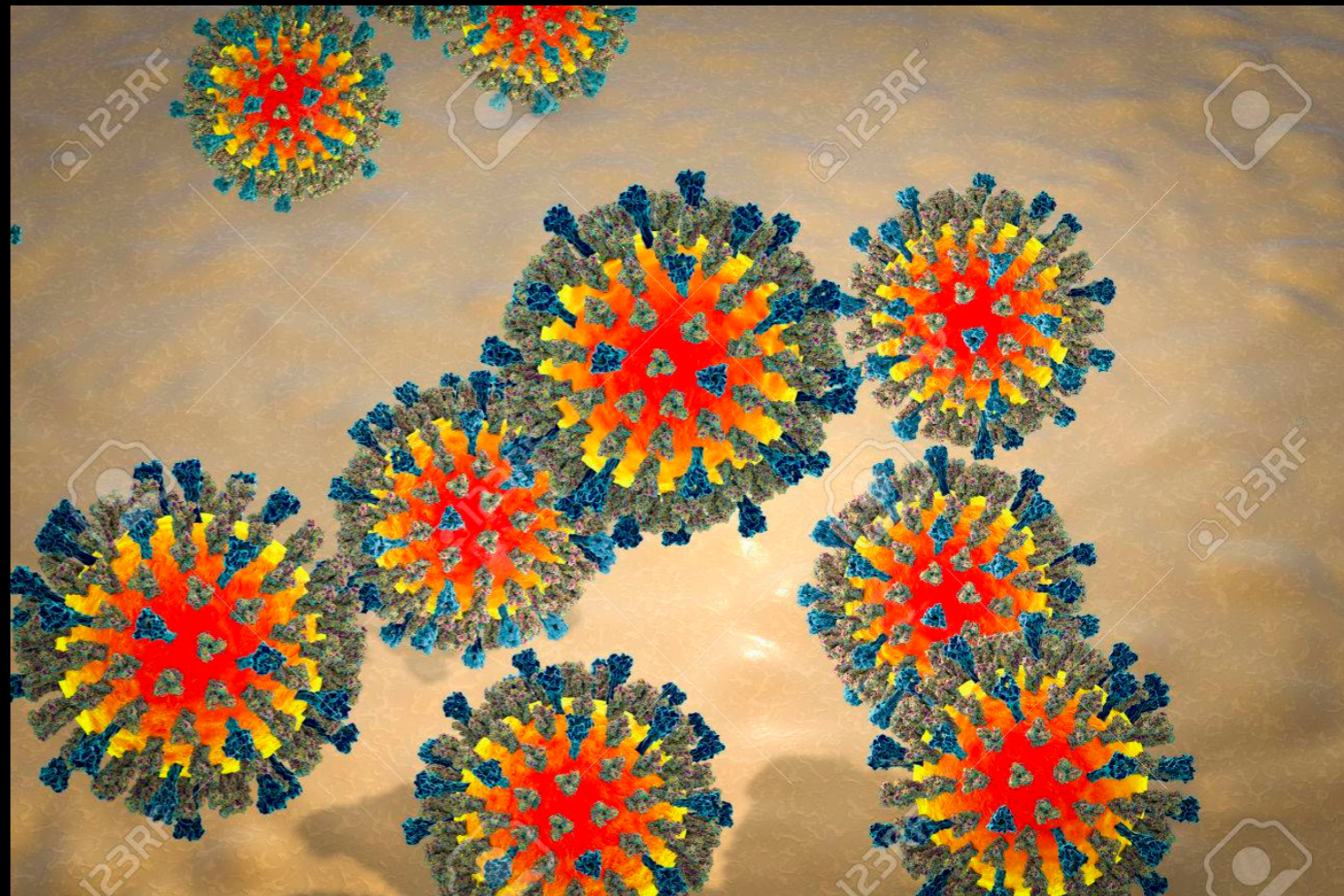


# Measles

(...and Pennsylvania)

Largest U.S. Measles Outbreak  
in 25 Years Surpasses 980 Cases  
NISE LU and SCOTT REINHARD UPDA  
measles across 26 states so far

- Morbillivirus
- Spread through coughing/sneezing
- Persists in the air for 2-4 hours
- Hallmark rash all over body
- Infectious 3-5 days before onset of rash and 1-2 days before fever
- **HIGHLY CONTAGIOUS**: 90% infection rate for unvaccinated people exposed to infected
- **HIGHLY CONTAGIOUS**: On average, one infected person infects 18 unvaccinated people.





# Measles: The Damage

- Sick for one week: Rash/aches/fever
- 30% cases: complications like diarrhea, ear infections, pneumonia, seizures, encephalitis
- Most survive/immune for life
- 5% mortality among affected children in areas of limited medical care

# HISTORY OF MEASLES

- FIRST RECORDED DESCRIPTION: 9TH C, PERSIAN PHYSICIAN
- 11TH/12TH C - RINDERPEST VIRUS (CATTLE MEASLES)  
MUTATED TO INFECT CATTLE HERDERS: MEASLES!
- CATTLE HERDERS>POPULATION CENTERS>TRADE ROUTES
- AMERICAS: 1600s... COLUMBUS/EUROPEAN INVADERS  
BROUGHT MEASLES, SMALLPOX, SYPHILIS AND PLAGUES
- 1654: OUTBREAK IN BOSTON
- 1693: Virginia governor announced “Day of Humiliation and Prayer,” due to measles
- 1861: 1st yr of Civil War - 21,676 measles cases among Union soldiers/551 deaths

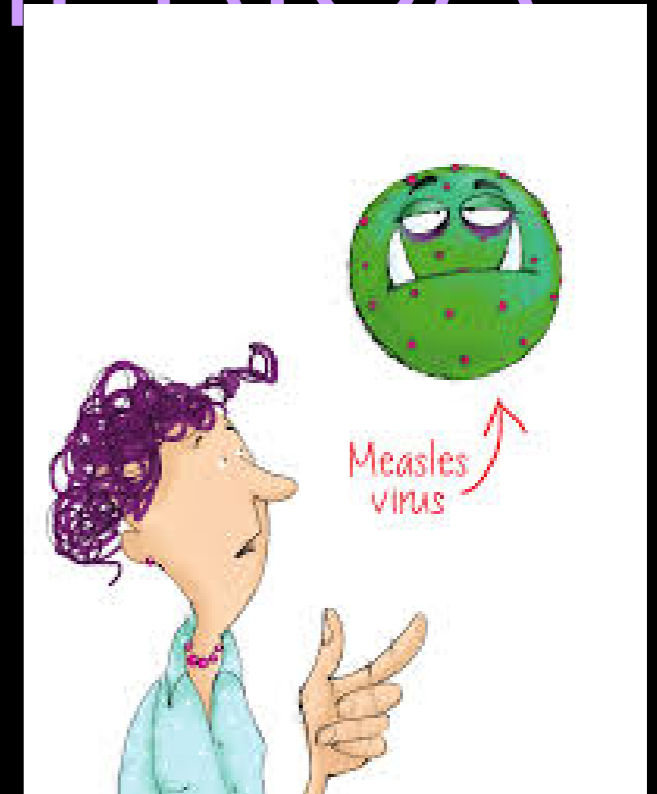


**1657**

## **Measles Appears in Boston**

In Boston, John Hull wrote in his diary that “the disease of measles went through the town,” but fortunately there were very few deaths.

# MEASLES TOURS AMERICA!



- 1920: 469,924 CASES; 7,575 DEATHS
- 1958-1962: 503,282 CASES/YR; 432 DEATHS/YR
- Measles dents populations in U.S. through mid-60s



# “Vaccine”

- ◆ “VACCA” - Latin for “cow”
- ◆ Edward Jenner
- ◆ 1798
- ◆ Cowpox pustules from milk maids
- ◆ Pioneered world’s first manufactured vaccine: smallpox vx



# MEASLES NORTH AMERICAN TOUR ENDS...

- 1963: Virologist John Enders develops first live, attenuated measles vaccine.
- 1971: Multivalent MMR vaccine takes its place.
- Cases in U.S. went from 500,000/yr to 30,000.
- 1978: CDC targeted measles for elimination.
- 2000: Measles declared “eliminated” in U.S.
- 2016: PanAmerican Health Organization (PAHO) declares America free of measles.



SPARING MILLIONS: Impact of the Measles vaccine (in the U.S.)

# Measles Vaccine


- Multivalent (MMR= measles/mumps/rubella)
- 1st dose: 12-15 mos.
- 2nd dose: 4-6 years
- 97%+ effective against measles


# Vaccine debate is born!


- 1998: British researcher Andrew Wakefield publishes study in *Lancet* journal.
- Describes isolation of measles in digestive tracts of autistic children
- Resulting vx scare: Measles cases in England explode from 56 to 1,348 in 10 years.
- 2010: MMR/autism connection debunked, and *Lancet* retracts Wakefield's article.

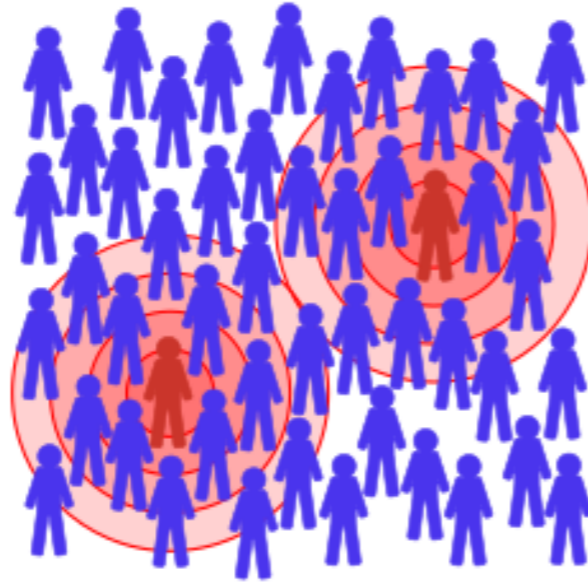
# HERD IMMUNITY

**Herd immunity** is a form of indirect protection from infectious disease that occurs when a large percentage of a population has become immune to an infection, thereby providing a measure of protection for individuals who are not immune.

 = not immunized, but still healthy

 = immunized and healthy

 = not immunized, sick, and contagious



No one is immunized.



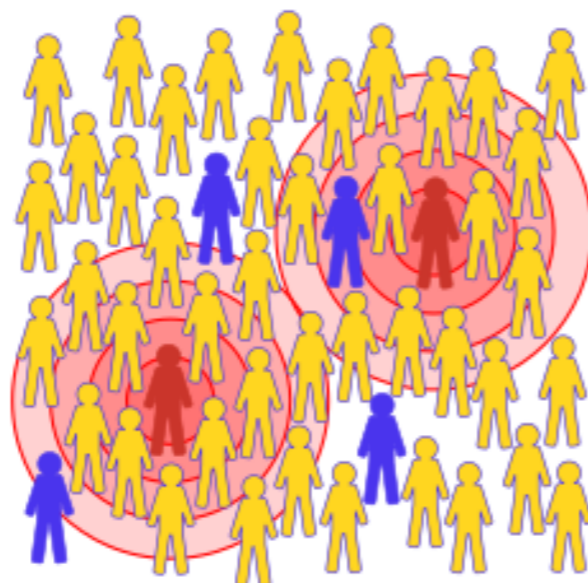
Contagious disease spreads through the population.



Some of the population gets immunized.



Contagious disease spreads through some of the population

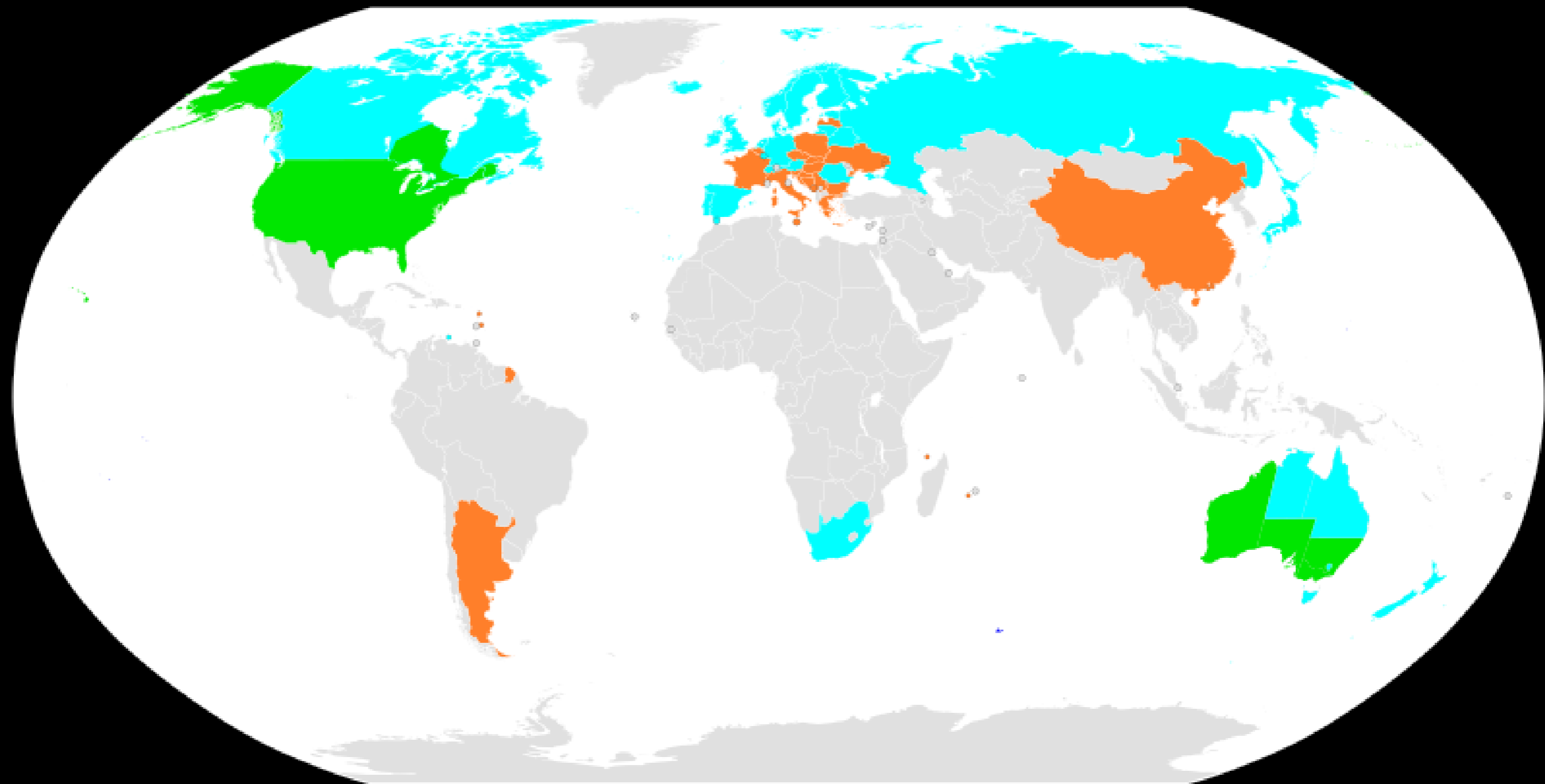


Most of the population gets immunized.



Spread of contagious disease is contained.





**Vaccination policy by country:**

Mandatory vaccination

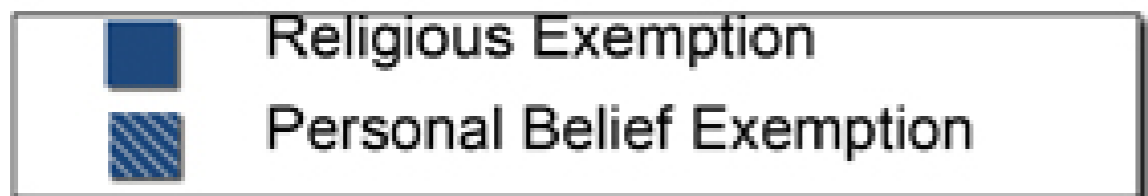
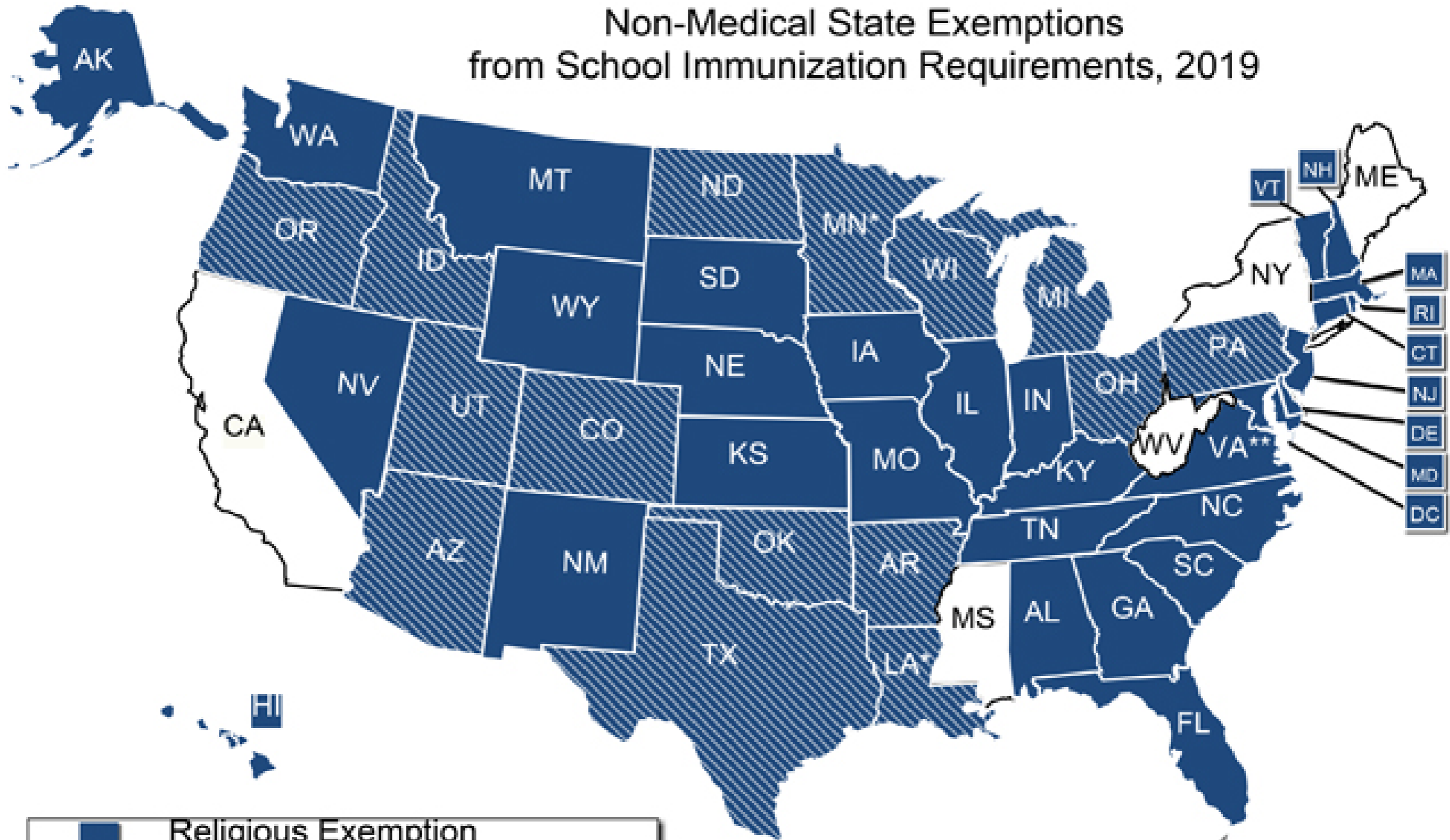
Voluntary vaccination

Vaccination not mandatory, but proof of vaccination needed to enroll in public schools





# Non-Medical State Exemptions from School Immunization Requirements, 2019



# Pennsylvania Vaccine Law

Children need not be immunized if the parent, guardian or emancipated child objects in writing to the immunization on religious grounds or on the basis of a strong moral or ethical conviction similar to a religious belief. Medical exemptions are also allowed.



# Herd Immunity in Pa...

Recommended immunization rate to protect schools/communities from measles outbreaks, providing “herd immunity” (disease has no opportunity for foothold)

= 95%

Percentage of Pa. kindergartners who are vaccinated w/ required two doses of MMR vaccine

=97%

# Pennsylvania Vaccine Exemptions, 2017-2018

- 7,661 K and 7th graders (philosophical/religious)
- = 1.5%

# DELAWARE COUNTY EXEMPTIONS:

- = 0.4% (K AND GRADE 7)

# Vaccine Exemptions Radnor Twnp Schools

- Total students: 3,700
- Total exemptions (1+ vx): 41 (0.011%)
- Does not include reports from private schools, some of which do not allow exemptions

# RTSD VX EXEMPTION PROCESS

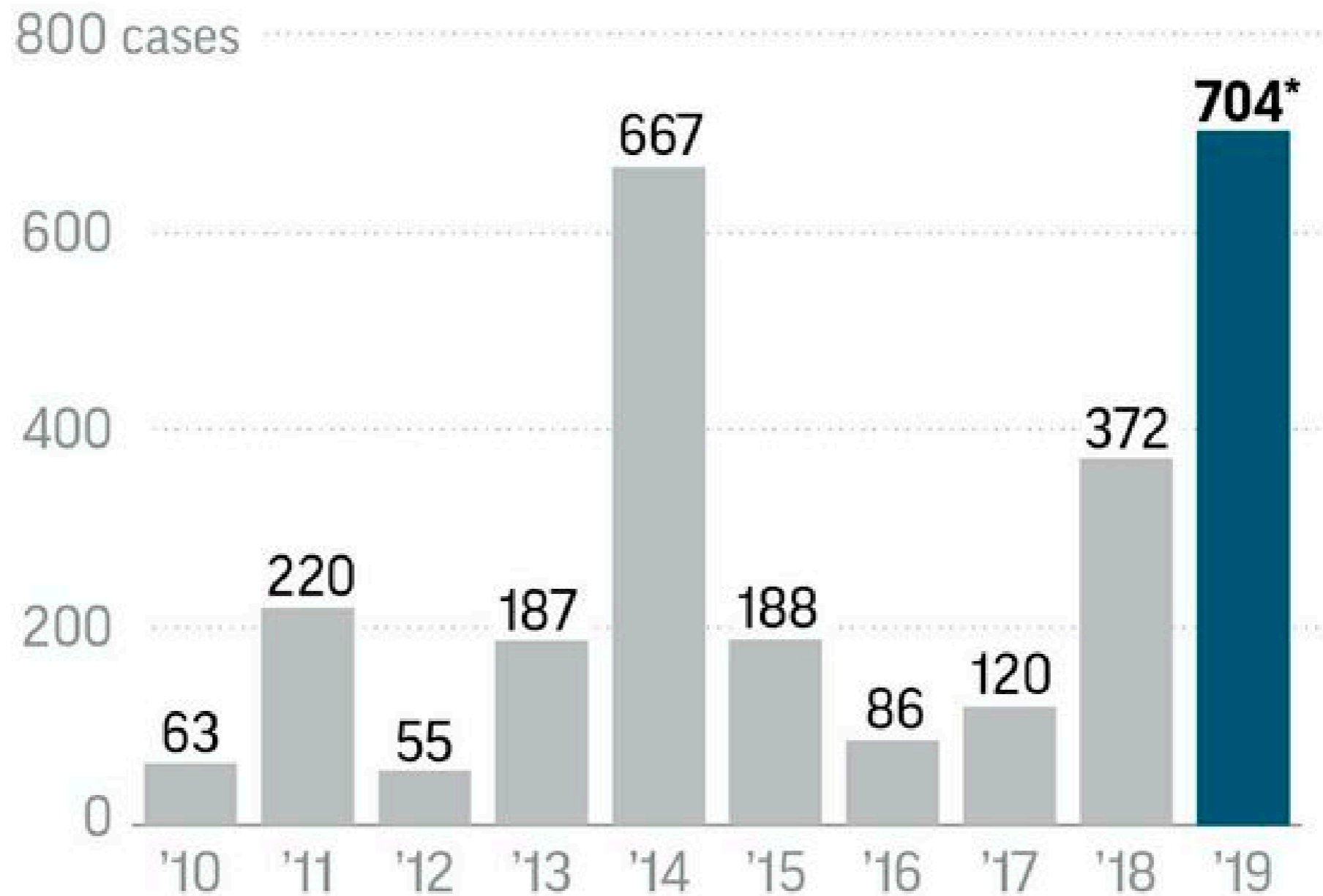
- PARENT SIGNS GREEN CARD AT NURSE'S OFFICE
- NO APPROVAL PROCESS



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# Rising number of US measles cases

This year is shaping up as the worst in years for measles cases, according to federal health officials.



\*As of April 26

SOURCE: Centers for Disease Control and Prevention

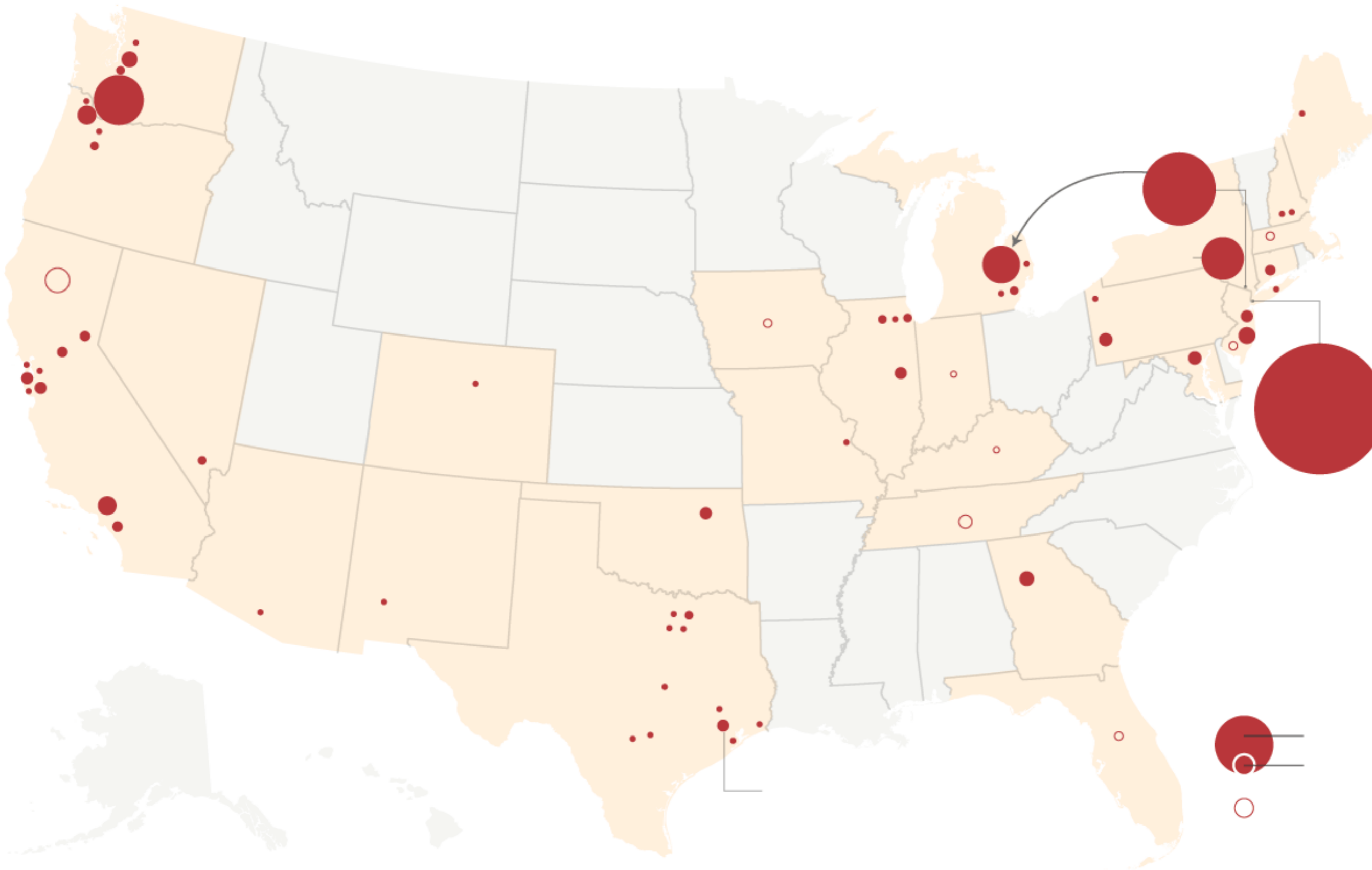
AP

## CURRENT U.S. OUTBREAK

From January 1 to June 6, 2019, **1,022** individual cases of measles have been confirmed in 28 states.

\*Greatest number of cases reported in the U.S. since 1992

\*50% of cases - unvaccinated, traveling abroad



# Outbreak Centers

- Washington State: strong anti-vaccine sentiment
- NY/Rockland County - Orthodox Jewish community
- Michigan/Oakland County - Orthodox Jewish community w/ travel abroad
- Pennsylvania - 5 cases: unvaccinated international visitors transmitting to unvaccinated family members in Allegheny County

ments for children. The United States is currently

Arguments to combat the belief that vaccination requirements are in violation of individual liberties tie into the fundamental belief that an individual shall not have protection of liberties if they are in direct opposition of another's individual liberties; if a person chooses to leave him/herself susceptible to illnesses that can be passed along to another, the government has a right to do all in its power to protect the individual (ie, baby) who did not choose to not become vaccinated.

# Vaccine debate: Ethics



Medical ethicist [Arthur Caplan](#) argues that children have a right to the best available medical care, including vaccines, regardless of parental opinions about vaccines: "Arguments about medical freedom and choice are at odds with the human and constitutional rights of children. When parents won't protect them, governments must."<sup>[</sup>



# Adults born before 1957

- MOST PROBABLY UNVACCINATED FOR MEASLES (MMR)
- CDC RECOMMENDATIONS: 2 VX 28 D APART FOR HEALTHCARE WORKERS AND IMMUNOCOMPROMISED +/- FOREIGN TRAVELERS

Legislative change for Pa?

March, 2019 - State Senator Daylin Leach (D, Montgomery/Delaware) introduced legislation to eliminate vaccine exclusions for philosophical/religious/ethical reasons in children prior to starting school.

