Measles Vaccine Update

Tina Q. Tan, MD
Professor of Pediatrics
Northwestern University Feinberg School of Medicine
Pediatric Infectious Diseases Attending
Ann & Robert H. Lurie Children’s Hospital, Chicago, Illinois
Measles

- Measles is one of the most contagious viral infections with secondary attack rates of > 90% in susceptible household contacts.
- Transmission: person to person by direct contact with droplets from infected respiratory secretions. Incubation period is 10 to 12 days.
- Patients are contagious from 4 days before the rash to 4 days after the appearance of the rash.
- Measles vaccine in the US is available in combination formulations, which include measles-mumps-rubella (MMR) and measles-mumps-rubella-varicella (MMRV). Single antigen measles vaccine is no longer available in the US.
- 5% to 10% of individuals do NOT respond adequately to their first dose of MMR vaccine therefore many adults remain susceptible to the disease since a booster dose of MMR was not recommended until 1989.
- Over 99% of individuals develop immunity to measles after 2 doses of MMR vaccine.

MMWR 2013;62:1-40
Measles in United States, 1996-Present
Measles, United States, 2001-2014
Age Specific Incidence

- ~65% unvaccinated
- ~15% vaccinated
- ~20% unknown

Most recent cases in adults, but incidence rates are lower
Measles in the United States - 2014

- 644 cases from 27 states and 23 outbreaks
- 60 importations: Philippines (25), India (9)
  - 54 (91%) in US residents
- 78 cases (12%) hospitalized
- Cases in US residents (N=635)
  - 77% unvaccinated
  - 15% unknown vaccination status (mostly adults)
  - 8% vaccinated
  - Among unvaccinated
    - 79% personal belief exemptions
    - 3% travelers age 6 months to 4 years
    - 8% too young to be vaccinated
    - 10% unknown
Measles Cases and Outbreaks
January 1 to February 6, 2015*

121
Cases

1
Outbreak


There have been 20 additional cases from Feb 7-13, 2015 for total of 141 cases representing 85% of reported cases this year

U.S. Measles Cases by Year

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

To date, there have been 13 measles cases reported in IL – 11 children and 2 adults

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Number of Cases</th>
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<tr>
<td>2005</td>
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<td>2014</td>
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<td>2015</td>
<td>13</td>
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Measles Vaccine

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Strain</th>
<th>Years in Use</th>
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<tbody>
<tr>
<td>Inactivated</td>
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<td>1963-1967</td>
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<tr>
<td>Live, attenuated</td>
<td>Edmonston B</td>
<td>1963-1975</td>
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<tr>
<td>Live, further attenuated</td>
<td>Schwarz</td>
<td>1965-1976</td>
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<tr>
<td>Live, further attenuated</td>
<td>Moraten – strain in the MMR and MMRV combination vaccines</td>
<td>1968-present</td>
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</table>
Community “Herd” Immunity

- Blue = not immunized but still healthy
- Yellow = immunized and healthy
- Red = not immunized, sick, and contagious

No one is immunized.
Contagious disease spreads through the population.

Some of the population gets immunized.
Contagious disease spreads through some of the population.

Most of the population gets immunized.
Spread of contagious disease is contained.

Vaccines.gov
Measles Vaccination Coverage (≥1 dose) Among Children 19-35 months of age – 2013

Overall national coverage rate 91.9%
Only 9 states with coverage rate ≥ 95%
Measles Vaccination Coverage (2 doses) Among Children in Kindergarten – 2013-2014 School Year

8 states have rates ≤ 90%
23 states have rates ≥ 95%

VT 91.2
NH ≥94.7
MA 95.1
RI 95.1
CT 96.9
NJ ≥96.8
DE ≥96.4
MD 97.6
DC 89

MMWR 2014;63(14):913-920
Measles Vaccination Coverage in IL

• Overall, in public schools 98.4% of the students have received the required 2 doses of MMR vaccine
  - 0.6% have cited religious objection for not being vaccinated (13,527 students)
  - 0.62% have not been vaccinated and cite no reason for not being vaccinated (14,040 students)

• For non-public schools, 97.35% of the students have received the required 2 doses of MMR vaccine
  - 1.09% have cited religious objection for not being vaccinated (2,489 students)
  - 0.68% have not been vaccinated and cite no reason for not being vaccinated (1,563 students)
Tribune analysis: More Illinois schools reach key measles vaccine threshold (2/2015)

School measles vaccination rates
By school year, as a percentage of schools

Percentage of schools reporting measles vaccination rates worse than 95%

- 2008-2009: 11.5%
- 2009-2010: 11.5%
- 2010-2011: 11.5%
- 2011-2012: 11.5%
- 2012-2013: 9.2%
- 2013-2014: 9.2%

Rates worse than 90%

- 2008-2009: 5.1%
- 2009-2010: 4.5%
- 2010-2011: 4.0%
- 2011-2012: 4.0%
- 2012-2013: 4.0%
- 2013-2014: 2.8%

SOURCE: Illinois State Board of Education
FIGURE 1. Recommended immunization schedule for persons aged 0 through 18 years — 2013 (for those who fall behind or start late, see the catch-up schedule [Figure 2])

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are in bold.

<table>
<thead>
<tr>
<th>Vaccines</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16-18 yrs</th>
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<td>Hepatitis B* (HepB)</td>
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<td>Rotavirus* (RV) RV-1 (2-dose series); RV-5 (3-dose series)</td>
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<td>Diphtheria, tetanus, &amp; acellular pertussis* (DTaP; &lt;7 yrs)</td>
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<td>Tetanus, diphtheria, &amp; acellular pertussis* (Td: ≥7 yrs)</td>
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<td>Haemophilus influenza type b* (HiB)</td>
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<td>Pneumococcal conjugate* (PCV13)</td>
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<td>Pneumococcal polysaccharide* (PPSV23)</td>
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<td>Influenza* (IIV, LAIV) 2 doses for some: see footnote B</td>
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<td>Measles, mumps, rubella* (MMR)</td>
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<td>Varicella* (VAR)</td>
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<td>Hepatitis A* (HepA)</td>
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<td>Human papillomavirus* (HPV2: females only; HPV4: males and females)</td>
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<td>Meningococcal* (Hib-MenCY ≥ 6 wk; MCV4-Dz9 mos; MCV4-CRM ≥ 2 yrs)</td>
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**Range of recommended ages for all children**

**Range of recommended ages for catch-up immunization**

**Range of recommended ages for certain high-risk groups**

**Range of recommended ages during which catch-up is encouraged and for certain high-risk groups**

**Not routinely recommended**
Measles Vaccine Recommendations – Infants and Children

• Routine measles immunization – 2 dose series:

  • First dose of MMR vaccine should be given at 12 through 15 months of age

  • The second dose of MMR vaccine is recommended routinely at school entry at 4 through 6 years of age, but can be given at any earlier age (e.g. during an outbreak or before international travel), provided the interval between the first and second dose is at least 28 days.

  • Catch up second dose immunization should occur for all school children (elementary, middle and high school) who have received only 1 dose
Measles Proof of Immunity

- Established by:
  - Positive serologic test result for measles antibody or laboratory confirmation of disease
  - Documented receipt of 2 appropriately spaced doses of live virus-containing measles vaccine, the first of which is given on or after the first birthday
  - Birth before 1957
  - Physician diagnosis of disease is NO LONGER acceptable as evidence of immunity for measles

MMWR 2013;62(RR04):1-34
# Adult Immunization Schedule

![Adult Immunization Schedule Table](image)

*Source: [www.cdc.gov](www.cdc.gov)*
Measles Vaccine Recommendations - Adults

- 2 doses of vaccine is recommended among adults in high risk groups including international travelers, college and other post-high school students, and healthcare personnel born during or after 1957

- All other adults, born during or after 1957, without other presumptive evidence of measles immunity should be vaccinated with 1 dose of MMR vaccine
Measles Vaccine Recommendations – Adults with Unclear Vaccine status

- Healthcare personnel (HCP) born before 1957 generally have been considered to be immune to measles. However, because measles cases have occurred in HCP in this age group, health care facilities should consider offering AT LEAST 1 dose of MMR vaccine to HCP who lack proof of immunity to measles.

- Persons with a history of receipt of inactivated measles vaccine (1963-1967) or unknown type of vaccine – this vaccine dose should be considered invalid and patient should be immunized with AT LEAST 1 dose of MMR.
Measles Vaccine Recommendations – Adults with Unclear Vaccine status

• If a person reports having received vaccination but does not have written documentation - there are two options:

  1. Test for immunity – if the tests indicate that the person is not immune, or if test results are indeterminate or equivocal, the person should receive 2 doses of MMR separated by at least 4 weeks.

  2. Give 2 doses of MMR at least 4 weeks apart – it is not recommended to serologically test after vaccination because commercial tests may not be sensitive enough to reliably detect vaccine-induced immunity.

www.immunize.org/askexperts/experts_mmr.asp
Measles Vaccine Recommendations – Adults

- Persons, especially HCP, with written documentation of receiving two MMR vaccines are considered immune to measles, regardless of the results of a subsequent serologic test for measles.

- Documented age-appropriate and timing appropriate vaccination supercedes the result of subsequent serologic testing.

- A HCP who develops a rash and low-grade fever after MMR vaccination is NOT infectious and no special precautions need to be taken. Approximately 5-15% of susceptible persons who receive MMR vaccine will develop low-grade fever and/or mild rash 7-12 days after vaccine.

www.immunize.org/askexperts/experts_mmr.asp
Measles Vaccination – International Travel

- Infants 6-11 mos who are traveling internationally should receive 1 dose of MMR vaccine at least 2 weeks prior to travel. The extra dose between 6 and 12 months **DOES NOT** count toward their required 2 doses.
- Children ≥ 12 mos and adults who plan to travel outside the United States should receive 2 doses of MMR vaccine separated by at least 28 days if they do not have evidence of immunity.
  - Presumptive evidence of immunity includes: laboratory evidence, birth before 1957, or laboratory confirmation of disease.
Effectiveness of Measles Vaccine After Exposure

• MMR vaccine, if administered within 72 hours of initial measles exposure and immunoglobulin (Ig), administered within 6 days of exposure, may provide some protection or modify the course of disease

• Except in health care settings, unvaccinated persons who receive their 1st dose of MMR vaccine within 72 hours post-exposure may return to childcare, school, or work

• Vaccine should be offered at any interval following exposure in order to offer protection from future exposures
Measles Exposure

- If a measles case or an outbreak occurs within or in the areas served by a hospital, clinic, or other medical or nursing facility, **ALL personnel** regardless of birth year, should receive 2 doses of MMR vaccine, unless they have other documentation of measles immunity.

- Birth year before 1957 is **NOT acceptable** presumptive evidence of immunity during an outbreak.

- The health care facility should provide MMR vaccine to **ALL personnel** without presumptive evidence of measles immunity at no charge. Recently vaccinated healthcare personnel (HCP) do not require any restriction in their work schedules.
Measles Exposure

- HCP without presumptive evidence of immunity who have been exposed to measles should be relieved from patient contact and excluded from the facility from the 5\textsuperscript{th} day after the first exposure through the 21\textsuperscript{st} day after the last exposure, regardless of whether they received MMR vaccine or Ig after the exposure.

- After the exposure, personnel who develop measles should be relieved from all patient contact and excluded from the facility for 4 days after they develop rash.
Individuals at High Risk for Severe Disease

- Infants ≤ 12 months, pregnant women without evidence of measles immunity, and severely immunocompromised persons are at high risk for severe measles disease but may not be able to receive MMR vaccine
- After exposure, these individuals may receive IM Ig 0.5 cc/Kg (max 15 cc) or IVIG 400 mg/kg
  - IM Ig should be given to infants ≤12 mos who have been exposed to measles if they do not receive vaccine
  - In infants 6-11 mos, MMR vaccine can be given in place of IM Ig, if administered within 72 hours of exposure
  - If many cases of measles are occurring among infants ≤12 mos of age, MMR vaccine may be given to infants as young as 6 mos as an outbreak control measure

MMWR 2013;62(RR04):1-34
Other Vaccine Questions

- Should the routine measles vaccine recommendations be changed so that the first dose is given at 6 months of age?

  - Currently CDPH and IDPH do not have a recommendation to change the age limit given that the current outbreak seems to be limited to the daycare setting in Cook County. If there were evidence of more widespread transmission in the community, CDPH and IDPH would re-evaluate and possibly consider a change.

  - 12 months of age remains the lower vaccination limit unless the infant is travelling internationally or has had exposure with a confirmed case.
Other Vaccine Questions

- Should the routine vaccination recommendations be changed so that the 2\textsuperscript{nd} dose of vaccine is given before 4 years of age?

- This is a practice that is not routinely recommended. The problem is there are some school systems that misinterpret the state law to believe that the second dose of MMR has to be administered at 4 years of age or later. Therefore, some children are asked to get a letter from their HCP or get revaccinated when they enter school.

- As long as the second dose is administered 28 days or more after the first dose, it is considered a valid dose of vaccine and no further doses of MMR are needed. This is consistent with the state law.