

Measles: Return of vaccine preventable disease

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Financial Disclosures

• 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:
- <u>New York State, Rockland County</u>
- <u>New York City</u>
- <u>California, Butte County</u>
- California, LA County
- <u>California, Sacramento County</u>
- <u>Pennsylvania</u>
- 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



https://www.who.int/csr/don/06-may-2019-measles-euro/en/

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 undervaccinated individuals.
- <u>https://www.who.int/csr/don/06-may-2019-measles-euro/en/</u>



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Vaccine hesitancy

Vaccine hesitancy – the reluctance or refusal to vaccinate despite the availability of vaccinas – threatens to reverse progress made in tackling vaccine-preventable diseases. Vaccination is no of the most costeffective ways of avoiding disease – it currently prevents 2.3 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 30% 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 a resurgence.

The reasons why people choose not to vaccinate are complex, a vaccines advisory group to VMO identified complexency, 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, and they must be supported to provide trusted, credible information on vaccines.

In 2019, WHO will ramp up work to eliminate cervical cancer workdwide by increasing coverage of the HeV vaccine, among other interventions. 2019 may also be the year when transmission of wild politovirus 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 for good.

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

- 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

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.











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 <u>pregnant women who have not had the MMR vaccine</u> 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

Diarrhea	8%
Otitis media	7%
Pneumonia	6%
Encephalitis	0.1%
Seizures	0.6-0.7%
Death	0.2%









Measles virus causes immune memory loss for up to 2 to 3 years after infection



ARTICLE DOI: 10.1038/s41467-018-07515-0 OPEN

Studies into the mechanism of measles-associated immune suppression during a measles outbreak in the Netherlands

Brigitta M. Laksono¹, Rory D. de Vries¹, R. Joyce Verburgh¹, Eline G. Visser², Alwin de Jong¹, Pieter L.A. Fraaij^{1,2}, Wilhemina L.M. Ruijs³, David F. Nieuwenhuijse¹, Henk-Jan van den Ham[®] ^{1,5}, Marion P.G. Koopmans¹, Menno C. van Zelm[®] ^{4,6}, Albert D.M.E. Osterhaus^{1,7} & Rik L. de Swart[®] ¹ Published in final edited form as: Science. 2015 May 8; 348(6235): 694–699. doi:10.1126/science.aaa3662.

Long-term measles-induced immunomodulation increases overall childhood infectious disease mortality

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https://www.nature.com/articles/s41467-018-07515-0.pdf https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4823017/pdf/nihms773022.pdf

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/measles/transmission.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fmeasles%2Fabout%2Ftransmission.html 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 (<u>MMR</u>), or combined with mumps, rubella and varicella (<u>MMRV</u>).

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.

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

Measles – United States, 1950-2011



Measles – United States, 1980-2011



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

The U.S. Is in Danger of Losing Its Measles Elimination Status. Here's What That Could Mean for the Rest of the World.

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

	First Dose	Second Dose
Children*	Age 12-15 months	Age 4-6 years
Teenagers and adults with no evidence of immunity**	As soon as possible	N/A

* 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 <u>MMRV vaccine</u>, 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

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

TABLE 3 Pediatrician Impressions of Parental Reasons for Vaccine Delays in 2013

Pediatricians were asked to select \geq 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

Catherine Hough-Telford, MD,^a David W. Kimberlin, MD,^a Inmaculada Aban, MS, PhD,^a William P. Hitchcock, MD,^{b,†} Jon Almquist, MD,^c Richard Kratz, MD,^d Karen G. O'Connor, BS^a

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

Lifetime odds of death for selected causes, United States, 2017									
Cause of Death Odds of Dying									
Heart Disease	1 in 6								
Cancer	1 in 7								
Chronic Lower Respiratory Disease	1 in 27								
Suicide	1 in 88								
Opioid overdose	1 in 96								
Motor Vehicle Crash	1 in 103								
Fall	1 in 114								
Gun Assault	1 in 285								
Pedestrian Incident	1 in 556								
Motorcyclist	1 in 858								
Drowning	1 in 1,117								
Fire or Smoke	1 in 1,474								
Choking on Food	1 in 2,696								
Bicyclist	1 in 4,047								
Accidental Gun Discharge	1 in 8,527								
Sunstroke	1 in 8,912								
et al le le receient	a 1 45 400								

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 20-100 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 MARKEN STATES Several hundred volunteers Notat 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 va	ccine only if: Benefits out	weigh risks
Vaccines are made in batches called lots.	888 888 888 888 888 888 888 888 888	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 ensuro quality and safety.
	FOR MORE INFORMATIO	N. VISIT HTTPS://WWW.	FDA.GOV/CBER

If the FDA licenses a vaccine, experts may consider adding it to the recommended immunization schedule.

How a vaccine is added to the U.S. Recommended Immunization Schedule

The Advisory Committee on Immunization Practices (ACIP) is a group of medical and public health experts. Members of the American Academy of Pediatrics (AAP) and American Academy of Family Physicians (AAFP) are among some of the groups that also bring related immunization expertise to the committee. This group carefully reviews all available data about the vaccine from clinical trials and other studies to develop recommendations for vaccine use. The ACIP continues to monitor vaccine safety and effectiveness data even after the vaccine's routine use and may change or update recommendations based on that data.

When making recommendations, ACIP considers:

- . How safe is the vaccine when given at specific ages?
- . How well does the vaccine work at specific ages?
- How serious is the disease this vaccine prevents?
- How many children would get the disease the vaccine prevents if we didn't have the vaccine?

ACIP recommendations are not official until the CDC Director reviews and approves them and they are published. These recommendations then become part of the United States official childhood immunization schedule.

New vaccine to protect your child against a disease is added to the schedule.



FOR MORE INFORMATION, VISIT HTTPS://WWW.CDC.GOV/VACCINES

Vaccine schedule

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.

 VSD can analyze healthcare information from over 24 million people. PRISM can analyze healthcare information from 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.



Vaccine safety monitoring

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

http://www.ncsl.org/research/health/school-immunization-exemption-state-laws.aspx



More effective

Less effective No indexing

Average

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

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New York State: County Religious Exemption Rates in NYS Schools in 2000 and 2010



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^{\dagger} – United States and territories, 2017–18 school year

		Nonmedic	al exemptions		Any exem	ption			
Immunization program	Medical exemptions, no. (%)	Religious no.	Philosophical no.	Total no. (%)	2017- 18, no.	2017- 18 %	2016- 17 %	Percentage point difference (2016– 17 to 2017–18)	Grace period or provisional enrollment [§] no. (%)
Median [¶]	(0.2)	-	-	(2.0)	-	2.2	2.0	0.2	(1.8)

Return

https://www.cdc.gov/mmwr/volumes/67/wr/mm6740a4.htm

The right to refuse vaccines is disproportionately exercised by affluent parents



L,-A, McNutt et al. / Vaccine 34 (2016) 1733-1738

Table 1

Bivariate associations between kindergarten characteristics and percent of students in the kindergarten with a personal belief exemption (PBE), 2014–2015 academic year.

	PBE					p-Value
	N	<5%	5-9,9%	10-19,9%	20%+	
Tuition ^a						
\$1000-\$4999	150	78,7	11.3	7.3	2.7	< 0.01
\$5000-\$7499	196	75,5	12,8	8,2	3,5	
\$7500-\$9999	100	74.0	14.0	5,0	7.0	
\$10,000+	119	56,3	17.6	17,7	8.4	
Religion affiliation						
Roman Catholic	217	89,4	8,3	2,3	0.0	< 0.01
Christian ^b	168	64,3	16,1	13,7	5,9	
Secular	159	58,5	19,5	10,7	11.3	
Jewish	12	50,0	0.0	50,0	0,0	
Islamic	9	66,7	11.1	22.2	0.0	
Kindergarten enroll	ment					
10-14	95	65,3	9,5	14,7	10,5	< 0.01
15-24	221	71,5	14,5	10,8	3,2	
25-34	111	77,5	10,8	7.2	4,5	
35+	138	73,2	17.4	5,1	4,3	

^a Tuition for full-day kindergarten.

^b Christian schools included 157 schools not affiliated with a major church, 7 Seventh Day Adventist, 2 Baptist and 2 Lutheran schools.

Fig. 1. Proportion of all private and public schools in California reporting levels of Personal Belief Exemptions (PBEs), 2000-2015,

McNutt LA, Desemone C, DeNicola E, El Chebib H, Nadeau JA, Bednarczyk JA, Shaw J. Vaccine 2016;34(14):1733-8.

Vaccination Rates at New York Schools 2013-14

Exemptors are geographically clustered

(i) Not secure	rochester.n	ydataba	ses.com/database/	vaccination-r	ates-new-york-	schools						🍖 🕁	0 0) :
ıblic S 🔫 Sch	ool Immunizatio	Fi	Logon 🗋 New Yo	rk Statewid	🔀 Biological J	ournals G	Google 🖋 H	erd Immunity A	nd 🔌 Log	on to the Healt.	•	»	, Other book	cmark
COUNTY ▲▼	DISTRICT NAME	TYPE ▲▼	SCHOOL NAME ▲ ▼	STUDENTS ▲▼	% MEDICAL EXEMPTIONS	% RELIGIOUS EXEMPTIONS	% IMMUNIZED POLIO ▲ ▼	% IMMUNIZED MEASLES ▲▼	% IMMUNIZED MUMPS ▲▼	% IMMUNIZED RUBELLA ▲ ▼	% IMMUNIZED DIPTHERIA	% IMMUNIZED HEPATITIS B	% IMMUNIZED VARICELLA	% CO IMN
ROCKLAND		Private School	YESHIVA AVIR YAKOV-GIRLS & BOYS	3,058	0%	0.1%	96%	92.2%	95.5%	95.4%	96.1%	95.9%	94.8%	85.9
ORANGE		Private School	CONGREGATION SHERI TORAH OF KHAL VYOEL MOSHE	2,734	0.9%	0.2%	88.3%	88.3%	88.3%	88.3%	88.3%	88%	88.3%	88%
ROCKLAND		Private School	YESHIVA AHAVATH ISRAEL-BNOS VISNITZ	2,948	0.4%	4.2%	95.3%	90.8%	95.3%	95.3%	95.3%	94.7%	93%	89.9
NEW YORK		Private School	U N INTERNATIONAL SCHOOLC/O NADIA BENSON	1,501	0%	0.1%	97.2%	98.8%	98.8%	98.8%	97.7%	96.3%	97.2%	85%
ROCKLAND		Private School	YESHIVA BELZ	379	0%	0.7%	73.9%	58.6%	74.3%	74.3%	73.9%	72%	68.1%	53.
ROCKLAND		Private School	UTA-GIRLS	1,993	0.1%	6.5%	93%	91.9%	92.3%	92.3%	93%	92.2%	92.9%	91.3
KINGS		Private School	KHHD YOEL OF SATMAR BP	4,832	0%	0%	99.3%	100%	100%	100%	99.2%	99.1%	99.6%	96.6

http://rochester.nydatabases.com/database/vaccination-rates-new-york-schools

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



ate private and public schools

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alth, State University of New York, University at Albany, Albany, NY, United States + Environment, University at Albany, State University of New York, Albany, NY, United States s Hospital, State University of New York, Syracuse, NY, United States

vaccine 32 (2014) 7070-7070

exemptions to school immunization requirements among







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).

-- o...r



(J Pediatr 2014;165:129-33).

Figure 1. Total (personal belief, religious, and medical reasons combined) exemption rate per 100 enrolled kinder-

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.

1. Shaw J, Long SS. Public Discourse on Measles, A Shot in the Arm for Vaccination. J Pediatr **2015**;167(2):477–480; 2. Kennedy A, LaVail K, Nowak G, Basket M, Landry S. Confidence about vaccines in the United States: understanding parents' perceptions. Health Aff 2011;30:1151-9.

3.Gust DA, Darling N, Kennedy A, Schwartz B. Parents with doubts about vaccines: which vaccines and reasons why. Pediatrics 2008;122:718-25.

Amid measles outbreak, New York ends religious exemptions for vaccines

- New York Gov. Andrew Cuomo signed a <u>bill</u> on June 13,2019
- "The science is crystal clear: Vaccines are safe, effective and the best way to keep our children safe," Cuomo <u>said</u> 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."

https://www.npr.org/2019/06/13/732501865/new-york-advances-bill-endingreligious-exemptions-for-vaccines-amid-health-cris

The Measles Success Story In California Shows Signs Of Fading

By Harriet Blair Rowan FEBRUARY 22, 2019

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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



From: Change in Medical Exemptions From Immunization in California After Elimination of Personal Belief Exemptions

JAMA. 2017;318(9):863-864. doi:10.1001/jama.2017.9242



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