

Overview of Three Vaccine-Preventable Diseases

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October 2025



Kentucky Public Health
Prevent. Promote. Protect.



TEAM 
KENTUCKY[®]
CABINET FOR HEALTH
AND FAMILY SERVICES

Kentucky Department for Public Health

About Us



Kentucky Public Health
Prevent. Promote. Protect.



The Kentucky Department for Public Health (KDPH) is dedicated to improving the health and safety of Kentuckians through *prevention, promotion, and protection*.

As a major part of the Cabinet for Health and Family Services, KDPH provides guidance and support for health departments in all 120 counties.

Serving as Kentucky's dedicated public health resource, KDPH is responsible for identifying and allocating resources to communities and public health institutions to prevent and protect against diseases, outbreaks, and hazards statewide.

After This Session, Participants Will Be Able To:

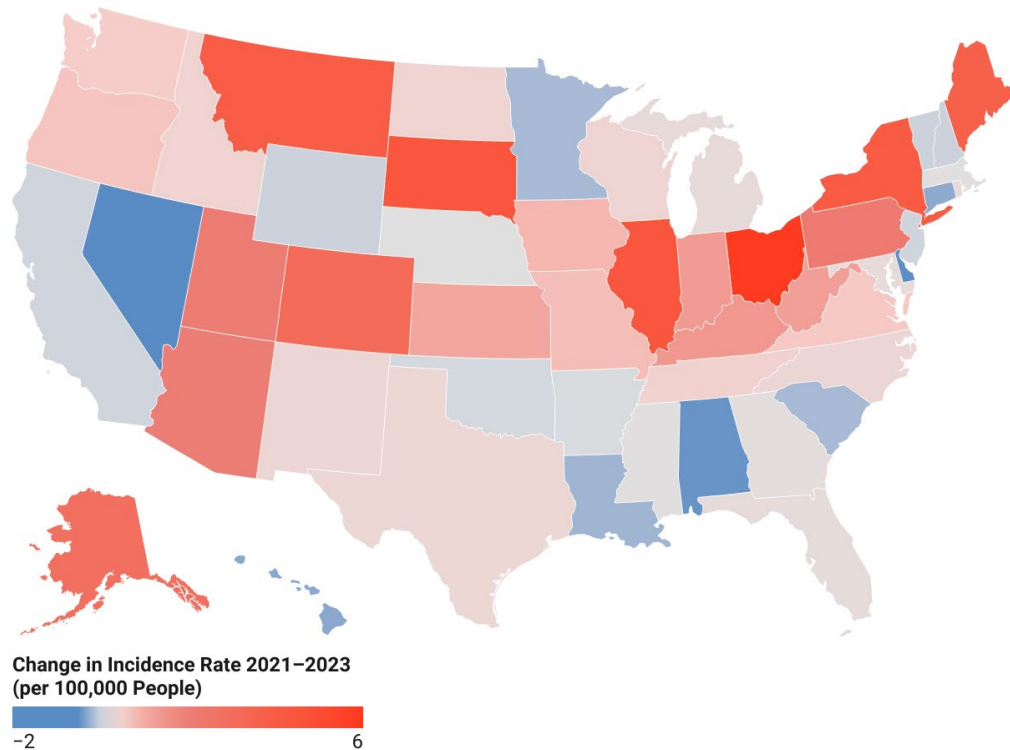


Describe critical rare manifestations of pertussis, measles and H. flu, type b.



Review specific measles scenarios with treatment implications

Pertussis



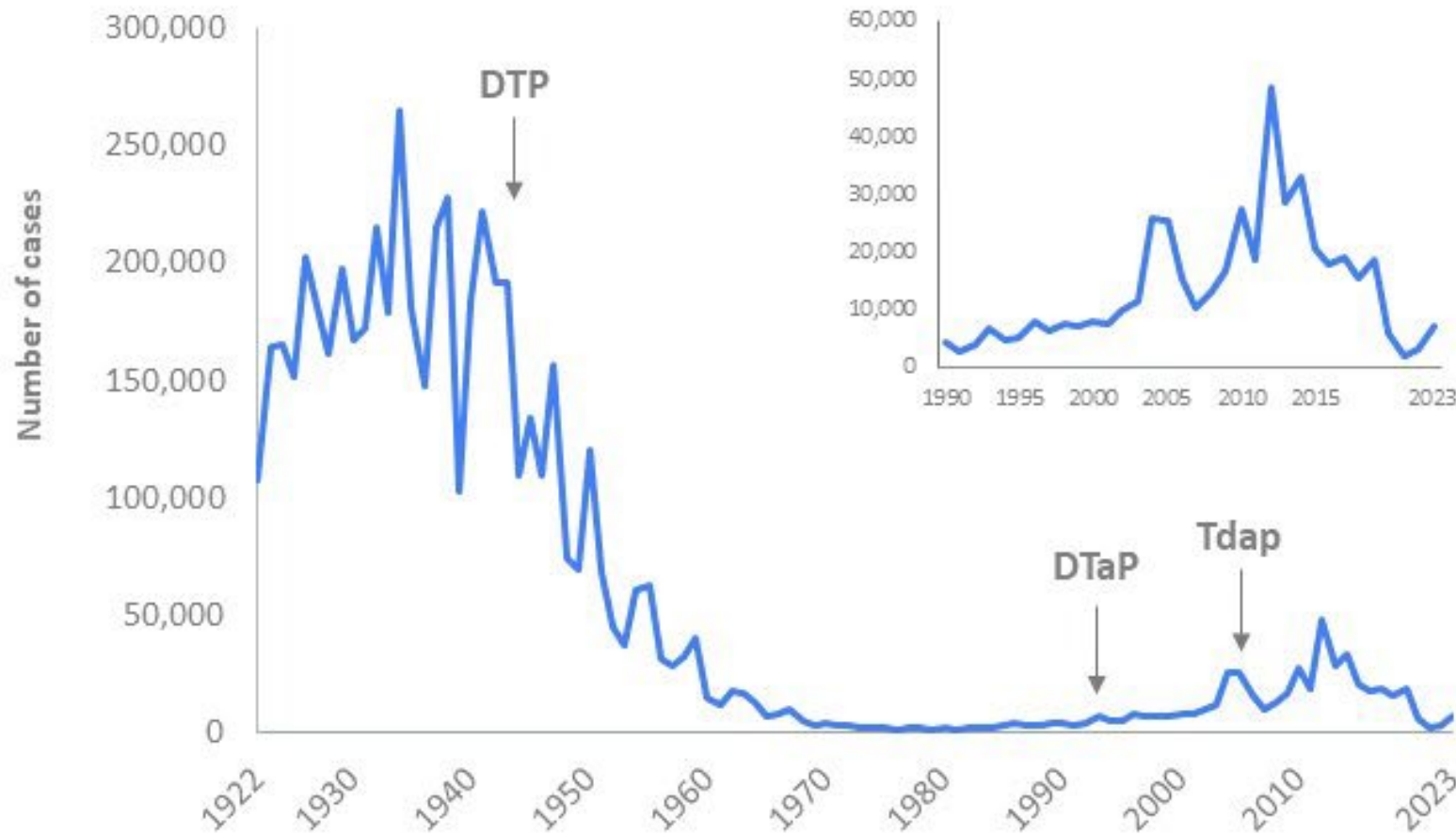
A map shows the changing incidence rates of whooping cough (pertussis) for each U.S. state; click on individual states for more detailed information. The rising trend has continued in 2024, with more than five times as many cases reported in the year to date compared with this time last year.

Newsweek Map: Ian Randall • Source: Centers for Disease Control and Prevention • Created with Datawrapper

- 🛡️ Caused by bacteria *Bordetella pertussis*
 - Treatment and PEP antibiotics
- 🛡️ Also called Whooping cough or the “100 days cough”
- 🛡️ DTaP at 2, 4, 6, 15 months and 4-6 years of age.
- 🛡️ Tdap at 11 years, then q 10 years for the rest of your life, with each pregnancy, and/or if tetanus part is needed.

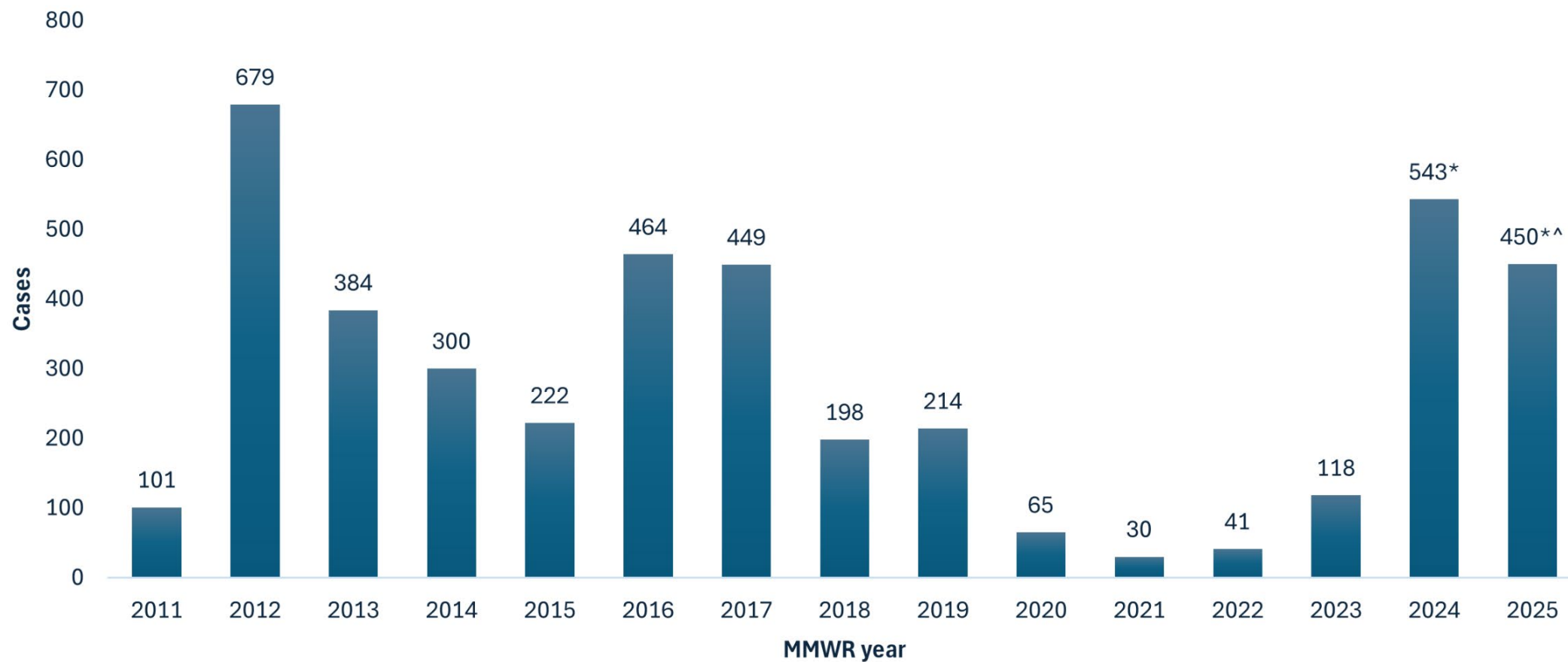
<https://www.newsweek.com/states-deadly-whooping-cough-rising-cdc-1971411>; <https://www.cdc.gov/acip-recs/hcp/vaccine-specific/dtap-tdap-td.html>

Reported NNDSS pertussis cases: 1922-2023



SOURCE: CDC, National Notifiable Diseases Surveillance System

Pertussis cases by year, Kentucky



* 2024 and 2025 data are preliminary, ^ 2025 data up to date as of 9/22/25

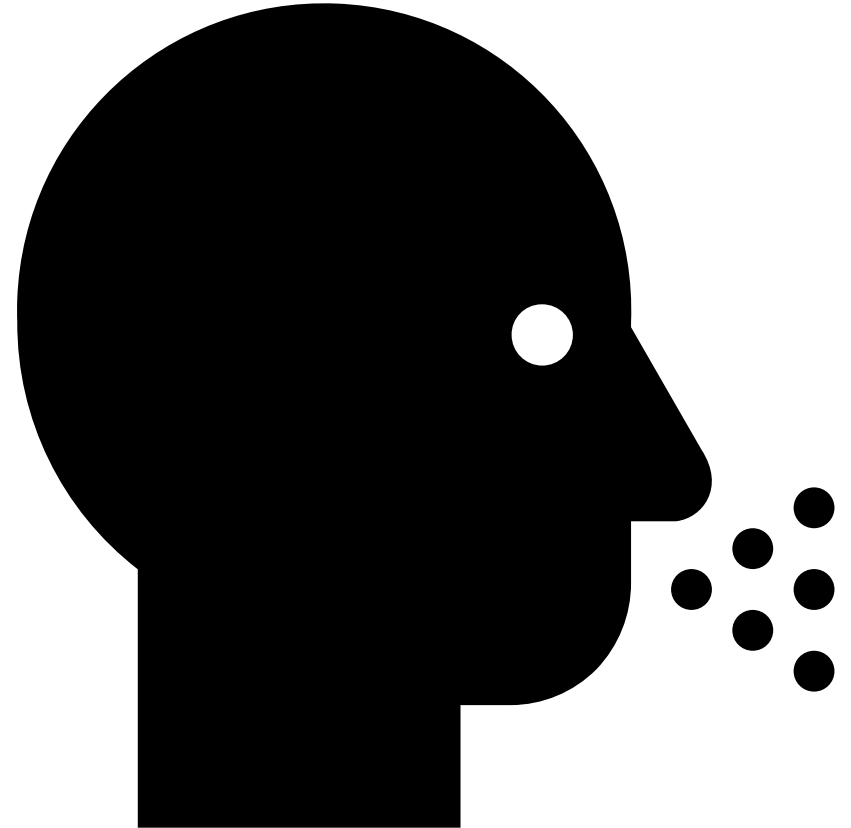
Testing for pertussis

- 🛡️ NP swab or wash for pertussis PCR
- 🛡️ NP or wash for culture is also an option but not preferred
- 🛡️ It is reportable in KY and on the nationally notifiable disease list.
 - 3 or more linked cases in 42-day period = concern for outbreak
- 🛡️ Antibiotics for treatment of the patient and PEP antibiotics for exposures are available!
 - Antibiotics may not improve symptoms but reduce the number of people infected by the sick person
 - Azithro, Clarithro, Erythro and TMP/SMX

https://www.chfs.ky.gov/agencies/dph/dehp/idb/Documents/Pertussis_Quicksheet.pdf

Common manifestations

- 🛡️ Week 1-2: URI symptoms
- 🛡️ Week 3-6: Paroxysmal or “whoop” stage
 - Or apnea in babies
- 🛡️ Week 7+: Persistent fatiguing cough
 - Risk of secondary pneumonia



What is that sound?

Additional possible complications



Post-tussive
emesis



Subconjunctival
hemorrhage



Rib fractures



Seizures and
encephalitis

Serious and rare manifestation: Malignant Pertussis



“Threatening pertussis is an unprecedented perilous illness depicted by outrageous respiratory disillumination, genuine leukocytosis, and aspiratory hypertension.”

<https://www.openaccessjournals.com/articles/the-death-of-malignant-pertussis-and-how-to-avoid-it-15245.html>

Serious and rare manifestation: Malignant Pertussis



“Threatening pertussis is an unprecedented perilous illness depicted by outrageous respiratory disillusionment, genuine leukocytosis, and aspiratory hypertension.”

*Written in 2021



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<https://www.openaccessjournals.com/articles/the-death-of-malignant-pertussis-and-how-to-avoid-it-15245.html>

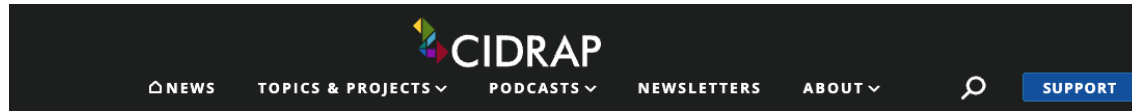
Malignant pertussis

- 🛡️ Population: infants
- 🛡️ Findings: WBC > 50 g/l, very fast heart rate and breathing, multiple organ failure
- 🛡️ Death in 75% of cases
- 🛡️ ECMO or leukodepletion may be helpful



<https://pmc.ncbi.nlm.nih.gov/articles/PMC8105476/>

Importance of maternal vaccination



Kentucky announces two pertussis deaths in infants this year

News brief | June 9, 2025

[Stephanie Soucheray, MA](#)

Topics: [Pertussis](#)



SHARE

On Friday, **Kentucky announced** two pertussis deaths in infants over the past 6 months, and neither the infants nor their mothers had been vaccinated against the highly contagious bacterial infection also known as whooping cough.

According to the Kentucky Department for Public Health (KDPH), these are the first whooping cough deaths in the state since 2018.

“Anyone can get whooping cough, but infants are at greatest risk for life-threatening illness”

“Anyone can get whooping cough, but infants are at greatest risk for life-threatening illness,” said KDPH Commissioner Steven Stack, MD, in a press statement. “Fortunately, when vaccinations are administered to pregnant women, it provides protection to both the mother and the baby.”



Infants are at highest risk for adverse outcomes from pertussis.



Receiving Tdap during pregnancy confers antibodies against pertussis to the baby that last until about age 3 months.



Infant immunity via receiving DTaP then takes over.

<https://www.cidrap.umn.edu/pertussis/kentucky-announces-two-pertussis-deaths-infants-year>

ACOG recommendations

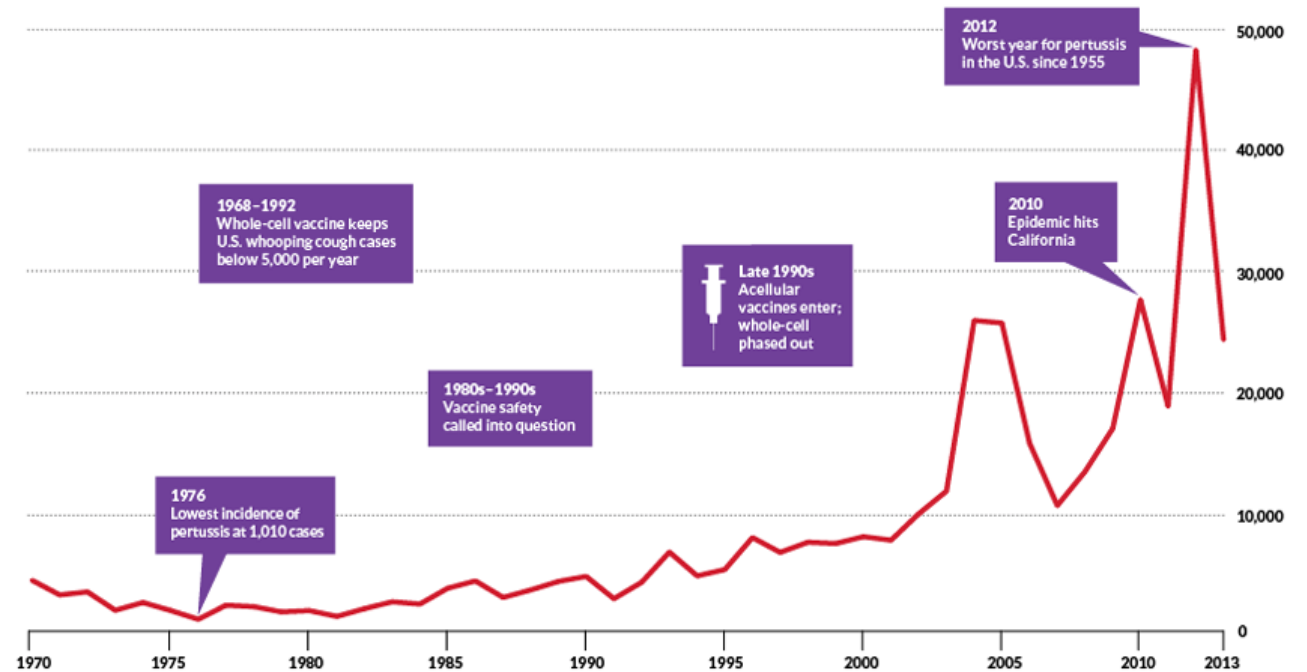
- 🛡️ All pregnant women should get Tdap between 27 and 36 weeks of pregnancy.
- 🛡️ This is repeated with every pregnancy.



<https://www.acog.org/womens-health/faqs/the-tdap-vaccine-and-pregnancy>

Why so many boosters?

- 1914: whole cell pertussis vaccine was invented
- 1940's: combined with diphtheria and tetanus in DTP
- 1991: acellular pertussis vaccine comes into use (fewer side effects)
- Immunity wanes and needs boosts!



<https://www.sciencenews.org/article/whooping-cough-bounces-back>

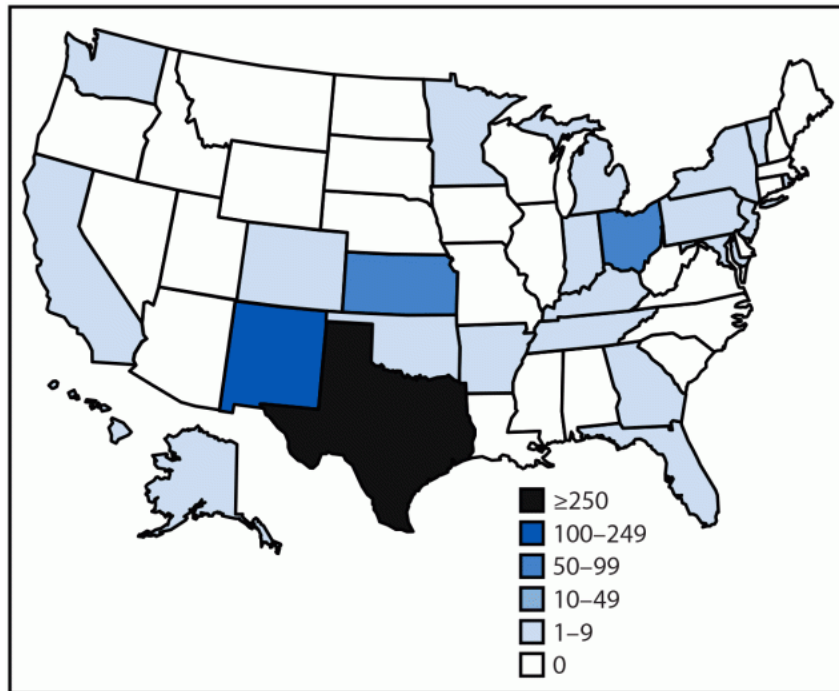
Should we change how we report infant vaccination status?

- 🛡️ Maternal Tdap vaccination helps protect the infant *until 3 months of age*
 - Infant DTaP starts at 2 months
- 🛡️ Maternal RSV, COVID and Flu vaccines provide benefit *until 6 months of age*
- 🛡️ *Should we think of a 1 month old with an unvaccinated mother as different than a 1 month old born to a vaccinated mother?*



Measles

FIGURE 1. Reported number of confirmed* measles cases, by state (N = 800) — United States, January 1–April 17, 2025



Caused by the measles virus

- One of the most contagious infectious diseases
- $R_0 = 12-18$

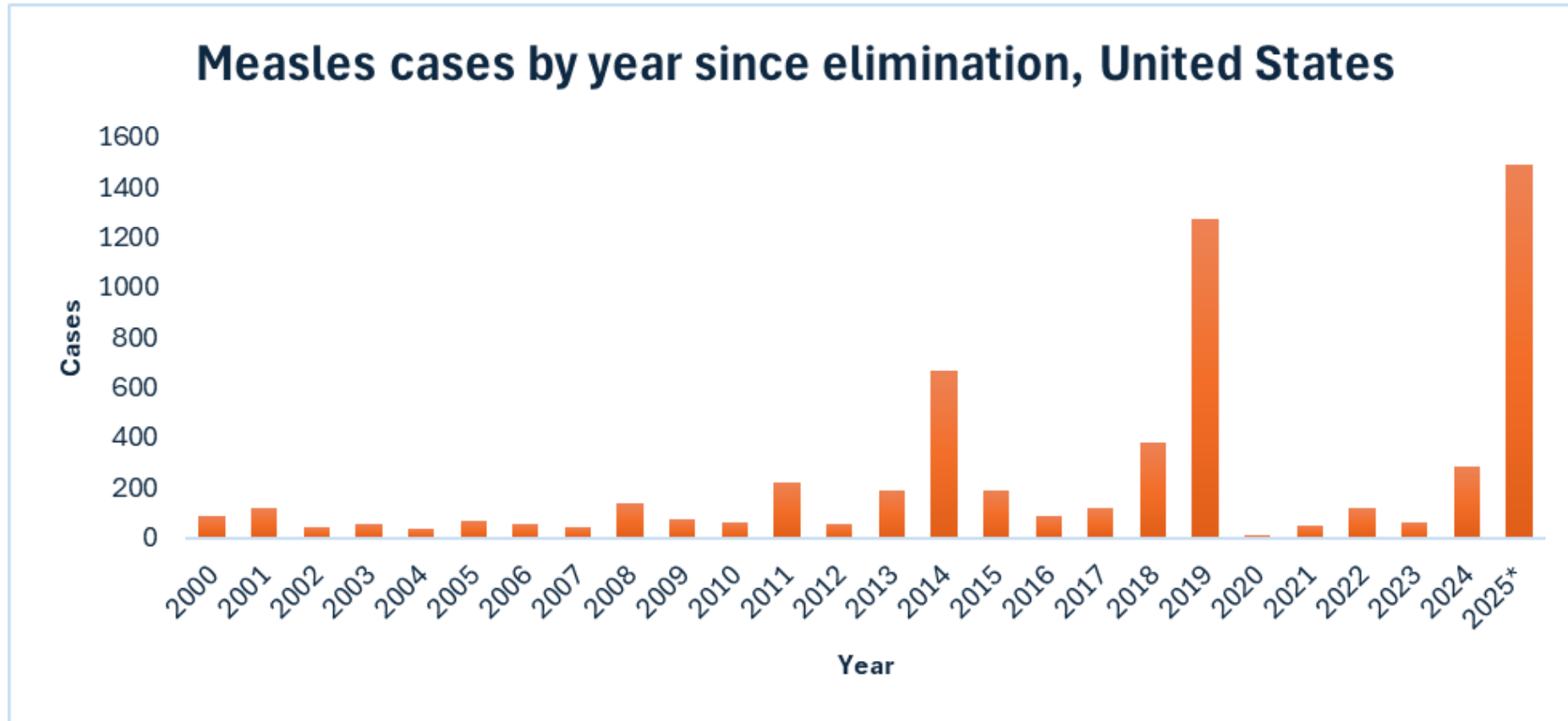


MMR(V) vaccine at age 12 months and 4-5 years

- Dose 0 = between 6 and 12 months
- Two doses considered sufficient
- No boosters

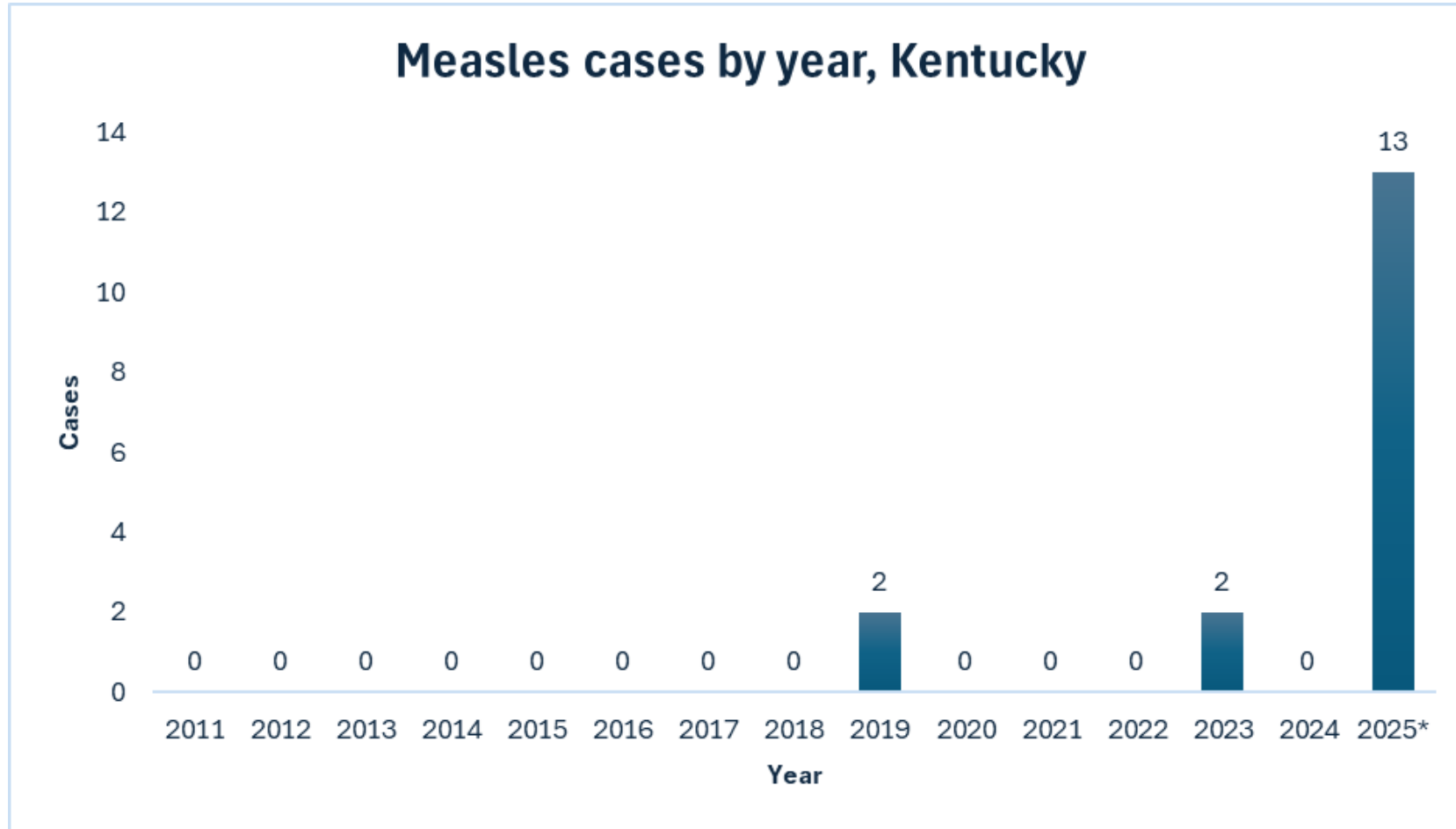
<https://www.cdc.gov/mmwr/volumes/74/wr/mm7414a1.htm>

National Measles numbers



* 2023–2025 case counts are preliminary and subject to change. 2025 data as of 9/16/25. Source: CDC

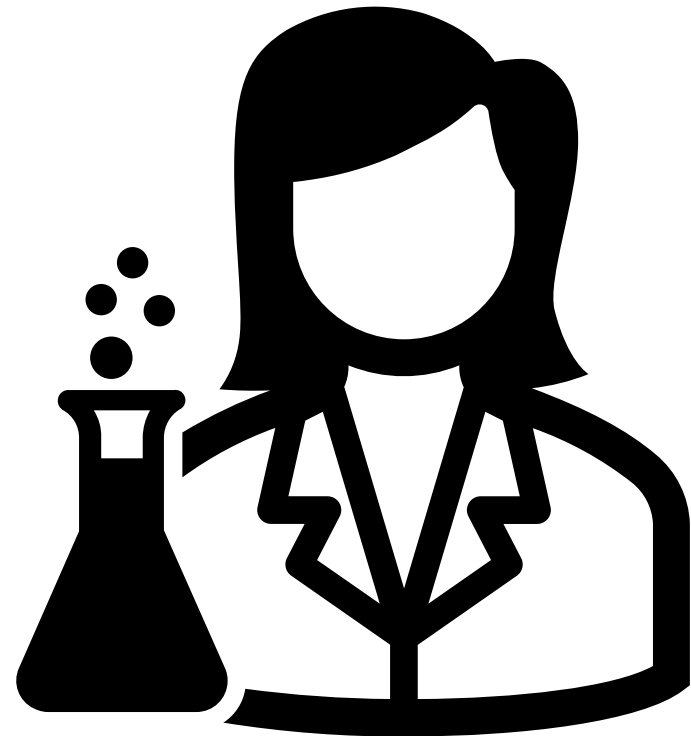
Kentucky Measles numbers



*2025 data preliminary and subject to change. Accurate as of 9/22/2025

Testing for Measles

- 🛡️ NP swab for measles virus PCR *highly preferred.*
- 🛡️ High probability cases or high consequence situations should be tested at DLS.
- 🛡️ Call VPD section at KDPH or regional epi to coordinate (*or the Epi On Call after hours*).



Contact information for DLS

Division of Laboratory Services

As leaders in public health laboratory practices, we perform unique reference testing services, generate reliable data, provide technical consultation and establish standards for quality clinical laboratory services in support of the commonwealth's commitment to promote and protect the health and well being of the public.

Main Laboratory number:(502)564-4446

Laboratory Emergency after hours number:(502) 320-4501

Epidemiology after-hours number:(888) 9REPORT, (888) 973-7678

Directions to KY Public Health Lab

CLIA Certificate/Application Information: (502)564-7963

[Email KY CLIA Lab Inquiries](#)

Sentinel Laboratory Information: (502) 782-7703



Common manifestations of measles



<https://www.cdc.gov/measles/signs-symptoms/photos.html>

Fever

Conjunctivitis and runny nose

Cough

Oral mucosa changes

Then the Rash (3-5 days in)

Measles differential:

 Things that cause fever, conjunctivitis, and runny nose:

 Things that cause red rash:

Measles differential:

 Things that cause fever, conjunctivitis, and runny nose:

- Flu
- COVID 19
- RSV
- Adenovirus
- Mononucleosis
- Pertussis
- Lots of things

 Things that cause red rash:

- HFM disease
- Staph scalded skin
- Scarlet fever
- Parvovirus
- Rubella
- Drug rash
- HHV6/roseola
- Eczema
- Other viral exanthems

Complications related to measles:

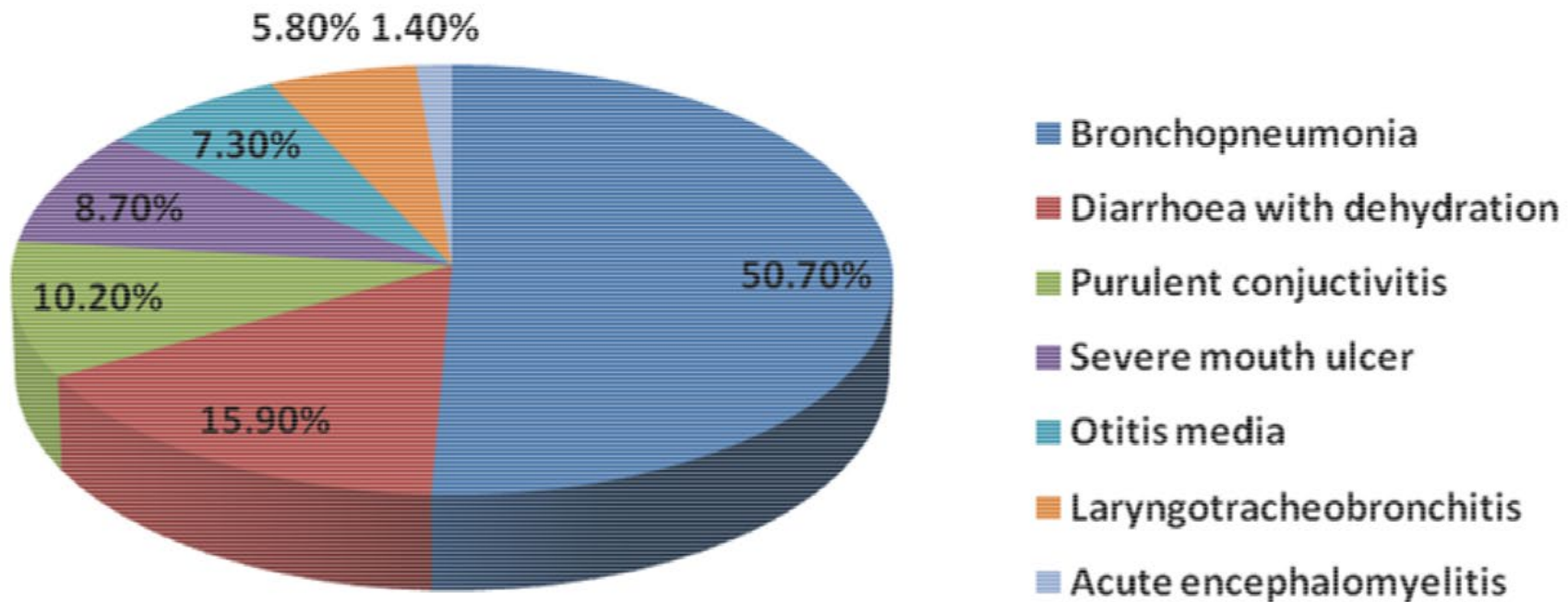


Figure 2. Distribution of complications in children with measles.

https://www.researchgate.net/publication/266495198_Clinical_profile_of_children_presenting_with_measles_in_a_Nigerian_secondary_health-care_institution/figures?lo=1

Other manifestations of measles

- 🛡️ Measles virus affects the immune system
 - Memory B and T cells are created when the body detects and overcomes an illness
 - Measles virus binds to and infects the immune system memory cells previously made by the body during other infections *and destroys them*
- 🛡️ The result is *immune amnesia*
- 🛡️ It takes 2-3 years for the person to regain the “immune memory” they had prior to measles infection!
 - You relearn the immune memory once you catch the illness again

Other manifestations of measles, cont'd

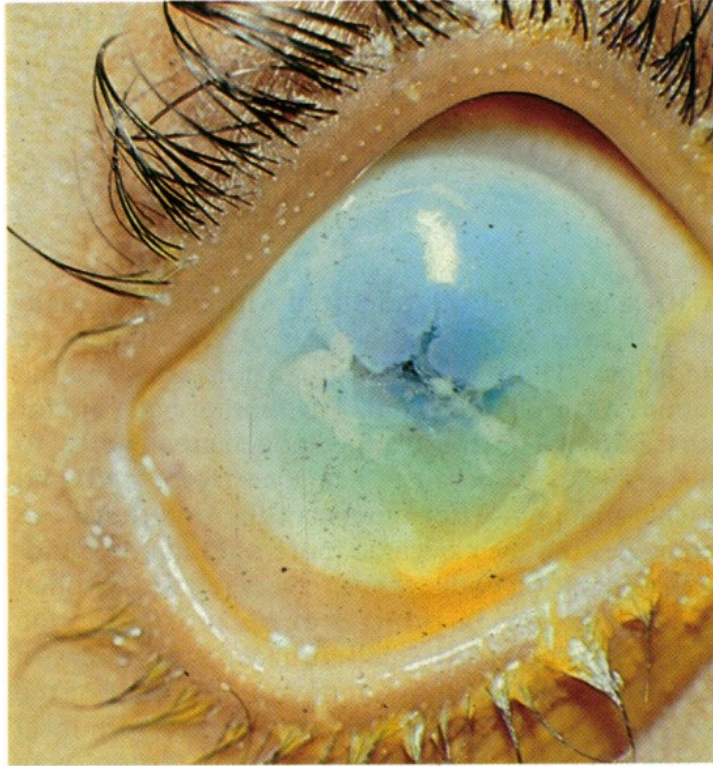


Fig. 3 Case 2. Right eye of a 20-month-old boy with measles and marasmus. There is limbus to limbus corneal necrosis with a central corneal perforation.

⚠ Xerophthalmia due to Vitamin A deficiency in the setting of measles:

- Keratitis with measles infection of the eye itself leads to ulceration
- Sloughing or scarring of cornea
- Permanent blindness

⚠ Protocols recommend giving Vit A to all children in the setting of acute measles to prevent this outcome (but it does not prevent measles).

- Two doses 24 hours apart +/- a third in a few weeks.
- <https://www.nfid.org/wp-content/uploads/2023/04/Call-to-Action-Vitamin-A-for-the-Management-of-Measles-in-the-US-FINAL.pdf>

https://bjo.bmj.com/content/bjophthalmol/71/5/331.full.pdf?casa_token=Ci04b5iYfC8AAAAA:qb2zd3GIX8SxYWWLqYHQTWiSPT9O0piN0ZIVYBuuKL6KwoynIIZR_V1Vf0GEo5ANPQFHWQZ37JeNpA

Rare (and time delayed) manifestation of measles

SSPE:

<https://www.ncbi.nlm.nih.gov/books/NBK560673/>

- Subacute sclerosing panencephalitis
 - Delayed 7-10 years on average from measles infection
 - Always related to previous wild-type measles infection (not associated with vaccine strain virus)
 - Virus retreats to neurons, where it remains latent for some time
 - Unknown trigger causes inflammatory response, which destroys the neurons
 - CSF, MRI and MR-spectroscopy changes are evident
 - Clinical symptoms may start with behavior or school-performance changes
 - Followed by progressive cognitive decline
 - About 1/3 develop epilepsy
 - Eventually patients enter a vegetative state from which they do not recover

Protective vs Risk factors for SSPE



Protective:

- Prevent measles infection with two doses of MMR vaccine at appropriate ages
- Some immunomodulators can reduce symptoms temporarily, *but there is no cure*



Risk factors:

- Infection with measles prior to age 2 years
 - » *Occurs 1: 10,000 total measles cases but 1:600 if infected in infancy*
- Unimmunized status
- 95% mortality rate overall, with the remaining 5% still experiencing extreme, unrelenting neurologic symptoms

<https://www.ncbi.nlm.nih.gov/books/NBK560673/>



NEWS RELEASE

313 N. Figueroa Street, Room 806 | Los Angeles, CA 90012 | [\(213\) 288-8144](tel:(213)288-8144) | media@ph.lacounty.gov



For Immediate Release:

September 11, 2025

Public Health Reminds Residents About the Importance of Measles Vaccination Following the Death of a Child from a Measles-Related Complication

The Los Angeles County Department of Public Health encourages residents to make sure that all members of their families are protected against measles following the recent tragic death of a school-aged LA County resident from a complication of measles infection acquired during infancy. The child was originally infected with measles as an infant before they were eligible to receive the measles vaccine which is routinely recommended to be administered between 12 and 15 months. Although they recovered from the measles illness, the child developed and ultimately died from subacute sclerosing panencephalitis (SSPE)—a rare but

<http://publichealth.lacounty.gov/phcommon/public/media/mediapubhpdetail.cfm?prid=5135>

Measles Quick Sheet

MARCH 2024

MEASLES QUICKSHEET

SYMPTOMS

PRODROME STAGE

- Stepwise increase in fever to 103°F–105°F
- Cough, coryza, and conjunctivitis (itchy eyes)
- Koplik spots (on mucous membranes)

RASH

- Maculopapular eruption that persists 5 to 6 days
- Begins at hairline, then involves face and upper neck
- Proceeds downward and outward to hands and feet
- Severe areas peel off in scales
- Fades in order of appearance

COMMON COMPLICATIONS

- Diarrhea
- Ear infections

SEVERE COMPLICATIONS

- Pneumonia
- Encephalitis (swelling of the brain)
- Death

LONGTERM COMPLICATIONS

- Subacute sclerosing panencephalitis (SSPE) is a very rare, but fatal



ETIOLOGIC AGENT

Measles/ Rubeola virus

TRANSMISSION

- *via large respiratory droplets and airborne transmission*

COMMUNICABILITY

- *4 days before through 4 days after rash onset*

INCUBATION PERIOD

- *11 to 12 days (range, 7 to 21 days)*

https://www.chfs.ky.gov/agencies/dph/dehp/idb/Documents/MeaslesQuicksheet_March_2024.pdf

Measles Quick Sheet link



Case scenarios: Who needs a dose of MMR?

-  50 year old healthy male who has one dose of MMR recorded and plans to go to Canada for a work conference.
-  36 year old healthy woman MD who is traveling to Tanzania to do medical volunteer work.
-  75 year old male being seen for an annual physical who cannot find his medical records.
-  7 month old healthy female who will be traveling to visit family in India for a month.
-  20 year old healthy male whose family did not vaccinate who has had an exposure to measles in his college dorm.
-  24 year old G1 P0 female at 36 weeks gestation whose family did not vaccinate but who is concerned about measles in her community.
-  6 year old fully vaccinated male going on vacation to Mexico with his family.

Case scenarios: Who needs a dose of MMR?

- 50 year old healthy male who has one dose of MMR recorded and plans to go to Canada for a work conference. **YES**
- 36 year old healthy woman MD who is traveling to Tanzania to do medical volunteer work. **NO. IF 2 DOSES, NO MORE. EVEN IF TITERS ARE "LOW"**
- 75 year old male being seen for an annual physical who cannot find his medical records. **NO. PRESUMED IMMUNITY DUE TO AGE**
- 7 month old healthy female who will be traveling to visit family in India for a month. **YES, THEN 2 MORE FOR TOTAL 3 DOSES**
- 20 year old healthy male whose family did not vaccinate who has had an exposure to measles in his college dorm. **YES X 2, BUT ALSO QUARANTINE**
- 24 year old G1 P0 female at 36 weeks gestation whose family did not vaccinate but who is concerned about measles in her community. **LATER. IMIG NOW?**
- 6 year old fully vaccinated male going on vacation to Mexico with his family. **NO**

Scenario: Rash after vaccination



A concerned mom calls you 7 days after her child received vaccines at the 12 month well child visit:

- Mild fever and fussiness that has resolved
- Red blotchy rash on face and torso



Scenario: Rash after vaccination

🛡️ A concerned mom calls you 7 days after her child received vaccines at the 12 month well child visit:

- Mild fever and fussiness that has resolved
- Red blotchy rash on face and torso

🛡️ Lab tests show:

- Positive Measles Ig M
- Negative Measles Ig G
- Positive measles NP PCR



Are you worried?

Rash after vaccination

- 🛡️ About 2% of patients may have a rash after MMR
- 🛡️ Measles is a live-attenuated virus with high immunogenic response
- 🛡️ Vaccine virus can cause a positive PCR test for measles
- 🛡️ More refined testing can differentiate between vaccine and wild type measles virus (send to CDC)
- 🛡️ *Consider* quarantine until 4 days post rash onset or confirmatory lab back*



Don't freak out!

<https://pmc.ncbi.nlm.nih.gov/articles/PMC3381670/>

Haemophilus influenzae, type b (Hib)

- 🛡️ Nationally notifiable disease since 1991
- 🛡️ Several H influenzae serotypes exist
- 🛡️ B was especially bad and previously common cause of bacterial infections in babies and adults
 - Ear infections
 - Pneumonia
 - Bacteremia
 - Epiglottitis
 - Septic arthritis
 - Endocarditis/pericarditis
 - *Meningitis*

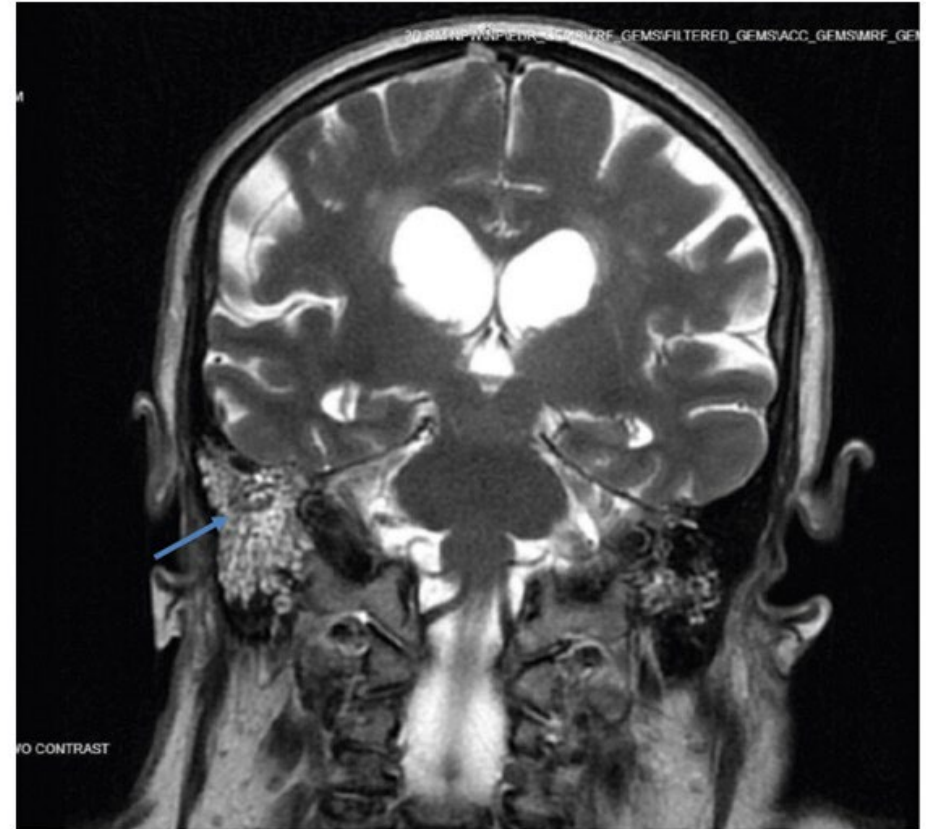
<https://pmc.ncbi.nlm.nih.gov/articles/PMC8482018/>

Hib vaccination schedule

- 🛡️ Hib exists as a standalone vaccine OR as part of combination vaccine product (e.g. DTaP, Polio, Hib all together in one shot)
- 🛡️ Schedule and number of doses can vary based on product used
- 🛡️ Vaccination starts at 2 months of age for all products
- 🛡️ Additional doses after age 5 may be recommended for people who:
 - Were not fully vaccinated as a child
 - Have undergone stem cell transplant
 - Have other immunocompromising conditions

The rare manifestation: *Hib* Meningitis

- 🛡️ May start as ear, sinus or mastoid infection
- 🛡️ Rapid progression in babies
- 🛡️ CSF studies typically show:
 - Very high WBC
 - Low glucose
 - High protein
 - High opening pressure
 - PCR or culture positive



<https://onlinelibrary.wiley.com/doi/10.1155/2024/5571104>

Answers to “If you could be a vaccine, which one would you choose?” at the AAP NCE 2025



Holly Maes (she/her) • 3rd+

Retired Pediatrician, CEO/PRESIDENT at Pediatric Providers of Danville

3d ...

I would be HIB vaccine. In my residency, there wasn't a night on call when there wasn't an invasive HIB infection on the admissions. Not much was scarier than epiglottitis, when you had to stay calm while your heart was racing at 200 BPM until anesthesia arrived! So many HIB infections...meningitis, pneumonia, sepsis and many, many more. Most vanished with the advent of HIB vaccine. I'd definitely be HIB, but I'm also showing my age????

Like · 2 | Reply



Leslie Parrish Fuchs • 3rd+

National Director of Membership at PracticeWell PBG

2d ...

So many great vaccines to choose from so many great answers!!

Like | Reply



Sanford Mayer • 3rd+

3rd Year Pediatric Clerkship Mentor, University of Rochester School of ...

1d ...

I'd be HiB vaccine. Having trained in the 1970's, I saw lots of deaths and meningitis!

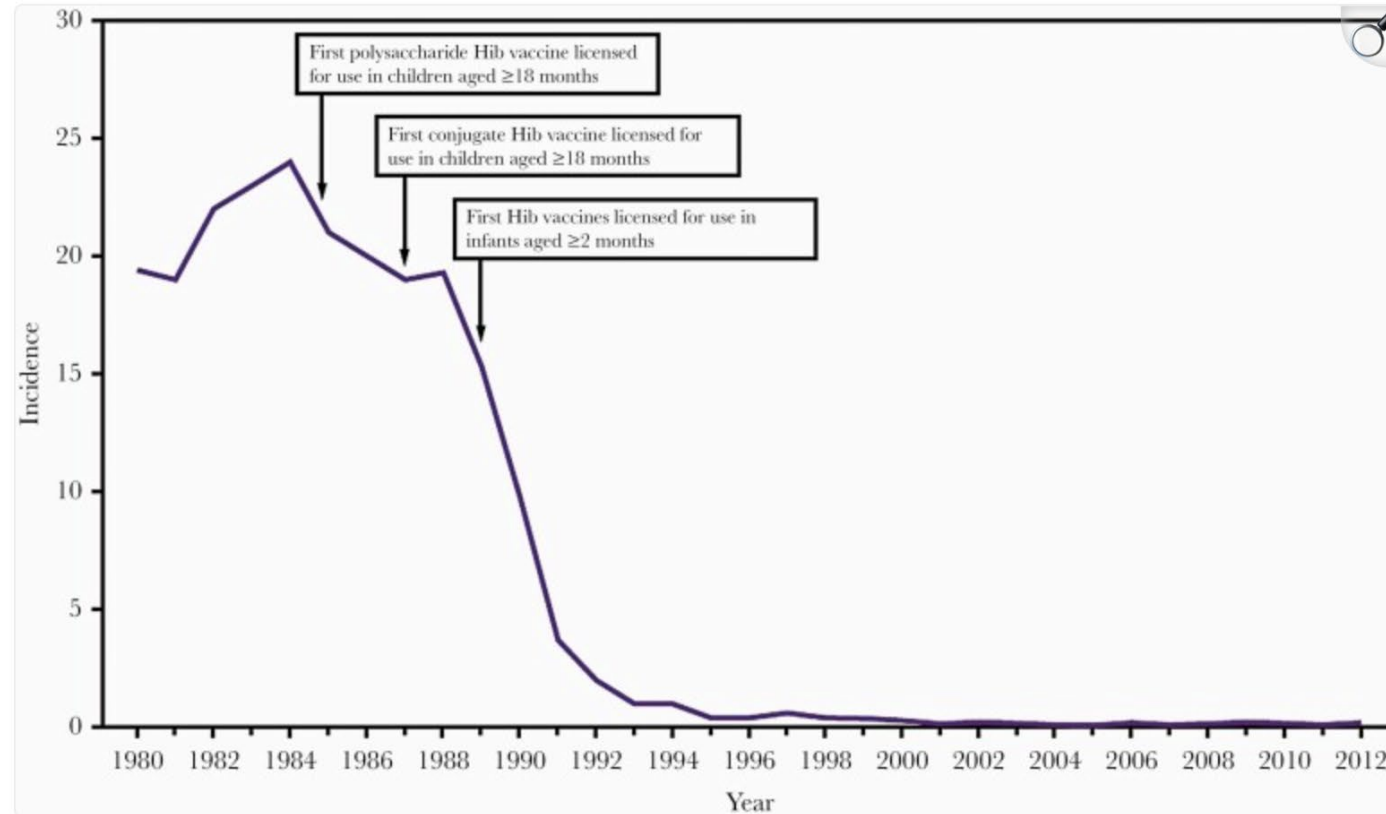
Like · 2 | Reply



https://www.linkedin.com/posts/american-academy-of-pediatrics_aap2025-ugcPost-7378223824808595457-xMzm?utm_source=share&utm_medium=member_desktop&rcm=ACoAAEP10tgB11XsL9KlfYUN7zojYo6pnhpBb8s

Hib incidence after advent of vaccination

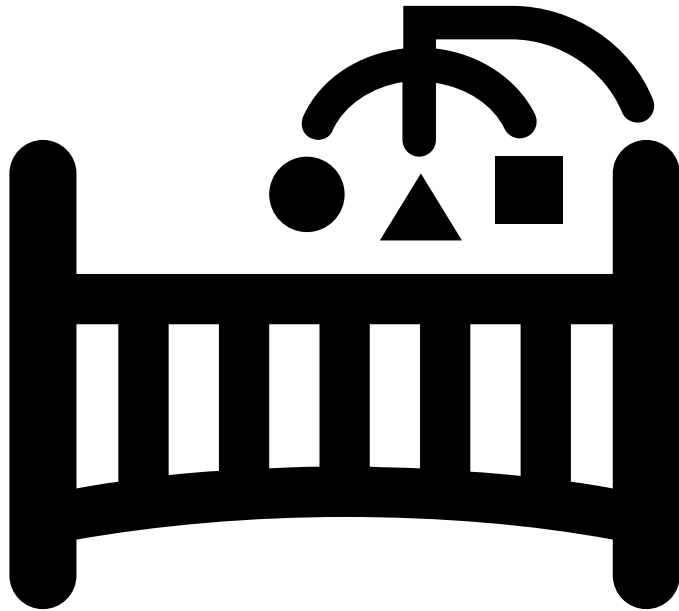
Figure 1.



Impact of *Haemophilus influenzae* type b (Hib) vaccines on incidence per 100 000 children <5 years old in the United States, 1980–2012 [29].

<https://pmc.ncbi.nlm.nih.gov/articles/PMC8482018/>

Hib meningitis and vaccination

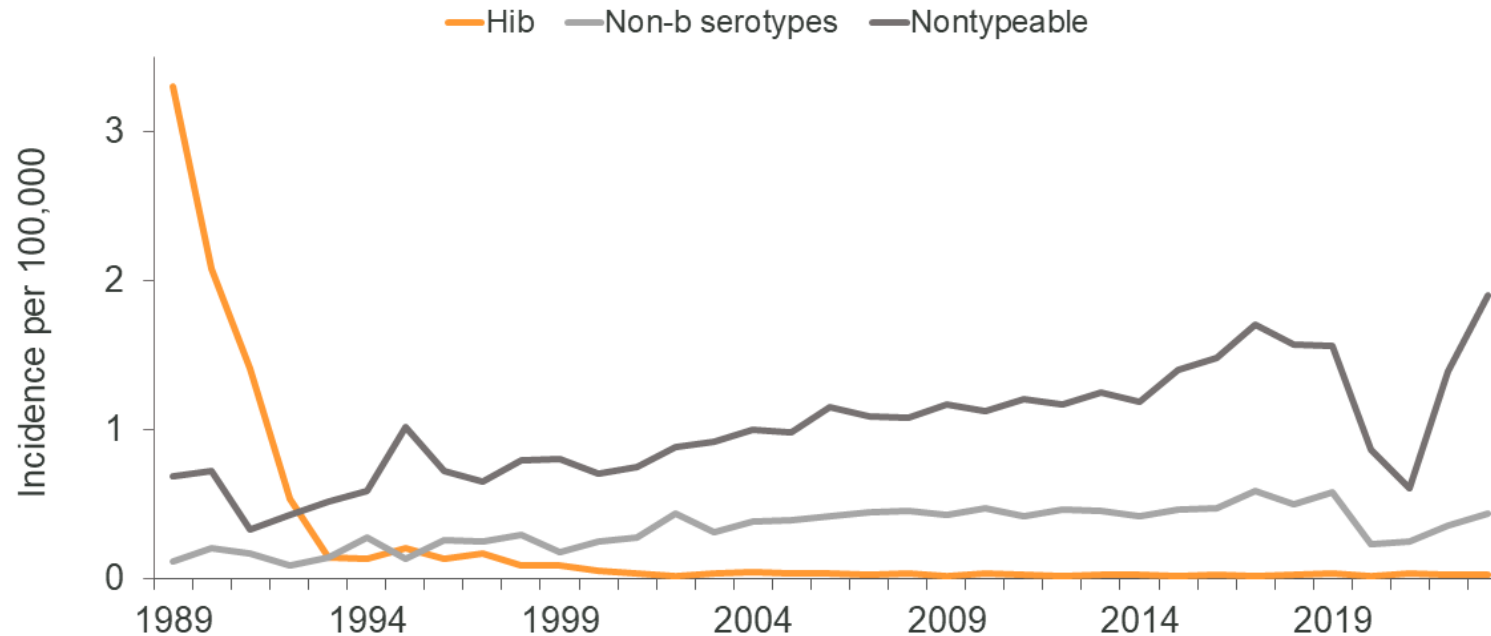


- 🛡️ *Prior to the vaccine, Hib was the #1 cause of pediatric meningitis*
 - 20,000 invasive cases per year in the US
 - 1,000 deaths per year in the US
 - 200,000 deaths worldwide
- 🛡️ 99% reduction of invasive Hib in the US after vaccination started
 - 4 pediatric H flu meningitis deaths in 2023 in the US
- 🛡️ 60% reduction seen worldwide with 193 countries vaccinating

<https://www.immunize.org/wp-content/uploads/catg.d/p4206.pdf>, https://www.cdc.gov/hi-disease/media/pdfs/2025/07/HiPSS2023_FINAL_508c.pdf

H. influenzae infections 2025

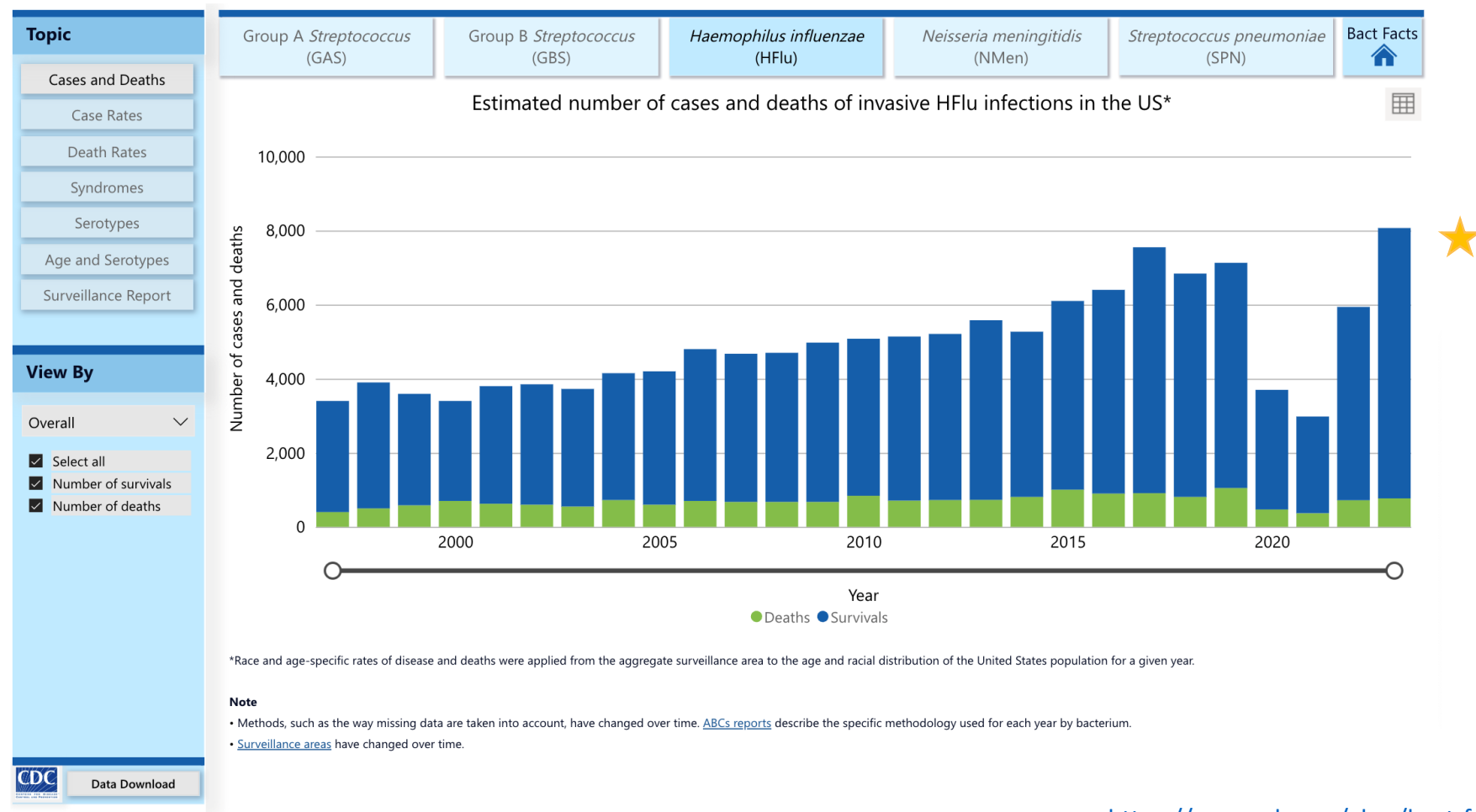
Incidence of invasive *H. influenzae* disease, United States



15

<https://www.cdc.gov/hi-disease/php/surveillance/index.html>

H. influenzae in 2025



<https://www.cdc.gov/abcs/bact-facts/data-dashboard.html>

Testing for *H. influenzae*

- 🛡️ Samples from invasive *H. influenzae* cases requested
 - Send to DLS to forward onto specialty lab
 - CDC can determine serotypes
 - Additional exposure and vaccination history should be gathered
- 🛡️ Knowledge that this was Hib may not be apparent early in the clinical course
- 🛡️ CDC also uses NNDSS and ABC (Active Bacterial Core) Lab surveillance
 - Weekly data pulls to monitor for trends
 - Ten ABC sites with additional testing measures

<https://www.cdc.gov/hi-disease/php/surveillance/index.html>

Having better conversations about vaccines: Setting Expectations



Having better conversations about vaccines: Setting Expectations



MMR
Varicella
HPV
Hep A
Hep B
...



Influenza
COVID
Pertussis

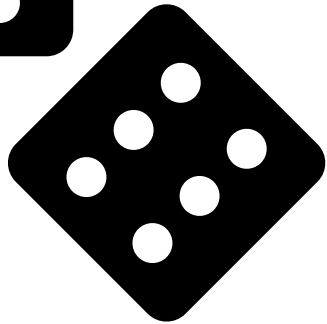
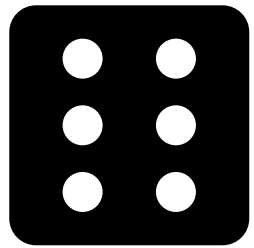


IMIG/IVIG

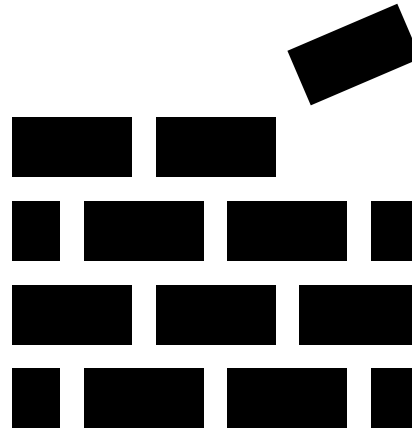
Monoclonal
antibodies

PEP use

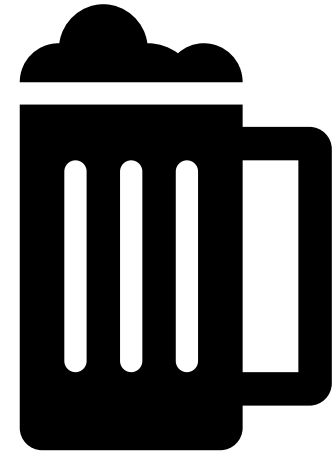
Why aren't there measles boosters?: Explaining mechanisms of action



Vs.



Vs.



WHO WE ARE

We **support** healthcare professionals with educational resources and **advocate** to remove barriers to vaccination for all.

Join 50,000 subscribers to our weekly IZ Express →

Visit our resources for the general public →

About CIDRAP

Real-world infectious disease experts

The Center for Infectious Disease Research and Policy (CIDRAP; "SID-wrap") is a global leader in addressing public health preparedness and emerging infectious disease response. Founded in 2001, CIDRAP is part of the [Research and Innovation Office](#) at the [University of Minnesota](#).

CIDRAP works to prevent illness and death from targeted infectious disease threats through research and the translation of scientific information into real-world, practical applications, policies, and solutions.



Advisory Committee on Immunization Practices (ACIP)

EXPLORE THIS TOPIC

SEARCH

GRADE Evidence Tables – Recommendations in MMWR

For Everyone
JANUARY 7, 2025

AT A GLANCE

The following is an index of GRADE (G evidence tables that accompany ACIP transparency, consistency, and commun

American Academy
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Patient Care

Immunizations

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View the recording of **Red Book Hot Topics Live Webinar: Preparing for Respiratory Virus Season** to hear from AAP leadership and infectious diseases experts on immunization guidance for COVID-19, RSV and influenza to protect pediatric patients this season.

[View \(Member login required\)](#)

Find [patient care resources](#) and [communications resources](#) to help your practice respond to the measles outbreak.

Toolkits for Vaccine conversations

AAP Vaccine Communications Toolkits:

<https://www.aap.org/en/patient-care/immunizations/communicating-with-families-and-promoting-vaccine-confidence/?srsId=AfmBOor3eSalsd6uFLSosi3VksaMBXEQVtn4lf3QCgWnZNBwCYasIHxt>

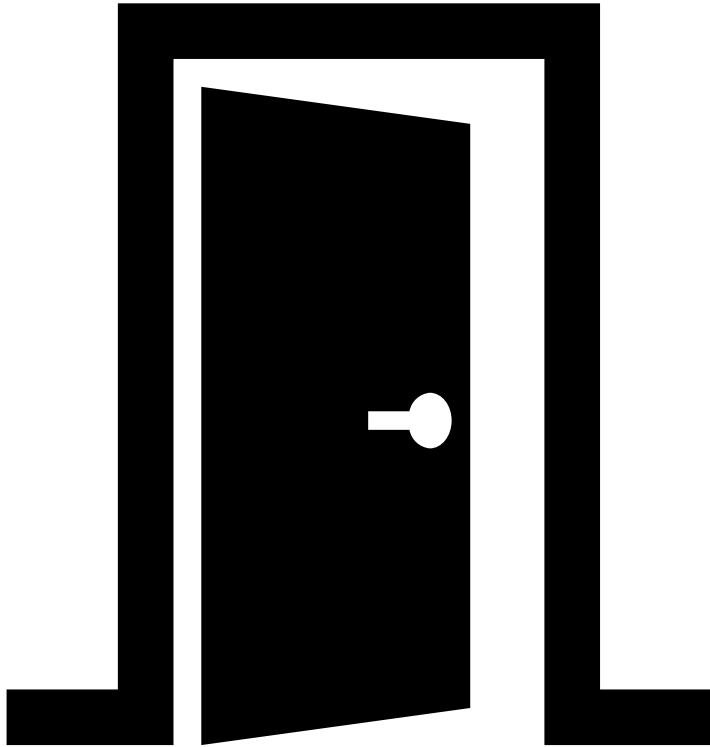
Association of Vaccine Managers Toolkits:

<https://www.immunizationmanagers.org/resources-toolkits/vaccine-confidence-toolkit/>

Motivational interviewing:

<https://pmc.ncbi.nlm.nih.gov/articles/PMC11352791/>

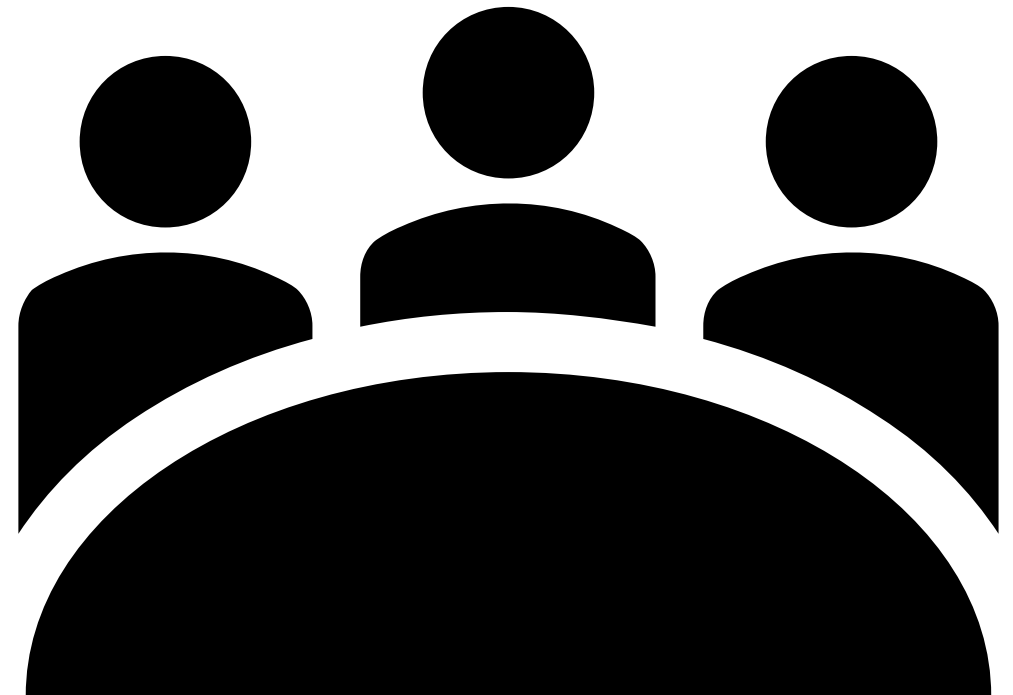
Motivational Interviewing: Why not zero?



- 🛡️ If starting a conversation on how likely they are to vaccinate, ask “How likely on a scale of 1-10 are you to vaccinate today?”
- 🛡️ If the number is 1 or higher, the follow up question is “Why isn’t it lower?”
- 🛡️ The goal is to reveal their thinking and keep the door open

Who is in the room?

- 🛡️ Motivational interviewing success depends on the person in the room being empowered to make the final decision
- 🛡️ Vaccination stance as a feature of the *community vs the individual*



Balancing Risks



Thank you.

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