared in 2000 and achieved due to:
  – High two-dose vaccine coverage
  – High quality measles surveillance and response
  – Improved measles control in the World Health Organization Region of the Americas

• Elimination does not mean “gone forever” - imported cases and limited spread occur every year

* Defined as interruption of continuous measles transmission for lasting > 12 months
Reported Measles Incidence
United States, 1992-2014*

*2014 case count preliminary as of July 3
Measles, United States, 1994 - 2014*
(Importations indicated by red bar, available since 2001)

*2014 case count preliminary as of July 3
Measles, United States, 2001-2014*
Importations by WHO Region

*2014 case count preliminary as of June 20

- Unknown
- Western Pacific (WPR)
- South East Asian (SEAR)
- European (EUR)
- Eastern Mediterranean (EMR)
- African (AFR)
- American (AMR)
Measles Case Distribution by Month and WHO Regions, 2008-2014

This is surveillance data, hence for the last month, the data may be incomplete.
SEAR India is not included in this graph.
As of 27 May 2013, South Sudan has reassigned to the Africa region (AFR) from the Eastern Mediterranean region (EMR).

Data source: surveillance DEF file
Data in HQ as of 7 July 2014
Global transmission patterns of measles viruses from the Philippines, 2014
Measles outbreaks in the Federated States of Micronesia

- **Kosrae**
  - 138 cases Feb – June
  - 4 months – 61 yrs (25 yrs median)
  - 68% vaccinated, most 2 doses

- **Pohnpei**
  - 119 cases to 7/3/14, 2 mon – 56 years (22 years median)
  - 58% vaccinated with at least 1 dose
  - One death in 21 month old unvaccinated child

- **Highest incidence infants < 12 months**

- **Vaccination campaigns targeting wide age range**
Measles, United States, Jan – June 20, 2014
Source of Importations (N=48)

<table>
<thead>
<tr>
<th>WHO Region</th>
<th># of cases</th>
<th>Countries of travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>African</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>1</td>
<td>Pakistan</td>
</tr>
<tr>
<td>European</td>
<td>5</td>
<td>Dubai/Germany/London (1), Republic of Georgia (1), Netherlands (1), France/Belgium</td>
</tr>
<tr>
<td>Americas</td>
<td>3</td>
<td>Brazil (1), Canada (1), Chile (1)</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>8</td>
<td>India (6), Indonesia (1), Thailand/South Korea (1)</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>31</td>
<td>China (3), Philippines (23), Singapore (1), Saipan (1), Vietnam (1), SE Asia/Philippines (1), FSM (1)</td>
</tr>
</tbody>
</table>

*Reflects travel patterns to and from the US for residents and visitors as well as measles activity at regional and country level*
Measles, U.S., 1997-2014*
Cumulative Number by Month of Rash Onset

*As of July 3, 2014
Measles U.S. 2014*

- 554 cases reported from 20 states including 17 outbreaks
  - 48 importations
    - 23 from the Philippines
    - 43 (90%) US residents
  - 98% cases import-associated
  - 57 cases (10%) hospitalized

- Cases in US residents (N=532)
  - 82% unvaccinated
  - 11% unknown vaccination status (most are adults)
  - 7% vaccinated

  - Among unvaccinated
    - 90% were personal belief exemptors
    - 2% travelers age 6 months to 4 years
    - 4% were too young to be vaccinated
    - 4% unknown/misc

* Provisional reports to CDC through July 2, 2014
2014 Measles Outbreak, Ohio, Confirmed Cases by Date of Rash Onset, N=368

Data as of 7/02/2014
Source: Ohio Disease Reporting System
Measles Outbreak In Ohio Leads Amish To Reconsider Vaccines

by SARAH JANE TRIBBLE
June 24, 2014  3:31 AM ET
Measles Outbreaks with 20 or more Cases, United States, 2001-2014*

<table>
<thead>
<tr>
<th>Year</th>
<th>Outbreak Name</th>
<th>State</th>
<th>Cases #</th>
<th>Import Status</th>
<th>Genotype</th>
<th>Setting</th>
<th>1st &amp; last rash onsets</th>
<th>Duration</th>
<th>Median Age</th>
<th>Age Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>Brooklyn</td>
<td>NYC</td>
<td>58</td>
<td>Imported (UK)</td>
<td>D8</td>
<td>Household/Community</td>
<td>3/13/2013 – 6/9/2013</td>
<td>13 weeks</td>
<td>10 y (early)</td>
<td>0 mos – 32 y</td>
</tr>
<tr>
<td>2005</td>
<td>Tippecanoe County</td>
<td>IN</td>
<td>34</td>
<td>Imported (Romania)</td>
<td>D4</td>
<td>Church/household</td>
<td>5/16/2005 – 6/24/2005</td>
<td>6 weeks</td>
<td>12 y</td>
<td>9 mo - 49 y</td>
</tr>
<tr>
<td>2013</td>
<td>Stokes/Orange County</td>
<td>NC</td>
<td>23</td>
<td>Imported (India)</td>
<td>D8</td>
<td>Community</td>
<td>4/5/2013 – 5/7/2013</td>
<td>5 weeks</td>
<td>14 y</td>
<td>12 mo - 59 y</td>
</tr>
<tr>
<td>2013</td>
<td>Tarrant/Denton County</td>
<td>TX</td>
<td>21</td>
<td>Imported (Indonesia)</td>
<td>D9</td>
<td>Church</td>
<td>7/21/2013 – 8/21/2013</td>
<td>5 weeks</td>
<td>11 y</td>
<td>4 mos – 44 y</td>
</tr>
<tr>
<td>2011</td>
<td>Hennepin County</td>
<td>MN</td>
<td>21</td>
<td>Imported (Kenya)</td>
<td>B3</td>
<td>Shelter</td>
<td>2/15/2011 – 4/24/2011</td>
<td>10 weeks</td>
<td>23 m</td>
<td>3 mo - 51 y</td>
</tr>
<tr>
<td>2008</td>
<td>Brooklyn/Kings County</td>
<td>NYC</td>
<td>21</td>
<td>Imported (Israel, Belgium)</td>
<td>D4</td>
<td>Community</td>
<td>2/17/2008 – 4/25/2008</td>
<td>10 weeks</td>
<td>15 m</td>
<td>5 mo - 11 y</td>
</tr>
<tr>
<td>2014</td>
<td>Manhattan</td>
<td>NYC</td>
<td>20</td>
<td>Imported-virus</td>
<td>B3</td>
<td>Community</td>
<td>2/16/2014 – 3/24/2014</td>
<td>5 weeks</td>
<td>23 y</td>
<td>3 mo – 36 y</td>
</tr>
</tbody>
</table>

*as of July 3
Keys to Measles Prevention Diagnosis, & Response

- **Vaccine**
  - Vaccine coverage to maintain high population immunity
  - Routine and travel recommendations

- **Measles diagnosis**
  - Clinical history and examination
  - Specimen collection and lab testing

- **Case and outbreak Response**
  - Reporting
  - Contact Investigation
  - Presumptive evidence of immunity
  - Isolation and Quarantine
  - Vaccine and immune globulin
MMR Vaccination Coverage

NIS data available at http://www.cdc.gov/vaccines/imz-managers/coverage/imz-coverage.html
Measles In the Postelimination Era

- Measles is due to **Failure to Vaccinate**
  - Communities with unvaccinated persons are at risk

- Measles Elimination is a Global Problem
  - Continued threat of importations and risk of outbreaks

- Measles occurs in the U.S.

- Maintenance of Elimination is Resource Intensive
  - Maintaining vaccine coverage
  - Intensive case/contact investigations
  - Healthcare workers diagnostic skills
  - Advanced laboratory techniques
Resources for Public Health & Healthcare Professionals

- Manual for Surveillance VPDs – measles chapter and ACIP 2013 MMR statement
- Guidance lab testing, other

- Clinical information on measles and MMR vaccine
- Weekly reported measles and outbreak data
- Webinars, netconferences
- CDC Fact Sheets and Resources
  - Fact sheets on measles and vaccine safety to guide discussions with patients and parents

- Images and children with Measles Video
Resources for the Public

- Measles Website
  - Disease Information
  - Vaccination Information and Recs
  - Travel Recommendations
  - Outbreak Statistics
  - http://www.cdc.gov/measles

- Infographics, Videos, & Podcasts

- Measles Feature
  - http://www.cdc.gov/features/measles/

- Put CDC’s Measles Content for the Public on Your Website

- Resources in Spanish
Acknowledgements

- State and local health departments
- Federated States of Micronesia Department of Health and Social Affairs
- Kosrae and Pohnpei Department of Health Services

- CDC staff:
  - NCIRD: Division of Viral Diseases, Division of Bacterial Diseases and Office of Communications
  - CGH: Global Immunization Division
Thank You

Questions?
Extra Slides
Measles outbreak response has a high economic burden in the U.S.

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Number of cases (outbreaks)</th>
<th>Estimated public health cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>US</td>
<td>107 (16)</td>
<td>$2.7-5.3M</td>
</tr>
<tr>
<td>2011</td>
<td>Utah</td>
<td>13 (2)</td>
<td>&gt;$330,000</td>
</tr>
<tr>
<td>2008</td>
<td>California</td>
<td>12 (1)</td>
<td>$125,000</td>
</tr>
<tr>
<td>2008</td>
<td>Arizona</td>
<td>14 (1)</td>
<td>$800,000 (limited to cost for 2 hospitals to respond to 7 cases in their facilities)</td>
</tr>
<tr>
<td>2005</td>
<td>Indiana</td>
<td>34 (1)</td>
<td>$168,000</td>
</tr>
<tr>
<td>2004</td>
<td>Iowa</td>
<td>1</td>
<td>$142,000</td>
</tr>
</tbody>
</table>

*Public health and health care costs expended to control the spread of measles
MMR Vaccine Routine Recommendations*

- **Children and adolescents**
  - Two doses at 12-15 months and 4-6 years or at least 28 days after the first dose
  - Catch up vaccination as needed

- **Adults without evidence of measles immunity**
  - Two doses (healthcare personnel, post high school students, travelers)
  - One dose (others)

*ACIP, AAP/COID, AAFP, ACOG, ACP, ACNM available at [http://www.cdc.gov/vaccines/schedules/hcp/adult.html](http://www.cdc.gov/vaccines/schedules/hcp/adult.html)
Persons aged ≥12 months without other evidence of immunity should receive 2 doses*

- Includes providing a 2nd dose to children prior to age 4-6 yrs
- Includes adults** who have only received one routine dose in the past

Children aged 6-11 months should receive 1 dose

- If vaccinated at age 6-11 months, still need 2 subsequent doses at age ≥12 months

* 2nd dose of MMR vaccine should be administered at least 28 days after the 1st dose
** Born in 1957 or later
# Measles Complications

More common in children < 5 years and adults

<table>
<thead>
<tr>
<th>Complication</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>8%</td>
</tr>
<tr>
<td>Otitis media</td>
<td>7-9%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1-6%</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>1 per 1,000 cases</td>
</tr>
<tr>
<td>Death</td>
<td>1 -3 per 1,000 cases</td>
</tr>
<tr>
<td>Subacute Sclerosing Panencephalitis (SSPE)</td>
<td>1 per 100,000 cases 7-10 years after measles</td>
</tr>
</tbody>
</table>
Measles and MMR Vaccines

- **Live, viral vaccines**
  - Measles vaccine licensed in 1963
  - Combination MMR vaccine licensed in 1971
    - Only MMR vaccine is available now in the US

- **Excellent safety profile with 50+ years use**
  - Low risk of febrile seizures in children 12-23 months (1 in 3,000 doses)
  - Temporary pain/stiffness in joints, mostly in teenage or adult women
  - Temporary low platelet count – ITP (~ 1 out of 30,000 doses)

- **Vaccine Effectiveness**
  - 1-dose: ~93%
  - 2-dose: ~97%
Measles Outbreak, Quebec, Canada 2011 (n=725)

Summary of Measles Elimination in the U.S.

- **Declared in the U.S. in 2000**
  - Pan American Health Organization (PAHO) documenting for the Americas

- **Huge Public Health Achievement**

- **Brings New Challenges**
  - Case investigations very resource intensive
  - Continued global threat
  - Highly contagious
  - Clustering, accumulation, and aging of susceptibles
Keys to Maintaining Elimination in the U.S.

- **High 2-dose MMR vaccine coverage**
  - Clustering, accumulation of vaccine exemptors & potential for outbreaks

- **High quality surveillance**
  - Rapid identification of and response to measles cases
  - Reportable within 24 hours per Council of State and Territorial Epidemiologists (CSTE) guidelines

- **Aggressive outbreak control measures**

- **Information sharing tools (Epi-X, HAN)**
Measles Outbreak, France, 2008-2011 (n>20,000)

Measles, United States, 2001-2014*
Age Specific Incidence

*2014 case count preliminary as of May 16
Reported Measles Cases by Month of Rash Onset 
Philippines, 2009–2014

*as of March 15, 2014
Source: National Epidemiology Center
Measles Seroprevalance 1999-2004 by Birth Cohort, U.S

Herd immunity threshold

Seropositive (%) vs Year of Birth

McQuillan GM et al. _JID_ 2007
Vaccine Exemption or Refusal

- < 1% children 19-35 months have not received any vaccines (NIS data 2012)
- Exemption is measured with respect to school vaccine requirements
- Refuse ≥ 1 required vaccine
- In 2012, < 0.1% in Mississippi to 7% in Alaska in Kindergarten
- Evidence of increase in vaccine refusal

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6133a2.htm
http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6236a1.htm?_s_cid=mm6236a1_e

Omer SB et al NEJM 2009
Nonmedical Exemptions for U.S. States With Religious Exemptions and With Personal Belief Exemptions - 1991 – 2007*

States that permit only religious exemptions (N=27)

States that permit personal belief exemptions (N=21)

All states allow medical exemptions

Omer et al., JAMA, 2006

*Updated data courtesy of S Omer
Measles Seroprevalence U.S., 1999-2004

95.9% among persons 6-49 years

McQuillan GM et al_JID 2007