

Vaccine Preventable Diseases and Vulnerable Rural Populations

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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.



Faculty Disclosure

- 🏥 Dr. Hodge is a dual employee of the University of Kentucky Department of Pediatrics and the Kentucky Department of Public Health.
- 🏥 Mr. Hundley has nothing to disclose.



Educational Need/Practice Gap

Need: Cases of **vaccine preventable diseases (VPDs)** are rising in the United States (U.S.). Providing clinical care in Kentucky requires inclusion of VPDs in the differential diagnoses of sick patients based on the symptoms, risk factors, and current local trends. Providers **need to know the resources available** to help them manage these conditions in their communities and stay aware of current outbreaks.

Gap: Healthcare providers may or may not be familiar with the **presentation, testing, and reporting protocols** for these diseases or where to find current information.



Objectives

Upon completion of this educational activity, you will be able to:

-  Review Kentucky data on re-emerging vaccine preventable diseases including measles, pertussis, and *Haemophilus influenzae* with special focus on rural populations.
-  Discuss tools available to diagnose potential cases.
-  Explain the partnering role of public health in managing cases and outbreaks.
-  Review resources for high quality information on VPDs and vaccines.



Expected Outcome

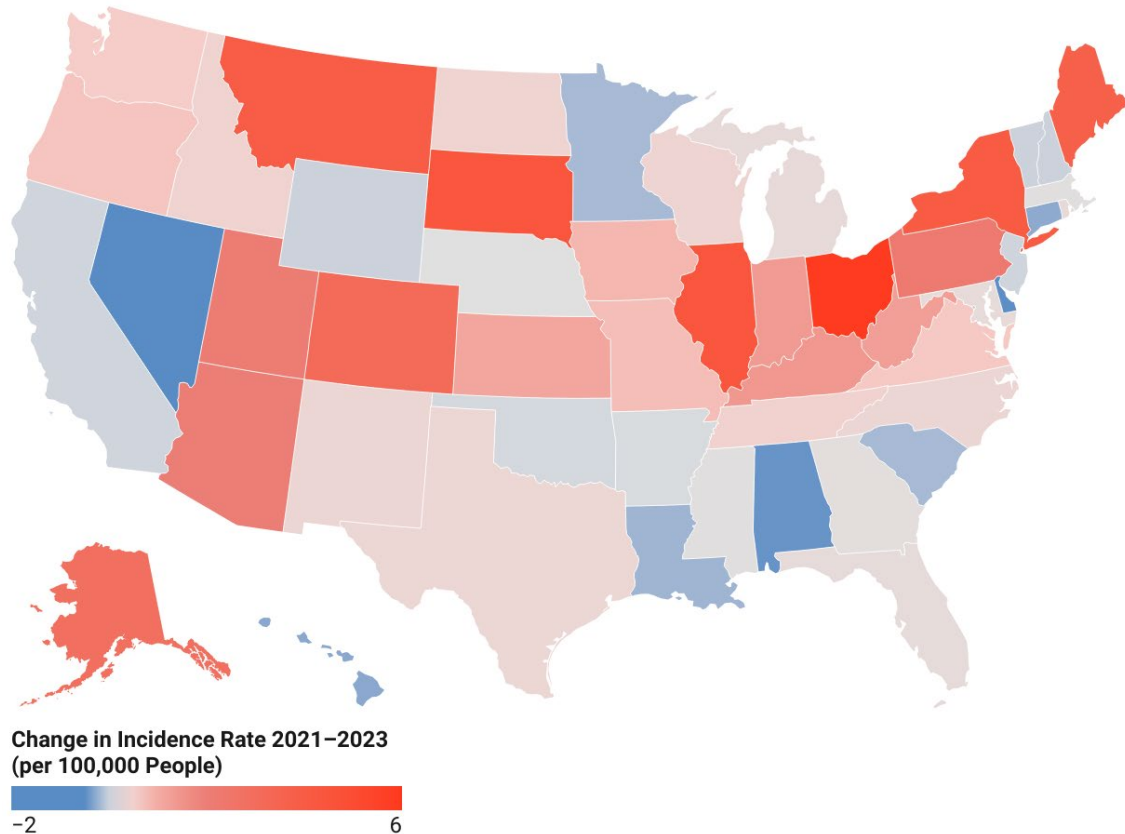
-  Providers will gain familiarity with 3 important VPDs and understand the role of public health in assisting with reporting and management of patients with VPDs.



Pertussis



Pertussis, Also Called Whooping Cough



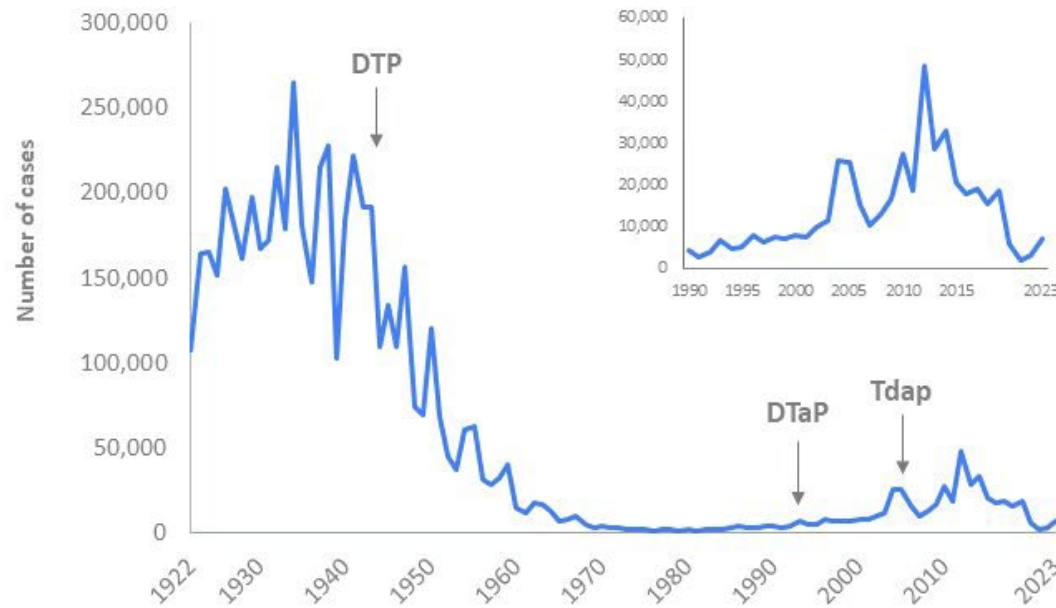
A map shows the changing incidence rates of whooping cough (pertussis) for each U.S. state; click on individual

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

- 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.

Reported Pertussis Cases

Reported NNDSS pertussis cases: 1922-2023



SOURCE: CDC, National Notifiable Diseases Surveillance System

Reported Pertussis Cases

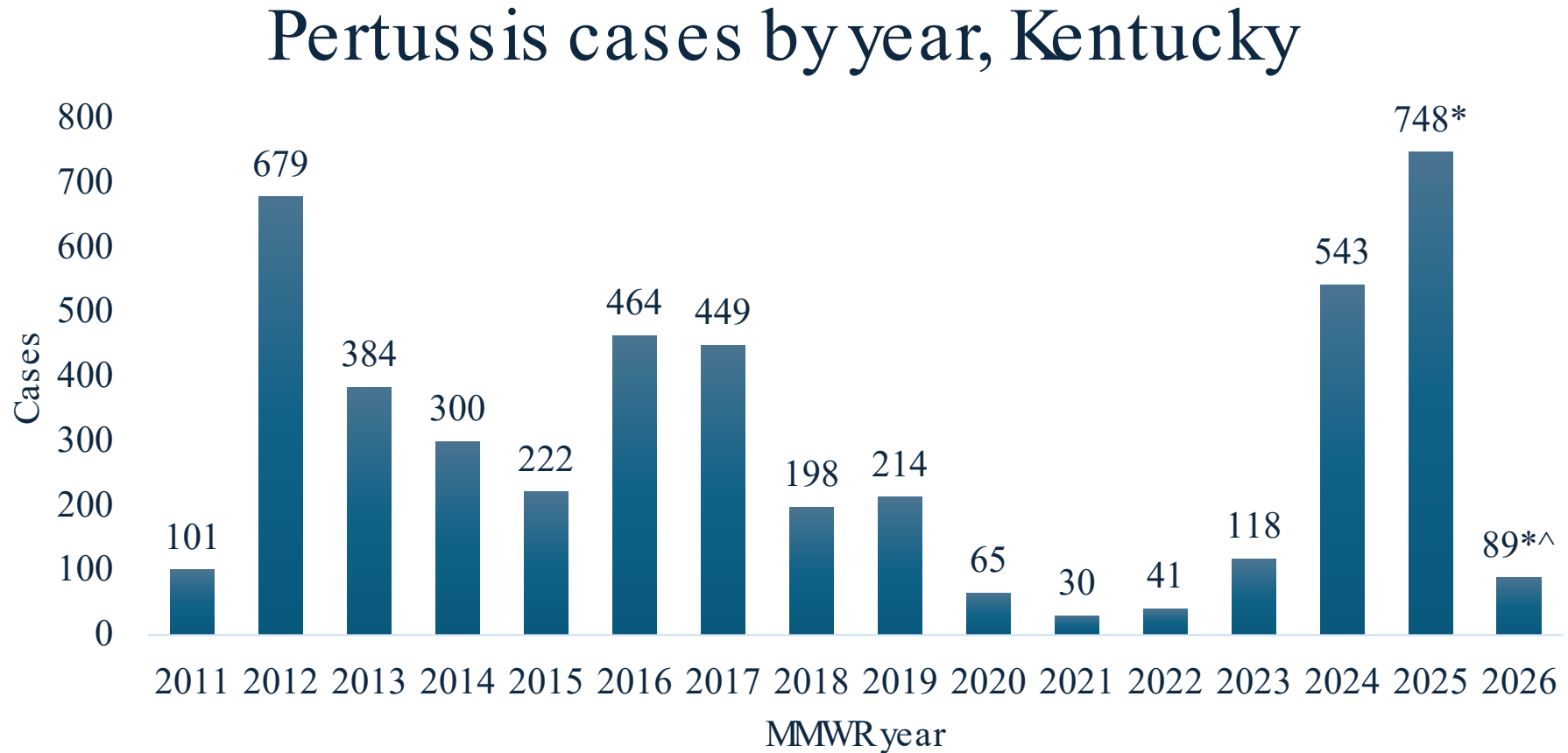
2024: 35,435*
2025: 28,783

*Provisional 2024 Week 52 reported pertussis cases; final 2024 data were not available at the time of publication.

Source: 2025 Provisional Pertussis Surveillance Report, CDC



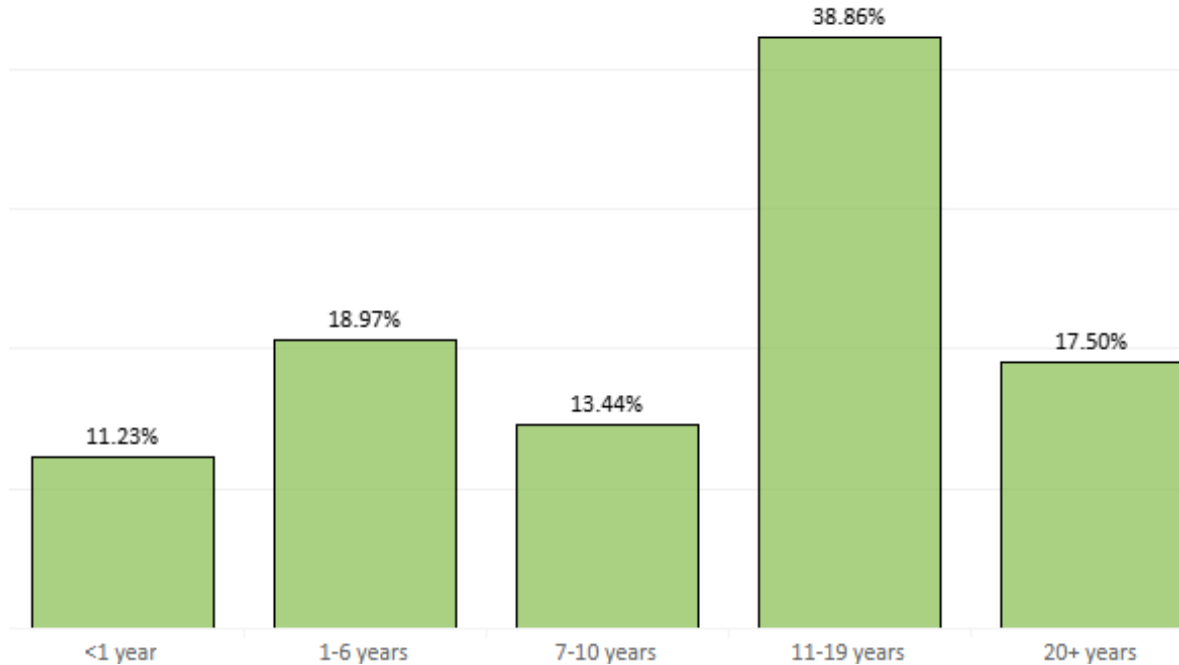
Pertussis in Kentucky



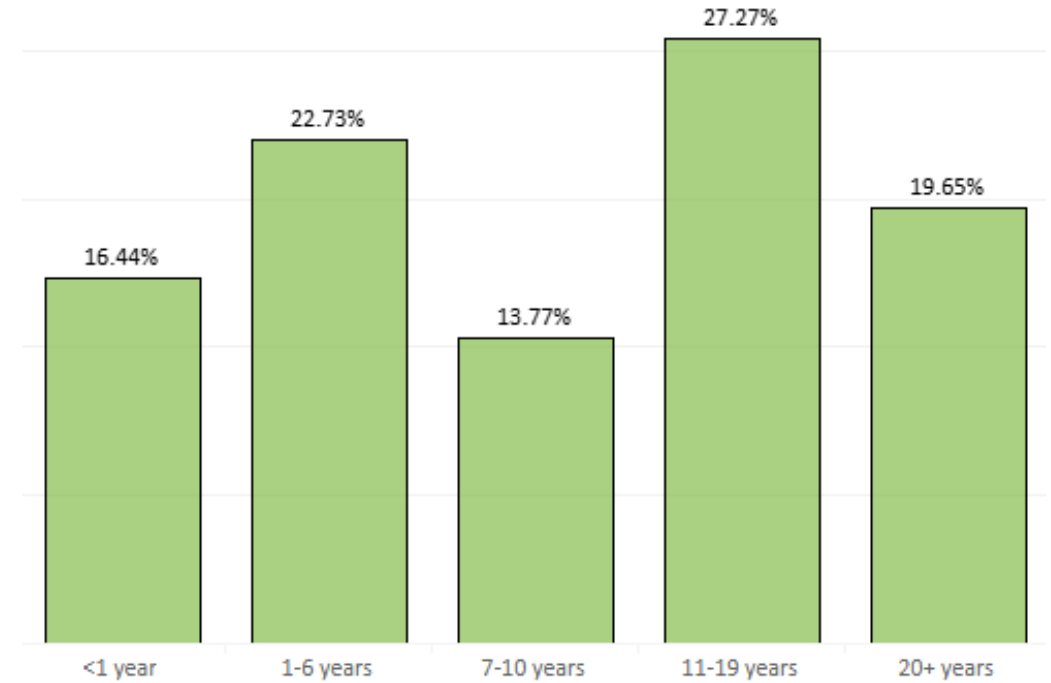
* 2025-2026 data are preliminary, ^2026 data current as of 4/9/25

Kentucky Pertussis Cases by Age, 2024-2025

2024 (n=543 cases)



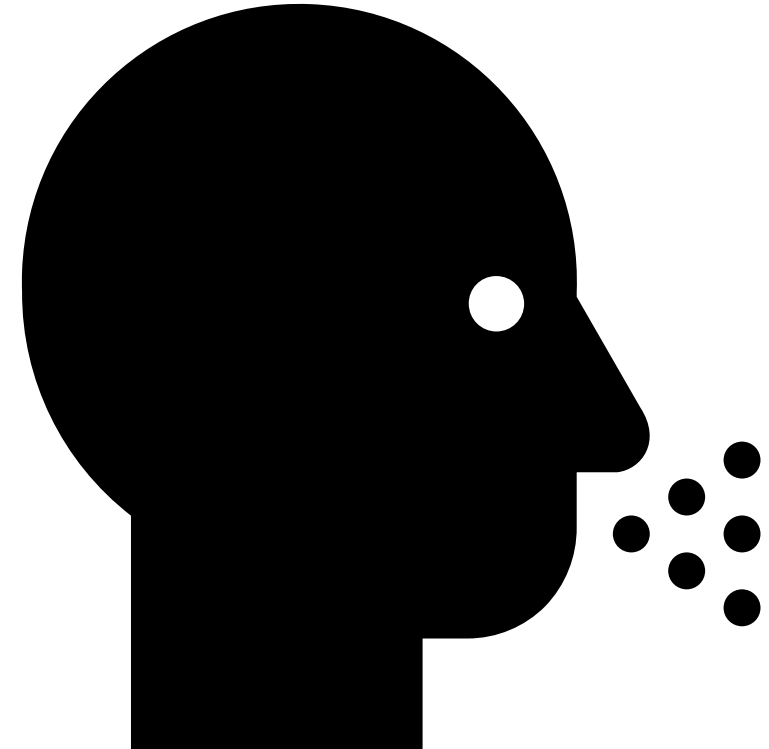
2025 (n=748 cases)



Source: KDPH provided data

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



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 disillusionment, 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, Cont.



“Threatening pertussis is an unprecedented perilous illness depicted by outrageous respiratory disillumination, 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/PMC810547/>

Pertussis Deaths



3 pertussis deaths identified among Kentucky infants in less than 12 months in 2024-2025

- First in Kentucky since 2018, first pediatric since 2016
- None of the infants or their mothers had received recommended vaccines



Reported infant (age <1) pertussis deaths **nationally** in previous years:

- 2025: 10*
 - 2024: 6*
 - 2023: 5
-
- 2019: 4
 - 2018: 3
 - 2017: 9
 - 2016: 6
 - 2015: 3

*Provisional data



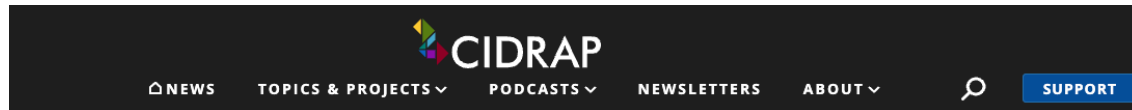
Early Detection is Critical

- 🛡️ Consider pertussis **early** alongside other common respiratory infections
 - It's treatable with antibiotics! Though toxin-mediated effects will still occur.
 - Many cases only diagnosed after 3+ healthcare visits
 - Make sure providers know whether pertussis is on their facility's respiratory PCR panel and order it concurrently if not
 - Treating the patient may decrease spread of the disease. Treating contacts may limit outbreaks.
- 🛡️ Reminder—very young infants may not present with classic symptoms
 - Some may only have apnea and mild (if any) cough

Testing for Pertussis

- 🛡️ NP swab for pertussis PCR
- 🛡️ NP or wash for culture is also an option but not preferred
 - Serology **not** typically recommended
- 🛡️ 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
 - Dosing guidelines here: <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5414a1.htm>

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-v>



ACOG Recommendations

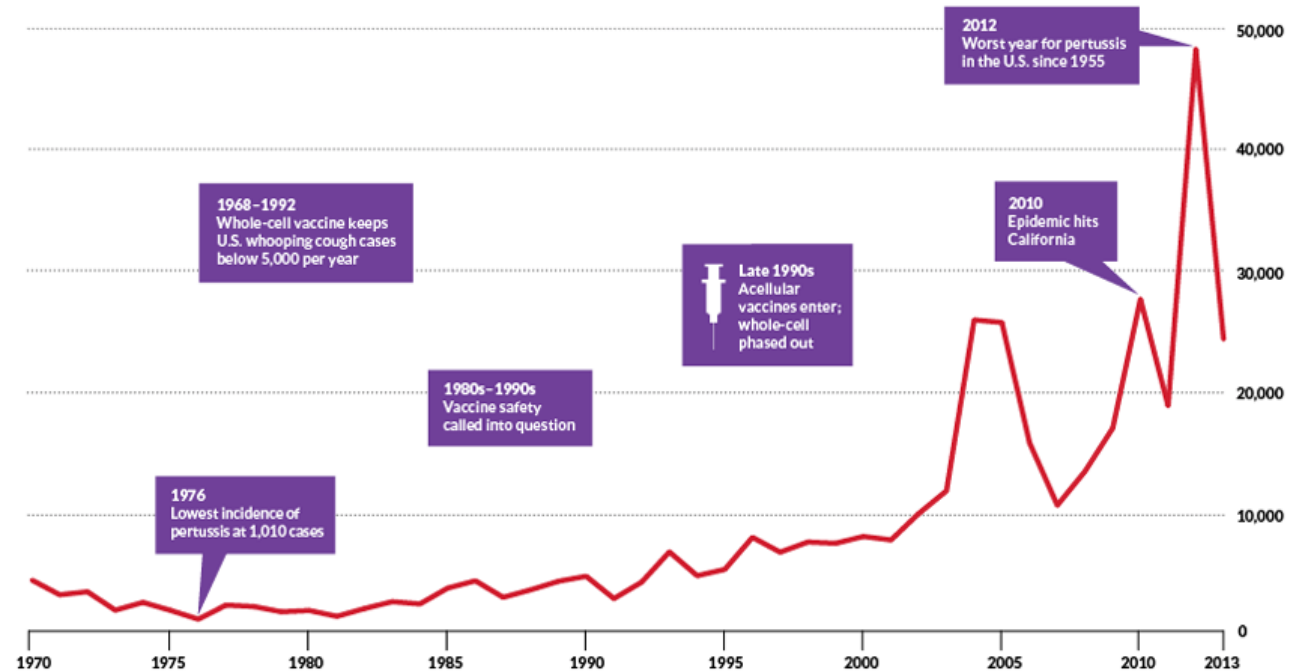
- 🛡️ All pregnant women should get Tdap between 27 and 36 weeks of pregnancy.
- 🛡️ This is repeated with every pregnancy.



<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?*

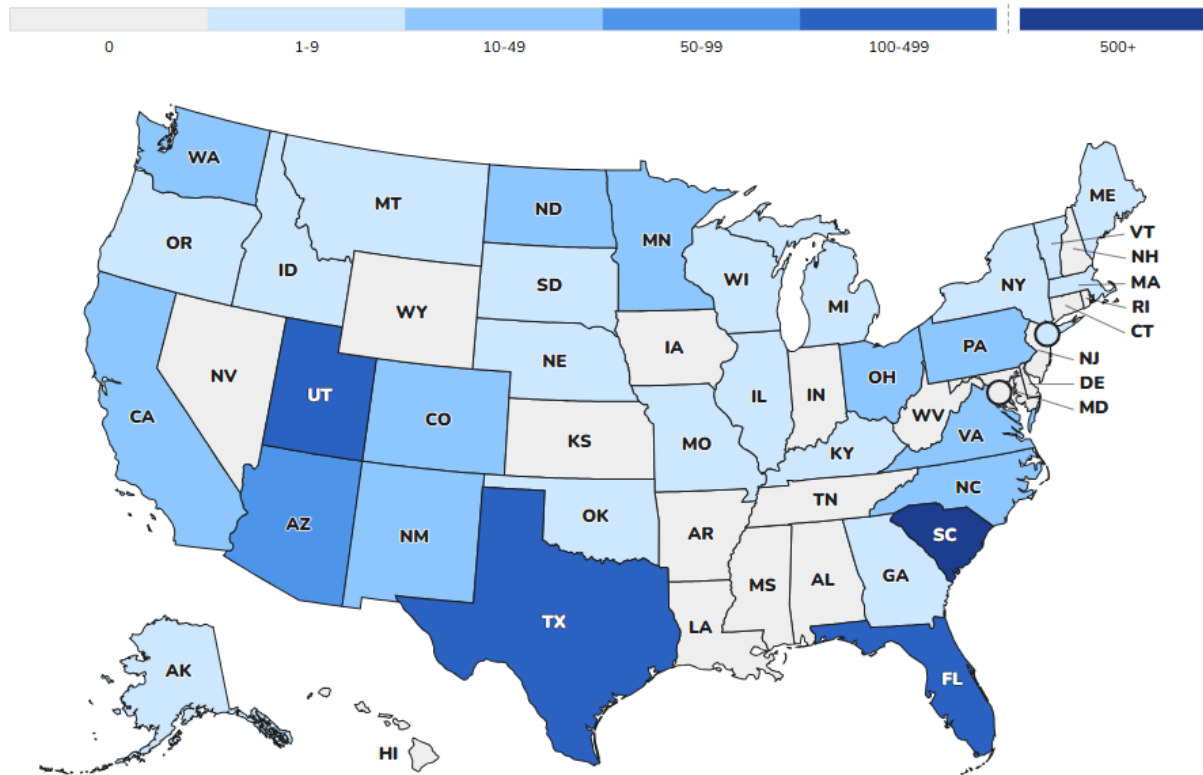


Measles



Measles Data

FIGURE 1. Reported number of confirmed* measles cases, by state (N = 1,671) — United States, January 1–April 2, 2026



<https://www.cdc.gov/measles/data-research/index.html>



Caused by the measles virus

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

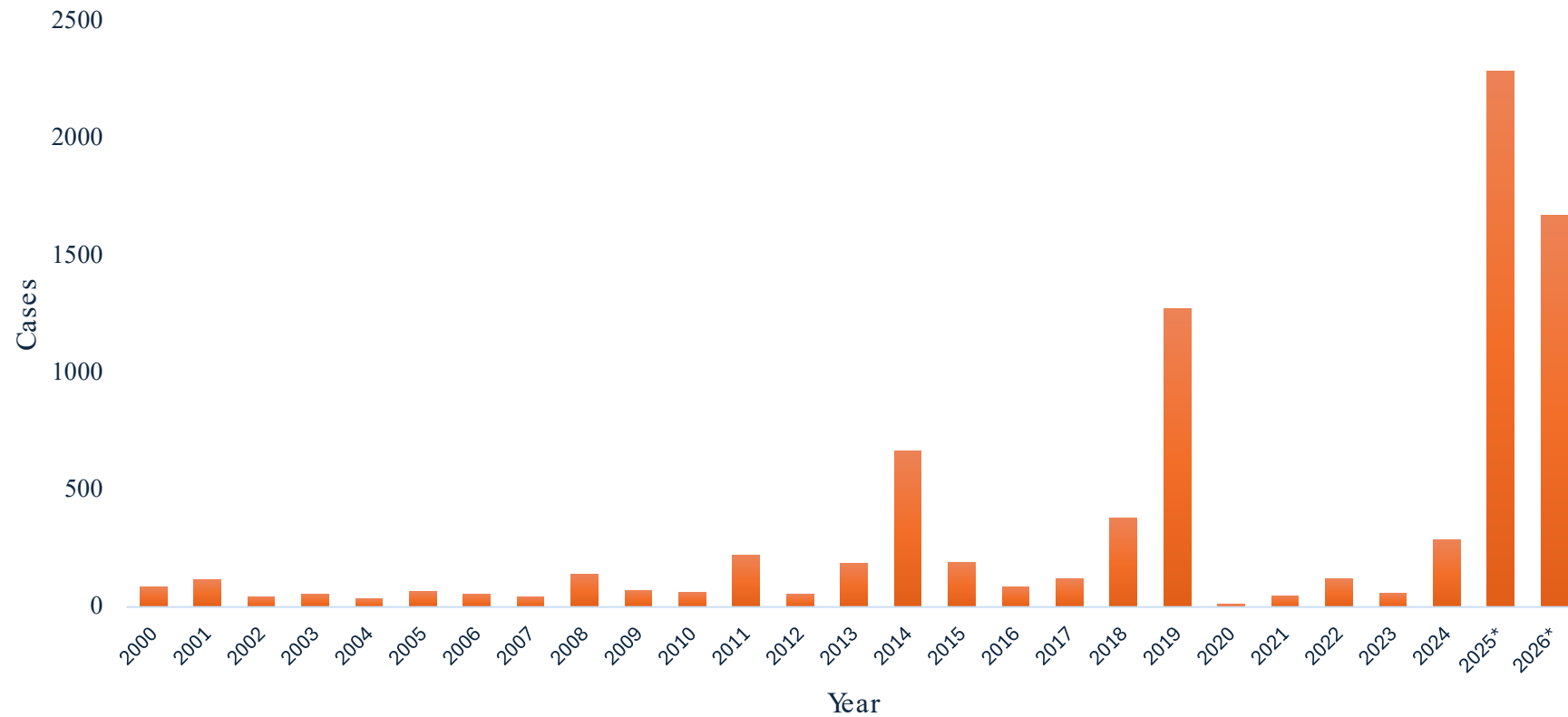


MMR(V) vaccine at age 12 months and 4-5 years

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

National Measles Numbers

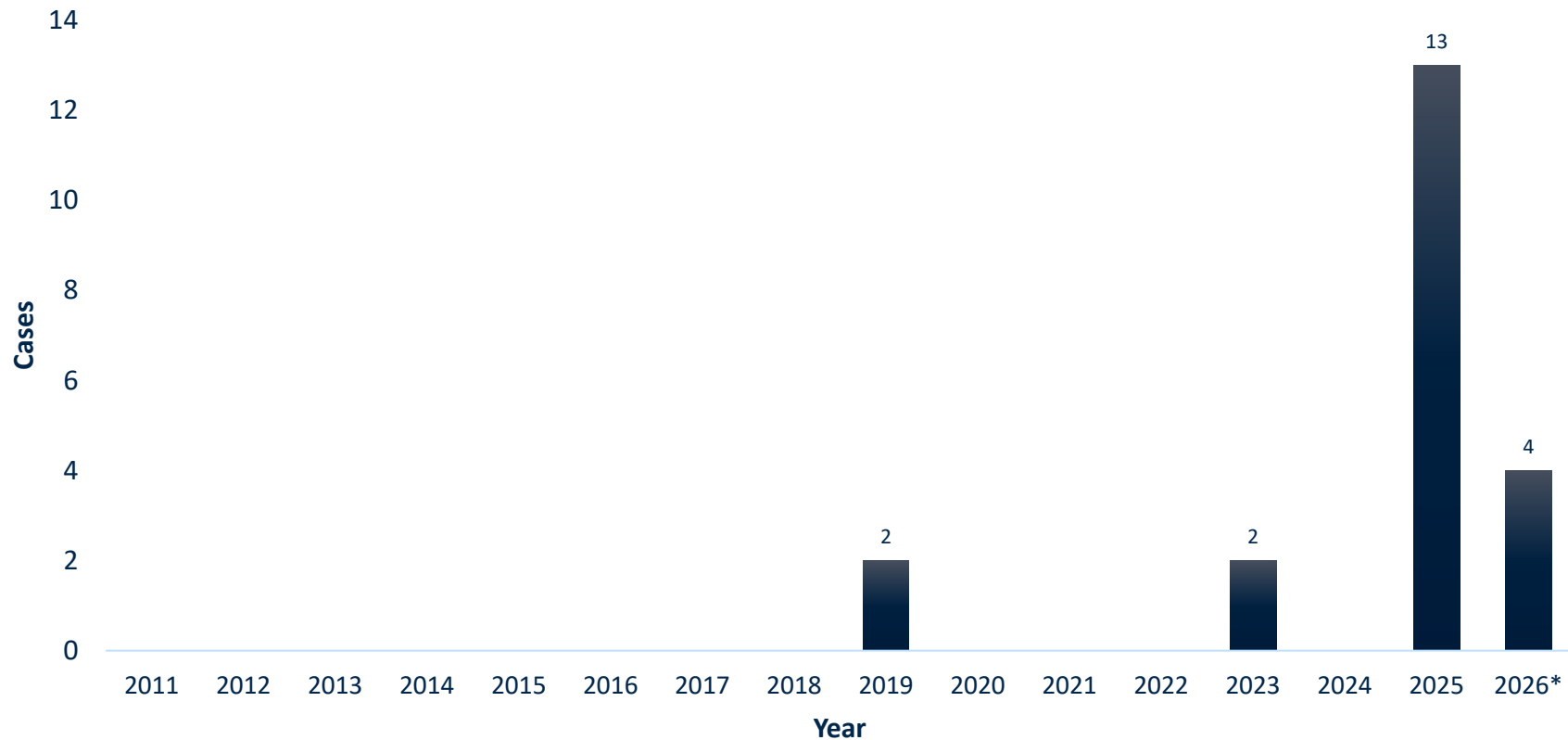
Measles cases by year since elimination, United States



* 2025–2026 case counts are preliminary and subject to change. 2026 data as of 4/2/26. Source: CDC

Kentucky Measles Numbers

Measles cases by year, Kentucky



*2026 data preliminary and subject to change. Data as of 4/9/2025.



Kentucky Measles Case Demographics, 2025-2026

County	Cases
Fayette	6
Franklin	1
Jefferson	2
Jessamine	4
Todd	1
Woodford	3

Age group	Cases
<5 years	3
5-17 years	11
18+ years	3

Vaccination status	Cases
Unknown/ unvaccinated	16
1 MMR dose	1
2+ MMR doses	0

Kentucky Measles Dashboard

Kentucky Measles Case Data

Refreshed Date: 10/13/2025

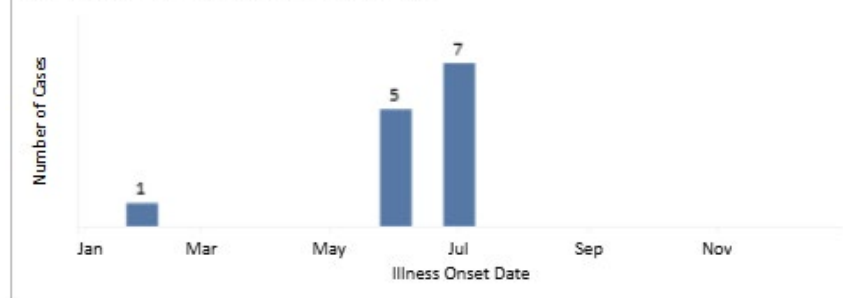


2025 Confirmed Cases	Number of Hospitalizations	Number of Deaths
13	2	0

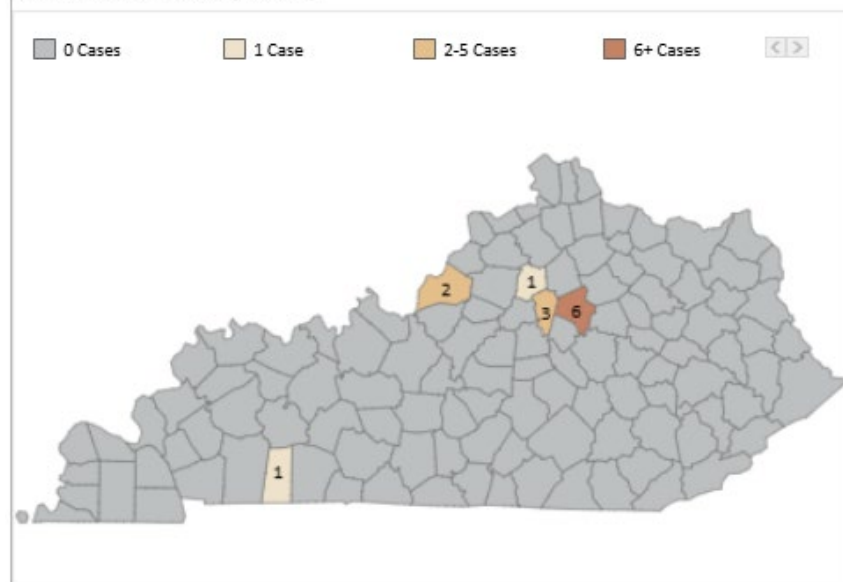
2025 Measles Cases by County		2025 Measles Cases by Age Group		2025 Measles Cases by Vaccination Status	
Fayette County	6	<5 years	0	Unknown/unvaccinated	12
Franklin County	1	5-17 years	10	1 MMR Dose	1
Jefferson County	2	18+ years	3	2+ MMR Dose	0
Todd County	1				
Woodford County	3				

<https://dashboard.chfs.ky.gov/views/MeaslesDashboard/MeaslesDashboard?%3Aembed=y&%3AisGuestRedirectFromVizportal=y>

2025 Measles Cases by Illness Onset Date

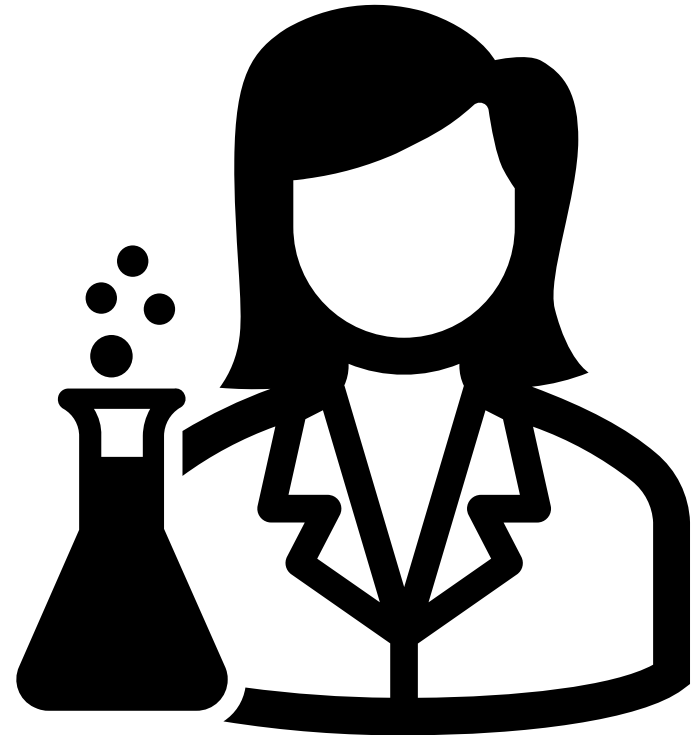


2025 Measles Cases by County



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 the Division of Laboratory Services (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

<https://www.chfs.ky.gov/agencies/dph/dls/Pages/default.aspx>



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)

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 memory B and T 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

<https://asm.org/articles/2019/may/measles-and-immune-amnesia>

Rare (and time delayed) Manifestation of Measles

Subacute sclerosing panencephalitis (SSPE):

- 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 an 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/NBK56067/>



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>



***Haemophilus influenzae*, type b (Hib)**



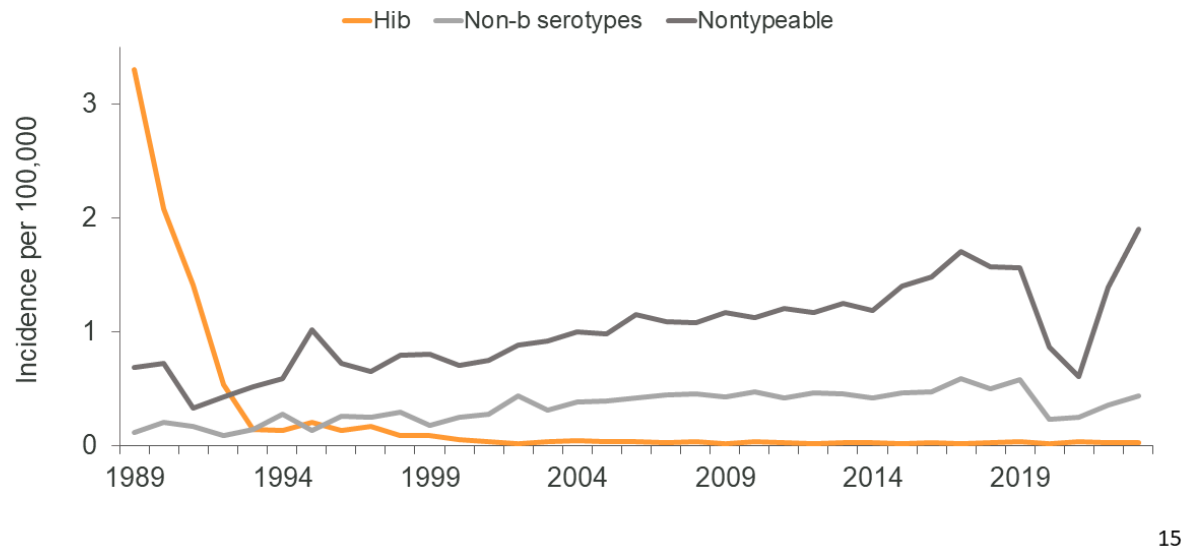
Haemophilus influenzae, type b (Hib), Cont.

- 🛡️ 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/PMC848207/>

H. influenzae Epidemiology

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

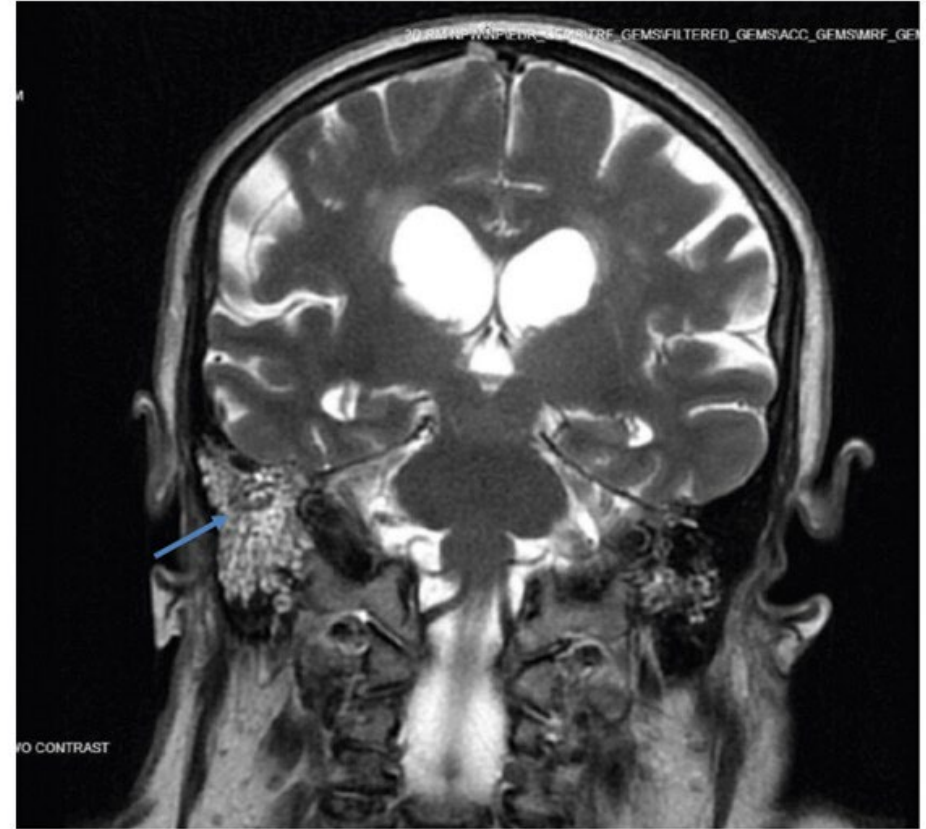


- 🛡️ "Invasive" = bacteria present in what is supposed to be a sterile space like blood or CSF
- 🛡️ Seeing the emergence of non-*Hib* strains as causes of disease
- 🛡️ Only 15 total lab-confirmed Hib cases (7 pediatric) in **Kentucky** since 2011

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

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/10.1155/2024/5571144>

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 ...

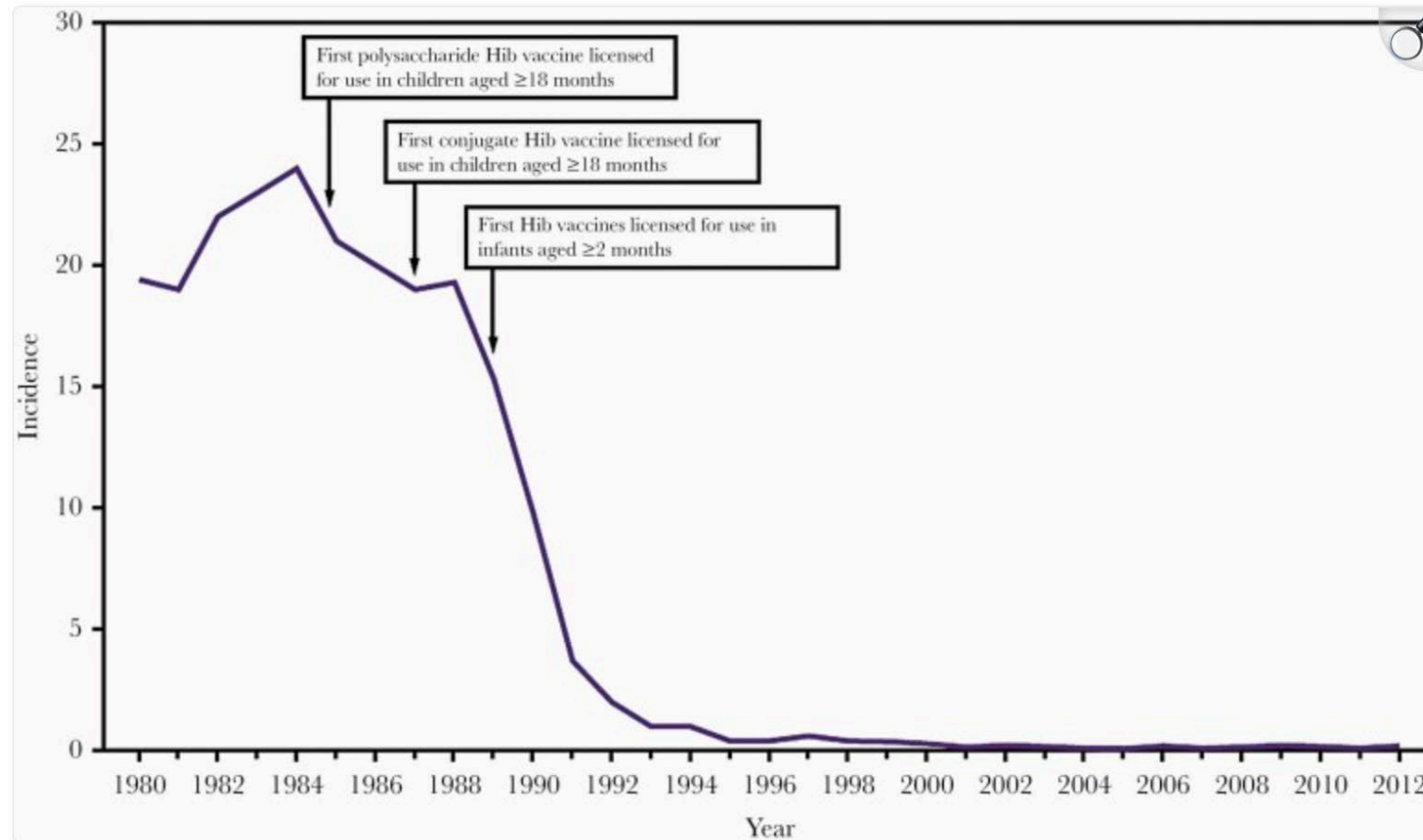
I'd be HiB vaccine. Having trained in the 1970's, I saw lots of deaths and meningitis!

Like · 2 | Reply

https://www.linkedin.com/posts/american-academy-of-pediatrics_aap2025-ugcPost-7378223824808595457-xMzm?utm_source=share&utm_medium=member_desktop&rcm=ACoAAEP10tgB11XsL9KlfYUN7zojYo6pnhpB/s



Hib Vaccination



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/PMC8481481/>

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

Hib Meningitis and Vaccination

- 🛡️ *Prior to the vaccine, Hib was the #1 cause of pediatric meningitis*
 - 20,000 invasive cases per year in the U.S.
 - 1,000 deaths per year in the U.S.
 - 200,000 deaths worldwide
- 🛡️ 99% reduction of invasive Hib in the U.S. after vaccination started
 - 4 pediatric H flu meningitis deaths in 2023 in the U.S.
- 🛡️ 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

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

Monitoring for Long Term Effects of *Hib* Meningitis

- 🛡️ Tailored antibiotic treatment required
 - Duration is driven by evidence of clearance of the pathogen
 - Weeks to months of IV medication needed
- 🛡️ Acquired brain injuries occur with this illness
 - 30% have long term complications and disability
 - 10-15% experience severe neurological effects
 - » Epilepsy
 - » Hearing loss
 - » Developmental delays
 - » Hydrocephalus, which may require CSF shunt

<https://www.meningitis.org/about-meningitis/bacterial-meningitis/haemophilus-influenzae-meningitis/>

VPDs in Close-knit Under-vaccinated Communities

VPDs in Close-knit Under-vaccinated Communities, Cont.

- 🛡️ “Plain” people
 - Amish, Mennonite, Anabaptist communities
 - Often in rural areas
- 🛡️ Ukrainian or other Eastern European refugees/immigrants
- 🛡️ Somali refugees/immigrants
- 🛡️ Ultra-orthodox Jewish communities

VPDs in Close-knit Under-vaccinated Communities, Cont.2

- 🛡️ Cases occur outside these communities as well, but they have a *disproportionate burden* of disease instances and associated outcomes.
- 🛡️ In these communities in 2025 KDPH identified:
 - 2 pertussis deaths in infants
 - » Other pertussis cases & outbreaks, some hospitalized
 - *Haemophilus influenzae* serotype b (Hib)-associated infant death
 - » First confirmed pediatric Hib death in at least 15 years
 - » Second severe hospitalized case also identified
 - Several measles cases

Summary: How Does Public Health Help with VPDs?

- 🛡️ Local health departments and KDPH have resources that can help with VPDs and outbreaks
 - Consult available when questioning a possible diagnosis
 - Advising on facility infection prevention protocols
 - Testing resources and access to state lab in some instances
 - Contact tracing and community outreach
 - Vaccine supplies or PEP coordination in some instances
 - Complete required reporting to state and federal entities
 - Connection to CDC and other agencies if large scale response or specialized testing is needed

Vaccine Promotion and Education



Having Better Conversations about Vaccines: Setting Expectations



Having Better Conversations about Vaccines: Setting Expectations, Cont.



MMR
Varicella
HPV
Hep A
Hep B
...



Influenza
COVID-19
Pertussis

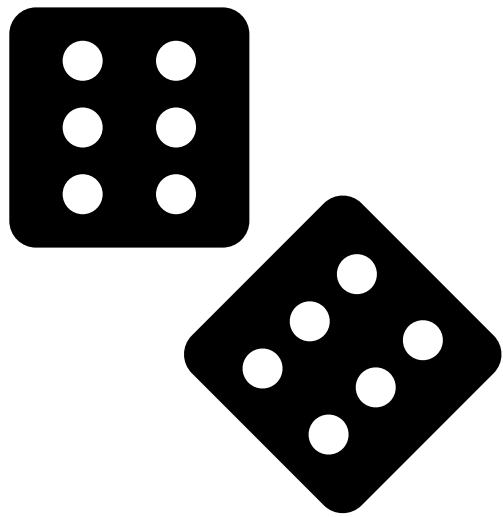


IMIG/IVIG

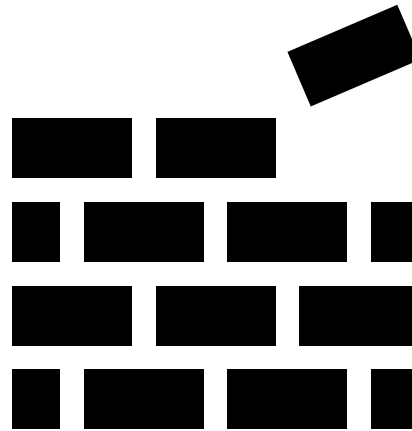
Monoclonal
antibodies

PEP use

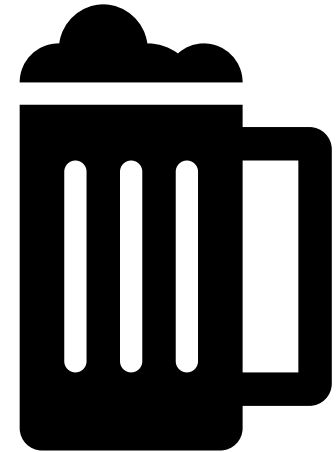
Why Aren't There Measles Boosters?: Explaining Mechanisms of Action



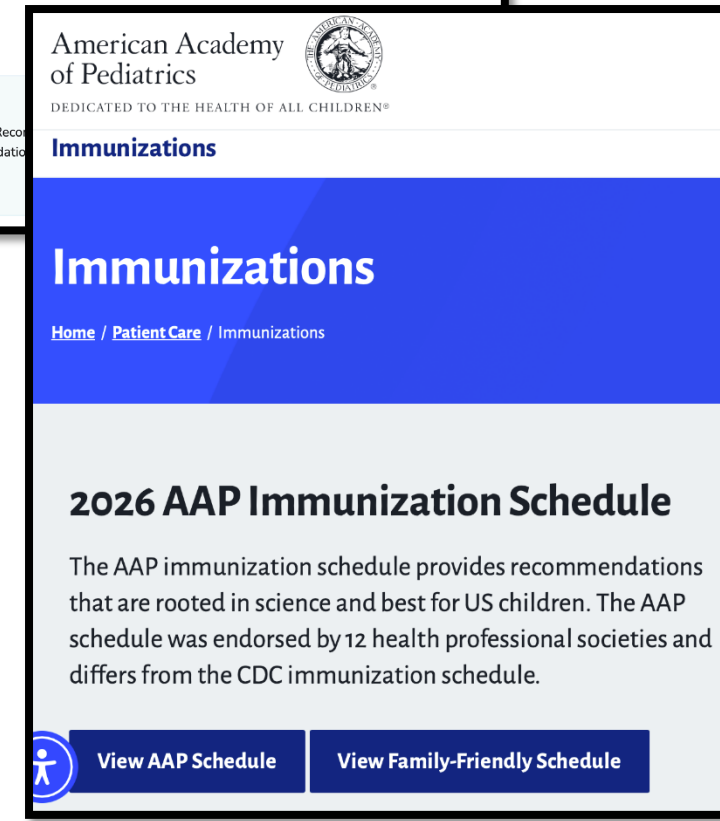
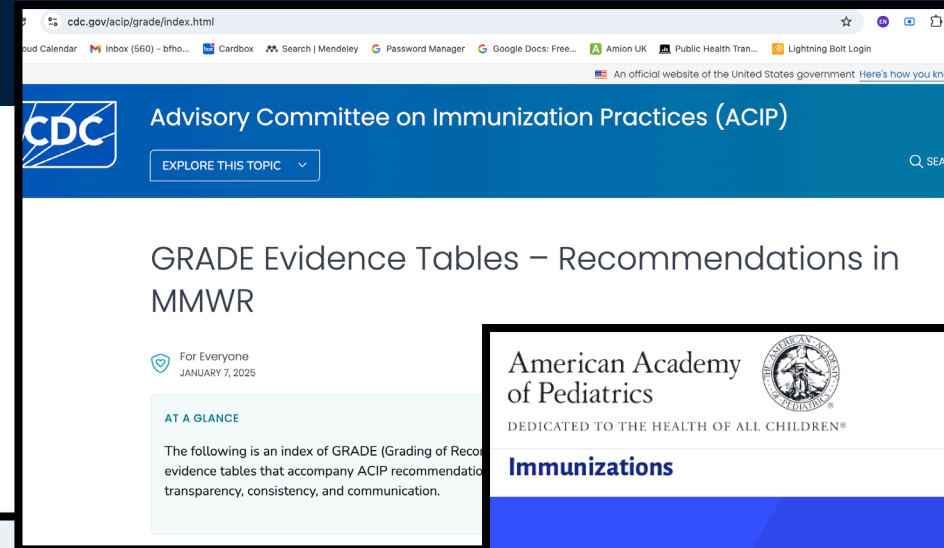
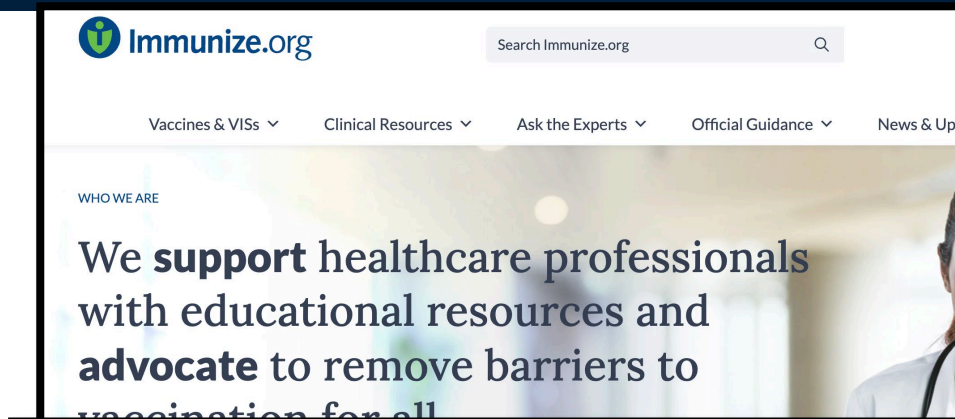
VS



VS



Sources



<https://www.immunize.org>, <https://www.cidrap.umn.edu/about-cidrap>, <https://www.cdc.gov/acip/grade/index.html>, <https://www.aap.org/en/patient-care/immunizations/?srsltid=AfmBOorzrBddD4n1Bi6YWz7a2CWmB0vxfF0Jg-NkXW78ut1OC1SRKw>



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>

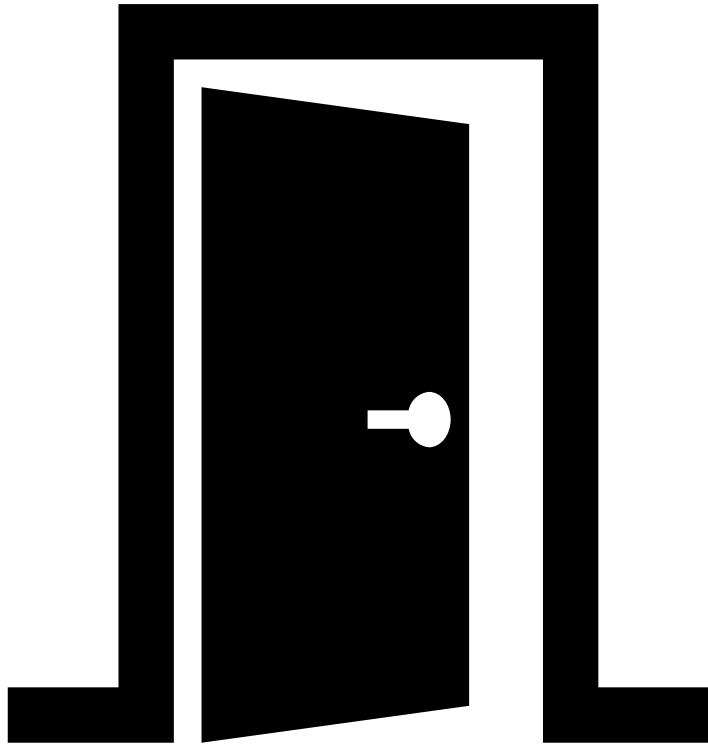
Association of Vaccine Managers Toolkits:

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

Motivational Interviewing:

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

Motivational Interviewing: Why Not Zero?

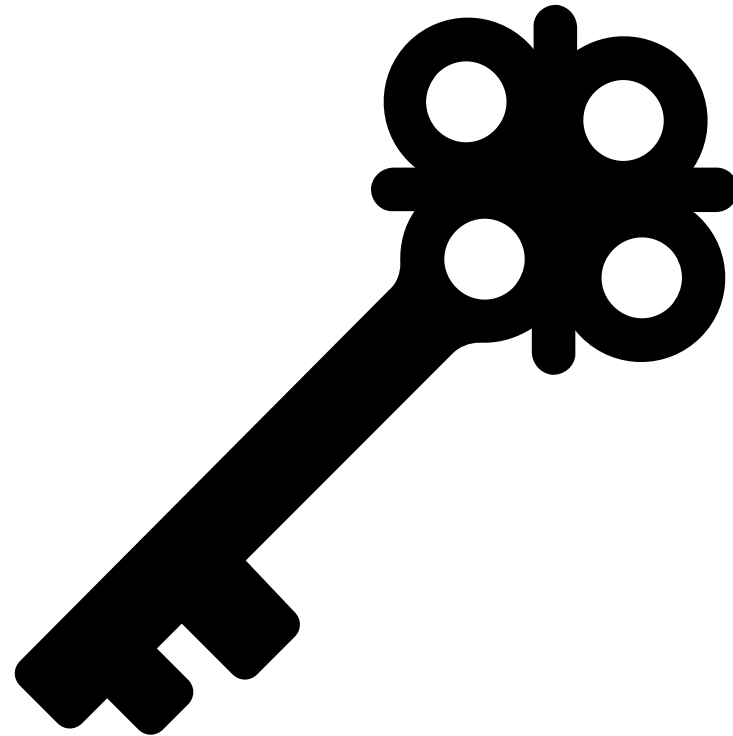


- 🛡️ If starting a conversation on how likely they are to vaccinate, ask “How likely on a scale of 0-10 are you to vaccinate today?”
- 🛡️ If the number is 1 or higher, the follow-up question is “Why isn’t it lower?”
- 🛡️ The goal is to reveal their thinking and keep the door open

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*
- 🛡️ LHD members are part of the local community and may know the stakeholders needed!

All Providers Need to Be Ready to Talk About Vaccines!



Thank you.

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