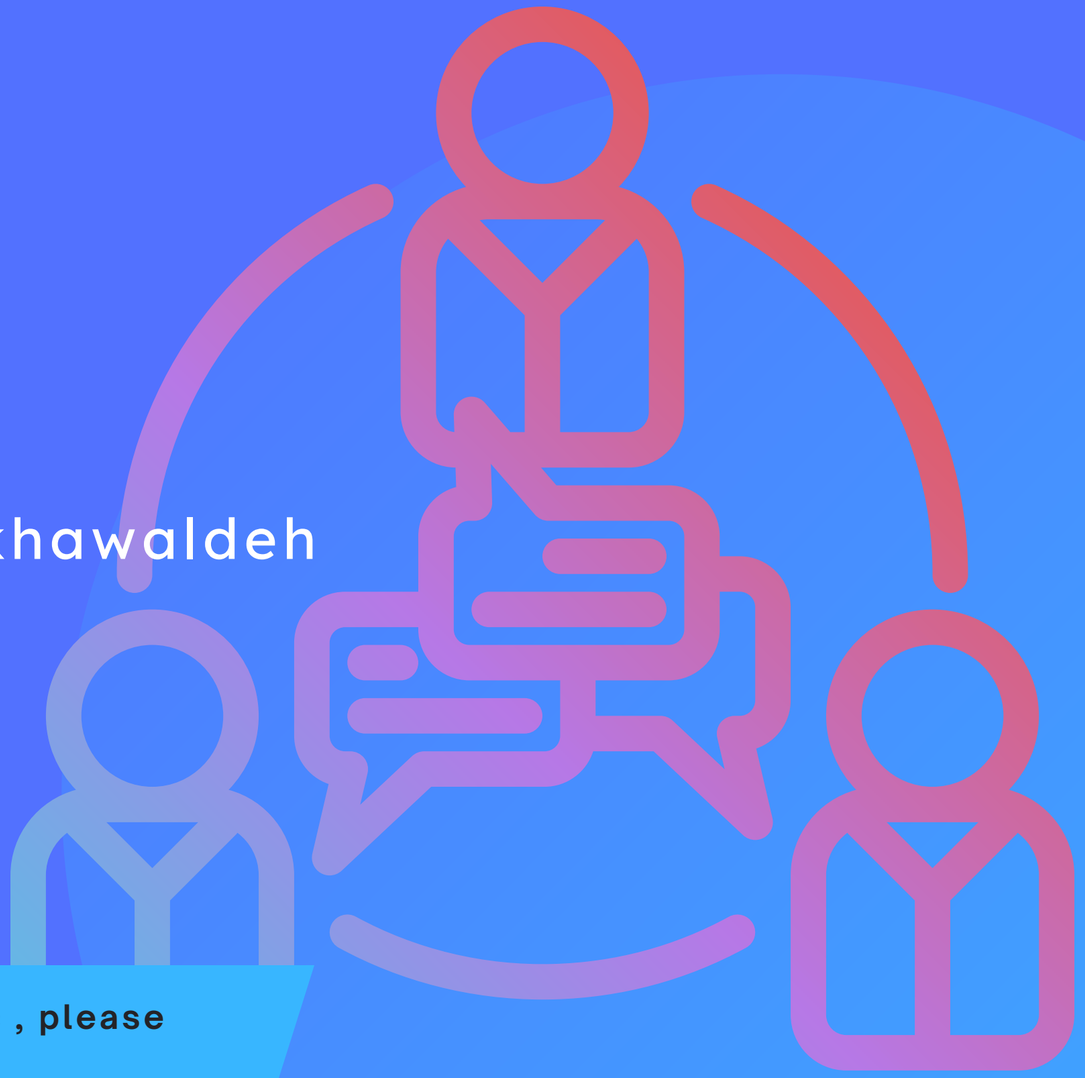
Yarmouk University

# Community Medicine

Lec. 14 - Pandemics ( Part 2 )

Written By : Group G4 - Sawsan Alkhawaldeh

If you come by any mistake , please kindly report it to shaghafbatch@gmail.com

# Pandemics part 2

تكلكوش، نص السلايدات أسئلة وتمارين

## How Did We Get Here And Where Are We Going?

*Dr. Batool Eldos*
*Assistant Professor in Family Medicine*
*Infectious Diseases/Geriatrics Fellowships*

# 2022 Monkeypox outbreak ( 2022 - present )

- First discovered in monkeys in 1958 then in humans in 1970
- Small viral outbreaks with a death rate of 10% occur routinely in equatorial Central and West Africa…
- In **May ‘2022**multiple cases of monkeypox were identified in several non-endemic countries (Britain, America and Europe, for the first time)
- Confirmed cases : 14,326
- Death toll : 72
- High risk ppl (those who’re exposed) must get **smallpox vaccine** (they are from the same family)
- There’s no variation in symptoms like covid. You can avoid contact with the pnt who’ll have skin lesions and other symptoms.

# What is an Epi Curve?

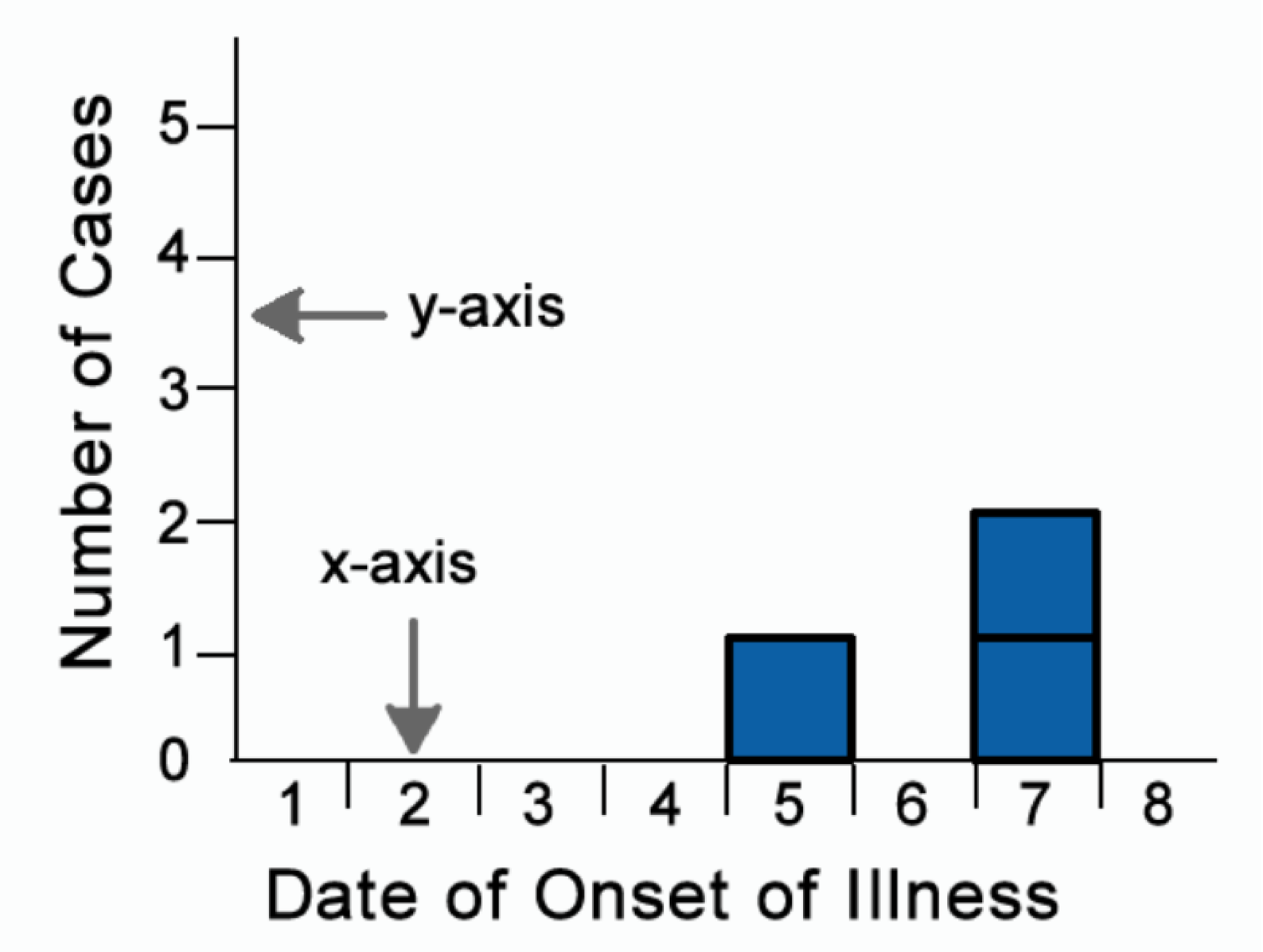
# Epi Curve

An **epi curve or epidemic curve** is a visual display of the **onset** of illness among **cases associated with an outbreak.**

You can learn a lot about an outbreak from an epi curve, such as

- The **outbreak's time trend**, that is, the distribution of cases over time
- **Outliers**, that is, cases that stand apart from the overall pattern
- **General sense** of the outbreak's magnitude (if it’s very bad, mild or serious)
- **Inferences** about the outbreak's **pattern of spread**
- The **most likely time period of exposure**

# Epi Curve

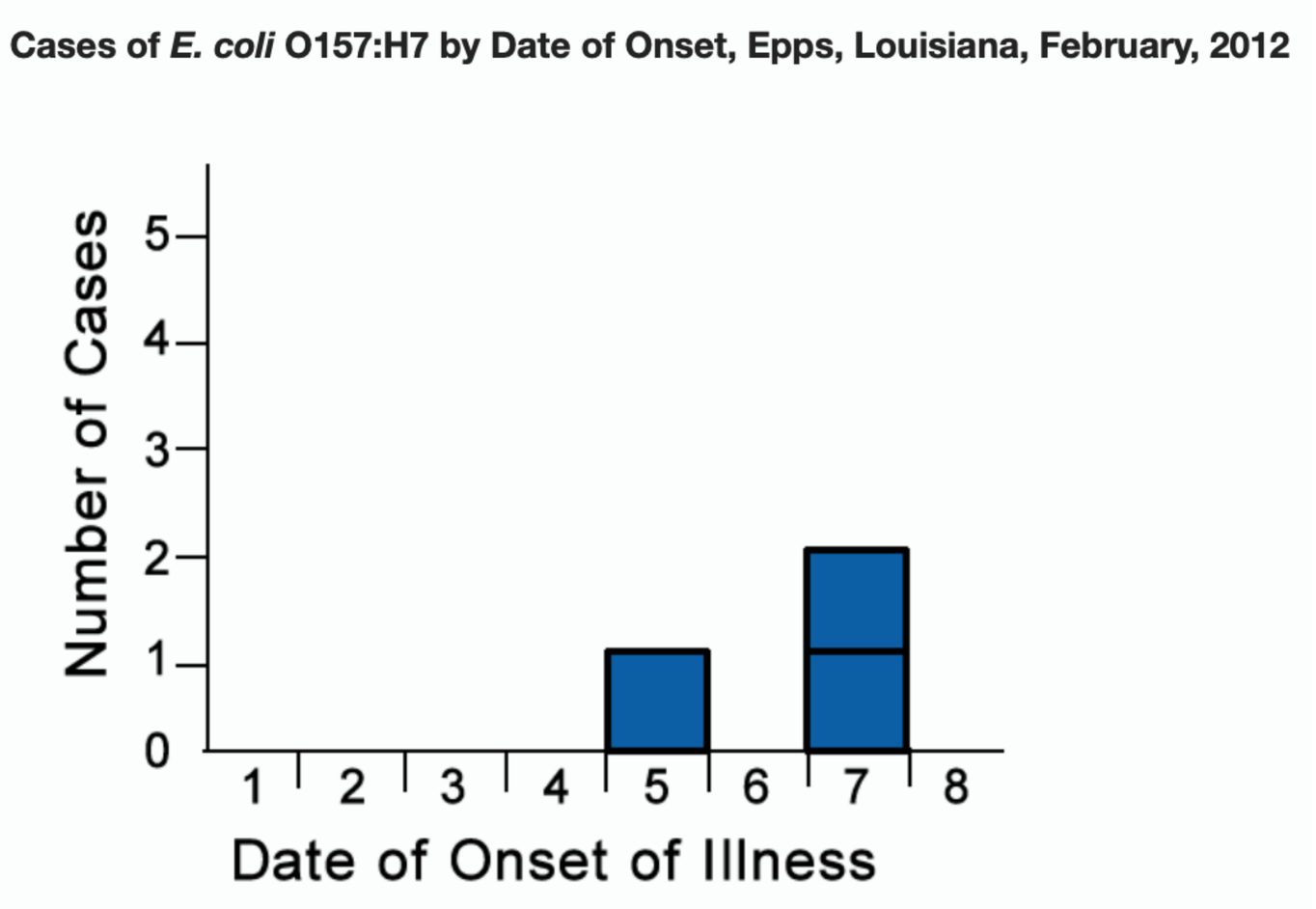

Number of Cases
5
4
3
2
1
0
y-axis
x-axis
1
2
3
4
5
6
7
8
Date of Onset of Illness

# Epi Curve

- **Time interval**: The unit of time for the x-axis is **based on the incubation period** of the disease under investigation and the length of time over which cases are distributed.
- If the incubation period of an illness is short, the interval on the epi curve might be indicated in hours or even minutes.
- As a general rule, the unit of time is set at roughly **1/4** (0.25) of the average **incubation period** for the illness under investigation.
- Average incubation period multiplied by .25 = Intervals
- E.x. the IP of a disease is 12 days… time interval must be 12/4 = 3 days

# Epi Curve

- An epi curve should have a title that describes it, including the **type of illness**, the **place** where the outbreak occurred, and the **time period.**



# Event 1

## Time

March 2014–February 2016

## Person

15,261 laboratory-confirmed cases

## Place

Guinea, Sierra Leone, and Liberia

## Signs and symptoms

Fever, severe headache, muscle pain, weakness, fatigue, diarrhea, vomiting, abdominal (stomach) pain, and unexplained hemorrhage (bleeding or bruising)

Do you think it's pandemic or epidemic?

It's an epidemic.. To be a pandemic, it has to be on more than one continent

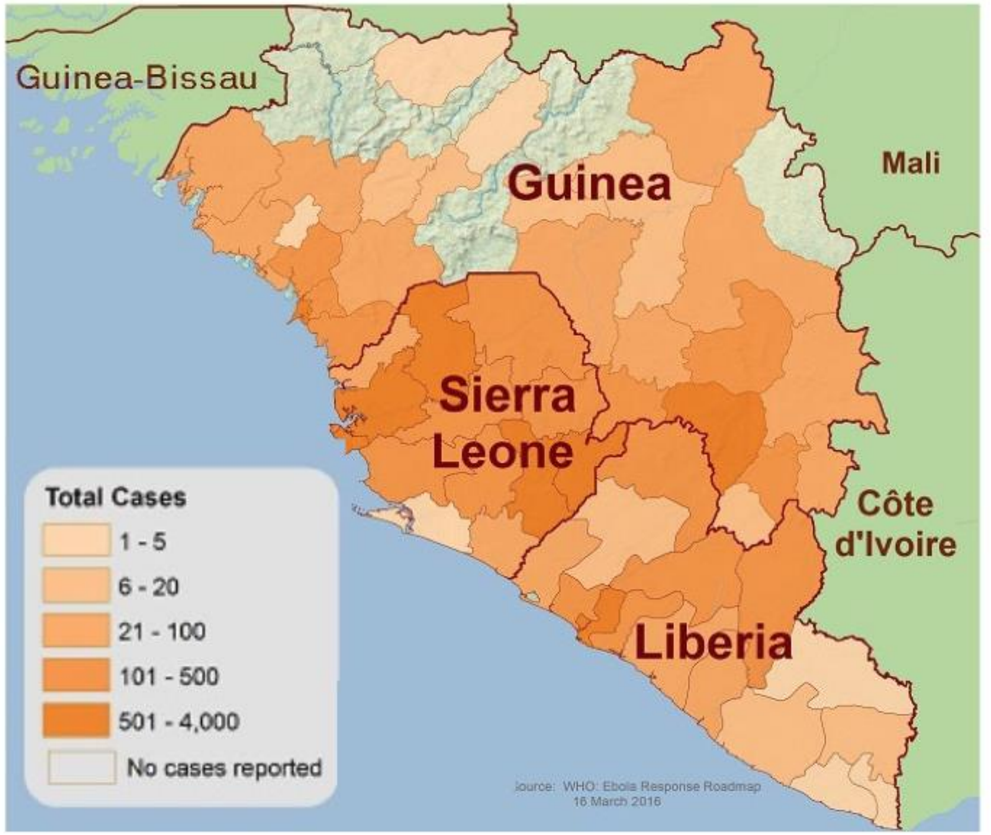



Figure 1: Total number of cases, March 2014–February 2016. On this map of Guinea, Sierra Leone, and Liberia total cases categories are 1–5 cases, 6–20 cases, 21–100 cases, 101–500 cases, 501–4,000 cases, and no cases reported.

# Event 2

## Time

January 4, 2015–April 2, 2015

## Person

125 confirmed cases

## Place

8 U.S. states, mostly California (n = 110 cases)

## Signs and symptoms

Rash lasting ≥3 days, fever, cough, coryza (runny nose), and conjunctivitis (pink eye)

Do you think it's pandemic or epidemic?

Neither epidemic nor pandemic.
This's 2015 Multi state Measles outbreak..


Figure 2: Number of reported cases (n = 159) by infection source, state, and county. Forty-three cases are non-Disney import-associated, 111 are Disney import-associated and 5 are of unknown source. On this map of the United States, cases are shown in 8 U.S. states with most of the cases in southern California (n = 110).

# Event 3

## Time

1998 to present day

## Person

About 10,000 cases reported each year in the United States

## Place

Primarily Southwest United States

## Signs and symptoms

Tiredness, cough, fever, shortness of breath, headache, muscle aches or joint pain, and rash on upper body or legs; can cause chronic pneumonia in severe cases

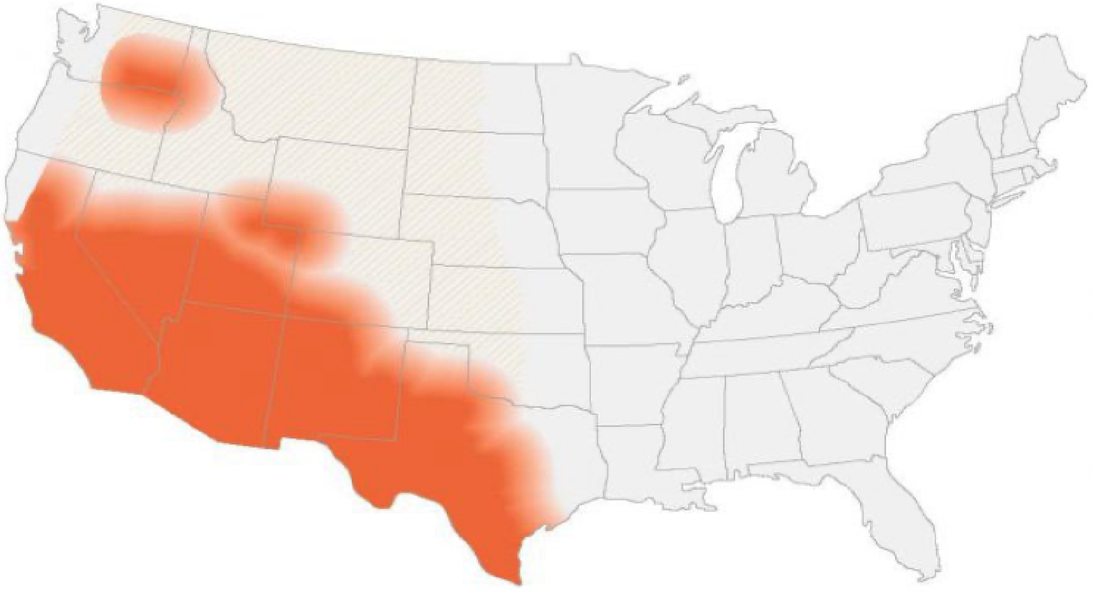


Figure 3: Areas at risk for exposure in the United States. On this map of the United States, most areas at risk for exposure are in the southwestern part of the United States.

مو لازم تكون مميز شو المرض، بهمها تكون
فاهم كيف ببتصنفه

Valley Fever Endemic (avg. of cases per time)

# Event 4

## Time

April 2009–April 2010

## Person

18,631 laboratory-confirmed cases, though between 123,000 and 203,000 were estimated globally for the last 9 months of 2009

## Place

168 countries

## Signs and symptoms

Fever or feverish chills, cough, sore throat, runny or stuffy nose, muscle or body aches, headache, fatigue, vomiting (in children), and diarrhea (in children)

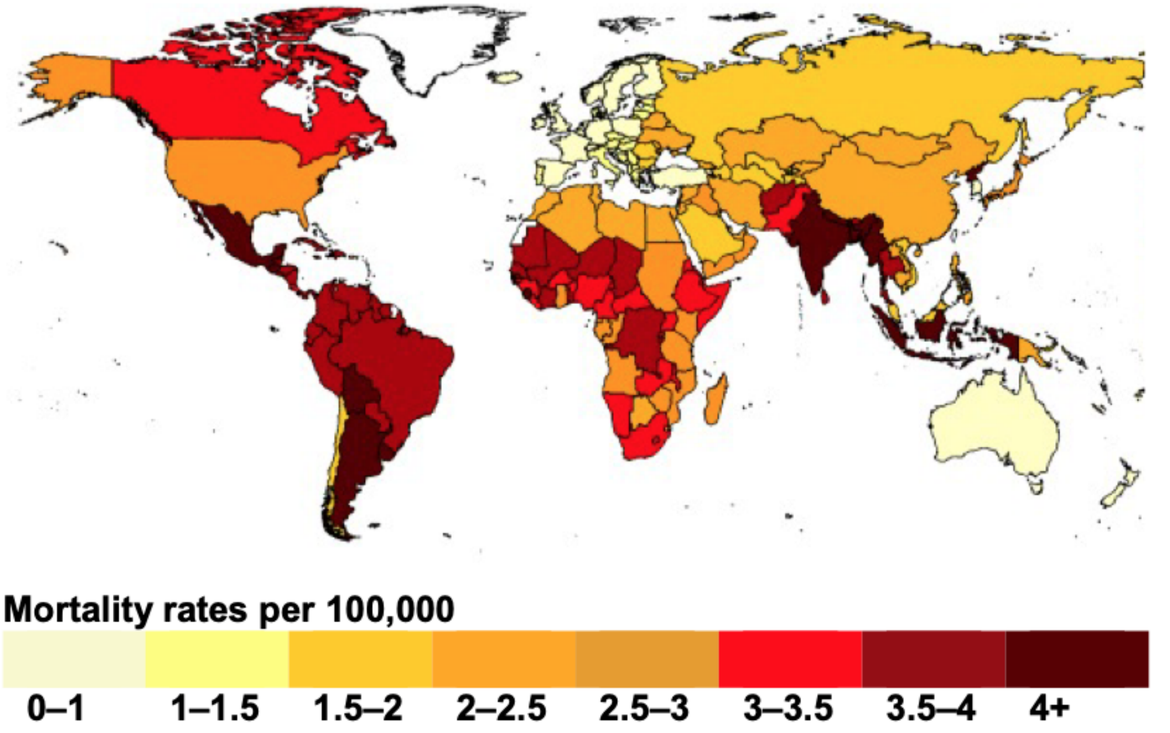



Figure 4: Projected worldwide mortality rates per 100,000 persons (all ages). This world map shows rates per 100,000 by country, including the United States (2–2.5), Canada (3–3.5), South American countries (2.5–4+), African countries (1.5–4+), European countries (0–2.5), Asian countries (1.5–4+) and Australia (0–1).

# Event 5

## Time

1990–Present day

## Person

36.5% Adults (aged 18+ years)
17.0% Children (aged 2–17 years)

## Place

Widespread, United States

## Signs and symptoms

Body Mass Index (BMI) ≥30.0 adults, BMI ≥95$^{th}$ percentile in children

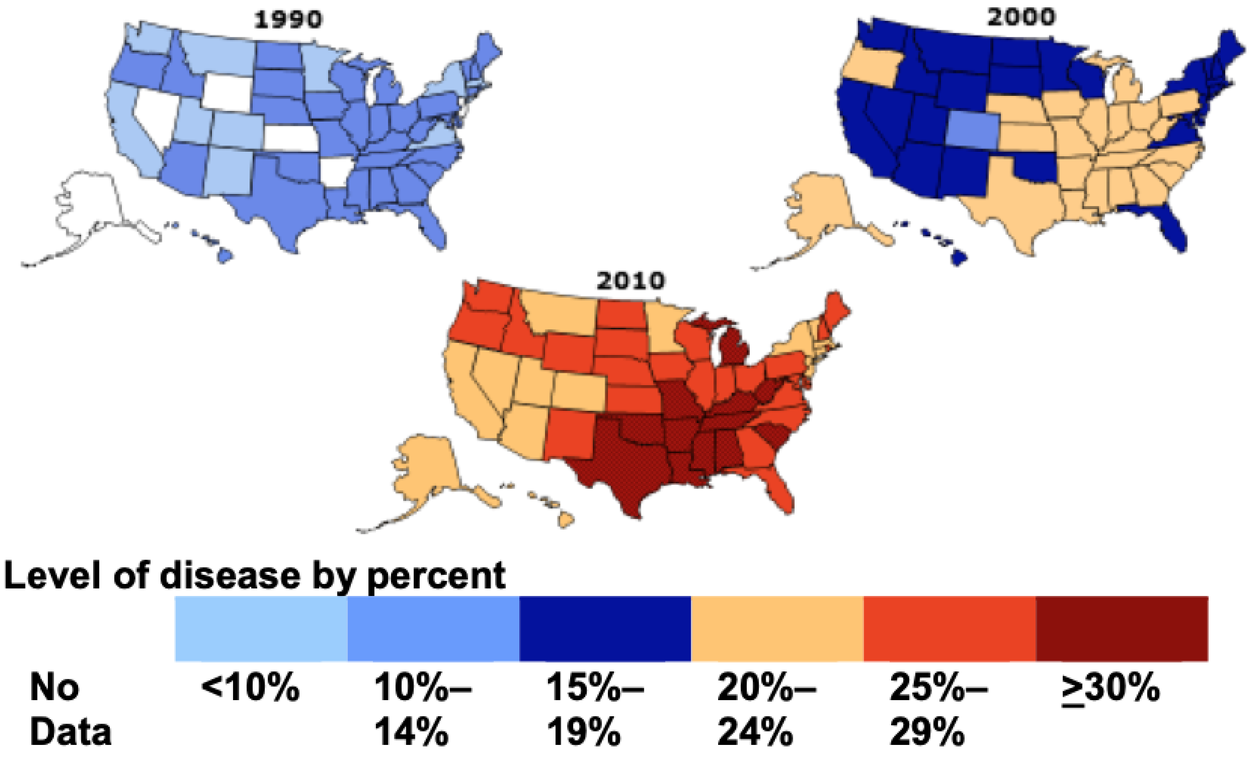



Figure 5: Level of disease over time in the United States. On the map for year 1990, states show a level of disease of <10%, 10%–14%, or No Data. On the map for year 2000, states show a level of disease of 10%–14%, 15%–19% or 20%–24%. On the map for year 2010, states show a level of disease of 20%–24%, 25%–29%, or ≥30%.

# Event 6

## Time

Present day

## Person

84,000–170,000 severe cases annually

## Place

West, East and Central Africa

## Signs and symptoms

Fever and feverish chills, severe headache, back pain, general body aches, nausea, and vomiting; in severe cases, high fever, jaundice, bleeding, and multiple organ failure

Yellow Fever endemic in Sub-Saharan Africa


Figure 6: Areas with risk of transmission in Africa. On this map of Africa, countries where vaccinations are recommended are mostly in central Africa, countries where vaccinations are generally not recommended are mostly in eastern Africa, and countries where vaccinations are not recommended are in north and south Africa.

EPIDEMIC

ENDEMIC

PANDEMIC

# Activity: NERD newsfeed

بعنذر منكم صوتها كان فيه مشكلة و مو طالع بالريكورد، بس هو تمرين موضح بالخطوات بالسلايدات

# What is NERD?

- NERD is a fictional novel emerging respiratory disease caused by a virus that can spread from person to person through direct contact, airborne transmission or contaminated surfaces
- Symptoms range from mild ( no symptoms) to severe illness and death
- Any age can get NERD
- Symptoms include: fever, cough, SOB, fatigue, new loss of taste or smell, sore throat, runny nose, N&V and diarrhea

You will classify levels of a novel emerging respiratory disease (NERD)

Your group will read posts from the NERD Newsfeed

You will observe how NERD spreads, starting with reports of 44 initial cases in the fictional country of Rocona

Using the posts, you will create a timeline of events and then decide when NERD should be declared a pandemic

Remember by declaring a pandemic, international cooperation can begin; however, if you declare it too early, too much time and resources may be spent unnecessarily.

You must be able to explain why you made your decision using evidence from the timeline.

**Nerd Tracker**
**@CDC_NERDNews**
**January 3**
44 cases of a novel emerging respiratory disease reported to the World Health Organization in the country of Rocona.

**Nerd Tracker**
**@CDC_NERDNews**
**January 20**
Imported cases of a novel emerging respiratory disease are confirmed: 2 in Thailand, 1 in Japan, and 1 in South Korea. All patients recently travelled to Rocona. To date, cases are confined to Asia.

**Nerd Tracker**
**@CDC_NERDNews**
**January 21**
This novel emerging respiratory disease is named NERD. United States reports first travel-related case of NERD in the state of Washington. The patient recently returned from the country of Rocona.

**Nerd Tracker**
**@CDC_NERDNews**
**January 30**
CDC confirms first human-to-human spread in U.S. Chicago, IL, woman infected her husband with NERD. Wife recently returned from overseas travel.

**Nerd Tracker**
**@CDC_NERDNews**
**February 15**
Egypt reports first confirmed NERD case on the continent of Africa.

**Nerd Tracker**
**@CDC_NERDNews**
**February 22**
Of the 346 confirmed NERD cases in South Korea, 80% were related to two nearby facilities. 169 (48.8%) cases tied to a church and 108 (31.2%) to a nearby hospital.

**Nerd Tracker**
**@CDC_NERDNews**
**March 7**
CDC confirms community transmission of NERD occurred at two family gatherings in Chicago, IL. The 16 confirmed cases included 3 deaths.

**Nerd Tracker**
**@CDC_NERDNews**
**March 9**
Italy announces travel restrictions for over 60 million people as the number of NERD cases climbs to 9,172 with 1,598 deaths.

**Nerd Tracker**
**@CDC_NERDNews**
**March 11**
NERD outbreaks have been reported in just over half (58%) of countries worldwide with 118,319 total cases (approximately .0015% of the world's population).

**Nerd Tracker**
**@CDC_NERDNews**
**March 17**
High NERD attack rate after exposure during choir practice in Skagit County, WA. Of 61 in attendance, 32 confirmed & 20 probable cases occurred. In total, 3 are hospitalized and 2 dead.

**Nerd Tracker**
**@CDC_NERDNews**
**March 26**
Canada reports 1,670 new cases of NERD bringing the total cases for the country to 3,409 with 35 deaths.

**Nerd Tracker**
**@CDC_NERDNews**
**April 4**
The number of confirmed NERD cases reported tops one million worldwide with over 56,000 deaths.

**Nerd Tracker**
**@CDC_NERDNews**
**April 27**
NERD among workers in meat and poultry processing plants reported in 19 U.S. states. Among approximately 130,000 workers at these facilities, 4,913 cases and 20 deaths occurred.

**Nerd Tracker**
**@CDC_NERDNews**
**April 28**
U.S. reports NERD tops one million cases. U.S. accounts for 1/3 of all reported cases worldwide.

**Nerd Tracker**
**@CDC_NERDNews**
**May 11**
Number of NERD cases tops 4 million worldwide as reported in 181 countries (93%) on 6 of the 7 continents.

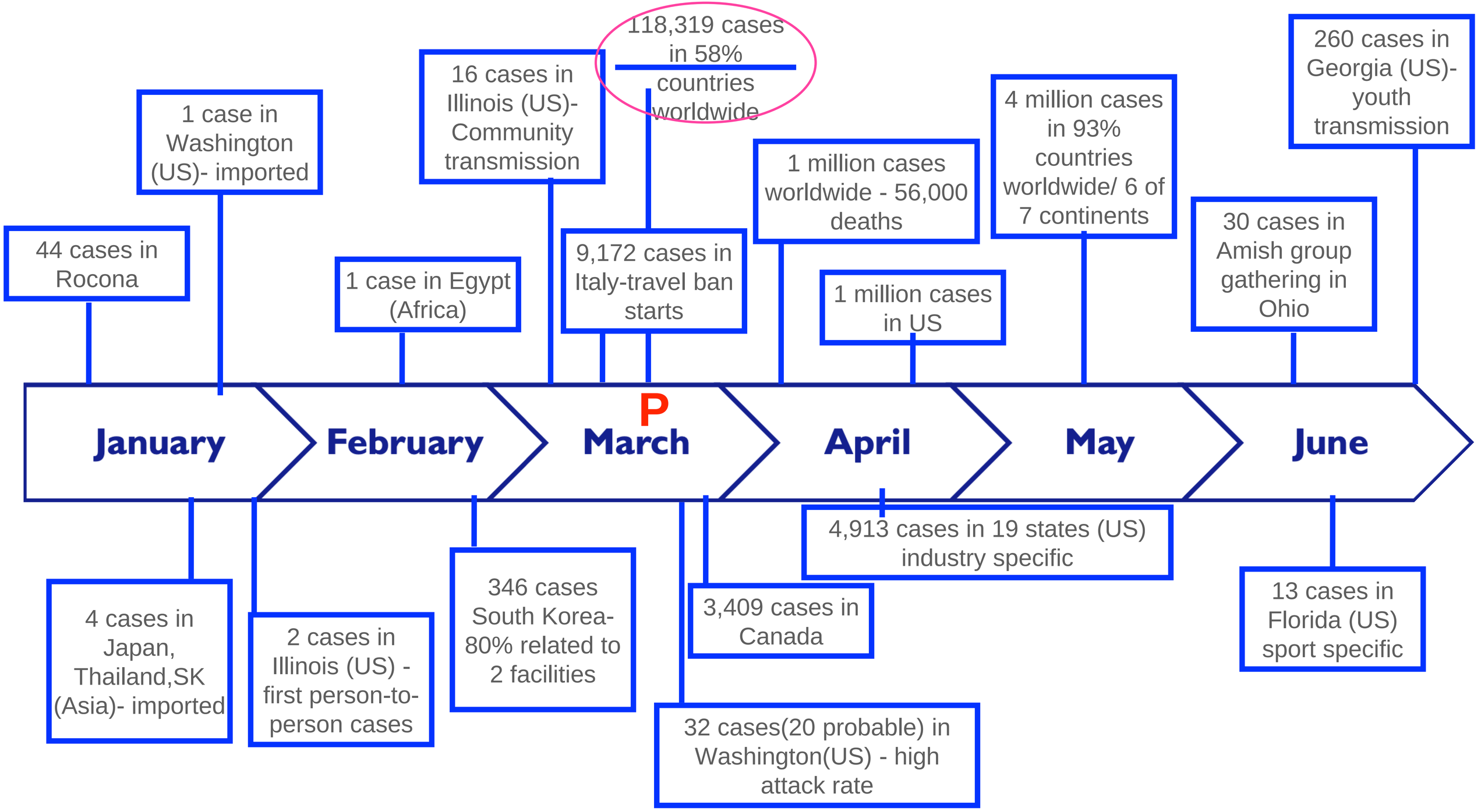
**Nerd Tracker**
**@CDC_NERDNews**
**June 11**
NERD cases increasing in rural U.S. communities. In total, 30 persons with laboratory-confirmed NERD attended Amish religious and social gatherings in the Ohio community.

**Nerd Tracker**
**@CDC_NERDNews**
**June 16**
Transmission of NERD associated with sports. In total 13 laboratory-confirmed cases linked to recreational hockey game in Florida.

**Nerd Tracker**
**@CDC_NERDNews**
**June 27**
Among 344 attendees of an overnight camp in Ohio, 260 (76%) tested positive for NERD despite efforts by camp officials to follow recommended prevention strategies.

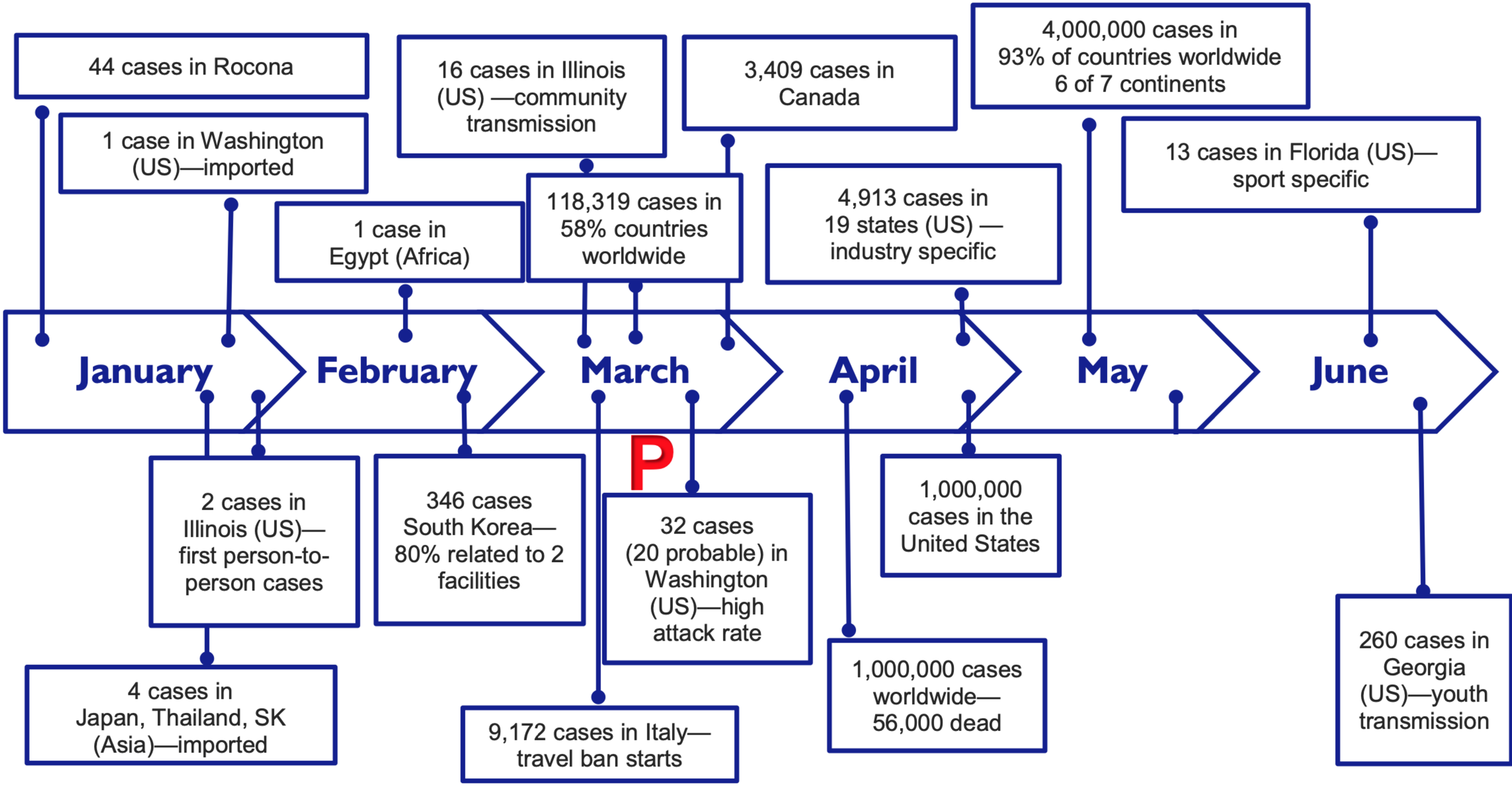
Decide when NERD should be declared a pandemic by marking the timeline with a “P”

# NERD timeline


44 cases in Rocona
1 case in Washington (US)- imported
1 case in Egypt (Africa)
16 cases in Illinois (US)- Community transmission
118,319 cases in 58% countries worldwide
9,172 cases in Italy-travel ban starts
1 million cases worldwide - 56,000 deaths
1 million cases in US
4 million cases in 93% countries worldwide/ 6 of 7 continents
30 cases in Amish group gathering in Ohio
260 cases in Georgia (US)- youth transmission
January
February
March
April
May
June
4 cases in Japan, Thailand,SK (Asia)- imported
2 cases in Illinois (US) - first person-to-person cases
346 cases South Korea- 80% related to 2 facilities
32 cases(20 probable) in Washington(US) - high attack rate
3,409 cases in Canada
4,913 cases in 19 states (US) industry specific
13 cases in Florida (US) sport specific

..هلا بالسلايد السابق، المخطط الزمني بفرجيك كيف انتشر المرض خلال فترة ما
بلشت بالصين بعدها بشوي مصر اللي هي بقارة ثانية (افريقيا) بعدهم كوريا الجنوبية اللي هي بقارة ثالثة و هكذا
الأعداد بكل دولة نسبيا كبيرة، و بوسط شهر آذار توصلوا هم للجملة التالية (محاطة بدوّيرة في السلايد السابق) مفادها:
118,319 cases in 58% countries worldwide
بناءً على هاي الأعداد و هاد الانتشار، صنفوها PANDEMIC لهيك حاطين حرف P
وهون بدأت الجائحة
هاي هي كل القصة اللي انفقدت من الريكورد

اذا بتسمع ريكورد وقفه و ١. كمل قراءة لسلايد ال covid
٢. اذا حسيت بدك شرح الدكتورة ما شرحت بس عرضت فيديو حطيت رابطه
٣. اقفز الى ٢:١٢ أو دقيقة ١٣٢ اذا فاتح من التيليجرام الريكورد


44 cases in Rocona
1 case in Washington (US)—imported
16 cases in Illinois (US) —community transmission
3,409 cases in Canada
4,000,000 cases in 93% of countries worldwide 6 of 7 continents
13 cases in Florida (US)—sport specific
1 case in Egypt (Africa)
118,319 cases in 58% countries worldwide
4,913 cases in 19 states (US) — industry specific
January
February
March
April
May
June
2 cases in Illinois (US)—first person-to-person cases
346 cases South Korea—80% related to 2 facilities
P
32 cases (20 probable) in Washington (US)—high attack rate
1,000,000 cases in the United States
4 cases in Japan, Thailand, SK (Asia)—imported
9,172 cases in Italy—travel ban starts
1,000,000 cases worldwide—56,000 dead
260 cases in Georgia (US)—youth transmission

# Investigating an outbreak

عرضت هاد الفيديو كشرح للسلايدات التالية

https://youtu.be/kYFIqTbRd2o

# Steps of an Outbreak Investigation

## WHAT IS THE CAUSE?

7. Develop hypotheses
8. Evaluate hypotheses epidemiologically
9. Reconcile epidemiology with laboratory & environmental findings
10. Conduct additional studies as necessary

## WHAT CAN WE DO ABOUT IT?

11 Implement & evaluate control & prevention measures

12 Initiate or maintain surveillance

13 Communicate findings

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

# COVID
# IS NOT GOING AWAY.

## How Does a Pandemic Become Endemic?

# When will the Pandemic just end-emic already?

- Well, we can draw some sessions from the “great influenza” of 1918

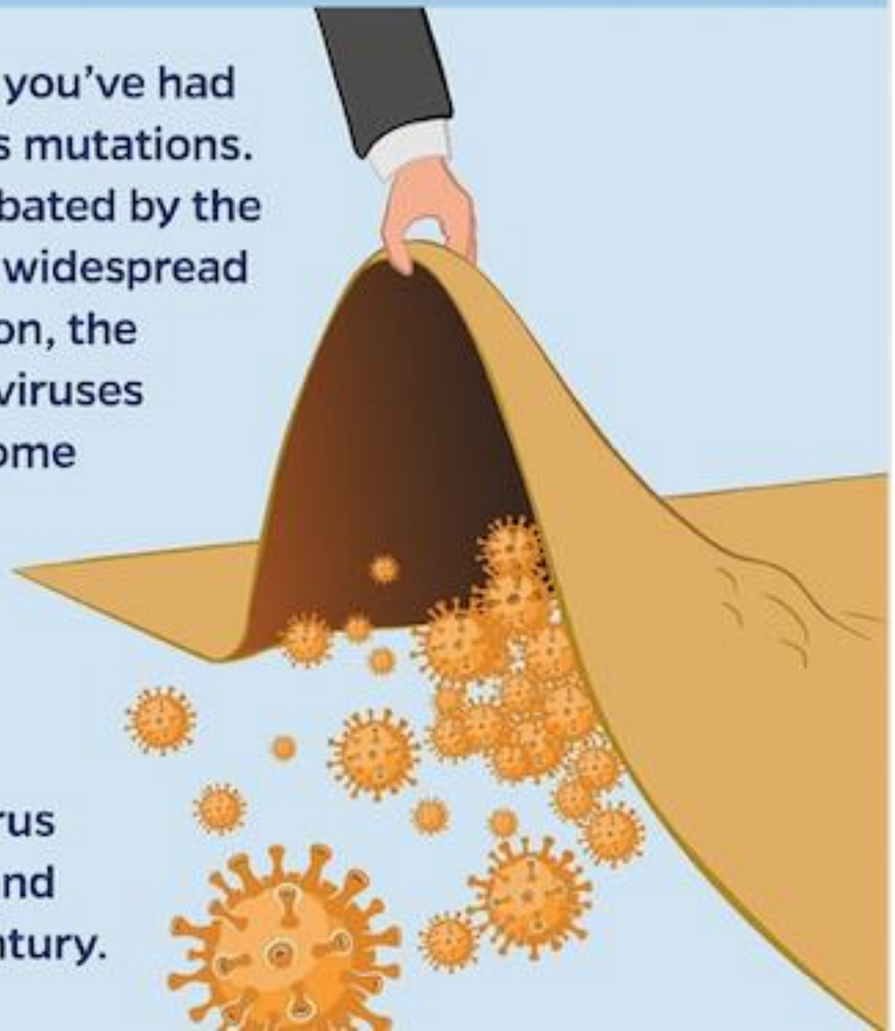
- Increased levels of population immunity is how we’ll get there, and everyone has a role to play: get **vaccinated and boosted if you can**

بالعربي كيف نتأقلم و ما نضل معتبرينها جائحة، تمامًا زي كورونا
اقرأ ال ٣ سلايدات التالية للتصفح

# THE GREAT INFLUENZA OF 1918

## never really went away, either.

In fact, it's possible that you've had a flu caused by one of its mutations. Yes, that flu pandemic abated by the 1920s, but that's due to widespread immunity and attenuation, the process by which some viruses evolve over time to become less deadly. A virus just wants to spread; it doesn't necessarily want to cause severe disease in its host. So mutating allowed the virus to continue spreading, and survive into the 21st century.



If that strain of the flu still exists, then

# WHY IS THE FLU PANDEMIC OF 1918 CONSIDERED OVER?

Colds and flus spread every year, but we don't consider them epidemics or pandemics unless they cause severe rates of infection and death. Occasionally, a seasonal flu will reach epidemic levels, but most of them are endemic, meaning they have low, manageable rates of death and transmission.

# WHEN WILL COVID BECOME ENDEMIC?

## What does that look like?

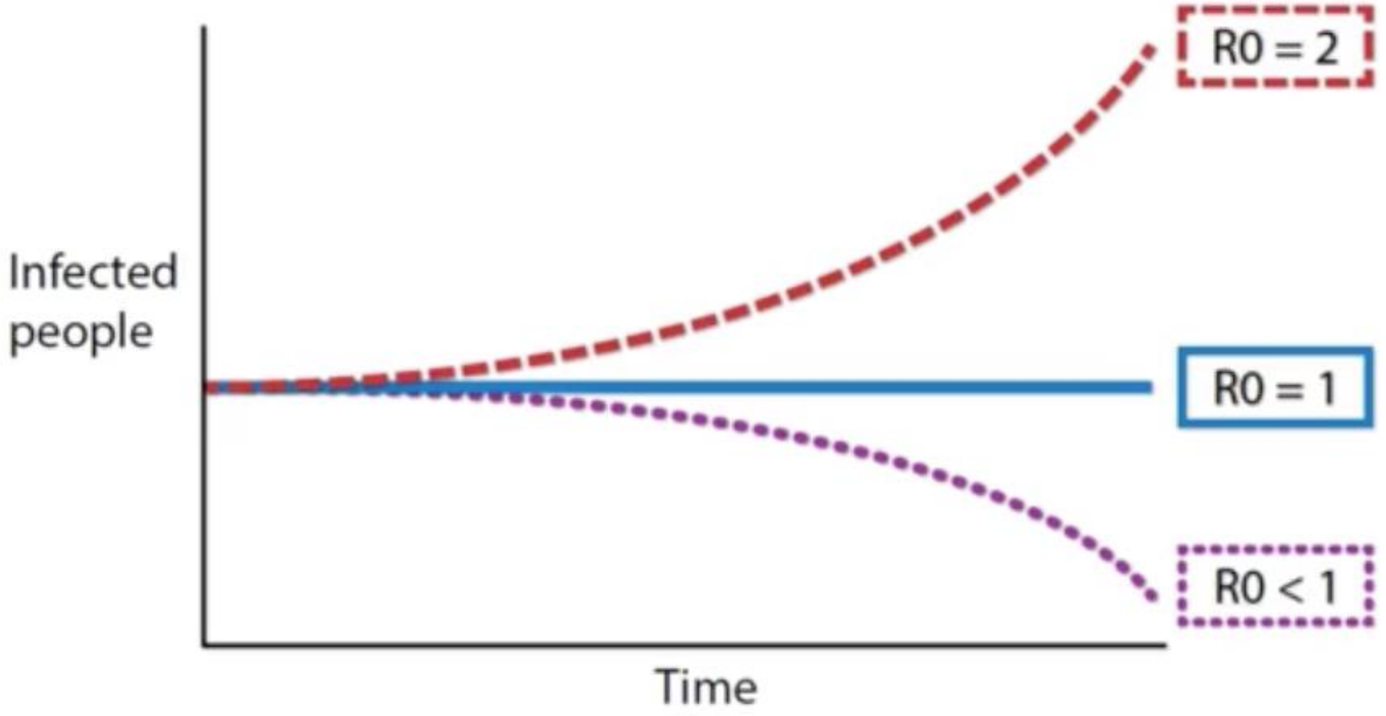
There's no way to predict when COVID will become endemic, but some key factors will likely include: overall severe case rates dropping thanks to immunizations and prior infections, decreasing rates of death and hospitalization, and our healthcare systems not being overwhelmed.

***REMEMBER:*** *an endemic COVID is NOT a fully eradicated COVID; it's simply a less threatening, more manageable version of the virus.*

# Reproductive Number (R0 or R-Naught)

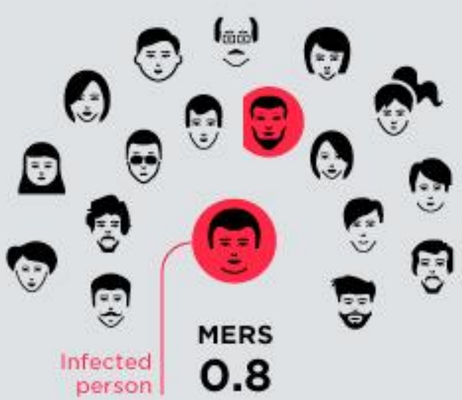
- ***Reproductive number***—the number of people one infectious person will infect if everyone that person has contact with is susceptible
- This is a good way to measure how fast a disease can spread
- The higher the reproductive number, the more people will be infected

مهم كثير



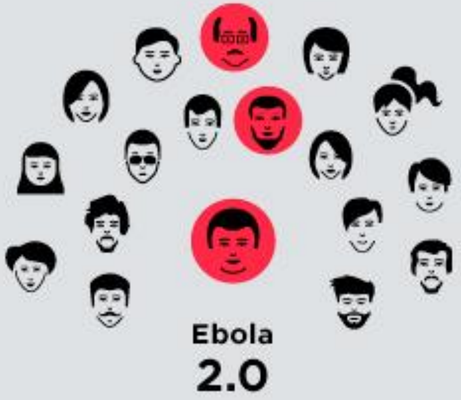
## R0 (basic reproduction number) of diseases

A measure of how many people each sick person will infect on average

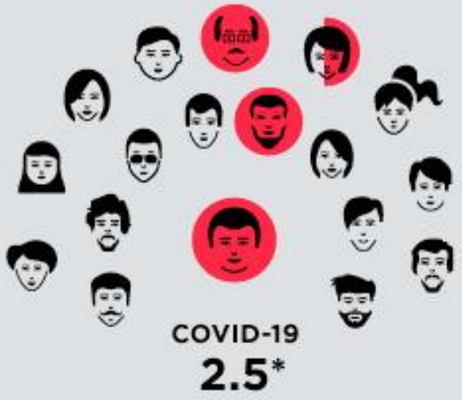



MERS
0.8

Influenza
1.5



Ebola
2.0



COVID-19
2.5*

SARS
3.5

Mumps
4.5

Rubella
6.0

Smallpox
6.0

Measles
16.0

*This number may change as we learn more about this new disease

# Even Small Reproductive Numbers Create Large Outbreaks

- If each infected person infects just two people, the size of the outbreak doubles quickly

R0 = 2

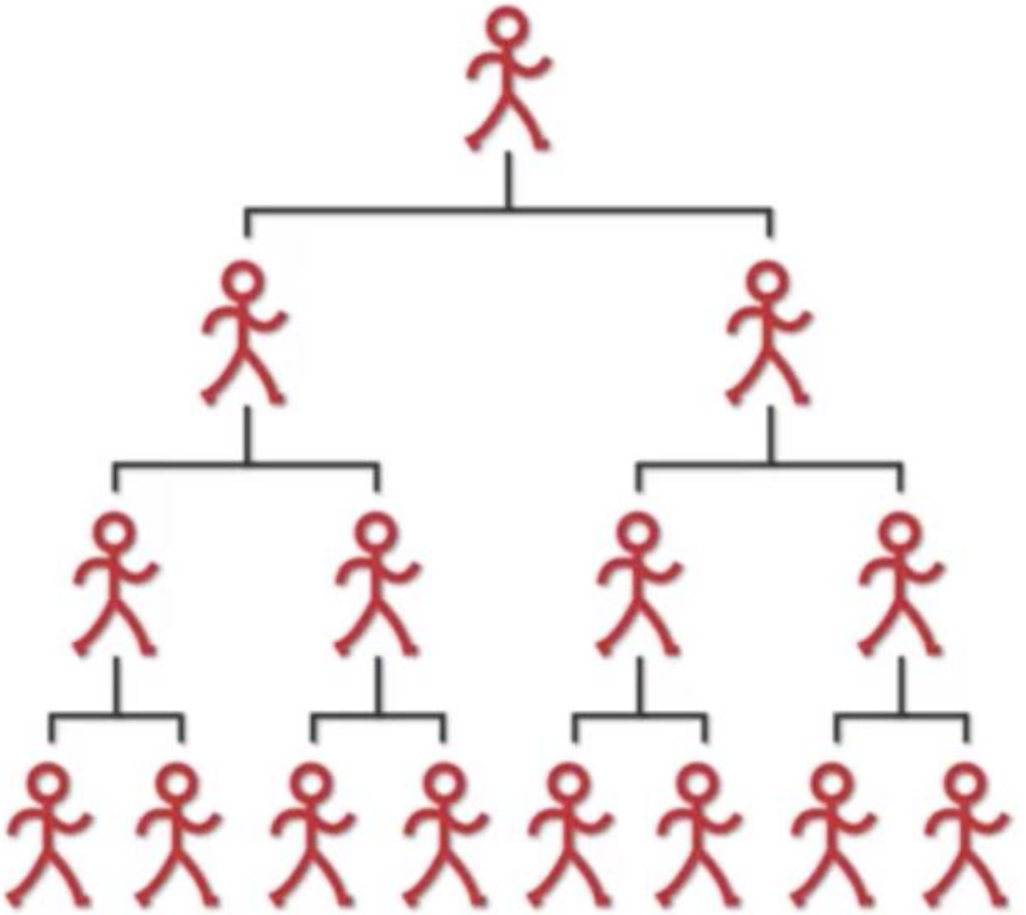


Image source: Johns Hopkins University.

Source: Eisenberg, J. (2020 March 17). R0: How scientists quantify the intensity of an outbreak

# Impact of Preventing Just One Infection

- If each infected person infects just two people, the size of the outbreak doubles quickly
- Preventing just one infection now can lead to big reductions of cases over time

What happens if we stop each case from infecting just one person?

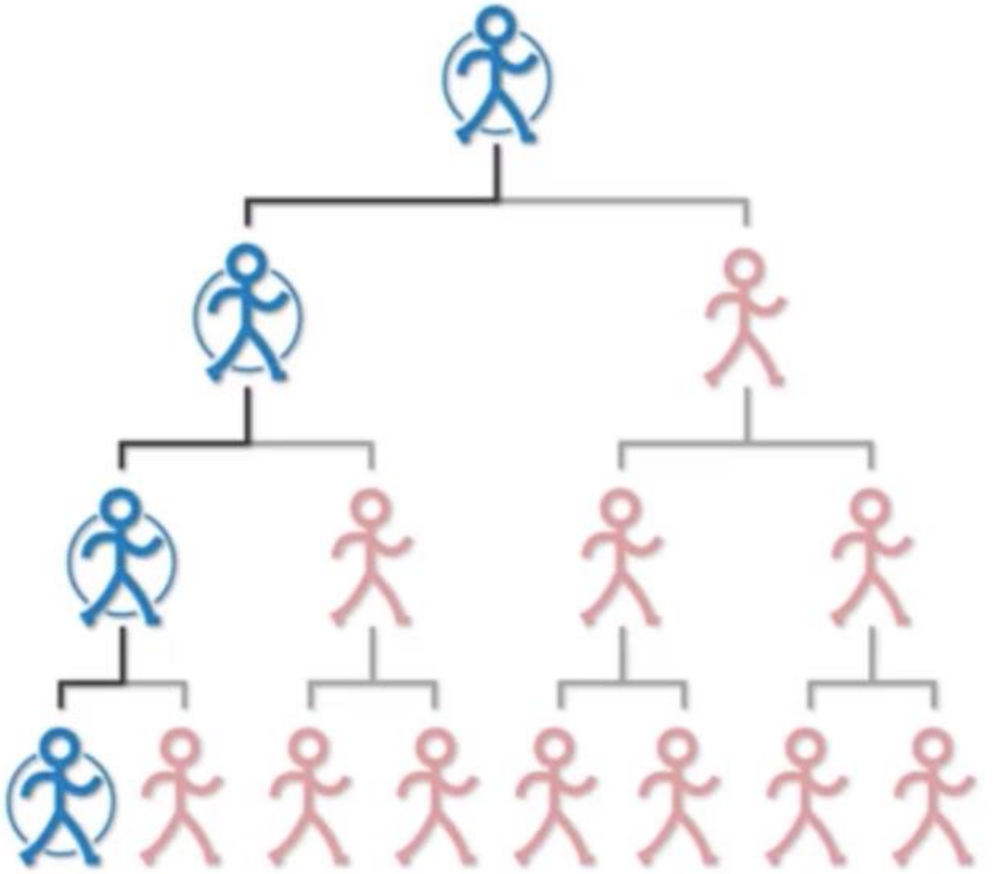
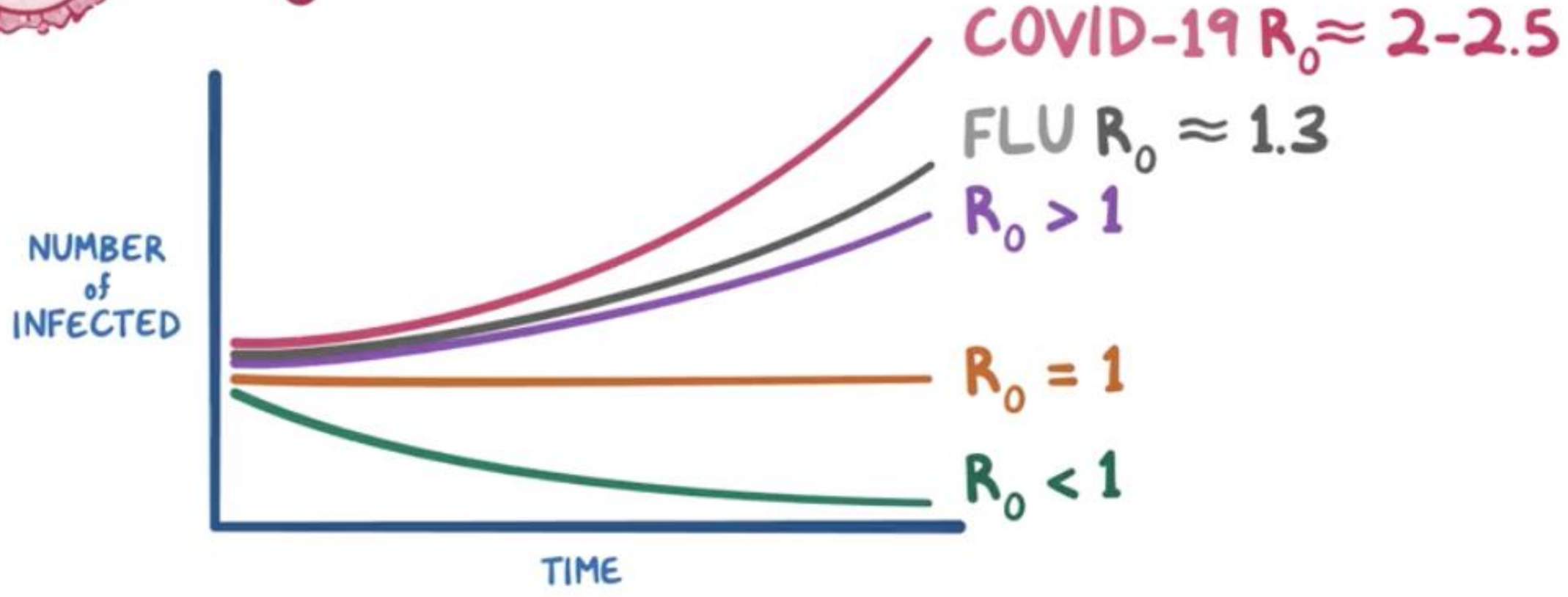


Image source: Johns Hopkins University.
Source: Eisenberg, J. (2020 March 17). R0: How scientists quantify the intensity of an outbreak

# $R_0$ → HOW QUICKLY it SPREADS



# What is new with COVID?

- There is a new wave of BA.5 COVID variant in Jordan and worldwide
- Started end of June 2022
- New variant is **less severe but highly contagious** ( 4 times more than previous variants)
- **Symptoms similar to previous COVID variant but last 2-3 days**
- Rising test positive cases **more than 5%** which is an indicator of a new wave
- Less fatalities and hospitalizations than previous variants

| Time | End of June 2022 | End of July 2022 |
| --- | --- | --- |
| **Weekly positive cases** | 1,329 | 5,417 |
| **Weekly positive rate** | 5.9% | 14.9% |
| **Weekly deaths** | 0 | 9 |

# Precautions

- If exposed or have symptoms stay home and isolate from others
- Hand hygiene
- Mask up and not just indoors
- Max out your vaccine and booster Keep rapid test on hand- and you them if needed

# Are COVID vaccine protective against Omicron BA.5?

- There is abundant evidence that being vaccinated and getting all COVID boosters helps protect you against severe disease

# What are the current recommendations for vaccine?

- According to CDC, children 6 months and older can get COVID vaccine (Pfizer and Moderna) but in smaller doses than teens and adults

# What are the current recommendations for booster vaccines?

CDC recommends a 2nd booster of either Pfizer or Moderna COVID-19 vaccine at least 4 months after the 1st booster for:

- Adults ages 50 years and older
- People who are moderately or severely immunocompromised

# The long history of mRNA vaccines

- Messenger RNA or mRNA was discovered in the early 1960s
- Research into how mRNA could be delivered into cells was developed in the 1970s.

- So, why did it take until the global COVID-19 pandemic of 2020 for the first mRNA vaccine to be brought to market? (next slide)

# The long history of mRNA vaccines

- **Biggest challenge** was that mRNA would be taken up by the body and quickly degraded before it could “deliver” its message—the RNA transcript—and be read into proteins in the cells.

- Solution to this problem came from advances in **Nanotechnology**: the development of **fatty droplets** (lipid nanoparticles) that **wrapped the mRNA** like a bubble, which **allowed entry into the cells.**

# The long history of mRNA vaccines

- The first mRNA vaccines using these fatty envelopes were developed against the deadly Ebola virus in West Africa

- Thanks to decades of research and innovation, mRNA vaccine technology was ready for COVID

- It’s a new era for vaccine technology and production, and a testament to scientific progress and decades of research.

# How can mRNA vaccine help beyond COVID?

- We are in a golden age of molecular biology
- Scientific advances are extraordinary
- Longer term scientific investment that paid off in the short term
- That is the fastest that we have ever gone from the discovery of the pathogen to a safe and effective vaccine
- 10 months after COVID we have 2 safe effective vaccine not by cutting corners on vaccine safety or efficiency study but by manufacturing in parallel while trial were going forward
- Can help with all kind of diseases for which immune control may be important (e.g cancers)

# Solve an outbreak

شوية تمارين

# The village of gold

## Your Mission:

Your help is needed in a terrible outbreak that's affecting children!

An international group that aids the sick has discovered a horrifying health emergency: more than 100 children in a remote corner of Nigeria have died, and many more are extremely sick.

The sick aren't responding to anti-malaria medicine or antibiotics. They desperately need your help to solve the outbreak!


You'll begin this investigation as an Apprentice. To become an Assistant, you'll need to:

- Review each clue in the investigation.
- Answer the questions correctly to solve the outbreak.

More than 100 children in a remote corner of Nigeria have died.

# Clue #1

Doctors Without Borders has been doing some routine health work in northwestern Nigeria. This is a remote area, with dusty and mountainous terrain. People here are very poor. Most are farmers or miners who dig for precious minerals like gold.

The doctors discovered that 3 villages are in the midst of a horrible outbreak: 118 children (many of them younger than 5) are dead. Many more are sick, with symptoms including vomiting, abdominal pain, headache, and convulsions (sudden, violent, uncontrollable shaking).


The villages of Zamfara Province are in a remote northwestern section of Nigeria, far from any city or paved roads.

Clue

# Answer this question

**It could take days to reach the village. What should you do?**

- Recommend that the Nigerian authorities take a closer look first
- Closely monitor the situation from CDC headquarters in Atlanta
- Go to Nigeria immediately  Even if it’s risky

# Clue #2

It's **a major undertaking**, but you and your team make it to the villages. There you find a terrible scene. Outside **the villages** is a graveyard with more than 100 newly dug, small graves.

Parents of children who died tell you that their kids had seizures, and you see that many of the sick kids are still having seizures. Others are listless, and some have gone blind.

Most of the sick are children. There are some sick adults, too, but they aren't as bad off, and no adults have died.

The Zamfara Province of Nigeria is a very poor, isolated area.

# Cases

There are 3 villages in this area. Each village consists of open-air dwellings with dirt floors, separated by low walls. People from extended families live in compounds (a number of dwellings close together, enclosed by a common wall).

Some of the compounds have their own well for drinking water, but people in other compounds use a common village well.

A few of the villagers begin to wonder if the drinking water is contaminated.

Village children fill water containers at the common village well.

# Answer this question:

**What should you do next?**

- Take sample of the sick people’s blood immediately
- Get permission from the village elders, then take the sample 
- Get everyone away from the village

# Clue #3

While doing your research in the villages, you notice that in many cases **entire families are involved in mining**. Many children work in the mines and even very young children help their mothers break down rocks or dry the ore in their own family compound.

The blood tests show that the sick children have extremely high levels of lead in their blood, which means they have **lead poisoning**, a serious and often fatal condition. The sick children need immediate treatment, but you only have a limited amount of medicine.

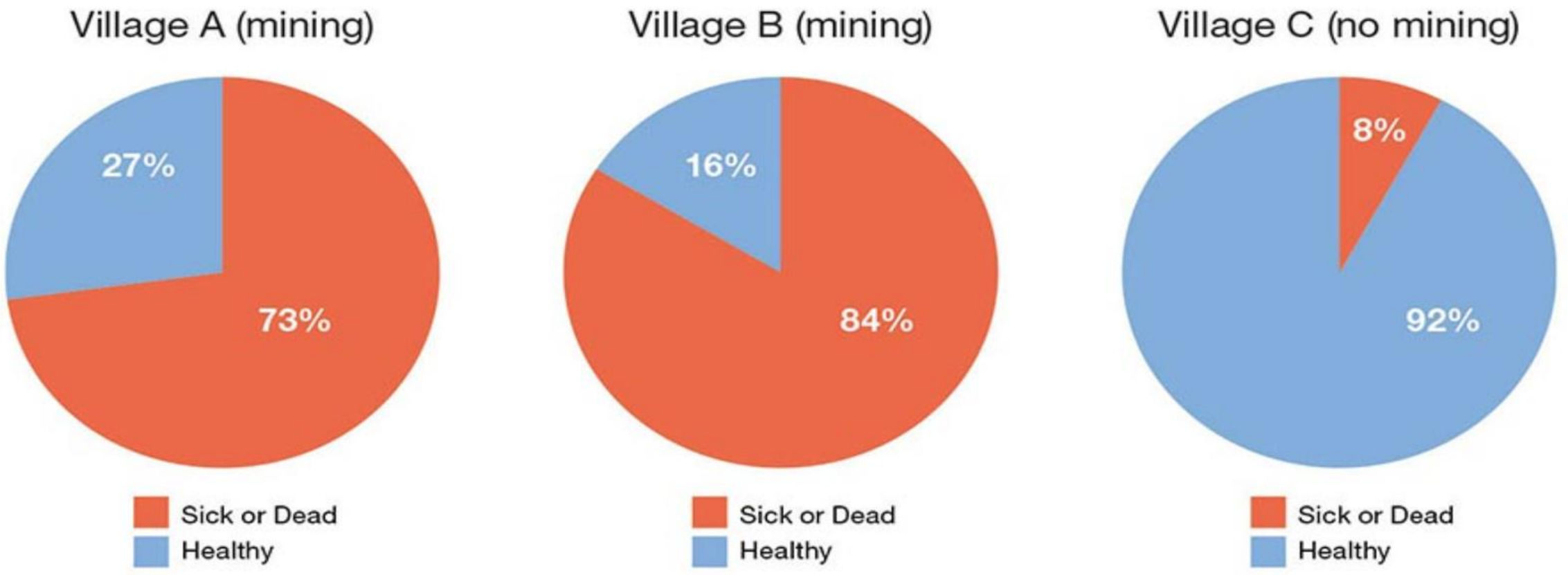
A medical treatment and supply tent.

# Cases

As part of the investigation, you discover that 1 of the 3 villages is not involved in gold mining and has a much lower rate of sickness than the other 2 villages. This leads you to suspect that the mining is to blame for the lead poisoning, since it releases so much toxic lead dust into the air.

The people who mine gold don't have sophisticated machinery or protective equipment. They collect large rocks and then crush them (with simple tools or their hands) without wearing facemasks, goggles, or gloves. And they don't do this work solely in a mine, either. Much of the work is done in the village, and some is even done in family compounds, by mothers and

# Villages Involved in Mining, and Rates of Sickness



# Definition

**What is lead poisoning?**

Lead poisoning is a serious condition that occurs when lead builds up in the body. Even small amounts of lead can cause severe health problems. At very high levels, lead poisoning can be fatal.

Children under the age of 5 are especially vulnerable to lead poisoning because it can severely affect mental and physical development. Young children are also more likely to get lead poisoning because they're often on the ground and exposed to lead-contaminated soil and dust. They tend to put their hands in their mouth and nose, increasing their chances of infection.

Children under the age of 5 are especially vulnerable to lead poisoning.

**You have limited amount of medicine. Whom should you give it to first?**

- Children who are least sick and have the best chance for recovery
- Children who are the most sick and have seizures or in a coma
- Children under 5 years old, beginning with the youngest

# Clue #4

You start treating the sickest kids with **chelation therapy** to help them recover.

You've learned that two-thirds of the families in the 2 sicker villages are mining gold. The mining could be responsible for the deaths, but because the villagers are so poor and this is the only way they can make money, they don't want to stop mining.

You need to determine what parts of mining put the villagers at highest risk. When interviewing the families, you ask about **the types of mining activities** they do. You need to figure out which of these activities are most dangerous.

A mine near a contaminated village.

# Definition

**What is chelation therapy?**
Chelation therapy is a treatment used to address lead poisoning. In Nigeria, doctors used an oral medicine (Succimer), a chemical that binds, or attaches, to heavy metals such as iron, lead, mercury, cadmium, and zinc. The body then removes the chemicals through urination.

Children treated with chelation therapy receive it over the course of many weeks. Children often need more than one dose of chelation especially if their blood lead levels are very high.

Children treated with chelation therapy receive it over the course of many weeks.

# Data

There are several steps to mining the gold. Some people break the rocks into smaller gravel, some grind the rocks into a fine powder, some wash and dry the ore powder to separate the gold out, and some use heat to vaporize the mercury out.

To figure out which steps are most dangerous, you have a talk with mothers who have healthy children as well as mothers who have sick children. In all, you gather data about 52 healthy kids and 50 sick kids. Then, you ask the parents about each mining activity they do so you can calculate the "attack rate" for each activity.

**Attack Rates for Activities Conducted by Parents of Sick and Healthy Children**

| | Number of kids whose parents do these tasks | | | | Number of kids whose parents don't do these tasks | | | |
|---|---|---|---|---|---|---|---|---|
| Activity | Sick | Well | Total | Attack Rate | Sick | Well | Total | Attack Rate |
| Break rocks into smaller rocks | 40 | 21 | 61 | 66% | 12 | 29 | 41 | 29% |
| Grind rocks into powder | 33 | 12 | 45 | 73% | 19 | 38 | 57 | 33% |
| Wash and dry ore | 27 | 19 | 46 | 59% | 25 | 31 | 56 | 45% |
| Use heat to vaporize | 15 | 11 | 26 | 58% | 37 | 39 | 76 | 49% |
| Do 2 of the above | 44 | 14 | 58 | 76% | 8 | 36 | 44 | 18% |
| Do 3 or 4 of the above | 45 | 8 | 53 | 85% | 7 | 42 | 49 | 14% |

Tip: To identify the likely source of the outbreak, look for a high attack rate among those who performed a specific activity and a low attack rate among those who did not.

# Attack Rates for Activities Conducted by Parents of Sick and Healthy Children

| | Number of kids whose parents do these tasks | | | | Number of kids whose parents don't do these tasks | | | |
|---|---|---|---|---|---|---|---|---|
| **Activity** | **Sick** | **Well** | **Total** | **Attack Rate** | **Sick** | **Well** | **Total** | **Attack Rate** |
| Break rocks into smaller rocks | 40 | 21 | 61 | **66%** | 12 | 29 | 41 | **29%** |
| Grind rocks into powder | 33 | 12 | 45 | **73%** | 19 | 38 | 57 | **33%** |
| Wash and dry ore | 27 | 19 | 46 | **59%** | 25 | 31 | 56 | **45%** |
| Use heat to vaporize | 15 | 11 | 26 | **58%** | 37 | 39 | 76 | **49%** |
| Do 2 of the above | 44 | 14 | 58 | **76%** | 8 | 36 | 44 | **18%** |
| Do 3 or 4 of the above | 45 | 8 | 53 | **85%** | 7 | 42 | 49 | **14%** |

**Based on your data, which children are more likely to get lead poisoning?**

- Kids whose parents grind rocks into powder, releasing toxic dust
- Kids whose parents wash and dry ore
- Kids whose parents perform the most mining activities

# Clue #5

Four weeks after arriving in the villages, **you've given chelation therapy** to the sickest kids younger than 5. Most of them have improved, though many may still have permanent disabilities. Teams of Nigerian workers and environmental specialists thought it was best to remove the top layer of contaminated earth from the villages to reduce the number of people who get sick, so it was removed and buried far outside the village. They had to hurry, because the rainy season is coming, and such work will be impossible then.

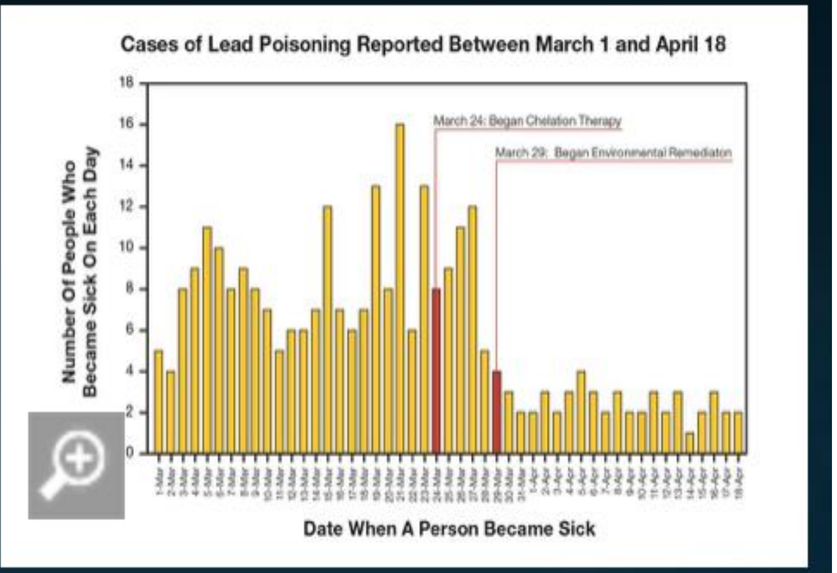
You've been working hard to educate the miners about the risks of this kind of mining. You tell them not to mine from inside their own compounds. They should always keep their living areas free of mining activities.

# Data

You've kept careful track of the number of cases since the epidemic started by using an epi curve. An epi curve shows how an outbreak changes over time. It includes:

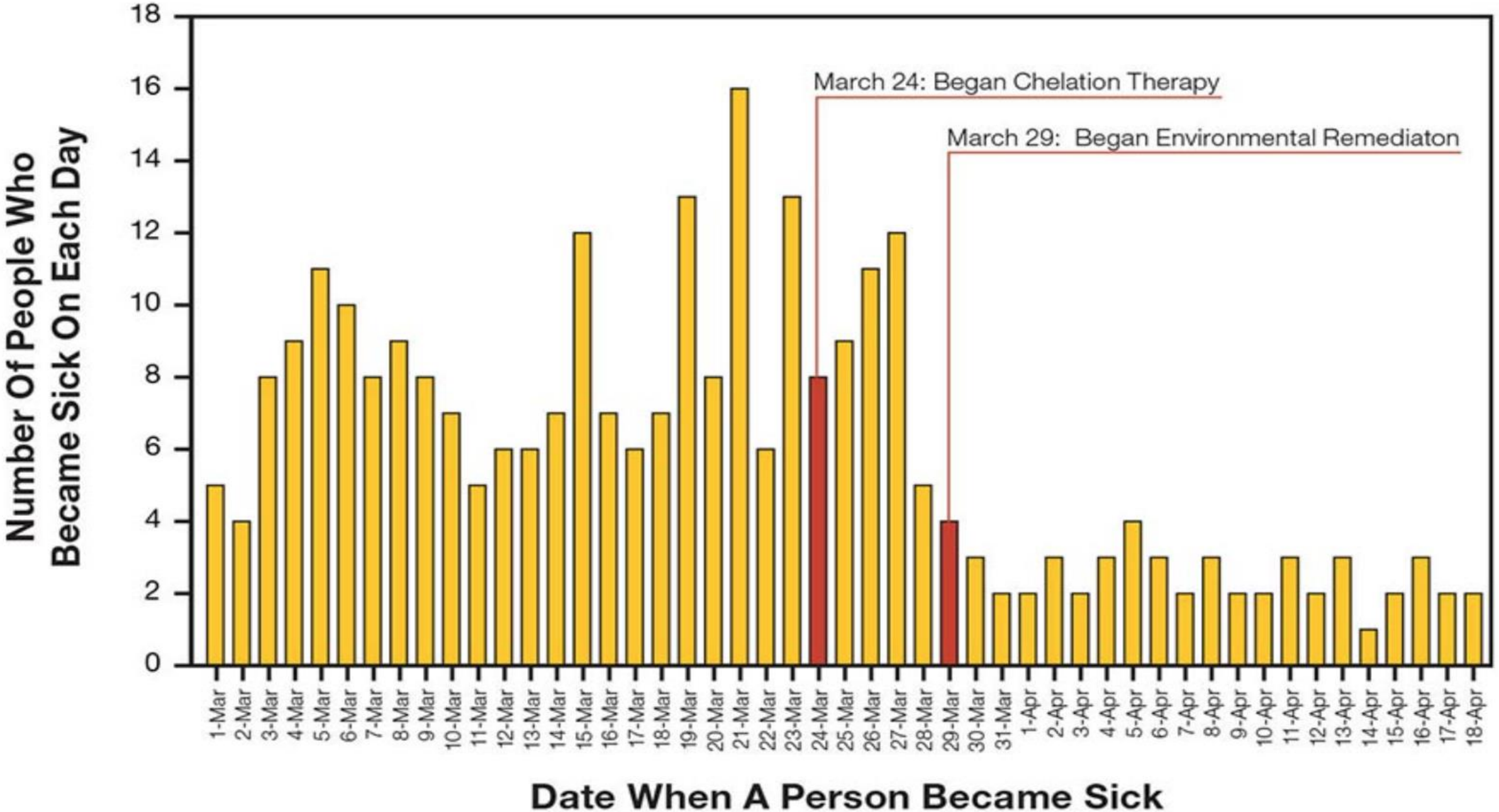
- Date when a person became sick.
- Number of people who became sick on each day.

Epi curves are updated as new data come in, so they are always changing. The shape of the curve can provide clues about the possible source of an outbreak.




You've kept careful track of how many people got sick.

# Cases of Lead Poisoning Reported Between March 1 and April 18



**Based on the Epi curve, which of the following do you think is happening?**

- The epidemic is better but hasn’t gone away. The treatment hasn’t worked
- The epidemic is better but miners are still getting too much lead near their kids
- The epidemic appears to be ending

# Solutions for preventing the next pandemic

- Future pandemics are inevitable, but we can reduce the risk
- The cost of preventing the next pandemic is 2% of the cost we’re paying for COVID-19
- Over the last 100 years, **2 viruses a year spillover from animals to humans**

# How to prevent the next pandemic?

- Governments must work together to strengthen global health system to better prevent, prepare for and respond to the next pandemic

1. Improve **global coordination and leadership**
    - Pandemic cross borders. They need countries to work together
2. Provide a **sound financial footing** for pandemic preparedness and response
    - Global solutions need collective investment.
    - Increased investment in research, manufacturing and distribution of treatment and vaccine

# How to prevent the next pandemic?

3. **Invest in the gaps in infrastructure** in monitor and respond to threats

    - We **need to invest in**: surveillance, manufacturing and co-ordinated research and development

- Coronavirus will not be the last pandemic in our lifetime.

- Scientists warn the threat posed by zoonoses – infectious diseases that jump from animals to humans – is on the rise.

- **The risk of a new pandemic is higher now than ever before**.

# Conclusion

- We are continually learning & adapting
- Current adaptations:
    1. Social distancing
    2. Wearing masks
    3. Quarantining
    4. New vaccine

# Conclusion

- Despite the persistence of current & potential pandemics, humanity continues to move forward
- Need to be aware of factors that nurture pandemics
- Improvement in health care is a powerful tool
- Public health plays an enormous role in communication

# The End