

IMMUNIZE. PREVENT WHAT'S PREVENTABLE

Herd Immunity: Protect Yourself and Others



THE
IMMUNIZATION
PARTNERSHIP

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The Immunization Partnership

Vision

A community protected from vaccine preventable diseases

Mission

To eradicate vaccine-preventable diseases by educating the community, advocating for evidence-based public policy, and supporting immunization best practices



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Continuing Education Statement

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Continuing Education Requirements

- Requirements for successful completion of learning activity
 - Listen to entire presentation
 - Submit online pre-test
 - Submit online evaluation
- Certificate of completion sent via email
- Contact Katy Gore at kgore@immunizeUSA.org with questions



Disclosure and Disclaimer

- The speakers and planning committee have disclosed no conflicts of interest.
- This presentation is for educational use only and does not constitute legal or medical advice.



Agenda

What is herd immunity?

How to achieve herd immunity

When herd immunity doesn't work...

Explanation and examples of vaccine-preventable outbreaks

Tips for reaching herd immunity

Helpful Resources



What is herd immunity?



Herd Immunity

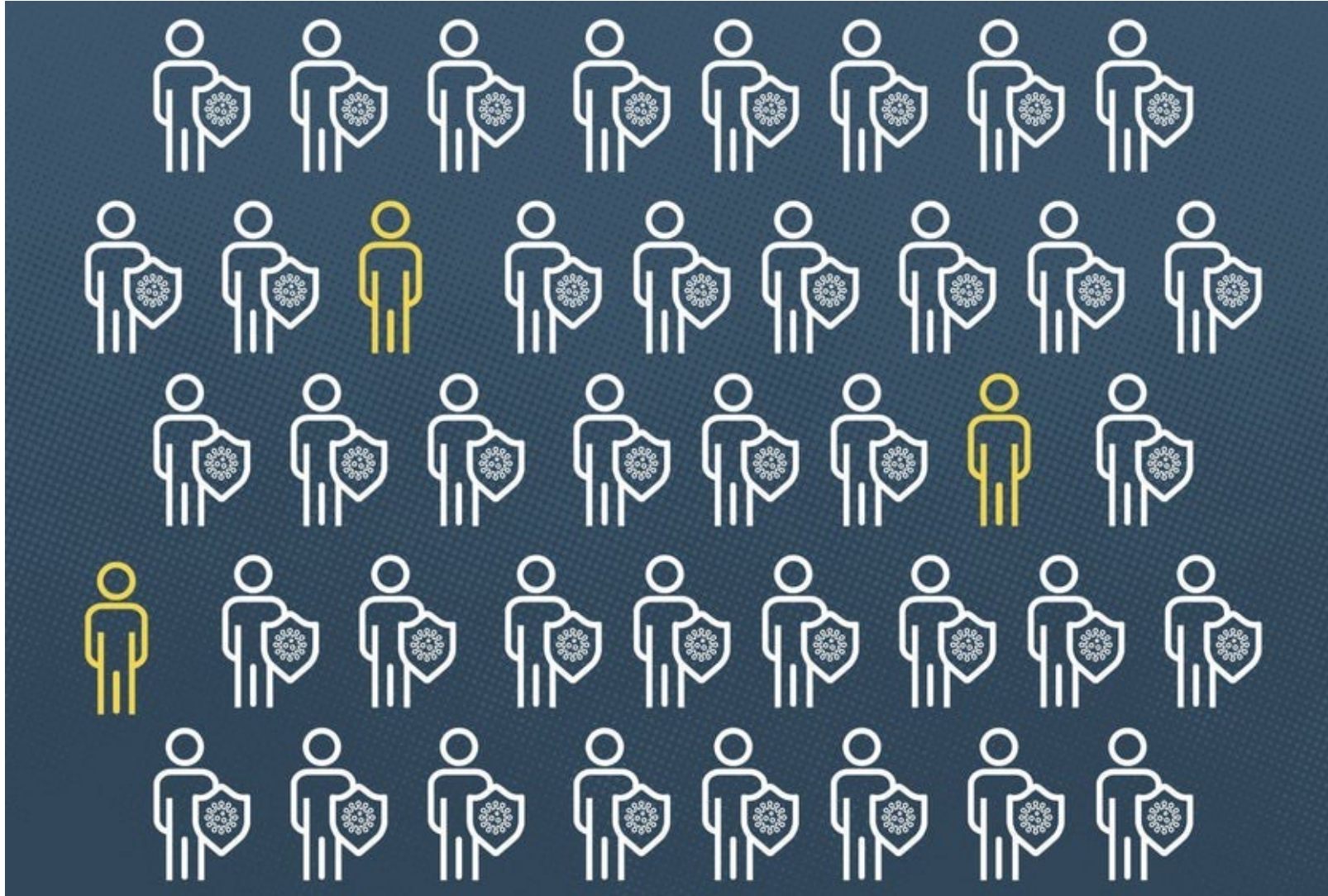


Image from: <https://slate.com/technology/2021/05/covid-herd-immunity-end-pandemic.html>

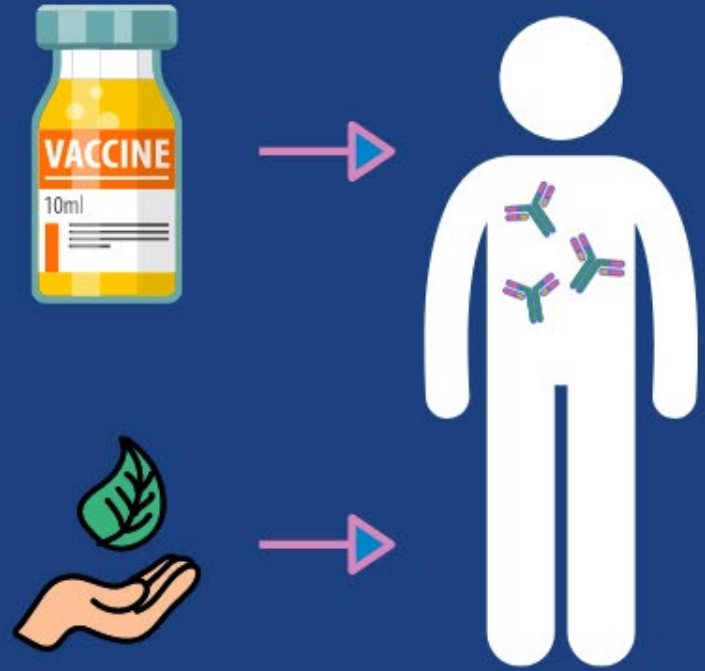


How to achieve herd immunity

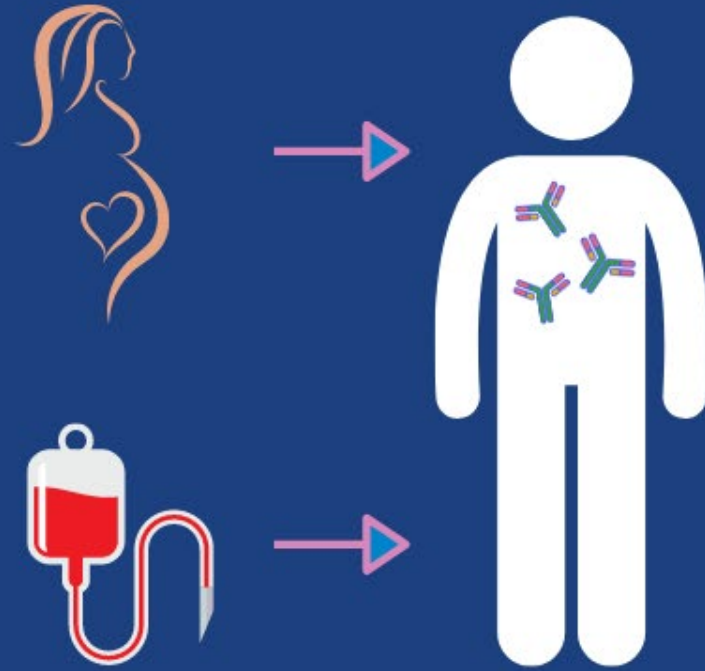


TYPES OF IMMUNITY

ACTIVE IMMUNITY



PASSIVE IMMUNITY



Natural Immunity

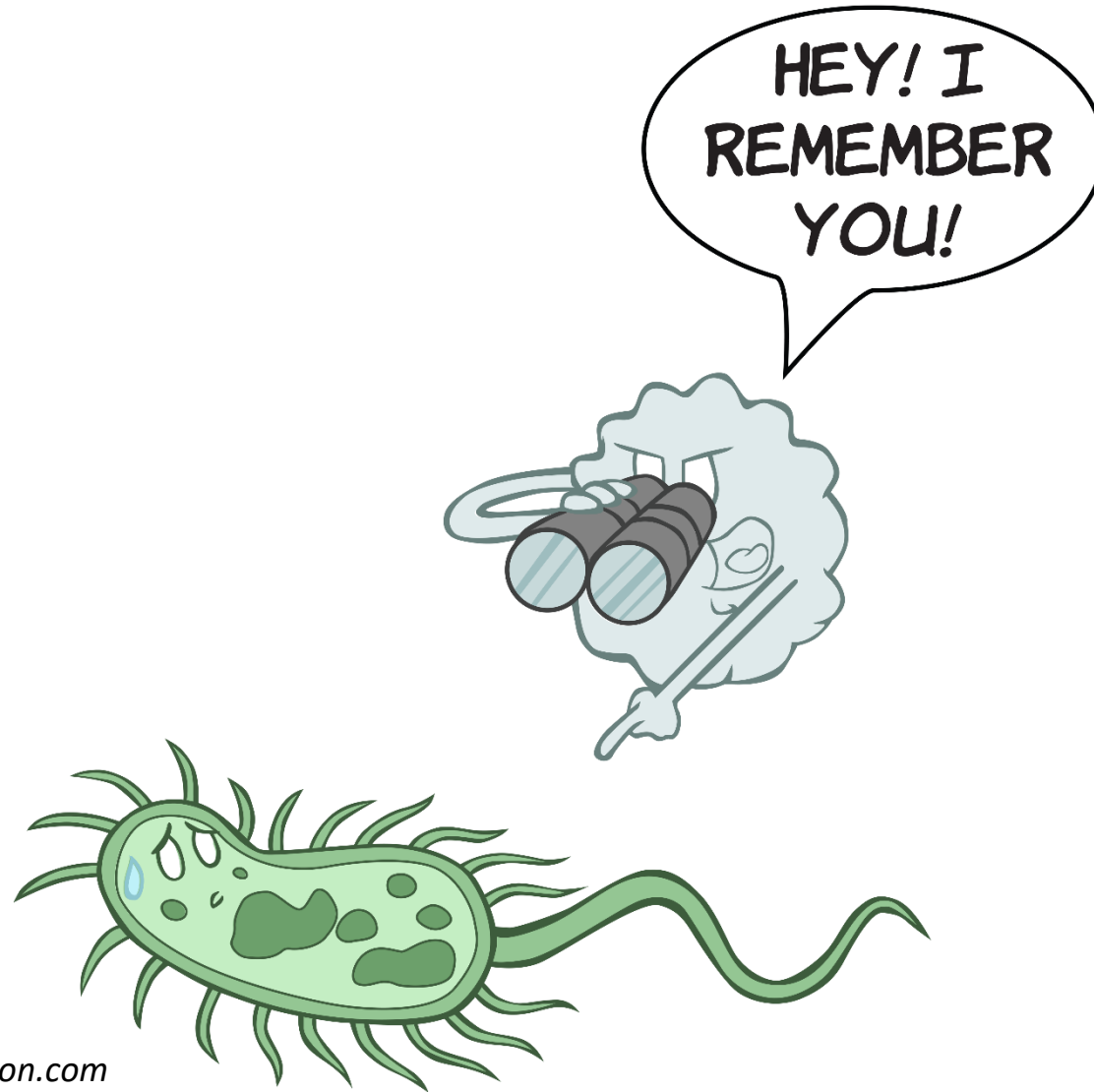


Image from:
[https://www.thepartnershipineducation.com
/resources/immune-system](https://www.thepartnershipineducation.com/resources/immune-system)



Natural infection

- Immunity develops after a single infection
- Large dose of exposure
- Time of exposure: Unknown
- More severe symptoms/outcomes (ex. pneumonia, birth defects, liver cancer, death)

- ✓ Herd immunity
- ✓ Long-lasting

Immunizations

- Full immunity usually develops after several doses
- Small dose of exposure
- Time of exposure: Controlled
- Mild symptoms (ex. headache, sore arm, nausea, chills)



Vaccines with Stronger Immune Responses

HPV vaccine

- High purity of the specific protein leads to better immune response

Tetanus vaccine

- The toxin made by tetanus is so potent that the amount that causes disease is lower than the amount that induces a long-lasting immune response. It's the reason why people with tetanus disease are still recommended to get the vaccine.

Hib vaccine

- Children less than 2 yrs old do not have a good response to the polysaccharide (sugar coating) on the surface of Hib that causes disease. The vaccine links this polysaccharide to a helper protein. Children under 2 yrs old with Hib disease are still recommended to get the vaccine.

Pneumococcal vaccine

- Works the same way as Hib vaccine



The Basics of Herd Immunity

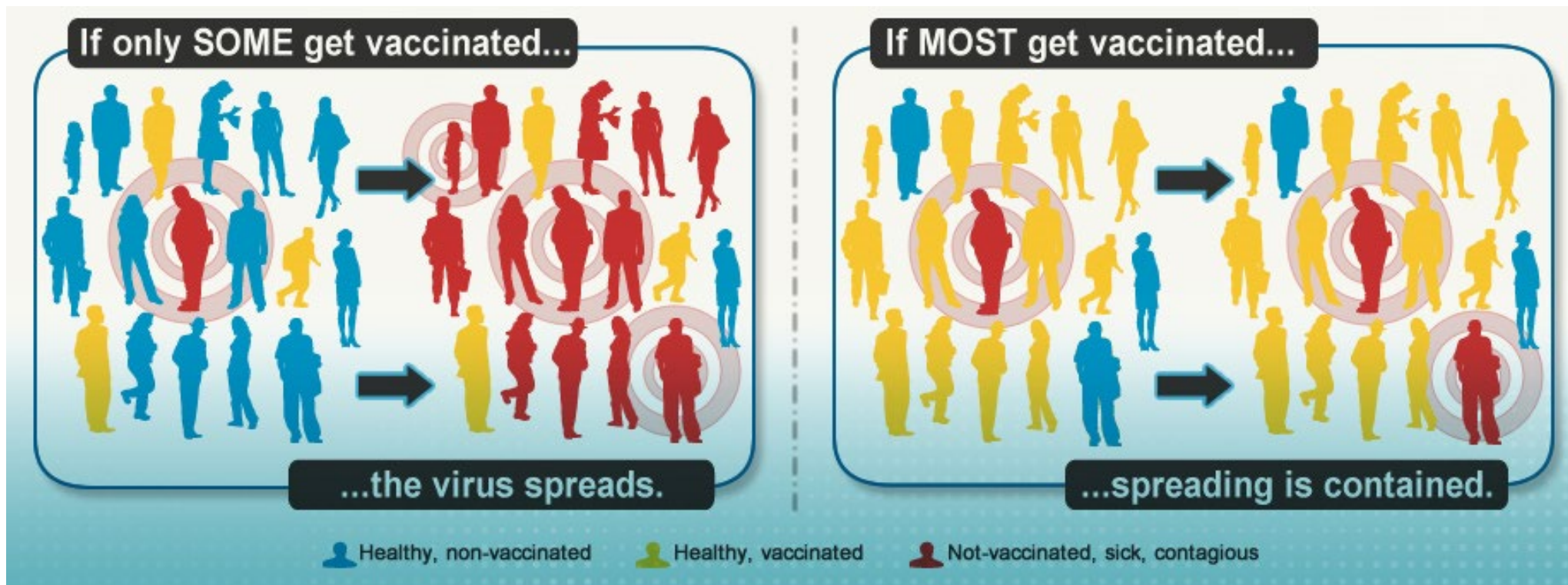


Image: <https://www.cdc.gov/vaccines/vac-gen/whatifstop.htm>



Herd Immunity Threshold

- Herd immunity threshold = $1 - 1/R_0$
- R_0 (pronounced “R naught”) = Avg. # of new people that a single infected person can expose and infect in a non-vaccinated population
- Ex. The chickenpox R_0 is around 10 - 12, meaning that each infected person infects an average of 10 - 12 more people
- Herd immunity threshold of chickenpox: $1 - (1/10) = 90\%$
- At least 90% of the of the population needs to vaccinated to stop the spread of chickenpox



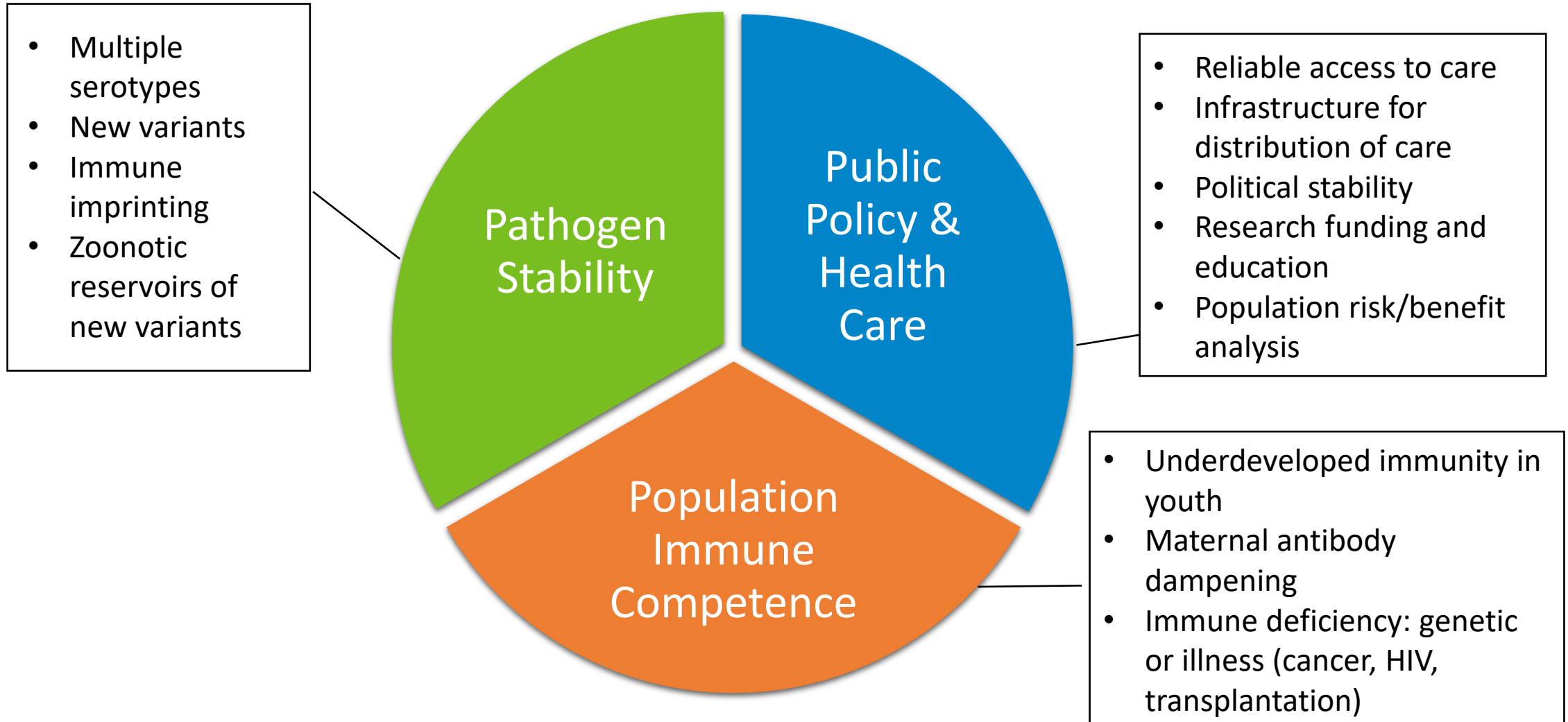
When herd immunity
doesn't work...



Groupthink Phenomenon



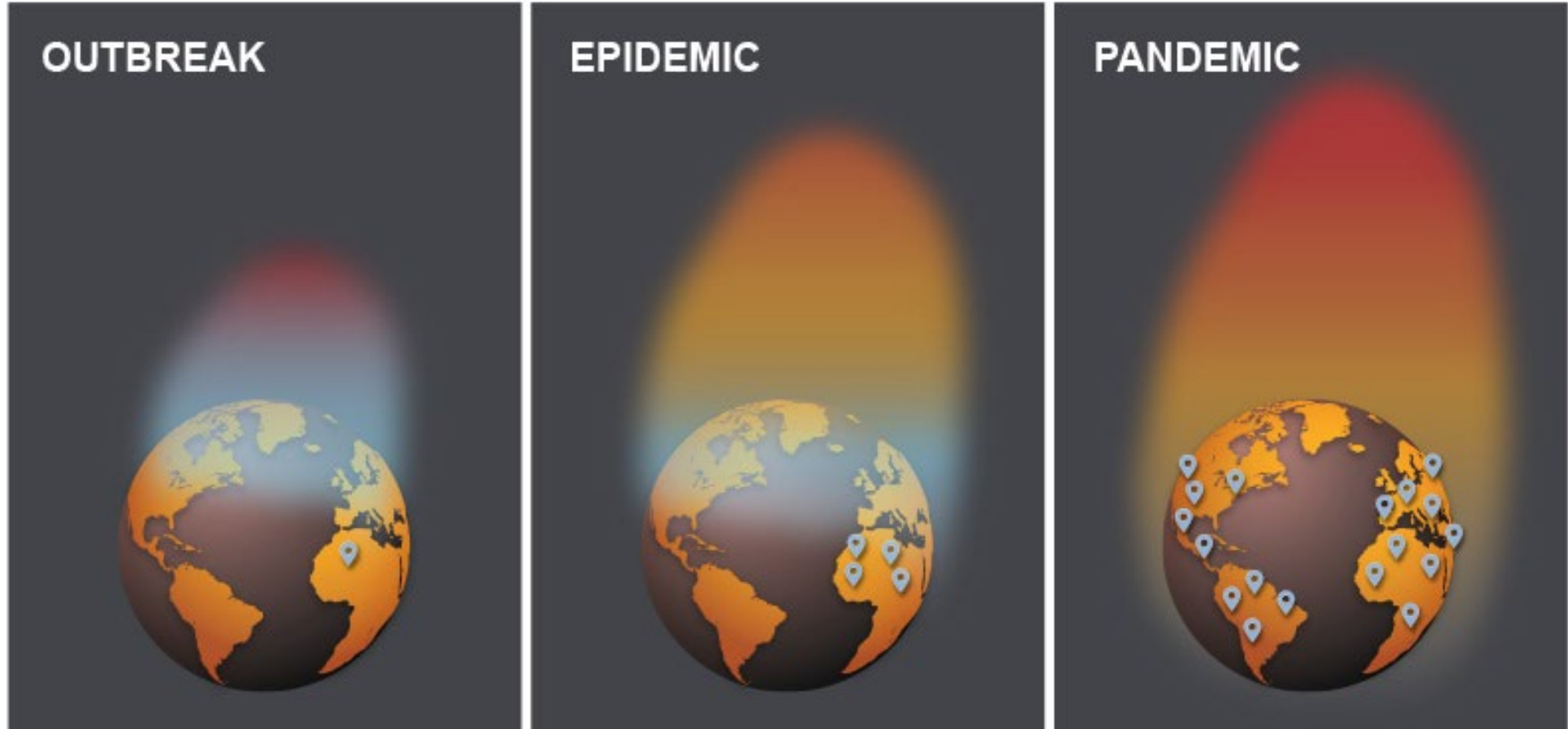
Factors Affecting Herd Immunity



Explanation and examples of vaccine-preventable outbreaks



Vaccine-preventable Outbreaks



Smallpox

- Evidence shows **smallpox has existed for at least 3,000 years.**
- Serious disease – spread from person to person through close contact. Infected individuals had **sores in mouth and throat** and **droplets (from coughs or sneezes)** could spread the virus. Fluids from body sores could also spread the virus.
- Roughly **3 out of 10 people** who contracted smallpox **died**. Survivors were often left with **scars.**
- Basis for vaccination began in **1796. Edward Jenner** inoculated the arm of 9-year-old boy with **cowpox** – proved successful protection against smallpox.



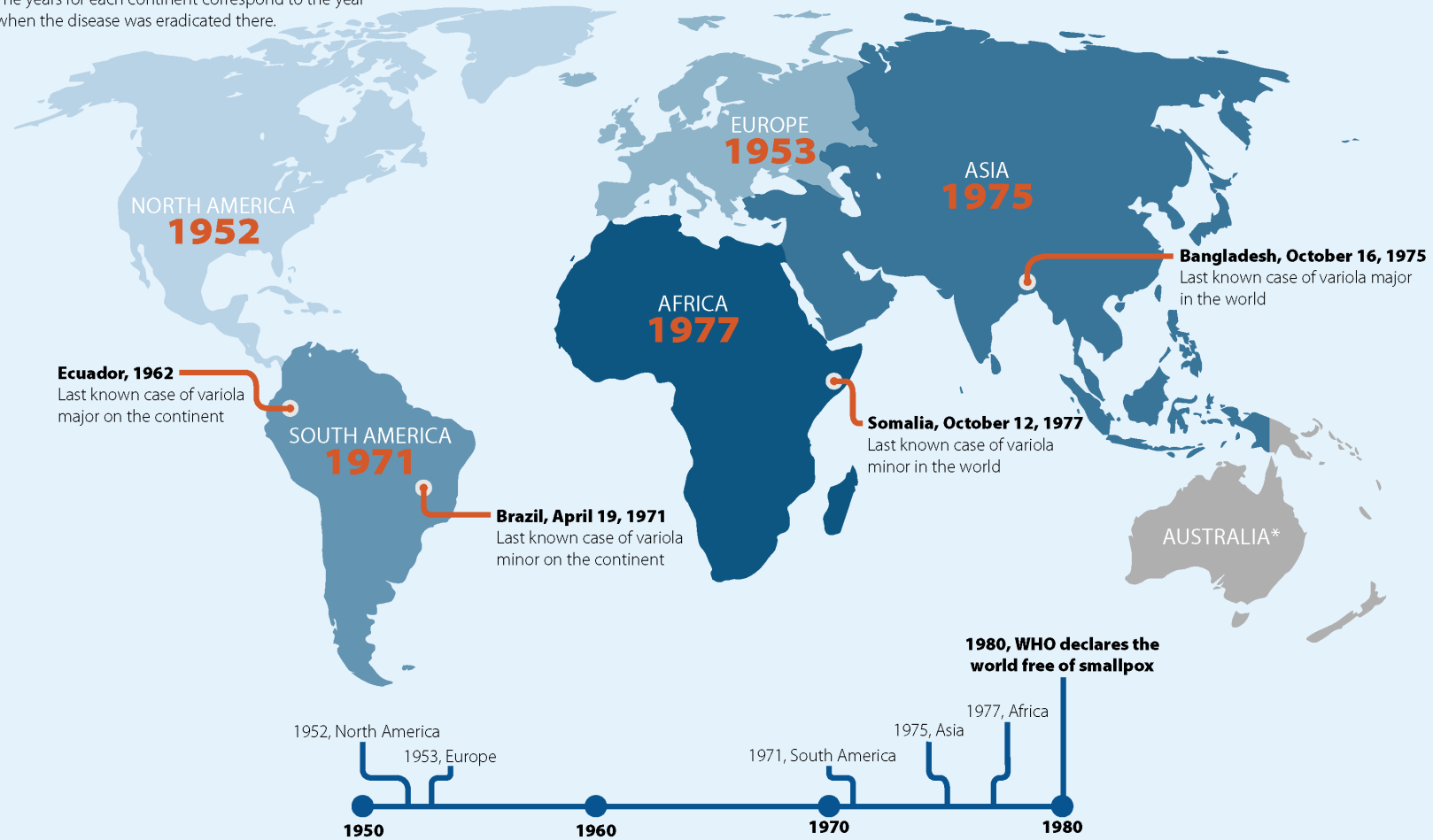
Unvaccinated vs. vaccinated 13-year-old boys



GLOBAL SMALLPOX ERADICATION

The historically important dates highlighted in the map show countries in which the last naturally acquired cases of smallpox occurred.

The years for each continent correspond to the year when the disease was eradicated there.



* Smallpox was never endemic (widespread) in Australia
CS265471-A



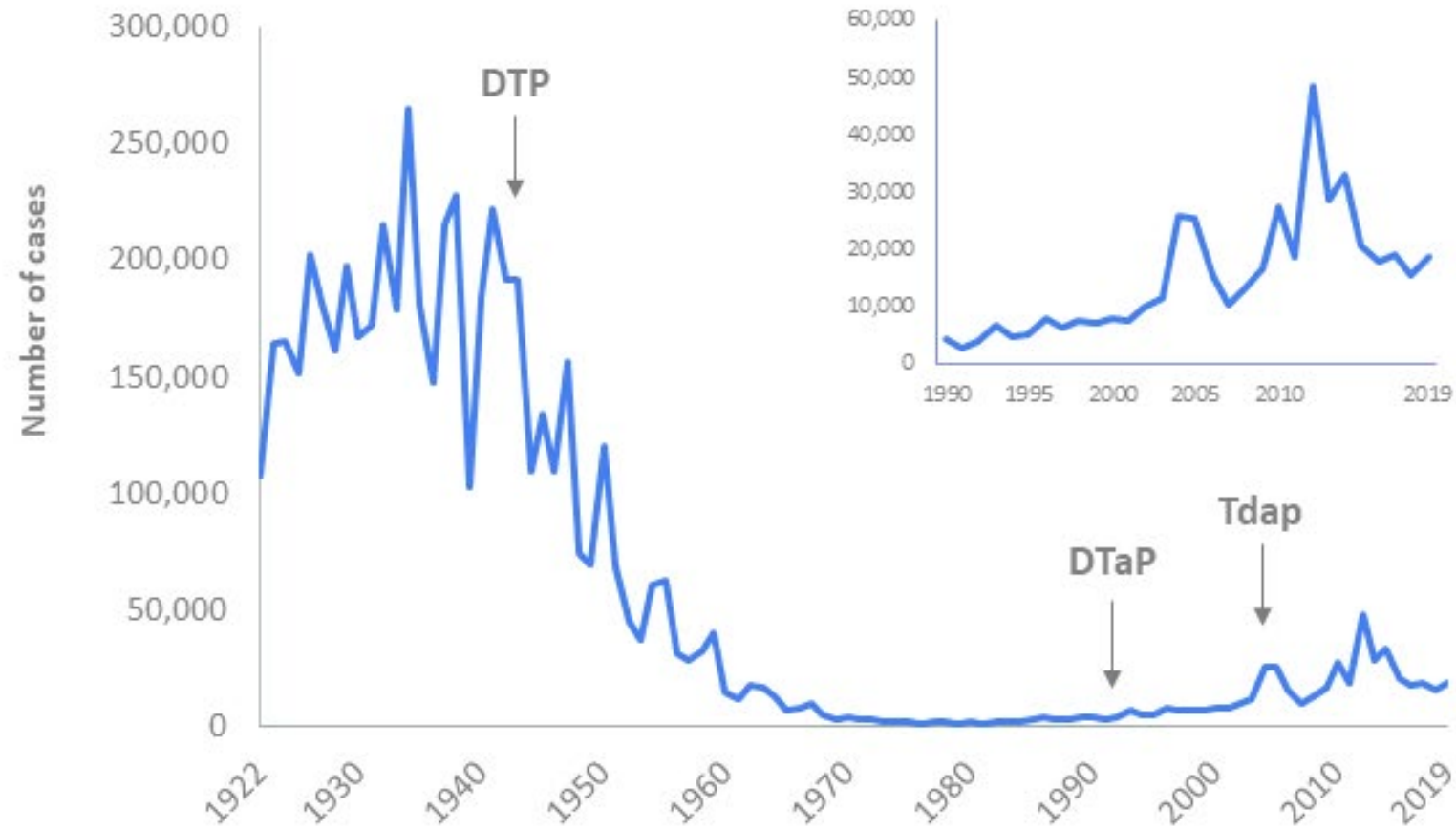
Pertussis

Common disease with frequent outbreaks

- **Pertussis** is a serious **respiratory illness** more commonly known as **whooping cough**. Caused by a bacteria that affects the upper respiratory system and is **spread through close person to person contact** (coughing, sneezing, etc.).
- Symptoms are typically **cold-like**, but can progress to more **severe, rapid coughing fits, vomiting, and exhaustion**.
- **Babies and young children** are at greater risk for **complications**, and **half of babies less than a 1** who get pertussis will **need to be hospitalized**.
- Two **vaccines** help prevent pertussis: **DTaP** (for children younger than 7) and **Tdap** (older children, teens, adults).



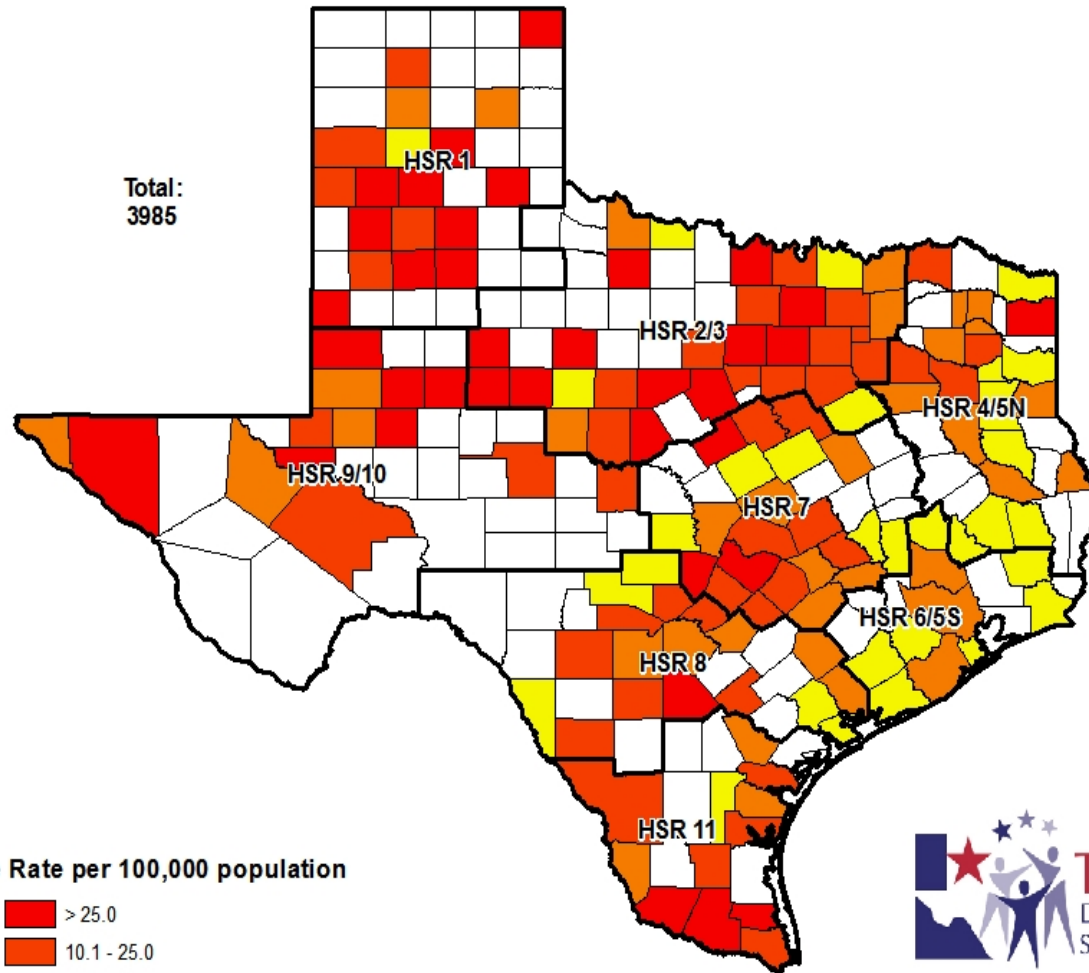
Reported NNDSS pertussis cases: 1922-2019



SOURCE: CDC, National Notifiable Diseases Surveillance System



Incidence Rates of Pertussis Cases in Texas, 2013



Incidence Rate per 100,000 population

- > 25.0
- 10.1 - 25.0
- 5.1 - 10.0
- 0.1 - 5.0
- No Cases Reported



Source: Texas Department of State Health Services, Infectious Disease Control Unit.

Prepared: June, 2014



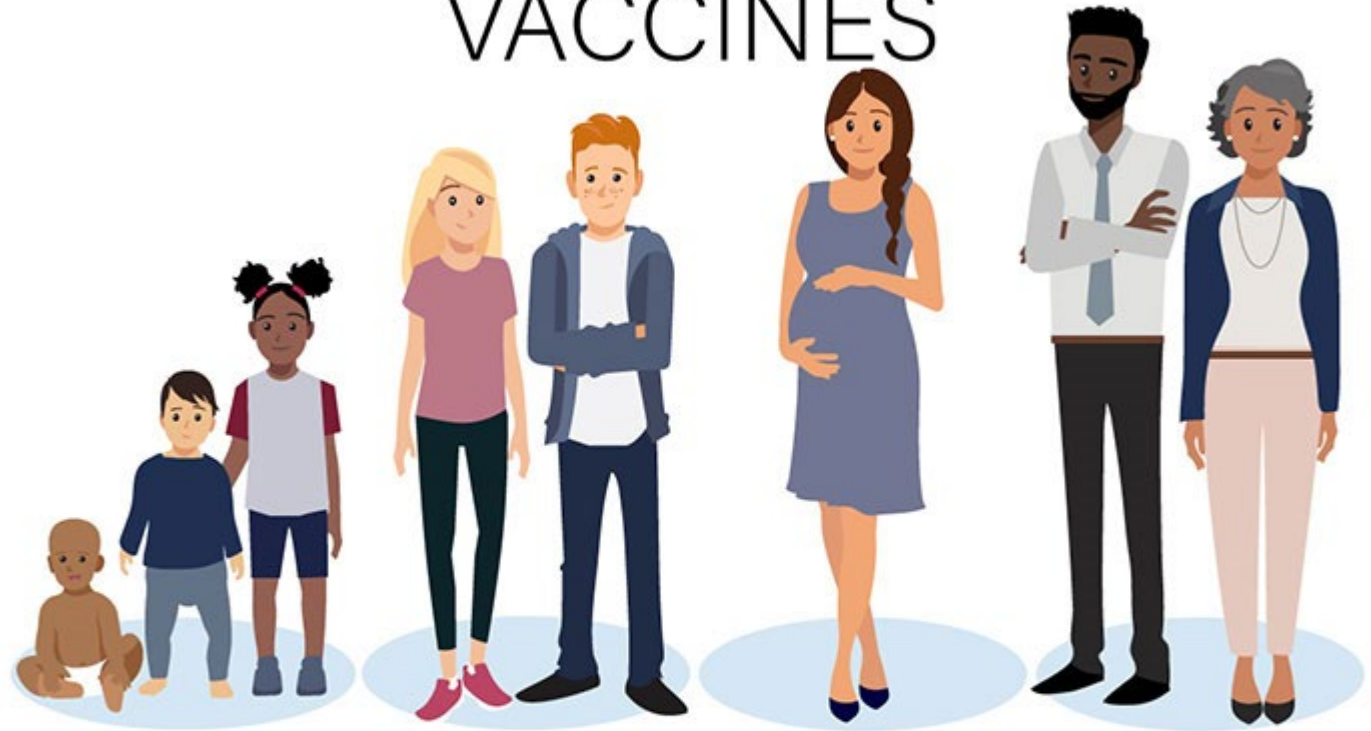
People of all ages need WHOOPING COUGH VACCINES

What is a booster dose?

Some vaccines require additional doses later in life, referred to as "boosters" to help maintain immunity levels. Tdap is the vaccine used to prevent diphtheria, tetanus, and pertussis in older children and adults.

The following individuals should receive Tdap:

- Adolescents (11-12 years)
- Pregnant people, early third trimester, every pregnancy.
- Adults who have never received a single dose of Tdap.
- All adults, every 10 years.



DTaP for young children	Tdap for preteens	Tdap for pregnant women	Tdap for adults
✓ 2, 4, and 6 months ✓ 15 through 18 months ✓ 4 through 6 years	✓ 11 through 12 years	✓ During the 27-36th week of each pregnancy	✓ Anytime for those who have never received it



Measles

From elimination to outbreaks

- A **serious** and **highly contagious** disease.
- About **1 in 5 people** in the United States who get measles will be **hospitalized**.
- Severe complications include **brain swelling**, pneumonia, and **death**.
- In **2000**, the United States declared that measles had been **eliminated** from the country.



Disney California Outbreak

On **January 5, 2015**, the California Department of Public Health (CDPH) was notified about a **suspected measles case**.

- Patient was a hospitalized, unvaccinated child, aged **11 years with rash onset on December 28**.
- Only **recent travel** was to two Disney parks in **Orange County, California**.
- CDPH was quickly notified of more cases, and eventually **147 measles cases were linked to Disney park exposure in late December 2014**.
- A **majority of patients were unvaccinated** or had an **unknown/undocumented vaccination status**.



Image from: <https://losangeles.cbslocal.com/2021/07/07/california-residents-get-into-disneyland-83-a-day-this-summer/>



New York and New Jersey Orthodox Jewish Community Outbreaks

On **October 1, 2018**, the Rockland County (**New York**) Department of Health (RCDOH) alerted the New York State Department of Health (NYSDOH) of an **unvaccinated teenager with recent travel**, who had been **diagnosed with measles**.

- Additional cases were quickly reported, all **linked to recent international travel to Israel**, where a large outbreak (3,150 cases) was occurring.
- **242 laboratory-confirmed cases** were linked to this outbreak in **New York** (outside of New York City cases) as well as **33 in New Jersey**.
- Cases occurred **primarily in members of the Orthodox Jewish community** where measles **vaccination rates were below the threshold for herd immunity**.

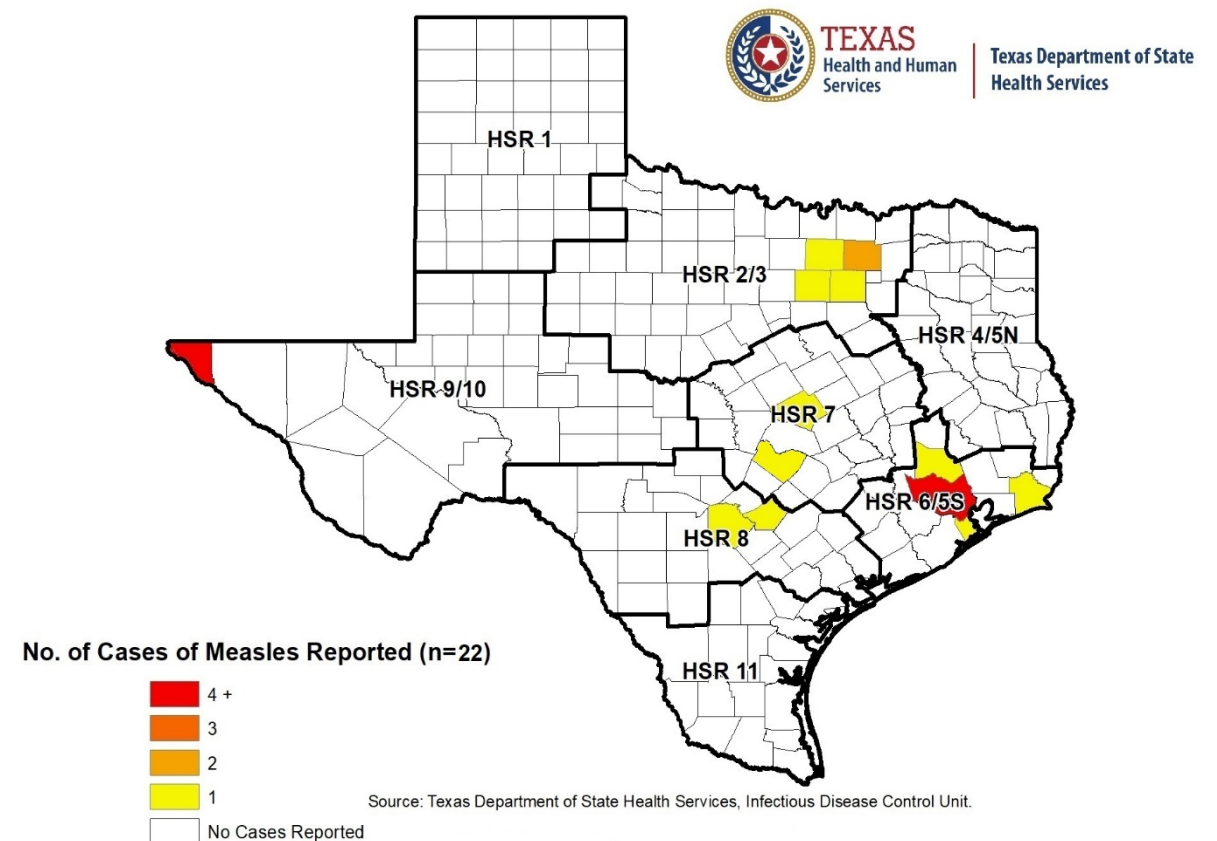


Texas Measles Cases, 2019

Texas saw a significant increase in measles cases in **2019**, with **22 laboratory-confirmed cases total**. (2015 – 2017 each saw 1 case each year)

- **9 cases** occurred in children **younger than 18**, and the remaining **13 cases** occurred in individuals **18 years and older**.
- **15 of the 22 cases** occurred in individuals who were either **unvaccinated**, only had **one dose** of their MMR vaccine, or who's **vaccine status was unknown**.

Cases of Measles in Texas, 2019*



Outbreaks indicate a **failure** to **achieve** or **maintain** herd immunity in a community.



Image from:
<https://www.munsonhealthcare.org/blog/what-is-herd-immunity>

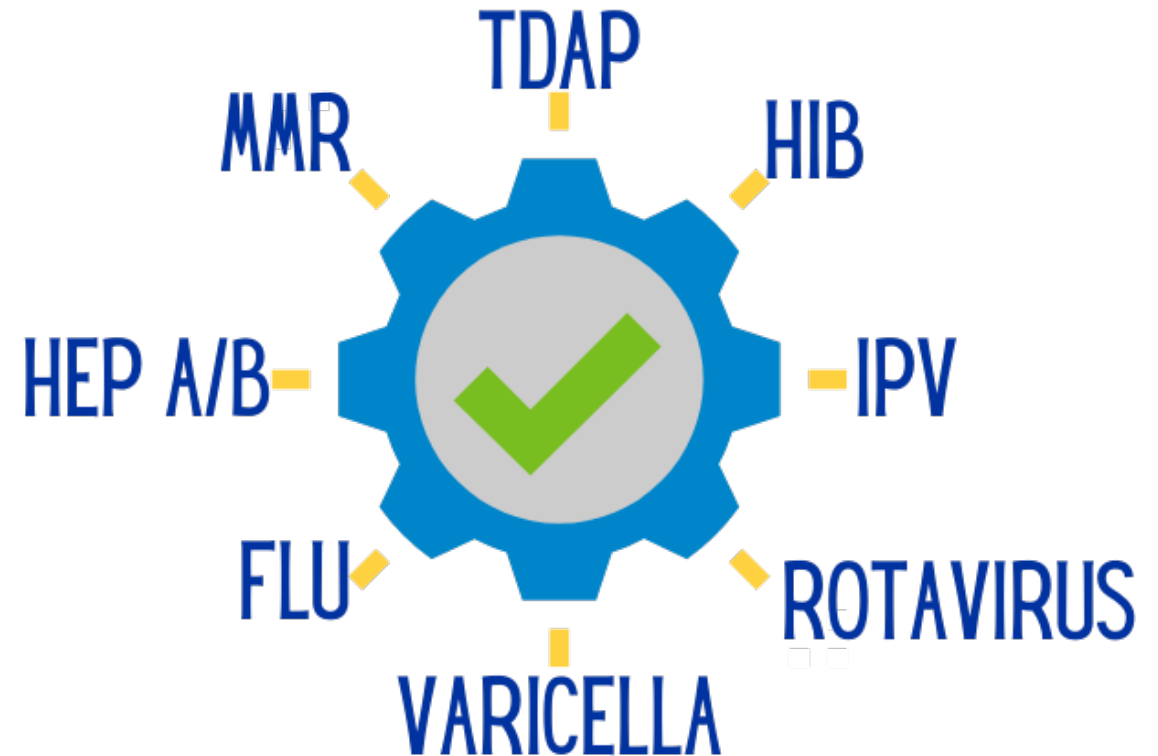


Tips for reaching herd immunity



Have Immunization Services Readily Available

- Keep an adequate stock of vaccines on hand
- Have alternative immunization clinic hours to work with patient's schedules



Standing Orders



- Gives **non-physician healthcare personnel** permission to administer vaccines **without** a prescription to eligible patients.



Utilize All Clinical Encounters as an Opportunity to Talk About Immunizations



- **Each encounter** with a healthcare provider, including ER and specialty visits, **is an opportunity** to screen vaccination status and, if indicated, administer needed vaccines.

Make EVERY visit an immunization visit.



Reminder and Recall Systems

- **Reminders:** Identify and contact patients who have **upcoming** vaccine doses
- **Recalls:** Identify and contact patients who have **missed** doses



Co-Schedule Immunization Appointments and Bundle Immunizations

- **Co-schedule** immunization appointments with other needed health-care services such as WIC, dental examinations, or developmental screening, provided such scheduling **can remove barriers** to time and transportation issues
- **Simultaneous administration** of multiple needed vaccines can potentially **raise immunization** coverage by 9%-17%.
- **Bundling** required school vaccinations with recommended age-appropriate vaccines will **raise vaccination rates**



Helpful Resources





- CDC, “Immunity Types”: <https://www.cdc.gov/vaccines/vac-gen/immunity-types.htm>
- APIC (Association for Professionals in Infection Control and Epidemiology), “Herd Immunity”: https://apic.org/monthly_alerts/herd-immunity/
- Vaccinate Your Family, “Outbreaks of Vaccine-Preventable Diseases”: <https://vaccinateyourfamily.org/questions-about-vaccines/outbreaks-of-vaccine-preventable-diseases/>



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