Measles: 
Return of vaccine preventable disease 

Jana Shaw MD, MPH, MSc, FPIDS 
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Health Link SUNY Upstate Medical University, 
Syracuse, NY
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• No relevant conflicts
Objectives

1. Describe burden of measles in the US
2. Explain reasons for vaccine refusal
3. Identify strategies to deal with measles outbreaks
4. Describe the impact of immunization laws on vaccination coverage and exemptions
Measles Cases in the US 2010-2019

Number of Measles Cases Reported by Year

2010-2019** (as of June 6, 2019)

https://www.cdc.gov/measles/cases-outbreaks.html
US Measles Outbreaks 2019

- Measles outbreaks (defined as 3 or more cases) are currently ongoing in 2019 in the following jurisdictions:
  - New York State, Rockland County
  - New York City
  - California, Butte County
  - California, LA County
  - California, Sacramento County
  - Pennsylvania
  - Washington
- These outbreaks are linked to travelers who brought measles back from other countries such as Israel, Ukraine, and the Philippines, where large measles outbreaks are occurring.
Immunization status of measles cases in the US

- Disneyland outbreak 2014-2015
  - 49 (45%) were unvaccinated (67% intentionally unvaccinated)
  - 47 (43%) had unknown or undocumented vaccination status
- Among the 84 patients with known hospitalization status, 17 (20%) were hospitalized.

2018 - 2019 Measles Outbreak in Rockland County:
As of June 12, 2019, there are 266 confirmed reported cases of measles in Rockland County.

Age groups for the confirmed measles cases in Rockland County as of June 12, 2019:
- Less than 1 year old: 11.8%
- 1-3 years: 26.3%
- 4-6 years: 13.5%
- 7-18 years: 28.2%
- 19+ years: 20.3%

Vaccination rates for confirmed measles cases in Rockland County as of June 12, 2019:
- 77.8% have had 0 MMRs
- 4.5% have had 1 MMR
- 3.4% have had 2 MMRs
- 14.3% have unknown status

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6406a5.htm
Monthly distribution and classification of measles cases, January 2017–February 2019, WHO European Region

Measles – European Region

• As of 28 March 2019, the WHO European Region reported a total of 83 540 measles cases and 74 related deaths for 2018.

• In 2018, eight countries reported over 2 000 cases each including Ukraine (n= 53 218), Serbia (n=5 076), Israel (3 140), France (n=2 913), Italy, (n=2 686), Russian Federation (n=2 256), Georgia (n=2 203) and Greece (n=2 193).

• Most cases are occurring in unvaccinated or under-vaccinated individuals.

1. Climate change and Pollution
2. Non-communicable diseases
3. Global pandemic influenza
4. Fragile and vulnerable settings
5. Antimicrobial resistance
6. Ebola and high-threat pathogens
7. Weak primary health care
8. Vaccine hesitancy
9. Dengue
10. HIV

Vaccine hesitancy

Vaccine hesitancy—the reluctance or refusal to vaccinate despite the availability of vaccines—threatens to reverse progress made in tackling vaccine-preventable diseases. Vaccination is one of the most cost-effective ways of avoiding disease—it currently prevents 3-3.5 million deaths a year, and a further 1.5 million could be avoided if global coverage of vaccinations improved.

Measles, for example, has seen a 39% increase in cases globally. The reasons for this rise are complex, and not all of these cases are due to vaccine hesitancy. However, some countries that were close to eliminating the disease have seen resurgence.

The reasons why people choose not to vaccinate are complex; a vaccines advisory group to WHO identified complacency, inconvenience in accessing vaccines, and lack of confidence are key reasons underlying hesitancy. Health workers, especially those in communities, remain the most trusted advisor and influencer of vaccination decisions; they should be supported to provide trusted, credible information on vaccines.

In 2019, WHO will ramp up work to eliminate cervical cancer worldwide by increasing coverage of the HPV vaccine among other recommendations. 2019 may also be the year when transmission of wild poliovirus is stopped in Afghanistan and Pakistan. Last year, less than 30 cases were reported in both countries. WHO and partners are committed to supporting these countries to vaccinate every last child to eradicate this crippling disease forever good.

https://www.who.int/emergencies/ten-threats-to-global-health-in-2019
Measles: Clinical Features

• Acute viral respiratory illness.
• Prodromes: fever and malaise, cough, coryza, and conjunctivitis -the three “C”s -, a pathognomonic enanthema (Koplik spots).
• Maculopapular rash -The rash spreads from the head to the trunk to the lower extremities.
• Patients are considered to be contagious from 4 days before to 4 days after the rash appears.
• Immunocompromised patients may not develop the rash.

https://www.cdc.gov/measles/hcp/index.html
Complications of Measles

-30% of reported measles cases have one or more complications.

Complications of measles are most common among children younger than 5 years of age and adults 20 years of age and older.

Severe Complications in Children and Adults

Some people may suffer from severe complications, such as pneumonia (infection of the lungs) and encephalitis (swelling of the brain). They may need to be hospitalized and could die.

About 1 in 5 unvaccinated people in the U.S. who get measles hospitalized.

As many as 1 out of every 20 children with measles gets pneumonia, the most common cause of death from measles in young children.

About 1 child out of every 1,000 who get measles will develop encephalitis (swelling of the brain) that can lead to convulsions and can leave the child deaf or with intellectual disability.

Nearly 1 to 3 of every 1,000 children who become infected with measles will die from respiratory and neurologic complications.

Measles may cause pregnant women who have not had the MMR vaccine to give birth prematurely, or have a low-birth-weight baby.

https://www.cdc.gov/measles/symptoms/complications.html
https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html

Measles Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>5%</td>
</tr>
<tr>
<td>Otitis media</td>
<td>7%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>6%</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>0.1%</td>
</tr>
<tr>
<td>Seizures</td>
<td>0.6-0.7%</td>
</tr>
<tr>
<td>Death</td>
<td>0.2%</td>
</tr>
</tbody>
</table>
Measles virus causes immune memory loss for up to 2 to 3 years after infection.
Transmission of Measles

- Measles is a highly contagious virus that lives in the nose and throat mucus of an infected person and spreads via large respiratory droplets.
- 90% of the people close to that person who are not immune will also become infected.
- If other people breathe the contaminated air or touch the infected surface, then touch their eyes, noses, or mouths, they can become infected.
- Airborne transmission via aerosolized droplet nuclei has been documented in closed areas for up to 2 hours after a person with measles occupied the area.
- Infected people can spread measles to others from four days before through four days after the rash appears.
- Measles is a disease of humans; measles virus is not spread by any other animal species.

https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html
Measles Vaccine

- In 1954, John F. Enders and Dr. Thomas C. Peebles isolated the measles virus.
- In 1963, John Enders and colleagues licensed measles vaccine in the United States.
- In 1968, an improved and even weaker measles vaccine, was developed by Maurice Hilleman and colleagues, began to be distributed.
- Edmonston-Enders strain vaccine has been the only measles vaccine used in the United States since 1968.
- Measles vaccine is usually combined with mumps and rubella (MMR), or combined with mumps, rubella and varicella (MMRV).

https://www.cdc.gov/measles/about/history.html
History

• Average of 549,000 measles cases, 48,000 people were hospitalized from measles and 1,000 people developed chronic disability from acute encephalitis caused by measles annually and 495 measles deaths were reported annually in the United States.

• In 2000, measles was declared eliminated from the United States.

• Since 2000, the annual number of cases has ranged from a low of 37 in 2004 to a high of 1022 as of June 6, 2019, and continues to climb.

• The majority of cases have been among people who are not vaccinated against measles.

https://www.cdc.gov/measles/cases-outbreaks.html
Measles Secular Trends

• Following licensure of vaccine the incidence of measles decreased by more than 95%.
• From 1985 through 1988, 42% of cases occurred in persons who were vaccinated on or after their first birthday → a second dose recommended.
• The most important cause of the measles resurgence of 1989–1991 was low vaccination coverage (only 50% of children had been vaccinated against measles by their second birthday

https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html

The U.S. is currently experiencing its highest levels of the disease since 1992, with more than 1,000 cases reported so far this year.

https://www.directrelief.org/2019/06/measles-us-cdc-elimination-status/
Responding to Measles Outbreaks

• Prompt recognition, reporting, and investigation of measles is important to limit the spread
• Public health response includes
  – vaccination
  – quarantine of susceptible contacts without presumptive evidence of immunity.
  – Laboratory confirmation is essential for all measles outbreaks.
• State and local health departments have the lead in investigating measles cases and outbreaks
• It is expensive
Consequences of VPDs Outbreaks

• Unnecessary suffering and harm
• Direct monetary cost to:
  – Individual
  – Family member
  – Health insurer
  – Public purse
Outbreak Cost to Public Health

• Preventing additional exposures
• Tracking down those at risk
• Identification of additional cases
• Arrange for diagnostic testing
• Cost of treatment and preventive measures
• Other
Prevent measles with MMR vaccine

Measles can be prevented with MMR vaccine. The vaccine protects against three diseases: measles, mumps, and rubella. MMR vaccine is given later than some other childhood vaccines because antibodies transferred from the mother to the baby can provide some protection from disease and make the MMR vaccine less effective until about 1 year of age.

Schedule for MMR vaccine if you’re not traveling

<table>
<thead>
<tr>
<th></th>
<th>First Dose</th>
<th>Second Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children</strong></td>
<td>Age 12-15 months</td>
<td>Age 4-6 years</td>
</tr>
<tr>
<td><strong>Teenagers and adults with no evidence of immunity</strong></td>
<td>As soon as possible</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* CDC recommends this schedule for children 12 months and older. Infants younger than 12 months old and children traveling outside the U.S. should follow another schedule.

MMR vaccine is safe

MMR vaccine is very safe and effective. Two doses of MMR vaccine are about 97% effective at preventing measles; one dose is about 93% effective.

Is there a link between the MMR shot and autism?

No. Scientists in the United States and other countries have carefully studied the MMR shot. None has found a link between autism and the MMR shot. Learn more

Measles can also be prevented with MMRV vaccine

Children may also get MMRV vaccine, which protects against measles, mumps, rubella, and varicella (chickenpox). This vaccine is only licensed for use in children who are 12 months through 12 years of age.

https://www.cdc.gov/measles/vaccination.html
Vaccine safety and discomfort - most common reasons for delaying vaccines

<table>
<thead>
<tr>
<th>Parental Reason</th>
<th>2013 Delays (n = 516), %a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discomfort to the child of having too many shots at 1 time</td>
<td>75.0</td>
</tr>
<tr>
<td>Too many vaccines are a burden on the child’s immune system</td>
<td>72.5</td>
</tr>
<tr>
<td>Safety or concerns about adverse side effects, other than autism or thimerosal</td>
<td>56.8</td>
</tr>
<tr>
<td>Concern about autism</td>
<td>53.9</td>
</tr>
<tr>
<td>Baby is too small</td>
<td>42.1</td>
</tr>
<tr>
<td>Believe immunizations are unnecessary</td>
<td>25.6</td>
</tr>
<tr>
<td>Concern about thimerosal</td>
<td>22.7</td>
</tr>
<tr>
<td>Philosophical opposition to immunizations</td>
<td>20.4</td>
</tr>
<tr>
<td>Mistrust of pharmaceutical industry, government advisory groups, or physician organizations</td>
<td>18.0</td>
</tr>
<tr>
<td>Too costly to pay for multiple vaccinations</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Pediatricians were asked to select ≥1 reasons for delays. Of the 525 respondents who experienced vaccine delays (Table 2), 9 did not provide reasons for delays.

a This represents the percentage of pediatricians who experienced delays (out of 516) and selected this particular reason as their impression of the parental reason for the delay.

Vaccine Delays, Refusals, and Patient Dismissals: A Survey of Pediatricians

https://pediatrics.aappublications.org/content/pediatrics/138/3/e20162127.full.pdf
Serious Side Effects To Vaccines Are Rare

• Vaccines are one of the best monitored biologicals
• Primarily allergic reactions/anaphylaxis
  – 1 in 100,000 - 1,000,000 vaccinees
• Thrombocytopenia after MMR
  – 1 in 40,000 vaccinees
• Intussusception after rotavirus
  – 1 in 20,000 to 1 in 100,000 vaccinees
• Febrile seizures after MMRV
  – 8 in 10,000 vaccinees

https://injuryfacts.nsc.org/all-injuries/preventable-death-overview/odds-of-dying/
Vaccine development

The Journey of Your Child’s Vaccine

Before a new vaccine is ever given to people, extensive lab testing is done that can take several years. Once testing in people begins, it can take several more years before clinical studies are complete and the vaccine is licensed.

How a new vaccine is developed, approved and manufactured

The Food and Drug Administration (FDA) sets rules for the three phases of clinical trials to ensure the safety of the volunteers. Researchers test vaccines with adults first.

PHASE 1
- 20-300 healthy volunteers
- Is this vaccine safe?
- Does this vaccine seem to work?
- Are there any serious side effects?
- How is the size of the dose related to side effects?

PHASE 2
- Several hundred volunteers
- What are the most common short-term side effects?
- How are the volunteers’ immune systems responding to the vaccine?

PHASE 3
- Hundreds or thousands of volunteers
- How do people who get the vaccine and people who do not get the vaccine compare?
- Is the vaccine safe?
- Is the vaccine effective?
- What are the most common side effects?

FDA licenses the vaccine only if:
- It’s safe and effective
- Benefits outweigh risks

For more information, visit https://www.fda.gov/cber

Vaccines are made in batches called lots.
Manufacturers must test all lots to make sure they are safe, pure and potent. The lots can only be released once FDA reviews their safety and quality.

The FDA inspects manufacturing facilities regularly to ensure quality and safety.
Vaccine schedule
Vaccine safety monitoring

After being added to the U.S. Recommended Immunization Schedule, health experts continue to monitor the vaccine's safety and effectiveness.

How a vaccine's safety continues to be monitored

FDA and CDC closely monitor vaccine safety after the public begins using the vaccine. The purpose of monitoring is to watch for adverse events (possible side effects). Monitoring a vaccine after it is licensed helps ensure that possible risks associated with the vaccine are identified.

Vaccine Adverse Event Reporting System (VAERS)

VAERS collects and analyzes reports of adverse events that happen after vaccination. Anyone can submit a report, including parents, patients and healthcare professionals.

Vaccine Safety Datalink (VSD) and Post-Licensure Rapid Immunization Safety Monitoring (PRISM)

Two networks of healthcare organizations across the U.S. can analyze healthcare information from over 24 million people and over 190 million people.

Scientists use these systems to actively monitor vaccine safety.

Clinical Immunization Safety Assessment Project (CISA)

CISA is a collaboration between CDC and 7 medical research centers.

Vaccine safety experts assist U.S. healthcare providers with complex vaccine safety questions about their patients. CISA conducts clinical research studies to better understand vaccine safety and identify prevention strategies for adverse events following immunization.

Vaccine recommendations may change if safety monitoring reveals new information on vaccine risks (like if scientists detect a new serious side effect).

For more information, visit https://www.cdc.gov/vaccinesafety

The United States currently has the safest vaccine supply in its history. These vaccines keep children, families and communities protected from serious diseases.
STATES WITH RELIGIOUS AND PHILOSOPHICAL EXEMPTIONS FROM SCHOOL IMMUNIZATION REQUIREMENTS

1/30/2019

Source: Adapted from the LexisNexis StateNet Database and the Immunization Action Coalition, Feb. 2018.
* The existing statute in Minnesota and Louisiana does not explicitly recognize religion as a reason for claiming an

Immunization Mandates, Vaccination Coverage, and Exemption Rates in the United States

Jana Shaw,1 Emily M. Mader,2 Brittany E. Bennett,2 Olesya K. Vernyi-Kellogg,3 Y. Tony Yang,4 and Christopher P. Morley2,5

1Department of Pediatrics, SUNY Upstate Medical University, Golisano Children’s Hospital, Syracuse, New York; 2Department of Family Medicine, SUNY Upstate Medical University, Syracuse, New York; 3Legal Resource Center for Public Health Policy, 500 W Baltimore St, Baltimore, Maryland; 4Department of Health Administration and Policy, George Mason University, Fairfax, Virginia; 5Department of Public Health & Preventive Medicine, SUNY Upstate Medical University, Syracuse, New York


Note: White states correspond to the set of states most effective, which were created through the summation of state policy combinations that were highly effective in increasing vaccination coverage. The designation of “more effective” indicates that, on average, a given state has a stronger policy combination to facilitate increased vaccination coverage, as compared to other states. The designation of “less effective” indicates that, overall, a given state’s policy combination to facilitate increased vaccination coverage is less strong when compared with other states.


Note: White states correspond to the set of states least effective, which were created through the summation of state policy combinations that were highly effective in decreasing exemption rates. The designation of “less effective” indicates that, overall, a given state has a stronger policy combination to facilitate increased exemption rates, as compared to other states. The designation of “less effective” indicates that, overall, a given state’s policy combination to facilitate increased exemption rates is less strong when compared with other states. Mississippi and West Virginia do not permit in-school exemption than vaccination exemptions during our study period. Their scores were not included in the index for in-school exemptions.
New York State: County Religious Exemption Rates in NYS Schools in 2000 and 2010

State mean exemption rate in 2000 = 0.23%
State mean exemption rate in 2010 = 0.45%
2016-17 = 1.0%
2017-18 = 1.1%

TABLE 2. Estimated number and percentage of children enrolled in kindergarten with reported type of exemption from vaccination, and grace period/provisional enrollment, by immunization program — United States and territories, 2017–18 school year

<table>
<thead>
<tr>
<th>Immunization program</th>
<th>Medical exemptions, no. (%)</th>
<th>Religious no.</th>
<th>Philosophical no.</th>
<th>Total no. (%)</th>
<th>2017–18, no.</th>
<th>2017–18 %</th>
<th>2016–17 %</th>
<th>Percentage point difference (2016–17 to 2017–18)</th>
<th>Grace period or provisional enrollment, no. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>(0.2)</td>
<td>—</td>
<td>—</td>
<td>(2.0)</td>
<td>—</td>
<td>2.2</td>
<td>2.0</td>
<td>0.2</td>
<td>(1.8)</td>
</tr>
</tbody>
</table>

https://www.cdc.gov/mmwr/volumes/67/wr/mm6740a4.htm
The right to refuse vaccines is disproportionately exercised by affluent parents.

Vaccination Rates at New York Schools 2013-14

Exemptors are geographically clustered

```
<table>
<thead>
<tr>
<th>COUNTY</th>
<th>DISTRICT NAME</th>
<th>TYPE</th>
<th>SCHOOL NAME</th>
<th>STUDENTS</th>
<th>% MEDICAL EXEMPTIONS</th>
<th>% RELIGIOUS EXEMPTIONS</th>
<th>% IMMUNIZED POLIO</th>
<th>% IMMUNIZED MEASLES</th>
<th>% IMMUNIZED MUMPS</th>
<th>% IMMUNIZED RUBELLA</th>
<th>% IMMUNIZED DIPHTHERIA</th>
<th>% IMMUNIZED HEPATITIS B</th>
<th>% IMMUNIZED VARICELLA</th>
<th>% COI IMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROCKLAND</td>
<td>Private School</td>
<td>YESHIVA AVIR YAKOV GIRLS &amp; BOYS</td>
<td>3,058</td>
<td>0%</td>
<td>0.1%</td>
<td>96%</td>
<td>92.2%</td>
<td>95.5%</td>
<td>95.4%</td>
<td>96.1%</td>
<td>95.9%</td>
<td>94.8%</td>
<td>85.6%</td>
<td></td>
</tr>
<tr>
<td>ORANGE</td>
<td>Private School</td>
<td>CONGREGATION SHERI TORAH OF KHAL YYOEL MOSHE</td>
<td>2,734</td>
<td>0.9%</td>
<td>0.2%</td>
<td>88.3%</td>
<td>88.3%</td>
<td>88.3%</td>
<td>88.3%</td>
<td>88.3%</td>
<td>88.3%</td>
<td>88%</td>
<td>88%</td>
<td>88%</td>
</tr>
<tr>
<td>ROCKLAND</td>
<td>Private School</td>
<td>YESHIVA AMARATH ISRAEL ENOS VISNITZ</td>
<td>2,948</td>
<td>0.4%</td>
<td>4.2%</td>
<td>96.3%</td>
<td>90.8%</td>
<td>96.3%</td>
<td>95.3%</td>
<td>95.3%</td>
<td>94.7%</td>
<td>93%</td>
<td>89.6%</td>
<td></td>
</tr>
<tr>
<td>NEW YORK</td>
<td>Private School</td>
<td>U N INTERNATIONAL SCHOOL CO NADIA BENSON</td>
<td>1,601</td>
<td>0%</td>
<td>0.1%</td>
<td>97.2%</td>
<td>90.8%</td>
<td>90.8%</td>
<td>90.8%</td>
<td>97.7%</td>
<td>96.3%</td>
<td>97.2%</td>
<td>85.6%</td>
<td></td>
</tr>
<tr>
<td>ROCKLAND</td>
<td>Private School</td>
<td>YESHIVA BELZ</td>
<td>379</td>
<td>0%</td>
<td>0.7%</td>
<td>73.9%</td>
<td>58.6%</td>
<td>74.3%</td>
<td>74.3%</td>
<td>73.9%</td>
<td>72%</td>
<td>68.1%</td>
<td>53.1%</td>
<td></td>
</tr>
<tr>
<td>ROCKLAND</td>
<td>Private School</td>
<td>UTA GIRLS</td>
<td>1,993</td>
<td>0.1%</td>
<td>6.5%</td>
<td>93%</td>
<td>91.9%</td>
<td>92.3%</td>
<td>92.3%</td>
<td>92.3%</td>
<td>92.2%</td>
<td>92.9%</td>
<td>91.2%</td>
<td></td>
</tr>
<tr>
<td>KINGS</td>
<td>Private School</td>
<td>KHHD YYOEL OF SATMAR BP</td>
<td>4,032</td>
<td>0%</td>
<td>0%</td>
<td>99.3%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>99.2%</td>
<td>99.1%</td>
<td>99.6%</td>
<td>96.6%</td>
<td></td>
</tr>
</tbody>
</table>
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Geographical Clustering Among “Exemptors”

- Non-medical exemptions tend to be geographically clustered
- State-level data may obscure refusal rates that are much higher in individual communities
- Social clustering of exemptions increases the risk of disease outbreaks (Indiana, Brooklyn, NY, Texas measles outbreaks, CA, measles pertussis)
- Reasons for geographical clustering are unclear

Am J Epidemiol 2008;168:1389-1396
Religious exemption rates from school immunizations in New York State schools between 2003 through 2012

Fig. 1. Medical and religious exemption rates from school immunizations among New York State public and private schools between 2003 through 2012. Notes: Exemption rates are weighted averages (total enrollment number as the weight). Exemption rates are defined as numbers of students claiming medical (or religious) exemption divided by total enrollment. Prior to 2009-2010, the rate was per 100 new enrollees; after 2010, the rate was per 100 total enrollees. Medical exemption rate increase in private schools, p < 0.05. Religious exemption rate increase in private and public schools, p < 0.05 for each, respectively.

Fig. 2. Religious exemption rates from school immunizations in New York State schools between 2003 through 2012. Notes: increase in religious exemption rates among Catholic/Eastern Orthodox, Protestant/Other Christian, Jewish, secular schools and public schools (Spearman’s R = 0.66, 0.99, 0.89, 0.93, and 0.81).
United States Private Schools Have Higher Rates of Exemptions to School Immunization Requirements than Public Schools

Jana Shaw, MD, MPH¹, Boldsetseg Tserenpuntsag, DrPH², Louise-Anne McNutt, PhD³, and Neal Halsey, MD⁴

Objectives: To compare medical, religious, and personal belief immunization exemption rates between private and public schools in the United States. (J Pediatr 2014;165:129-33).

Figure 1. Total (personal belief, religious, and medical reasons combined) exemption rate per 100 enrolled kindergarten students. Rates were calculated as the total number of exemptions divided by the number of students in the school and multiplied by 100.

Figure 2. Personal belief, religious, and medical exemption rate per 100 enrolled kindergarten students, stratified by whether personal exemptions were allowed (CDC School Immunization Assessment Survey for the school year 2009-2010). P values indicate a difference in the exemption rate between the private and public schools.
Highlight community interests and benefits to Public Health

• The benefits of vaccines extend beyond individual who is vaccinated

• Unvaccinated children pose risk to others:
  – Risk to other unvaccinated children
  – Risk to vaccinated individuals who remain susceptible to the VPDs
  – Risk to children who cannot be vaccinated
  – Cost to vaccinated who contract VPD

• “Free riders” place their family interest ahead of their civic responsibility
Build trust with hesitant parents

• Providers remain an important and influential source of vaccine information, with 85% of parents identifying healthcare personnel as 1 of the 3 most important sources of vaccine information.
• Nearly 40% of vaccine-hesitant parents changed their mind after having talked with their child’s provider.
• Build and strengthen trust with parents who remain hesitant
• Connect on a personal level, embrace their fears of harm as genuine and foster communication
• Develop creative and thoughtful approaches to building genuine trust and respect among providers, authorities, and parents.
• Research into interventions that could lead parents to accept vaccinations
• Develop innovative vaccination messages targeted to parents with a variety of vaccination sentiments are urgently needed.

New York Gov. Andrew Cuomo signed a bill on June 13, 2019. "The science is crystal clear: Vaccines are safe, effective and the best way to keep our children safe," Cuomo said after signing the bill. "While I understand and respect freedom of religion, our first job is to protect the public health and by signing this measure into law, we will help prevent further transmissions and stop this outbreak right in its tracks."

"We are facing an unprecedented public health crisis," said Sen. Brad Hoylman, the legislation's sponsor. "The atrocious peddlers of junk science and fraudulent medicine who we know as anti-vaxxers have spent years sowing unwarranted doubt and fear, but it is time for legislators to confront them head-on."

The Measles Success Story In California Shows Signs Of Fading

California’s Momentum On Measles Vaccinations Stalled

After rising sharply over three years, the percentage of kindergarten students at schools with vaccination rates of 95 percent and above — the level considered optimal for preventing outbreaks — stopped rising.

Note: Data based on schools with 20 or more kindergartners.

Credit: Harriet Blair Rowan/California Healthline
Figure Legend:
County-Level Change in the Percentage of Incoming Kindergarteners With a Medical Exemption From 2015 to 2016Two counties were not included in the analysis due to data censoring.
Thank you