Measles Elimination: Successes and Challenges in Alaska

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Measles in the News: Disneyland Outbreak

- Dec 28, 2014 to April 17, 2015
- 147 people from 7 states
- The outbreak likely started from an overseas traveler who visited the park while infectious.
- The measles virus type (B3) is identical to the type that caused the large outbreak in the Philippines.

CDC Health Advisory Jan 23, 2015 http://content.govdelivery.com/accounts/USCDC/bulletins/ebe440
Measles Is . . .

- Measles is one of the most contagious infectious diseases.
- 90% of exposed people will get measles.
- Measles causes a rash, fever, pneumonia, and diarrhea.
- Measles can leave children blind, deaf, and brain-damaged.

Photo source: AAP Red Book Online Visual Library
Impact of Measles Vaccination in U.S.

Before measles vaccine:
- 3-4 million cases of measles
- 48,000 measles hospitalizations
- 1,000 cases of permanent brain damage from measles encephalitis
- 500 reported deaths from measles

2000: Measles eliminated in U.S.

After measles vaccine:
- Cases dramatically decrease
- After 2 dose recommendation and school laws, measles eliminated in U.S.
- Between 2000 and 2013, approximately 100 U.S. cases/year continue to occur because of travelers from other countries

1963: Measles vaccine introduced
Rise in U.S. Measles Cases, 2014-15

Measles Cases and Outbreaks
January 1 to April 17, 2015*

162 Cases

4 Outbreaks
representing 90% of reported cases this year

U.S. Measles Cases by Year

*Provisional data reported to CDC’s National Center for Immunization and Respiratory Diseases

http://www.cdc.gov/measles/cases-outbreaks.html
Before Vaccination: Infant Deaths in Alaska

- In 1960-62, 5.6% of Alaska Native children in Southwest Alaska died between their 1 month and 12 month birthdays.
- Nearly half of these deaths were caused by measles or pertussis.

Lum et al, Public Health Rep 1986;101:309-14
## The Impact of Vaccines in Alaska

<table>
<thead>
<tr>
<th>Disease</th>
<th>Before Vaccines</th>
<th>Because of Vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hib meningitis and sepsis</td>
<td>40-80 cases per year in children</td>
<td>0-2 cases of per year</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Alaska-wide epidemics with up to 4,000 cases</td>
<td>No hepatitis A epidemics</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>10% of Alaska Natives infected in some regions</td>
<td>Alaska Natives have the lowest rate of hepatitis B in the U.S.</td>
</tr>
<tr>
<td>Measles</td>
<td>Measles outbreaks contributed to high infant mortality</td>
<td>No measles cases in Alaska since 2000!</td>
</tr>
</tbody>
</table>

Vaccination . . . does more than safeguard children against measles; it also stops other infections taking advantage of measles-induced immune damage.

*Science*, May 8, 2015
Some Alaska Measles History

![Bar chart showing the cases of measles in Alaska from 1972 to 1994.](chart.png)
1990 Statewide Outbreak

Locations:
- Nuiqsut
- Anchorage
- Bethel
- Ketchikan
### 1990 Statewide Outbreak—80 Cases

#### Vaccination History of the 80 Total Cases

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unvaccinated</td>
<td>59</td>
<td>74%</td>
</tr>
<tr>
<td>Vaccine indicated but not given</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Routine vaccine not indicated</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Person &lt;18 months of age</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Person born before 1957</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Laboratory immunity/MD diagnosis</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Medical exemption</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Vaccinated</td>
<td>29</td>
<td>26%</td>
</tr>
</tbody>
</table>

[Further information](http://www.epi.hss.state.ak.us/bulletins/docs/b1990_11.pdf)
1990 Statewide Outbreak Response

Surveillance

• Detected new cases
• Evaluated contacts’ vaccine histories
• Vaccinated susceptibles

Vaccine

• Second measles vaccine recommended for Ketchikan school children vaccinated before 15 months
• Measles vaccine recommended at 6 months in outbreak areas

1996 Juneau Outbreak

- Largest US outbreak among school children in 2 years
- 63 confirmed cases
- 41 cases (65%) among school-aged children (6-18 years)

Vaccination History of the 63 Total Cases

<table>
<thead>
<tr>
<th>Vaccination Status</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two doses of MCV*</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>One MCV at 1 year or older</td>
<td>33</td>
<td>52%</td>
</tr>
<tr>
<td>Not vaccinated</td>
<td>30</td>
<td>48%</td>
</tr>
</tbody>
</table>

*Measles containing vaccine

Status of the 30 Unvaccinated Cases

<table>
<thead>
<tr>
<th>Status</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible to be vaccinated</td>
<td>24</td>
<td>80%</td>
</tr>
<tr>
<td>Religious exemption</td>
<td>12</td>
<td>40%</td>
</tr>
</tbody>
</table>
1996 Juneau Outbreak Response

Surveillance
- Active surveillance for cases

Vaccine
- MCV for unvaccinated school age children
- Second MCV becomes required for all Alaska students in kindergarten and 1st grade.

1998 Anchorage Outbreak

- School-centered measles outbreak in Anchorage
- Largest outbreak in the U.S. in 2 years: 33 cases

Vaccination History of Total 33 Cases

<table>
<thead>
<tr>
<th>Vaccination History</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>One MCV</td>
<td>29</td>
<td>88%</td>
</tr>
<tr>
<td>Two MCV</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Unimmunized</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Vaccine history unknown</td>
<td>1</td>
<td>3%</td>
</tr>
</tbody>
</table>

Vaccination History at High School Where 17 Cases Occurred

<table>
<thead>
<tr>
<th>Vaccination History</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student population</td>
<td>2186</td>
</tr>
<tr>
<td>One dose of MMR</td>
<td>1073</td>
</tr>
<tr>
<td>Two or more doses of MMR</td>
<td>1112</td>
</tr>
<tr>
<td>Unimmunized</td>
<td>1</td>
</tr>
</tbody>
</table>

http://www.epi.hss.state.ak.us/bulletins/docs/b1999_02.htm
August 10: 4-year-old from Japan with measles
September 5: 16-year-old large high school student with measles
Sept. 17-19: More cases reported at large high school
Sept. 20-24: Measles cases identified at other Anchorage schools

http://www.epi.hss.state.ak.us/bulletins/docs/b1999_02.htm
New 2 Dose MCV Requirement

The Anchorage outbreak led to enforcement of a 2nd MCV requirement for schoolchildren.

- **September 24, 1998**: All children in Anchorage schools are required to have two measles vaccine doses by November 16, 1998.
- **October 2, 1998**: The two-dose requirement is expanded to include all schools in the state.
- **January 4, 1999**: Deadline for all Alaska students to receive two-dose vaccine. Students are vaccinated by their usual providers and school clinics.

http://www.epi.hss.state.ak.us/bulletins/docs/b1999_02.htm
The tremendous amount of work was successful:

- **November 17, 1998**: 98.6 percent of 49,346 Anchorage students had documentation of two doses of MCV.

- **January 7, 1999**: Only 142 of the 79,109 public school students outside of Anchorage were not in compliance.
Lessons from the Outbreaks

✓ Measles can spread in schools, even with 93-95 percent of the student population vaccinated at least once.

✓ Sustained school-centered measles transmission is unlikely in populations immunized with 2 MMR doses.

✓ Risk of sustained measles transmission will increase if the proportion of students without measles immunity increases.

✓ Enhancing immunity during an outbreak is a ton of work.
Alaska Measles Elimination

- There have been no measles cases in Alaska since 2000.
- In 2014 there was a case of measles on a cruise ship in Alaskan waters.
Kids need their shots! Travelers need shots!

http://www.cdc.gov/measles/importation-infographic.html

http://www.cdc.gov/vaccines/events/niiw/promotional/media/downloads/printad-superbaby-8x11-color.pdf
Estimated Vaccine Coverage for the Standard Composite Series* among Children Aged 19-35 Months

CDC National Immunization Survey Data
Most People Accept Vaccines

Vaccine acceptors

Vaccine hesitant

Vaccine rejectors

Douglas Opel MD, MPH and Douglas Diekema, MD MPH
Vaccine Fears Are Not New

James Gillray, Publications of the Anti-Vaccine Society, 1802

Library of Congress, Prints & Photographs Division, LC-USZC4-3147 (color film copy transparency), archival TIFF version (4 MB), converted to JPEG with the GIMP 2.4.5, image quality 88.
Are Alaskan parents vaccine-hesitant about MMR?

Based on NIS data, no appreciable change in our 19-35 month MMR coverage has occurred during this interval despite significant public misinformation.

Anti-vaccine milestones:
- Wakefield article
- Thimerosal controversy begins
- David Kirby publishes *Evidence of Harm*
- Jenny McCarthy on Oprah
What are known factors associated with being under-vaccinated?

- Low SES
- Paying for immunizations
- Lack of health insurance
- Low parental education
- Younger maternal age
- Large family size
- Not remembering vaccination schedules and appointments
- Delayed well child visits
- Sick child delays
- Inadequate provider support
- Lack of available health structures
- Transportation and accessibility issues for immunization clinics
- Lack of knowledge about vaccines and diseases
- Negative beliefs/attitudes
- Fear/safety concerns
- Skepticism/doubts about medical information provided

*Falagas ME and Zarkadoulia E, “Factors associated with suboptimal compliance to vaccinations in children in developed countries: a systematic review.” Current Medical Research and Opinion, Vol 24(6):2008*
Socioeconomic Disparity in District B

% Current Non-Native Kindergarteners UTD on DTaP: Socioeconomic Comparison in District B

Average Disparity 7-15 mos: **18.2%**

Average Disparity 19-35 mos: **13.4%**