

**CONFRONTING A GROWING PUBLIC HEALTH  
THREAT: MEASLES OUTBREAKS IN THE U.S.**

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**HEARING**  
BEFORE THE  
SUBCOMMITTEE ON OVERSIGHT AND  
INVESTIGATIONS  
OF THE  
COMMITTEE ON ENERGY AND  
COMMERCE  
HOUSE OF REPRESENTATIVES  
ONE HUNDRED SIXTEENTH CONGRESS

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## C O N T E N T S

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	Page
Hon. Diana DeGette, a Representative in Congress from the State of Colorado, opening statement .....	1
Prepared statement .....	3
Hon. Brett Guthrie, a Representative in Congress from the Commonwealth of Kentucky, opening statement .....	4
Prepared statement .....	6
Hon. Frank Pallone, Jr., a Representative in Congress from the State of New Jersey, opening statement .....	7
Prepared statement .....	8
Hon. Greg Walden, a Representative in Congress from the State of Oregon, opening statement .....	9
Prepared statement .....	11
Hon. Michael C. Burgess, a Representative in Congress from the State of Texas, prepared statement .....	12
Hon. Kathy Castor, a Representative in Congress from the State of Florida, prepared statement .....	55

### WITNESSES

Nancy Messonnier, M.D., Director, National Center for Immunization and Respiratory Disease, Centers for Disease Control and Prevention, Department of Health and Human Services .....	13
Prepared statement .....	16
Answers to submitted questions .....	61
Anthony S. Fauci, M.D., Director, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Department of Health and Human Services .....	26
Prepared statement .....	28
Answers to submitted questions .....	75

### SUBMITTED MATERIAL

Article of February 5, 2019, "Collapse Of Health System Sends Venezuelans Fleeing To Brazil For Basic Meds," by Jason Beaubien, NPR, submitted by Mr. Duncan .....	56
Letter of February 26, 2019, from Peter Hotez, M.D., to Mr. Burgess, submitted by Mr. Burgess .....	59



## **CONFRONTING A GROWING PUBLIC HEALTH THREAT: MEASLES OUTBREAKS IN THE U.S.**

**WEDNESDAY, FEBRUARY 27, 2019**

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS,  
COMMITTEE ON ENERGY AND COMMERCE,  
*Washington, DC.*

The subcommittee met, pursuant to call, at 10:01 a.m., in the John D. Dingell Room 2123, Rayburn House Office Building, Hon. Diana DeGette (chair of the subcommittee) presiding.

Members present: Representatives DeGette, Schakowsky, Ruiz, Kuster, Castor, Tonko, Pallone (ex officio), Guthrie (subcommittee ranking member), Burgess, McKinley, Griffith, Brooks, Mullin, Duncan, and Walden (ex officio).

Staff present: Kevin Barstow, Chief Oversight Counsel; Billy Benjamin, Systems Administrator; Jesseca Boyer, Professional Staff Member; Jeff Carroll, Staff Director; Waverly Gordon, Deputy Chief Counsel; Tiffany Guarascio, Deputy Staff Director; Judy Harvey, Counsel; Chris Knauer, Oversight Staff Director; Jourdan Lewis, Policy Analyst; Kaitlyn Peel, Digital Director; Andrew Souvall, Director of Communications, Outreach, and Member Services; C. J. Young, Press Secretary; Jen Barblan, Minority Chief Counsel, Oversight and Investigations; Mike Bloomquist, Minority Staff Director; Jordan Davis, Minority Senior Advisor; Margaret Tucker Fogarty, Minority Staff Assistant; Ryan Long, Minority Deputy Staff Director; Kristen Shatynski, Minority Professional Staff Member, Health; Alan Slobodin, Minority Chief Investigative Counsel, Oversight and Investigations.

Ms. DEGETTE. The Subcommittee on Oversight and Investigations will now come to order.

Today, the subcommittee is holding a hearing entitled “Confronting a Growing Public Health Threat: Measles Outbreaks in the U.S.”

The purpose of today’s hearing is to examine the public health surveillance and infrastructure response to the current measles outbreaks in the United States.

The Chair now recognizes herself for the purposes of an opening statement.

### **OPENING STATEMENT OF HON. DIANA DEGETTE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF COLORADO**

Today, we will examine a serious public health emergency that is threatening communities across the country. Since the start of

this year alone, more than 159 people across 10 States have been infected by measles.

This is a highly contagious and potentially deadly disease that was once declared eliminated here in the United States, thanks to the development of a successful preventative vaccine.

Yet, despite the previous success, as we sit here today, we have communities across the country scrambling to protect their residents and we have parents who are reading daily headlines about an outbreak, worried how they are going to protect their children and their families.

If there was ever one topic that should transcend politics or party lines, this should be it. On behalf of the American people, it is this committee's job to ensure that our public health agencies are doing everything they can to prevent the spread of this disease.

And I can tell you, right now, this committee has serious concerns about how our Nation's public health system is responding to the current outbreak. What we accomplished less than 20 years ago in eliminating this disease was truly amazing and we want to know exactly what this administration is doing to once again stop the spread of this highly contagious disease.

We also want to know how we got ourselves back into this situation and what our agencies are doing to prevent another outbreak, such as this one, from happening again.

Before the measles vaccine was developed in 1963, there were half a million cases of the measles being reported every year to the CDC. Forty-eight thousand people a year were being sent to the hospital and, as a result, as many as 500 people a year died.

It wasn't until the development of the measles, mumps, and rubella vaccine—known as the MMR vaccine—that we, as a country, were able to stop this horrific illness.

But despite that success, here we are again, as I said, less than 20 years later, dealing with the fear associated with yet another outbreak of the disease.

As of now, there have been 127 reported cases of the measles in 10 States, including in my home State of Colorado. In fact, in my district last month, the Denver Public Health Department was forced to issue a measles exposure warning when an adult acquired the measles after traveling internationally.

Now, that seems to be isolated, but the recent outbreaks are a real cause for national concern. The national measles vaccination rate of children between 19 and 35 months old is currently at 91 percent.

That may seem high to some, but given the highly contagious nature of measles, it is well below the 95 percent vaccination rate that is required to protect communities and give it what is known as "herd immunity."

This so-called "herd immunity" is particularly vital to protecting those who cannot be, or are not yet, vaccinated against the measles, such as infants or those with prior medical conditions who are at a higher risk of suffering severe complications from the vaccine.

As our public health agencies have repeatedly emphasized, reaching that 95 percent vaccination rate is critical to preventing outbreaks such as the one we are experiencing today.

While the overall national rate of MMR vaccinations is currently at 91 percent, the rate in some communities is much lower. Some are as low as 77 percent. In fact, Colorado has one of the lowest rates of kindergartners vaccinated for MMR in the country, well below the rate necessary to protect vulnerable children from this potentially deadly disease.

Outbreaks, like the one we are seeing with measles, remind us of just how interconnected our communities are. They remind us of how the decisions of one community can directly affect other communities across the country and we have—as a nation, to stop the spread of deadly diseases, we have to address the root cause of the problem and we have to identify concrete steps.

We have to provide parents and community leaders with real science-based information, not only about how vaccines are safe, but why they are so important. We need to support additional research into vaccine safety to further increase consumer confidence in these vaccines.

And we need to strengthen our public health infrastructure at all levels of our Government to better prepare for and respond to these outbreaks.

We have to work together to protect the most vulnerable among us and we have got to ensure that an outbreak of measles once again becomes a rarity in this country.

I want to thank our witnesses, Dr. Messonnier, who is here on behalf of the Centers for Disease Control and Prevention, who is on the front lines of preventing this, and, of course, Dr. Anthony Fauci from the National Institutes of Health, no stranger to this committee on a variety of issues, who is here to talk about his in-depth knowledge of the vaccines and how we can prevent these diseases from spreading in the U.S.

Thank you both for being here, and I am now happy to recognize the ranking member of the subcommittee, Mr. Guthrie, for 5 minutes for his opening statement.

[The prepared statement of Ms. DeGette follows:]

#### PREPARED STATEMENT OF HON. DIANA DEGETTE

Today, we will examine a serious public health emergency that's threatening communities across the country.

Since the start of this year alone, more than 159 people across 10 States have been infected by measles.

This is a highly contagious and potentially deadly disease that was once declared eliminated here in the United States—thanks to the development of a successful preventive vaccine.

Yet, despite that previous success, as we sit here today, we have communities across the country scrambling to protect their residents—and we have parents, who are reading daily headlines about an outbreak, worried about how they are going to protect their children and their families.

If there was ever one topic that should transcend politics or party lines, this should be it.

On behalf of the American people, it is this committee's job to ensure that our public health agencies are doing everything they can to prevent the spread of this disease.

And I can tell you, right now, this committee has serious concerns about how our Nation's public health system is responding to this current outbreak.

What we accomplished less than 20 years ago—in eliminating this disease—was truly amazing.

And we want to know exactly what this administration is doing to once again stop the spread of this highly contagious disease.

We also want to know how we got ourselves back into this situation and what our agencies are doing to prevent another outbreak, such as this one, from happening again.

Before the measles vaccine was developed in 1963, there were half a million cases of the measles being reported every year to the CDC. 48,000 people a year were being sent to the hospital and, as a result, as many as 500 people a year died as a result.

It wasn't until the development of the measles, mumps, and rubella vaccine—known as the MMR vaccine—that we, as a country, were able to stop this horrific illness.

But despite that success, here we are again—as I said, less than 20 years later—dealing with the fear associated with yet another outbreak of this disease.

As of now, there have been 159 reported cases of the measles in 10 States, including in my home State of Colorado.

In fact, in my district last month, the Denver Public Health Department was forced to issue a measles exposure warning when an adult acquired the measles after traveling internationally.

Now, that seems to be isolated, but these recent outbreaks are cause for real national concern.

The national measles vaccination rate of children between 19 and 35 months old is currently at 91 percent.

That may seem high to some, but given the highly contagious nature of measles, it's well below the 95 percent vaccination rate that's required to protect communities and give it what is known as "herd immunity."

This so-called "herd immunity" is particularly vital to protecting those who cannot be, or are not yet, vaccinated against the measles—such as infants or those with prior medical conditions who are at a higher risk of suffering severe complications from the vaccine.

As our public health agencies have repeatedly emphasized, reaching that 95 percent vaccination rate is critical to preventing outbreaks such as the one we are experiencing today.

While the overall national rate of MMR vaccinations is currently at 91 percent, the rate in some communities is much lower—some are as low as 77 percent.

In fact, my State of Colorado has one of the lowest rates of kindergartners vaccinated for MMR in the country—well below the rate necessary to protect vulnerable children and people from this potentially deadly disease.

Outbreaks, such as the one we are seeing today with measles, remind us of just how interconnected our communities are.

They remind us how the decisions of one community can directly affect other communities across the Nation.

We, as a nation—to stop the spread of these deadly diseases—have to address the root cause of the problem. And we have to identify concrete steps.

We have to provide parents and community leaders with the real, science-based information—not only about how vaccines are safe, but why they are so important.

We need to support additional research into vaccine safety, to further increase consumer-confidence in these vaccines.

And we need to strengthen our public health infrastructure at all levels of our Government to better prepare for, and respond to, these outbreaks.

We have to work together to protect the most vulnerable among us, and we have to find ways to ensure that an outbreak of measles once again becomes a rarity in this country.

I want to thank our witnesses who are here to testify today.

Dr. Nancy Messonnier, who is here on behalf of the Centers for Disease Control and Prevention, and is on the frontline of preventing this.

And Dr. Anthony Fauci from the National Institutes of Health—who is no stranger to this committee—is here to talk about his in-depth knowledge of the vaccines and how we can prevent these diseases from spreading in the U.S.

Thank you both for being here.

**OPENING STATEMENT OF HON. BRETT GUTHRIE, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF KENTUCKY**

Mr. GUTHRIE. Thank you, Chair DeGette, for holding this important and timely hearing, and this is an area of bipartisan interest.

Measles is an extremely contagious virus. It can cause significant respiratory symptoms, fever, and rash.

In some cases, the consequences can be severe. One in 20 children with measles develops pneumonia. One in a thousand children develop brain swelling that can cause brain damage. One or two in a thousand children who contract measles will die.

Fortunately, measles was declared eliminated in the United States in 2000 because the Nation had gone more than 12 months without any contagious disease transmission. Public health experts believe this progress was achieved because of the very safe combination of measles-mumps-rubella—or MMR—vaccine, very high vaccination rates and a strong public health system to detect and respond to outbreaks.

However, elimination does not mean the disease was completely eradicated. The disease remains in many parts of the world. There are about 20 million cases worldwide each year.

Measles returns to the U.S. when the infected travelers bring the disease back to parts of the country where some parents have chosen not to vaccinate their children. Because measles is so contagious, it is estimated 93 to 95 percent of people in a locality need to be vaccinated to achieve population immunity.

This level of population immunity provided by very high vaccination rates prevents outbreaks and sustained transmission of measles. According to CDC tracking, while national vaccination rates remain high, estimated MMR vaccination rates among 13-to-17-year-old teenagers can vary widely, ranging from 77.8 percent to 97.9 percent across States and local counties in the United States.

We currently have multiple measles outbreaks in the United States. As of February 21st, 2019, the CDC reported that there are 159 confirmed cases of measles this year in 10 States.

My home State of Kentucky was recently added to the list. Unfortunately, this current outbreak is continuing a recent trend. An average of 63 measles cases were reported to CDC from 2000 to 2007.

However, from 2011 to 2017, the annual average of reported cases increased to 217. The CDC told the committee staff that in the last 5 years there have been 26 measles outbreaks involving five or more people. Seventy-five percent of those cases spread in the local close-knit communities with groups of unvaccinated people.

These outbreaks are tragic, since they were completely avoidable. Every State except three have enacted religious exemptions for parents who wish not to vaccinate their children. There are 17 States that allow a personal or philosophical exemption, which means that most people can opt out for any reason.

For example, in Washington State, just 0.3 percent of Washington's families with kindergartners use a religious exemption while 3.7 percent of families use a personal exemption and 0.8 percent use a medical exemption.

Vaccine exemptions have increased in the past 3 years to a median 2.2 percent of kindergartners among all States. With recent links to pockets of undervaccination, some State legislators are looking to tighten or eliminate certain types of exemptions that allow parents to not have their children immunized.

After the Disneyland-linked outbreak of measles in 2014, the State of California ended a religious and personal exemption for vaccines. The Washington legislature is working on legislation that substantially narrows the exemptions for vaccination that would eliminate the personal or philosophical exemption while tightening the religious exemption.

In recent weeks, State legislators in New Jersey, New York, Iowa, Maine, and Vermont have proposed eliminating religious exemptions for vaccines. However, last week the Arizona House Health and Human Service Committee approved three bills to expand exemptions for mandatory vaccinations.

Given the concerns raised by the measles outbreak in various parts of the Nation and recent State legislative activity, it is appropriate to have this hearing to provide greater discussion and examination at a national level.

I welcome our two expert witnesses, Dr. Messonnier of the CDC and Dr. Anthony Fauci of the National Institute of Allergy and Infectious Diseases.

I look forward to your testimony, and I yield back my time.

[The prepared statement of Mr. Guthrie follows:]

#### PREPARED STATEMENT OF HON. BRETT GUTHRIE

Thank you, Chair DeGette, for holding this important and timely hearing. This is an area of bipartisan interest.

Measles is an extremely contagious virus. It can cause significant respiratory symptoms, fever, and rash. In some cases, the consequences can be severe. One in 20 children with measles develops pneumonia, and one in 1,000 children develop brain swelling that can cause brain damage. One or two in 1,000 children who contract measles will die.

Fortunately, measles was declared eliminated in the United States in 2000 because the Nation had gone more than 12 months without any continuous disease transmission. Public health experts believe this progress was achieved because of a very safe combination measles-mumps-rubella—or MMR—vaccine, very high vaccination rates, and a strong public health system to detect and respond to outbreaks.

However, elimination does not mean the disease was completely eradicated. The disease remains in many parts of the world. There are about 20 million cases worldwide each year. Measles returns to the U.S. when infected travelers bring the disease back to parts of the country where some parents have chosen not to vaccinate their children. Because measles is so contagious, it is estimated 93 to 95 percent of people in a locality need to be vaccinated to achieve population immunity. This level of population immunity—provided by very high vaccination rates—prevents outbreaks and sustained transmission of measles. According to CDC tracking, while national vaccination rates remain high, estimated MMR vaccination coverage among 13-to-17-year-old teenagers, can vary widely, ranging from 77.8 percent to 97.9 percent across States and local counties in the United States.

We currently have multiple measles outbreaks in the United States. As of February 21, 2019, the CDC reported that there are 159 confirmed cases of measles this year in 10 States. My home State of Kentucky was recently added to this list.

Unfortunately, this current outbreak is continuing a recent trend. An average of 63 measles cases were reported to CDC from 2000 to 2007. However, from 2011 to 2017, the annual average of reported cases increased to 217. The CDC told the committee staff that in the last 5 years there have been 26 measles outbreaks involving five or more people. Seventy-five percent of those cases spread in local close-knit communities with groups of unvaccinated people. These outbreaks are tragic since they are completely avoidable.

Every State, except three, have enacted religious exemptions for parents who wish not to vaccinate their children. There are 17 States that allow a personal or philosophical exemption, which means that most people can opt out for any reason. For example, in Washington State, just 0.3 percent of Washington's families with kindergartners used a religious exemption, while 3.7 percent of families used a personal exemption and 0.8 percent used a medical exemption. Vaccine exemptions

have increased in the past 3 years to a median 2.2 percent of kindergartners among all States.

With recent outbreaks linked to pockets of undervaccination, some State legislatures are looking to tighten or eliminate certain types of exemptions that allow parents to not have their children immunized. After the Disneyland-linked outbreak of measles in 2014, the State of California ended religious and personal exemptions for vaccines. The Washington legislature is working on legislation that substantially narrows the exemptions for vaccination that would eliminate the personal or philosophical exemption while tightening the religious exemption. In recent weeks, State legislators in New Jersey, New York, Iowa, Maine, and Vermont have proposed eliminating religious exemptions for vaccines. However, last week, the Arizona House Health and Human Services Committee approved three bills to expand exemptions for mandatory vaccinations.

Given the concerns raised by the measles outbreak in various parts of the Nation and recent State legislative activity, it is appropriate to have this hearing to provide greater discussion and examination at a national level.

I welcome our two expert witnesses, Dr. Nancy Messonnier of the CDC, and Dr. Anthony Fauci of the National Institute of Allergy and Infectious Diseases. I look forward to your testimony, and I yield back.

Ms. DEGETTE. The gentleman yields back.

The Chair now recognizes the chairman of the full committee, Mr. Pallone, for 5 minutes for an opening statement.

**OPENING STATEMENT OF HON. FRANK PALLONE, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY**

Mr. PALLONE. Thank you, Madam Chair.

This committee has a long history of addressing public health concerns and infectious disease crises. Today, we are here to discuss the troubling increase in the number of measles cases here in the United States.

This issue hits close to home for me. Just this past December, 33 cases of measles were confirmed in Ocean and Passaic Counties in my home State of New Jersey. And Madam Chair, my written statement actually says that, fortunately, the outbreak in New Jersey is now over.

But the reality is I have to change my written statement because I was reading through my press clips this morning and this was front the Bergen Record, which is a publication—a daily newspaper in the northern part of the State—and it says, I quote, “Confirmed cases of measles exposure reported in Bergen County. A New Jersey man who has been diagnosed with measles may have exposed people in Bergen County to the disease earlier this month, particularly at two locations in Hillsdale, State health officials said. Exposures would have occurred between February 17th and Monday,”—this past Monday—“a spokeswoman for the State health department said.”

So it isn’t true that the outbreak is over in New Jersey. This is—these are—this is a case now in a county where measles had been previously reported.

So as of this morning, there have been—and that doesn’t count this—there have been 159 measles cases reported across the Nation already this year, and there are now six outbreaks of three or more cases in four States. Not only are we seeing a troubling increase in cases, but the number of outbreaks also continues to grow, and it is deeply disturbing.

The reemergence of this highly contagious vaccine-preventable disease poses a threat beyond the pockets of communities in which it arises. It is particularly dangerous to infants, children under the age of 5, those who are pregnant, and people with compromised immune systems.

All these people are at higher risk of severe complications from measles. But what is particularly disconcerting is that this is a public health problem for which science has already provided a solution: a safe and effective vaccine. There is overwhelming confidence among researchers, public health officials, and parents in the MMR vaccine.

Yet vaccine hesitancy and, to a lesser degree, vaccine access concerns are behind the growing number of measles cases in the United States since 2010.

I know that we will discuss both of these issues and hear from our experts as to the Federal Government's responsibility in addressing both. But I would also like to hear from witnesses about one particular area of great concern to me, and that is the proliferation of disinformation about the safety and efficacy of the MMR vaccine.

I am deeply troubled by the role digital media plays in perpetuating myths and fears regarding measles. It is undermining the facts on how to safely and effectively prevent measles and other vaccine-preventable diseases.

For example, recent media reports found that users on YouTube and Facebook are steered towards antivaccination content due to the platform's algorithms.

Both companies have said they are taking steps to address the promotion of conspiracy theories, but we must keep our eye on where this misinformation will pop up next, particularly when we know there is a preponderance of evidence that the MMR vaccine is safe and effective and that there are numerous measures in place to continue to monitor and assess its safety and the safety of other vaccines.

I am deeply troubled that parents are being inundated with distortions and misinformation campaigns when they are going online to try to make informed decisions about their child's health.

And I look forward to hearing from Dr. Messonnier—if I am pronouncing it right—and Dr. Fauci about what is driving the recent measles outbreak. I would also like to know what efforts are underway by the CDC and NIH to address this growing public health threat and where they still need additional support.

So, hopefully, this will be a hearing where we try to get to the bottom of what is actually happening out there, and thank you for our witnesses.

Thank you, Madam Chair. This is a very important hearing. Thank you.

[The prepared statement of Mr. Pallone follows:]

PREPARED STATEMENT OF HON. FRANK PALLONE, JR.

This committee has a long history of addressing public health concerns and infectious disease crises. Today, we are here to discuss the troubling increase in the number of measles cases here in the United States.

This issue hits close to home for me. Just this past December, 33 cases of measles were confirmed in Ocean and Passaic counties of my home State of New Jersey.

Fortunately, the outbreak in New Jersey is now over, but as of this morning, there have been 159 measles cases reported across the Nation already this year. And there are now six outbreaks—of three or more cases—in four States. Not only are we seeing a troubling increase in cases, but the number of outbreaks also continues to grow. This is all deeply disturbing.

The reemergence of this highly contagious vaccinepreventable disease poses a threat beyond the pockets of communities in which it arises.

It is particularly dangerous to infants, children under the age of 5, those who are pregnant, and people with compromised immune systems. All of these people are at higher risk of severe complications from the measles.

What is particularly disconcerting, is that this is a public health problem for which science has already provided a solution: a safe and effective vaccine. There is overwhelming confidence among researchers, public health officials, and parents in the MMR vaccine.

Yet vaccine hesitancy, and, to a lesser degree, vaccine access concerns are behind the growing number of measles cases in the U.S. since 2010.

I know that we will discuss both of these issues and hear from our experts as to the Federal Government's responsibility in addressing both.

I'd also like to hear from our witnesses about one particular area of great concern to me, and that is the proliferation of disinformation about the safety and efficacy of the MMR vaccine.

I am deeply troubled by the role digital media plays in perpetuating myths and fears regarding measles. It is undermining the facts on how to safely and effectively prevent measles and other vaccine-preventable diseases.

For example, recent media reports found that users on YouTube and Facebook are steered toward antivaccination content due to the platform's algorithms.

Both companies have said they are taking steps to address the promotion of conspiracy theories, but we must keep our eye on where the misinformation will pop up next.

Particularly when we know there is a preponderance of evidence that the MMR vaccine is safe and effective. And, that there are measures in place to continue to monitor and assess its safety and the safety of other vaccines.

I am deeply troubled that parents are being inundated with distortions and misinformation campaigns when they are going online to try to make informed decisions about their child's health.

I look forward to hearing from Dr. Messonnier and Dr. Fauci about what's driving the recent measles outbreaks. I'd also like to know what efforts are underway by the CDC and NIH to address this growing public health threat, and where they still need additional support.

Thank you, and I yield back.

Ms. DEGETTE. The gentleman yields back.

The Chair now recognizes the ranking member of the full committee, Mr. Walden, for 5 minutes for the purposes of an opening statement.

**OPENING STATEMENT OF HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON**

Mr. WALDEN. Good morning, Madam Chair. Thank you for holding this hearing.

The reemergence of vaccine-preventable diseases including measles coincided with the undervaccination as a major public health concern. World Health Organization last month called vaccine hesitancy one of the 10 biggest threats to global health, noting the shocking 30 percent increase in measles cases worldwide last year.

In 2000, measles was considered to have been eliminated in the United States. Last year, the U.S. had its second most cases since 2000. The current measles outbreak showcases the problem of undervaccination.

It is a problem that hits close to home for me since 65 measles cases in the outbreak have mainly occurred in Clark County,

Washington, a suburb of Portland, Oregon, with four in Multnomah County, Oregon, for a total of 69 confirmed measles cases.

Measles exposure even reached my district with an infected person from Clark County visiting a trampoline park in Bend, Oregon. While there have been no confirmed cases resulting from that particular exposure, this highlights the reach of the measles outbreak.

Unfortunately, the case information suggests the region near Portland has been an area of undervaccination. Most of these cases involve people who are not vaccinated and most of those infected were children between the ages of one and ten.

County public health officials are confronted with directing hundreds of susceptible families who have been exposed to the virus at more than three dozen locations including a Portland Trailblazers basketball game, schools, churches, and stores such as Costco and Walmart.

There are important reasons for getting the measles vaccine. Measles is a highly contagious infectious disease that spreads through coughing and sneezing. Health officials say the virus is so contagious that if an unvaccinated person walks through a room after someone with measles has left, there is a 90 percent chance that an unvaccinated person will get that disease.

This can be a very serious disease. Measles infection typically causes a high fever and rash. About one of four people who gets measles will be hospitalized.

Infection can lead to ear infections, hearing loss and, in rare cases, brain swelling and even death. Measles vaccine is highly effective and may be one of the most effective vaccines around.

Two doses are about 97 percent effective and since the introduction of the combination MMR vaccine there has been a 99 percent reduction in the number of measles cases compared to the prevaccine era.

It not only protects you, but others as well, particularly vulnerable infants who cannot be vaccinated. This year can help provide important information—this hearing—I am sorry—can help provide important information to address questions for some people about the safety of the vaccine as well as heightened awareness about the effectiveness of the vaccine and the importance of getting vaccinated.

If we don't reverse the downward trend of vaccination we risk bringing back measles in full force.

So I welcome both of our witnesses today to provide their expertise about the disease of measles and insights into the facts and value of measles vaccine.

Dr. Nancy Messonnier, thank you for your service and your leadership in various senior capacities at the Centers for Disease Control and Prevention.

Dr. Anthony Fauci, the director of National Institutes of Health Institute of Allergy and Infectious Diseases—sir, you need no introduction, having testified probably hundreds of times before our committee.

However, on this occasion, I think you should be recognized, sir, for more than 50 years of public service, including your 35th anniversary year as director of the National Institute of Allergy and Infectious Diseases and for your achievements.

[Applause.]

You have made substantial contributions to HIV/AIDS research. You have helped develop therapies for formerly fatal diseases. With many honors, you have been awarded the Lasker Award and the Presidential Medal of Freedom.

Chair DeGette, I really think we need to congratulate him. So we look forward to your testimony and to learning more in this committee about what we should do, going forward.

[The prepared statement of Mr. Walden follows:]

#### PREPARED STATEMENT OF HON. GREG WALDEN

Chair DeGette, thank you for holding this hearing. The reemergence of vaccine-preventable diseases, including measles, coinciding with undervaccination is a major public health concern. The World Health Organization last month called “vaccine hesitancy” one of the 10 biggest threats to global health, noting the shocking 30 percent increase in measles cases worldwide last year. In 2000, measles was considered to have been eliminated in the United States. But last year, the U.S. had its second-most cases since 2000.

The current measles outbreak showcases the problem of undervaccination.

It’s a problem that hits close to home for me since 65 measles cases in this outbreak have mainly occurred in Clark County, Washington (a suburb of Portland, Oregon), with four in Multnomah County, Oregon, for a total of 69 confirmed cases of measles. The measles exposure even reached my district, with an infected person from Clark County visiting a trampoline park in Bend, Oregon. Though there have been no confirmed cases resulting from that particular exposure, this highlights the reach of the measles outbreak.

Unfortunately, the case information suggests the region near Portland has been an area of undervaccination. Most of these cases involved people who were not vaccinated, and most of those infected were children between the ages of one and 10.

County public health officials are confronted with directing hundreds of susceptible families who have been exposed to the virus at more than three dozen locations, including a Portland Trailblazers basketball game, schools, churches, and stores such as Costco and Walmart.

There are important reasons for getting the measles vaccine. Measles is a highly contagious, infectious disease that spreads through coughing and sneezing. Health officials say the virus is so contagious that if an unvaccinated person walks through a room after someone with measles has left, there is a 90 percent chance that an unvaccinated person will get the disease. This can be a very serious disease. Measles infection typically causes a high fever and rash, and about one of four people who gets measles will be hospitalized. The infection can lead to ear infections, hearing loss, and in rarer cases, brain swelling and death.

The measles vaccine is highly effective, and maybe one of the most effective vaccines around. Two doses are about 97 percent effective. Since the introduction of the combination MMR vaccine, there has been a 99 percent reduction in the number of measles cases, compared to the prevaccine era. It not only protects you, but others as well, particularly vulnerable infants who cannot be vaccinated. This hearing can help provide important information to address questions for some people about the safety of the vaccine, as well heighten awareness about the effectiveness of the vaccine and the importance of getting vaccinated. If we don’t reverse the downward trend of vaccination, we risk bringing back measles in full force.

I welcome both of our witnesses to provide their expertise about the disease of measles, and insights into the facts and value of the measles vaccine. Dr. Nancy Messonnier, thank you for your service and your leadership in various senior positions at the Centers for Disease Control and Prevention. Dr. Anthony Fauci, the Director of the National Institutes of Health Institute of Allergy and Infectious Diseases, you need no introduction, having testified probably hundreds of times before this committee. However, on this occasion I think you should be recognized, sir, for your more than 50 years of public service, including your 35th anniversary year as Director of the National Institute of Allergy and Infectious Diseases, and your achievements. You have made substantial contributions to HIV/AIDS research, and you have developed therapies for formerly fatal diseases. Among many honors, you have been awarded the Lasker Award, and the Presidential Medal of Freedom. Chair DeGette, I think he deserves a bipartisan round of applause and our appreciation.

We look forward to your testimony, and to learning how our committee can help support your efforts to protect public health.

Mr. WALDEN. With that, I will yield the balance of my time to Dr. Burgess.

Mr. BURGESS. I thank the chairman for the recognition. In full disclosure, I am a measles survivor. I was of an age where the measles vaccine was not available.

Even though I was very young when that happened, I still remember the clinical course with the measles of hard shaking chills, the muscle pain, and, of course, the rash that is pathognomonic of measles.

I will tell you that we forget about some of the complications of measles. I took the liberty of printing out a couple of pages from Harrison's Principles of Internal Medicine.

Let me just run through some of the highlights: laryngitis, croup, bronchitis, otitis media, ear infections, pneumonia both viral and secondary bacterial, fever, headache, drowsiness, coma, seizures. Ten percent of patients who have measles encephalitis do not survive. Transverse myelitis following measles has been reported, similar to polio. Gastrointestinal complications, hepatitis, appendicitis, ileocolitis, mesenteric adenitis.

Other rare complications include myocarditis, glomerulonephritis, pulmonary nephritis, post-infection thrombocytopenia purpura. It is a serious illness. It is entirely vaccine preventable. I am grateful we are having the hearing today. I yield back.

[The prepared statement of Mr. Burgess follows:]

#### PREPARED STATEMENT OF HON. MICHAEL C. BURGESS

Thank you, Mr. Walden. This is an incredibly important hearing to hold as we are seeing measles outbreaks in different areas throughout the country. While the largest outbreaks have been in Oregon and Washington State, as of February 14th there are eight total confirmed cases in Texas in 2019, including one in my district in Denton. According to the Centers for Disease Control and Prevention, reported measles incidence decreased 87 percent from 2000 to 2016, and the annual estimated measles deaths decreased 84 percent. What these statistics show us is that the vaccination program was safe and effective.

It is frustrating to see a measles resurgence nearly 20 years after measles was declared eliminated from the United States. I look forward to hearing from Dr. Fauci and Dr. Messonnier about how NIH and CDC have worked and will continue to work to protect our Nation's public health and prevent further spread of this terrible disease.

Ms. DEGETTE. I thank the gentleman for yielding and, Mr. Walden, I really thank you for recognizing Dr. Fauci. He really is a true treasure, and we are always happy to see him.

I am going to ask unanimous consent that Members' written opening statements be made part of the record.

Without objection, so ordered.

I also ask unanimous consent that Energy and Commerce members not on the Subcommittee on Oversight and Investigations be permitted to participate in today's hearing.

Without objection, so ordered.

I would now like to introduce our witnesses, who have already been introduced by a number of opening statements.

Dr. Nancy Messonnier, who is with the National Center for Immunization and Respiratory Diseases at the CDC, and Dr. Anthony Fauci, the director of the National Institute for Allergy and Infectious Diseases at the National Institutes of Health.

Both of you are aware, I know, that the committee is holding an investigative hearing and, as such, has had the practice of taking testimony under oath.

So either of you have any objections to taking your testimony under oath?

Let the record reflect the witnesses have responded no. The Chair then advises you that under the rules of the House and the rules of the committee you are entitled to be accompanied by counsel. Do you desire to be accompanied by counsel today?

Let the record reflect the witnesses have answered no. If you would then, please rise and raise your right hand so you may be sworn in.

[Witnesses sworn.]

You may be seated. Let the record reflect that the witnesses have responded affirmatively, and you are now under oath and subject to the penalties set forth in Title 18 Section 1001 of the U.S. Code.

And the Chair will now recognize our witnesses for a 5-minute summary of their written statements. As both of you know, there is a microphone and a series of lights in front of you.

The light turns yellow when you have a minute left, and it turns red to indicate that your time has come to an end.

So, Dr. Messonnier, I recognize you for your opening statement. Thank you.

**STATEMENTS OF NANCY MESSONNIER, M.D., DIRECTOR, NATIONAL CENTER FOR IMMUNIZATION AND RESPIRATORY DISEASE, CENTERS FOR DISEASE CONTROL AND PREVENTION, DEPARTMENT OF HEALTH AND HUMAN SERVICES; ANTHONY S. FAUCI, M.D., DIRECTOR, NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES, NATIONAL INSTITUTES OF HEALTH, DEPARTMENT OF HEALTH AND HUMAN SERVICES**

**STATEMENT OF NANCY MESSONNIER**

Dr. MESSONNIER. Thank you.

Good morning, Chair DeGette, Ranking Member Guthrie, and members of the committee. I am Dr. Nancy Messonnier. I am the director of the National Center for Immunization and Respiratory Diseases at CDC.

Thank you for the opportunity to speak with you today. Outbreaks of measles have, once again, been prominent in the headlines. From January 1st to February 21st, 159 cases of measles have been confirmed in 10 States, including California, Colorado, Connecticut, Georgia, Illinois, Kentucky, New York, Oregon, Texas, and Washington.

In 2018, 372 people with measles were reported from 25 States and the District of Columbia. Most cases have been unvaccinated. Measles outbreaks have been and continue to be a constant threat to the health of the American people.

While measles has been eliminated in the U.S. since 2000, measles is circulating in many parts of the world and importations remain a challenge.

Unvaccinated U.S. residents traveling abroad are at risk for measles and returning unvaccinated U.S. residents and foreign visitors to the U.S. may develop measles and expose their families and communities.

Nationally, we enjoy high measles vaccination coverage. However, there are pockets of people who are vaccine hesitant, who delay or even refuse to vaccinate themselves and their children.

Outbreaks of measles occur when measles gets into these communities of unvaccinated people. Those choosing not to vaccinate tend to live near each other. Some of these are what we call close-knit communities, people who share common religious beliefs or racial ethnic background. Others are people who have strong personal belief against vaccination.

In the past 5 years, there have been 26 measles outbreaks of more than five cases. Twelve of these were in close-knit communities including outbreaks in a Somali community in Minnesota in 2017 and orthodox Jewish communities in New York City and New York State in 2018.

These 12 outbreaks account for 75 percent of cases over the past 5 years. Vaccine hesitancy is the result of a misunderstanding of the risk and seriousness of disease combined with misinformation regarding the safety and effectiveness of vaccines.

However, the specific issues fueling hesitancy varies by community. Because vaccine hesitancy remains a highly localized issue, the strategy to address these issues need to be local with support from CDC. Strong immunization programs at the State and local levels are critical to understanding the specific issues and empowering local action.

CDC also works to support State and local public health efforts through research to understand these reasons and develop targeted strategies to address hesitancy.

In addition, a rapid response coordinated across local, State, and Federal jurisdictions is critical to control of outbreaks. The public health immunization infrastructure, the systems, and people is the backbone for such a response.

Front line public health workers and clinicians across the country are following up on people potentially exposed to measles and recent outbreaks.

A critical component of our immunization infrastructure is the Vaccines for Children program. Enacted in 1994 in response to a large measles outbreak, VFC is celebrating its 25 anniversary.

Because of VFC, we have seen significant decreases in the disparities in vaccination coverage that previously existed. I would like to acknowledge and thank Congress for the leadership they have shown in supporting VFC and providing us this national treasure.

Our investments in the immunization program have been of great benefit to our children, our communities, and our country. Immunization continues to be one of the most cost-effective public health interventions.

Each dollar invested in the childhood immunization program earn \$10 of societal savings and \$3 in direct medical savings. Immunizing our children is the social norm with only 1 percent of children receiving no vaccines. Not only that, most parents continue to have confidence in the safety and effectiveness of vaccines.

In many ways, however, we are a victim of our own success. Because of our success, fewer and fewer doctors and parents have witnessed the serious and sometimes life-threatening consequences of vaccine-preventable diseases, or VPDs.

Because of our success, we live in a time when outbreaks of VPDs make headlines and are not just seen as a routine and sometimes tragic part of childhood.

Because of our success, parents may wonder if vaccines are really necessary and they may believe that the risk of vaccinating infants or temporary discomfort a vaccine may cause outweighs the benefits of protecting them from VPDs.

Our immunization system has risen to challenges in the past. CDC is committed to keeping measles and other VPDs from regaining a foothold in our country.

Even very large outbreaks start with a single case. Working together, we can keep these numbers down, keep measles from returning and threatening the health of our communities, and sustain the enormous health and societal benefits that our immunization partnership has achieved.

Thank you.

[The prepared statement of Dr. Messonnier follows:]



**Testimony before the  
Committee on Energy and Commerce  
Subcommittee on Oversight and  
Investigations  
United States House of Representatives**

**U.S. Public Health Response to the Measles Outbreak**

**Nancy Messonnier, MD (CAPT, USPHS, RET)  
Director, National Center for Immunization and Respiratory  
Diseases, Centers for Disease Control and Prevention, U.S.  
Department of Health and Human Services**



For Release upon Delivery  
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**INTRODUCTION**

Good morning Chair DeGette, Ranking Member Guthrie, and Members of the Committee. I am Dr. Nancy Messonnier, Director of the National Center for Immunization and Respiratory Diseases at the Centers for Disease Control and Prevention (CDC). Thank you for the opportunity to testify before your Subcommittee on this important topic.

It has been said many times that vaccines are one of public health's greatest achievements. The immunization of children in the United States (U.S.) has prevented hundreds of thousands of deaths, contributed to longer life expectancy, reduced health disparities, improved quality of life, and saved trillions of dollars in societal costs. Immunizations are safe and effective and have become a routine part of how we care for our children. CDC estimates that one percent of children in the U.S. receive no vaccines at all. Despite this low percentage of unvaccinated children, vaccine-preventable diseases continue to be a threat to the health of our communities. In 2018, CDC provided technical support to nearly 300 vaccine-preventable disease (VPD) investigations and conducted nearly 2,000 laboratory tests in support of these investigations. Why do VPD outbreaks still occur despite record-high vaccination coverage rates and near-record lows of most VPDs? Small numbers of cases can lead to the re-emergence of VPDs if there are increasing numbers of unvaccinated people, leaving communities susceptible to outbreaks of these preventable diseases. At particular risk are those who cannot get vaccinated because they are too young or have specific health conditions. While confidence in vaccines remains consistently high at the national level, there are pockets of people who are vaccine-hesitant, who delay or refuse to vaccinate themselves and/or their children. The World Health Organization named vaccine hesitancy as one of the top ten threats to global health in 2019.

Vaccine hesitancy, in general, is rooted in misinformation about the risk of disease and the safety and efficacy of vaccines. However, the specific issue fueling the hesitancy often varies by community. For some, it could be that fewer and fewer doctors, other healthcare providers, and parents have witnessed the serious and sometimes life-threatening consequences of VPDs. Parents may wonder if vaccines are really necessary, and they may believe that the risks of vaccinating infants or temporary discomfort a vaccine may cause outweigh the

benefits of protecting them from infection. For some, they question whether vaccines are safe, or whether they contain harmful ingredients. Others have religious beliefs that dissuade them from seeking medical care, including vaccination. Regardless of the reason for an individual's hesitancy, CDC's goal is to improve vaccine coverage rates, including by communicating the benefits and safety of vaccines, so that Americans can protect themselves, their family members, and others in their community from all VPDs.

## Measles

The recent measles outbreaks in the U.S. provide an excellent example of our continued vulnerability to VPDs. Measles is a highly-contagious respiratory disease caused by a virus. It spreads through the air through coughing and sneezing. After an infected person leaves a location, the virus remains infectious for up to two hours on surfaces and in the air. It spreads so easily that if one person has it, 90 percent of the people close to that person who are not vaccinated or otherwise immune will also become infected. Since the 1960's, there has been a safe and highly-effective vaccine to prevent measles. One dose is approximately 93 percent effective at preventing measles; two doses are approximately 97 percent effective. Before the U.S. measles vaccination program started in 1963, approximately three to four million people in the U.S. got measles each year; 400–500 of them died, 48,000 were hospitalized, and 4,000 developed encephalitis because of measles. In the United States, widespread use of the vaccine has led to a 99 percent reduction in measles cases compared with the pre-vaccine era.

Because of a highly effective vaccination program and a strong public health system for detecting and responding to measles cases and outbreaks, measles was declared eliminated from the U.S. in 2000. Despite elimination status in the US, because measles continues to circulate in many other countries, with nearly 175,000 reported cases occurring worldwide annually, outbreaks can occur in the U.S. when unvaccinated groups are exposed to imported measles virus. Between 2000 and 2018, a range of 37 to 667 measles cases per year were reported in the U.S. with most of these originating outside the country. Importations of measles remain a significant challenge. Unvaccinated U.S. residents traveling overseas are at risk for measles, and

returning unvaccinated U.S. residents and foreign visitors to the U.S. may develop measles and expose unvaccinated people in the U.S. When measles gets into communities of unvaccinated people in the U.S., outbreaks are more likely to occur. Research has found that people who seek personal belief exemptions for their children often live near one another, which could make it difficult to control the spread of measles and increase the chance of the virus re-establishing itself in our country again. In addition, unvaccinated people put others at risk who cannot get vaccinated because they are too young or have specific health conditions.

High measles vaccine coverage and rapid public health response are critical for preventing and controlling measles cases and outbreaks. While overall measles vaccination coverage rates are high at 92 percent, one in 12 children in the United States are not receiving their first dose of measles-mumps-rubella (MMR) vaccine on time, increasing measles susceptibility across the country. In addition, we see considerable variability in coverage across states. In 2017, there were 11 states where more than 10 percent of toddlers had not received even a single dose of MMR vaccine. Within states, some counties or communities have much lower vaccination rates than the state average.

From January 1 to February 21, 2019, 159 individual cases of measles have been confirmed in 10 states. The states that have reported cases to CDC are California, Colorado, Connecticut, Georgia, Illinois, Kentucky, New York, Oregon, Texas, and Washington. Infected people can expose others in a variety of settings, such as school, daycares, emergency departments, outpatient clinics or airplanes. Frontline public health workers and clinicians across the country are following up on suspected measles cases in light of the recent outbreaks. These public health workers and clinicians are part of an enormous public-private partnership that protects health and saves lives through the nation's immunization system.

### Overview of U.S. Immunization Policies and Programs

CDC's national immunization recommendations currently provide guidance for the prevention of 17 VPDs across a person's life span. CDC's immunization program plays a fundamental role in achieving national immunization goals and sustaining high vaccination coverage rates to prevent death and disability from VPDs. CDC's

Immunization program includes the Vaccines for Children (VFC) entitlement program, and CDC's discretionary Immunization program.

VFC is one of the largest and most successful public-private partnerships. Celebrating its 25<sup>th</sup> anniversary, VFC was created by the Omnibus Budget Reconciliation Act of 1993 and implemented in 1994 as a new entitlement program. It allows eligible children to receive recommended vaccinations free of charge as part of routine care, supporting the reintegration of vaccination and primary care. The VFC program serves children through 18 years of age without insurance, children eligible for Medicaid, American Indian/Alaska Native children, and underinsured children who receive care through Federally Qualified Health Centers or Rural Health Clinics. CDC purchases vaccines to distribute to VFC-enrolled providers by funding 61 eligible grantees for VFC-related operations activities. Currently, there are more than 44,000 public and private providers in the VFC program, and VFC purchases and distributes over half of all doses, across all routinely-recommended vaccines administered in the United States to those 18 years and younger. VFC has been instrumental to achieving high vaccination coverage rates and reducing disparities.

The discretionary immunization program was enacted in 1962 through the Vaccine Assistance Act, or section 317 of the Public Health Service Act. Over its 50-year history, the Program has played a critical role in helping to achieve national immunization goals by supporting the essential public health workforce and systems at the national, state, and local levels that protect all Americans, regardless of health insurance status, from disability and death from VPDs. These include proper vaccine storage and handling; management of vaccine shortages; and provider education on the vaccine schedule for people across the life span. To implement the discretionary program, CDC works collaboratively with 64 grantees, comprised of the 50 states, six large cities (including the District of Columbia), five territories, and three Pacific Freely Associated States.

In addition, the discretionary program is responsible for investments that strengthen the evidence base for our immunization policies and practices. The program supports disease surveillance, laboratory capacity, and scientific studies to evaluate vaccine effectiveness, safety, and program impact. The program supports the

nation's ability to maintain public health preparedness for a response to a vaccine-preventable emergency, such as a pandemic or biologic attack. The program also purchases routinely recommended vaccines to protect at-risk and vulnerable populations not eligible for immunizations through the VFC Program and to meet urgent public health needs, such as controlling VPD outbreaks.

Scientifically-based vaccine policies are a foundation of the U.S. immunization system. In the U.S., the Advisory Committee on Immunization Practices (ACIP) advises the CDC on national vaccine policy for preventing infectious diseases in the civilian population. The immunization systems and expertise supported by CDC's immunization program make substantial contributions to the evidence base that informs immunization recommendations made by ACIP. The ACIP makes recommendations based upon data about the burden of disease, safety and efficacy of vaccines, economic analyses, including cost-effectiveness data, and information about other factors such as how recommendations can be implemented by the health care system in conjunction with other recommended vaccines.

Once adopted by CDC, the Committee's recommendations establish the standard of practice for preventing VPDs. The Affordable Care Act requires that vaccines recommended by ACIP be covered without cost to vaccine recipients by new private health insurance plans (along with other recommended preventive services). In addition to post-market surveillance conducted by the CDC and the Food and Drug Administration (FDA) for FDA-licensed vaccines, the ACIP continues to review the safety and effectiveness of vaccines after they are recommended, and updates recommendations as more data become available. New data are reviewed in the context of the risks of adverse effects and the benefits provided by the vaccine.

Investments in CDC's Immunization program have improved the health of Americans. Coverage for many childhood vaccinations are at, near, or above 90 percent, and reported cases for most VPDs have decreased by 90 percent or more in the United States with the introduction of vaccines. Immunization continues to be one of the most cost-effective public health interventions. For each dollar invested in the U.S. childhood immunization program, it is estimated that there is \$10 of societal savings and \$3 in direct medical savings. From 1994 to

2016, the childhood immunization program has been estimated to prevent 381 million illnesses, 855,000 deaths, and nearly \$1.65 trillion in societal costs. CDC's support of national, state and local programs has dramatically improved access to vaccination for all children and put systems in place to detect and respond to outbreaks of VPDs and to monitor vaccine effectiveness and safety.

### Challenges

While overall vaccination rates remain high, there continue to be challenges in preventing VPDs. The majority of parents believe in the benefits of immunization and have their children vaccinated; however, CDC is aware that there are certain concerns that lead some parents to delay or refuse vaccinations. CDC has conducted research to better understand why some parents choose not to vaccinate their children. There are many reasons parents give for their vaccine hesitancy despite consistent scientific evidence that vaccines are safe and effective. For some, many VPDs do not have the visibility they once had and many parents question whether the vaccines are more dangerous for their child than the disease they prevent. Parents also have access to conflicting and often inaccurate information about vaccines via the Internet, and others express concern that there are too many vaccines. Before 1985, the recommended immunization schedule included seven vaccines. Today, we can protect children younger than 2 years of age from 14 potentially-serious diseases with vaccines.

Maintaining public confidence in immunizations is critical to preventing declines in vaccination coverage rates and outbreaks of VPDs. CDC monitors the safety of vaccines by performing high-quality vaccine safety research; determining whether vaccines cause reactions in certain cases and helping to learn about preventable risk factors; and, identifying vaccine adverse events through public health surveillance. CDC also supports science-based communication campaigns and other efforts to convey the benefits of vaccines to the public to aid individuals in making informed vaccine decisions to protect themselves, their loved ones and their communities. CDC works with organizations, such as the American Academy of Pediatrics and the American Academy of Family Physicians, to educate healthcare providers about current immunization policy and clinical best practices to help them protect their patients and communities from VPDs. CDC has also developed a dynamic provider toolkit for

conversations with parents about vaccination that includes evidence-based strategies, print materials, and web-based tools.

While vaccine hesitancy tends to be a focus during times of outbreaks, there are also disparities in vaccination coverage that threaten the nation's ability to maintain high vaccination coverage. Most recently, CDC's national surveys that monitor vaccination coverage have identified that unvaccinated children are more likely to be uninsured, live below the poverty level, and live in rural areas. For example, vaccination coverage was 15-30 percentage points lower for children without health insurance compared to children with private health insurance and 3-7 percentage points lower for children living in rural areas compared to children living in urban areas. These disparities demonstrate gaps in reaching the most vulnerable children and suggest there may be logistical challenges faced by parents who want to get their children vaccinated, such as lack of transportation or lack of immunization providers within their community. CDC is undertaking additional research to identify the challenges these parents face, and to develop appropriate strategies to ensure these children are not left behind.

As the influenza season continues, I also want to mention our progress with childhood vaccination against influenza. CDC's early season estimates from November of last year indicated that 46% of children under age 18 years had received their flu vaccine. This is the highest early season coverage in 5 years and may indicate actions taken by parents in response to the severe 2017-2018 season. While this is encouraging news, end of season estimates typically show less than 60% of children receive their flu vaccine. Coverage varies widely by state and there are disparities in coverage similar to those previously mentioned - by insurance status, socioeconomic status, and by urban/rural status. Achieving high vaccination coverage and preventing pediatric deaths due to influenza is a priority for CDC. CDC is working with state immunization programs to help ensure ordering of enough VFC vaccine to serve their VFC eligible population. CDC is also encouraging states to use alternative venues, such as schools, for vaccinating children against seasonal influenza.

While coverage rates for most childhood and adolescent vaccines are high, coverage estimates for human papillomavirus (HPV) vaccination remain low, with only half of U.S. adolescents receiving all recommended doses of HPV vaccine. The annual national vaccination coverage estimate among teens for one dose of HPV vaccine has been more than 20 percentage points lower than the estimate for one dose of Tetanus, Diphtheria and acellular Pertussis (Tdap) vaccine, demonstrating that valuable opportunities are being missed to vaccinate against HPV. We know that HPV vaccine is safe and effective in preventing cervical and other forms of cancer. CDC is enhancing its efforts to support state and local immunization programs, and to partner with medical professional associations, cancer organizations, and other stakeholders to educate parents and clinicians on taking every opportunity to vaccinate adolescents. Collaborative efforts remain critical to promoting vaccination so that adolescents nationwide are protected against vaccine-preventable disease, including cancers caused by HPV.

Outbreaks of VPDs continue to be an ongoing challenge for the public health system. In addition, there have also been recent outbreaks of meningitis and mumps in university settings and other tight knit communities. Today, these outbreaks are an indicator of how globally interconnected we are, with measles importations uncovering those communities opting out of immunization, and indicating those communities may be getting larger. Ongoing surveillance is critical to detecting and responding to outbreaks quickly to prevent further spread of the disease and to understanding vaccine effectiveness and safety over time. CDC is committed to a strong evidence base to assure that national immunization policies and programs are protecting Americans and based on the best available data, continuously reviewed and updated.

### Looking Forward

The U.S. has reached high coverage levels and achieved low incidence of most VPDs. The threat of VPDs remains, as the current increase in measles cases has shown us. The increase in measles cases should be seen as a wake-up call. Our public health system has risen to challenges in the past, and CDC is committed to keeping

measles and other VPDs from returning and threatening the health of our communities. CDC is committed to sustaining the enormous health and societal benefits that our immunization partnership has achieved.

Ms. DEGETTE. Thank you, Doctor.  
 Dr. Fauci, you are now recognized for 5 minutes.

**STATEMENT OF ANTHONY S. FAUCI**

Dr. FAUCI. Thank you very much, Chairman DeGette, Ranking Member Guthrie, members of the committee. Thank you for giving me the opportunity to talk to you for a few minutes about the continued reemergence of vaccine-preventable disease, measles.

As shown on this slide and as mentioned by several of you already, measles virus is one of the most contagious viruses that we know among the pathogens that confront mankind—as mentioned, that if an individual gets into a room with someone who has measles and that person is coughing and sneezing, there's about a 90 percent chance that that person—that is very unlike other diseases like influenza and other respiratory diseases when the hit rate, although it is high, is nothing approaching 90 percent.

Also, we know a lot about the virus. It has been very well sequenced. That is important, because we can tell when the virus is reintroduced into our country from where it comes, such as the Israel insertion into the—into the Brooklyn among the Hasidic Jews. We knew that it had come from an individual from Israel.

Importantly is the potential for eradication because a similar virus among animals was eradicated. I consider it really an irony that you have one of the most contagious viruses known to man juxtaposed against one of the most effective vaccines that we have and yet we don't do and have not done what could be done, namely, completely eliminate and eradicate this virus.

You heard some of the—oops, I better go back one. Oops, it is just—it has got a life of its own. Go back a few. There you go.

As was mentioned, prior to the vaccine era there were about 3 million deaths each year. The decrease was dramatic. There were 21 million lives that were saved from vaccines between the year 2000 and 2017.

But, as shown on the last bullet on this slide, there are 110,000 deaths still today in the world, which means there is the danger of the reinsertion of measles from other countries and if we are not protected.

Again, prevaccine measles in the United States 3 to 4 million measles case and, as was mentioned by several of you, 48,000 hospitalizations. Like Dr. Burgess, I remember very clearly the year that I got infected with measles. It was very uncomfortable and it was very scary because at that year I went back and looked at the statistics. There were 900,000 to a million cases in the United States that year.

But look what the vaccine done. This is a very dramatic slide. As shown, it dramatically decreased it to the point of the year 2000 when we essentially eliminated.

But let us take a look at some of the things that I mentioned about the disease itself. Fever, cough, rash, as was mentioned by Dr. Burgess—again, contagious from four days before the rash to four days after. So people are spreading measles before they really know that they actually have measles.

We have a group of individuals who are particularly at risk for complications—infants and children, pregnant women,

immunocompromised, and even adults. If you are not protected and you get infected, adults have a high incidence of complications.

We have heard about the complications. They are not trivial. One out of ten with ear infections, which could lead to deafness; pneumonia in one out of 20 cases; encephalitis one in a thousand; a very rare occurrence called subacute sclerosing panencephalitis, which I will mention in a moment.

I don't want to scare the audience here but this is an x-ray of a child who was infected, developed pneumonia with bacterial complications. That x-ray, if it were normal, should look all dark where the lungs are. The light is what we call whiting out of the lungs, which very often leads to death.

As I mentioned, subacute sclerosing panencephalitis is very rare, but it should be mentioned 7 to 10 years after an individual develops measles they can have a very devastating neurological syndrome—no known cure and is vaccine preventable.

This is what it looks like. The brain on the right side has a lot of dark spaces where. That is where brain tissue should be. That is what happens when the brain gets damaged.

And so this is the statistics that Dr. Messonnier and several of you mentioned about what is going on right now. This slide is really unacceptable. This is a totally vaccine-preventable disease and when we see these kind of blips, this is not something to be taken lightly.

So what we all should strive for that measles in the United States we need to get to zero.

Thank you.

[The prepared statement of Dr. Fauci follows:]

DEPARTMENT OF HEALTH AND HUMAN SERVICES  
NATIONAL INSTITUTES OF HEALTH

Measles: The Continued Re-emergence of a Vaccine-Preventable Disease

Testimony before the  
House Committee on Energy and Commerce  
Subcommittee on Oversight and Investigations

Anthony S. Fauci, M.D.

Director

National Institute of Allergy and Infectious Diseases  
National Institutes of Health

February 27, 2019

Madam Chair, Ranking Member Guthrie, and Members of the Subcommittee:

Thank you for the opportunity to discuss the role of the National Institutes of Health (NIH) in addressing the re-emergence of measles. I direct the National Institute of Allergy and Infectious Diseases (NIAID), the lead NIH institute for conducting and supporting research on emerging and re-emerging infectious diseases, including measles. Measles was once a common childhood infection in the United States. However, the disease was declared eliminated in this country in 2000 thanks to the deployment of a highly effective vaccine in the 1960s. We are now seeing a resurgence of measles, primarily due to gaps in vaccine coverage that allow sporadic outbreaks to occur. Unfortunately, many of these gaps in the United States result from an anti-vaccine movement that continues to gain momentum.

The Centers for Disease Control and Prevention report that in 2018 there were more than 370 cases of measles in the United States and in 2019 there have been 159 cases of measles confirmed in ten states as of February 21, 2019. Six outbreaks have been reported in 2019 throughout the United States: three in New York State, one in Illinois, one in Texas, and one in Oregon and Washington State. Recent outbreaks have been sparked by individuals infected with measles virus in areas of the world with large measles outbreaks, such as the Philippines, Israel, and Ukraine. Fortunately, unlike with many other infectious disease threats, we already have the means to control measles virus: a safe and highly effective vaccine. However, failure to fully utilize this important intervention can have potentially serious individual and public health consequences.

### OVERVIEW OF MEASLES

Measles is one of the most contagious viral infections known to man. The disease is caused by the measles virus, an RNA virus of the genus *Morbillivirus* in the family Paramyxoviridae. The measles virus was isolated in 1954 and is composed of eight proteins, two of which – the hemagglutinin and fusion proteins – are essential to its ability to cause disease. Full genome sequences of multiple measles virus strains are available, allowing for comparison to newly emerging strains. These genetic tools have been successfully utilized to detect the origin of measles cases imported to the United States from abroad. Measles is still common in many parts of the world where vaccine coverage is incomplete or insufficient to limit spread of the disease. There were approximately 110,000 measles deaths globally in 2017, mostly in children younger than five years of age.

Despite the continued spread of measles, there is the real potential to eradicate the disease entirely with a concerted global public health effort to increase measles vaccination. A cattle virus closely related to measles called rinderpest was eliminated in 2011 after a sustained worldwide vaccination campaign. There is no reason why the same cannot be accomplished for measles.

Measles is spread from person to person primarily by coughing and sneezing. Infectious droplets can remain airborne and transmit measles for up to two hours. This means that the disease can spread long after an infected person has left a room. If a person with active measles infection is in a closed space and is coughing and sneezing, 90 percent of the people in that space who are not immune will likely become infected. Individuals infected with the measles virus typically experience a 10- to 14-day incubation period before the development of a fever (as high as 105°F), runny nose, cough, red eyes, and sore throat lasting two to four days. These

symptoms usually are followed by the appearance of a rash that spreads from the head to the body to the lower extremities. Patients with measles can remain contagious from four days before through four days after the appearance of the rash.

Since most children who contract measles recover uneventfully, measles often is incorrectly portrayed as a disease of limited consequence; however, measles-associated complications can result in severe, lifelong disability or even death. Prior to the availability of a vaccine, three to four million measles cases occurred each year in the United States, resulting in approximately 48,000 hospitalizations and 500 deaths. Today, even in industrialized countries and settings with access to optimal care, measles infections still result in serious health consequences. One in ten patients experience ear infections, and one in twenty develop pneumonia. One in a thousand are affected by encephalitis, or inflammation of the brain, that can cause seizures and result in deafness or intellectual disability. Two or three in a thousand will die from the measles. In rare cases, a persistent central nervous system infection occurs, causing a fatal degenerative neurological disease called subacute sclerosing panencephalitis (SSPE). SSPE generally develops seven to ten years after measles infection and is characterized by behavioral changes, mental and motor deterioration, seizures, blindness, and ultimately death within one to three years.

The risks of serious complications or death from measles are higher in children younger than five years and adults older than 20 years. Fortunately, the widespread availability of a measles vaccine beginning in 1963 has led to a 99 percent reduction in measles cases and a corresponding reduction in measles-related complications in this country. Mass vaccination campaigns and increased routine immunization coverage in recent years have helped to reduce

the death toll from measles. The World Health Organization estimates that between 2000 and 2017, measles vaccination prevented an estimated 21.1 million deaths worldwide.

### **THE IMPORTANCE OF VACCINATION**

The goals of vaccination are two-fold: to prevent illness and death in the vaccinated individual and to decrease viral transmission in the community. Prior to the availability of the measles vaccine, measles occurred in epidemic cycles. The introduction of a vaccination program for measles led to a reduction in the number of cases as well as the frequency and the size of epidemics. The measles vaccine when given in the recommended regimen of one dose at 11 to 12 months of age and an additional dose at 4 to 6 years of age is 97 percent effective in protecting against measles infection, making it one of the most effective vaccines available against any virus. This fact together with its excellent safety record, the highly contagious nature of the infection, and its potentially serious consequences underscore the importance of not withholding measles vaccination from those for whom it is indicated.

Immunization programs that achieve sufficiently high vaccination rates reduce the number of individuals in the community who are susceptible to infection, thereby limiting the spread of a contagious disease. This is called herd immunity. For herd immunity to be effective with measles, from 92 to 95 percent of the community must be immune, either by prior infection or by vaccination. Herd immunity protects unvaccinated individuals, including children who are too young for certain vaccinations or have other health conditions that preclude them from being immunized. For example, children younger than one year are too young to receive the measles vaccine. Nonetheless, they receive indirect protection when older individuals are vaccinated and become less likely to transmit measles. This indirect protection also is important for certain

individuals, such as those with immunodeficiency disorders or certain cancers, for whom the vaccine is medically contraindicated. Thus, the benefits of immunization against measles extend beyond just the vaccinated individual to the entire community.

#### **NIH MEASLES RESEARCH**

NIAID has a longstanding commitment to research on vaccine-preventable diseases, including those caused by morbilliviruses such as measles. This research has informed our understanding of measles virus biology and pathogenesis as well as the host immune response to measles infection and vaccination. NIAID has responded to the re-emergence of measles in the United States by expanding our portfolio of research on measles virus. This NIAID measles research includes efforts to understand why the disease spreads so efficiently from person to person by using an animal model to study measles virus replication within the airway. NIAID also is supporting several studies of vaccine-induced immunity, including using a third dose of vaccine to further boost the immune response; exploring potential differences in immune responses between sexes; and elucidating the mechanisms underlying the “waning immunity” that is observed in vaccine recipients compared to the life-long immunity observed in people naturally infected with measles virus.

No antiviral therapies are currently available to treat measles. NIAID is working to address this unmet need by facilitating collaborations among antiviral researchers through a scientific workshop to accelerate the development of measles antivirals. NIAID also funds efforts to screen antiviral compounds for activity against measles. In addition, NIAID supports basic research to improve our understanding of the host immune response to measles infection

and the mechanisms used by the virus to evade that response. This knowledge will provide the foundation for developing novel therapeutic strategies.

### **CONCLUSION**

NIH is committed to continued collaboration with U.S. Department of Health and Human Services agencies and other partners across the U.S. government to address the re-emergence of vaccine-preventable diseases, including measles. NIAID efforts to elucidate the biology of measles virus and develop therapies to treat measles will help to limit the severity of measles-associated complications. NIAID also will continue to support efforts to improve our understanding of the host immune response to measles vaccines. Vaccines are among the 20th century's safest, most successful, and cost-effective public health tools for preventing disease, disability, and death. In addition to preventing a vaccinated individual from developing a potentially serious disease, vaccines help protect the entire community by reducing the overall transmission of infectious agents such as measles. Confidence in the safety and efficacy of vaccines is essential, and we will continue to work with our partners to stress the public health benefit of vaccination for measles and other vaccine-preventable diseases.

Ms. DEGETTE. Thank you, Dr. Fauci.

It is now time for Members to have the opportunity to ask questions. I will recognize myself for 5 minutes.

Since we first announced we would be holding this hearing almost two weeks ago, more than 58 additional measles cases and an additional outbreak have been reported. Parents around the country are seeing headlines about these outbreaks.

As, Dr. Fauci, you mentioned, it is so rare now that it actually does make headlines. But there is also a lot of noise out there on measles and vaccines and I think sometimes because we eliminated measles for a while parents now are unclear about how best to protect their children and families.

Both of our witnesses are the two—two of the top public health officials in the country. And so I would like to ask each one of you what is the most important piece of advice you would give to parents around the country on how they can best protect their children and families from measles.

Dr. Messonnier?

Dr. MESSONNIER. Taking care of your health, eating well, exercising, getting enough sleep—those are all parts of a healthy lifestyle.

But the only way to protect against measles is to get vaccinated. It is a safe and effective vaccine, and parents should go ahead and get vaccinated.

If they have questions, they should talk to their doctor. Their doctor can provide them more information about measles, answer their questions, and reassure them to then go ahead and get vaccinated.

Ms. DEGETTE. Dr. Fauci, do you have anything to add?

Dr. FAUCI. Yes. I think it is important to point out, obviously, ditto what everything that Dr. Messonnier said. But we should look upon it in two approaches. One, it is for the safety of your own child and the other is a responsibility to the community, because in your opening statement, Congressman DeGette, you mentioned this issue of herd immunity and we all have a responsibility to be part of that umbrella of herd immunity. And once it goes down below a certain percentage, then you have danger to the entire society.

And something that is not fully appreciated is that we vaccinate children first time at 11 to 12 months, and then the boost at 4 to 6 years. Those infants are vulnerable to measles if they get exposed.

So it is our responsibility to protect them and the only way you can protect those who are not old enough to yet get vaccinated or the immunosuppressed is to be part of that herd immunity.

Ms. DEGETTE. Right. Now, Dr. Messonnier, you talked about the risks and benefits, and we have heard a lot from both of you about the benefits.

What are the risks of the—and maybe, Dr. Fauci, you want to add into this, too—what are the risks inherent in the vaccine itself? I think that might be one reason why some parents are choosing not to vaccinate their children as they believe that the risks with the vaccine outweigh the benefits.

Dr. MESSONNIER. I think you are exactly right and I think in the setting of not a lot of measles cases around parents weigh in their mind the risks and benefit and think they shouldn't vaccinate.

The truth is this is an incredibly safe vaccine. We have a host of experience with it. The vaccine has been used for a really long time.

We, in the United States, enjoy one of the most robust systems to monitor the safety of vaccines and that is why we can say with confidence that this is a safe vaccine. The most common side effects are a sore arm, which goes away pretty quickly.

Ms. DEGETTE. And where can parents go to get factual information about vaccines?

Dr. MESSONNIER. Yes, thank you. That is a really important question. As a parent myself I understand that there is lots of information out there and it is really hard to sort through it all and make sure that you are getting the correct choices for your children.

CDC works really hard to make sure that we put out scientifically credible information. That is one of our core missions. But we also provide that information to health care providers.

Parents say that the person they trust most to help them make health care decisions is still their health care provider and that is also true of patients that are hesitant to vaccinate.

So parents should talk to their health care provider. They can help them sort through the sea of information out there to what is scientifically correct.

Ms. DEGETTE. Dr. Fauci, do you have a sense of what parents can do to get accurate information about the risks and benefits?

Dr. FAUCI. Yes. I mean, I want to echo what Dr. Messonnier said. The CDC website is just really a cornucopia of important information. It is easily accessible. You go to [cdc.gov](http://cdc.gov). It says Search. Put measles in and all the things you really want to know about it are right there with references.

Ms. DEGETTE. Great. OK. Thank you very much, both of you, for being with us today and clearing up some of these myths.

I am now happy to recognize the ranking member, Mr. Guthrie, for purposes for asking questions for 5 minutes.

Mr. GUTHRIE. Thank you very much, and again, thanks for the witnesses for being here. And this is important and I think every parent, regardless of what decisions they made on—want to make the best decision for their child. That is what people—and so we want to make sure the best information, the accurate information, so they can make the best decision for the child.

This is particularly pertinent to me. One of my great friends growing up—I was born in 1964. He was born just a few months before me in 1963 and his mom had rubella. He was born without a hand—essentially, without a hand. And so I have always thought of measles and how devastating it can be.

As a matter of fact, you can see him play baseball. He could throw the ball, have his glove on his hand, put his hand in and just amazing how he adapted to it. But it was something.

So I remember later in life when I was a little older my mom telling how the—because she was six or seven months pregnant with me when he—when he was born and just the terror that went

through our community and with women that were pregnant with their children at that time.

So it has always been—so I just want to ask some questions and try to get information out, moving forward, and for both of you to answer. In your opinion as physicians and leaders in Federal public health agencies, should parents of unvaccinated children be more fearful of measles or the measles vaccine?

Dr. FAUCI. To me, it is a no doubt. That is really a no-brainer. Clearly, if you look, and as I try to describe in my opening statement, the potential complications and even if you don't have complications, just the discomfort associated with the illness of measles far, far outweighs, as Dr. Messonnier said, of a very, very safe vaccine.

So, to me, there is no doubt. I am a parent. I have three daughters. They were all vaccinated and the thing that I worried about was them, if I did not vaccinate them, getting measles if it came into the community. That would scare me, not the vaccine.

Mr. GUTHRIE. Thank you.

Dr. MESSONNIER. One thing I will add is that in the current outbreak in Clark County, Washington State, we have seen a huge upsurge in acceptance of vaccine and use of vaccine in the community.

When faced with the real threat of measles, people—parents weigh that same equation and realize it is better to vaccinate. What we need to do is get those messages to parents before the measles outbreak hits.

Vaccine is incredibly safe. Measles remains a risk throughout the country. Yes, it is a no-brainer.

Mr. GUTHRIE. And your children are vaccinated?

Dr. MESSONNIER. Of course my children were vaccinated.

Mr. GUTHRIE. So for both of you, again, how many doses of MMR vaccine have been given in the U.S.? Millions or—

Dr. MESSONNIER. I mean, millions of doses of MMR vaccine are given every year.

Mr. GUTHRIE. And after more than 55 years of experience and hundreds of millions of doses, we estimate, what is the safety record of MMR vaccine?

Dr. MESSONNIER. You are right. Millions of doses in the U.S., not to count also the multimillion of doses given globally, all tell us for certain that the safety record is good. It is an incredibly safe vaccine. Parents should be reassured that we know this vaccine is safe because of all this experience.

Mr. GUTHRIE. Dr. Fauci?

Dr. FAUCI. Also, I think it is important about how some people can get confused because when you're in a certain area of childhood—so vaccines are recommended at around one year—11 to 12 months—and then the boost at 4 to 6 years.

During that period of time of childhood a lot of things happen to children. They get a lot of different diseases. Sometimes bad things happen. And if you were to look at that you can make an association and say, well, maybe that's due to the vaccine.

But a number of studies over many, many years have shown the disassociation of that and, as Dr. Messonnier said, that when you

go back and look at the strict safety of the vaccine it is extraordinarily safe.

Mr. GUTHRIE. I want to look at some of the concerns. I have heard some parents claim that measles vaccine can cause brain inflammation—encephalitis. Is that true? Is that true?

Dr. FAUCI. Brain inflammation encephalitis?

Mr. GUTHRIE. Encephalitis. Can measles vaccine cause encephalitis—the vaccine?

Dr. FAUCI. The vaccine, no.

Mr. GUTHRIE. There are no cases—

[Disturbance in hearing room.]

Dr. MESSONNIER. There is no—

Dr. FAUCI. Rare.

Ms. DEGETTE. The Chair will remind all persons in the audience that manifestation of approval or disapproval of the proceedings is in violation of the rules of the House and its committees.

The gentleman may proceed.

Dr. MESSONNIER. In healthy children MMR vaccine does not cause brain swelling or encephalitis.

Mr. GUTHRIE. So if a child wasn't healthy when they are vaccinated would—

Dr. MESSONNIER. So there are rare instances of children with certain very specific underlying problems with their immune system and who the vaccine is contraindicated. One of the reasons it is contraindicated is in that very specific group of children there is a rare risk of brain swelling.

Mr. GUTHRIE. Would a parent know if their child was in that category before they are—

Dr. MESSONNIER. Certainly, and that is why a parent should talk to their doctor.

Mr. GUTHRIE. OK. And then one more, because I had a couple of seconds with the questions. So another thing, that the people can self-medicate with Vitamin A to prevent measles and not do the vaccine. What is the validity of that, in your opinion?

Dr. FAUCI. Well, the history of Vitamin A and measles goes back to some very important and, I think, transforming studies that were done years ago in sub-Saharan Africa, is that with Vitamin A supplements and particularly in Vitamin A deficiency that children who get measles have a much more difficult course.

So Vitamin A associated with measles can actually protect you against some of the toxic and adverse effects. Importantly, since in a country—a developed nation where you really don't have any issue with Vitamin A deficiency, that you don't really see that transforming effect.

But some really good studies that were done years ago show that Vitamin A supplementation can be very helpful in preventing the complications of measles.

Mr. GUTHRIE. It doesn't prevent onset of measles, if you are not immunized?

Dr. FAUCI. No. No.

Mr. GUTHRIE. Is that what you are saying? I don't want to put words in your mouth.

Dr. FAUCI. It doesn't prevent—it doesn't prevent measles. But it is important in preventing some of the complications in societies in which Vitamin A deficiency might exist.

Mr. GUTHRIE. Thank you. I appreciate your indulgence.

Ms. DEGETTE. The gentleman yields back.

The Chair now recognizes the gentlelady from Illinois, Ms. Schakowsky, for 5 minutes.

Ms. SCHAKOWSKY. Dr. Messonnier and Dr. Fauci, if we could just once—maybe once again put on the record, yes or no. Is the highly contagious measles virus life-threatening—deadly? Yes or no.

Dr. MESSONNIER. Yes.

Dr. FAUCI. The answer is yes. It rarely occurs. I mean, most children—myself, Mike Burgess—

Ms. SCHAKOWSKY. Myself.

Dr. FAUCI [continuing]. Who developed measles—yourself and many people on the committee who got measles would recover completely. But you ask yourself, is there a potential to be deadly?

History tells us unequivocally that's the case, because when you were talking about the measles vaccine before we vaccinated here in the United States in the early to mid-'60s, there were 400 to 500 deaths directly due to measles.

Prior to the measles vaccine globally there were over a million—1 to 2 million—deaths in a year. So as Dr. Messonnier said in direct answer to your question, is it potentially deadly? Absolutely.

Ms. SCHAKOWSKY. That is very important. Thank you.

And that deeply should concern all of us and over the past two weeks a new outbreak has sprouted in my home State of Illinois with four confirmed cases in Champaign County, the home of the University of Illinois. It happens to be my alma mater.

And I am trying to understand what has happened between 2000 and 2019 and why we have fallen so far from the public health success stories when the CDC actually said that there—we had eradicated in the United States measles in 2000.

So, Dr. Messonnier, yes or no. Do you believe the primary cause of the spike in measles outbreak over the past few years is due to vaccine hesitancy and misinformation?

Dr. MESSONNIER. Yes and no. I think vaccine hesitancy is a word that means many different things. Parents have questions about vaccines. They get those questions answered. That is what you should call hesitancy.

So I do believe that parents' concerns about vaccine leads to undervaccination and most of the cases that we are seeing are in unvaccinated communities.

However, if you look nationally at measles vaccination coverage, there are other things that are associated with low coverage. For example, living in a rural area versus an urban area. Rural areas have lower vaccine coverage with measles.

Ms. SCHAKOWSKY. How would you account for that?

Dr. MESSONNIER. Well, I think that there are other things besides the choice that are around access to care. For example, kids without health insurance have lower measles vaccination coverage.

Ms. SCHAKOWSKY. So, generally, lack of access to care?

Dr. MESSONNIER. In addition to parents making decisions not to vaccinate their kids, yes.

Ms. SCHAKOWSKY. More than 50 percent of the current outbreak cases this year occurred in Clark County, Washington. In that region, only 81 percent of 1-to-5-year-old children and only 78 percent of 6-to-18-year-olds received the age-appropriate measles, mumps, and rubella vaccine dosage. So it is really deeply troubling that it seems to cluster in certain places.

Dr. Messonnier and Dr. Fauci, what do you believe would happen—let us say if only 78 percent of the entire U.S. population was vaccinated against the—against measles or, worse yet, what would happen if we stopped all measles vaccinations?

Dr. FAUCI. Well, measles, as I mentioned in my presentation, exists. There were 110,000 deaths in 2017. So measles is out there.

Even though we, as a country, now have a high degree of vaccination, if we did what you are suggesting and essentially dropped it down to 70 percent, 50 percent, or even stopped, we would have an entirely susceptible population. We would be like countries prior to the vaccine era and that would be a catastrophe waiting to happen.

So even if you go down to a certain level, if you look not only at the United States—we showed the figures of the United States—but right now there is a terrible outbreak going on in Madagascar. There have been 900 deaths so far in Madagascar.

We are seeing that in other countries in which when you go below a certain level and that umbrella of herd immunity lifts, it truly is a catastrophe waiting to happen. So that is something that would be very scary to think about.

Ms. SCHAKOWSKY. Let me just say as an organizer, I think part of it is a communications issue, an organizing issue, and we need to mobilize the public on this question. It is not just up to the two of you. We want to work with you but I think we need to get some organizers going.

Thank you. I yield back.

Ms. DEGETTE. The Chair now recognizes the gentleman from Texas, Dr. Burgess, for 5 minutes.

Mr. BURGESS. Thank you for the recognition.

I learned something this morning. I always learn something on this committee. Mr. Guthrie asked a question about Vitamin A and, Dr. Fauci, thank you for your answer.

I did not know that in Vitamin A deficient individuals perhaps there was going to be a harder course for the disease.

I do feel obligated to mention that Vitamin A is not like Vitamin C. You may not take unlimited quantities of Vitamin A with impunity. It is a fat-soluble vitamin and it is stored in the body. So don't go out and hyperdose on Vitamin A because it will not accrue to your long-term benefit.

So vaccines themselves are at the very heart of medical innovation and some my parallel the history of this country. Dr. Edward Jenner began his career and introduced the first vaccination in 1796, 20 years after our Declaration of Independence. So a long history of an association with vaccination.

So the two of you work together on these issues. So can you perhaps tell us a little bit how you work together to prevent the re-appearance of vaccine-preventable diseases, focused on measles this morning?

Rubella—something I remember from my residency at Parkland Hospital. A congenital rubella syndrome in a child was devastating. These are illnesses that new generations of doctors don't see because of the effectiveness of the vaccine.

Can you speak just briefly of how you—how your agencies interact and work together?

Dr. FAUCI. Well, as you know, Dr. Burgess, that the CDC and the NIH are within the Department of Health and Human Services. So we consider each other sister agencies, as it were, and the CDC has the major responsibility, as Dr. Messonnier will tell you, about the public health—the surveillance and the messages.

We, as a research institution, try to fill in any of the gaps that occur from a research standpoint. What we are talking about today is really less of a research problem than it is an implementation problem.

So how we help and work with our colleagues at the CDC is to continue to provide the evidence-based—the science-based evidence of why we need to implement a highly successful program that is, as we know, the vaccine program that we are talking about.

Dr. MESSONNIER. No, I think this is an area where CDC does have the leadership role within HHS and our program is vast and diverse including all the operational pieces that it takes to deliver vaccines and, importantly, all the local partnerships that it takes to make the—to make the case for why vaccines are important.

Communication is a hugely important part. Monitoring the effectiveness and safety of vaccines so that we can continue to assure the public that we know that the vaccines are working like we think they are.

Mr. BURGESS. And, Madam Chairman, I will just say that both of these—both NIH and CDC—where Members of Congress come visit it. I know it is a pain in the neck but you are always very good to receive us.

Dr. FAUCI, I try to come to the NIH once each congressional term and, Dr. Messonnier, I was at CDC—it is harder to get to Atlanta for me, but the—you have been very good about when I have come to make available information and personnel and it is very, very helpful in sort of setting the background for what you just described.

Let me ask a question of either of you or both of you. The 1999—the Public Health Service recommended removing thimerosal, the mercury-containing compound. My understanding is that childhood vaccinations now no longer contain thimerosal except for a select few—perhaps the multidose flu vaccine.

Did the measles-mumps-rubella vaccine ever contain mercury or thimerosal? I need a verbal answer for the clerk.

Dr. FAUCI. No, it is preservative free.

Dr. MESSONNIER. No, and you didn't ask this but I just would also point out this is an area where we work with FDA very closely since vaccine safety is their mandate.

Mr. BURGESS. Was there ever any evidence to suggest that mercury or thimerosal was unsafe? I guess that is a better question for the FDA but you all are experts—subject matter experts.

Dr. FAUCI. There is no evidence that it is unsafe.

Dr. MESSONNIER. The thimerosal was removed from vaccines out of an abundance of caution at a time when there wasn't enough evidence. But evidence since then has been very conclusive.

Mr. BURGESS. Well, I thank you for that. I have some additional questions. I will submit those for the record.

I yield back.

Ms. DEGETTE. Thank you very much.

The Chair now recognizes the chairman of the full committee, Mr. Pallone, for 5 minutes for questioning.

Mr. PALLONE. Thank you, Madam Chair.

The elimination of measles in the United States in 2000 was a testament to science research and the public health system we have in place in this country. So it is disturbing to see the numbers on the current measles outbreaks and just how common these outbreaks are once again becoming in the United States.

You know, I mean, I guess the CDC made the announcement based on the number of cases that had been eradicated. But even I myself, when I was doing my opening statement this morning, you know, my staff said oh, it is, you know, over in New Jersey and then we have a new outbreak.

So, you know, I think there is reason to be concerned. So let me just say, Dr. Messonnier, is—what is the reason or the reason why we should be concerned that measles cases and outbreaks are increasing or may increase in the coming years, I mean, and do you agree that we should be concerned?

Dr. MESSONNIER. Yes, we should certainly be concerned. So measles was identified as eliminated in the United States in 2000 because there was no longer sustained transmission in the U.S.

However, measles continues to circulate globally, which means unvaccinated U.S. travelers can be exposed to measles and bring it back home with them and folks in their families and their communities, if they are not protected by vaccine are at risk. Measles is so incredibly contagious that it can spread really quickly. So yes, we should be concerned.

Mr. PALLONE. All right.

Now, given your answers, I am glad we are focusing on it today. But this threat, in my opinion, is amplified, unfortunately, by the spread of disinformation. There has been a significant—there has been significant reporting in the past few weeks regarding the use of digital media platforms to spread misinformation and fear about vaccinations.

So let me go to Dr. Fauci. What role do you see the spread of disinformation online playing in the rise of these outbreaks?

Dr. FAUCI. I believe, Mr. Pallone, that it—that it plays an important role. It is not the only one but I believe it plays an important role and I think the classic example of that was the disinformation associated with the relationship between measles vaccination and autism, which back when it came out years ago there was a big concern that this was the case.

When it was investigated it became clear that the data upon which those statements were made were false and fraudulent and the person who made them had his medical license revoked in England.

And yet, as you know very well, the good news about the internet is that it spreads important information that is good, and the bad news about the internet is that when the bad information gets on there, it is tough to get it off.

And yet people refer to things that have been proven to be false. So disinformation is really an important issue that we need to try and overcome by continuing to point people to what is evidence based and what is science based.

So in so many respects, we don't—we shouldn't be criticizing people who get these information that is false because they may not know it is false. We need to try and continue to educate them to show them what the true evidence base is.

But in direct answer to your question, that is an important problem—disinformation.

Mr. PALLONE. Now, do you think that the promotion of this inaccurate and fear-based messages—would you consider that in itself a threat to public health?

Dr. FAUCI. Yes, of course. I think the spread of false information that leads people into poor choices, even though they are well meaning in their choice, it is a poor choice, based on information. I think that is a major contribution to the problem that we are discussing.

Mr. PALLONE. I mean, part of the problem is, you know, is this 30 seconds. In other words, you know, people will listen to the news or watch the internet and they will hear, as you say, that somehow vaccinations lead to autism and they will hear that and then, you know, they won't hear what comes later that says that that is false because that is more complicated, you know. I mean, it is just the nature of it.

Look, the main thing I wanted to say because we are—you know, I only have 5 minutes—is that you keep stressing the science and that we have to follow the science and protect the public health based on what the science tells us, and I think that is what's so crucial here, and that is the one thing that, you know, we have and that, you know, CDC and National Institutes of Health are providing for us, is the science-based information and we have to rely on it and get that out.

So thank you so much. Thank you both. Thank you, Madam Chair.

Ms. DEGETTE. The gentleman yields back.

The Chair will once again remind the persons in the audience that manifestation of approval or disapproval of proceedings is in violation of the rules of the House and the committees, and if these violations continue then we will notify the Sergeant at Arms, who will have you removed.

So I would appreciate cooperation of everyone so we can hear the witnesses and so we can hear the Members' questioning.

And with that, I will now recognize the gentlelady from Indiana, Mrs. Brooks, for 5 minutes for her questioning.

Mrs. BROOKS. Thank you, Madam Chairwoman.

Dr. Fauci, I would like to focus—and actually both of you, Dr. Messonnier and Dr. Fauci—I would like to talk a little bit about U.S. biodefense.

And Congresswoman Eshoo and I led the Pandemic All-Hazard Preparedness Act bill, which we have gotten passed through the House once again, and I think what a lot of people in the country don't fully appreciate is the importance of a biodefense and defending our country, whether it is for national security reasons or with respect to public health threats.

Is undervaccination to U.S. biodefense and how does—how do vaccinations play into the protection of our country and what does biodefense mean?

Dr. Fauci?

Dr. FAUCI. Yes. Thank you for that question. That is a very good question because we have been involved in biodefense for quite a while. The effort really galvanized at 9/11 when we had the anthrax attack and we put a considerable amount of resources into developing countermeasures in the parts of vaccines, therapeutics, diagnostics, against what were classically agents that were used in bioterror.

When we analyzed our approach back in 2001, 2002, and 2003 it became clear that it really is all a part of emerging and re-emerging infections—those that naturally emerge as new infections, like we saw with AIDS and SARS. Those that—

Mrs. BROOKS. Zika?

Dr. FAUCI. Yes, Zika.

Mrs. BROOKS. Ebola?

Dr. FAUCI. But those that—those are reemerging so there are brand new infections. There are reemerging infections and we would consider as part of the big problem and the link that I think you are referring to, and I totally agree with you, that if you have a vaccine-preventable disease but you still let that disease go unchecked because of lack of vaccination, that is all part of the problem of not adequately addressing reemerging infectious disease.

Measles in an old disease. Right now what we are seeing on the charts that we showed is the reemergence of a vaccine-preventable disease, which to me falls under that broad category that you are referring to.

Mrs. BROOKS. And I—and I appreciate you giving us the numbers. We were at 159 as of February 21st. The numbers might be slightly higher. But that—those numbers are dramatic for only two months of the new year.

How is it—and both of you have talked about the importance of eradicating it entirely with a concerted global public health effort because you have got 900 people who have died in Madagascar, and I know while people here in this country may not think that people in Madagascar can infect our country, why do we believe it is possible to eradicate a disease like measles? Why do we think it is even possible?

Dr. Messonnier? Dr. Fauci?

Dr. FAUCI. So I have been saying that it is a—the vaccine is extraordinarily effective. We have eliminated—the agricultural industry has eliminated a closely related virus among animals called rinderpest. So it is, essentially, the same virus only the animal version of it.

So when you have a highly effective, and I want to underscore that because measles is one of the most effective vaccines that we

have of any vaccine, that a massive public health effort could lead to eradication because we don't have an animal vector.

We don't have an intermediate host. We don't have a vector that transmits it. It is just person-to-person transmissibility.

So, theoretically, we could eradicate it. The problem between eradication and elimination, if you eliminate it like we did in this country in 2000, as long as there is measles somewhere you always have the threat of it reemerging if you let down the umbrella of herd immunity.

Mrs. BROOKS. And so, Dr. Messonnier, helping other countries with vaccine implementation would be helpful to our country. Is that correct?

Dr. MESSONNIER. That is right. I mean, control of measles around the world is a priority for CDC and there are a whole variety of efforts towards that.

I do think it is important, though, Dr. Fauci is correct about Madagascar. But I think Americans don't realize that in 2018 there were also outbreaks in England, France, Italy, and Greece. American travelers going abroad need to think about their immunization status, not just when they are going to countries like Madagascar but even going to Europe.

Mrs. BROOKS. Thank you. I yield back my time.

Ms. DEGETTE. The Chair now recognizes the gentleman from California, Dr. Ruiz, for 5 minutes.

Mr. RUIZ. Thank you very much for being here again. My questions are going to be in line of two separate topics, which are inter-related as well.

One is the disparities that we see in the vaccination rates and two is the coordination between your agencies and the State, Federal, nonprofit in dealing with communications and the outreach.

So, Dr. Messonnier, you said that one of the biggest challenges is access to these vaccines and so we see disparities in low income, uninsured, underinsured populations in getting the vaccine.

The Affordable Care Act made it a mandatory coverage for private health insurance through the essential health benefits to provide these vaccines.

If we eliminate or repeal these essential health benefits and allow insurance companies to not cover these vaccines, would that—would that worsen the problem of access to these vaccines?

Dr. MESSONNIER. So thanks for the opportunity to talk about this. In fact, the vaccines for Children's Program provides a safety net. Vaccines—

Mr. RUIZ. So if the private—if the private health insurance were no longer required to provide vaccines, would that decrease perhaps the vaccination rate?

Dr. MESSONNIER. So right now the issue is not in private insurance. All insurance companies provide vaccines free of charge.

Mr. RUIZ. Of course. So the Affordable Care Act right now makes it mandatory to provide. It is part of the essential health benefit. So if they repeal that essential health benefit and they are no longer required to provide it, they can choose not to provide, which then makes it difficult to get access to the care.

Medicaid is also a good program that gives low-income children and other families the ability to get the vaccination, along with the programs that you administer as well.

So if we repeal those, then we are going to make the problem worse by not having those vaccinations available. Can you speak, broadly, to the coordination role that CDC plays and how that is important for responding to outbreaks?

Dr. MESSONNIER. Sure. The backbone of our response to outbreaks is the State, local, Federal, community interaction around immunizations. I think Clark County is a perfect example.

The health departments, certainly, at the local level was the first to respond. These outbreaks can be quickly overwhelming because every case has potentially hundreds and thousands of contacts that need to be tracked down.

The county quickly got overwhelmed. They came to the State asking for support and then the State came to CDC. CDC already has folks embedded in the health department and we work closely with them every day. But they asked for more support and we had boots on the ground right away.

Mr. RUIZ. Would—Dr. Fauci, when it comes to the measles cases or other vaccine-preventable diseases, are there particular challenges to mobilizing and promoting a cohesive preparedness message or communications plan within communities at a national level?

Dr. FAUCI. At a national level, the communication I think from the CDC is quite good. I mean, if you look at the messages that come out from the CDC—and I could let Nancy speak about this better than I—but the beauty about what the CDC does is that they work very, very closely with the State and local health authorities. I mean, that is a very, very important partnership.

So you have the Federal level with a very important message that gets disseminated through the State and local health authorities.

Mr. RUIZ. And what is the coordination with the Indian Health Service in reaching out to rural and reservations?

Dr. MESSONNIER. Yes. It is a close partnership and has been for a long time. The immunization community—again, State, local, Federal community—is very closely aligned and works really closely together.

We understand that a lot of these issues are local. So while CDC provides scientifically credible information, it is often most effective for folks in the community to be the ones conveying that information.

Mr. RUIZ. Are you talking more about the programs that you offer to low-income and uninsured, underinsured and how do you get to those communities that are very underinsured?

Dr. MESSONNIER. I mean, the vaccine for Children's Program has provided that safety net for a number of years and it is one of the reasons we have enjoyed such good control of measles and other vaccine-preventable diseases.

This data that suggests that there are some communities that are not taking advantage of that program is concerning and we are working closely with our local and State partners to understand the drivers.

I am not sure the issues are the same everywhere. We really need to understand what the local issues are and then figure out how to solve them.

Mr. RUIZ. I agree. I think that local communication plans is very important and herd immunity is also very important as well.

Thank you. I yield back my time.

Ms. DEGETTE. The Chair now recognizes the gentleman from South Carolina, Mr. Duncan, for 5 minutes.

Mr. DUNCAN. Thank you, Madam Chair.

When I travel I carry a yellow card with me in addition to my passport to have a record of all the shots that I have taken—immunizations—and as a father of three sons, when my sons entered kindergarten and grade school we had to provide an immunization record for them and I would argue that they probably would not have been able to attend public schools in South Carolina without certain immunizations and vaccinations.

We had a hearing last week about unaccompanied children and child separation at the border, et cetera, and one point I made then is that, you know, we don't know the vaccination history of a lot of the children that show up at our border and we have a porous southern border and there are children and other individuals that come into this country that we don't know about—that aren't apprehended, they don't go through a normal port of entry—and what we are seeing is a rise of certain diseases—not necessarily measles but diseases in this country that we had beaten back over the years.

And so I think it is alarming from a subject of vaccination and immunization when we see those diseases rising, and one of the world's measles outbreaks right now is happening Brazil where people fleeing a completely broken country of Venezuela are spreading measles.

And Madam Chair, I would like to submit for the record an NPR article, "Collapse Of Health System Sends Venezuelans Fleeing To Brazil For Basic Meds," and I will submit that for the record.

[The information appears at the conclusion of the hearing.]

They have been in an unvaccinated population because of the collapse of the failed socialist state in Venezuela, where there should be an instructive example for some of us in this committee room of the lack of that sort of medical treatment of vaccinations.

I would note that the humanitarian aid that countries like the U.S. are trying to send to Venezuela is being burned on bridges by the Maduro regime instead of actually being used to help his own people.

This includes vaccinations like the ones we are discussing today. There were measles vaccinations that were burned on the bridges as part of the relief effort to Venezuela.

So now the CDC tells us that the first dose of MMR vaccine provides 93 percent of coverage against measles. The second dose increases that number to 97 percent.

We also know from reports here in the U.S. and around the globe that some kids have faced adverse reactions to this powerful and life-giving immunization.

Therefore, my question for each of you on the panel is this. Considering the prodigious advances in technology and medical re-

search that our Nation has discovered since around the 1960s when the MMR vaccine was first introduced, how can we now further increase the efficiency of the MMR vaccine to fight measles while at the same time work to limit the adverse reactions that some children have had after receiving the MMR shot?

And I ask both of you that.

Dr. MESSONNIER. This is a great example of a vaccine that is so good, so effective, and so safe that we haven't tinkered with it. I think that while there are many challenges in immunizations, the effectiveness and safety of measles vaccine isn't one of them.

The measles vaccine has mostly stayed the same because of the high effectiveness and the long track record of safety.

Mr. DUNCAN. Dr. Fauci?

Dr. FAUCI. There was—I totally agree with Dr. Messonnier. You know, as a person who has been involved with developing vaccines for a long time you really don't get much better than 97 percent. That is really good.

So the thing that you, I believe, were alluding to when the Edmonston strain came out in 1963 it was highly effective and not serious—any serious adverse events. But there was a percentage of fevers that were associated with an occasional rash. That was improved in 1965 to develop another strain.

And then since 1968 what was—a strain that is now being used in Attenuvax it is called is one, as Dr. Messonnier has said, that not only maintains the 97 percent effectiveness but it is very, very free of serious toxicities.

Mr. DUNCAN. And I agree. I mean, I think these strains are adaptive. We see that in the flu virus where we can only anticipate what the virus is going to look like this year. Sometimes it adapts or sometimes it changes and the vaccine for the flu isn't quite the right flu vaccine for the year and we see an increase.

So I want to continue to raise awareness that we need to make sure as asylum seekers come to this country whether they are coming along our southern border or whether folks are immigrating to the Nation from other places that we make sure that those countries have the right immunization schedules and vaccinations for the children and the adults because, ultimately, when they come to this country and live amongst us they may not have the same vaccinations and immunizations that we experience in this country and we may see measles today and maybe something else in the future.

And with that, I yield back.

Ms. DEGETTE. The gentleman yields back.

The gentleman from Texas has a unanimous consent request.

Mr. BURGESS. Thank you, Madam Chair. I have a unanimous consent request to place into the record a letter from Dr. Peter Hotez from Children's Hospital in Houston.

Ms. DEGETTE. Without objection, that letter shall be placed into the record, and also without objection the NPR article that the gentleman from South Carolina requested be put in the record will be placed in the record.

[The information appears at the conclusion of the hearing.]

The Chair now recognizes the gentlelady from Florida, Ms. Castor, for 5 minutes.

Ms. CASTOR. Thank you, Madam Chair. Thank you very much for being here today.

I want to get a little more specific on Dr. Ruiz's questions on disparities. You said, Dr. Messonnier, that disparities exist when it comes to the MMR vaccine. What do those disparities look like and how do they break down by demographics?

Dr. MESSONNIER. Thank you.

So, you know, there is always the national picture and then the local picture. Nationally, I can tell you that there are certain groups that have lower risks of MMR vaccination, although overall everybody and generally nationally has high rates. But there are low rates of MMR in those of lower socioeconomic status, those without insurance, and those who live in rural areas as opposed to urban areas.

The specific drivers, though, locally may be different and that is why we really have to work closely at the State and local level to understand at a community level what that is. Is that access, is it misinformation, and how can we resolve the issues?

Ms. CASTOR. How about by location?

Dr. MESSONNIER. Oh. So there are States in the U.S. that have higher vaccination coverage than others. But I would also say that, if you talk to any State health department, what you find is that even within the State there are differences at a community, local, county, school level.

I think one real advancement in using the data that is available is that some States have actually put that data online and so you can go to a website and look, for example, at a State and see at a county level and at a school level what immunization coverage is. It is really powerful information for parents to understand what is going on in their communities.

Ms. CASTOR. What is the biggest source of the reemergence by demographic?

Dr. MESSONNIER. So I think it is an interesting question. The groups that I was talking about with lower vaccination coverage are a concern because it is a failure of our safety net.

But most of the disease and certainly the large outbreaks we are seeing in this country are actually not associated with those. It is associated with groups of people like close-knit communities that are undervaccinated and clustering together.

Ms. CASTOR. Because I—and that was my impression and I was a little confused by the last line of questioning that the alarm should be over immigration and asylum seekers.

Do you have a comment on that? Dr. Fauci?

Dr. FAUCI. Well, I think what Dr. Messonnier said is absolutely correct. If you look at the known outbreak, so if you take the outbreak in the Williamsburg section of Brooklyn in New York City and in Rockland County it was a relatively closed group who had a rate of vaccination that was below the level of a good herd immunity.

A person from Israel, understandably, came over legally as a visitor into the community and then you had a massive outbreak in New York. The Somali community in Minnesota, the same thing happened.

You had a group there who had a lower rate that went below the cutoff point for herd immunity. Some immigrant came in as one of the members of the community. It was a relatively closed community and that is what you have.

So I think when you talk about outbreaks, it really transcends some of the demographic issues that you were talking about about lower income or rural versus urban. It really is in a closed community that we are seeing it.

Ms. CASTOR. With lower vaccination rates. So that is—

Dr. FAUCI. Right. Exactly. It is all lower vaccination rates.

Ms. CASTOR. So it is pretty remarkable. We really are fortunate that we have such a safe and effective measles vaccine. I mean, these statistics are fairly remarkable. Pre-vaccine, 2.6 million deaths each year.

After the vaccine was introduced in 1963 a dramatic decrease. Dr. Fauci, you say from 2000 to 2017 over 21 million deaths have been prevented, and it used to be that most children were—acquired measles by age 15 but thanks to all of the great work by scientists and public health agencies like you all, as a result, we were able to practically eliminate this.

But despite this breakthrough, the millions of lives it has saved, there is still so much misinformation about the vaccine. Today, you all, leading health experts, help us clarify some of this.

Dr. Fauci, looking at the science, what do we know about the—again, I don't think we can say this often enough because of the misinformation—how safe and effective is the measles vaccine—the MMR vaccine—and how would you compare it to other vaccines?

Dr. FAUCI. Well, let us talk about efficacy first. It is, clearly, one of if not the most effective vaccine that we have. As Dr. Messonnier said, you really can't get much better than that.

That is the reason why we don't want to tinker with its efficacy. Ninety-seven percent is really, really good. And as both of us have said many times, it is a very safe vaccine—over millions and millions and millions of doses that have been given. It is a very, very safe vaccine.

Ms. CASTOR. Thank you very much. I yield back.

Ms. DEGETTE. The Chair now recognizes the gentleman from New York, Mr. Tonko. I was trying to figure out the order. New York. Mr. Tonko, for 5 minutes.

Mr. TONKO. Thank you, Chairwoman DeGette.

Promoting healthy families in communities is possible thanks to the dissemination of science-informed health information directly to patients and health providers play a critical role as the most trusted source of health information for people and, certainly, parents.

However, ensuring that patients receive accurate information has grown complicated in the digital age. In fact, according to the Pew Research Center, seven in ten adults in the United States look online for health information, and even when they are not searching for information online, content finds them.

I know you spoke a bit about this with Chairman Pallone. I went to delve a little more deeply. Recently, the Guardian reported that antivaccination content is being recommended to users on a range of digital media platforms proliferating misleading information, tes-

timonies, and advertisements on mediums used to explore news-related topics.

So, Dr. Messonnier, what do the data and examples of recent measles outbreaks tell us concerning the impact of disinformation on public health and in these communities?

Dr. MESSONNIER. Yes. I am certainly really concerned about the misinformation. But I also understand how complicated it is for parents that are inundated with information and aren't sure what information to trust.

All our research continues to show that among all groups of parents of all ages of children they still trust their own health care provider most. So most parents are hearing this information and then going to their health care provider to help them sort it through and most parents in the U.S. are still going on to get their kids vaccinated.

Mr. TONKO. Thank you.

And Dr. Fauci, what guidance do you have to assist patients in discerning fake information from science-based information?

Dr. FAUCI. What we try and do is to steer them towards the well-established scientific literature as opposed to claims that are just made in a almost haphazard way.

I mean, that is one of the problems, that if a person makes a claim it gets onto the internet and, understandably, people—parents, in particular—have a difficulty discerning what is false equivalency. Like someone says this and then the other one says that and they say, I don't know who to believe.

But if you delve deep into it and you look at some of the published work from organizations like the CDC and other organizations you will see that that is based on very strict science and that is what we hope we can get them to understand.

Mr. TONKO. Thank you, Doctor.

In response to the spotlight on the monetization of misinformation about vaccines, are there ways in which platforms are being manipulated to promote antivaccination messaging? Some companies have announced new policies. For instance, Facebook says it is working on its algorithms to prevent antivaccination content from being recommended to users.

Pinterest has decided to remove all vaccination-related posts and searches, even accurate information, and YouTube just recently announced that it would prevent channels that promote antivaccination content from running advertising.

Dr. Fauci, do you think these actions are a step in the right direction to ensure parents and families have access to science-based factual health information?

Dr. FAUCI. Obviously, it is a very sensitive subject because it then gets in that borderline between the—you know, essentially, crushing of information that might actually be useful information.

However, having said that, I do think that a close look and scrutiny at something that is egregiously incorrect has some merits of taking a careful look as to whether one—you want to be participating in the dissemination of that.

Always being careful about not wanting to essentially curtail freedom of expression, you still want to make sure you don't do something that is so clearly hazardous to the health of individuals.

Mr. TONKO. I appreciate that.

And, Dr. Messonnier, as the agency charged with protecting our national public health, what efforts are underway at CDC to counter the online proliferation of antivaccination disinformation?

Dr. MESSONNIER. As a science-based agency, CDC really focuses on making sure that we get scientifically credible information available to the folks at the front lines that need it every day.

In order to do that, we do scan social media to see what issues are arising and what questions are emerging to make sure that we can then gather the scientifically appropriate answers and get that to our partners on the front lines so that they can talk to patients about that information.

Mr. TONKO. Thank you. I appreciate both of you testifying today and with that, Madam Chairwoman, I yield back.

Ms. DEGETTE. The gentleman yields back.

The Chair now recognizes the gentlelady from New Hampshire, Ms. Kuster, for 5 minutes.

Ms. KUSTER. Thank you, Madam Chair, and thank you to our witnesses for being with us and to all the caring families that are here with us today as well.

Thanks to the introduction of the MMR vaccine, 56 years ago the vast majority of families in the United States have never had to experience firsthand.

Perhaps the fact that measles is so rare now has contributed to the misunderstandings about the disease itself, its potential severity, and the threats posed by the outbreaks, and you both testified to us today about how measles poses a public health threat and we have evidence ongoing right now as these pockets are—the contagious nature of the disease is being demonstrated in these communities with low vaccination rates.

We have been fortunate in New Hampshire to have very high vaccination rates and thus we have not experienced—and I should knock on wood—an outbreak of measles in the Granite State.

But recently we have a new threat and that is an outbreak of hepatitis A. Hepatitis A is not currently a required vaccine in New Hampshire, though it is in 13 States.

I would love to ask you, are you concerned about that the continued distrust of vaccines like the MMR or hepatitis B will detract from efforts to vaccinate for future maladies and in particular, in this case, hepatitis A and how concerned should we be in terms of protecting my constituents from outbreaks of new pathogens including hepatitis A?

Dr. MESSONNIER. Yes. I think that is a great point. You know, in the equation that a parent has in terms of what they believe is the risk of disease and the safety and effectiveness of vaccine, if they don't see the disease as a clear and present danger sometimes they don't vaccinate.

When I try to talk to families and parents about immunization, I don't want to scare them into getting measles vaccine. I want to increase their faith in the U.S. immunization program and in the immunizations that are part of it so they don't just get measles vaccine. They get all of the recommended vaccines.

Ms. KUSTER. And could you comment? For something like hepatitis A that's not required as a vaccine in most States how do we

get to the point where we would have herd immunity—where people would be safe from this public health threat, and how do we go about educating the community of what the risks are to individual families with hepatitis A?

Dr. MESSONNIER. I am sorry to say that I am not enough of an expert in the hepatitis A vaccine to answer that. But we will certainly get—

Ms. KUSTER. Could you answer just generally about herd immunity, not using hepatitis A per se but just the concept of getting us to the place where most people in the community are safe from a particular pathogen or contagious disease?

Dr. MESSONNIER. So the concept of herd immunity is that by vaccinating an individual you don't just prevent them from getting disease but you also prevent them from transmitting it to others.

And what that means is that in a community individuals who, for example, can't get the vaccine because they are too young or they have some kind of illness that prevents it are still protected by the question of protection provided by their community. It is a really important concept and it is why we as a society need to take care of those most vulnerable children.

Dr. FAUCI. Hepatitis A is a bit different than measles, as we all know, for a number of reasons is that if you look at the level of herd immunity that you would need with measles, it is really 92, 93 to 95 percent.

Ms. KUSTER. It is quite high.

Dr. FAUCI. It is much less so—it is much less so with hepatitis. Hepatitis A is something you want to avoid. You can avoid it. It is a really good vaccine, and it is a safe vaccine.

It tends, unlike measles, which is essentially an equal opportunity microbe, in that it is, as we have seen the outbreaks of hepatitis A they are very much more skewed towards homeless individuals, individuals who are in a situation where hygienic issues are a problem. We have seen outbreaks in different cities throughout Nevada and Las Vegas and other places.

So it is a preventable disease and, as Dr. Messonnier said, we would encourage people to embrace the entire vaccination program because we have vaccines that are preventing diseases that were problems years ago.

Ms. KUSTER. Well, thank you for your work. We appreciate it, and certainly as a mother I appreciate keeping my own family safe. Thank you. I yield back.

Ms. DEGETTE. I thank the gentlelady. The ranking member has some final comments.

Mr. GUTHRIE. So I just want to close and thank the witnesses for coming, and I have discussed this with several people back home, and I just want to reiterate what I said. I know there are a lot of parents in the room here today.

There is not a parent I have talked to that whatever decisions they are making are making it—what they believe in the love and the best interests of their child.

And so I think it is important that we do have the science, the CDC, the NIH, and people with your credentials and reputations to present this evidence, and hopefully people have the opportunity to see it and to read it because I—like I said, there is not anyone

that I have ever talked to that may have a different opinion from me that the opinion wasn't formed in what they thought was for the love and interest of their child.

So we appreciate people being here today. Thank you.

Ms. DEGETTE. I want to thank the witnesses for their participation in this hearing and I want to remind Members that, pursuant to committee rules, they have 10 business days to submit additional questions for the record to be answered by witnesses who have appeared before the subcommittee.

I ask that witnesses agree to respond promptly to any such questions should you receive any and, again, thank you for giving us your science-based testimony today. We appreciate it.

And with that, this subcommittee is adjourned.

[Whereupon, at 11:34 a.m., the committee was adjourned.]

[Material submitted for inclusion in the record follows:]

## Committee on Energy and Commerce

Opening Statement as Prepared for Delivery  
of

Subcommittee on Oversight and Investigations Member Kathy Castor

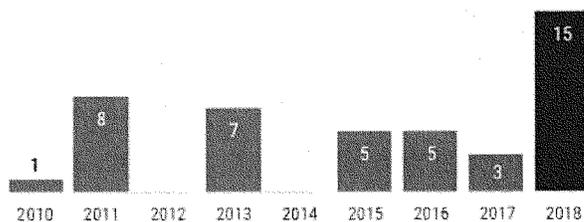
*Confronting a Growing Public Health Threat: Measles Outbreaks in the U.S.*

February 27, 2019

Chairwoman DeGette, thank you for holding this important hearing today on the measles outbreak that is hitting certain communities around the country. While most of the attention is focuses on Washington State, I wanted to share some facts from Florida's Department of Health (DOH) on how measles impacted my home state in 2018.

According to DOH, 15 measles cases were reported in four counties in 2018, while fewer than 10 cases were reported each year from 2010 to 2017 as you can see in the graph below. Last year, 15 Floridians and four visitors with measles have spent time in Florida while infectious. DOH reports that there were two outbreaks in 2018, which represent 11 of the 15 cases that were reported. In December 2018, there were four reported cases and they were all associated with an outbreak in Sarasota County just south of my Congressional District. All four of the measles cases reported in December were unvaccinated for measles.

It is my hope that through the continued work of local public health experts, we are able to vaccinate all Floridians with the safe and effective MMR vaccine and prevent outbreaks that could have life- threatening consequences.



Source: Florida Department of Health Measles Surveillance December 2018

<https://www.npr.org/sections/goatsandsoda/2019/02/05/691588994/collapse-of-health-system-sends-venezuelans-fleeing-to-brazil-for-basic-meds>

**Goats and Soda** STORIES OF LIFE IN A CHANGING WORLD

## Collapse Of Health System Sends Venezuelans Fleeing To Brazil For Basic Meds

Heard on [All Things Considered](#)



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*Venezuelans wait in line for food in northern Brazil in February 2018. The migrants often say the main reasons they've fled are to get food and health care. Andre Coelho/Bloomberg via Getty Images*

Venezuela's once impressive medical system has crumbled dramatically. But it's hard to know exactly how bad things are — because the Ministry of Health stopped releasing national health data.

"There has been a strict secrecy policy in public institutions in Venezuela ... since 2012," says Jenny García, a demographer from Venezuela now living in Paris. The government hasn't wanted to release health statistics that are simply going to make it look bad, García says.

Statistics that have come out show that all the basic parameters of health in Venezuela have been moving ominously in the wrong direction for the past decade. Rates of malnutrition and HIV are rising; there are new outbreaks of preventable diseases like diphtheria. Infant mortality, which García has been tracking, is on the rise.

García and her colleagues just published a study on rising infant mortality in Venezuela in the journal [Lancet Global Health](#). "But the mortality estimates [from the government] haven't been updated or publicly available since 2012," she says.

So García and her colleagues had to piece together infant mortality estimates from census data and hospital death reports. Infant mortality, the death rate for children under age 1, is widely viewed as a barometer of a nation's overall health.

García's study found that the infant mortality rate is now 21.1 deaths per 1,000 births, up from 15 deaths per 1,000 births in 2008. That's far above the average infant death rate for Latin America and comparable to the country's infant mortality rate in the 1990s.

"This is shocking," she says. "I mean, we have lost 18 years of progress in infant mortality. It is shocking."

It's shocking for many reasons. First, Venezuela is a relatively rich nation. It has the [largest oil reserves](#) in the world. (Yes, even more than Saudi Arabia!) Twenty years ago, President Hugo Chávez promised free universal health care in the South American nation and made significant strides toward delivering it. In 2010, the United Nations announced that Venezuela had met most of the Millennium Development Goals — a set of measures for basic social progress. The country slashed its extreme poverty rate from 30 percent of the population in 2003 to 7.2 percent in 2009. The Chávez administration wiped out measles in 2007 through a nationwide vaccination campaign. People with HIV got anti-AIDS medications for free through the public health care system. From a public health perspective, Venezuela's future was looking bright.

But now under an economic and political crisis that started in the late 2000s and has worsened since Nicolás Maduro became president in 2013, all of that has changed dramatically. Last year, hyperinflation zoomed to somewhere between 80,000 percent and 1 million percent, depending on whether you go with the [estimate from a Forbes article](#) or the [International Monetary Fund's estimate](#).

Millions of Venezuelans have fled the country since Maduro took office. Late last year, [Dr. Kathleen Page](#), an infectious disease specialist at the Johns Hopkins School of Medicine, visited border towns in northern Brazil that are now hosting tens of thousands of migrants. Page, who is originally from Uruguay, says the local Brazilian hospitals are overwhelmed with incredibly sick people. In the HIV wards, she felt as if she were stepping back in time to the early days of the AIDS crisis.

"I was not a doctor in the 1980s when the AIDS epidemic started. But I know what happened, and I felt that in these wards I was going back to the 1980s," Page says.

"People were basically dying of opportunistic infections. They were emaciated, dying of chronic diarrhea, infections in their brain — things that we know are treatable and preventable. And to give credit to the Brazilian doctors, they were doing everything they could to help people, but the hospitals were at capacity."

She traveled to the Brazil-Venezuela border as part of a fact-finding trip for Human Rights Watch.

"I interviewed over 100 people crossing the border, and I would ask them, 'Why did you come?' " she says. "Ubiquitously the answer was food or health care."

Many people told her they'd been surviving for months in Venezuela on a diet only of yucca, a rugged shrub that has a potato-like root.

The resurgence of measles is another sign of the country's backsliding in public health. After having wiped out measles more than a decade ago, last year the country was hit by a major outbreak of the disease that has sickened more than 9,000 and, according to the U.N., resulted in the death of at least 74 Venezuelans in 2018. Officials with the Pan American Health Association have also linked measles outbreaks in nine other countries in the region to strains of the virus circulating in Venezuela.

"One of the things that I think is notable," Page says, "is that Venezuela had made incredible progress in terms of many of the public health markers that we care about. Infant mortality, maternal mortality, malaria control — all these things had really gone in the right direction for Venezuela for many years, and then starting in the late 2000s things started to decline."

Now, she says, the health care system in the South American nation has completely collapsed.

Page says Venezuelan patients she met at the border with Brazil told her that the hospitals in Venezuela had run out of all the most basic supplies. Some no longer had running water or electricity to sterilize equipment.

"It was really shocking talking to these patients," Page says. Patients who needed medical care were told by the hospital staff that they had to find all their own surgical supplies. "You have to buy your own gloves; you have to buy your own syringes. You have to bring everything in," Page says. "But even buying gloves and syringes becomes impossibly expensive because of inflation in the black market."

Page was really struck by one mother who had just come out of Venezuela with her 10-year-old daughter. The girl was in a wheelchair and needed a catheter.

"They had been using the same catheter for a year. These catheters are supposed to be changed every time you use them," Page says. The girl had developed a kidney infection, and they couldn't get any antibiotics. "So they actually pushed her 200 miles across the border," she says.

Two hundred miles on foot for a catheter and some antibiotics.

Page says the health conditions she saw among the Venezuelans were startling, particularly given Venezuela's reputation as a relatively wealthy Latin American country. And these migrants weren't fleeing a war zone.

"The devastation that you're seeing is not war. It's mismanagement, poor economic decisions. It's corruption," she says. "There is a lot of complicated factors, but it's totally man-made."

February 26, 2019

The Honorable Michael Burgess M.D.  
United States House of Representatives  
2161 Rayburn House Office Building  
Washington, DC 20515

Congressman Burgess,

Thank you for your inquiry regarding the recent outbreaks of vaccine-preventable diseases, including measles, in the United States. My name is Peter Hotez. I am a pediatrician-scientist at Texas Children's Hospital where I lead a team of scientists developing new vaccines for poverty related neglected diseases. Our vaccines for neglected tropical diseases are being developed in the non-profit sector because they target diseases of the world's poorest people. I am also the founding dean of the National School of Tropical Medicine at Baylor College of Medicine, a unique school devoted exclusively to emerging and neglected diseases.

In addition to my role as a scientist and educator, I am also a husband and parent of four adult sons and daughters, including Rachel who has autism and intellectual disabilities. I've just written a new book entitled, *Vaccines Did Not Cause Rachel's Autism* (Johns Hopkins University Press) which reports on the massive evidence involving studies of over one million children showing that vaccines do not cause autism, and also how autism begins in early fetal development well before children ever receive vaccines. I also talk about my family and Rachel's struggle as an adult woman with autism as she seeks employment and acceptance into the community.

I wrote *Vaccines* in response to my concerns that the antivaccine or antivax movement has grown in strength and size and is now affecting public health. Measles is one of the most serious human virus infections, causing permanent injury such as deafness or neurological injury, or even death. As recently as a few decades ago measles ranked among the leading killer of children globally, including the United States, but the number of deaths have recently decreased due to widespread global vaccination campaigns led by Gavi the Vaccine Alliance, UNICEF, and WHO. Unfortunately these public health gains have recently become reversed in Europe (where there were 80,000 measles cases in 2018) and in some US states in 2019 – Washington, Oregon, and Texas – due to an aggressive antivaccine lobby. My goal in the writing the book is to counter the phony misinformation from the antivax movement claiming that vaccines cause autism or other conditions.

In the book I report how the modern day antivaccine movement began in the late 1990s as a fringe group, but it has now expanded into its own media empire. Today, the antivax movement dominates the internet with almost 500 misinformation websites, which are amplified on Facebook and other forms of social media. The antivax lobby also produces books and documentaries filled with false information. And there is a political arm to it with antivaccine political action committees (PACs) in multiple states.

In 2018 I reported in the Public Library of Science (PLOS Medicine) how because of the antivaccine exemptions, non-medical vaccine exemptions (NMVEs) are rising in many of the 18 states that allow these exemptions for reasons of philosophical and personal beliefs. As a result there are now US counties where a high percentage of kids are not being vaccinated, including several (such as Clark County WA and Multnomah OR) where we're seeing measles outbreaks. Measles is typically the first break through

infection we see as vaccine coverage declines due to its high transmissibility. I consider measles a “biomarker” of low vaccine coverage and a biomarker of antivax activities.

I believe that left unchecked we’ll continue to see measles outbreaks and that while measles was eliminated in the US in 2000, now it’s coming back, so that soon measles will become the “new normal” in antivax America.

I believe that there are 3 major advocacy and policy steps needed to halt or slow the antivax movement and the return of measles and other vaccine-preventable diseases to America:

1. We need to begin disassembling or dismantling the antivax media empire. To do so will require public private partnerships between the US federal agencies devoted to public health and the major enablers of the antivax movement, including Facebook, Twitter, Google, Yahoo, and Amazon.
2. We need to close the non-medical exemptions in the 18 states that allow them for reasons of philosophical and personal belief. This action was instrumental in restoring vaccine coverage rates in California after their terrible measles outbreak in 2014-15.
3. Finally we need to restore a robust system of pro-vaccine advocacy in the US and work with the major federal agencies committed to public health for that purpose.

These three steps will not be easy, but they are doable and if we start now, I feel within 18 months we can go a long way towards restoring vaccine confidence and ensure that measles will be consigned to American history.

Sincerely,

Peter Hotez, M.D., Ph.D.

Energy and Commerce Subcommittee on Oversight and Investigations  
Hearing on "Confronting a Growing Public Health Threat: Measles Outbreak in the U.S."  
February 27, 2019

Questions for the Record

Nancy Messonnier, Director, National Center for Immunization and Respiratory Diseases  
Centers for Disease Control and Prevention

**Pallone (D-NJ):**

**Q1. This year marks the 25th anniversary of the Vaccines for Children (VFC) program, which ensures all children are guaranteed life-saving vaccines regardless of their parent or guardian's ability to pay. According to National Immunization Survey data from CDC, however, there are growing disparities in childhood vaccination rates based on socioeconomic status, whether a child is privately or publically insured and whether a child lives in a rural area. What can we do to resolve access issues and ensure we do not lose any of the amazing progress we've made through VFC?**

A1. Most U.S. children receive recommended vaccines on schedule. However, the proportion of children who have received no vaccines has increased in recent years. Communities where children are under-immunized remain, meaning these children have not received all recommended vaccines or are behind the recommended vaccine schedule. There are opportunities to improve vaccination coverage among these groups and strengthen the protective effects of immunization.

The Vaccine for Children's program has been a cornerstone to ensure easy access to vaccines by providing vaccine at no-cost for eligible children, including uninsured, Medicaid-eligible, and American Indian and Alaska Native children. Removing the financial barriers to immunizations has resulted in overall high vaccine coverage rates and the near elimination of disparities. However, CDC data indicates that there are some emerging disparities in child and adolescent coverage rates.

A higher proportion of uninsured children are more likely to have received no vaccinations by age two than insured children, and vaccination rates for HPV are more than 11 percentage points lower for children in rural communities compared to urban areas. The lower rates in these groups suggest it is harder for some children to get access to vaccine providers. With VFC, access to a provider and a vaccine should never be a barrier to vaccination. Concentrated efforts are required to address any potential obstacles to vaccination, including minimizing costs, connecting parents with providers, ensuring adequate supply, identifying new opportunities for vaccination, reducing missed or skipped provider visits, and educating providers.

**Q2. Planning for Healthy People 2030, the national health promotion and disease prevention objectives for the next decade, is now underway. How can immunization play a role in long-term planning for public health goals?**

A2. Healthy People provides science-based, national goals and objectives with 10-year targets designed to guide national health promotion and disease prevention efforts to improve the health of all people in the United States. The Immunization and Infectious Disease (IID) work

group is responsible for 17 core objectives moving forward in Healthy People 2030, and seven of those objectives are related to immunization. The proposed Healthy People 2030 objectives represent key metrics for immunization compliance especially related to childhood and adolescence. Among the proposed objectives, two pertain to measles, mumps, and rubella (MMR) vaccination coverage—at age 2 years and at kindergarten—as well as an objective for HPV for adolescents, and one for seasonal influenza for persons 6 months of age and older. Immunization coverage indicators for these vaccine/age group help to identify areas of concern.

**Q3. While national vaccination rates remain high, according to CDC data from 2017, the estimated MMR vaccination coverage among 13 to 17 year-old young people ranged from 77.8% to 97% across states and local counties in the country. Does CDC assess these data and develop an annual map of the vaccination rates in the United States by county in order to identify areas requiring further public health engagement, or for forecasting purposed to identify potential geographic areas where outbreaks of vaccine preventable disease could be most likely?**

A3. CDC monitors vaccination coverage through the National Immunization Survey and through the collection of state-reported data. Although MMR vaccine coverage among teens varied from 84.7% (Texas) to 97.7% (Georgia), 40 states had MMR coverage of 90% or higher in 2017. State and/or local health departments may assess vaccination coverage at the county level. Many states use their immunization information systems (IIS) for county-level vaccination coverage assessment,<sup>1</sup> and some make county-level estimates available online. CDC provides funding and technical support for development and use of IIS to 50 states, local area awardees, and U.S.-affiliated jurisdictions.

CDC monitors vaccination coverage in children 19-35 months with the National Immunization Survey – Child (NIS-Child). In addition to providing national and state-level estimates, estimates are available routinely for the two counties (Bexar County, Texas, and Philadelphia County, Pennsylvania) and three cities (Chicago, Houston, New York City) which receive immunization grant funds directly from CDC. CDC has used small area statistical methods to estimate county-level coverage.<sup>2</sup> The most recent estimates are based on data from 2014-2015 combined and available for 181 counties.

CDC collects state-reported state-level data on vaccination coverage among children in kindergarten<sup>3</sup>). CDC encourages states to post school or community-level estimates online, and maintains a list of state websites with this information<sup>4</sup>. There are currently 29 states listed.

**Q4. According to the Pew Research Center, 7 in 10 adults in the United States look online for health information. Has CDC previously engaged with or plan to directly engage with internet, digital, or social media stakeholders, such as Amazon, Facebook, Instagram, Pinterest, Reddit, Twitter, Yahoo, or others on the issue of immunization and their respective policies regarding the promotion or proliferation of anti-vaccine media?**

<sup>1</sup> <https://repository.immregistries.org/resource/identifying-immunization-pockets-of-need-small-area-analysis-of-iis-data-to-detect-undervaccinated-pi/from/type:documents>

<sup>2</sup> County-Level Trends in Vaccination Coverage Among Children Aged 19--35 Months -- United States, 1995--2008: <https://www.cdc.gov/mmwr/preview/mmwrhtml/ss6004a1.htm>

<sup>3</sup> Mellerson JL, Maxwell CB, Knighton CL, Kriss JL, Seither R, Black CL. Vaccination Coverage for Selected Vaccines and Exemption Rates Among Children in Kindergarten — United States, 2017–18 School Year. *MMWR Morb Mortal Wkly Rep* 2018;67:1115–1122. <https://www.cdc.gov/mmwr/volumes/67/wr/mm6740a3.htm>

<sup>4</sup> SchoolVaxView: <https://www.cdc.gov/vaccines/imz-managers/coverage/schoolvaxview/pubs-resources.html>

- A4. It is critical for parents and anyone seeking information on vaccines to become informed health consumers. Unfortunately, some of the information about vaccines online may be inaccurate. CDC advocates tirelessly to protect the American public from disease and other health threats, including vaccine preventable diseases. We are a critical source for credible health information and committed to providing up-to-date, science-based recommendations that anyone, including parents, kids, health departments, businesses, and healthcare providers, can use to make informed health decisions. Additionally, CDC's online information is in the public domain and free for anyone to access, use or repurpose. This includes internet, digital and social media stakeholders like Facebook and others.

When CDC engages in social media, we aim to consistently provide science-based and timely information in plain language to help educate audiences so that they can make informed decisions. We customize our outreach efforts based on the best channels to use for certain audiences, if we have visual elements, what messages resonate with a specific audience, what information is new or newsworthy, and what additional information or links they might need.

Parents and anyone who has questions about vaccines should make sure to talk to their health care provider.

Jan Schakowsky (D-IL):

**Q1. When outbreaks occur, our most pressing concern is often and immediate response. However, I believe that we also must reflect on our nation's progress in prevention of vaccine preventable diseases. The Department of Health and Human Services (HHS) Healthy People objectives from immunization and infectious disease are a cornerstone for federal, state, and local efforts to protect against vaccine preventable conditions across the lifespan.**

**I was surprised to learn that the draft Healthy People 2030 objectives include very few immunization objectives in total. At a time when we are seeing increased outbreaks of diseases that were already virtually eliminated in this country, could you explain the rationale behind the reduction in immunization objectives in the draft Healthy People 2030 framework? Do you plan to restore these objectives moving forward?**

**A1.** Healthy People provides science-based, national goals and objectives with 10-year targets designed to guide national health promotion and disease prevention efforts to improve the health of all people in the United States. Healthy People 2020 tracks 1,200 objectives, organized into 42 topic areas. A priority of Healthy People 2030 was to reduce this number to 375 objectives. The number of objectives for the Immunization and Infectious disease work group was reduced from 83 to 17, with a significant portion still focused on immunization. The reduction in number of objectives is a reflection of the change to the Healthy People framework, not a reduced prioritization of immunization. We anticipate that fewer objectives overall will result in a higher impact for each of those that remain.

The proposed Healthy People 2030 objectives represent key metrics for immunization compliance especially related to childhood and adolescence. Among the proposed objectives, two pertained to measles, mumps, and rubella (MMR) vaccination coverage—at age 2 years and at kindergarten—as well as an objective for HPV for adolescents, and one for seasonal influenza for persons 6 months of age and older. Immunization coverage indicators for these vaccine/age groups help to identify areas of concern.

Monitoring and reporting vaccination coverage rates is a core function of CDC's Immunization program. CDC will continue to monitor and report vaccination coverage for all routinely recommended vaccines through the National Immunization Survey.

**Brett Guthrie (R-KY):**

**Q1. In May 2015, the journal Science published a report in which researchers found that the measles infection can leave a population at an increased risk for mortality from other diseases for two to three years. Besides this report, is there evidence that measles increases susceptibility to other infections?**

A1. The report in Science was a modeling study and CDC cannot comment on the utility of the model or how the study was done. There are no other similar studies; however, there are numerous reports of non-specific benefits of measles vaccination. Children that are vaccinated for measles are less likely to die from other infectious diseases.

Measles infection is immunosuppressive and can lead to increased susceptibility to opportunistic infections. Most measles deaths are the result of bacterial secondary infections. The duration of measles immunosuppression is likely variable among individuals infected with measles virus, and depends on a number of host factors, comorbidities, as well as exposures to other pathogens following the primary measles infection. The attached review discusses the immunosuppressive effects of measles.

**Q2. What are antigens? How much are used in MMR vaccine? How does that small amount compare to the antigens that are encountered in the environment?**

A2. Antigens are proteins or carbohydrates that are recognized by the immune system. Vaccine antigens are typically purified from bacteria or viruses or produced by recombinant technology based on knowledge of protein sequences. They are incorporated into vaccines to trigger specific immune responses, usually the production of antibodies. Antibodies protect the body from disease by binding to antigens found on infecting bacteria or viruses and inactivating or destroying them.

Babies are exposed to numerous bacteria and viruses on a daily basis. Eating food introduces new bacteria into the body; numerous bacteria live in the mouth and nose; and infants place their hands or other objects in their mouth hundreds of times every hour, exposing the immune system to still more germs. However, when a baby is born, his or her immune system is ready to respond to the many antigens in the environment and the selected antigens in vaccines.

When a child has a cold, he or she is exposed to up to 10 antigens, and exposure to strep throat involves about 25 to 50 antigens. Each vaccine in the childhood vaccination schedule has between 1-69 antigens that are weakened or dead and therefore cannot cause infection the way other antigens can. A child who receives all the recommended vaccines in the 2018 childhood immunization schedule may be exposed to up to 320 vaccine antigens by the age of 2. The MMR vaccine contains three different weakened live viruses: measles, mumps, and rubella, and 24 antigens.

**Q3. Is ensuring high vaccination rates a federal responsibility at all or does ensuring adequate vaccination coverage just a state issue?**

A3. CDC works closely with public health agencies and private partners to improve and sustain immunization coverage by developing, disseminating and supporting the implementation of evidence-based strategies to improve access to and use of immunization services. One tool states have used to maintain low rates of vaccine-preventable disease is vaccination law. State vaccination laws include vaccination requirements for children in public and private schools and day care settings, college/university students, and healthcare workers and patients in certain facilities. State laws also affect access to vaccination services by determining whether providing

vaccinations to patients is within the scope of practice of certain healthcare professionals, such as pharmacists.

All states, the District of Columbia, and territories have vaccination requirements for children attending childcare facilities and schools. These vaccination requirements are important tools for maintaining high vaccination coverage and low rates of vaccine-preventable diseases. Exemptions from vaccination requirements may apply for some children.

CDC works with state and local health departments to collect and report data on school vaccination coverage, exemption rates, and grace period and provisional enrollment each year. Immunization programs can use these data to understand and address undervaccination among kindergartners and to identify schools and communities where focused interventions could improve coverage with required vaccines.

**Q4. At what point would exemptions from vaccination become a federal issue?**

A4. In considering state vaccine requirements and exemptions, the federal government's role is to provide the evidence base and recommendations for the use of vaccines to protect Americans from diseases that are preventable. State legislatures have access to their State Public Health Officials and the evidence base and vaccine recommendations when determining their state requirements.

**Q5. What is your professional judgement of the likely public-health impact of state vaccination exemptions based on personal or professional beliefs?**

A5. State and local school vaccination requirements exist to ensure that students are protected from vaccine-preventable diseases. Every state requires children enrolled in public school to be vaccinated against a series of diseases, including measles. Most states also require children in private schools to be vaccinated. All states establish vaccination requirements for children as a condition for day care attendance.

All states allow an exemption to the required vaccines when it is medically necessary, and all but three states (California, Mississippi, and West Virginia) also allow non-medical exemptions based on religious or personal beliefs. Many states have laws expressly allowing state and local health officials or school administrators to temporarily exclude children from school during an outbreak. Children who are not vaccinated are often required to stay home from school and school-related functions until the outbreak ends or they get vaccinated.

During the 2017-2018 school year, the median rate of school exemptions from one or more vaccines was 2.2%, ranging from 0.1% in Mississippi to 7.5% in Oregon. Median vaccination coverage was 94.3% for 2 doses of measles, mumps, and rubella vaccine. Although the overall percentage of children with an exemption was low, this was the third consecutive school year that a slight increase was observed. Reasons for the increase cannot be determined from the data reported to CDC but could include the ease of the procedure for obtaining exemptions or parental vaccine hesitancy. Reported exemptions do not distinguish between exemptions for one vaccine versus all vaccines. Previous studies indicate that most children with exemptions have received at least some vaccines.<sup>5</sup>

<sup>5</sup> Mellerson JL, Maxwell CB, Knighton CL, Kriss JL, Seither R, Black CL. Vaccination Coverage for Selected Vaccines and Exemption Rates Among Children in Kindergarten — United States, 2017–18 School Year. *MMWR Morb Mortal Wkly Rep* 2018;67:1115–1122. <https://www.cdc.gov/mmwr/volumes/67/wr/mm6740a3.htm>

**Q6. What is the definition of an outbreak?**

A6. An outbreak of measles is defined as three or more cases in a cluster. Prompt recognition, reporting, and investigation of measles is important because the spread of the disease can be limited with early case identification and public health response including vaccination and 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.

**Q7. When measles spreads in a locality that is under-vaccinated, does the spread only stay in that pocket of under-vaccination?**

A7. Measles is a highly contagious virus that lives in the nose and throat mucus of an infected person. It can spread to others through coughing and sneezing. Also, measles virus can live for up to two hours in an airspace where the infected person coughed or sneezed. If other people breathe the contaminated air or touch the infected surface, then touch their eyes, noses, or mouths, they can become infected. Measles is so contagious that if one person has it, up to 90% of the people close to that person who are not immune will also become infected. When measles gets into communities with pockets of unvaccinated people, outbreaks are more likely to occur. These communities make it difficult to control the spread of the disease, endangering people that are unable to be vaccinated including infants younger than 12 months of age.

**Q8. How does the CDC determine the rates of non-vaccination and the reasons for non-vaccination?**

A8. CDC monitors vaccination coverage through the National Immunization Survey and through the collection of state-reported data. The National Immunization Survey (NIS) is a family of surveys that determines rates of vaccination in two-year-old children (NIS-Child), in adolescents ages 13-17 years (NIS-Teen), and influenza vaccination in children 6 months through 17 years. CDC collects data from randomly selected parents during a telephone interview, and then collects detailed vaccination histories for their children from medical providers. These data are used to track vaccination coverage over time, and identify states and sociodemographic groups with lower vaccination coverage. CDC determines rates of vaccination among children entering kindergarten by requiring reporting of summary data from state and selected local areas and territories. States collect this information to determine compliance with their school entry immunization laws and regulations. Together, these data sources assess receipt of recommended vaccines throughout childhood.

CDC helps to identify local pockets of lower vaccination coverage with data collected from schools on their compliance with state immunization requirements. Once identified, CDC supports state health departments to develop targeted strategies in addressing hesitancy issues relevant to these specific communities. CDC also encourages immunization programs to report school or community level vaccination coverage and exemption rates among kindergartners.

CDC works to identify the causes of vaccine hesitancy through an ongoing research to practice approach. We use principles of behavioral theory, risk communication approaches, and original research to develop and implement best practices for addressing vaccine hesitancy. Analysis of these data is used to identify areas for further investigation to better understand reasons for non-vaccination. Periodically, additional questions have been added to the National Immunization Survey on parental attitudes toward vaccination. Those data will be used to

determine how much of non-vaccination may be due to vaccine hesitancy as compared to issues related to access or other sociodemographic-related barriers to vaccination.

**Q9. How does the CDC support state and local health departments to contain measles outbreaks?**

- A9. Through its Immunization Program, CDC provides vaccines and funding to 64 awardees to support immunization workforce and systems at the state and local levels. This immunization infrastructure is critical in responding to measles outbreaks. When requested, CDC provides states with rapid, on-site assistance during outbreak investigations and supports states with risk communication during emergency responses, including measles. CDC helps states quickly detect measles cases by testing laboratory specimens from both routine and complex suspected measles cases and helps interpret laboratory results. In addition, CDC's Public Health Emergency Preparedness (PHEP) cooperative agreement supports critical public health infrastructure, training staff to effectively respond to outbreaks and other emergency responses.

CDC provides important updates including information on outbreaks, vaccine policy, and clinical guidance to the public, parents, healthcare providers, and other stakeholders through a variety of media, including the CDC website, e-mails, and webinars, and through professional associations. CDC develops and disseminates travel notices regarding countries with measles outbreaks so that travelers are aware of vaccination recommendations.

**Q10. What is involved with contact tracing in a measles outbreak?**

- A10. Prompt recognition, reporting, and investigation of measles cases are important because of how quickly measles can spread. Outbreaks can be contained with early case identification and vaccination of susceptible contacts. State and local health departments conduct case investigations for every confirmed measles case to assure timely reporting of suspected cases and to mitigate the risk of exposure.

As part of a measles case investigation, state and local health departments assess the potential for further transmission based on exposed contacts of the case-patient. The investigation also examines the presumptive evidence of immunity of contacts during the infectious period, which is between four days before to four days after onset of rash. Contact tracing consists of a thorough review of all places a case-patient may have stayed or visited during the infectious period, identification of contacts exposed in these settings, interviews of contacts to assess presumptive immunity to measles, and administration of appropriate post-exposure prophylaxis when indicated.

Based on the findings of individual case investigations, state and local health departments:

- identify the population at risk of infection (unvaccinated preschool-age children, high school students who have only received one dose of measles vaccine, persons who visited the emergency room of a hospital on a certain day, etc.);
- determine where transmission is occurring or likely to occur, such as in households, daycare, schools, health care settings, and in congregate settings like churches, colleges and prisons; and
- identify persons who are at highest risk of infection or transmission including other unvaccinated children, students attending other schools, immunocompromised persons, pregnant women, health care personnel, infants under 12 months of age.

Exposed persons who cannot readily document presumptive evidence of measles immunity are offered postexposure prophylaxis (vaccine or immunoglobulin) or excluded from settings where they can infect others such as school, day care, or hospitals. Except in health care settings, unvaccinated persons who receive their first dose of MMR vaccine within 72 hours postexposure may return to childcare, school, or work. Individuals who are at risk for severe disease and complications from measles (e.g., infants under 12 months of age, pregnant women without evidence of measles immunity, and severely immunocompromised persons regardless of vaccination status) should receive immunoglobulin within 6 days.

Persons who do not receive appropriate postexposure prophylaxis within the appropriate time should be excluded from affected institutions in the outbreak area until 21 days after the onset of rash in the last case of measles.

**Q11. What resource burdens are imposed on state and local health departments to contain a measles outbreak?**

A11. State and local health departments have the lead in investigating measles cases and outbreaks. When a suspected measles case is identified the local health department is responsible for an exhaustive investigation process. This is a significant burden on local public health in that they must expend resources in obtaining clinical specimens so that the diagnosis of measles can be confirmed by state or other public health laboratories; identify other individuals and communities that may have been exposed to the disease; provide immunizations or immune globulin as appropriate to exposed individuals and advise individuals if they need to avoid public places; and when warranted local or state health departments may hold special immunization clinics for impacted communities or facilities. Local or state health workers are responsible for monitoring large numbers of individuals who may have been exposed to measles. Additional investigations occur for any new cases to prevent the illness from spreading further.

State health department responsibilities include coordination of activities between jurisdictions within the state, providing or coordinating financial or other resources as needed, providing laboratory support, and coordinating with CDC.

For additional information, please see the following:

- Marx GE, Chase J, Jasperse J, et al. Public Health Economic Burden Associated with Two Single Measles Case Investigations — Colorado, 2016–2017. *MMWR Morb Mortal Wkly Rep* 2017;66:1272–1275. DOI: <http://dx.doi.org/10.15585/mmwr.mm6646a3>
- Wendorf KA, Kay M, Ortega-Sánchez IR, Munn M, Duchin J. Cost of measles containment in an ambulatory pediatric clinic. *Pediatr Infect Dis J* 2015;34:589–93. <https://doi.org/10.1097/NF.0000000000000682>
- Ortega-Sanchez IR, Vijayaraghavan M, Barskey AE, Wallace GS. The economic burden of sixteen measles outbreaks on United States public health departments in 2011. *Vaccine* 2014;32:1311–7. <https://www.sciencedirect.com/science/article/pii/S0264410X13013649?via%3Dihub>.

**Q12. Are more federal resources needed to help support the state and local response?**

- A12. CDC is using available resources to address current outbreaks in states and local areas. CDC provides funding to support state and territorial immunization programs to 64 awardees, including all 50 states. These funds help support public health immunization workforce and systems at the state and local levels, including to respond to vaccine preventable disease outbreaks. CDC also provides critical epidemiology and laboratory capacity to respond to outbreaks, providing technical assistance to state and local areas. We expect outbreak responses to be an ongoing issue, and resource needs will be considered as new issues emerge.
- Q13. As you may know, the Washington Poison Center was activated by the Washington State Department of Health (DOH) in mid-January to take calls on behalf of Clark County Public Health from both the public and healthcare facilities related to the measles outbreak. The Clark County Public Health Measles Hotline number is forwarded to the Washington Poison Center, and thus far, its personnel have taken a total of 1,162 calls on this matter. The measles hotline is staffed 24/7/365, and these calls are in addition to the average 175 toxicology calls received on a daily basis.**
- To adequately address the significant volume of incoming measles calls, the Washington Poison Center leadership developed an innovative process to recruit healthcare and medical students to serve as on-call contractors to assist with measles-related calls. Within 36-hours of project conception, 50 students from the fields of pharmacy, nursing and naturopaths were recruited, contracted and trained by the center's toxicology professionals. This approach has received accolades from the state Secretary of Health, the state Office of Emergency Preparedness and Response and numerous state legislators.
- The University of Washington School of Pharmacy, Nursing and Public Health, as well as Bastyr University, played an integral role in addressing this public health outbreak. Do you believe it is important to have an established CDC training program for these types of students so that there will be a team of people ready to be activated quickly in times of crisis? Are there resources that could be activated to provide this curriculum?
- A13. CDC supports the education and training of state and local public health officials through a variety of resources. CDC's Public Health Emergency Preparedness (PHEP) cooperative agreement supports critical public health infrastructure, training staff to effectively respond to outbreaks and other emergency responses. States may use this funding and other support from CDC to develop training programs for surge capacity in the event of a public health emergency.

**Michael C. Burgess, M.D. (R-TX)****Q1. What safety monitoring systems are in place to ensure that the vaccines on the Advisory Committee on Immunization Practices (ACIP) recommended schedule are not causing a lot of side effects?**

A1. The United States' long-standing vaccine safety program closely and constantly monitors the safety of vaccines to make sure that vaccines used in the United States are safe. Vaccines are rigorously tested, and a vaccine sponsor must demonstrate that the vaccine is safe and effective before it can be licensed by the U.S. Food and Drug Administration (FDA). The FDA ensures that vaccines undergo a rigorous and extensive development program and assesses the safety and effectiveness of drugs and biological products, such as vaccines, for their intended uses. FDA conducts a thorough evaluation of this information to make a determination whether to license a vaccine for use in the United States. CDC's Division of Healthcare Quality Promotion - Immunization Safety Office (ISO) conducts post-licensure vaccine safety monitoring on vaccines licensed and recommended for routine use in the public by the U.S. Advisory Committee on Immunization Practices (ACIP).

It is important to have robust vaccine safety monitoring, including multiple systems that work in different ways to complement each other and allow CDC to rapidly detect and assess possible safety problems. CDC and FDA use a number of systems to monitor vaccine safety:

- **Vaccine Adverse Event Reporting System (VAERS)**
  - Collaboration between CDC and FDA
  - U.S. national frontline spontaneous (passive) reporting system to rapidly detect potential vaccine safety problems
  - The system is not designed to determine whether a reported adverse event was caused by vaccination, but it serves as an early warning system and helps CDC and FDA identify areas for further study
  - Potential safety problems identified in VAERS are further studied and/or investigated through CDC's Vaccine Safety Datalink or CDC's Clinical Immunization Safety Assessment Project
- **Vaccine Safety Datalink (VSD)**
  - Collaboration between CDC and integrated managed health plans
  - Considered the gold standard system for monitoring vaccine safety in the world
  - Large linked database system used for active surveillance to look for rare, serious adverse events and to conduct studies to address gaps in vaccine safety knowledge
- **Clinical Immunization Safety Assessment (CISA) Project**
  - Collaboration between CDC, medical research centers, and other vaccine safety experts
  - Conducts individual clinical vaccine safety assessments and clinical research studies on adverse events following vaccination
  - Improves understanding of potential vaccine adverse events at the individual patient-level and in special populations (e.g., pregnant women and elderly) and develop prevention strategies to address those concerns
- **FDA Sentinel Postlicensure Rapid Immunization Safety Monitoring System (PRISM)**
  - Collaboration and Contract with Harvard Pilgrim HealthCare
  - Engages more than 20 insurers and academic partners
  - Active surveillance, claims-based data system that covers more than 170 million patients in the US

- PRISM is used to address regulatory questions concerning vaccine safety and effectiveness
- **FDA-CMS and use of Medicare Claims data for vaccine safety surveillance**
  - Collaboration between FDA and Center for Medicare & Medicaid Services to conduct vaccine surveillance, safety and effectiveness studies
  - Covers persons 65 years of age and older plus younger disabled persons.
  - Covers more than 50 million US beneficiaries
- **FDA Biologics Effectiveness and Safety (BEST) System**
  - Includes approximately 75 million patient electronic health records (EHR) and more than 50 million patient claims data.
  - Provides rapid access to medical chart information
  - BEST can also be used to address regulatory questions concerning vaccine safety and effectiveness

More information is available at:

<https://www.cdc.gov/vaccinesafety/ensuringsafety/monitoring/index.html>

**Q2. Why is it important that vaccines are administered on schedule according to CDC/ACIP guidelines?**

- A2. The Advisory Committee on Immunization Practices (ACIP) is a group of medical and public health experts that develops recommendations on how to use vaccines to control diseases in the United States. CDC sets the immunization schedules based on ACIP's recommendations that have been approved by the CDC Director. These recommendations are set to protect infants, children, adolescents, and adults against vaccine-preventable diseases at the earliest age possible

The ACIP carefully examines data about each vaccine-preventable disease to determine at what ages the rates of the disease peak. Protection against vaccine-preventable disease at the earliest time possible is critical, especially for young children or other high risk groups, for whom a disease can be especially serious. For example, pertussis vaccine is recommended in the United States beginning at 2 months of age to protect infants. That timing saves lives that would otherwise be lost to the disease if vaccines were not given at a very young age.

The immunization schedule also is based on balancing the risk of being exposed to the disease against the added protection of vaccinating at the age that a vaccine works best. Before a vaccine is licensed by the FDA, extensive testing is done to determine the best ages to safely and effectively give the vaccine.

**Q3. What is the impact of outbreak response on the ability of state and local public health officials to perform routine public health functions?**

- A3. State and local health departments have the lead in investigating measles cases and outbreaks. When a suspected measles case is identified the local health department is responsible for an exhaustive investigation process. This is a significant burden on local public health in that they must expend resources in obtaining clinical specimens so that the diagnosis of measles can be confirmed by state or other public health laboratories; identify other individuals and communities that may have been exposed to the disease; provide immunizations or immune globulin as

appropriate to exposed individuals and advise individuals if they need to avoid public places; and when warranted local or state health departments may hold special immunization clinics for impacted communities or facilities. Local or state health workers are responsible for monitoring large numbers of individuals who may have been exposed to measles. Additional investigations occur for any new cases to prevent the illness from spreading further.

State health department responsibilities include coordination of activities between jurisdictions within the state, providing or coordinating financial or other resources as needed, providing laboratory support, and coordinating with CDC.

For additional information, please see the following:

- Marx GE, Chase J, Jasperse J, et al. Public Health Economic Burden Associated with Two Single Measles Case Investigations — Colorado, 2016–2017. *MMWR Morb Mortal Wkly Rep* 2017;66:1272–1275. DOI: <http://dx.doi.org/10.15585/mmwr.mm6646a3>
- Wendorf KA, Kay M, Ortega-Sánchez IR, Munn M, Duchin J. Cost of measles containment in an ambulatory pediatric clinic. *Pediatr Infect Dis J* 2015;34:589–93. <https://doi.org/10.1097/INF.0000000000000682>
- Ortega-Sanchez IR, Vijayaraghavan M, Barskey AE, Wallace GS. The economic burden of sixteen measles outbreaks on United States public health departments in 2011. *Vaccine* 2014;32:1311–7. <https://www.sciencedirect.com/science/article/pii/S0264410X13013649?via%3Dihub>.

**Q4. Why is it important to eradicate infectious diseases like measles? Couldn't we just have low levels of circulating disease?**

- A4. Before the measles vaccination program started in 1963, about 3 to 4 million people got measles each year in the United States. Of those people, 400 to 500 died, 48,000 were hospitalized, and 4,000 developed encephalitis (brain swelling) from measles.

In 2000, the United States declared that measles was eliminated from this country. The United States eliminated measles because it has a highly effective measles vaccine, a strong vaccination program that achieves high vaccination coverage in children, and a strong public health system for detecting and responding to measles cases and outbreaks. CDC defines measles elimination as the absence of continuous disease transmission for 12 months or more in a specific geographic area. Measles is no longer endemic (constantly present) in the United States.

Maintaining elimination is still a priority for the United States. Since measles is still common in many countries, travelers will continue to bring this disease into the United States. Measles is highly contagious, so anyone who is not protected against measles is at risk of getting the disease. People who are unvaccinated for any reason, including those who refuse vaccination, risk getting infected with measles and spreading it to others. And they may spread measles to people who cannot get vaccinated because they are too young or have specific health conditions.

**Q5. The federal government is working to develop objectives for the Healthy People 2030 goals; how can immunization best be positioned within these goals to maximize national and individually protection from infectious diseases?**

- A5. Healthy People provides science-based, national goals and objectives with 10-year targets designed to guide national health promotion and disease prevention efforts to improve the health of all people in the United States. The Immunization and Infectious Disease (IID) work group is responsible for 17 core objectives moving forward in Healthy People 2030, and seven of those objectives are related to immunization. CDC included Healthy People 2030 objectives that represent key metrics for immunization compliance especially related to childhood and adolescence. Among the proposed objectives, two pertained to measles, mumps, and rubella (MMR) vaccination coverage—at age 2 years and at kindergarten—as well as an objective for HPV for adolescents, and one for seasonal influenza for persons 6 months of age and older. Immunization coverage indicators for these vaccine/age groups help to identify areas of concern.

Energy and Commerce Subcommittee on Oversight and Investigations  
Hearing on "Confronting a Growing Public Health Threat: Measles Outbreaks in the U.S."  
February 27, 2019

Questions for the Record

NIAID Director Anthony Fauci

The Honorable Frank Pallone Jr. (D-NJ)

1. The Centers for Disease Control and Prevention (CDC) has determined that receiving the measles, mumps, and rubella vaccine-known as the MMR vaccine- is safer than getting any of the viruses. CDC notes, however, that as with any medication, there is a chance of adverse reaction.
  - a. What range of adverse reactions are associated with the MMR vaccine?

NIAID Response:

The measles, mumps, rubella (MMR) vaccine and the MMRV vaccine, which includes varicella (V - chickenpox), are the two measles-containing vaccines commercially available in the United States. The MMR and MMRV vaccines are 97 % effective against measles and both measles-containing vaccines are very safe. The vast majority of individuals who receive the vaccines experience no adverse reactions coinciding with vaccination and the most common adverse reactions reported with use of the vaccines are mild: low-grade fever, injection site redness or rash, temporary stiffness and pain of the joints, and pain at the injection site. Much less common are temporary adverse reactions reported with use of the vaccines such as: full body rash, low platelet count, and facial swelling. In rare cases, more serious adverse reactions have been reported with use of the vaccines. These include febrile seizures, which can be caused by a variety of conditions that induce fever, including the diseases that the vaccines are designed to prevent. In this regard, up to five percent of young children will have a febrile seizure at some time in their life, usually associated with an infection that they have contracted. Other exceedingly rare adverse reactions reported following use of measles-containing vaccines are anaphylaxis in those with allergies to vaccine components, and, in extremely rare cases, measles inclusion body encephalitis, almost always in individuals with compromised immune systems.

It is important to note that infection with measles virus can result in complications that may include severe, lifelong disability, or even death. About one in ten patients experience ear infections, which can result in deafness, and one in twenty develop pneumonia. One in a thousand are affected by encephalitis, or inflammation of the brain, that can cause seizures and result in deafness or intellectual disability. Two or three infected patients in a thousand will die from measles. In rare cases, a persistent central nervous system infection can also occur, causing a fatal degenerative neurological disease called subacute sclerosing panencephalitis (SSPE). SSPE generally develops seven to ten years after measles infection and is characterized by behavioral changes, mental and motor deterioration, seizures, blindness, and ultimately death within one to three years.

- b. Under what circumstances have more severe reactions been documented?

NIAID Response:

There are certain individuals for whom measles-containing vaccines are medically contraindicated due to risk of severe adverse reactions. It is important that parents or guardians have a conversation with healthcare providers to ensure that a child does not have any preexisting conditions that would indicate they should not receive a measles-containing vaccine. Package inserts<sup>1,2</sup> for measles-containing vaccines contain a section pertaining to warnings. This section of the labeling includes a description of serious adverse reactions and potential safety risks, limitations in use imposed by them and steps that should be taken if they occur. The labeling also includes information pertaining to contraindications. These include: an immunodeficiency, febrile illness, a hypersensitivity to any of the vaccine components, or an anaphylactic reaction to the vaccine component neomycin. In addition, measles-containing vaccines are contraindicated in pregnant women.

CDC recommends the first dose of measles-containing vaccine be administered to children between 12 to 15 months of age in most circumstances. Infants 6 through 11 months of age should receive one dose of MMR vaccine if they will be traveling internationally. Recent studies have shown that children who receive a delayed initial MMR vaccine dose after 16 months are at an increased risk of febrile seizures.<sup>3</sup> This increased risk of seizure lasts for about two weeks after vaccine administration and is most prevalent in the contraindicated group of children with a history, or a family history, of febrile seizures.<sup>4</sup> The MMRV vaccine also has been shown to be associated with a slightly higher, but still very low, risk of febrile seizures. Notably, children who experience a febrile seizure after vaccination are at no greater risk of epilepsy long-term.

Exceedingly rare anaphylactic reactions to the MMR vaccine are due to allergies to vaccine components. The MMR vaccine is contraindicated in individuals with a history of an allergic reaction to the vaccine component neomycin due to the presence of trace amounts of this antibiotic in the vaccine. The MMR vaccine also uses gelatin as a stabilizing agent to maintain the potency of the vaccine when exposed to cold or hot conditions. The MMR vaccine is contraindicated in individuals with an allergy to gelatin.<sup>5</sup>

Individuals with a weakened immune system due to disease (such as primary immunodeficiency, cancer, or HIV/AIDS) or medical treatments (such as chemotherapy, radiation, steroids, or immunotherapy) may be at a greater risk of experiencing rare adverse reactions with use of live attenuated vaccines, including measles-containing vaccines. Apart from the issue of response to vaccines, individuals with weakened immune systems are unable to mount an effective immune response against infectious diseases such as measles and are at a greater risk of viral encephalitis from these infections. MMR vaccines contain a weakened vaccine strain of measles that a healthy individual can easily clear while developing long-

<sup>1</sup> MMR-II Package Insert: <https://www.fda.gov/biologicsbloodvaccines/vaccines/approvedproducts/ucm094050.htm>

<sup>2</sup> ProQuad (MMRV) Package Insert:

<https://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM123793.pdf>

<sup>3</sup> Rowhani-Rahbar et al. Effect of Age on the Risk of Fever and Seizures Following Immunization with Measles-containing Vaccines in Children. *JAMA Pediatrics* 2013. <https://www.ncbi.nlm.nih.gov/pubmed/24126936>

<sup>4</sup> Vestergaard et al. MMR Vaccination and Febrile Seizures: Evaluation of Susceptible Subgroups and Long-term Prognosis. *JAMA* 2004. <https://www.ncbi.nlm.nih.gov/pubmed/15265850>

<sup>5</sup> Kelso et al. Anaphylaxis to Measles, Mumps, and Rubella Vaccine Mediated by IgE to Gelatin. *J Allergy Clin Immunol* 1993. <https://www.ncbi.nlm.nih.gov/pubmed/8473675>

lasting immunity to wild-type measles. Measles-containing vaccines are contraindicated in those with weakened immune systems because they are unable to develop an effective immune response to this vaccine strain, which increases the risk of severe adverse reactions, including encephalitis. Most children with significant primary immunodeficiencies will be identified prior to the age of initial MMR vaccination and the MMR vaccine is contraindicated for such individuals. It is important to note that these individuals with weakened immune systems who do not receive the vaccine rely on the herd immunity that arises from the vaccination of healthy people.

- c. Does the National Institutes of Health concur with CDC's determination that the risks associated with acquiring measles, mumps, or rubella are greater than the possible reactions from the MMR vaccine?

NIAID Response:

The NIH concurs with CDC's determination that the risks associated with acquiring these diseases are significantly greater than the low risk of serious adverse reactions reported with use of the MMR vaccine.

The Honorable Jan Schakowsky (D-IL)

1. When outbreaks occur, our most pressing concern is often an immediate response. However, I believe that we also must reflect on our nation ' s progress in prevention of vaccine preventable diseases. The Department of Health and Human Services (HHS) Healthy People objectives for immunization and infectious disease are a cornerstone for federal, state, and local efforts to protect against vaccine preventable conditions across the lifespan.

I was surprised to learn that the draft Healthy People 2030 objectives include very few immunization objectives in total. At a time when we are seeing increased outbreaks of diseases that were already virtually eliminated in this country, could you explain the rationale behind the reduction in immunization objectives in the draft Healthy People 2030 framework? Do you plan to restore these objectives moving forward?

NIAID Response:

NIAID defers to the Office of the Assistant Secretary for Health for questions regarding the Healthy People 2030 initiative.

The Honorable Brett Guthrie (R-KY)

1. In May 2015, the journal *Science* published a report in which researchers found that the measles infection can leave a population at an increased risk for mortality from other diseases for two to three years. Besides this report, is there evidence that measles increases susceptibility to other infections?

NIAID Response:

There is an extensive body of evidence documenting that measles virus infection causes transient suppression of the host immune system, which increases an individual's susceptibility to other infections and can result in the development of secondary bacterial infections in the lungs during the course of measles infection. In the referenced May 2015 *Science* publication, researchers used population-level data to suggest measles vaccination also can protect against other infectious diseases by preventing the "immune amnesia" that has been associated with immune suppression caused by measles infection.<sup>6</sup>

2. What are antigens? How much are used in MMR vaccine? How does that small amount compare to the antigens that are encountered in the environment?

NIAID Response:

An antigen is a substance that can trigger an immune response, resulting in the host immune system's production of an antibody or cellular response as part of the body's defense against infectious agents and other foreign substances. Many antigens are foreign proteins (those not found naturally in the body). For example, the hemagglutinin and fusion proteins of measles virus are antigens that stimulate our immune cells to attack the virus. Every microbe carries its own unique set of antigens, which are central to creating vaccines. Upon birth, the infant leaves the protected environment of the womb and is exposed to the outside world, which contains an almost infinite array of microbes and antigens. Within hours, the newborn's skin and upper respiratory and intestinal tracts are colonized by a variety of microorganisms with their own set of antigens.

Each dose of the measles, mumps, and rubella vaccine contains 24 viral antigens.<sup>7</sup> In contrast, recent systems biology studies have found that a single bacterial infection may potentially expose an individual to hundreds to thousands of antigens.<sup>8,9</sup> In addition, although the current immunization schedule contains several more vaccines than in past decades, the total number of antigens contained in the vaccines has actually decreased predominantly as a result of the removal of the whole-cell pertussis vaccine.

Many well-executed studies have been conducted and have not found increased risks of

<sup>6</sup> Mina et al. Long-term Measles-induced Immunomodulation Increases Overall Childhood Infectious Disease Mortality. *Science* 2015. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4823017/>

<sup>7</sup> Plotkin et al. *Plotkin's Vaccines* (Seventh Edition). Elsevier. 2018.

<sup>8</sup> Liang et al. Systems Biology Approach Predicts Antibody Signature Associated with *Brucella melitensis* Infection in Humans. *J Proteome Res* 2011. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3189706/>

<sup>9</sup> Darton et al. Identification of Novel Serodiagnostic Signatures of Typhoid Fever Using a *Salmonella* Proteome Array. *Front Microbiol* 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5609549/>

adverse health outcomes related to the number of vaccines or vaccine antigens received early in life. Taken together, these findings strongly suggest that the number of antigens in vaccines recommended in the official CDC immunization schedules do not pose a health risk.

3. What is your professional judgment of the likely public-health impact of state vaccination exemptions based on personal or professional beliefs?

NIAID Response:

In my lifetime, I have seen first-hand the devastating effects that measles can have on the health of unvaccinated individuals. Prior to the availability of a vaccine, three to four million measles cases occurred each year in the United States, resulting in approximately 48,000 hospitalizations and 400 to 500 deaths. Globally, there were approximately 110,000 measles deaths in 2017, mostly among children under the age of five. Without a vaccine, it is estimated that 21.1 million people in the world would have died of measles from 2000 to 2017. Now that we have a very safe and highly effective measles vaccine, we must ensure that vaccination rates remain high enough to maintain herd immunity to protect those for whom the vaccine is contraindicated. We know from experience that if for any reason the vaccination rate decreases below the level required to maintain herd immunity – generally from 93 to 95 percent in crowded populations – the result will be more outbreaks of measles and measles-associated complications. We are seeing examples of this currently in Rockland County, New York, and other locations in the United States where the level of measles vaccination has fallen below the critical level.

As a public health official, I strongly recommend that anyone eligible receive the measles vaccine. We must ensure that parents and guardians have accurate and evidence-based information on the safety, efficacy, and benefit of vaccines. We need to better understand what information is available to concerned parents seeking knowledge about vaccines to combat misinformation. We also seek to understand what is motivating individuals to seek personal or professional belief exemptions from vaccination to better inform public health messaging and increase vaccine acceptance. Widespread exemptions due to personal or professional beliefs pose a risk of measles outbreaks (as we are currently seeing) with their associated health consequences at the individual and community levels. Our focus is on helping parents and guardians understand how vaccines protect their children as well as their community from serious and potentially deadly diseases such as measles.

4. What has your institute learned from research about why measles spreads so efficiently? How will this improved understanding help develop novel therapeutic strategies?

NIAID Response:

Measles virus is one of the most infectious viruses on Earth. There are three aspects of the measles virus that make it spread so efficiently: first, individuals are infectious for a few days before it is obvious that they have measles virus infection; second, small amounts of virus are sufficient to cause infection and large amounts of virus are expelled from an infected patient; and third, the virus can stay viable in the air and on surfaces for extended periods. In this

regard, it is estimated that if an unvaccinated individual is in an enclosed space with an infectious person, there is a 90 percent chance that they will become infected with measles. In addition, measles virus can linger in the air as infectious droplets for up to two hours after an infected person leaves an area. Transmission of measles virus also may occur through contact with surfaces.<sup>10</sup>

The initial infection with measles virus occurs in the respiratory tract and then spreads via infected immune cells to organs throughout the body, as well as to the cells in the upper airway.<sup>11</sup> It is the sloughing of this infectious tissue in the upper airway that induces coughing and sneezing of aerosolized respiratory droplets, facilitating transmission from person to person. The knowledge of where in the body measles virus infects and what cells in those organs are infected can help inform which host pathways can be targeted to inhibit viral replication and transmission. In addition, NIAID is funding basic research to explore the measles virus replication cycle, which may lead to the identification of components of the virus that can be targeted with novel therapeutic strategies.

NIAID will continue to support research to better understand measles virus transmission, pathogenesis, and mechanisms of immune evasion as well as host innate immune responses. For example, NIAID is supporting research to understand measles virus replication and spread in primary cultures of human airway epithelial cells and in a rhesus monkey model. NIAID-supported basic research on measles virus provides the foundational knowledge required for the identification and development of novel measles therapeutics. NIAID also is planning a scientific workshop on the development of antivirals to treat measles.

5. What does the research so far show about using a third dose of MMR vaccine to further boost the immune response?

NIAID Response:

Two doses of the MMR vaccine are approximately 97 percent effective in preventing measles if a person is exposed to the virus. CDC considers people who received two doses of measles vaccine as protected for life. However, in rare cases, people who have had two doses of the MMR vaccine can still get measles if exposed to the virus. It is unclear why these individuals are not immune to the virus. In a recent study of registered, laboratory-confirmed measles cases in California between 2000 and 2015, 46 out of 232 measles cases (20 percent) with a documented vaccine history had received at least one dose of measles-containing vaccine, indicating the potential lack of an adequate immune response to the measles component of the vaccine, or the occurrence of waning immunity to measles in these individuals. NIAID is supporting research at the Mayo Clinic in Minnesota to understand whether a third measles vaccination will boost the immune response of individuals who do not exhibit a sufficient immune response after two doses. The findings of this research could inform whether investigation is warranted for a third dose of MMR vaccine for protection against measles.

<sup>10</sup> Bischoff et al. Detection of Measles Virus RNA in Air and Surface Specimens in a Hospital Setting. *JID* 2015. <https://www.ncbi.nlm.nih.gov/pubmed/26386428>

<sup>11</sup> Griffin et al. The Immune Response in Measles: Virus Control, Clearance and Protective Immunity. *Viruses* 2016. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5086614/>

In contrast to generally successful protection against measles from the MMR vaccine, a 2018 study estimated that immune protection against mumps wanes to the point of making an individual susceptible to infection again 27 years after last mumps vaccination on average, suggesting the potential need for a third vaccine dose.<sup>12</sup> CDC, based on advice from the Advisory Committee on Immunization Practices, now recommends a third dose of a mumps virus-containing vaccine such as MMR for individuals previously vaccinated with two doses who are identified as being at increased risk for acquiring mumps because of proximity to a mumps outbreak. This recommendation is designed to improve protection against mumps virus infection and related complications in these individuals. It is important to note that there are no data available to demonstrate how long a third dose of MMR vaccine provides additional protection from mumps.

6. Is there reason to believe that there are differences in immune responses between sexes?

NIAID Response:

For some vaccines, biological sex can be a strong determinant of vaccine response, with females demonstrating higher antibody responses. However, previous studies of measles vaccine-induced immune responses have not resulted in definitive conclusions regarding the role of biological sex. Studies on sex-based differences in antibody production resulting from administration of the measles vaccine have shown conflicting results, some suggesting that either males or females were more likely to develop a strong antibody response and some indicating that there were no sex-based differences in antibody response. In 2016, a NIAID-supported analysis for sex differences in antibody responses to measles vaccination in three cohorts (2,872 children total) found no evidence for sex differences.<sup>13</sup> NIAID will continue to support research to improve understanding of the host immune response to vaccination, including potential sex differences.

7. What is the concern with "waning immunity," and how can it be addressed?

NIAID Response:

The overwhelming majority of measles cases in the United States occur in unvaccinated persons with no immunity against measles virus. However, as noted in the response to question 5, there have been reports of laboratory-confirmed measles cases in individuals previously vaccinated against measles, indicating the possibility of inadequate initial immunity or waning immunity, which is a decreased immunity against the virus over time. Additional studies would be required to more precisely estimate the level of waning immunity to measles in high vaccine coverage settings. NIAID is supporting research to understand the difference between immunity following measles vaccination and immunity gained by natural infection.

<sup>12</sup> Lewnard et al. Vaccine Waning and Mumps Re-emergence in the United States. *Science Translational Medicine* 2018. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5899613/>

<sup>13</sup> Voigt et al. Genetically Defined Race, but not Sex, is Associated with Higher Humoral and Cellular Immune Responses to Measles Vaccination. *Vaccine* 2016. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5278779/>

8. Why are there no antiviral therapies currently available to treat measles? Is it because it is particularly challenging or a lack of market interest?

NIAID Response:

NIAID recognizes the need for antiviral therapies to treat measles and is planning a scientific workshop to accelerate the development of measles antivirals. NIAID also is supporting efforts to screen antiviral compounds for activity against measles. The lack of antivirals against measles virus is not due to any significant scientific challenge, but more likely the relatively low number of cases in the United States, the late stage of diagnosis (usually after rash), and the highly effective vaccine, which has a dampening effect on the interest of researchers and industry in developing new antiviral therapies. However, NIAID will continue to support research on the identification and development of novel measles antivirals. In addition, existing antiviral therapies, such as interferon and ribavirin, have been tested clinically against measles with varied results.<sup>14</sup>

It is important to note that CDC provides recommendations to healthcare providers for situations where an individual has been exposed to measles and has no evidence of immunity via vaccination or prior infection. If these patients present to their healthcare provider within 72 hours of exposure, they can be offered post-exposure prophylaxis (PEP) in the form of the MMR vaccine. Alternatively, immunoglobulin can be administered within six days. PEP has been found to be highly effective at preventing or limiting infection. Vitamin A also has been shown to prevent some of the adverse effects of measles and CDC recommends severe measles cases among children, such as those who are hospitalized, should be treated with vitamin A.<sup>15</sup> This is particularly useful in settings where vitamin A deficiencies are common.

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<sup>14</sup> Piemper et al. Measles Control – Can Measles Virus Inhibitors Make a Difference? *Current Opinion in Investigational Drugs* 2009. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2728049/>

<sup>15</sup> <https://www.cdc.gov/measles/hcp/index.html>

The Honorable Michael C. Burgess, M.D. (R-TX)

1. What steps can parents take to best protect their children from infectious diseases like measles?

NIAID Response:

Vaccination is the best step parents can take to protect their children from infectious diseases such as measles. We must ensure that parents and guardians have easy access to accurate and evidence-based information on the safety, efficacy, and benefit of vaccines. The measles, mumps, rubella (MMR) vaccine and the MMRV vaccine, which includes varicella (V - chickenpox), are the two measles vaccines commercially available in the United States. The MMR and MMRV vaccines are 97 % effective against measles and both measles-containing vaccines are very safe. Two doses of the MMR vaccine are approximately 97 percent effective in preventing measles if a person is exposed to the virus.

2. What are some of the sideeffects associated with measles, and how often do these occur?

NIAID Response:

Infection with measles virus can result in complications that may include severe, lifelong disability or even death. One in ten patients experience ear infections, which can result in deafness, and one in a thousand develop pneumonia. One in a thousand develop encephalitis, or inflammation of the brain, that can cause seizures and result in deafness or intellectual disability. Two to three infected patients in a thousand will die from the measles. In rare cases, a persistent central nervous system infection occurs, causing a fatal degenerative neurological disease called subacute sclerosing panencephalitis (SSPE). SSPE generally develops seven to ten years after measles infection and is characterized by behavioral changes, mental and motor deterioration, seizures, blindness, and ultimately death within one to three years. Vaccination is the best step parents can take to protect their children from these measles-associated complications.

3. Some people say that measles is not serious and did not cause great harm in the past. Can you talk about the historic impact of measles in the past both in the U.S. and globally?

NIAID Response:

Prior to the availability of a vaccine, three to four million measles cases occurred each year in the United States, resulting in approximately 48,000 hospitalizations and 400 to 500 deaths. Globally, even though a safe and effective vaccine is now available, there were still approximately 110,000 measles deaths in 2017, mostly among children under the age of five. Without a vaccine, it is estimated that 21.1 million people in the world would have died of measles from 2000 to 2017. We must ensure that vaccination rates remain high enough to maintain herd immunity to protect those for whom the vaccine is contraindicated. We know from experience that if the vaccination rate decreases below the level required to maintain herd immunity for any reason, the result will be more outbreaks of measles and measles-associated complications.

