

Pediatric Vaccines - An Overview of The Evidence Behind Their Use

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Pediatric Infectious Diseases

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Learning Objectives

- Overview of vaccine development
- Common childhood vaccines
- Common misconceptions / discussions with families
 - (If there is time)

Learning Objectives

- Overview of vaccine development
- Common childhood vaccines
- Common misconceptions / discussions with families
 - (If there is time)
- **Goal: make you confident about the science behind vaccines so you can be confident with your patients!**



Review of Vaccinology

Vaccines \neq Good

Vaccines ≠ Good

- Most vaccines failed in clinical trials
- Some vaccines were dangerous
- Some vaccines have nasty side effects
- Some vaccines don't work well
- Some vaccines cover disease kids were never at risk for in the U.S.

Good Vaccines = Good

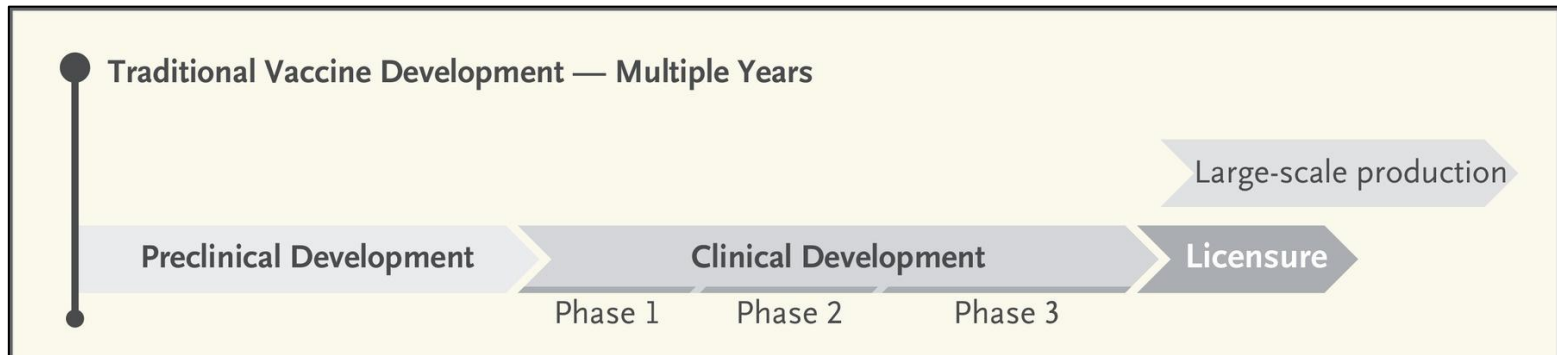
Good Vaccines = Good

- **Safe**
- Highly effective
- Prevents disease that are of concern in the population

Goal of Immunization

- **1. Prevent severe disease**
- 2. Reduce mild/moderate disease
- 3. Reduce transmission
- 4. National elimination

Vaccine Development



- Pre-clinical
- Clinical trials
- Post introduction

Pre-Clinical Studies

- Basic Science:
 - Microbiology, immunology, chemistry
 - Does natural post infection immunity exist?
 - Potential vaccine target?
- Animal studies:
 - Safety
 - Immunology (if possible)



Clinical Trials

- Phase 1

- Primary goal: Safety
 - Secondary goal: Dosing
- Study Size: <100 people

- Phase 2

- Primary goal: Safety, Dosing
 - Secondary goal: Efficacy
- Study Size: 100 -1000's

- Phase 3

- Primary goal: Efficacy, Safety
- Study Size: 1000 to 10,000s

Clinical Trials

- Phase 1

- Primary goal: Safety
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- Phase 3

- Primary goal: Efficacy, Safety
- Study Size: 1000 to 10,000s

**It takes decades to
develop a vaccine**

**For every vaccine we have, dozens
of others failed in clinical trials**

Post Introduction

- Phase 4
 - Optimal use
 - Different populations
 - Break through disease
 - Boosters
 - Rare side effects

Post Introduction

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- Optimal use
- Different populations
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Clinical trials have inflexible,
unrealistic timing

Post Introduction

- Phase 4
 - Optimal use
 - Different populations
 - Break through disease
 - Boosters
 - Rare side effects



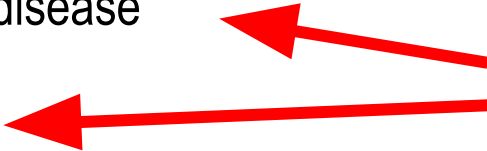
Clinical trials often exclude high risk populations

Post Introduction

- Phase 4

- Optimal use
- Different populations
- Break through disease
- Boosters
- Rare side effects

All vaccines need boosters at some point. Only time (and breakthrough cases) tells when



Post Introduction

- Phase 4
 - Optimal use
 - Different populations
 - Break though disease
 - Boosters
 - Rare side effects



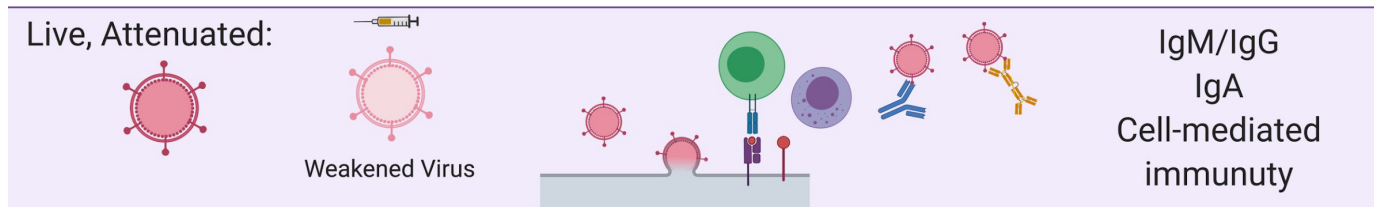
Clinical trials can only find side-effect base on the size of the study

Vaccine Types

- Live attenuated
- Inactivated
- Component
- Nucleic acid (mRNA)

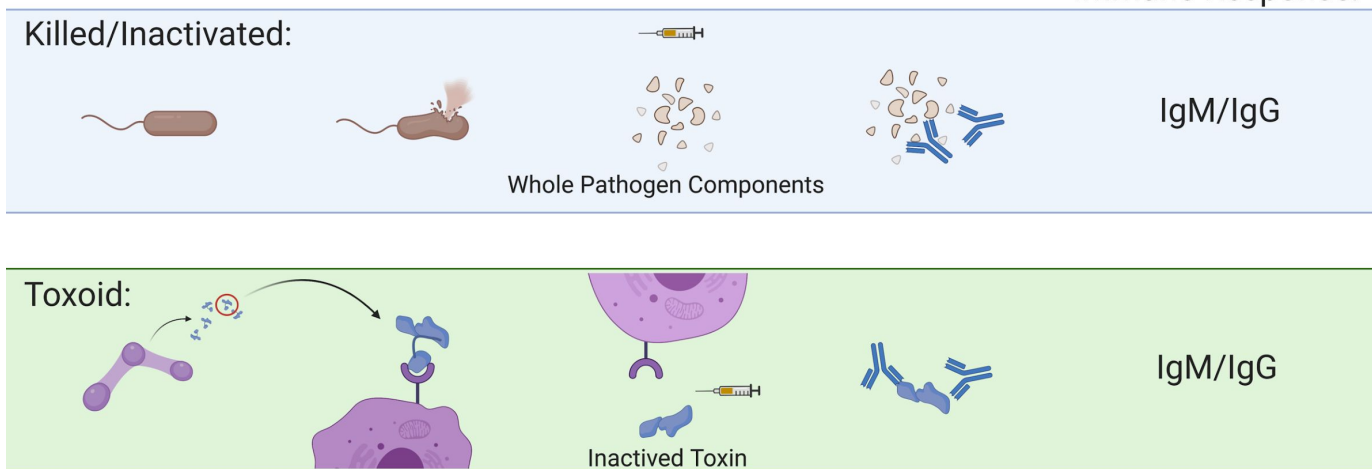
Vaccine Types

- Live attenuated
 - Weaken strain of a pathogen that replicates briefly and dies
 - Typically thought to provide superior cellular immunity
 - Examples: Measles, Mumps, Rubella, Flu mist, Rotavirus, Varicella



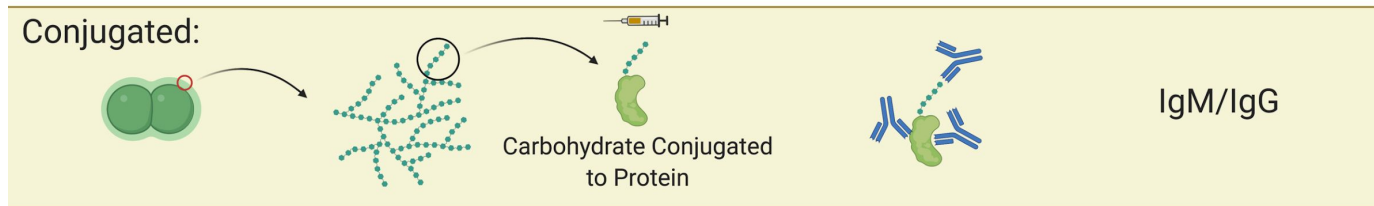
Vaccine Types

- Live attenuated
- Inactivated
 - Pathogen or toxins treated to inactivate them
 - Inactivated examples: Tetanus, diphtheria, hepatitis A, Flu, Polio



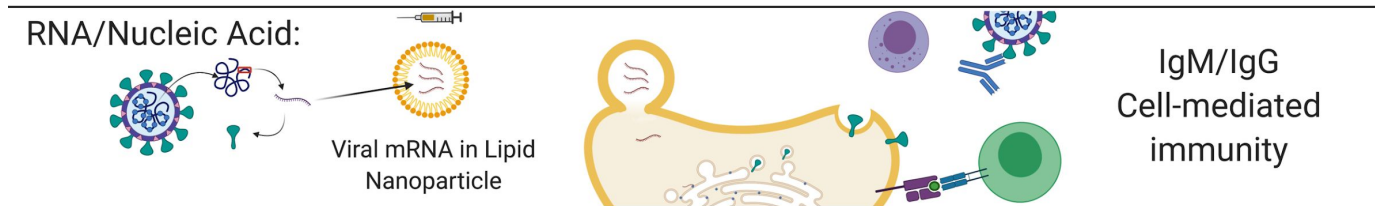
Vaccine Types

- Live attenuated
- Inactivated
- Component
 - Purified components of a pathogen, often modified for better response
 - Component examples: HepB, Pneumococcal, Hib, pertussis, HPV



Vaccine Types

- Live attenuated
- Inactivated
- Component
- Nucleic acid (mRNA)
 - Nucleic acid that produces pathogen components inside cells, then degrades
 - Example: COVID-19



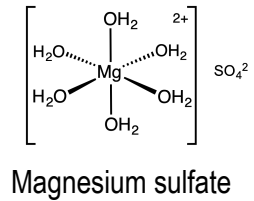
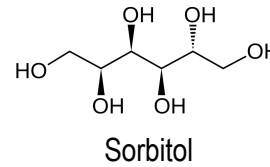
Vaccine Composition

- Combination vaccines
 - Same effectiveness/ safety profile
 - Fewer shots
 - Literally no downsides



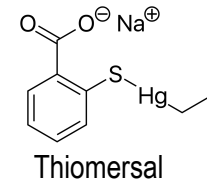
Vaccine Composition

- Stabilizers



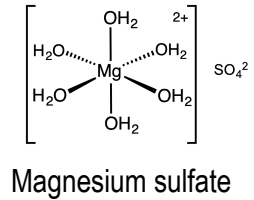
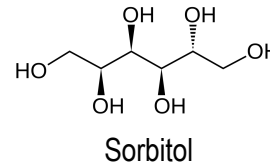
- Preservatives

- Phenol compounds
- Thimerosal (not used in childhood vaccines anymore)



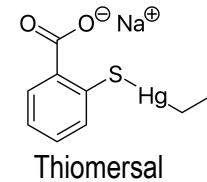
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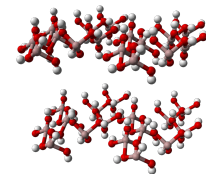
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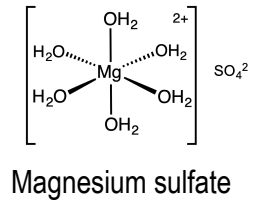
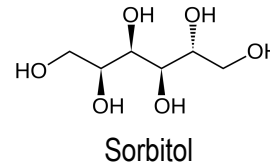
- Adjuvants

- Augment the vaccine by stimulating the immune system
- Usually aluminum salts



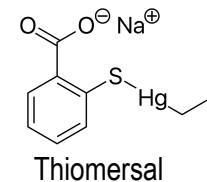
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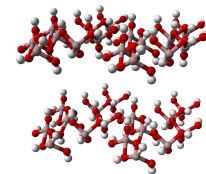
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- Adjuvants

- Augment the vaccine by stimulating the immune system
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- All other manufacturing products are removed

- Cell products, antibiotics, formaldehyde, etc.

Dosing Schedules

- All vaccines are timed to provide immune **BEFORE** they are at risk for severe disease
 - Risk in early life
 - RSV, DTP, pneumococcal, Hib, Polio, rotavirus, measles, mumps, rubella
 - Hep B in some populations
 - Risk as adults
 - Severe disease in adults: Hep A, Hep B
 - Risk factors in adults: Hep B, HPV, Rubella
 - Vaccines in adults have poor uptake... which is why we vaccinate kids

Dosing Schedules

Vaccine and other immunizing agents	Birth	1 mos	2 mos	4 mos	6 mos	8 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2–3 yrs	4–6 yrs	7–10 yrs	11–12 yrs	13–15 yrs	16 yrs	17–18 yrs	
Respiratory syncytial virus (RSV-mAb [nirsevimab, clesrovimab])	1 dose during RSV season depending on maternal RSV vaccination status (See Notes)				1 dose nirsevimab during RSV season (See Notes)														
Hepatitis B (HepB)	1 st dose	2 nd dose				3 rd dose													
Rotavirus (RV): RV1 (2-dose series), RV5 (3-dose series)			1 st dose	2 nd dose	See Notes														
Diphtheria, tetanus, and acellular pertussis (DTaP <7 yrs)		1 st dose	2 nd dose	3 rd dose				4 th dose					5 th dose						
<i>Haemophilus influenzae</i> type b (Hib)		1 st dose	2 nd dose	See Notes				3 rd or 4 th dose (See Notes)											
Pneumococcal conjugate (PCV15, PCV20)		1 st dose	2 nd dose	3 rd dose				4 th dose											
Inactivated poliovirus (IPV)		1 st dose	2 nd dose	3 rd dose								4 th dose	See Notes						
COVID-19 (1vCOV-mRNA, 1vCOV-aPS)					1 or more doses of 2025–2026 vaccine (See Notes)				1 or more doses of 2025–2026 vaccine (See Notes)				1 or more doses of 2025–2026 vaccine (See Notes)						
Influenza					1 or 2 doses annually (See Notes)								1 dose annually (See Notes)						
Measles, mumps, and rubella (MMR)					See Notes		1 st dose					2 nd dose							
Varicella (VAR)							1 st dose					2 nd dose							
Hepatitis A (HepA)					See Notes	2-dose series (See Notes)													

- Primary series:
 - Initially based on vaccine studies
 - Aimed to fit with other vaccines timing
 - Modified based on post introduction experience
- Boosters:
 - Based on breakthrough cases after introduction

Safety: Priority #1

Vaccine Safety

- Since vaccines are given to healthy children, they must be exceedingly safe
 - Common side effects are picked up in clinical trials
 - Rare side effects won't get seen until introduction
 - But will be picked up quickly after



Vaccine Safety

- Expected side effects
 - Injection site pain / swelling
 - Mild systemic symptoms (fever, fussiness, headache, myalgias, chills, rash)
 - Ibuprofen is your friend!
 - Rare: Allergic reactions, febrile seizure, specific to individual vaccines reactions, theoretical post inflammatory

Vaccine Safety

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- Safety monitoring
 - Vaccine Adverse Event Reporting System (VAERS)
 - Vaccine Safety Datalink
 - International equivalents

Vaccine Adverse Event Reporting System

- CDCs passive adverse event reporting system:
 - 1. Reports get submitted
 - 2. Physicians review serious reports
 - 3. May request more information from submitter
 - 4. Analyzed to identify concerning events

Vaccine Adverse Event Reporting System



- About VAERS
- Report an Adverse Event
- VAERS Data
- Resources
- Submit Follow-Up Information

Completion Status

- Patient Information
- Reporter Information
- Facility Information
- Vaccine Information
- Additional Information

Report an Adverse Event - Patient Information [Instructions](#) | [en](#) | [spanol](#)

Note: Fields marked with an * are essential and should be completed.

Item 1

Patient first name: Patient last name:

Street address:

City: State: County:

Zip code: Phone: Email:

Item 2

* Date of birth mm/dd/yyyy or mm/yyyy

* Sex: Male Female Unknown

Item 3

Item 4

* Date of vaccination mm/dd/yyyy or mm/yyyy

Time: AM PM

[\(Link to preview VAERS form\)](#)

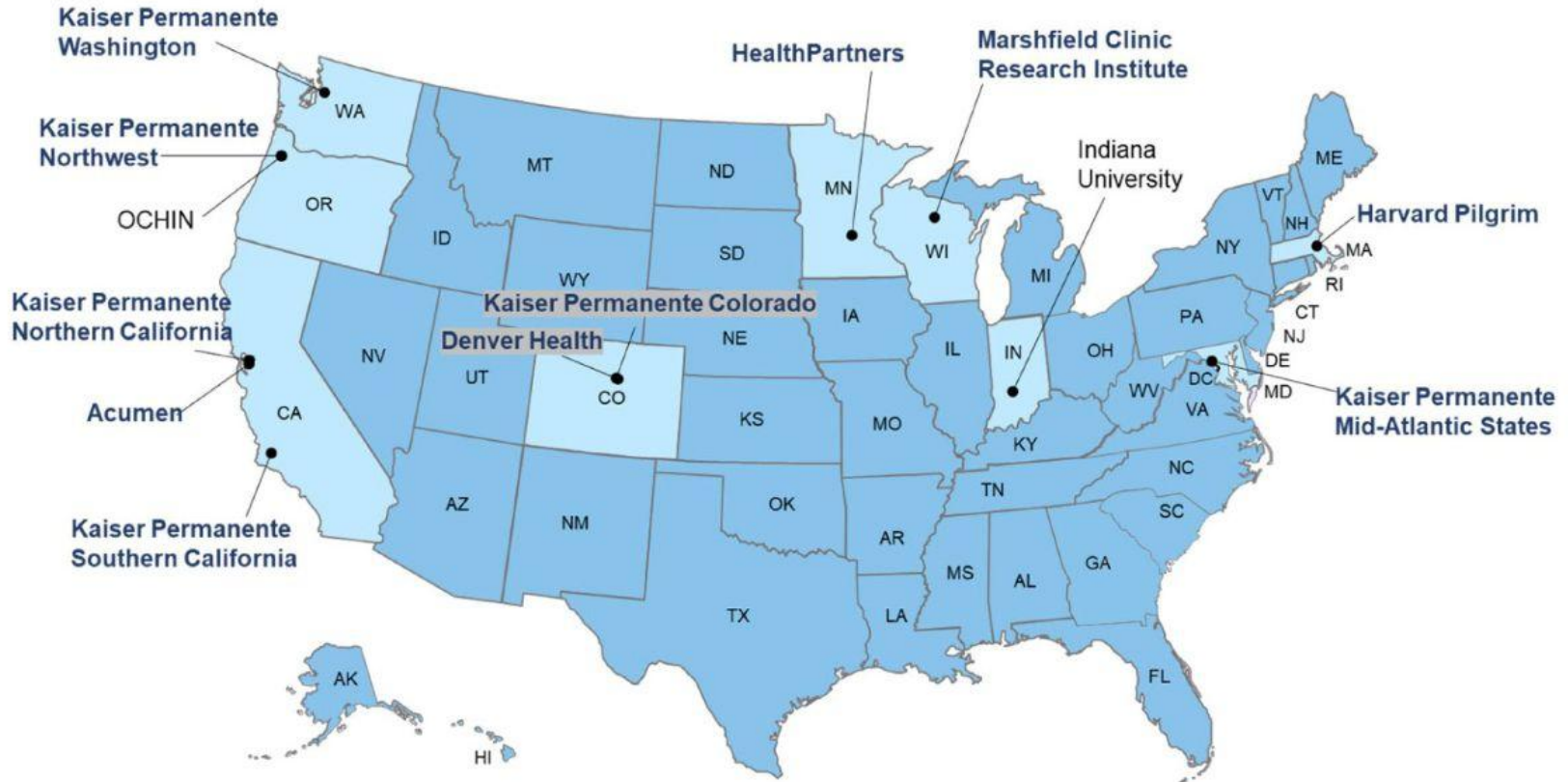
Vaccine Adverse Event Reporting System

- Benefits
 - Anyone can report
 - Known to healthcare workers
 - Early warning / hypothesis generating system
- Limitations
 - Underreporting
 - Unverified reports
 - Not population based

Vaccine Safety Datalink

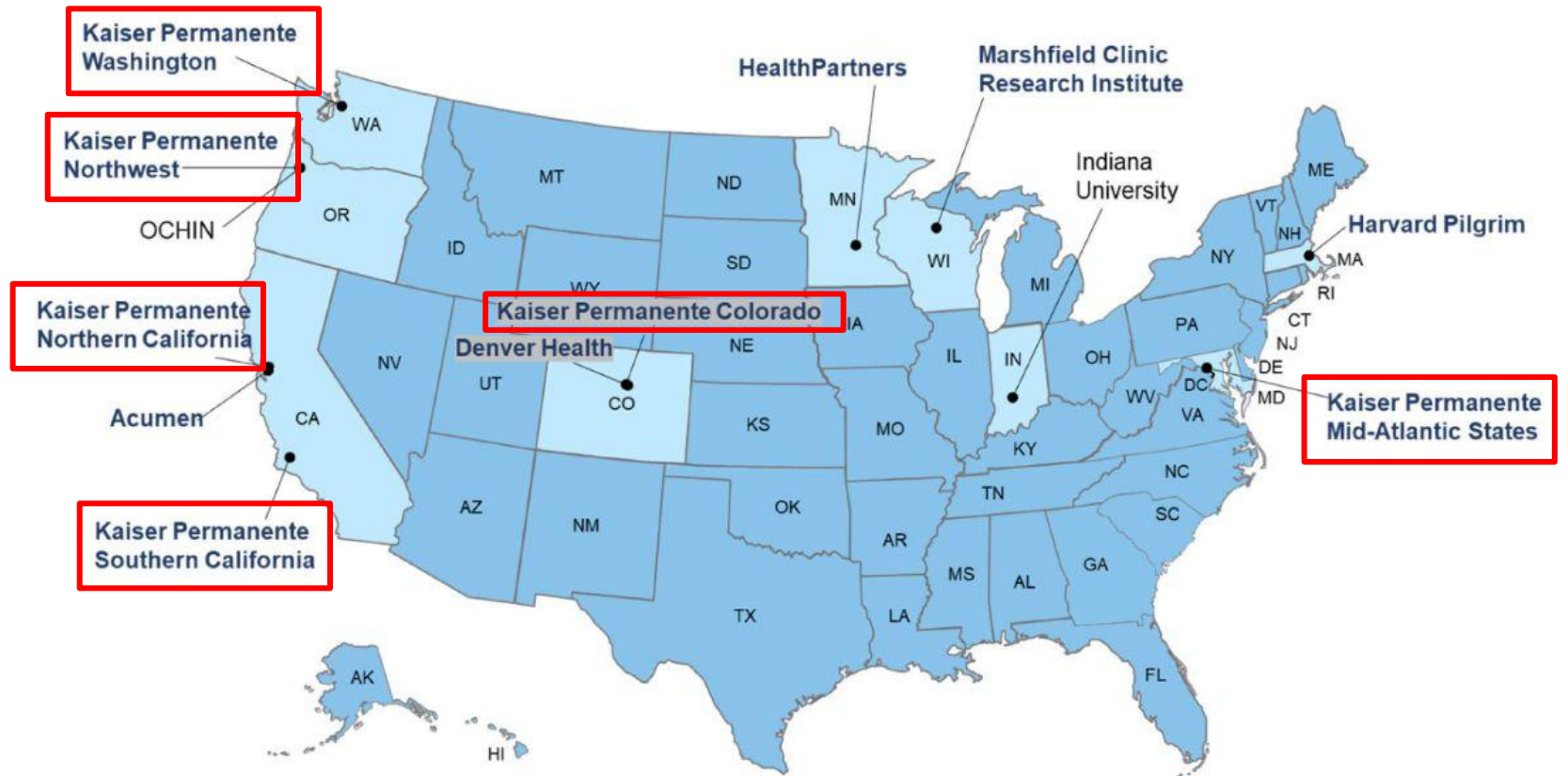
- Collaboration between CDC and 11 health care organizations
- Conducts safety studies based on concerns raised from the medical literature / VAERS
- Benefits
 - Accurate and robust electronic medical records
 - >12 million people in the system
 - Able to provide a baseline population

Vaccine Safety Datalink



With this amount of data it's easy to find rare side effects

Vaccine Safety Datalink



Basically, the Kaiser System

Now on to the Vaccines!

Pediatric Vaccines

- Disease overview
- Reason to immunize
- Impact of vaccination

The Enemy



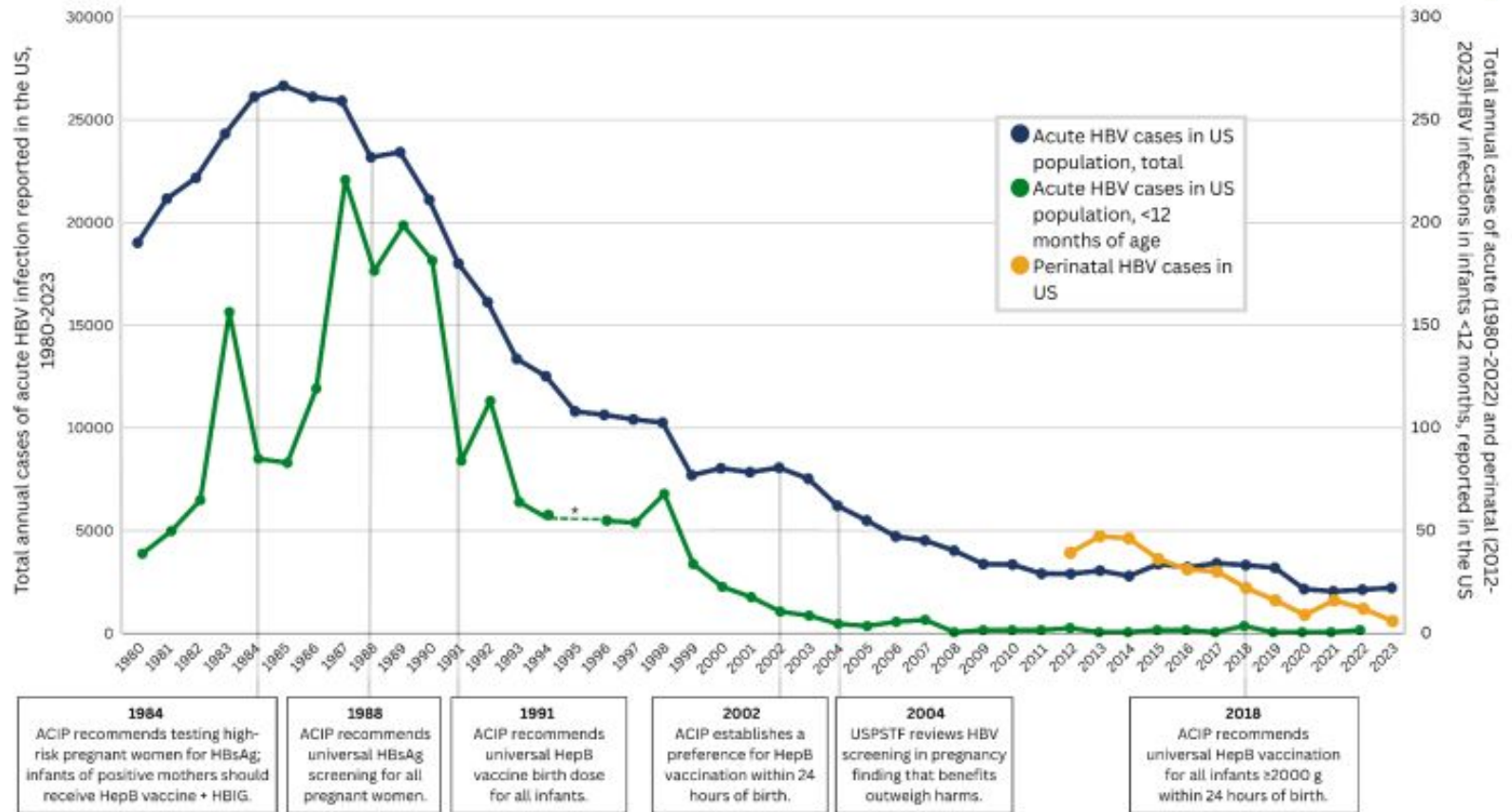
Newborn Vaccines

Hepatitis B



- Overview
 - Highly contagious fluid / blood born pathogen
 - Disease: mostly asymptomatic, mild hepatitis
 - Complications: chronic infection, cirrhosis, liver failure, cancer.
 - Chronic infections develop in 90% newborns, 40% children, 5% adults
- Reason to immunize
 - Prevent chronic disease in adults
 - Attempts to vaccinate adults failed
 - Prevent occult transmission in newborns / children
 - Rare, but there is no downside to vaccination infants and protection is life long

Hepatitis B – Impact



- Adult disease has disappeared due to pediatric vaccination

Respiratory Syncytial Virus

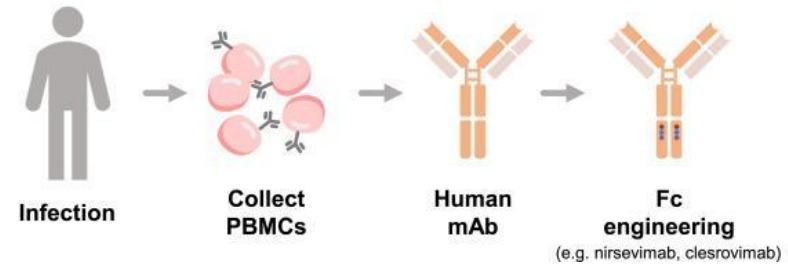


- Overview
 - Highly contagious respiratory virus
 - Disease: mild, cold-like illness
 - Complications: Bronchiolitis, pneumonia – mostly in <6 m/o
- Reason to immunize
 - Prevent hospitalization (70,000 per year)
 - Prevent huge number of outpatient cases

RSV – Not Quite Vaccines



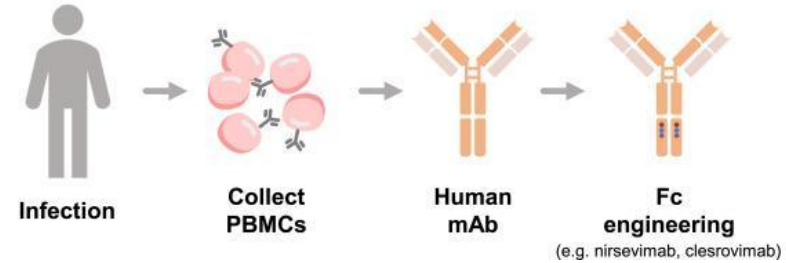
- Nirsevimab / clesrovimab
 - Long lasting antibody
 - Does not provide permanent immunity
 - Does protect for >6 months



RSV – Not Quite Vaccines



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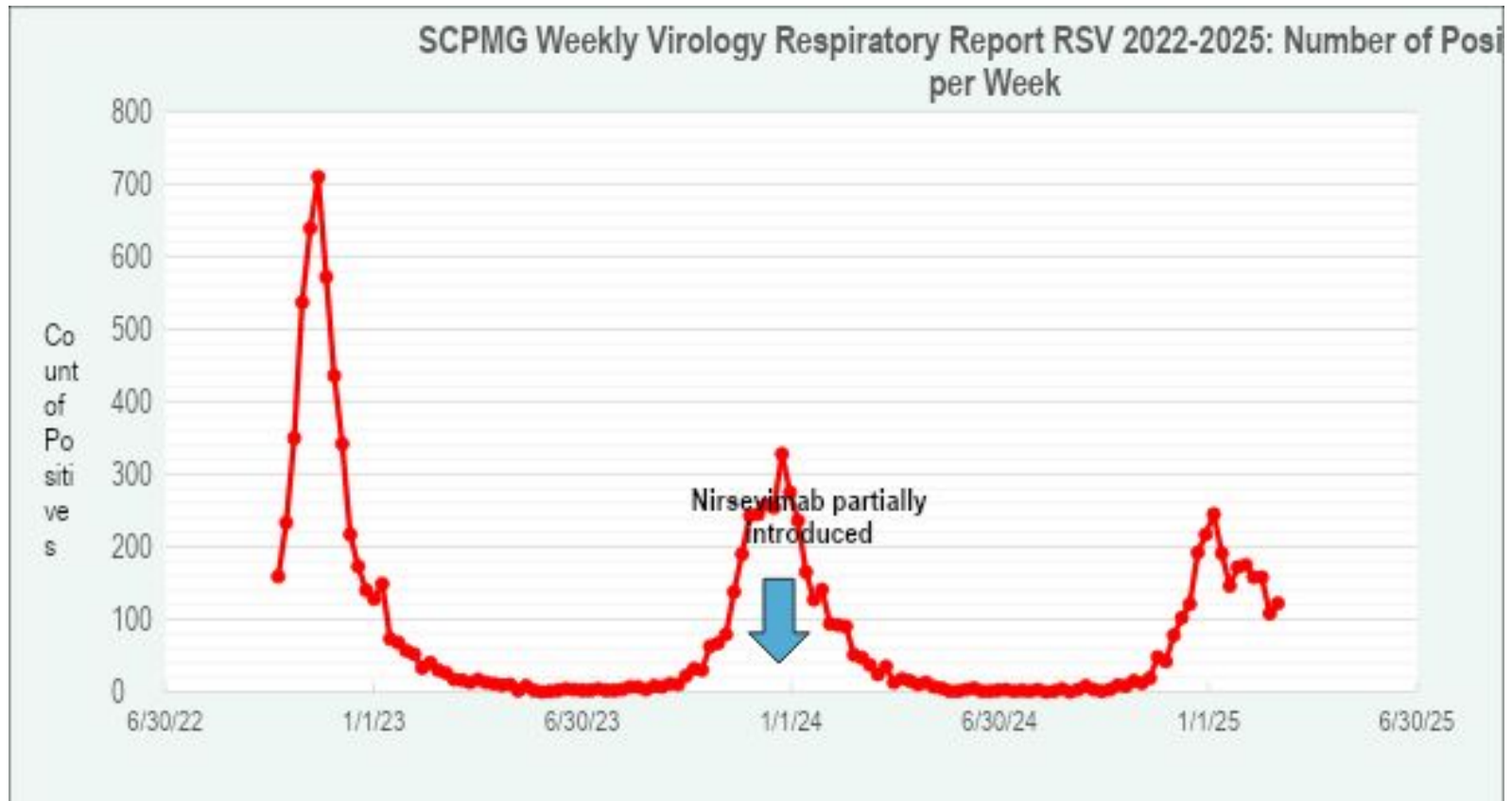


- Why no pediatric vaccines?
 - One was in develop in the 1960's
 - Failed in clinical trials: led to more severe infections!
 - Never introduced

RSV – Not Good



RSV “Vaccine” – Impact



- 87% effective against lower respiratory infection
- 96% effective against hospitalization
- Real time reduction seen after introduction

Infant Vaccines

Diphtheria

- Overview
 - Highly contagious upper respiratory bacteria
 - Disease: Pharyngitis with pseudo membrane
 - Complications: Toxin induce myocarditis / neuritis / respiratory failure
- Reason to immunize
 - Prevent deaths (15,000 per year)

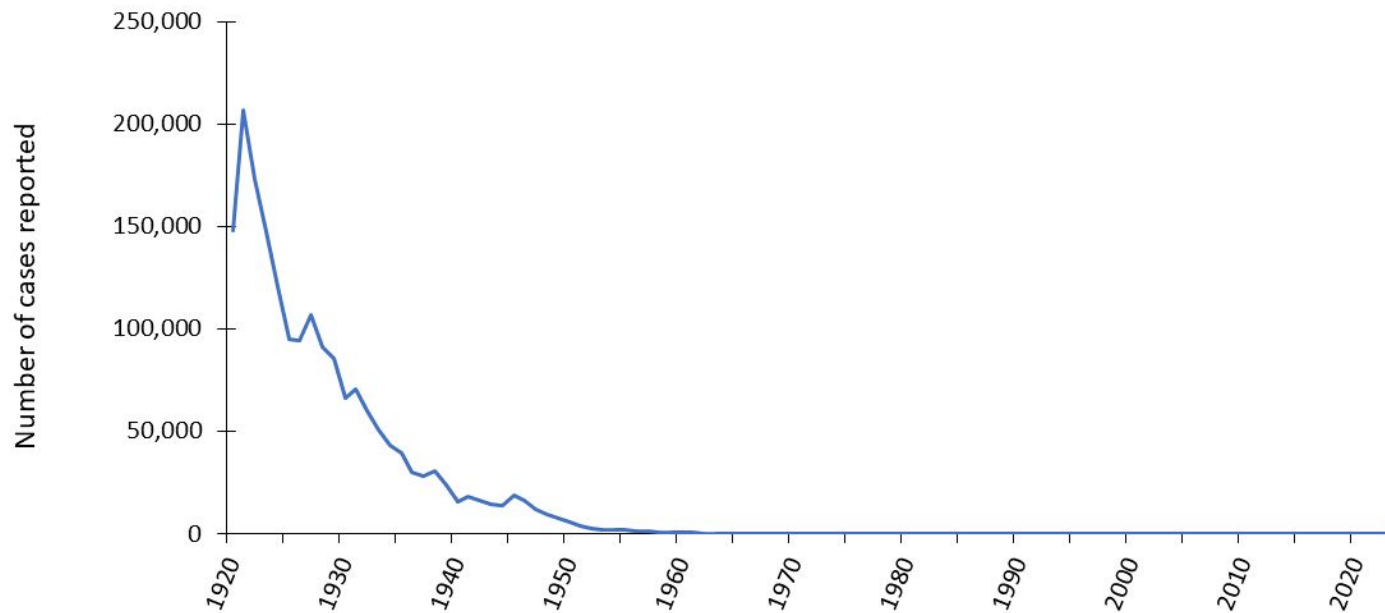
Diphtheria – Not good



- Classic pseudomembrane
- Dumps toxins into the blood

Diphtheria Vaccine – Impact

Reported Diphtheria, 1920–2023, NNDSS, United States



Pertussis



- Disease
 - Highly contagious upper respiratory bacteria
 - Disease: Whooping cough, pneumonia
 - Complications: respiratory depression, toxin induced encephalopathy
- Reason to immunize
 - Prevent severe cases in infants
 - Prevent any disease (200,000 per year)

Pertussis – Not good

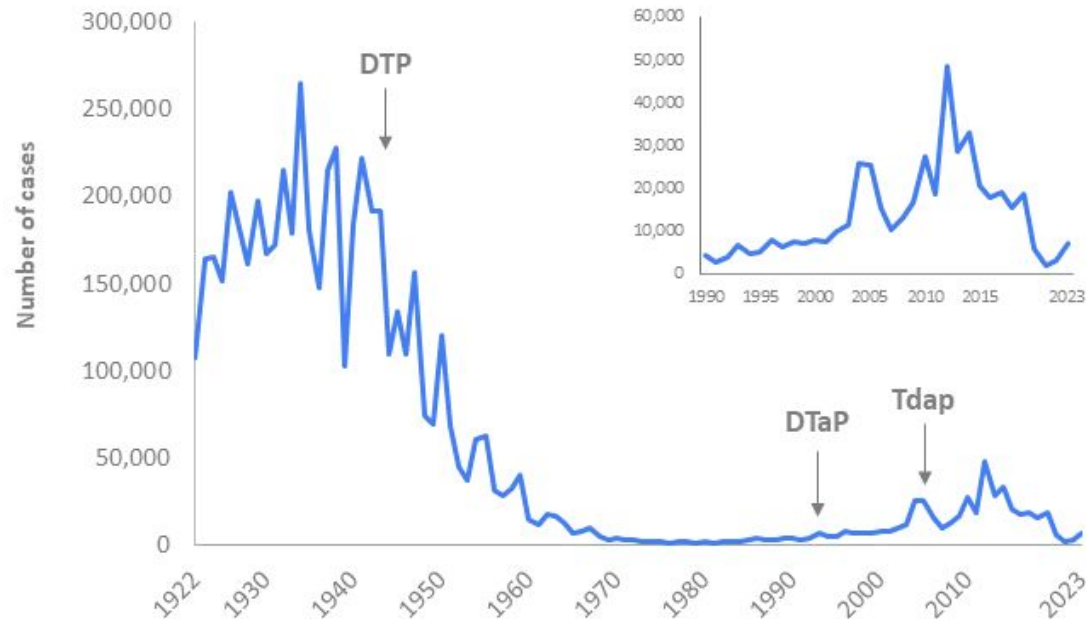


- Infants get very sick

Pertussis – Impact



Reported NNDSS pertussis cases: 1922-2023



- Infant cases are eliminated
- Mild sporadic cases occur in older kids
 - A-cellular pertussis does not protect as well against colonization

Tetanus



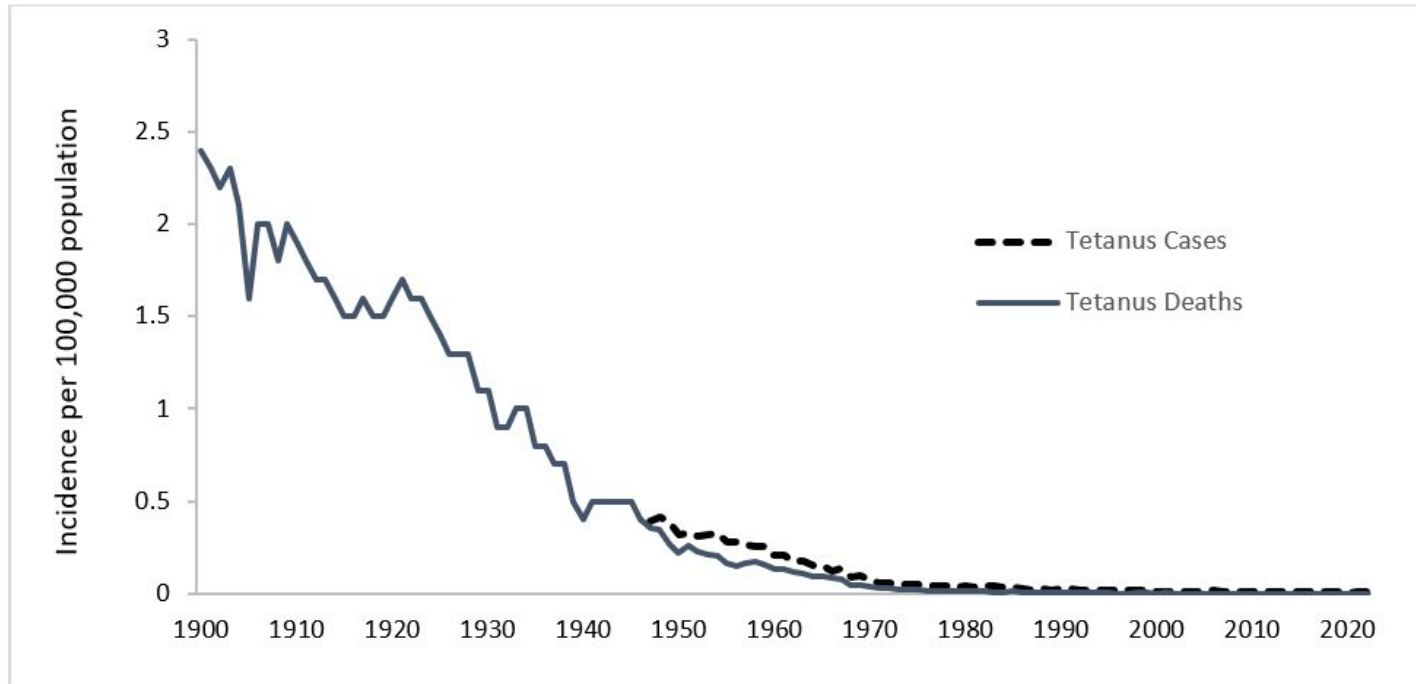
- Overview
 - Ubiquitous soil bacteria
 - Disease: Severe generalized muscle spasms
- Reason to immunize
 - 10% mortality even with treatment
 - Hard to predict risk who is at risk (rare: ~500 cases per year)

Tetanus – Not good



- One of the more terrible ways to die

Tetanus – Impact

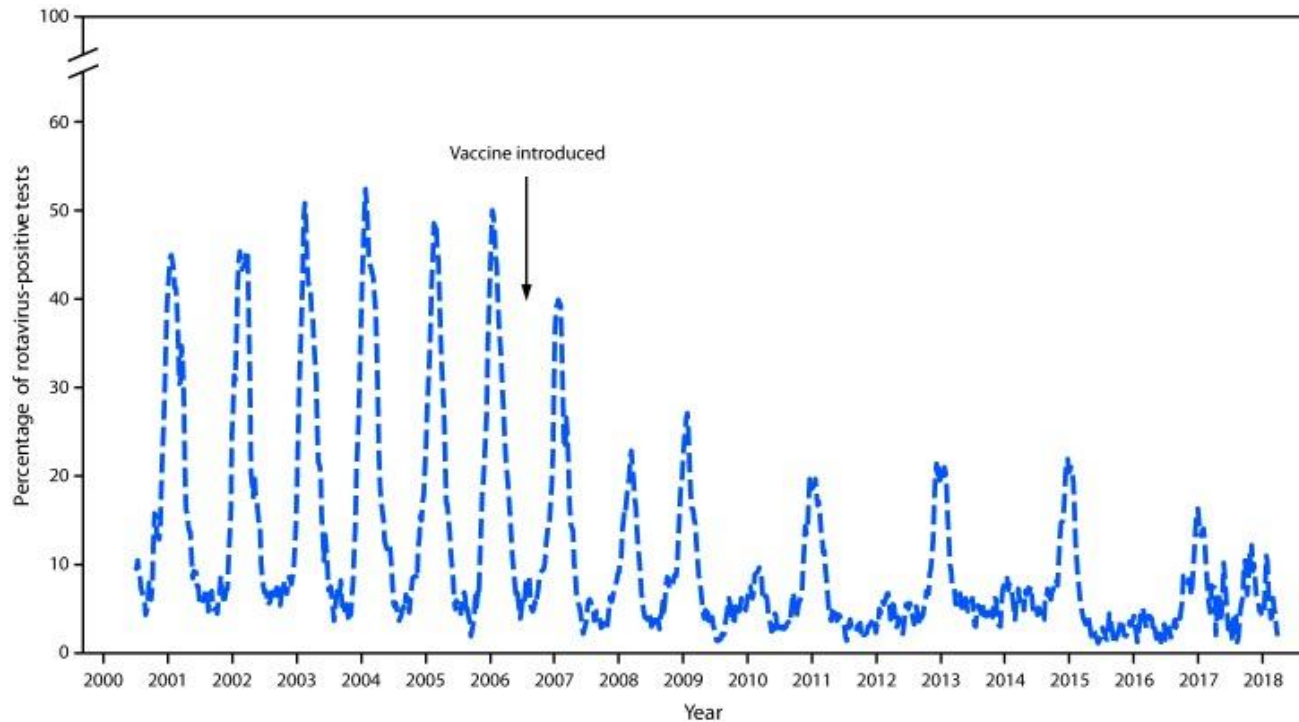


Rotavirus



- Overview
 - Extremely infectious gastrointestinal virus
 - Disease: Severe diarrhea, dehydration
- Reason to immunize
 - Prevent hospitalization (45,000 per year)
 - Prevent outpatient cases (2.7 million per year)

Rotavirus – Impact

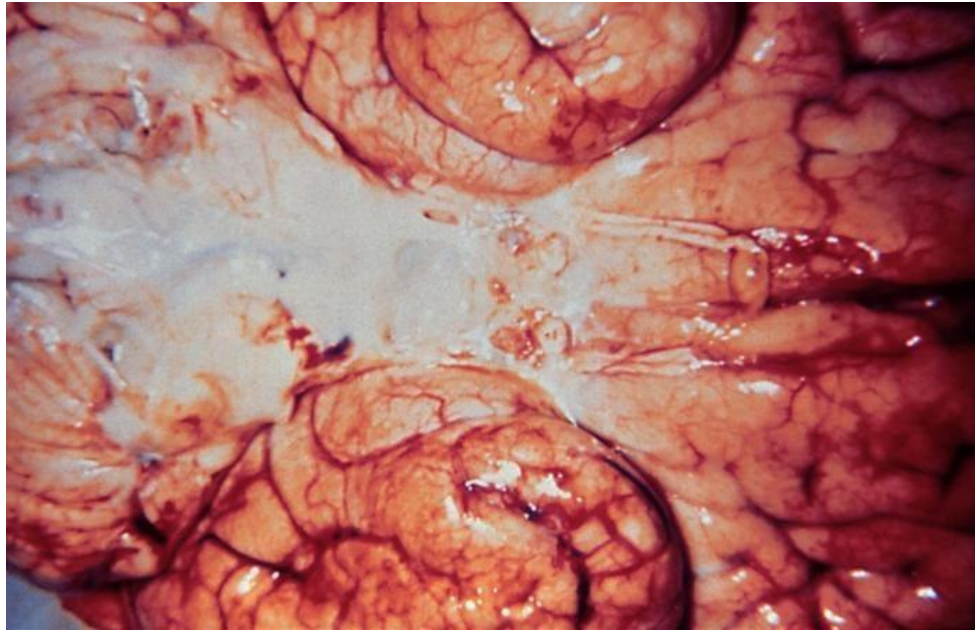




Haemophilus influenzae B

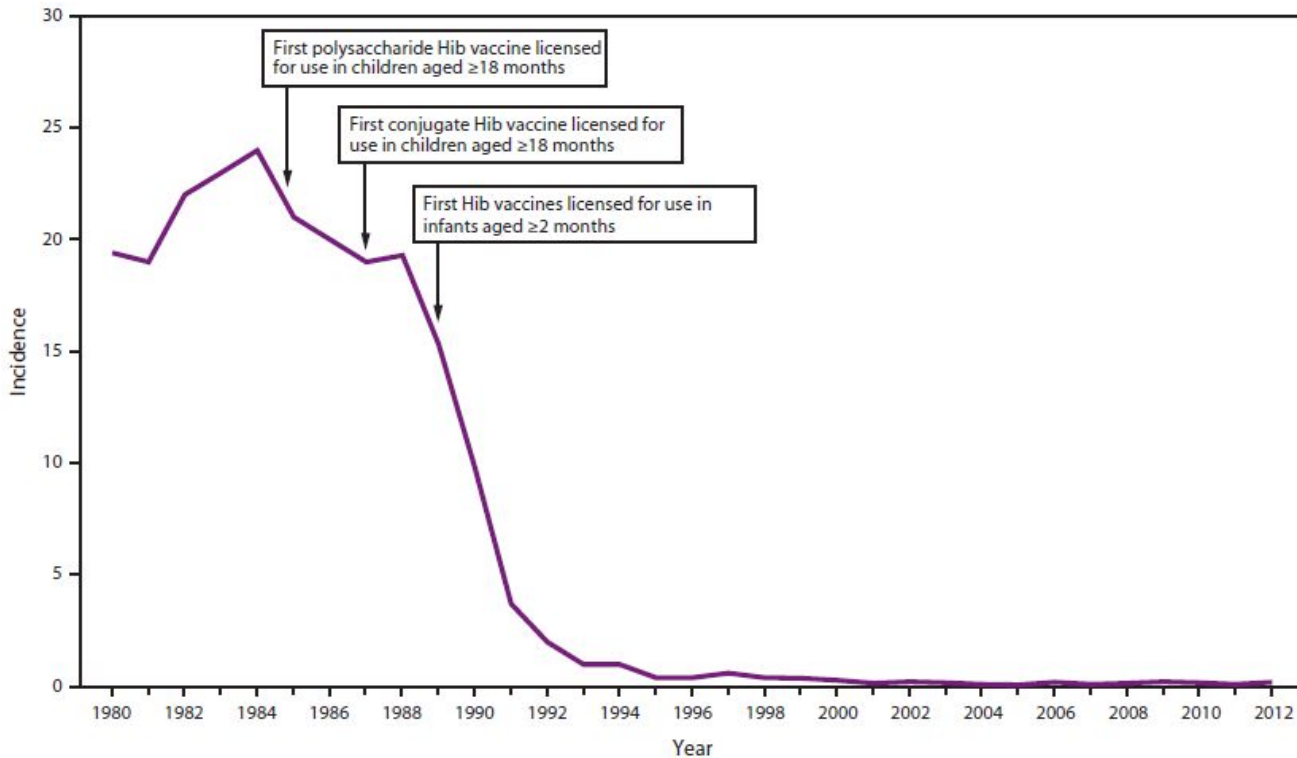
- Overview
 - Transient bacterial colonizer of the nasopharynx
 - Disease: Pneumonia, sepsis, meningitis
- Reason to immunize
 - Prevent meningitis (#1 cause: 20,000 invasive cases per year)
 - Prevent pneumonia (#2 cause of bacterial pneumonia)

Haemophilus influenzae B – Not good



- Meningitis fills a child's brain full of pus

Haemophilus influenzae B



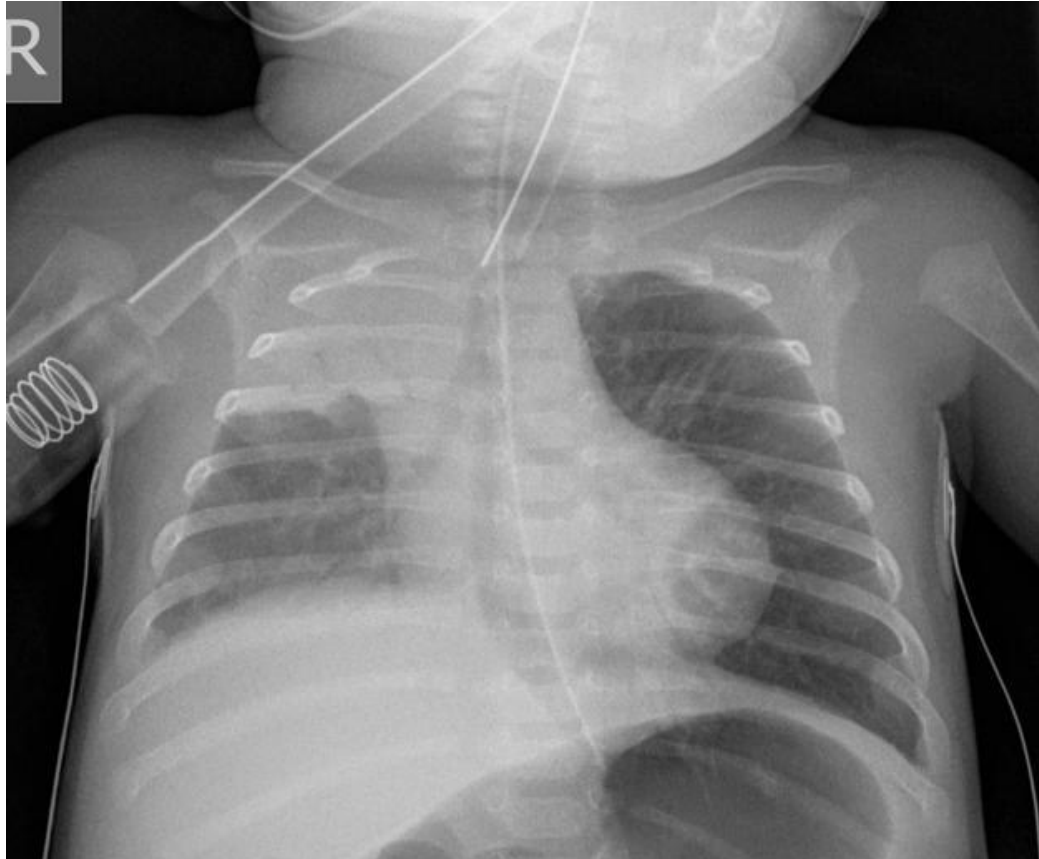
- Elimination of invasive disease
- 25% reduction in bacterial pneumonia after introduction

Streptococcus pneumoniae



- Overview
 - Transient bacterial colonizer of the nasopharynx
 - Disease: otitis media, pneumonia,
 - Complications: sepsis, meningitis
- Reason to immunize
 - Prevent meningitis (#2 cause of meningitis, 17,000 invasive cases per year)
 - Prevent pneumonia (#1 cause of bacterial pneumonia)
 - Prevent otitis media (5 million cases per year)

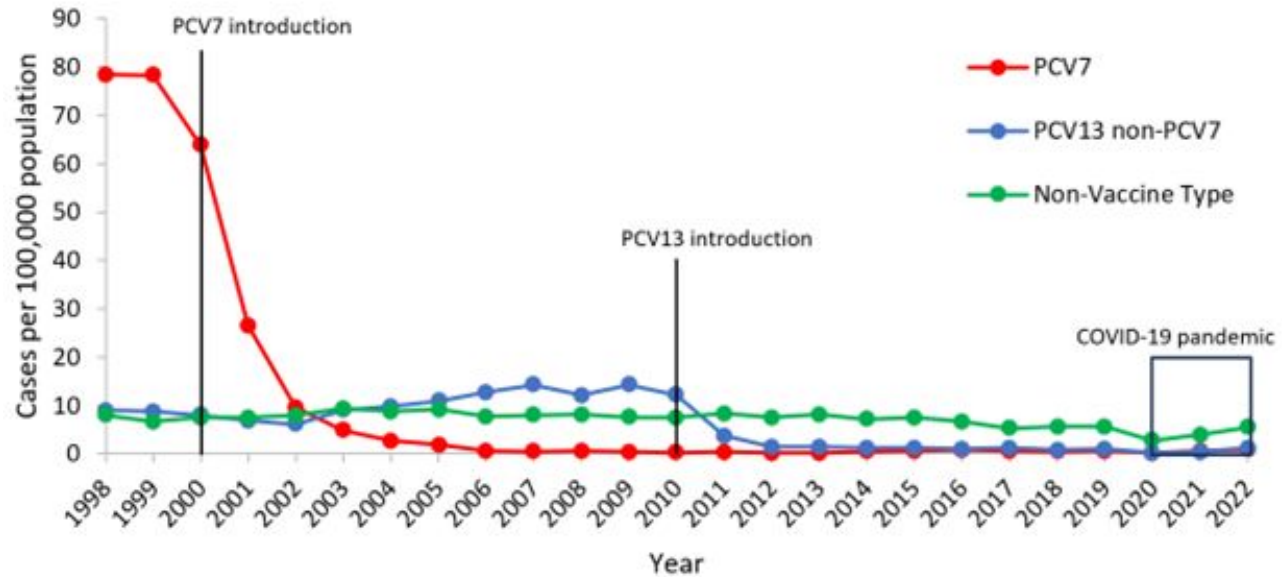
Streptococcus pneumoniae – Not good



Streptococcus pneumoniae – Impact



Rates of invasive pneumococcal disease among children <5 years of age



- 30% reduction in ***all*** AOM
- 40% reduction in bacterial pneumonia
- Elimination of vaccine type invasive disease

Polio



- Overview
 - Highly contagious respiratory / GI virus
 - Disease: 94% asymptomatic / non-specific viral symptoms
 - Complications: 1% meningitis / flaccid paralysis
- Reason to immunize
 - Prevent flaccid paralysis (20,000 paralytic cases per year)
 - Prevent paralytic disability



Polio – Not good



“Iron lung” ward



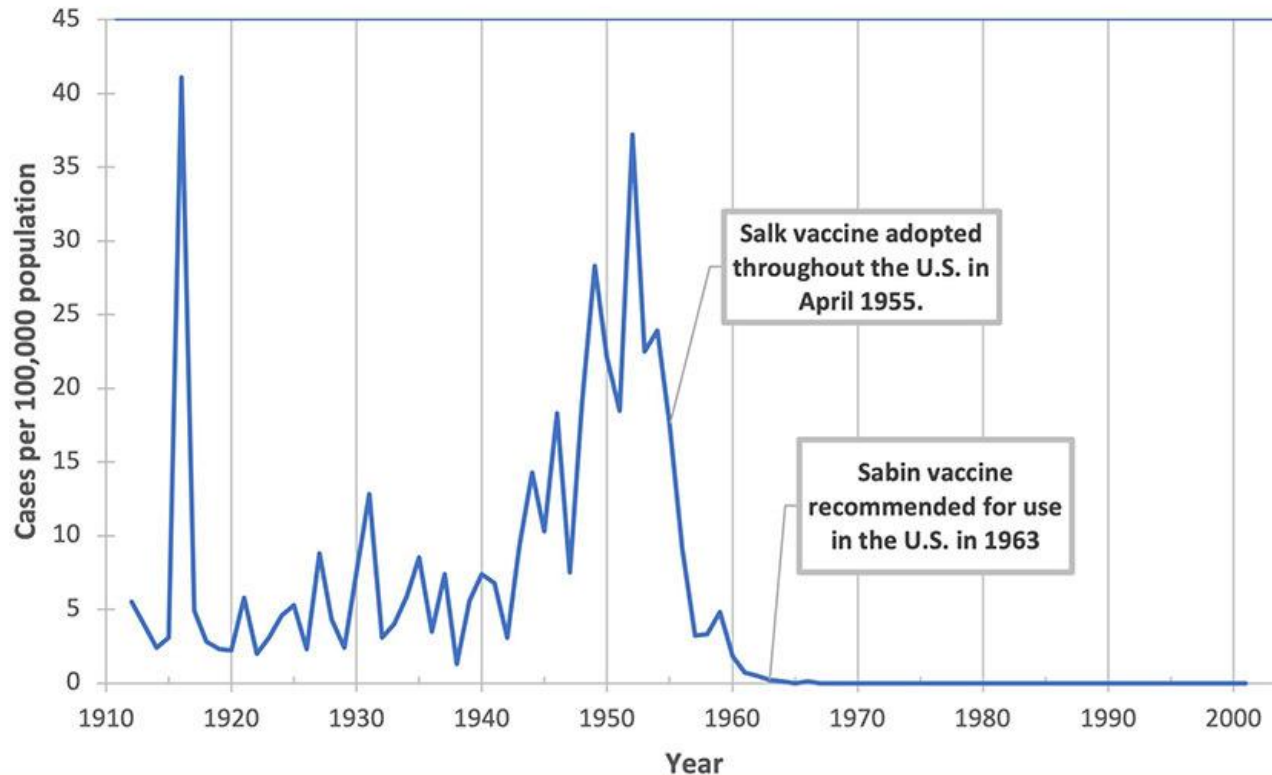
Long term neurological effects of polio



Polio – Impact



Poliomyelitis Cases in United States 1912-2001



MedLink Neurology ♦ www.medlink.com

Toddler

Measles



- Overview
 - Most contagious respiratory virus ever!
 - Disease: High fever, malaise, cough, coryza, conjunctivitis, rash
 - Complications: diarrhea, pneumonia, encephalitis, immune amnesia, degenerative neurological disease ... and many more!
- Reason to immunize
 - Prevent hospitalizations (20% of cases require hospitalization)
 - Prevent huge numbers outpatient cases / visits (every child gets it once)

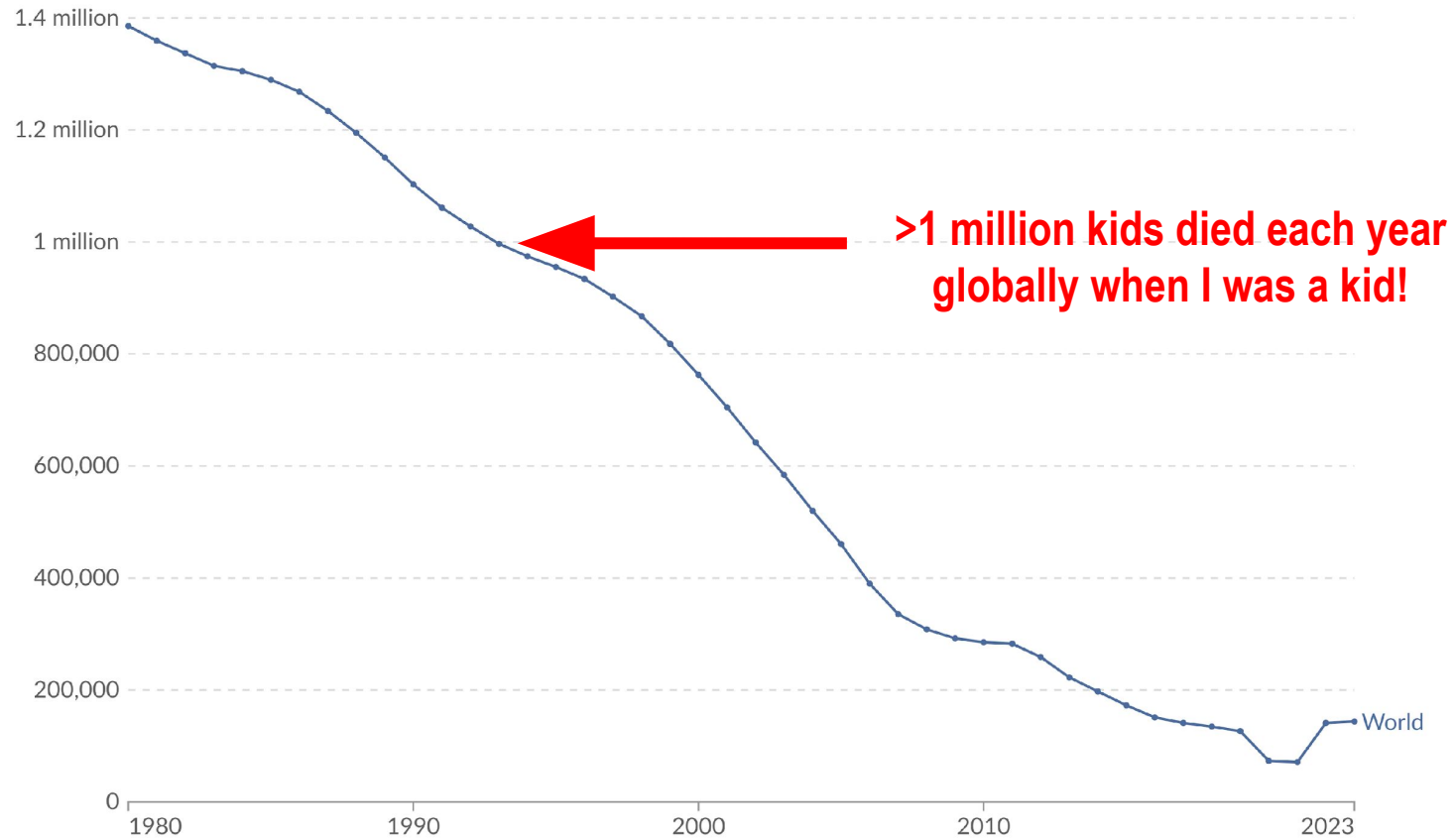
Measles – Not good



Deaths due to measles, 1980 to 2023

Our World
in Data

Estimated annual number of deaths due to measles.



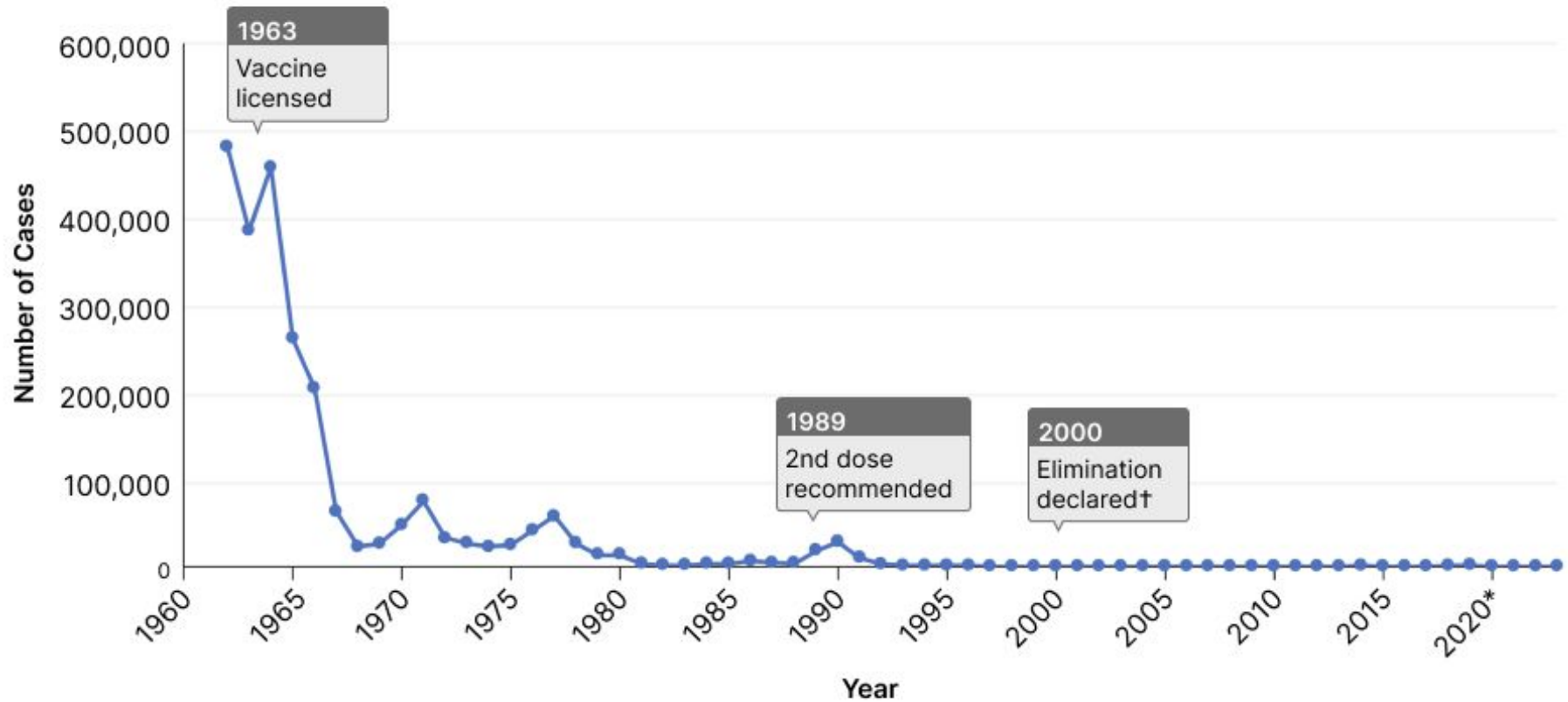
Data source: IHME, Global Burden of Disease (2025)

OurWorldinData.org/microbes-battle-science-vaccines | CC BY

Measles – Impact



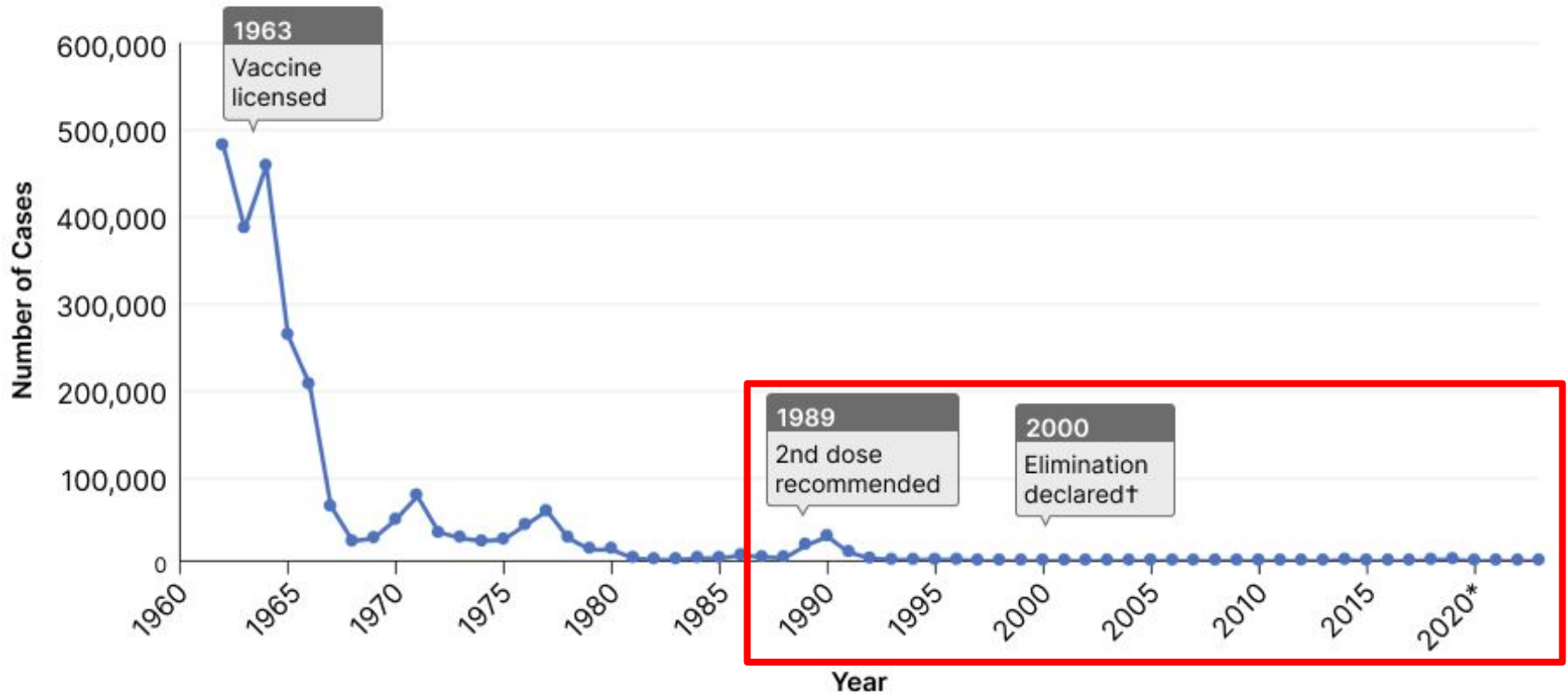
Reported Measles Cases in the United States from 1962 – 2023*



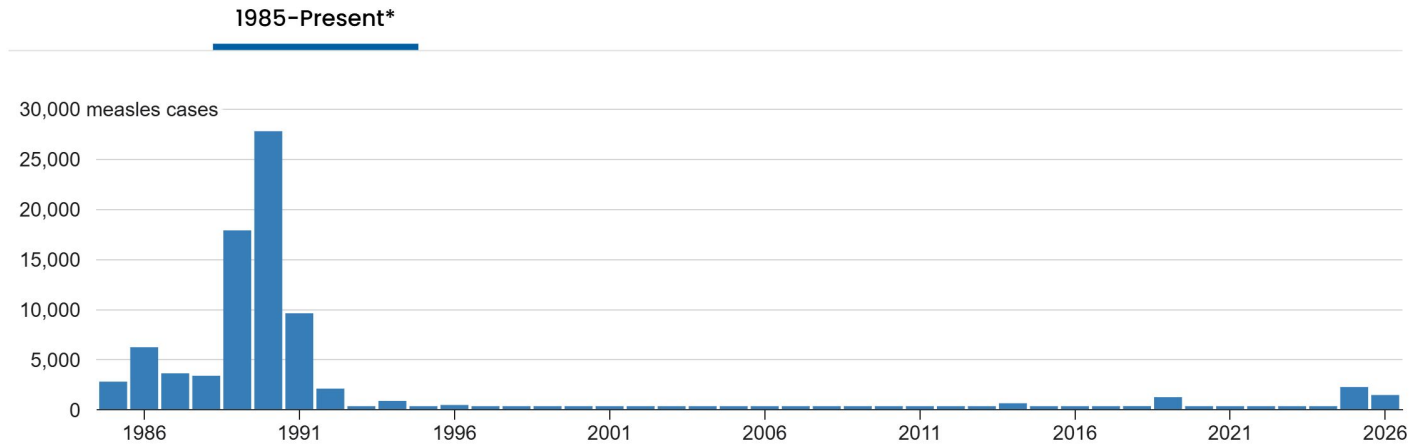
Measles – Impact



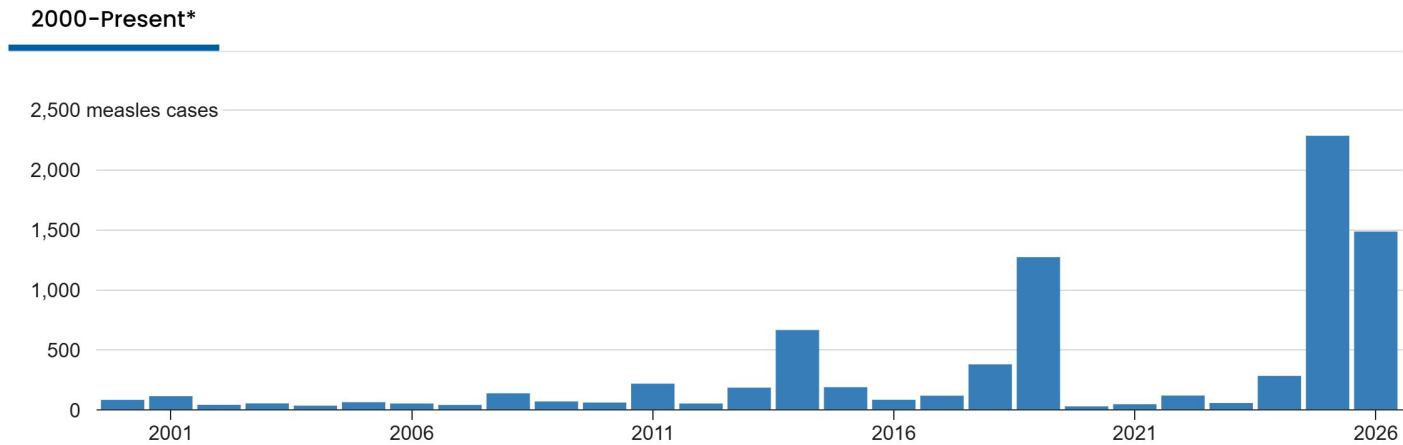
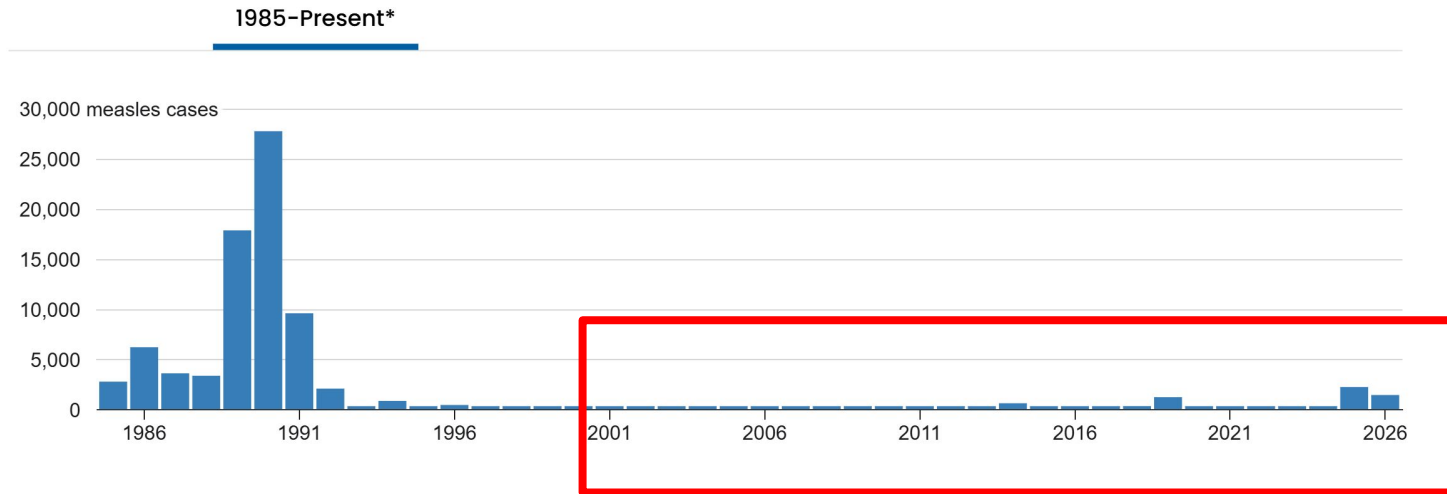
Reported Measles Cases in the United States from 1962 – 2023*



Measles – Impact



Measles – Impact



No need to panic yet... but I don't like this trend

Mumps



- Overview
 - Highly contagious respiratory virus
 - Disease: parotitis, orchitis (30%)
 - Complications: Common cause of viral meningitis and hearing loss
- Reason to immunize
 - Prevent common painful infection (>150,000 per year)
 - Prevent hearing loss and neurological damage

Mumps – Not good

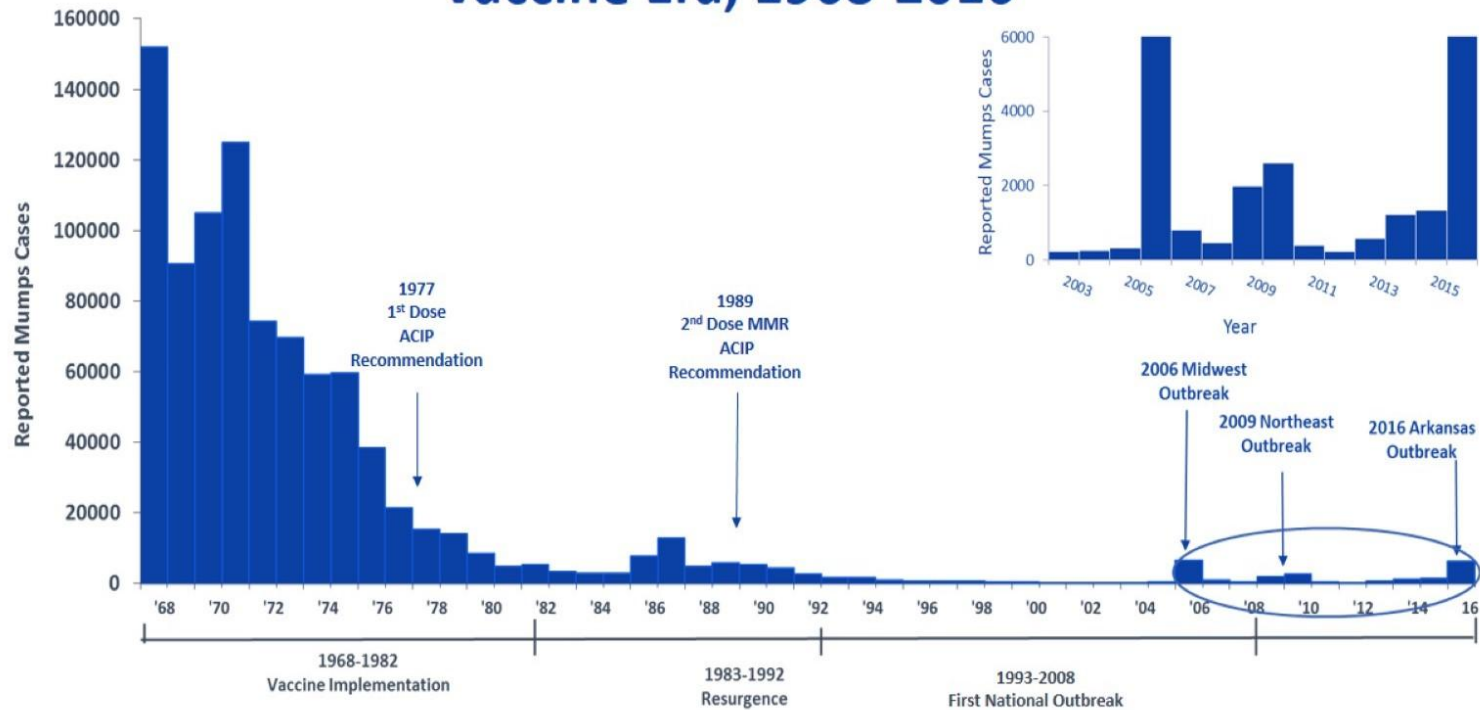


- This is a painful infection, and cosmetically dramatic
- It infects testicles -> testicular atrophy

Mumps – Impact



Reported Mumps Cases, United States, Vaccine Era, 1968-2016



Rubella



- Overview
 - Upper respiratory virus
 - Disease: mild viral illness with rash, outbreaks every few years
 - Complications: congenital rubella
- Reason to immunize
 - Prevent pre / neonatal deaths (13,000 per outbreak)
 - Prevent congenital rubella (20,000 per outbreak)
 - Why vaccinate boys? ***They are the vectors***

Congenital Rubella Syndrome – Not good



- Cataracts
- Glaucoma
- Congenital heart disease
- Hearing impairment
- Microcephaly
- Developmental delay



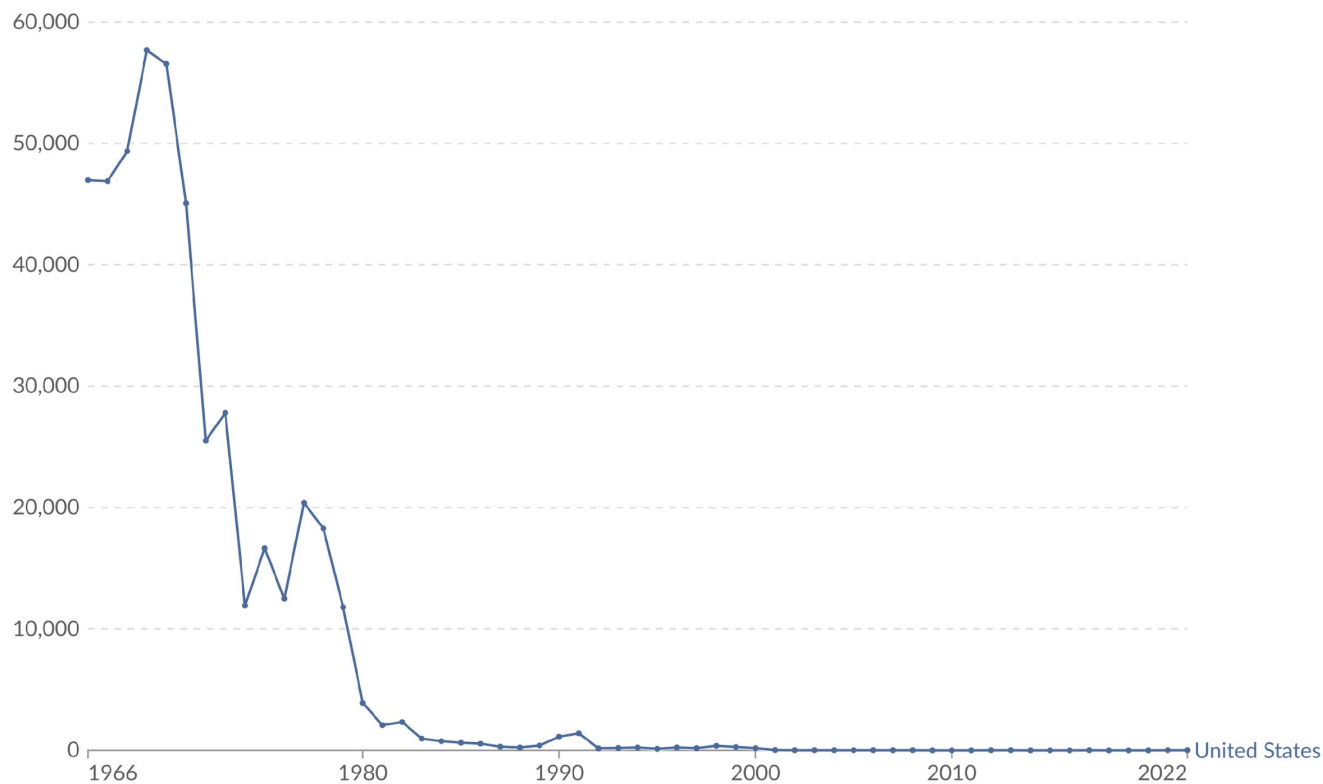
Rubella – Impact



Rubella cases in the United States, 1966 to 2022

Our World
in Data

Reported number of rubella¹ cases in the United States.



Varicella

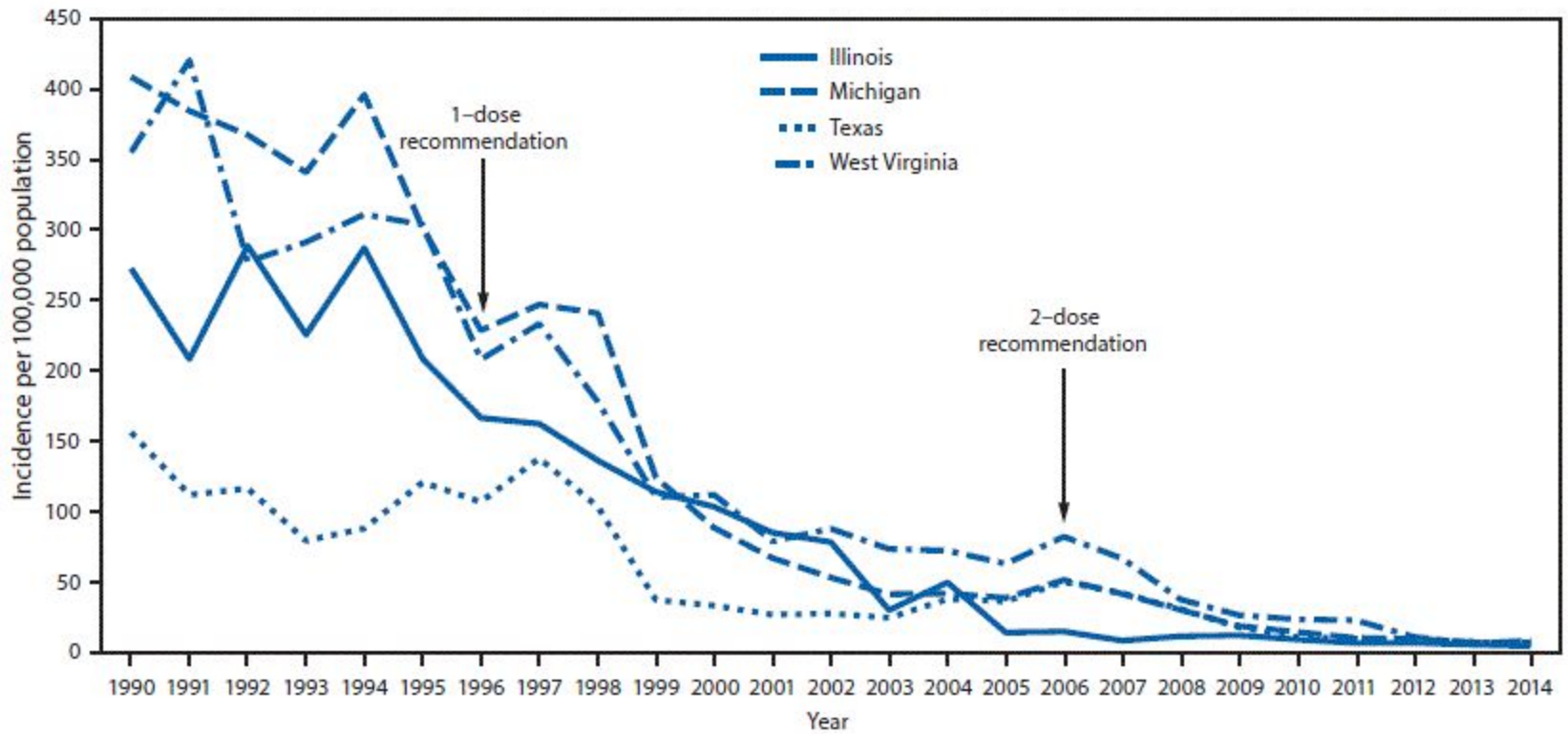


- Overview
 - Highly contagious respiratory virus
 - Disease: Febrile illness with vesicular rash
 - Complications: Bacterial skin infections, pneumonia, encephalitis
- Reason to immunize
 - Prevent hospitalizations (10,000 hospitalizations)
 - Prevent huge number of cases (~ 4 million per year)

Varicella – Not good



Varicella – Impact

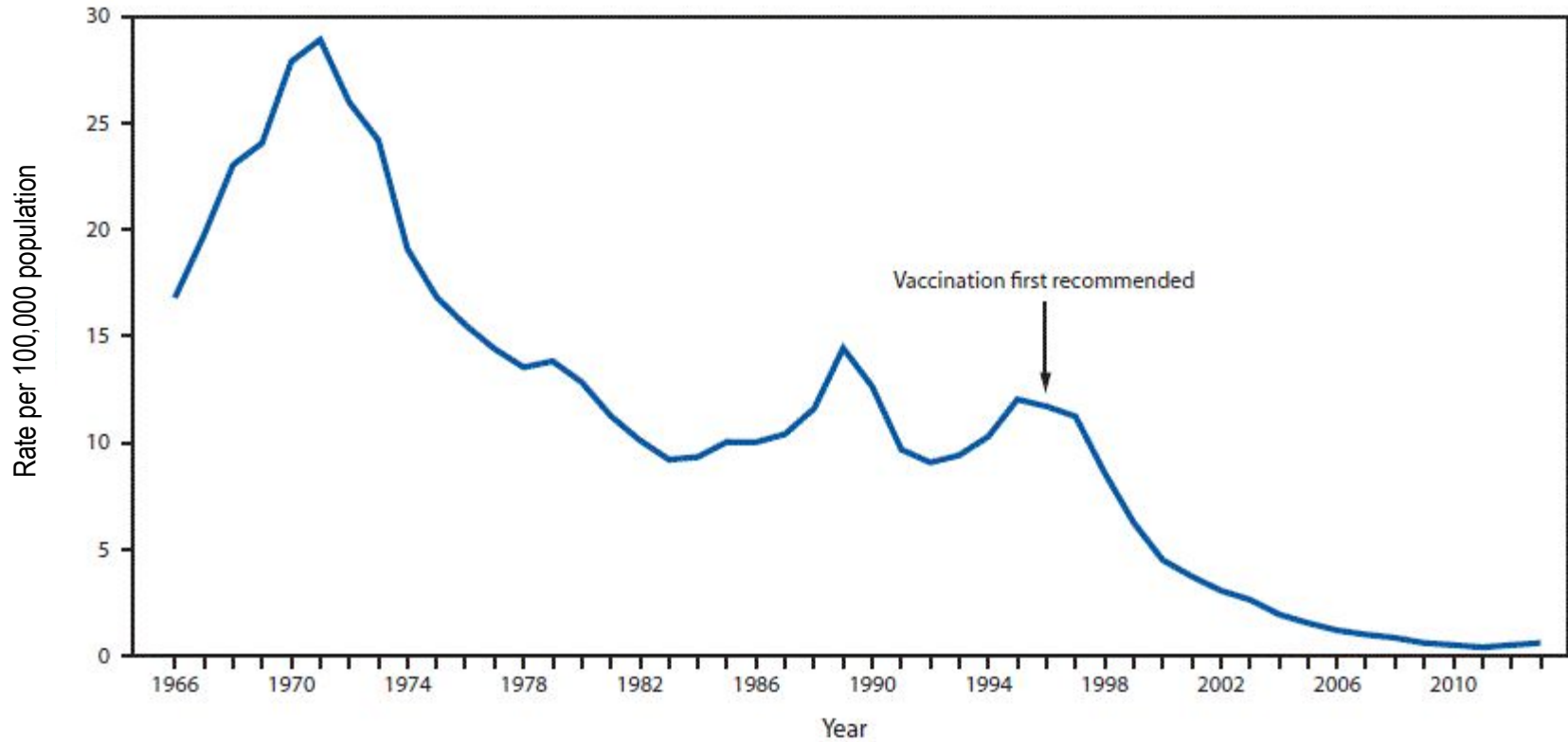


Hepatitis A



- Overview
 - Highly contagious stool virus
 - Seroprevalence prior to vaccination: 38%
 - Disease: hepatitis
 - Children 70% asymptotic
 - Adults: <~1% liver failure
- Reason to immunize
 - Prevent liver failure from infections

Hepatitis A – Impact



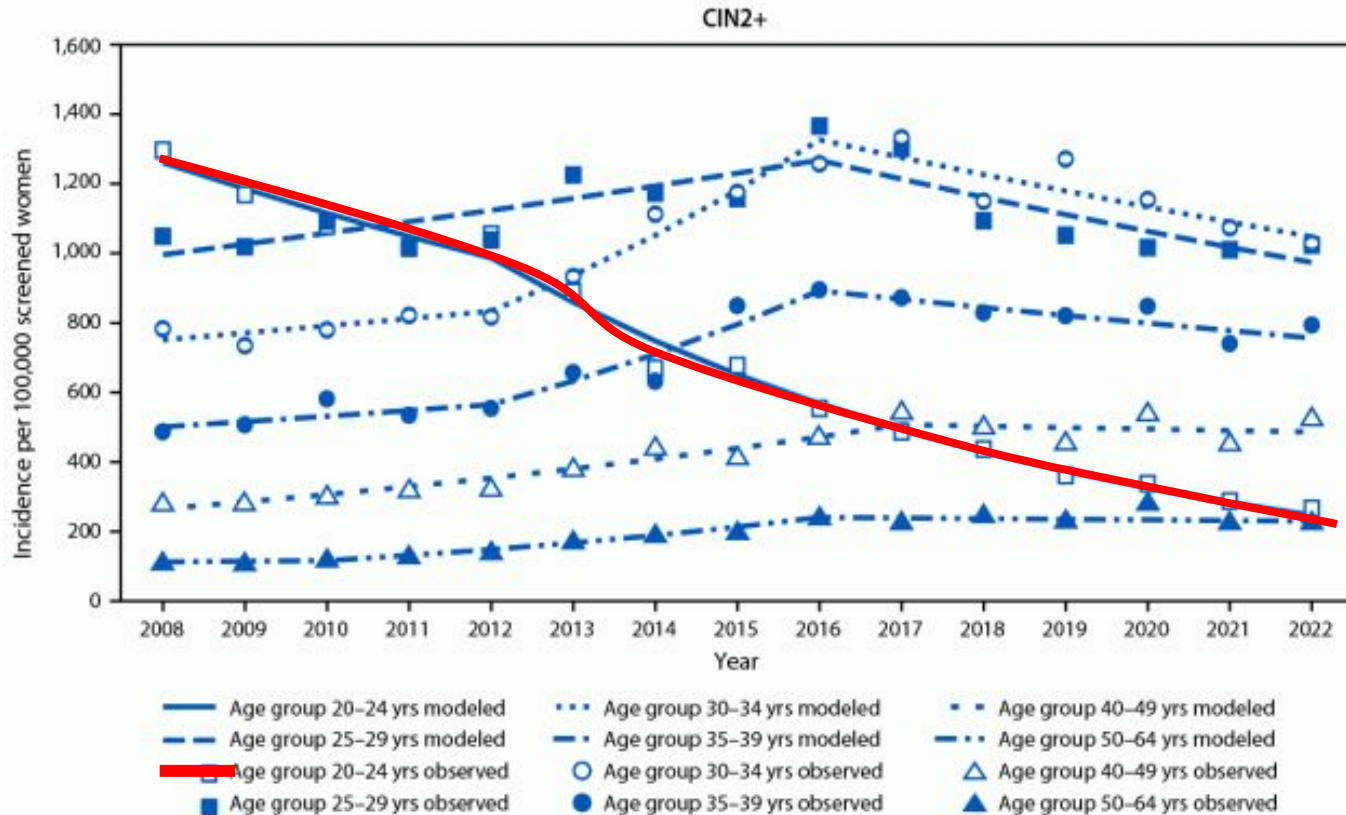
Older Kids

Human papilloma virus



- Overview
 - Viral sexually transmitted infection
 - Disease: Often minimally symptomatic or warts
 - Complications: HPV causes 100 % of cervical cancer
- Reason to immunize
 - Prevent cervical cancer (12,000 cases per year)
 - Why vaccinate boys? **They are the vectors**

Human papilloma virus – Impact



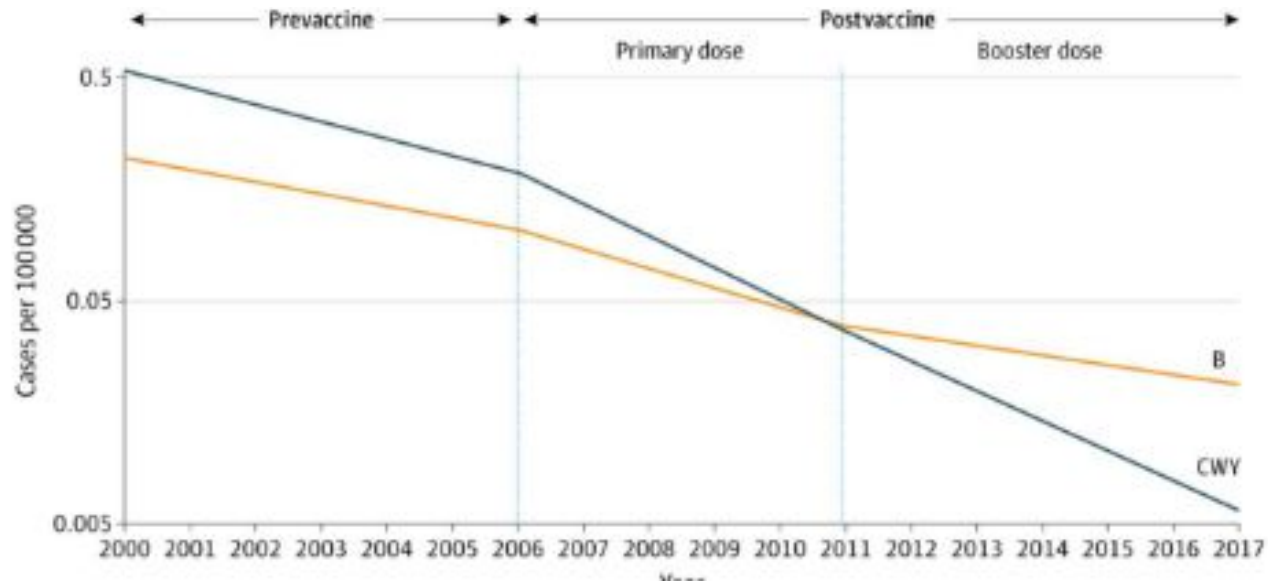
- Dramatic decrease in precancer screens in vaccine aged women
- It will take a generation to see an impact on cervical cancer

Neisseria meningitidis



- Overview
 - Transient bacterial colonizer of the nasopharynx
 - Disease: Meningitis, sepsis
 - Classically associated outbreaks due to communal living
 - Overall relatively low incidence
- Reason to immunize
 - Prevent a scary disease, but admittedly rare

Neisseria meningitidis



“Yearly”

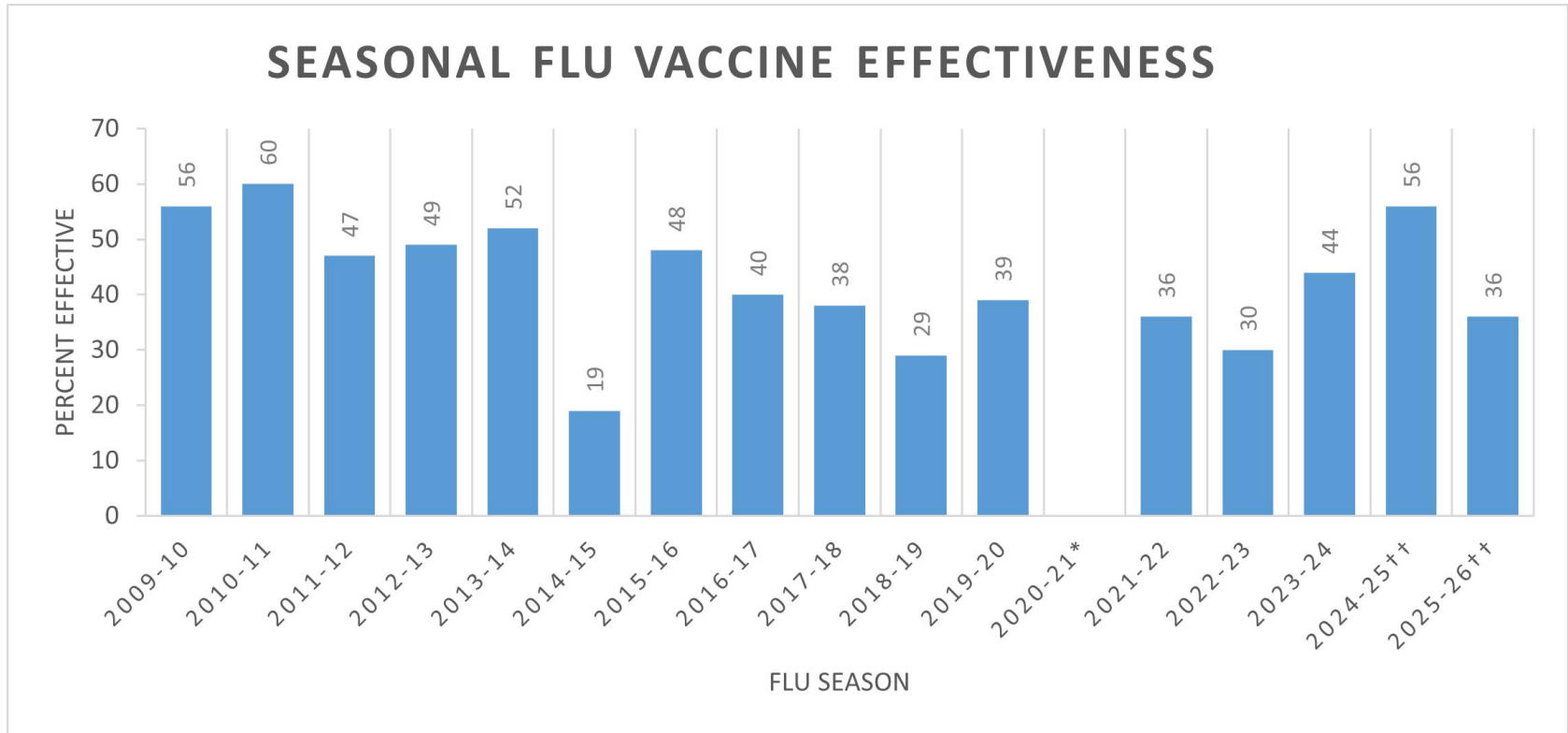
Influenza



- Overview
 - Highly infectious respiratory virus
 - Disease: “Influenza like illness”
 - Complications: viral pneumonia, bacterial super infections
- Reason to immunize
 - Prevent hospitalization is in kids <5 years old (~15,000 per year)
 - Prevent high rate of illness is in kids <18 years old



Influenza

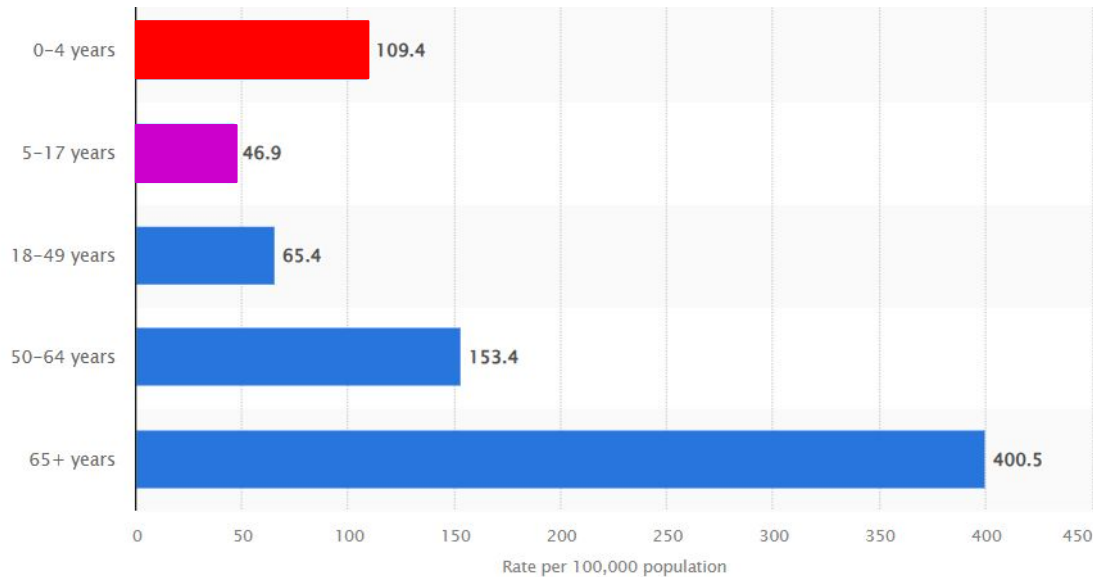


- Efficacy ranges from 30-60%
- Thought to be higher in youngest kids with no prior infection

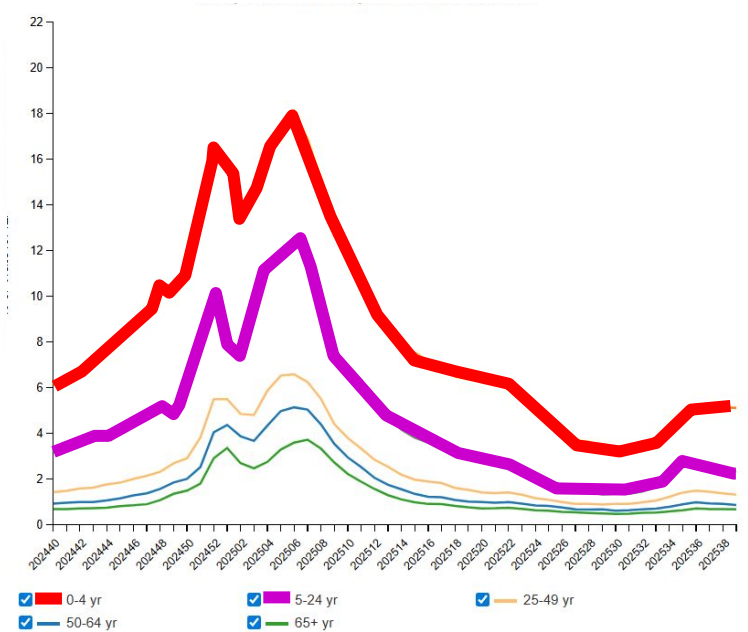
Influenza – Not good



Incidence of Hospitalization



Incidence of illness



Focusing on immunizing the youngest / un-immunized / high risk is the most important

Also: the nasal vaccine is an easier sell

COVID



- Overview
 - Highly infectious respiratory virus
 - Disease: Typically, mild cold like symptoms in kids
 - Complications: hospitalization in babies, Multisystem Inflammatory Syndrome in Children
- Reason to immunize
 - Prevent hospitalization in infants
 - Prevent MIS-C in unvaccinated / uninfected children

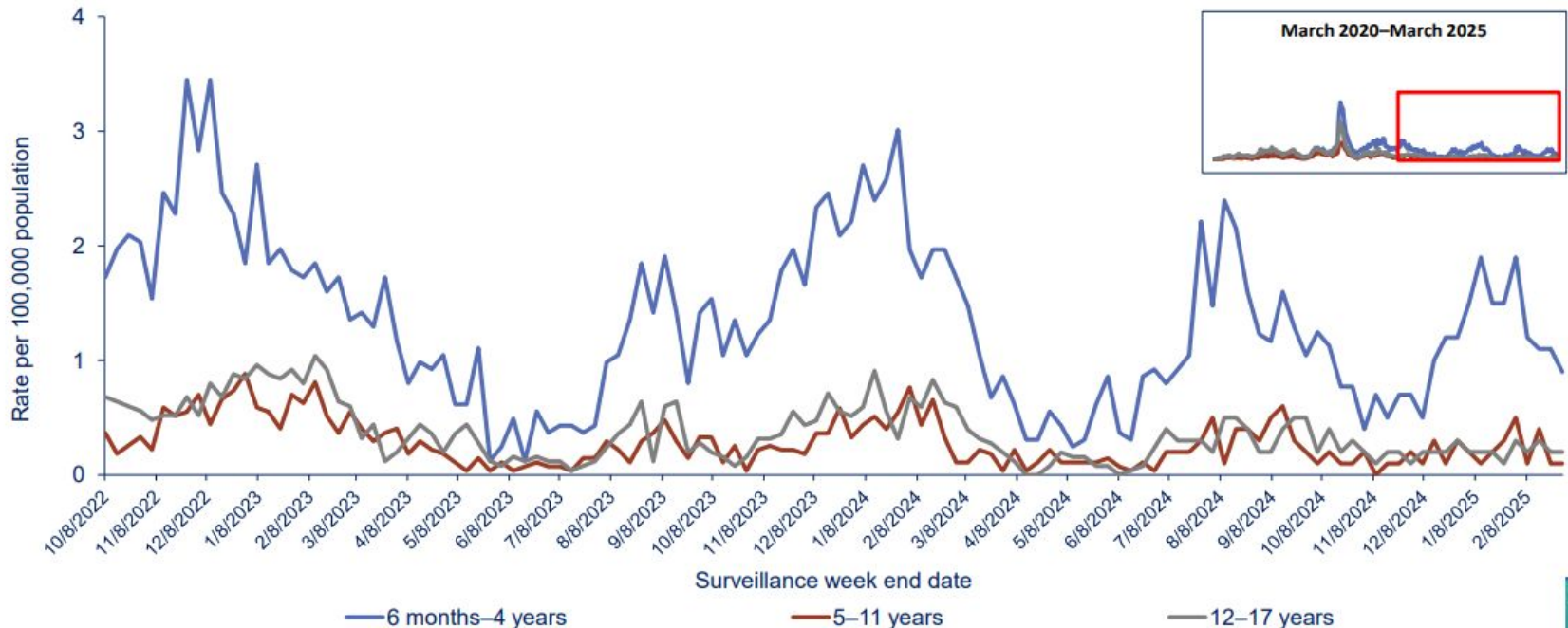


COVID – Not good



Among children and adolescents eligible for COVID-19 vaccines, cumulative rates of COVID-19–associated hospitalizations remain the highest among children ages 6 months–4 years.

Weekly rates of COVID-19–associated hospitalizations — COVID-NET, October 2022–March 2025



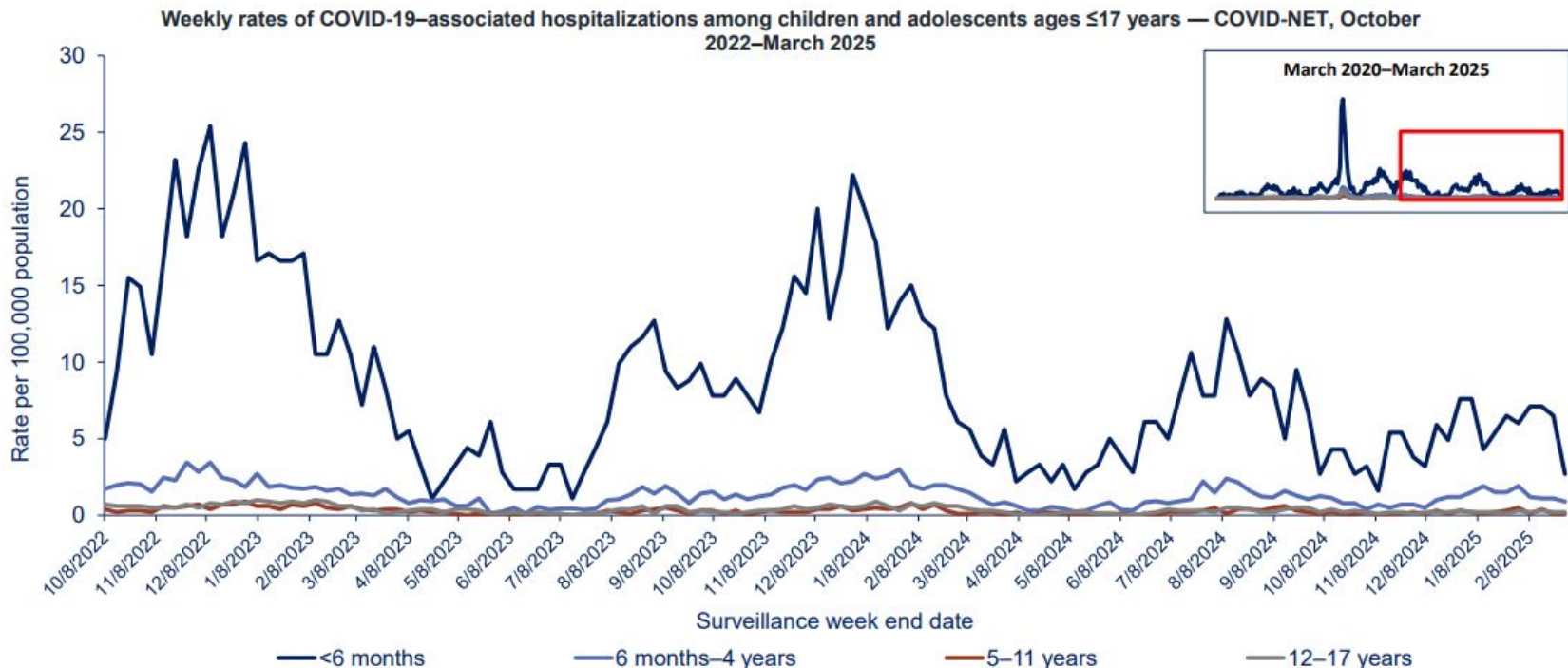
Focusing on immunizing the youngest / un-immunized is the most important



COVID – Not good



Among all children and adolescents, rates of COVID-19–associated hospitalizations are highest among infants ages <6 months.



**COVID hospitalization is highest in <6 months olds...
which is why maternal vaccination is important**



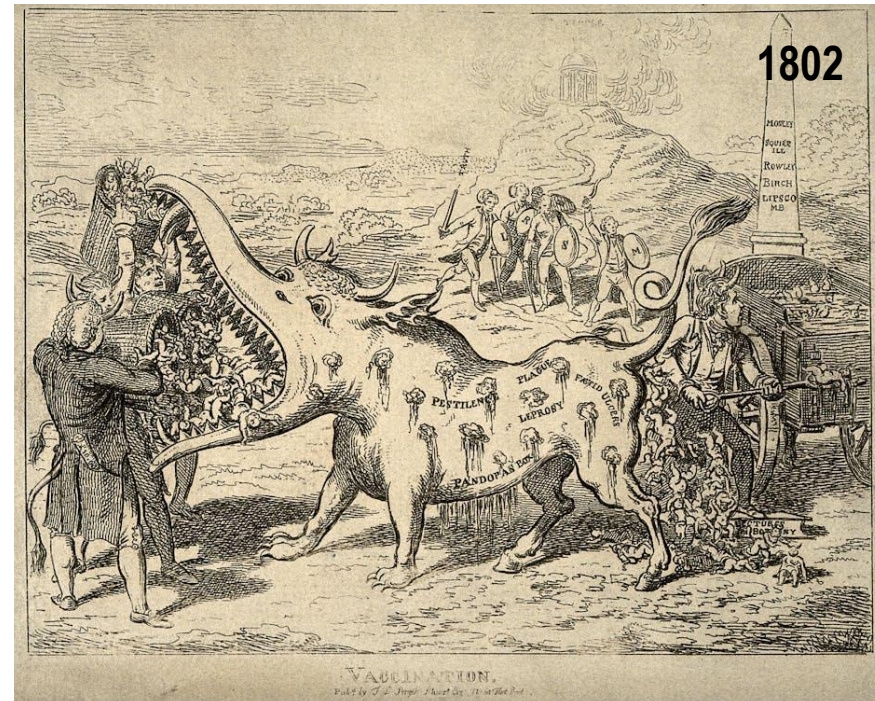
Discussions with Families

(time permitting)

Vaccine Fear – Not Remotely New!



This was satire....



This was not....

Discussion with Families

- Ask about specific concerns
- Answer confidently
- Answer be honest
- Use common language
 - Meningitis = brain eating bacteria or "head full of pus"
 - Pneumonia = bacteria rotting lungs
 - Encephalitis = brain inflammation
- Give examples of bad vaccines to make the good ones look good

Discussion with Families

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 - Meningitis = brain eating bacteria or "head full of pus"
 - Pneumonia = bacteria rotting lungs
 - Encephalitis = brain inflammation
- Give examples of bad vaccines to make the good ones look good
- **Choose your battles base on level of hesitance**

Chose Your Battles

- Specific concerns
- General reservations
- No interest whatsoever

Chose Your Battles

- Specific concerns
 - Gets most vaccines, but has questions
 - Might not get yearly vaccines
- General reservations
- No interest whatsoever

Example: my sister

- Easy discussion
- May need refreshers

Chose Your Battles

- Specific concerns
 - Gets most vaccines, but has questions
 - Might not get yearly vaccines
- General reservations
 - Mandatory school vaccine only
 - Delayed vaccination
 - Probably no yearly vaccines
- No interest whatsoever

Example: my sister

- Easy discussion
- May need refreshers

Example: my cousins

- Readdress over several visits
- Slow vaccination = success

Chose Your Battles

- Specific concerns
 - Gets most vaccines, but has questions
 - Might not get yearly vaccines
- General reservations
 - Mandatory school vaccine only
 - Delayed vaccination
 - Probably no yearly vaccines
- No interest whatsoever
 - Mandatory school vaccines (but angry about it)
 - No vaccines

Example: my sister

- Easy discussion
- May need refreshers

Example: my cousins

- Readdress over several visits
- Slow vaccination = success

Example: my dad

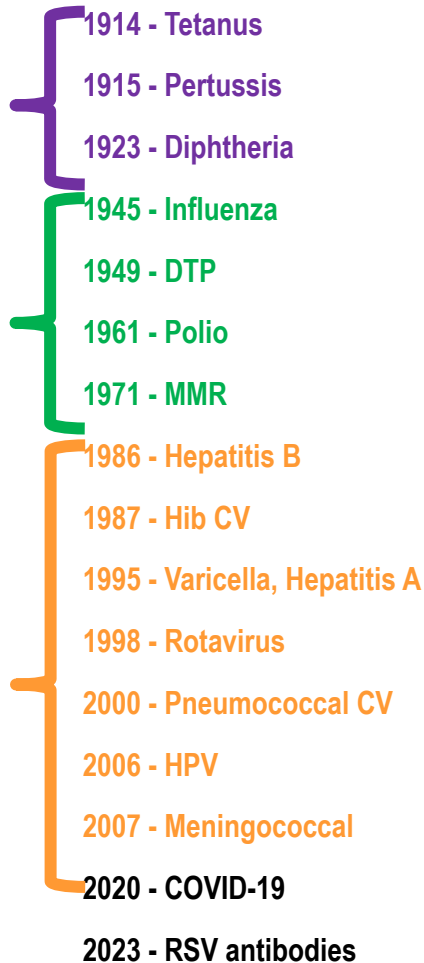
- No amount of reasoning will work
- Recommend vaccines, but this is not where to commit your time

Common Misconception

Common Misconceptions

- Things I often hear:
 - We don't know the long-term effects
 - Vaccines are “too much for their little bodies”
 - Vaccines side effects are worse than a natural infection
 - Waiting to vaccinate is OK
 - They are not at risk for the infection
 - We can just treat the infections

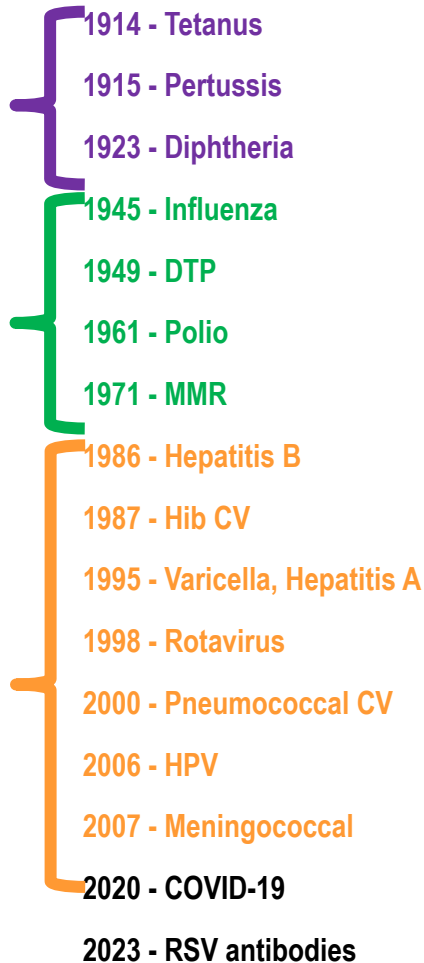
“We don’t know the long-term effects”



Pediatric Vaccine introduction in the US

- **OG vaccine: >100 years of use**
- **Core vaccines: >50 years of use**
- **Expanded: >20 years experience**

“We don’t know the long-term effects”



Pediatric Vaccine introduction in the US

- **OG vaccine: >100 years of use**
- **Core vaccines: >50 years of use**
- **Expanded: >20 years experience**

So what do I say?

We have generations of experience with pretty much all vaccines. Some as long at 100 years. Any long-term effects would be clear by now.

“Too much for their little bodies”

- Usually a vague concern about too much “inflammation”, “exposure”, etc. in vaccines.
 - The specific phrasing each person uses is variable
- Children get exposed to more antigen with natural infection
 - MMR contains ~1,000 live attenuate measles particles
 - Measle infections sheds >10 billion particles per day in the urine alone
 - That’s >10 million times the “exposure” per day alone!

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 - Measle infections sheds >10 billion particles per day in the urine alone
 - That’s >10 million times the “exposure” per day alone!
- So, What do I say?
 - Even the common cold exposes a kid to more infection / antigen / inflammation than every vaccine a kid will ever get combined.

Vaccine side effects vs natural infection

- Febrile seizures
 - Measles infection: febrile seizures common, encephalitis 1 in 500
 - Measles vaccine: 1 in 4000
- Guillain-Barré syndrome
 - Influenza infection: 18-fold risk of GBS after influenza-like illnesses
 - Influenza vaccine: No increased risk of GBS

Vaccine side effects vs natural infection

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- Guillain-Barré syndrome
 - Influenza infection: 18-fold risk of GBS after influenza-like illnesses
 - Influenza vaccine: No increased risk of GBS
- So, what do I say?
 - Natural infections are much, much worse than any vaccine side effects
 - Natural infections are 100s of times more likely to cause seizures than vaccines... ***Vaccines are our only way to prevent febrile seizures***

Concerning Vaccines get Removed

- Polio

- Oral polio vaccines rarely caused poliomyelitis (1 in 500,000 vaccinations)
- Result: OPV phased out in US, replaced with IPV



- Rotavirus

- Found to cause intussusception (1 in 5 to 10,000 vaccinations)
- Result: taken off market, took several years to develop safer vaccines



- Whole cell pertussis

- Lots of systematic / local reactions
- Result: Phased out in US, replaced with acellular vaccine



Vaccination is Global, So is Safety Monitoring

- All countries agree with pediatric vaccination
 - DTP, Hep B, Hib, Polio, Measles, Rubella, PCV, MMR, HPV, rotavirus are universal
 - Billions of doses are given every year
- So, what do I say?
 - We have given 10s of billions of doses... even rare side effects would be super obvious by now
 - All countries agree with pediatric vaccination, regardless of their politics

“Waiting to Vaccinate is OK”

- Usually, a concern that vaccines are safer in older children
 - See previous slides on why vaccines are timed when they are...
- So, what do I say?
 - We vaccinated kids before they are at risk of getting disease... postponing / alternative schedules means they are unprotected when they are at their highest risk.
 - Vaccinated kids are protected from most scary things that cause fever. When an unvaccinated kid comes in with a fever, I'm always scared for the kid.
 - *I say this EVERY TIME I see an unvaccinated kid with a fever*

“They are not at risk for the infection”

- Can be true depending on the vaccine...
 - No risk / eliminated: Diphtheria, Hib, rubella, polio
 - Low risk / outbreaks: Hepatitis A, Hepatitis B, Measles, Meningococcal, tetanus
 - Still circulate in the community: RSV, pertussis, rotavirus, pneumococcal, varicella, HPV, influenza, COVID

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 - Low risk / outbreaks: Hepatitis A, Hepatitis B, Measles, Meningococcal, tetanus
 - Still circulate in the community: RSV, pertussis, rotavirus, pneumococcal, varicella, HPV, influenza, COVID
- So, what do I say?
 - I'm honest about the various risks
 - I prioritize vaccines to some extent if it will get them vaccinated
 - I refuse to break apart combination vaccines
 - Its mean to give extra shots

“We can just treat the infections”

- No
 - Hep A, HPV, Rotavirus, RSV, Polio, measles, mumps, rubella,
- Yes, but the treatment is not effective
 - COVID, Hep B, flu, varicella
- Yes, often the damage is done
 - Hib, pneumococcal, meningococcal, pertussis



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- Yes, but the treatment is not effective
 - COVID, Hep B, flu, varicella
- Yes, often the damage is done
 - Hib, pneumococcal, meningococcal, pertussis
- So, what do I say?
 - Most have no treatment. A few have treatments, but by the time you use them the damage is already done.

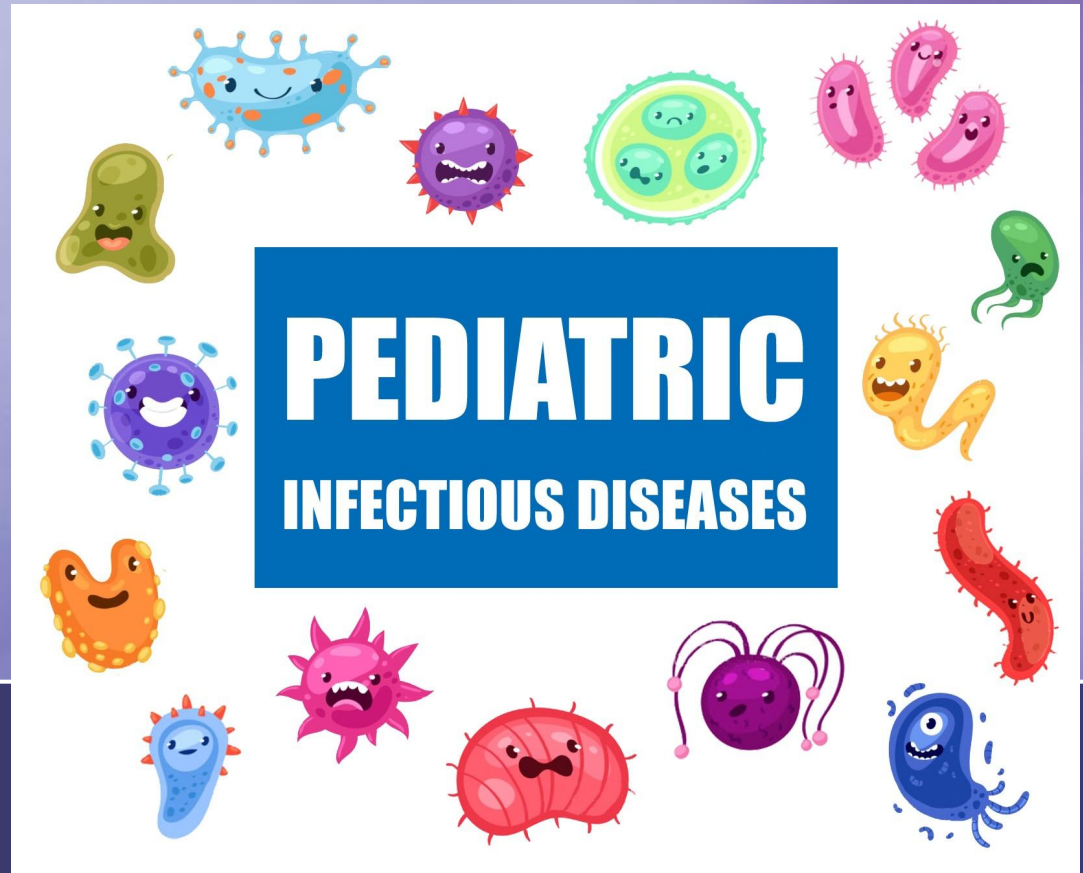
Conclusions

Vaccinate!



Questions?

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Concerns and Conspiracies

Concerns and Conspiracies

- Aluminum
- Autism
- Mercury

Aluminum

- Known risk of neurotoxicity with large doses
- No risk from vaccines
 - Amount in vaccines: 4-7 mg total
 - Amount in food: 7 mg daily
 - No health risk in cohort of >1.2 million Danish children



Aluminum

- Known risk of neurotoxicity with large doses
- No risk from vaccines
 - Amount in vaccines: 4-7 mg total
 - Amount in food: 7 mg daily
 - No health risk in cohort of >1.2 million Danish children
- So, what do I say?
 - Your child eats more aluminum every day in their diet than they get in all vaccines they will ever get combined



Autism



- Diagnosed 1+ years old, after vaccines have been given
- Discredited English autism study suggested a link
 - The data in the study was faked: it was retracted
 - The primary author was trying to drum up business for his own vaccines
- No risk from vaccines
 - No increased autism risk in cohort of >500,000 Danish children
 - All other studies agree

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- Discredited English autism study suggested a link
 - The data in the study was faked: it was retracted
 - The primary author was trying to drum up business for his own vaccines
- No risk from vaccines
 - No increased autism risk in cohort of >500,000 Danish children
 - All other studies agree
- So, what do I say?
 - We don't know the cause of autism is, but we know 100% that its not vaccines

Mercury

- Known risk of neurotoxicity of mercury
 - Thimerosal (preservative) contains mercury
- Thimerosal is no longer in scheduled pediatric vaccines
 - Thimerosal is metabolized to ethyl mercury, which is not toxic
 - Amount a set of vaccines: maximum 200 mcg
 - Amount 1 liter of breastmilk: 1,000 mcg



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 - Thimerosal (preservative) contains mercury
- Thimerosal is no longer in scheduled pediatric vaccines
 - Thimerosal is metabolized to ethyl mercury, which is not toxic
 - Amount a set of vaccines: maximum 200 mcg
 - Amount 1 liter of breastmilk: 1,000 mcg
- So, what do I say?
 - Mercury is no longer in scheduled pediatric vaccines
 - When it was, babies got more mercury exposure per day from drinking breast milk than from a set of shots

