

2

Ricardo Fumari/Brazil Photos/LightRocket
via Getty Images



A patient with measles, a highly contagious disease, rests at the Amazon Tropical Medicine Foundation in Manaus, Brazil. In the first three months of 2019 the number of measles cases worldwide rose 300 percent compared to the same period in 2018, according to the World Health Organization.

From *CQ Researcher*,
September 13, 2019

Measles Resurgence

Can experts reduce skepticism about vaccines?

By Melba Newsome

THE ISSUES

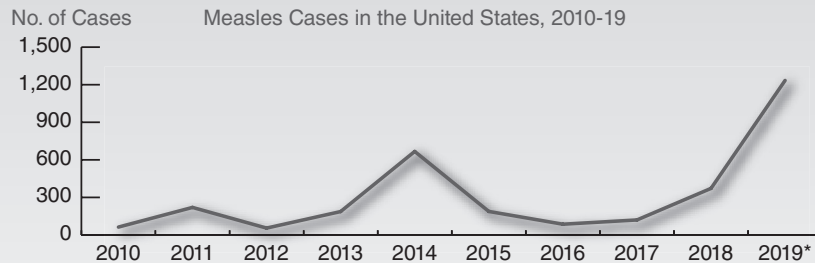
Rachel's seven children range in age from 1 to 15. After her oldest received the vaccine for measles, mumps and rubella (MMR) when she was 18 months old, the child was hospitalized with a 106-degree fever. Despite her doctor's assurance that the vaccination was blameless, Rachel was unsatisfied. Information from an anti-vaccine advocacy group convinced her that vaccines were harmful, so she did not vaccinate her youngest children.

Rachel, who asked that her real name not be used, is an Orthodox Jew living in Brooklyn's Williamsburg neighborhood, where vaccination rates among the ultra-Orthodox community have dropped precipitously. Visitors from places where measles was spreading, such as Israel, enabled the disease to get a foothold in Brooklyn.¹ Similar conditions caused outbreaks in Rockland County, N.Y., and Ocean County, N.J. Washington state has had two outbreaks and 86 reported cases this year.² One was traced to an exposure at Sea-Tac Airport in Seattle and the other to Clark County in southern Washington, where only 78 percent of 6- to 18-year-olds are vaccinated.³

The World Health Organization (WHO) declared measles eliminated in the United States in 2000, but recently skepticism has arisen—fueled largely by misinformation on the internet and a campaign by high-profile critics—about the safety, efficacy and necessity of vaccines.

U.S. Measles Cases Spike in 2019

The number of measles cases in the United States this year reached 1,241 by Sept. 5, more than three times the number in all of 2018, according to the Centers for Disease Control and Prevention. The last spike in measles cases in the past decade occurred in 2014, with much of the increase resulting from an outbreak among unvaccinated Amish communities.



* Through Sept. 5.

Source: "Measles Cases and Outbreaks," Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Sept. 9, 2019, <https://tinyurl.com/y39perlml>

states are eliminating exemptions from mandatory vaccination policies for schoolchildren, and health officials are using a variety of strategies to overcome skepticism about the necessity and safety of vaccines.

Measles is transmitted by direct contact with infectious droplets or spread through the air for up to two hours after an infected person breathes, coughs or sneezes. Babies, young children, pregnant women and people with compromised immune

systems are at greatest risk. Measles is so contagious that a single child in a pediatric oncology clinic in Shanghai infected 23 other children; nearly 22 percent of them died and more than half suffered severe complications.⁵

Before the measles vaccine was introduced in 1963, about 4 million people in the United States contracted the disease annually, says Dr. Sandra Fryhofer, a member of the board of trustees of the American Medical Association. Of those who caught measles each year, 500 died, 48,000 had to be hospitalized and about 1,000 developed chronic disabilities from acute encephalitis, an inflammation and swelling of the brain that can cause hearing loss, pneumonia and brain damage, she says. "Worldwide, it killed between 2 and 3 million people annually," she says.

Before the development of vaccines, thousands of people each year were sickened, impaired and even killed by common illnesses such as measles, mumps and chicken pox. Vaccines have led to the decline or eradication of many of those diseases, leading to public complacency about the dangers of diseases such as the measles, says Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases (NIAID), a division of the National Institutes of Health that conducts and supports research on infectious diseases.



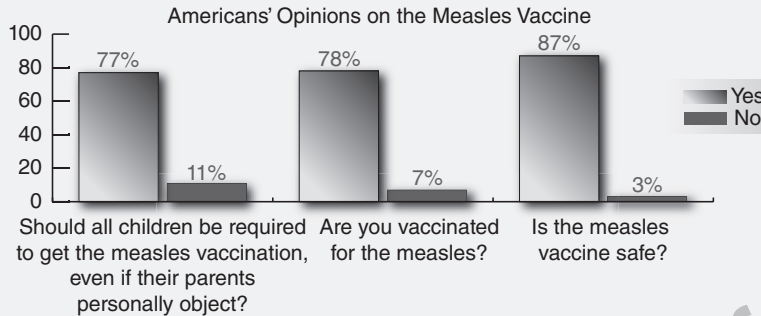
Spencer Platt/Getty Images

A sign in the Williamsburg section of Brooklyn in New York City tells people who have been exposed to the measles or who have symptoms of the disease not to enter the building. Earlier in 2019, Mayor Bill de Blasio declared a state of emergency during a measles outbreak in the city's ultra-Orthodox Jewish community.

Immunization rates are down, particularly in certain communities, and the incidence of measles among the unvaccinated has been on the rise, reaching the highest level since 1992 during the first eight months of this year. Infectious disease experts say unless this trend reverses, the disease is poised to return full force this school year.⁴ Some

Most Americans Support Mandatory Measles Vaccine

As the number of measles cases rises in the United States, Americans overwhelmingly support requiring that all children be vaccinated against the disease, a stricter rule than exists in most states today. A similar percentage say they have been vaccinated for measles, and 87 percent believe the vaccine is safe.



Source: Gabriella Borter, "77% of Americans say kids should get measles shot even if parents object: Reuters Poll," Reuters, May 7, 2019, <https://tinyurl.com/y3qcxdkr>

Although health officials in New York declared on Sept. 3, 2019, that the measles outbreak there had ended, by Sept. 5, 2019, 1,241 measles cases have been reported nationwide, with cases in 31 states, according to the latest report from the U.S. Centers for Disease Control and Prevention (CDC).⁶ Of those who caught measles this year, 130 people have been hospitalized and 65 have suffered complications such as pneumonia or encephalitis.⁷

Moreover, preliminary data from the WHO indicates measles is on the rise worldwide, with reported cases up 300 percent in the first three months of this year over the same period in 2018.⁸ A 43-year-old Israeli flight attendant and mother of three contracted the disease in March after flying from New York City to Israel. She suffered brain damage, fell into a coma and died on Aug. 13, the third measles death in Israel since 2018.⁹

Public health officials blame this year's measles outbreaks on anti-vaccine groups and misinformation spread via the internet, social media and through documentaries such as *Vaxxed: From Coverup to Catastrophe*. This film was written, produced and directed by Andrew Wakefield, a British researcher who is best known for writing a 1998 article in the British medical journal *The Lancet* linking vaccines to autism, which has since been discredited.¹⁰ Amazon removed *Vaxxed* from its video

streaming service after Rep. Adam Schiff, D-Calif., complained to Amazon CEO Jeff Bezos that it contained misleading information about vaccines.¹¹

Despite the overwhelming scientific consensus that the MMR vaccine is safe for healthy children, reluctance to have children vaccinated continues to pose a public health challenge—and is not limited to the United States. The WHO calls such "vaccine hesitancy" one of the top 10 threats to global health and a serious hurdle to the worldwide eradication of measles.¹²

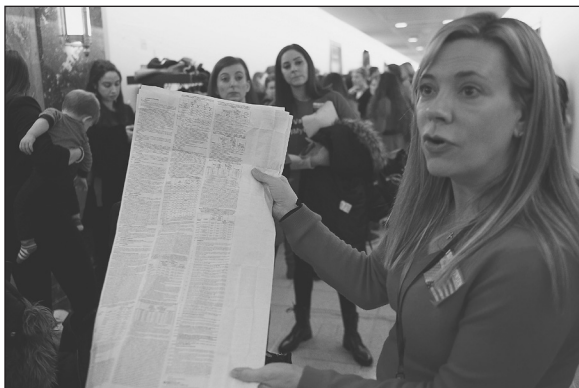
In the United States, all states have requirements for schoolchildren to receive the MMR vaccine, but 45 states allow parents to opt out for medical, religious or philosophical reasons. Many parents who oppose vaccines have done so using the philosophical and religious exemption.

Linda Fentiman, a professor at Pace University School of Law and author of *Blaming Mothers: American Law and the Risks to Children's Health*, says anti-vaxxers are "disproportionately people with more education, more wealth or more time. They typically cluster in groups, and the word spreads about how to claim exemptions."

But Richard Moskowitz, a family physician specializing in homeopathic medicine, has a different view. In his book, *Vaccines, A Reappraisal*, he wrote that making vaccines mandatory poses significant risks of disease, injury and death, deprives citizens of genuinely informed consent and prevents parents from making health care decisions for their own children.

"If you cannot voluntarily decide when and for what reason you are willing to risk your life or the life of your child, your unalienable right to life and liberty has been taken from you," said Barbara Loe Fisher, co-founder and president of the National Vaccine Information Center, a group based in Sterling, Va., that lobbies for vaccine safety reforms and for informed consent protections for parents.¹³

Fisher was referring to vaccines in general, and neither Fisher nor Moskowitz gave examples of children dying from getting the MMR vaccine. In fact, the MMR appears to be one of the safest vaccines available, according to data from the National Vaccine Injury Compensation Program, a federal program that compensates people who have been injured by vaccines.



JIM WATSON/AFP via Getty Images

An anti-vaccine parent holds up a prescription document as she waits to enter a hearing about vaccines before the Senate Committee on Health, Education, Labor & Pensions in March, 2019. While some celebrities and internet activists help spread the idea that vaccines are unsafe, most Americans support mandatory vaccinations for schoolchildren.



Robert Gauthier/Los Angeles Times via Getty Images

John Leddy swings his 2-year-old daughter, Vanessa, with wife Christy Lambertson, at a park in Culver City, Calif. When the couple found out that the day care center they were considering for their daughter had a low measles vaccination rate, they decided not to enroll her there.

Between 2006 and 2017, some 101 million doses of the MMR vaccine were distributed in the United States, but only 123 people were compensated for an injury from the vaccine during that period, according to the program's database.¹⁴

While many vaccine opponents believe vaccines are unsafe, others make a different argument: Parents are best positioned to determine whether their child needs a particular vaccine and are better qualified than health experts or public health agencies to decide what is in their family's best interests.¹⁵

But Fentiman says it is not that simple. "No matter how much a parent tries to educate themselves, most are not physicians and aren't able to assess the risk because there is so much misinformation," she says. In addition, "When a parent decides not to vaccinate their child, other children are . . . being put at risk."

Several well-known people, ranging from President Trump—before he took office—to Hollywood celebrities, have at times used their highly visible platforms to spread doubts about vaccine safety and oppose mandatory vaccinations. In June 2019, actress Jessica Biel lobbied California state legislators against a proposed bill that would make it more difficult to claim a medical exemption, arguing that vaccine decisions should be left to parents, not mandated by the state. Other performers who have opposed mandatory vaccinations include Robert DeNiro, Jenna Elfman, Jim Carrey and Juliette Lewis.

"Celebrities have always had an exaggerated and often unwarranted influence on society," said Andrew Selepak, a media professor at the University of Florida. "That we place such high value on the uninformed opinions of celebrities is one problem, but the bigger problem is when we act on these uninformed opinions and it puts ourselves or others in danger."¹⁶

In 2014, before entering electoral politics, Trump, a Republican, lent credence to the discredited claim that vaccines can cause autism, tweeting: "Healthy young child goes to doctor, gets pumped with massive shot of many vaccines, doesn't feel good and changes—AUTISM. Many such cases!"¹⁷ Shortly before he was sworn in as president, Trump met with vaccine skeptic Robert F. Kennedy Jr., who later said Trump asked him to lead a commission on vaccine safety. However, the commission was never formed.¹⁸

But after this year's measles outbreaks, the president urged parents to vaccinate their children. "They have to get the shots. The vaccinations are so important," Trump told reporters in April. "This is really going around now. They have to get their shots."¹⁹

Dr. Dean Blumberg, chief of pediatric infectious diseases at UC Davis Children's Hospital, says Trump's mixed message is harmful. "You need clear, consistent messaging. One slip-up and we're back to the conspiracy theories," says Blumberg. "Every time a respected public figure waffles on the issue, that is a definite setback that will take years to overcome."

In addition, if the Trump administration succeeds in its effort to overturn the Affordable Care Act, insurance companies will no longer be required to pay for federally recommended vaccinations with no out-of-pocket costs, making them unaffordable for many families, wrote University of Connecticut law professor John Aloysius Cogan Jr. in a piece for the medical news website *Stat*.²⁰

U.S. health officials are using a variety of strategies to improve measles vaccination rates and halt the disease's spread, starting with repeatedly debunking widespread misinformation. Fauci, of the NIAID, says it is important to involve community and religious leaders and health care workers so skeptics can get reliable information from their peers rather than from government officials.

"Public health officials can't pejoratively confront them because that will turn them off," says Fauci. "We have to present the communities with the facts in a measured way and get them to understand that they need to make health decisions based on facts, not on distorted and false information."

BACKGROUND

Foundations Laid Early

Vaccines can be traced to 10th-century China, when the first precursor of today's immunizations was used to guard against smallpox.²¹

In 1796, English country doctor Edward Jenner inoculated an 8-year-old boy with pus from a cowpox lesion on a milkmaid's hand. Six weeks later, when Jenner infected the boy with smallpox, the disease failed to take hold, laying the foundation for modern vaccinology.



Christopher Fine Art/Universal Images Group via Getty Images

A painting by Georges Gaston Mélingue shows the first vaccination, performed by English doctor Edward Jenner, who is inoculating 8-year-old James Phipps in 1796 using pus from a cowpox lesion on a milkmaid's hand.

The 20th century ushered in the modern age of immunology with vaccines against pertussis, also called whooping cough, in 1914, diphtheria in 1926 and tetanus in 1938. By the late 1940s, vaccines were being mass-produced, allowing the implementation of disease control policies on a much broader scale.

Following a record-setting polio outbreak of almost 58,000 cases in 1952, medical researcher Jonas Salk announced he had developed a vaccination for the dreaded disease, which frequently caused paralysis and was often fatal. The polio vaccine was introduced in 1955, followed by the measles vaccine in 1963. Vaccines against mumps and rubella followed in 1967 and 1969, respectively. All three were combined into the MMR vaccine in 1971.

Every February the CDC updates its recommendations on who should receive vaccines, at what age, how many doses, the length of time between doses and what combination, if any, of vaccines should be given. While the CDC's recommendations are not mandatory, states typically use the CDC schedule as the basis for requiring children to be vaccinated before they can attend public schools. All 50 states and the District of Columbia require public school students to be vac-

C H R O N O L O G Y

900s-1920s *Early efforts to immunize against disease are developed.*

900-1000 The variolation technique—deliberate infection with a disease—is developed in China to inoculate against smallpox.

1796 After noticing that milkmaids who contract cowpox appear immune to smallpox, English scientist Edward Jenner inoculates an 8-year-old boy with pus from a cowpox blister on the hand of an infected milkmaid. The boy does not contract smallpox. Two years later, Jenner publishes his work on the development of a smallpox vaccine.

1800 Benjamin Waterhouse, a Harvard professor of medicine, performs the first vaccinations in the United States on his children and works to encourage public immunization.

1885 French biologist Louis Pasteur prevents rabies in a 9-year-old boy with a live rabies vaccine. . . . Spanish physician Jaime Ferrán develops a live cholera vaccine, the first immunization against a bacterial disease.

1898 Greater regulation of pharmaceutical companies and advances in microbiology lead to increased vaccine safety and production.

1899 British military uses early version of typhoid vaccines during the second Boer war.

1902 After 22 children die from contaminated diphtheria and smallpox vaccines, Congress enacts the Biologics Control Act to establish government oversight of the purity of biological treatments.

1914 U.S. scientists develop vaccines for typhoid, rabies and tetanus.

1915 Vaccine against pertussis (whooping cough) is approved.

1923 Diphtheria vaccine is licensed.

1940s-1960s *Scientists develop additional vaccines.*

1945 The first influenza vaccine is approved in the United States for military use, and in 1946 for civilian use.

1949 The last case of smallpox in the United States is reported. . . . A combination vaccine to immunize against diphtheria, pertussis and tetanus is licensed.

1952 The worst polio epidemic in U.S. history results in 57,628 reported cases.

1954 American scientist John Enders and pediatrician Thomas Peebles isolate the measles virus in cell culture.

1955 American scientist Jonas Salk licenses the first polio vaccine. . . . Six years later, Albert Sabin's oral polio vaccine is licensed for use in the United States.

1962 The Vaccination Assistance Act allows the Centers for Disease Control and Prevention (CDC) to launch mass immunization campaigns.

1960s-2000 *As more vaccines are developed, questions are raised about the safety of immunization.*

1963 Measles vaccine is introduced.

1964 The U.S. surgeon general creates the Immunization Practices Advisory Committee to review the childhood immunization schedule and recommend newly licensed vaccines.

1966 The CDC announces the first national measles eradication campaign. . . . Two years later the incidence of measles has fallen by more than 90 percent.

1967 The U.S. Food and Drug Administration approves the mumps vaccine.

1971 A combined measles, mumps and rubella (known as German measles) vaccine (MMR) is developed.

1977 The Department of Health, Education and Welfare launches the national Childhood Immunization Initiative, which aims to achieve 90 percent vaccination levels among all U.S. children.

1980 The United Nations' World Health Assembly certifies that the world is free of naturally occurring smallpox.

1986 The Department of Health and Human Services establishes the Vaccine Adverse Event Reporting System to

accept reports of suspected adverse reactions to vaccines against measles, mumps, rubella, polio, pertussis, diphtheria and tetanus.

1988 Congress establishes the National Vaccine Injury Compensation Program to compensate victims of vaccine-related injury or death.

1998 British medical journal *The Lancet* publishes a study linking vaccines to autism, an article it retracts 12 years later.

2000-Present *Despite advances in vaccines, immunization rates fall and measles makes a comeback in some areas as new controversies and fears arise about vaccine safety, largely spread via the internet.*

2000 The CDC declares measles eradicated in the United States.

2005 The CDC announces that rubella is no longer regularly found in the United States.

2014 U.S. measles cases spike to 667—up by more than threefold from the previous year's total—much of it due to an outbreak among unvaccinated Amish communities.

2018 Measles cases start to rise, up threefold from 2017.

2019 The CDC reports 1,241 measles cases in the United States as of Sept. 5, the highest number in 27 years. . . . The World Health Organization lists reluctance to undergo vaccination as one of the 10 greatest threats to global health.

nated, while allowing exemptions for medical reasons. Forty-four states and the district allow exemptions based on religious grounds and 15 states allow exemptions for personal, moral or other beliefs. Five states—New York, California, Maine, Mississippi and West Virginia—do not allow religious or philosophical exceptions.²²

According to the CDC, children should receive the MMR vaccine shortly after their first birthday and a second dose between the ages of 4 and 6. This schedule confers immunity to measles, mumps and rubella to 97 percent of vaccinated children. The remaining 3 percent may still contract one of those diseases, though often with milder symptoms.

While vaccines have saved millions of lives over the years, some people have, in fact, been injured by vaccines. The federal government in 1986 established the National Vaccine Injury Compensation Program to compensate people injured by vaccines. By establishing the program, the government also exempted vaccine manufacturers from liability for injuries caused by vaccines. The program's online database indicates that the MMR vaccine is extremely safe compared to other vaccines: Of the 4,400 people compensated for injuries caused by the 3.5 billion vaccine doses distributed in the United States between 2006 and 2017, only 123 were compensated for injuries due to the MMR vaccine.²³

Vaccines have often stirred controversy, with public reactions ranging from awe to skepticism and outright hostility.²⁴

In 1998, the British medical journal *The Lancet* published a paper by Wakefield asserting a link between the MMR vaccine and autism, a condition characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication. Many parents seized on the study as proof that the vaccine was dangerous. But in 2010, after years of controversy, *The Lancet* retracted the paper, saying that several elements were incorrect. Wakefield later lost his medical license in the United Kingdom.²⁵

Nevertheless, many anti-vaccine activists still cite that article as evidence that vaccines are dangerous. Experts say the internet and social media have greatly increased the ability to spread misinformation, taking a once-fringe issue mainstream.

In addition to the many sincere anti-vaccine activists, more nefarious actors have used social media to spread the message, Blumberg says. "This anti-vaccine message has been amplified by Russian bots because it creates conflict and creates discord," he says. "It's not surprising that the Russians would want U.S. children to be vulnerable to disease."

In addition, during a 2015 GOP presidential primary debate, candidates Trump, Ben Carson and Sen. Rand Paul all voiced concerns about vaccine safety. Trump told the story of a 2-year-old who allegedly became autistic after

“Herd Immunity” Acts As Shield

It protects those who cannot be vaccinated due to health reasons.

The term “herd immunity” refers to indirect protection from an infectious disease that occurs when a community or a population has near-universal immunity to the disease. It is usually achieved when a certain proportion of individuals in a particular population have been immunized, reducing the incidence of infection and thus protecting the population from new infection.¹

With herd immunity, people who have not themselves been immunized have a lower risk of infection if the virus or disease is introduced into that community. In other words, vaccinations protect not only the immunized individuals but also those with whom they come in contact. Thus, if vaccination rates remain high, the disease becomes rare and may be eliminated altogether. “When a high percentage of people in the community are vaccinated, those vulnerable people who can’t get vaccinated are protected because the virus has no place to spread,” says Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases.

This community immunity, as it is also known, only works for diseases spread directly between people, such as measles, mumps and rubella. It does not work on tetanus, for example, which is caught from bacteria in the environment.

In the case of measles, most Americans born before the 1970s became immune by contracting and surviving the virus. The first measles vaccine was developed in 1963, and the combined measles, mumps and rubella (MMR) vaccine was introduced in 1971.²

To achieve herd immunity, all 50 states, the District of Columbia and several U.S. territories require that children entering schools and child care receive the MMR vaccine. That raises the question frequently asked by vaccine skeptics: Why does failing to vaccinate a child pose a risk to him or her and others if the child is protected through herd immunity?

The answer, experts say, is that vaccination is the best protection against a disease. In addition, unless the unvaccinated individual stays in one location, surrounded by the same people, he or she cannot rely on the herd for protection. Traveling to a place with lower vaccine coverage puts the unvaccinated at risk.³

While vaccine-preventable diseases such as measles are rare in the United States, they are still prevalent elsewhere in the world. The recent measles outbreaks in Washington state and in the ultra-Orthodox communities in New York and New Jersey occurred after vaccination rates dropped

being vaccinated. Carson—a neurosurgeon—expressed concern that bundling vaccines like MMR might be dangerous and Paul, an ophthalmologist, suggested that mandatory vaccines infringed on parental freedom.²⁶

“We are in a constant battle between what’s true and not,” says Dr. Robert McLean, President of the American College of Physicians. “The anti-vaxxer stuff is always a challenge because, even when you present [parents] with the facts, they don’t believe them. They think they’re selective facts.”

CURRENT SITUATION

State Exemptions

Several state legislatures are reassessing their vaccine waiver policies after a dramatic increase in nonmedical exemptions has been shown to be associated with outbreaks of vaccine-preventable disease.²⁷

On Jan. 25, 2019, Washington Gov. Jay Inslee, a Democrat, declared a state of emergency in all counties in response to more than two dozen confirmed cases of measles in the state. Months later, the state enacted a law that eliminated personal and philosophical objections to the MMR vaccine for children in public and private schools and day care centers.²⁸

In New York state, a bill introduced by Democratic Sen. Brad Hoylman to discontinue the religious exemption for immunizations for public school students became law in June.²⁹

On May 25, 2019, Maine enacted one of the country’s toughest vaccination laws, removing all nonmedical exemptions. “It is my responsibility to protect the health and safety of all Maine people, and it has become clear that our current laws do not adequately protect against the risks posed,” Democratic Gov. Janet Mills said in a written statement. Doctors and pediatric primary care

and infected travelers brought the virus into the United States, where it took hold in undervaccinated populations.

In addition, some people cannot be vaccinated for health reasons, such as being ill, taking medication that weakens the immune system, being allergic to the vaccine or one of its ingredients or having had a serious reaction to a vaccine in the past. Others are too young to be immunized. Such individuals are most vulnerable to infection and must rely on others for protection.

That protective shield is pierced or compromised when vaccination rates fall below those required to trigger herd immunity. The rate differs according to the disease, but it typically ranges between 90 percent and 95 percent. Because measles is the most infectious of the vaccine-treatable diseases, 93 percent to 95 percent of the population must be immunized for herd immunity to work. For a less contagious disease, such as polio, only 80 percent to 85 percent of the population would need to be vaccinated.

Before the MMR vaccine was introduced, every person with measles would infect another 10-15 people, leading to a rapid spread of the disease. Even a slight decline below the herd immunity threshold puts others at risk, with potentially disastrous consequences. In one 2015 case in China, a single baby with measles infected 23 other children in a pediatric oncology clinic, with a fatality rate of nearly 22 percent.⁴ The children were too young to be fully

vaccinated, and because they had cancer, their immune systems were compromised, so they were doubly at risk.

A study published in the journal *JAMA Pediatrics* found that a 5 percent reduction in MMR vaccination rates resulted in a threefold increase in annual measles cases.⁵

“Herd immunity through high vaccination rates helps minimize transmission of disease to the unvaccinated and people who are at the highest risk of severe infection,” says Dr. Sandra Fryhofer, a member of the board of trustees of the American Medical Association. “Vaccines not only protect the child or adult who receives them but also the health of the community.”

—Melba Newsome

¹ Paul Fine, Ken Eames and David L. Heymann, “‘Herd Immunity:’ A Rough Guide,” *Clinical Infectious Diseases*, Vol. 52, Issue 7, April 1, 2011, pp. 911-916, <https://tinyurl.com/ydz8mozw>.

² “Vaccine History: Developments by Year,” Children’s Hospital of Philadelphia, undated, <https://tinyurl.com/y47ds566>.

³ “Measles, Mumps and Rubella (MMR) Vaccination: What Everyone Should Know,” U.S. Centers for Disease Control and Prevention, undated, <https://tinyurl.com/y7joyjwh>.

⁴ Y.L. Ge *et al.*, “Measles outbreak in pediatric hematology and oncology patients in Shanghai, 2015,” *Chinese Medical Journal*, June 5, 2017, <https://tinyurl.com/y3762tax>.

⁵ Nathan C. Lo and Peter J. Hotez, “Public Health and Economic Consequences of Vaccine Hesitancy for Measles in the United States,” *JAMA Pediatrics*, September 2017, <https://tinyurl.com/yxfywubx>.

givers will now determine if a child should receive a medical exemption and the Maine Center for Disease Control will report on the safety and effectiveness of vaccines in an effort to increase transparency. Unvaccinated students will have until 2021 to receive vaccinations required for school.

Given California’s experience with such laws, they may not solve the problem of vaccine avoidance. After a measles outbreak that began at Disneyland in 2014, the state eliminated all religious and personal belief vaccine exemptions in 2015.³⁰ But parents exploited another provision in the law, says Catherine Flores-Martin, executive director of the California Immunization Coalition, an advocacy group in Sacramento that promotes full immunization in the state.

“Some found doctors willing to write medical exemptions so that their children would not get

vaccinations and still be in school,” she says. “We know this because they shared information on the internet, Facebook and other social media sites about where parents could find a vaccine exemption-friendly doctor.”

California State Sen. Dr. Richard Pan, a Democrat and a pediatrician, introduced a bill to require that a doctor’s waiver be approved by state health officials.³¹ Both measures have been strongly opposed by anti-vaccine advocates, including Kennedy, and groups such as the Informed Consent Action Network and Parents United 4 Kids. Actress Biel traveled to the state Capitol in Sacramento to lobby against the new legislation. Opponents say these provisions violate patient-doctor relationships and infringe on medical freedom.

Dorit Reiss, a UC Hastings law professor, has written extensively about the vaccine requirements and testified

A T I S S U E

Should nonmedical vaccine exemptions be eliminated?

YES**Sandra Fryhofer, M.D.***Board Member, American Medical Association; Liaison to the Advisory Committee on Immunization Practices*Written for *CQ Researcher*, September 2019

Immunization programs are credited with having controlled or eliminated the spread of epidemic diseases, including measles, smallpox, mumps, rubella, diphtheria and polio. That public health success is in jeopardy today as a growing number of parents are refusing to vaccinate their children based on long-debunked claims about vaccine safety, efficacy or necessity.

According to the Centers for Disease Control and Prevention (CDC), the United States has the highest number of measles cases since the disease was considered eradicated nearly 20 years ago. This recent outbreak is the result of declining vaccination rates.

The scientific evidence is overwhelming that vaccines are among the safest and most effective medical interventions. Vaccines prevent death and illness from preventable diseases, such as measles, and safeguard public health by helping to prevent the disease from spreading to others in close contact. When individuals opt out as a matter of convenience, personal preference or misinformation, they put themselves and others at risk—particularly children too young to be vaccinated, cancer patients and other immunosuppressed patients who cannot be vaccinated.

To protect communities, it is vitally important that policymakers eliminate nonmedical exemptions from required childhood immunizations and physicians grant exemption requests only when patients cannot receive vaccines for medical reasons. And, given the declining child vaccination rates, the American Medical Association supports legislation, regulations, programs and policies that encourage states to eliminate all nonmedical exemptions from mandated pediatric immunizations.

Nonmedical vaccine exemptions have doubled in the past 20 years. The process for obtaining personal-belief exemptions varies by state, with some requiring education about the risks and benefits of vaccines before an exemption can be granted and others allowing a parent to simply check a box on a school form. Allowing personal-belief exemptions lends credence to the disproven claim that vaccines are unsafe or cause health problems.

Broad vaccine exemption policies take us down a dangerous path to compromising public health. People who cannot be vaccinated due to medical reasons rely on community or “herd” immunity to prevent disease. At least 93 percent of the population

NO**Michael Sussman***Civil Rights Lawyer for Vaccine Opponents*Written for *CQ Researcher*, September 2019

The difficulty with eliminating nonmedical vaccine waivers is vividly illustrated by a pending vaccine exemption case in New York state.

In early fall 2018, a measles outbreak developed in several New York counties. Public health authorities failed to utilize the measures and means permitted by state law to quell such outbreaks. They did not quarantine or isolate those infected with measles. The outbreak spread, and in early December a county health commissioner barred all unvaccinated children from all public and private schools, even though there was no evidence that these children had contributed to the spread of the disease. In addition, state law allows that if a case of measles occurs in any school, unvaccinated children could be barred from that school for several weeks.

In March 2019, Rockland County Executive Ed Day declared a public health emergency, ordered all unvaccinated children with religious exemptions to remain indoors and barred them from any public place. Apart from the obvious enforcement issues, this ban was both troublingly overbroad and under-inclusive at the same time. Unvaccinated adults were not included because it would be too expensive and disruptive, Day’s lawyer told a state Supreme Court justice. And more than 1,000 healthy children were stigmatized and isolated by Day’s order. The Supreme Court enjoined Day’s ban, so Day began vociferously lobbying state legislators to repeal the religious exemption to vaccinations. His message—and that of bill sponsors—was quite blunt: People claiming religious exemptions were frauds; no religion prohibits vaccinations, and those claiming the contrary were pretenders.

This direct assault on sincerely held religious beliefs continued in the legislature, where lawmakers repealed the 55-year-old religious exemption, without any legislative hearings, tossing 26,000 children out of their schools without a strategy for educating them. This includes special-needs children whose educations are protected by federal law.

I am challenging the repeal of the religious exemption, because the legislative debate makes it clear that the discussion was dominated by an animosity toward religion—indeed, the outright denigration of people of religious faith, invalidating the state’s action. Motive matters,

needs to receive the measles vaccine to guard against the spread of the disease.

Some parents say they should be free to make medical decisions on behalf of their children, but they also have a responsibility to do what's in the best interest of their child and the community at large. We cannot allow misinformation and persistent rumors about vaccines to take us backward in this fight to eradicate disease.

and those who spoke made clear that their very belated response to the ebbing outbreak was intended to signal that people who hold religious views contrary to those of the majority should be damned. That is not what a constitutional democracy looks like. It is more like the establishment of a state religion, which is prohibited, quite strictly, by the First Amendment.

before the California State Senate judiciary committee in support of the current law and the proposed change. “No court, state or federal, has ever struck down an immunization law, because parental rights have never been absolute,” says Reiss. “They have always been limited. Vaccine mandates are especially natural because they protect the welfare of the child and the safety of others.”

Not all such legislative efforts have been successful. Democrats in the Oregon Legislature abandoned a bill to end nonmedical exemptions after Republicans walked out of the Capitol to block its passage. In Alabama the Senate failed to pass a bill introduced in May that would have removed religious exemptions. And in Florida, after religious exemptions increased nearly fourfold last year, from about 6,500 in 2011 to 25,000, efforts to disallow such exemptions have stalled.³²

Connecticut lawmakers dropped proposed legislation that would have prohibited unvaccinated students from enrolling in the state's public schools. The legislators could not agree on how to address unvaccinated children who were already in school.³³ “They let the perfect become the enemy of the good,” says the American College of Physicians' McLean.

Public health officials acknowledge that countering online misinformation is an uphill battle. “It's impossible to respond to everything on social media and the internet,” says Fauci of the National Institute of Allergy and Infectious Diseases. “Instead of responding tit-for-tat, we tend to give statements regarding the broad issues of what the evidence and facts are.”

Dr. Mobeen Rathore, a pediatric infectious disease specialist and spokesperson for the American Academy of Pediatrics says he believes the anti-vaccine tide has slowed. “Fortunately, there is no push for expanding exemptions,” he says. “People have realized that we

cannot continue with this trend, and there is increased interest in protecting us from disease. It is a slow process and a lot of damage has already been done.”

OUTLOOK

Reducing Vaccine Avoidance

If declining vaccination rates continue to result in an uptick in the number of measles cases, the disease may no longer be considered eliminated in the United States.

The American Medical Association, the American Pediatric Association and the American College of Physicians support eliminating all religious and philosophical vaccine exemptions for the MMR as the first step to get measles under control.

Governors have declared states of emergency where outbreaks have occurred in Brooklyn and Rockland County, N.Y., as well as in Washington state. “There has been a 99 percent increase in vaccinations in various areas of Williamsburg, Brooklyn, compared to the same time last year,” says Fauci.

In addition, new cases appear to be declining, with 54 in June and July of 2019 compared to 177 in April and 166 in March of the same year, according to Fauci. And infectious disease experts say taking an anti-vaccine stance has become increasingly unpopular this year as the nation has grappled with the measles outbreak.

But health experts worry that unless vaccine avoidance rates are reduced, even worse things are on the horizon.

“Measles is the most contagious of all the vaccine-preventable diseases, so this is the canary in the coal mine,” says Blumberg, at UC Davis Children's Hospital. “If we can't get our hands on this, we will see outbreaks of rubella or mumps or meningitis. We may even see the return of something like diphtheria,” which was eradicated in the 1920s.

NOTES

1. Julia Belluz, "New York's Orthodox Jewish community is battling measles outbreaks. Vaccine deniers are to blame," *Vox*, April 10, 2019, <https://tinyurl.com/y8znlarg>.
2. Kirk Johnson, "A Match Into a Can of Gasoline": Measles Outbreak Now an Emergency in Washington State," *The New York Times*, Feb. 6, 2019, <https://tinyurl.com/y7trcubd>; "Measles 2019: Measles in Washington State," Washington State Department of Health, undated, <https://tinyurl.com/y438vmo9>.
3. "What are the immunization rates for children in Clark County?" Clark County Washington Public Health, Dec. 31, 2018, <https://tinyurl.com/y3dwrwgu>; Asia Fields and Paige Cornwell, "Trips to Sea-Tac Airport may link cases in new measles outbreak in Seattle area; Issaquah, Bothell schools affected," *The Seattle Times*, May 16, 2019, <https://tinyurl.com/yxo9lmwp>.
4. Peter M. Strebel and Walter A. Orenstein, "Measles," *The New England Journal of Medicine*, July 25, 2019, <https://tinyurl.com/y6dc4lbm>.
5. YL Ge *et al.*, "Measles outbreak in pediatric hematology and oncology patients in Shanghai, 2015," *Chinese Medical Journal* (English), 2017, <https://tinyurl.com/y3762tax>.
6. "Measles Cases and Outbreaks," U.S. Centers for Disease Control and Prevention, Sept. 9, 2019, <https://tinyurl.com/y39perlm>.
7. *Ibid.*; "Mayor de Blasio, Health Officials Declare End of Measles Outbreak in New York City," press release, City of New York, Sept. 3, 2019, <https://tinyurl.com/yxj8fgml>.
8. "New measles surveillance data for 2019," World Health Organization, Aug. 15, 2019, <https://tinyurl.com/y4w42atw>.
9. Morgan Krakow, "A flight attendant who contracted measles has died amid a global rise in outbreaks," *The Washington Post*, Aug. 13, 2019, <https://tinyurl.com/y33fdeub>; "El Al flight attendant dies 4 months after contracting measles on a plane from NY," *The Times of Israel*, Aug. 13, 2019, <https://tinyurl.com/yy4yr72f>.
10. "Vaxxed: From Cover-Up to Catastrophe," IMDB.com, 2016, <https://tinyurl.com/y5r4kf9l>.
11. Rep. Adam Schiff, letter, March 1, 2019, <https://tinyurl.com/y636vrnp>; Hilary Brueck, "Amazon just took down a controversial documentary that links vaccines to autism," *Business Insider*, March 4, 2019, <https://tinyurl.com/y6jc7uhu>.
12. "Ten Threats to Global Health in 2019," World Health Organization, accessed Sept. 6, 2019, <https://tinyurl.com/y66mn4sx>.
13. Barbara Loe Fisher, "Freedom to Dissent and the New Black List in America," National Vaccine Information Center, July 1, 2019, <https://tinyurl.com/yxor2g9b>.
14. "Data and Statistics," Health Resources & Services Administration, updated Aug. 1, 2019, <https://tinyurl.com/y5l4mktx>.
15. Jennifer Reich, "What's wrong with these anti-vaxxers? They're just like the rest of us," *The Conversation*, May 22, 2019, <https://tinyurl.com/y4mdagw4>.
16. Karin Roberts, "When it comes to vaccines, celebrities often call the shots," *NBC News*, Oct. 28, 2018, <https://tinyurl.com/y43u8smq>.
17. Donald Trump, Twitter post, March 28, 2014, <https://tinyurl.com/pzyue8h>.
18. Sheila Kaplan and Dylan Scott, "Vaccine critic Robert F. Kennedy Jr. says he will chair Trump's vaccine safety panel," *Stat*, Jan. 10, 2017, <https://tinyurl.com/jtyj2rm>.
19. Dartunorro Clark, "Trump on measles vaccine: 'They have to get the shot,'" *NBC News*, April 26, 2019, <https://tinyurl.com/y4enwgow>.
20. John Aloysius Cogan, Jr., "Vaccinations will take a hit if Trump administration topples the Affordable Care Act," *Stat*, May 22, 2019, <https://tinyurl.com/y5ym8kr6>.
21. Lecia Bushak, "A Brief History Of Vaccines: From Medieval Chinese 'Variolation' To Modern Vaccination," *Medical Daily*, March 21, 2016, <https://tinyurl.com/y4265l4f>.
22. "Immunizations Policy Issues Overview," National Conference of State Legislatures, May 22, 2019, <https://tinyurl.com/zuyztg5>; and Aleksandra

- Sandstrom, "Amid measles outbreak, New York closes religious exemption for vaccinations—but most states retain it," Pew Research Center, June 28, 2019, <https://tinyurl.com/yy38r8wa>.
23. "Data and Statistics," *op. cit.*
 24. Alexandra Minna Stern and Howard Markel, "The History Of Vaccines And Immunization: Familiar Patterns, New Challenges," *Health Affairs*, May/June 2005, <https://tinyurl.com/y6lgzgzq>.
 25. Laura Eggertson, "Lancet retracts 12-year-old article linking autism to MMR vaccines," *Canadian Medical Association Journal*, March 9, 2010, <https://tinyurl.com/z6q85j5>; Alice Park, "Doctor behind vaccine-autism link loses license," *Time*, May 24, 2010, <https://tinyurl.com/pb6pdgq>.
 26. Ashley Welch, "GOP debate fact check: Claims about vaccines and autism," *CBS News*, Sept. 17, 2015, <https://tinyurl.com/y52ecxj5>.
 27. "Immunizations Policy Issues Overview," *op. cit.*
 28. "Inslee declares local public health emergency after identifying outbreak of measles," news release, Washington Governor Jay Inslee, Jan. 25, 2019, <https://tinyurl.com/y6oconjd>; "MMR Vaccine Exemption Law Change 2019," Washington State Department of Health, undated, <https://tinyurl.com/y3nlyve8>.
 29. "Senate ends non-medical exemption for vaccines amidst historic measles outbreak," news release, New York State Senator Brad Hoylman, June 13, 2019, <https://tinyurl.com/yytgbbv2>.
 30. David Siders, Alexei Koseff and Jeremy B. White, "Jerry Brown signs California vaccine bill," *The Sacramento Bee*, July 1, 2015, <https://tinyurl.com/y4ygf45c>.
 31. "Dr. Richard Pan Introduces SB 276 to Combat Fake Medical Exemptions that Put Children and Communities at Risk," news release, Dr. Richard Pan, California State Senator, March 26, 2019, <https://tinyurl.com/yysfce8b>.
 32. Kirby Wilson, "Anti-vaxxers blamed as record 25,000 Florida students claim religious objections to vaccines," *Tampa Bay Times*, April 9, 2019, <https://tinyurl.com/y6k4j6o2>.
 33. Jenna Carlesso, "No vote to end religious vaccine exemptions this year," *The CT Mirror*, May 16, 2019, <https://tinyurl.com/yyjlswnw>.

BIBLIOGRAPHY

Books

Fentiman, Linda, *Blaming Mothers: American Law and the Risks to Children's Health*, NYU Press, 2017.

A law professor evaluates the focus on mothers as the primary source of health risks—including making decisions about vaccinations—for their children.

Moskovitz, Richard, *Vaccines, A Reappraisal*, Skyhorse Publishing, 2017.

A family physician examines the risk posed by vaccines and argues that the current public health policy mandating vaccines for schoolchildren is unnecessary and dangerous.

Articles

Belluz, Julia, "New York's Orthodox Jewish community is battling measles outbreaks. Vaccine deniers are to blame," *Vox*, April 10, 2019, <https://tinyurl.com/y8znlarg>.

A journalist covers what led to the measles outbreak in Brooklyn's ultra-Orthodox Jewish community.

Branswell, Helen, "'They have to get the shots': Trump, once a vaccine skeptic, changes his tune against measles outbreak," *Stat*, April 26, 2019, <https://tinyurl.com/yyv8f24s>.

A medical news outlet reports that Trump now advises parents to vaccinate their children.

Carlesso, Jenna, "No vote to end religious vaccine exemptions this year," *The CT Mirror*, May 16, 2019, <https://tinyurl.com/yyjlswnw>.

The Connecticut state legislature failed to limit vaccine exemptions because of questions about how it would affect unvaccinated children already in school.

Cogan, John Aloysius, Jr., "Vaccinations will take a hit if the Trump administration topples the Affordable Care Act," *Stat*, May 22, 2019, <https://tinyurl.com/y5ym8kr6>.

A law professor lays out how vaccination coverage would change if the Affordable Care Act is repealed.

Johnson, Kirk, “‘A Match Into a Can of Gasoline’: Measles Outbreak Now an Emergency in Washington State,” *The New York Times*, Feb. 6, 2019, <https://tinyurl.com/y7trcubd>.

A journalist traces the cause of the measles outbreak in the state of Washington.

Otterman, Sharon, “New York Confronts Its Worst Measles Outbreak in Decades,” *The New York Times*, Jan. 17, 2019, <https://tinyurl.com/y7pm4sgr>.

A journalist reports on efforts to control the state of New York’s measles outbreak.

Roberts, Karin, “When it comes to vaccines, celebrities often call the shots,” *NBC News*, Oct. 28, 2018, <https://tinyurl.com/y43u8smq>.

A reporter analyzes the influence celebrities have on the vaccine debate.

Reports and Studies

“Decline in Measles Vaccination Is Causing a Preventable Global Resurgence of the Disease,” National Institute of Allergy and Infectious Diseases, April 18, 2019, <https://tinyurl.com/y5qfh6qq>.

A federal health agency examines the link between lower vaccination rates and the return of measles.

“Immunizations Policy Issues Overview,” National Conference of State Legislatures, May 22, 2019, <https://tinyurl.com/zuyztg5>.

An information clearinghouse on state laws tracks the status of vaccine legislation by state.

“Measles Cases and Outbreaks,” Centers for Disease Control and Prevention, Aug. 18, 2019, <https://tinyurl.com/y39perlm>.

The federal health agency compiles the latest statistics on measles cases in the United States.

“New measles surveillance data for 2019,” World Health Organization, Aug. 15, 2019, <https://tinyurl.com/y4w42atw>.

The United Nations’ global health organization provides data about measles cases worldwide.

Cantor, Julie D., “Mandatory Measles Vaccination in New York City—Reflections on a Bold Experiment,” *The New England Journal of Medicine*, July 11, 2019, <https://tinyurl.com/y259o8lk>.

A law professor argues for mandatory measles vaccinations.

Ge, YL, et al., “Measles Outbreak in Pediatric Hematology and Oncology Patients in Shanghai, 2015,” *Chinese Medical Journal*, June 5, 2017, <https://tinyurl.com/y3762tax>.

Chinese doctors recount the rapid spread and deadly effect of measles on children with cancer.

Paules, Catharine I., Hilary D. Marston and Anthony S. Fauci, “Measles in 2019—Going Backward,” *The New England Journal of Medicine*, June 6, 2019, <https://tinyurl.com/y4qygecg>.

Health experts describe the danger of the global measles resurgence.

Strebel, Peter M., and Walter A. Orenstein, “Measles,” *The New England Journal of Medicine*, July 25, 2019, <https://tinyurl.com/y6dc4lbn>.

Doctors discuss steps for coping with measles.

Documentary

“Vaxxed: From Cover-Up to Catastrophe,” IMDB.com, 2016, <https://tinyurl.com/y5prvcyc>.

A controversial film alleging that the government hid a link between vaccines and autism that was pulled from the Amazon streaming service after complaints that it included erroneous information about vaccines.

THE NEXT STEP

Anti-Vaccine Movement

Allen, Arthur, “How the anti-vaccine movement crept into the GOP mainstream,” *Politico*, May 27, 2019, <https://tinyurl.com/y5mvlaks>.

While anti-vaccine sentiment had historically been relegated to the far left and far right, elected Republican officials have begun to take up the position as a matter of freedom and personal liberty.

Hall, Ellie, “Jessica Biel Says She’s Not Anti-Vax Despite Lobbying With A Prominent Anti-Vaxxer,” *Buzzfeed News*, June 13, 2019, <https://tinyurl.com/y3okxkv7>.

Actress Jessica Biel says she supports vaccines generally even though she lobbied California lawmakers earlier this year alongside Robert F. Kennedy Jr. to reject a bill that would limit medical exemptions from vaccine mandates.

Reich, Jennifer, “I’ve talked to dozens of parents about why they don’t vaccinate. Here’s what they told me,” *Vox*, June 13, 2019, <https://tinyurl.com/y4lbouvg>.

Parents who decide not to vaccinate their children often practice a hyper-vigilant parenting style and put the interests of their own children ahead of the good of the community, writes a sociologist who has studied parental decision-making.

Recent Outbreaks

Cohen, Elizabeth, “The US eliminated measles in 2000. The current outbreak could change that,” *CNN*, Sept. 3, 2019, <https://tinyurl.com/yxft74zs>.

According to medical experts, there is a chance the World Health Organization could withdraw the United States’ designation as a country where measles has been eliminated.

Karlamangla, Soumya, “Where did the measles outbreak in LA start? Officials are looking abroad,” *Los Angeles Times*, April 29, 2019, <https://tinyurl.com/y3mxn8l4>.

Officials and medical experts suspect that a recent measles outbreak in Los Angeles County started with travelers who contracted the virus overseas.

Weber, Jared, “Measles outbreak: As students head back to school, US and world officials warn about risk,” *USA Today*, Aug. 14, 2019, <https://tinyurl.com/y4hlq3dh>.

This year’s worldwide total of measles cases is at a 13-year high, according to the World Health Organization, and international travel is worsening the situation.

Responding to Vaccine Hesitancy

Chodosh, Sara, “We’re finally studying how to combat the anti-vax movement, but the methods may

surprise you,” *Popular Science*, May 20, 2019, <https://tinyurl.com/y2h44w64>.

Researchers studying how doctors should approach parents who are hesitant about vaccines say that acknowledging their concerns before encouraging them to vaccinate is the most effective method.

Kirka, Danica, “UK to pressure social media companies to fight anti-vax info,” *The Associated Press*, Aug. 19, 2019, <https://tinyurl.com/y2fxjx7e>.

The British government will hold a summit with social media companies to discuss how to fight online misinformation about vaccines, as the number of measles cases rises in the country.

Liao, Shannon, “GoFundMe pledges to remove anti-vax campaigns,” *The Verge*, March 22, 2019, <https://tinyurl.com/yxpq5agv>.

The crowdfunding website removed anti-vaccine fundraisers from their platform a few weeks after Amazon removed the documentary *Vaxxed* from its streaming service.

Vaccine Legislation

Ho, Vivian, “The California senator fighting for the strictest vaccination laws in the US,” *The Guardian*, Aug. 29, 2019, <https://tinyurl.com/y4fdug9e>.

A California state senator and pediatrician is leading the charge to limit exceptions to vaccine mandates for schoolchildren in the state.

Roy, Yancey, “Judge upholds law eliminating vaccine religious exemption,” *Newsday*, Aug. 27, 2019, <https://tinyurl.com/yy3v3vam>.

A judge on the New York Supreme Court upheld a new state law that eliminated a religious exemption from mandatory vaccines for children in schools or daycare programs.

Smith, Kelsie, “New vaccine law impacting student enrollment,” *WHAM*, Aug. 15, 2019, <https://tinyurl.com/yy36a4gt>.

A New York state law eliminating religious exemptions from vaccine mandates is leading to lower student enrollment in upstate New York, particularly in private schools.

For More Information

American Academy of Pediatrics, 141 Northwest Point Blvd., Elk Grove Village, IL 60007; 847-434-4000; www.aap.org. Association of physicians concerned with the health of children, adolescents and young adults.

American College of Physicians, 190 North Independence Mall West, Philadelphia, PA 9106-1572; 800-ACP-1915; www.acponline.org. National organization of internists, internal medicine subspecialists, medical students, residents and fellows.

American Medical Association, 330 N. Wabash Ave., Suite 3930, Chicago, IL 60611-5885; 312-464-4782; www.ama-assn.org. Organization that promotes the science of medicine and the improvement of public health.

California Immunization Coalition, 1331 Garden Highway, Sacramento, CA 95833; 916-414-9016; www.ImmunizeCa.org. Advocacy group that promotes full immunization in the state.

Centers for Disease Control and Prevention, 1600 Clifton Road, Atlanta, GA 30333; 404-639-3311; www.cdc.gov. Federal agency responsible for tracking and preventing disease, injury and disability.

National Institutes of Allergy and Infectious Disease, 5601 Fishers Lane, Bethesda, MD 20892-9806; 866-284-4107; www.niaid.nih.gov. Federal institute that researches infectious diseases, among other things.

National Vaccine Information Center, 204 Mill St., Suite B1, Vienna, VA 22180; 703-938-0342; www.nvic.org. An organization that lobbies for vaccine safety reforms and informed consent protections for parents.

World Health Organization, Ave. Appia 20m 1211, Geneva, 27, Switzerland; +41-22-791-2111; www.who.int/en/. United Nations organization that coordinates global public health efforts.