Lessons from the Measles Outbreak: 2018-2019, New York City

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I have no disclosures or conflicts of interest
Measles 101

- Viral infection characterized by fever and rash
- Highly contagious
  - 90% attack rate in non-immune close contacts
- Airborne and droplet transmission
- Incubation period (time from exposure to illness)
  - 7 to 21 days after exposure
- Infectious period
  - 4 days before through 4 days after rash onset
Measles Outbreak: 2018-19, New York City

- Measles was declared eliminated in the U.S. in 2000
- New York City (NYC) has experienced periodic measles outbreaks due to importation of the virus by people who become infected while traveling outside of the US
- Current outbreak in NYC
  - Began on September 30, 2018 with an unvaccinated child from Brooklyn who acquired measles in Israel
  - Largest outbreak in the US since 1992
  - 653 cases as of August 13, 2019; >21,000 people exposed
Map of Measles Outbreak: 2018-19, New York City

- Centered in two Orthodox Jewish neighborhoods in Brooklyn: Williamsburg and Borough Park
Measles Outbreak, 2018-19, New York City: Confirmed Measles Cases by Month of Rash Onset

N=653 cases

* Date of first positive lab test if rash onset date unknown
Source: NYC DOHMH surveillance data, as of 8/12/19.
# Measles Outbreak, New York City, 2018-19: by Age and Vaccination History

<table>
<thead>
<tr>
<th>Age Category</th>
<th>No MMR</th>
<th>1 Prior MMR</th>
<th>2 Prior MMRs</th>
<th># MMR Not Known</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>99</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>101 (15%)</td>
</tr>
<tr>
<td>1 to 4 years</td>
<td>245</td>
<td>32</td>
<td>1</td>
<td>0</td>
<td>278 (43%)</td>
</tr>
<tr>
<td>5 to 18 years</td>
<td>129</td>
<td>5</td>
<td>10</td>
<td>3</td>
<td>147 (23%)</td>
</tr>
<tr>
<td>&gt;18 years</td>
<td>4</td>
<td>7</td>
<td>20</td>
<td>96</td>
<td>127 (19%)</td>
</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td>477</td>
<td>46</td>
<td>31</td>
<td>99</td>
<td>653</td>
</tr>
</tbody>
</table>

- Median Age: 3 years (Range: 1 month to 70 years)
- 86% of cases with known vaccine history were unvaccinated
Outbreak Control Measures

• Notification of exposed contacts
  – Post-exposure prophylaxis (PEP) with Measles-Mumps-Rubella (MMR) or immune globulin (IG)
  – Home isolation as needed

• Alerts to providers citywide and targeted
• Promoting MMR vaccination
• Press release and media interviews/articles
• Print ads and social media
• Community engagement
• Daycare and school exclusions
• Emergency order requiring vaccination
Why Did This Outbreak Occur

• Vaccine hesitancy and delay in vaccination
  – Conducted focus groups in 2011
  – Religious exemptions
• Large outbreaks in Europe and Israel: multiple importations and chains of transmission
• Increased influence of anti-vaccine movement, deliberately targeting this community
• Large families, densely, populated and congregate settings
• Measles parties and not seeking medical care
Targeted Efforts to Reach Community

- Reliance on partnerships
  - Providers
  - Hatzolah ambulance services
  - Jewish media
  - CBO/service providers (WIC, Head Start, Early Intervention)

- Emergence of new organizations
  - Jewish Orthodox Women’s Medical Association (JOWMA)
  - Vaccine Task Force (Orthodox Jewish Nurses)

- Community mobilization, example, Borough Park event
Community Engagement

• Meetings with local religious, community and elected officials
• Letters sent to parents through schools
• Letters sent to households with unvaccinated children
• Robocalls (multiple times, ~75,000 contacts)
• Call center and immunization hotline
• Partners holding small informational sessions with mothers and/or hosting hotlines
Community Engagement: Media and Education

• Focus on print and digital media serving the community
  – English and Yiddish
  – Measles symptoms and travel warning, MMR vaccination
  – Co-branded
  – WhatsApp

• Distribution of materials, Tzim Gezint booklet and Slice of PIE, through providers and local community-based organizations
  – Mailing to 29,000 households
MMR Vaccine Uptake Among Children Ages 5 to 18 Years as of 7/7/2019

Source: NYC DOHMH Citywide Immunization Registry
Data run on 7/9/2019
Interesting, but what does this have to do with HPV?
ACIP has recommended routine HPV vaccination for females ages 9-26 since 2006 and for males ages 11-21 since 2011.

Series can be completed with 2 or 3 doses depending on series initiation at <15 years of age and interval between dose 1 and dose 2 is >5 months.

Source: NYC DOHMH Citywide Immunization Registry (numerator) and NYC DOHMH Epiquery and 2010 US Census (population estimates).

1 ACIP has recommended routine HPV vaccination for females ages 9-26 since 2006 and for males ages 11-21 since 2011.

2 Series can be completed with 2 or 3 doses depending on series initiation at <15 years of age and interval between dose 1 and dose 2 is >5 months.
HPV Vaccine Coverage Among 13 Year-Olds by the 13\textsuperscript{th} Birthday

\begin{restorelanguage}{english}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{chart.png}
\caption{HPV Vaccine Coverage Among 13 Year-Olds by the 13\textsuperscript{th} Birthday}
\end{figure}

\end{restorelanguage}

Source: NYC DOHMH Citywide Immunization Registry (numerators) and NYC DOHMH Epiquery and 2010 US Census (population estimates).
HPV Vaccination Coverage
Percent of adolescents ages 13-17 who completed the human papillomavirus (HPV) vaccine series

<table>
<thead>
<tr>
<th>Borough</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Highest</td>
<td></td>
</tr>
<tr>
<td>1 Jackson Heights</td>
<td>91.4</td>
</tr>
<tr>
<td>2 Mott Haven</td>
<td>90.9</td>
</tr>
<tr>
<td>3 University/Morris Heights</td>
<td>89.4</td>
</tr>
<tr>
<td>4 Hunts Point</td>
<td>88.3</td>
</tr>
<tr>
<td>5 Sunset Park</td>
<td>87.7</td>
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<table>
<thead>
<tr>
<th>Borough</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Lowest</td>
<td></td>
</tr>
<tr>
<td>59 Tottenville and Great Kills</td>
<td>22.2</td>
</tr>
<tr>
<td>58 Williamsburg and Greenpoint</td>
<td>22.7</td>
</tr>
<tr>
<td>57 Borough Park</td>
<td>29.2</td>
</tr>
<tr>
<td>56 Willowbrook and South Beach</td>
<td>30.2</td>
</tr>
<tr>
<td>55 Sheephead Bay</td>
<td>33.3</td>
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</tbody>
</table>

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<thead>
<tr>
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<th>Percent</th>
</tr>
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<tbody>
<tr>
<td>Borough</td>
<td></td>
</tr>
<tr>
<td>Manhattan</td>
<td>69.0</td>
</tr>
<tr>
<td>Bronx</td>
<td>77.4</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>50.4</td>
</tr>
<tr>
<td>Queens</td>
<td>61.2</td>
</tr>
<tr>
<td>Staten Island</td>
<td>35.5</td>
</tr>
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</table>

NYC Overall: 67.7%

Legend
- 22% - 50%
- 51% - 62%
- 63% - 72%
- 73% - 91%
- Unpopulated Areas

Source: NYC Citywide Immunization Registry, 2018 (numerator); Vintage 2018 Population Estimates for 2017 (denominator)

Review Date: Dec 31, 2018
Created Date: March 12, 2019
Lessons Learned

• Identify population and communities at risk
  – Immunization Information Systems
  – Geography, religion or ethnicity

• Establish relationships before an outbreak
  – Providers
  – Community organizations providing services
  – Community leaders
  – Haredi health department community liaison

• Cultural sensitivity
Ongoing DOHMH HPV Work

- Quality improvement visits (IQIP)
- Provider feedback reports
  - Twice annually
  - Recognition
- Provider and public education
  - Updating HPV toolkit
  - Grand rounds
DOHMH Plans

• Target HPV education to providers in the Orthodox Jewish community
• HPV materials being developed for the Orthodox Jewish community
  – Address vaccine myths
• Targeted efforts in Staten Island
• Expanded work with SBHCs and schools
• Development adolescent facing materials
Q & A

For more information: https://www1.nyc.gov/site/doh/providers/health-topics/measles.page

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Thank you!
Extra Slides
Strategies for Vaccine Use

• **Eradication**
  – Complete absence of transmission and no risk of disease
  – Gold standard is smallpox

• **Elimination**
  – Interruption of transmission in a geographically defined area

• **Control**
  – Focus is reduction of transmission and disease prevention
Examples of Definitions for Elimination

• Measles
  – No endemic transmission for ≥1 year
  – Quality of surveillance
  – Vaccine coverage and population immunity
  – Importations may occur

• Tetanus
  – *C. tetani* spores are present in the soil worldwide
  – Focus is on maternal and neonatal tetanus
  – <1 case neonatal tetanus per 1,000 live births per district