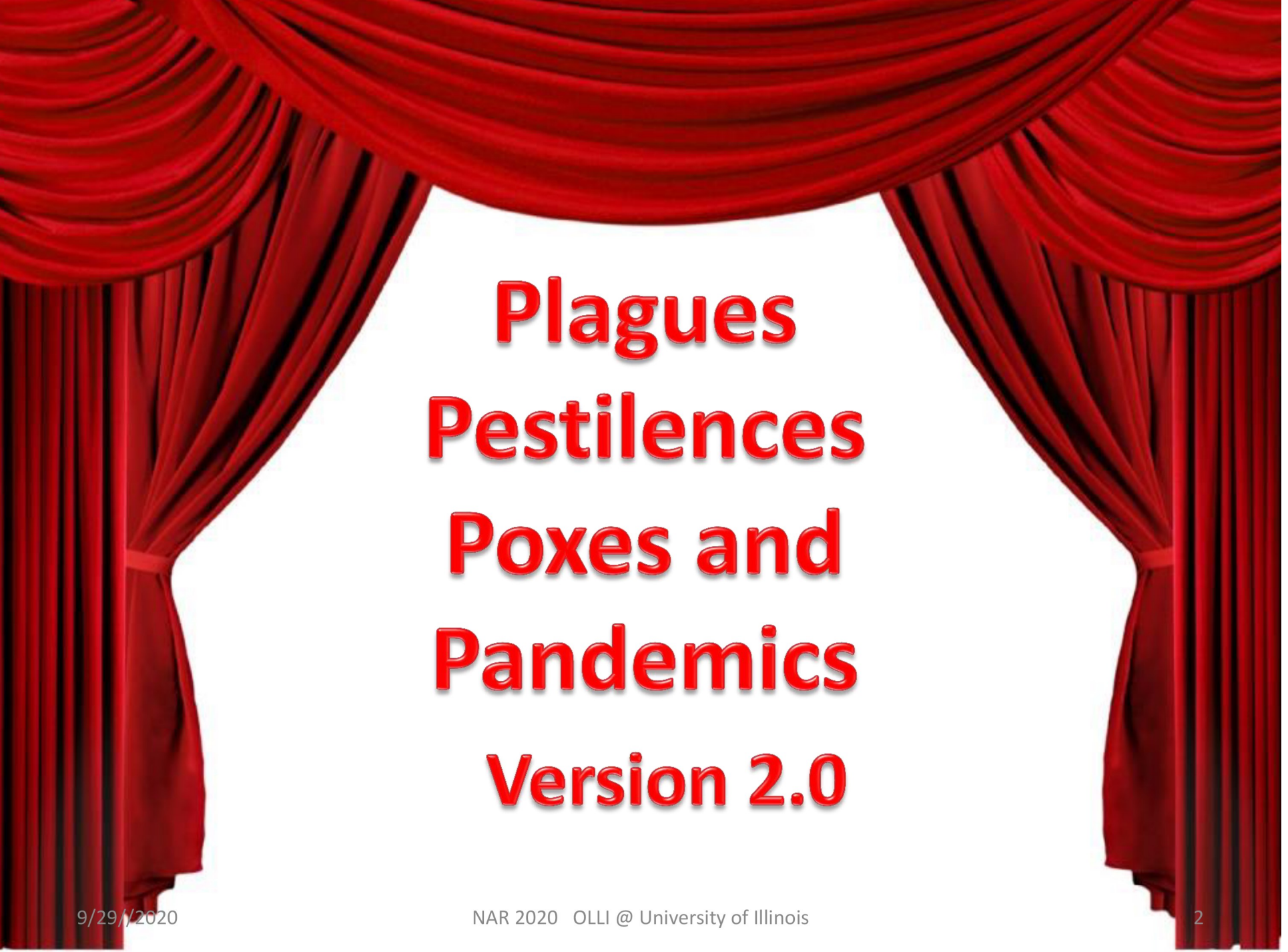

HIOX
Good
Afternoon


Plagues
Pestilences
Poxes and
Pandemics
Version 2.0

Course Overview

- Session 1 February 27: Definitions, Biblical Plagues.
- Session 2 March 5: The PLAGUE through time & place.
- Session 3 March 12: Other epidemic diseases.
- Session 4 March 19: The Columbian Exchange.
- Session 5 March 26: 20th Century Pandemics Past & Current
- Session 6 April2: HIV/AIDS
- Session 7 April 9: 20th and 21st Century Viruses.
- Session 8 April 16: Crystal Ball into the Future?

Session 5

20th Century Pandemics Past & Current

March 26, 2024

Session Overview

- Definition of Pandemic
- The Influenza Virus
- The "Big 4" of the 20th Century
  - 1. Spanish Flu
  - 2. Asian Flu
  - 3. Hong Kong Flu
  - 4. Cholera
- Encephalitis Lethargica

Other Epidemics and Pandemics

- Plague: Session 2
- Polio: Session 3
- Yellow Fever: Session 3
- Cholera: Session 3
- Malaria: Session 3
- HIV/AIDS: Session 6
- Dengue Fever: Session 7
- Corona viruses: Session 7

Session 5

20TH CENTURY PANDEMICS PAST & CURRENT and OTHER EPIDEMIC ILLNESSES

Epidemic

- *Sudden* and *rapid* spread of disease to a large number of people in a population within a short period of time.

- Used for infectious diseases, and for diseases with an environmental origin.

Pandemic

- An *epidemic* that crosses international boundaries, usually affecting people on a worldwide scale.

- Near-global disease *outbreaks* when multiple countries across the world are infected.

- Term refers to **extent** of illness not **speed** of spread.

THE INFLUENZA VIRUS

The A, B, C's of Influenza Virus

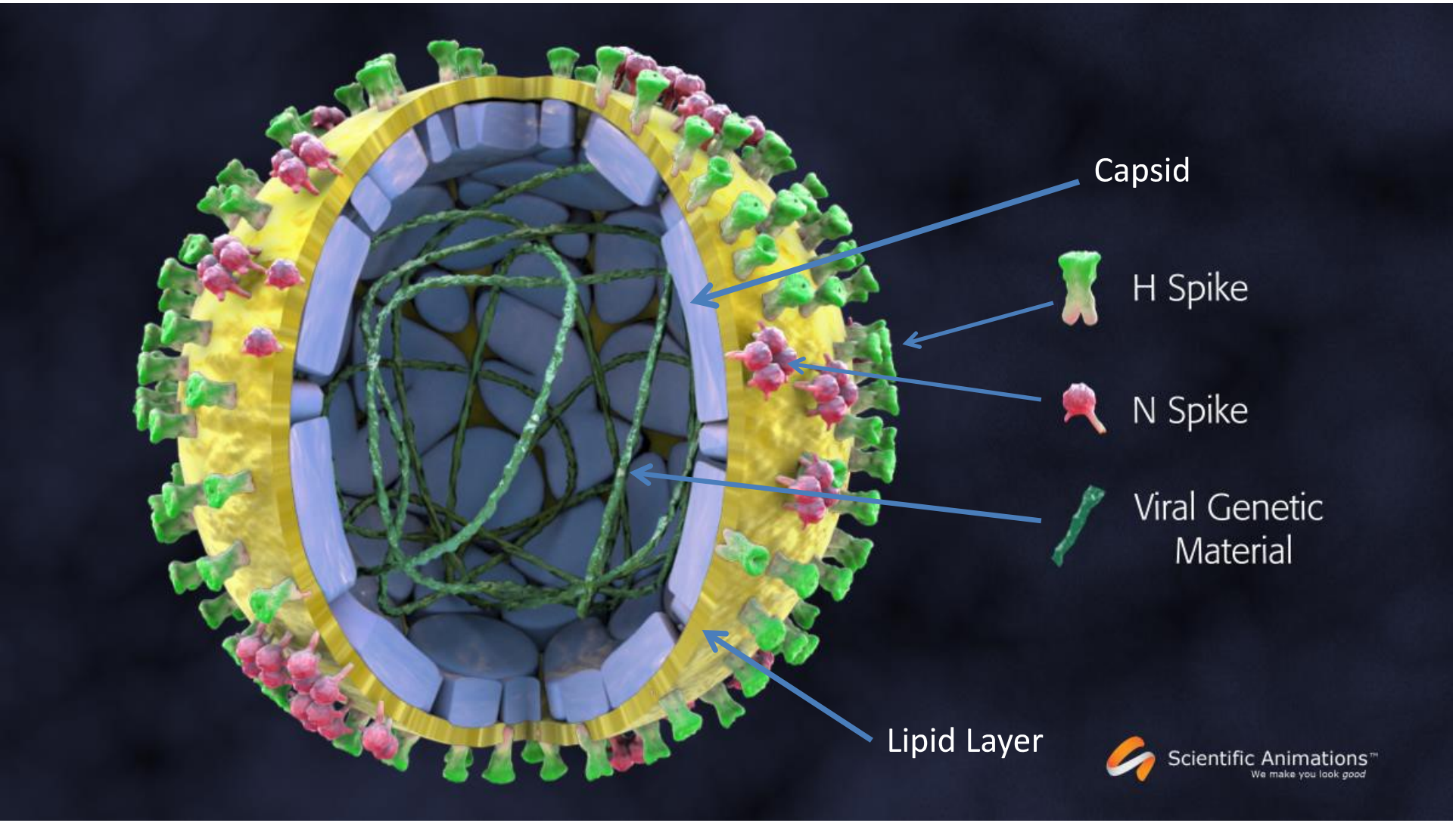
- Influenza comes in 4 basic types ***A***, ***B*** ,***C,*** *and* ***D*** that tell us how dangerous the virus can be.

- All Influenza pandemics have come from Type ***A*** (originates in aquatic birds, affects humans, pigs, mammals).

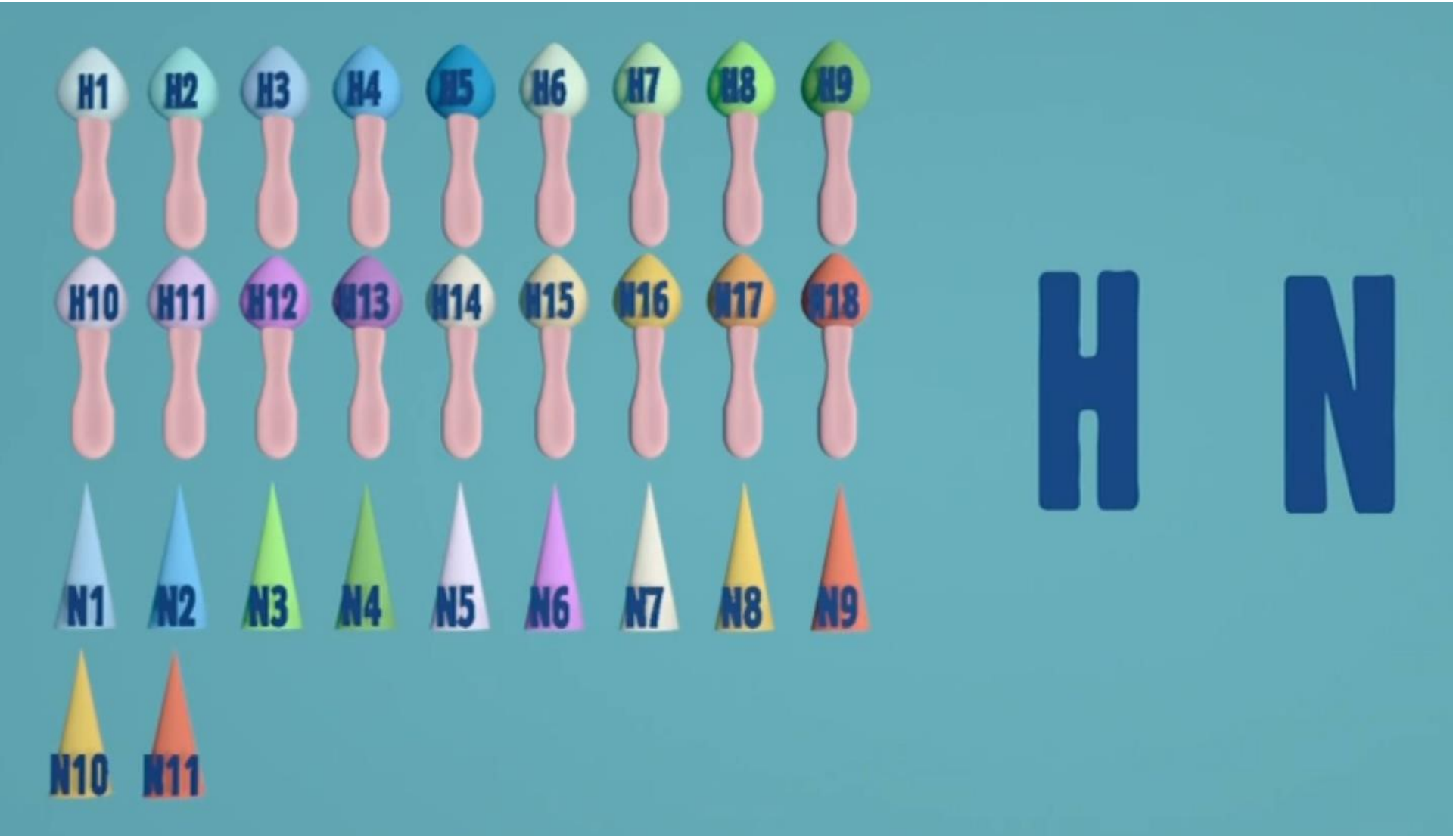
- Influenza ***B*** (seasonal epidemics) can make you just as sick as ***A***, but has never triggered a worldwide pandemic, and Influenza ***C*** causes the mildest disease.

- Influenza ***D*** is found in cattle and pigs, does not cause human illness.

Influenza Virus



H and N viral spikes



What do the H's and N's Mean?

- ***H*** and ***N*** are protein spikes on the virus' surface that help it invade cells:
  - **H** or HA is *hemagglutinin*, binds the virus to the host cell
  - **N** or NA is *neuraminidase,* releases the virus from host cell

- The spikes come in 18 types for **H**emagglutinin and 11 for **N**euraminidase (198 varieties of flu, not all of them infective, and some not identified in nature); each flu takes one ***N*** and one ***H.***

- Influenza B and C do not have protein spikes like A does.

INFLUENZA COMPLEXITY

Influenza Virus Changes

- The virus adapts to changes in its environment.
- It changes to improve or maintain its infectivity.
- It can change by 1 of 2 mechanisms:
  - Antigenic **Drift**
  - Antigenic **Shift**

Antigenic **Drift**

Influenza **A** viruses constantly undergo antigenic evolution.

Either ***H*** or ***N*** change in a particular strain.

This produces new strains, which trips up the immune system.

If ***H*** and ***N*** mutate, antibodies may no longer recognize them and bind to them.

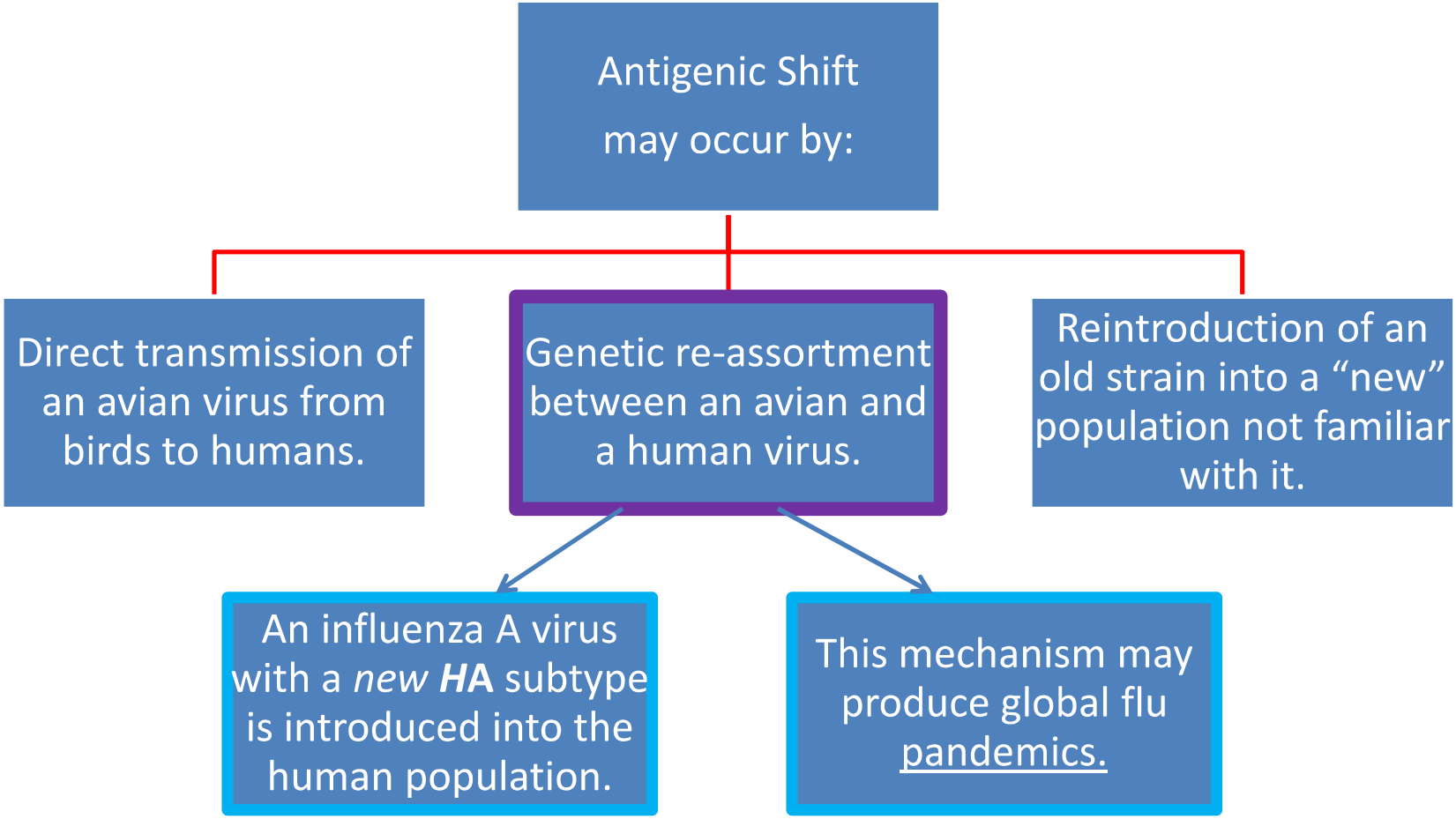
This leaves the virus fully **infective**, which may cause flu epidemics.

Infective vs Infectious

- **Infective**: the capability of an organism to produce an infection

- **Infectious**: process caused by the entry into the body of organisms which grow, multiply and can spread infection

Antigenic **Shift**



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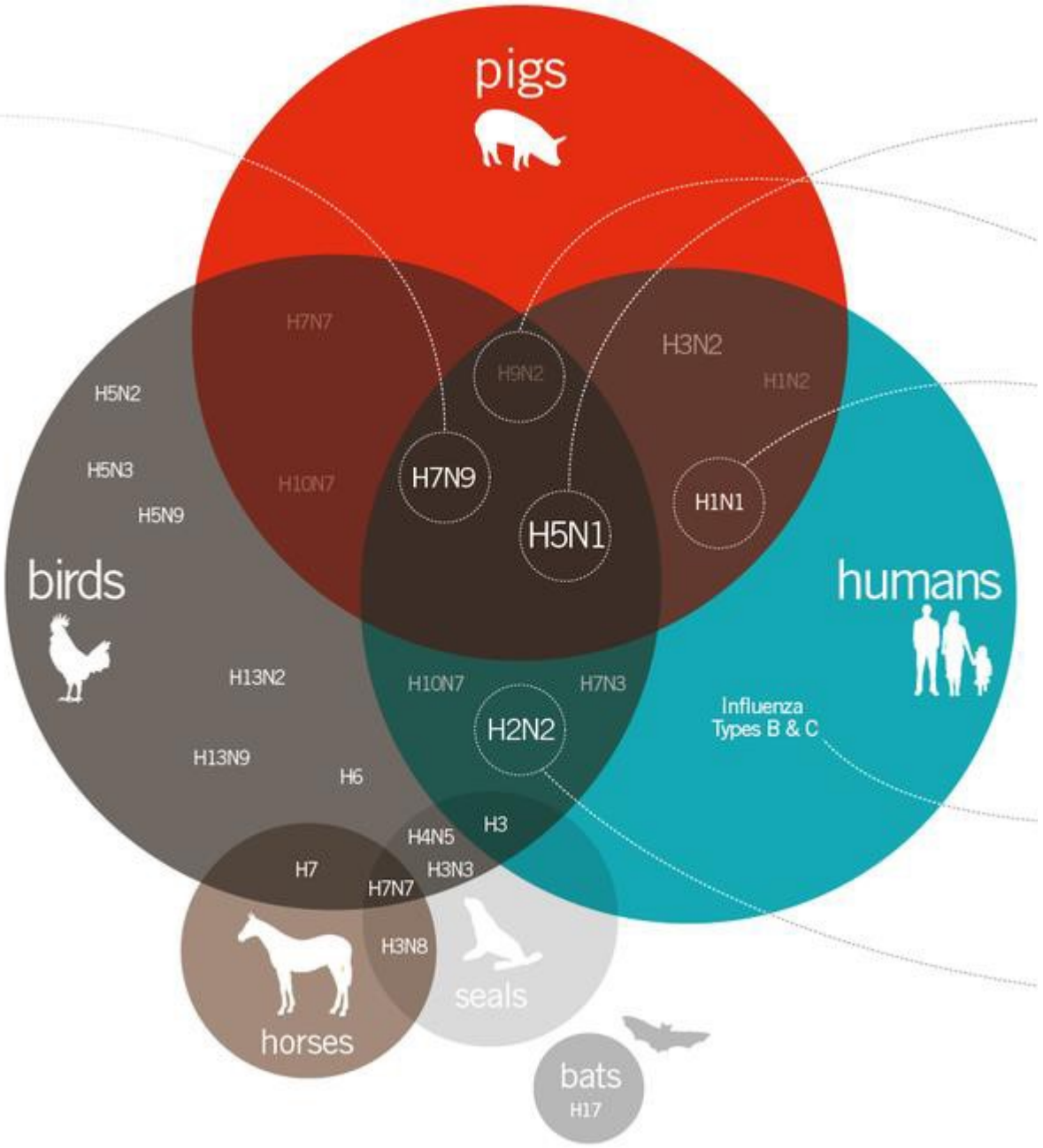
Influenza Virus species overlap



Antigenic Shift

- The process by which 2 or more different strains of a virus, or strains of 2 or more different viruses, combine to form a new subtype that has a mixture of the surface antigens of the original strains.

- It is a specific case of reassortment that confers a phenotypic change, and occurs ***only*** in influenza A.

- Because it affects other mammals and birds, influenza A has the chance to do a major reorganization of its surface antigens.

Antigenic Drift

- The natural mutation over time of known strains of influenza which may lead to a loss of immunity, or cause vaccine mismatch.

- Antigenic drift occurs in all types of influenza including influenza A, influenza B and influenza C.

Antigenic Drift

- The changes associated with antigenic drift happen continually over time as flu viruses replicate when they infect a host and make copies of themselves.

- Flu vaccines are designed to target one or more of the surface proteins/antigens (*HA* and **NA**) of flu viruses.

- Flu viruses that are closely related to each other usually have similar antigenic properties, so antibodies will likely recognize and respond to antigenically similar flu viruses ("cross-protection").

Antigen Drift

- When a flu virus has “antigenically drifted”, the virus’ antigenic properties are different enough that the body’s immune system will have a harder time recognizing it and fighting against the virus.

- It can sometimes result in a person becoming susceptible to flu virus infection again, because a person’s existing antibodies won’t effectively recognize and neutralize the antigenically different flu viruses.

- It is an important reason why people can get flu multiple times over the course of their lives, and the primary reason why the composition of seasonal flu vaccines is reviewed annually and updated to keep up with evolving flu viruses.

Flu Vaccine changes

- In October 2023, the WHO concluded that protection against the Yamagata lineage was no longer necessary in the seasonal flu vaccine, and reduced the lineages in the vaccine from 4 to 3.

- The FDA's Vaccines and Related Biological Products Advisory Committee (VRBPAC) proposed using *A*(**H**1**N**1)pdm09, *A*(**H**3**N**2), and *B*/Austria/1359417/2021-like viruses in trivalent flu vaccines to be used in the US for the 2022-2023 flu season.

- The B/Yamagata lineage might have become extinct in 2020/2021 due to COVID-19 pandemic measures, and there have been no naturally occurring cases confirmed since March 2020.

Antigenic Shift

- A major change in a IFA virus, resulting in new HA and/or new HA and NA proteins in the viruses, that can result in a new flu A subtype infecting people for the first time.

- Shift can happen if a flu virus from an animal population gains the ability to infect humans, so that most people will have little or no immunity against the new (“novel”) virus.

- Such a shift occurred in the spring of 2009, when an **H**1**N**1 virus with genes from North American swine, Eurasian swine, humans and birds emerged to infect people and quickly spread, causing a pandemic.

- Flu viruses evolve genetically all the time and often undergo antigenic drift, but antigenic shift happens infrequently.

- Type A viruses undergo both antigenic drift and shift and are the only flu viruses known to cause pandemics, while flu type B viruses change only by antigenic drift.

Peek-a-Boo, I See You! (1)

Antigenic Drift

- A virus may remain hidden and then emerge again as a pandemic virus when immunity in the population has waned.

- The virus of the Russian flu in 1977 turned out to be genetically identical to the ***H***1***N***1 virus that caused a major epidemic in 1950.

- Drift may be reintroduction of an old strain into a "new" population unfamiliar with it Novel virus).

Peek-a-Boo, I See You! (2)

- In 1968, an **H**$_3$**N**$_2$ virus emerged from Hong Kong to replace the **H**$_2$**N**$_2$ virus; this pandemic resulted in 1-2 million deaths (antigenic shift)

- **H**$_1$**N**$_1$ virus re-surfaced in 1977 (antigenic drift).

- Currently, **H**$_3$**N**$_2$, **H**$_1$**N**$_1$ and reassortant **H**$_1$**N**$_2$ viruses are circulating in the human population causing minimal epidemic disease.

Reassortment

- Influenza A virus genetic exchange by reassortment speeds viral evolution and create pandemic strains.

- For reassortment to occur, 2 or more distinct viruses must co-infect the same cell, producing chimeric viruses with enhanced potential for cross-species transfer.

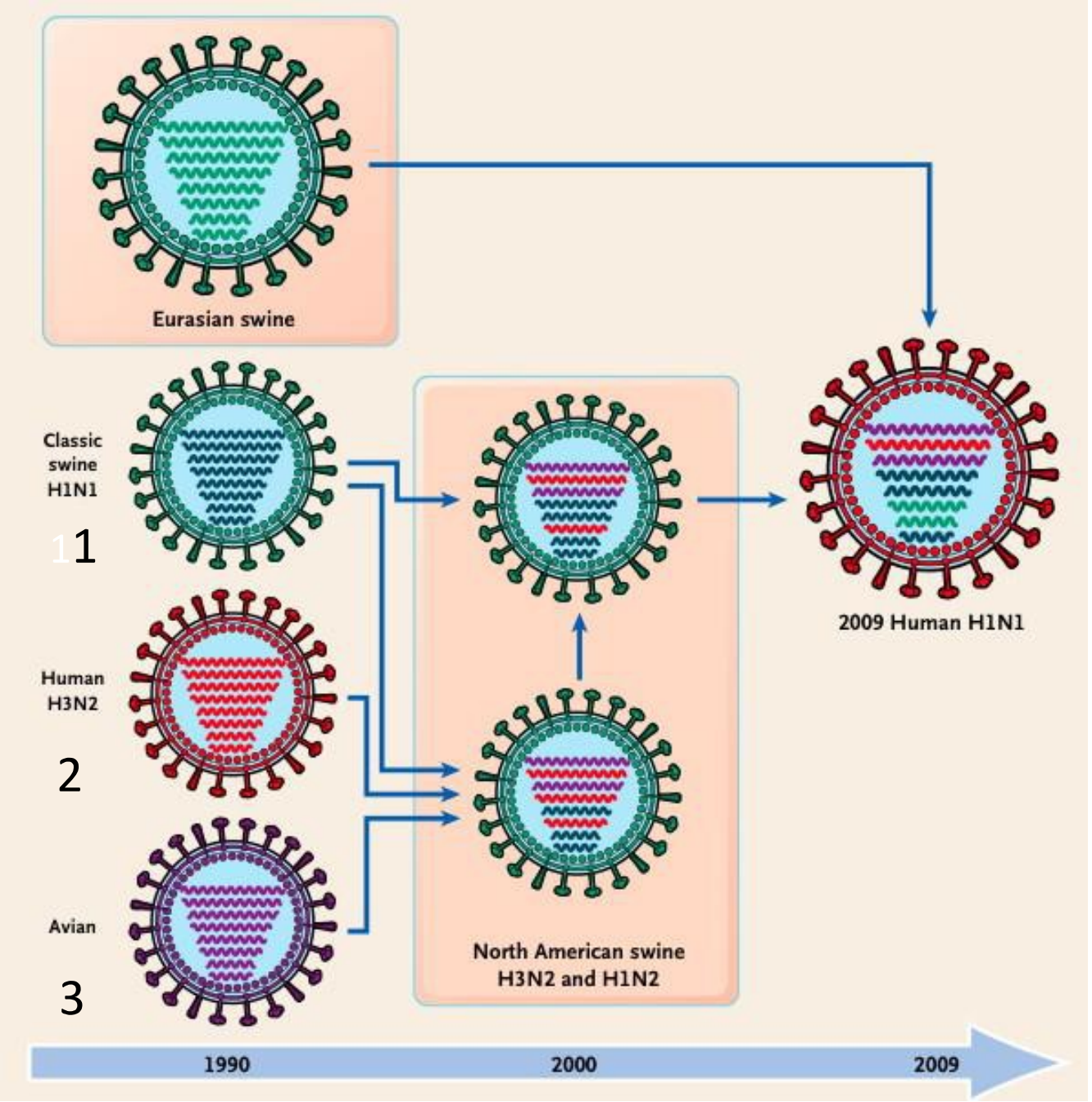
- Spillover events with sustained transmission, seeded the novel reassortant strains and IAV lineages that gave rise to the 1957, 1968, and 2009 influenza pandemics.

Re-assortment

- May occur when a host cell is infected with 2 distinct influenza **A** types simultaneously.

- In reassembly of viruses, the RNA segments get mixed together, making a 3rd viral strain with a unique combination of genes.

- Pigs can be infected by both human and avian influenza viruses.



Flu Re-assortment

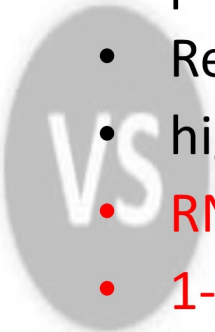
1. Swine
2. Human
3. Avian

Viruses

Differences

DNA Virus

- pass DNA into cell nucleus
- replicate inside nucleus
- low mutation level
- DNA polymerase, stable
- 2-step viral protein process
- larger
- 2-strand most common
- accurate replication

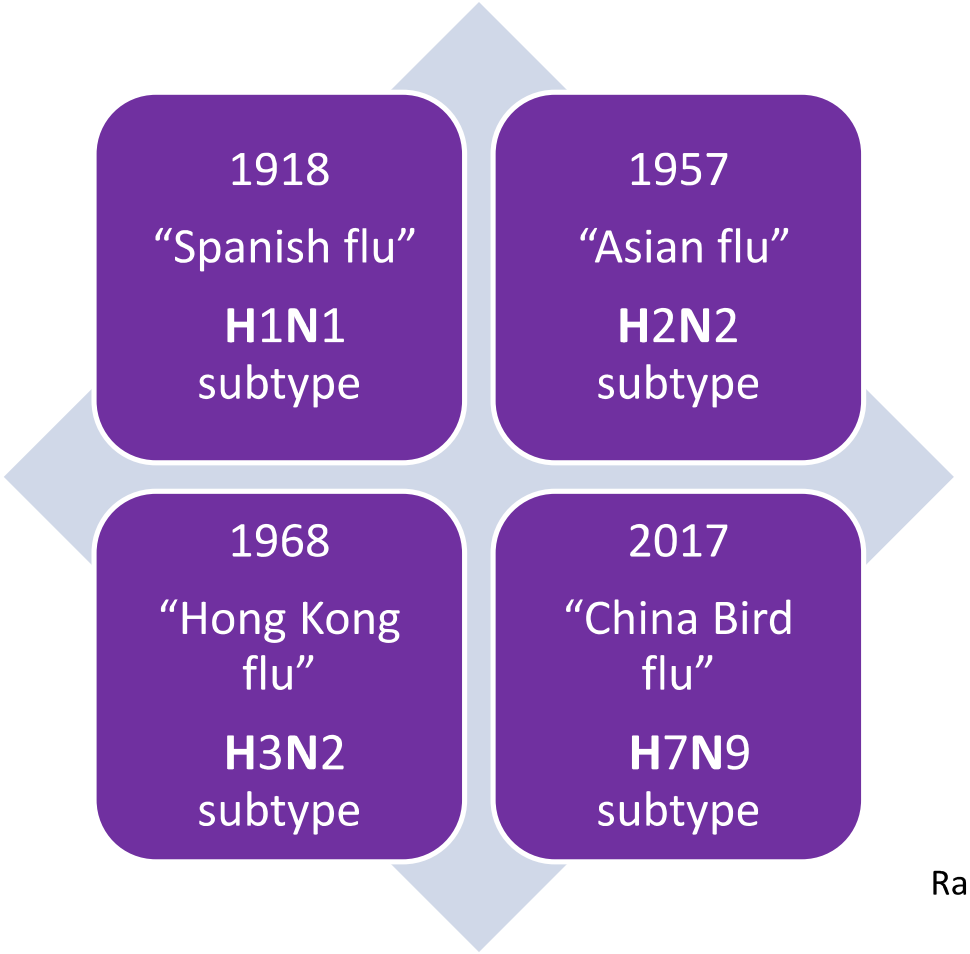


RNA Virus

- passes RNA into cytoplasm
- Replicate inside cytoplasm
- high mutation level
- RNA Polymerase, unstable
- 1-step 5 Viral proteins
- smaller
- single strand most common
- error-prone replication

Questions? 1

Flu Epidemics in 20th and 21st Centuries



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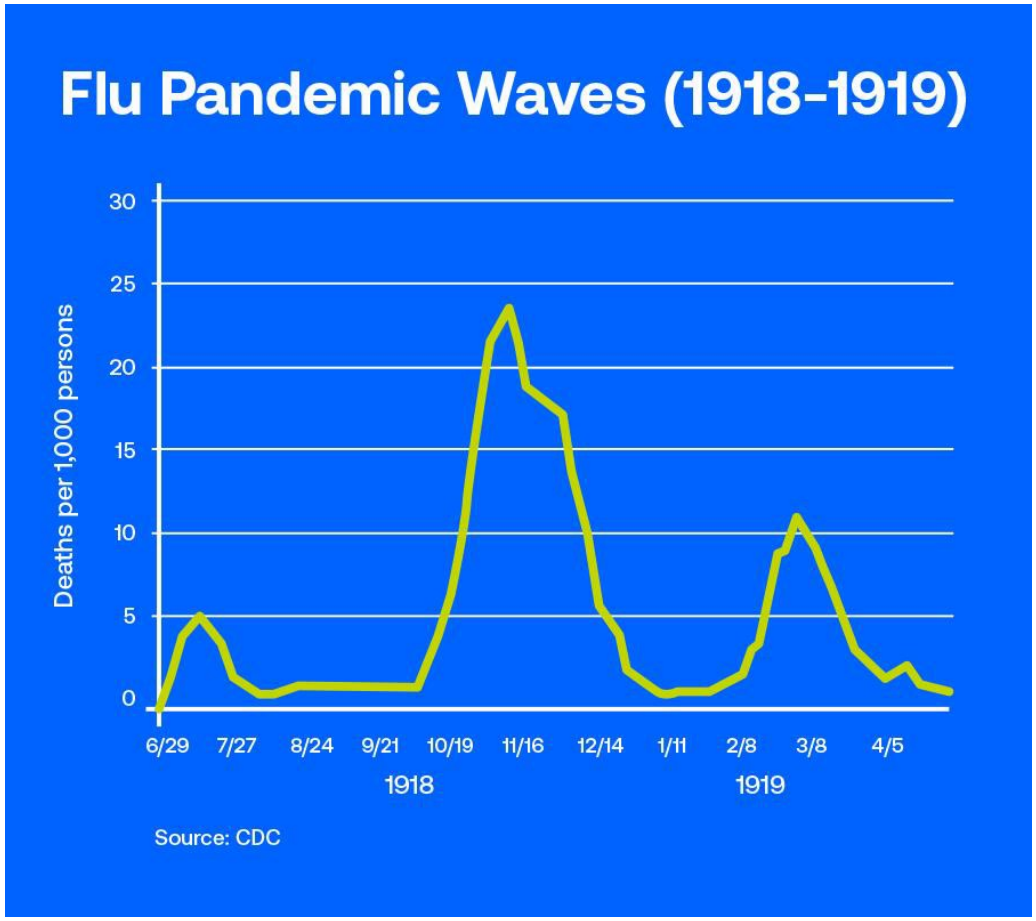


1. The “SPANISH FLU”

1918 FLU PANDEMIC

World War I (1)
(1914-1918)

- One of the deadliest wars in history, with about 9M combatant deaths and 13M civilian deaths.

- The related 1918 influenza pandemic caused about 50M deaths worldwide.

- Also various genocides caused about another 50 Million deaths.

World War I (2)
(1914-1918)

- In the summer of 1918, 10,000 men per day arrived at the Western Front for the American Expeditionary Force (AEF).
- During the war the U.S. mobilized over 4 million military personnel and suffered 65,000 deaths.
- Not included: ~45K who died of the 1918 Flu (30K died before they even reached France!).
- The war produced:
  - dramatic expansion of the U.S. government
  - significant increase in the size of the U.S. Armed Forces

WW and WWI

Woodrow Wilson and World War I

- German U-Boats sank 7 US merchant ships, so WW asked Congress to declare war on Germany.
- Congress voted on April 6, 1917.
- WW ordered 250K more men to be “trained & sent”.
- In some Army units, 80% died of Spanish flu.
- The “training and sending” was killing them!

WW and WWI (2)

Woodrow Wilson and World War I

- Wanted above all to win the War.

- WW created Committee on Public Information:
  - write and distribute articles re: America's greatness
  - sailors made to write home denying news about the flu
  - Morale Law of 1917 punished with 20 years prison for writing negative things about US government

- WW restricted & censured war & flu information to Americans.

The “Spanish Flu”

- Spain’s free press first reported on it in Madrid in May, 1918.
- Allies & the Central Powers had censors who withheld news of the flu to keep morale high; Spain was neutral.
- Public in US, Britain and France were told that everything was OK.

What's in a Name?

In Senegal 'the Brazilian flu'.

In Brazil 'the German flu'.

In Poland 'the Bolshevik disease'.

In the US & Britain the 'Spanish lady'.

In Nigeria 'ifelunza'

In Germany 'pseudoinfluenza'.

In Freetown 'manhu' (what is it?).

In Spain 'Naples Soldier' or 'French Flu'.

1918 Schoolyard Rhyme

I had a little bird,

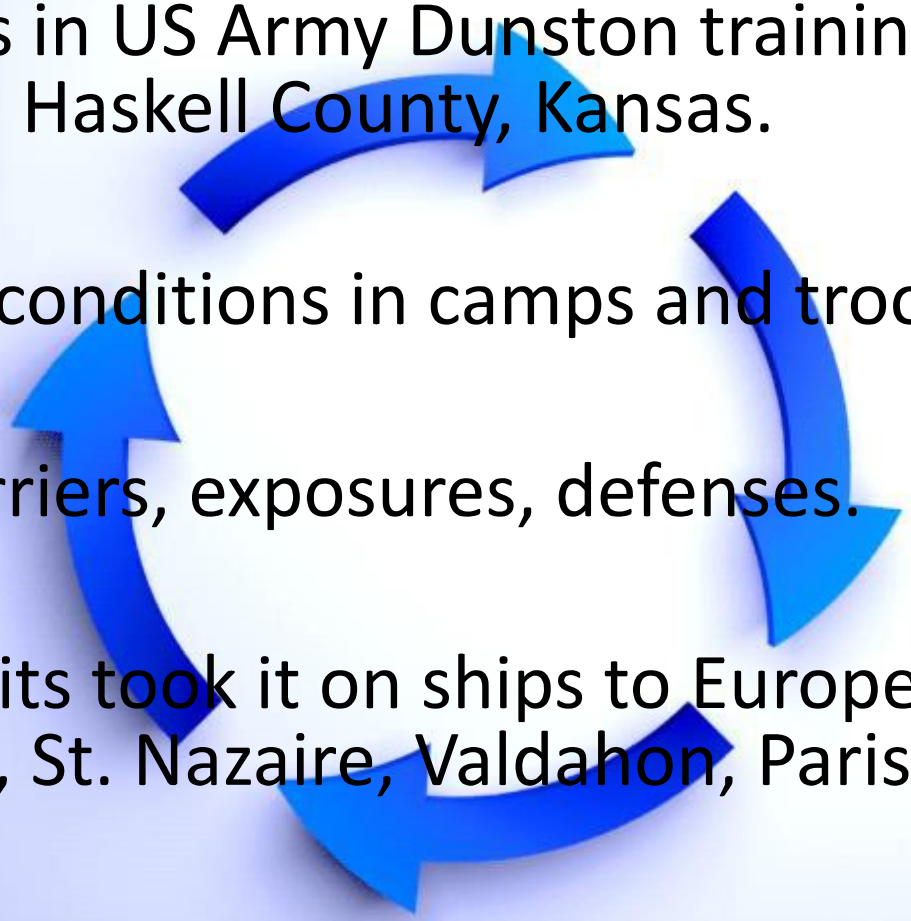
Its name was Enza.

I opened the window,

And in flew Enza.

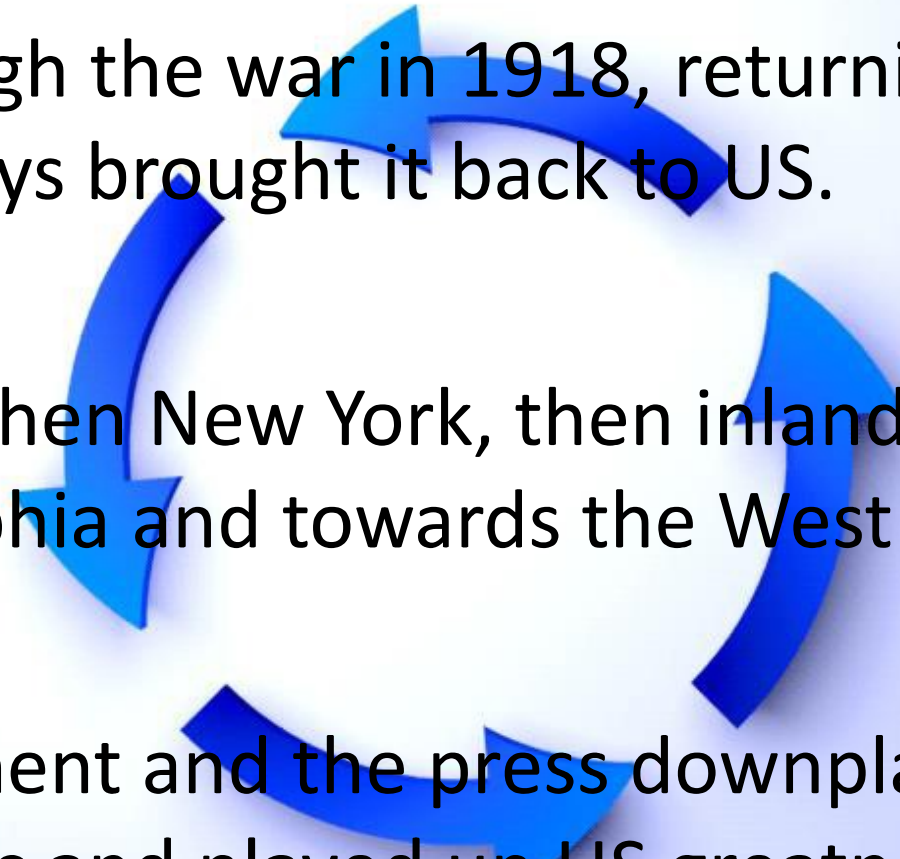
The “Spanish Flu” goes…

- First cases in US Army Dunston training camp in Fort Riley, Haskell County, Kansas.
- Crowded conditions in camps and troop ships.
- Mix of carriers, exposures, defenses.
- Sick recruits took it on ships to Europe: Brest, Bordeaux, St. Nazaire, Valdahon, Paris, Spain, London.



…and then it comes back!

- All through the war in 1918, returning doughboys brought it back to US.
- Boston, then New York, then inland to Philadelphia and towards the West Coast.
- Government and the press downplayed the pandemic and played up US greatness.



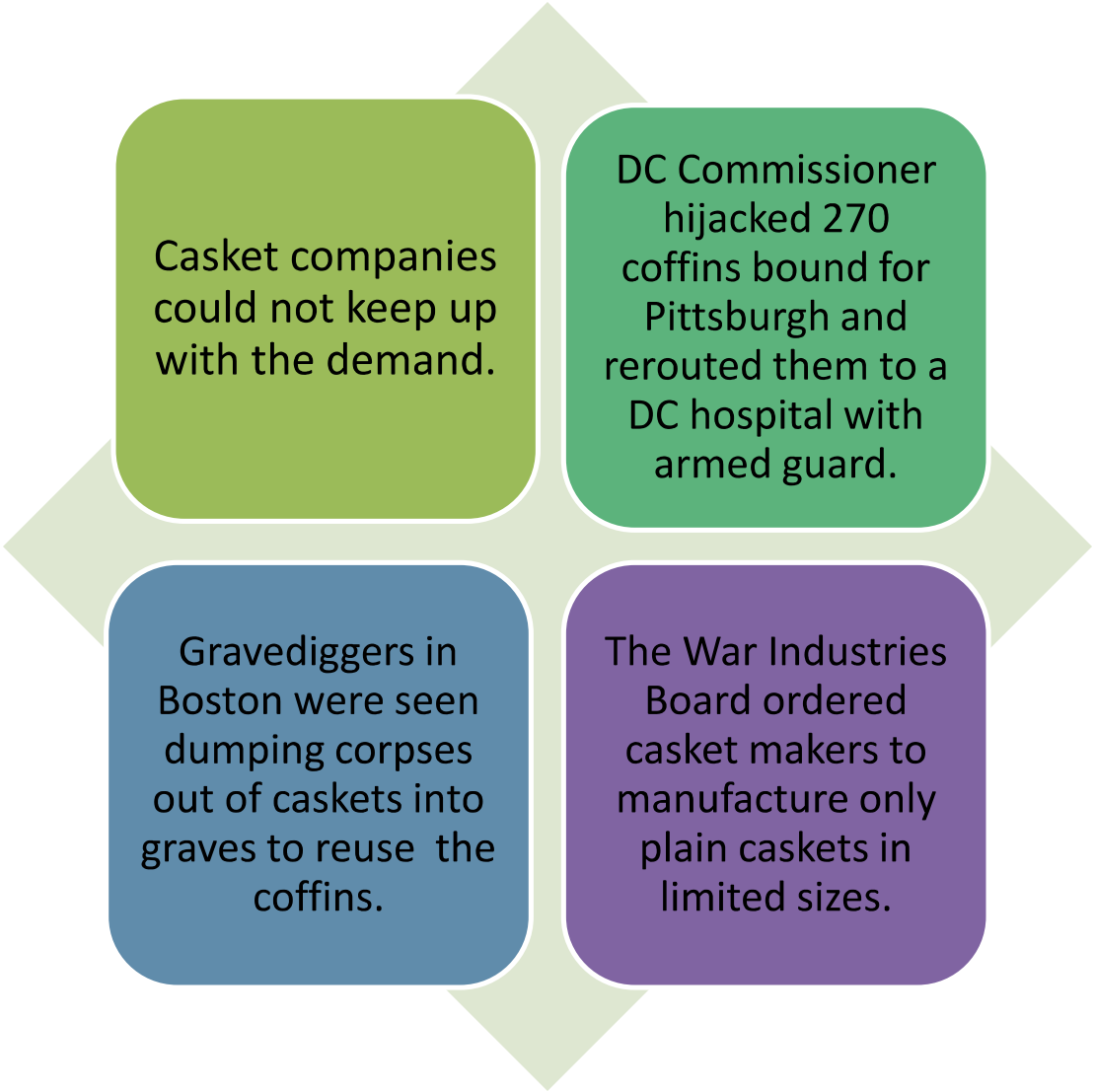
Troops and the 1918 Flu

- Victims mostly healthy males in their 20's.
- Recruits subject to unsanitary overcrowding.
- The flu overstimulated healthy immune systems and turned them against the soldiers' body.
- "Cytokine storm" floods the infection site with immune cells and produces severe inflammation.

Mortality of the 1918 Flu

- 16 weeks between September & December 1918 were the deadliest.
- Possibly because virus mutated in Europe before troops came back.
- Returning soldiers were partially immune, but locals were not.

A-Tisket-A-Tasket, We Need a Casket



Philadelphia Coffin Truck

The Philadelphia Story (1)

Philadelphia resembled the Middle Ages with deaths approaching 1,000 a day.

Entire neighborhoods were draped in black crepe on front doors to mark deaths inside.

A streetcar manufacturer was asked to make 1,000's of rudimentary boxes in which to bury the dead.

Needed coffins arrived in the city under armed guard.

500 bodies crowded the 36-corpse city morgue.

The city opened 6 supplementary morgues and placed bodies in cold storage plants.

Some Philadelphia residents were tossed into mass graves.

The Philadelphia Story (2)

Day and night a constant parade of wagons kept priests and the police busy collecting corpses draped in sack cloths and blood-stained sheets.

Bodies were left on porches and sidewalks and were piled on top of each other in the wagons with limbs protruding from underneath the sheets.

Parents of a boy who died of the flu begged the authorities to allow him to be buried in a wooden macaroni box instead of having him taken away in a wagon.

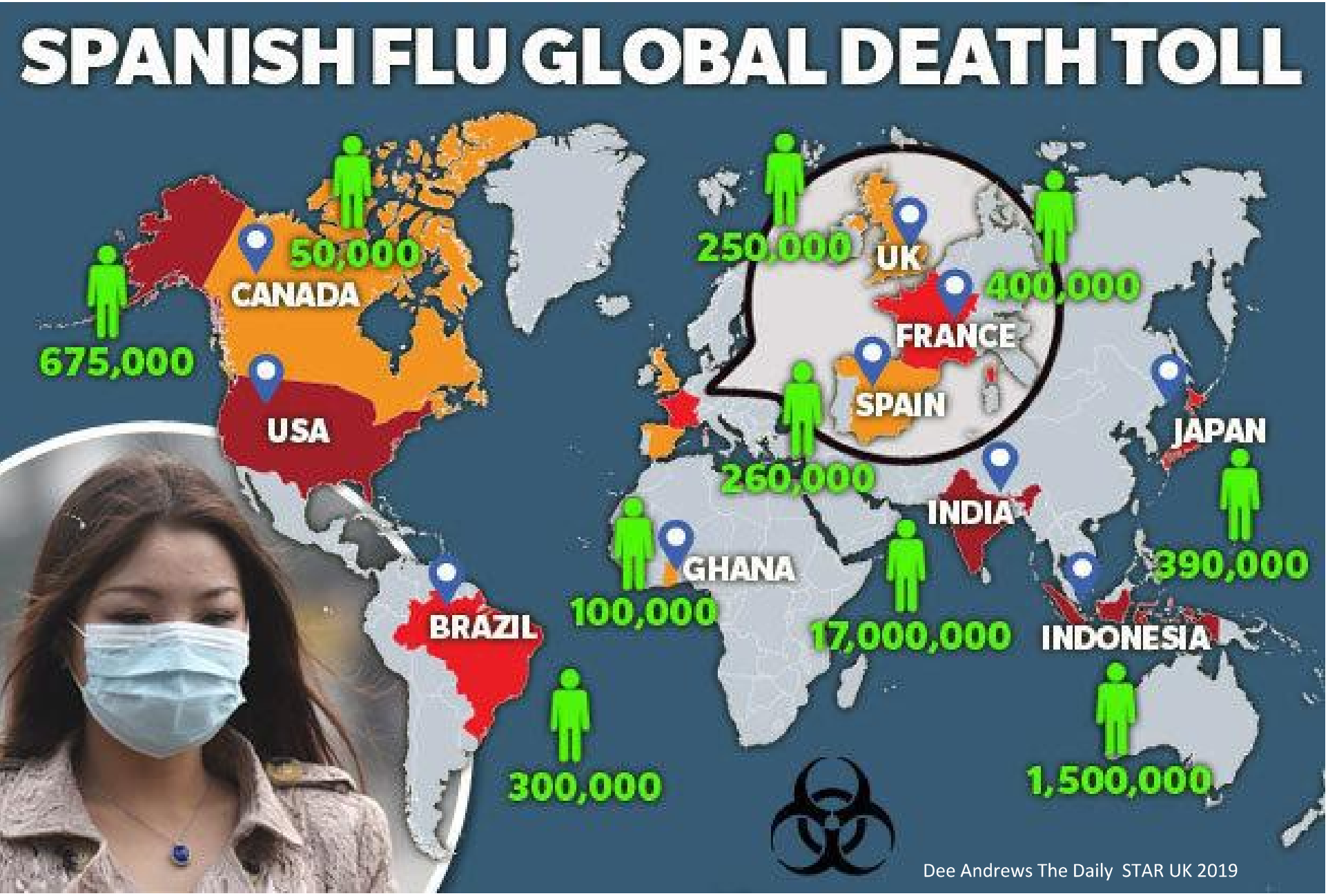
Phildelphia workers digging mass grave at St. Charles Borromeo Parish.

Philadelphia Mass Grave

Collective Graves in Samoa

Other Cities

- Public funerals and wakes were banned in cities like Philadelphia and Chicago.
- Iowa prohibited public funerals and even the opening of caskets.
- Exceptions were made only for parents or wives who identified soldiers before burial.
- Caskets could only be opened if family members used masks and refrained from touching the body.

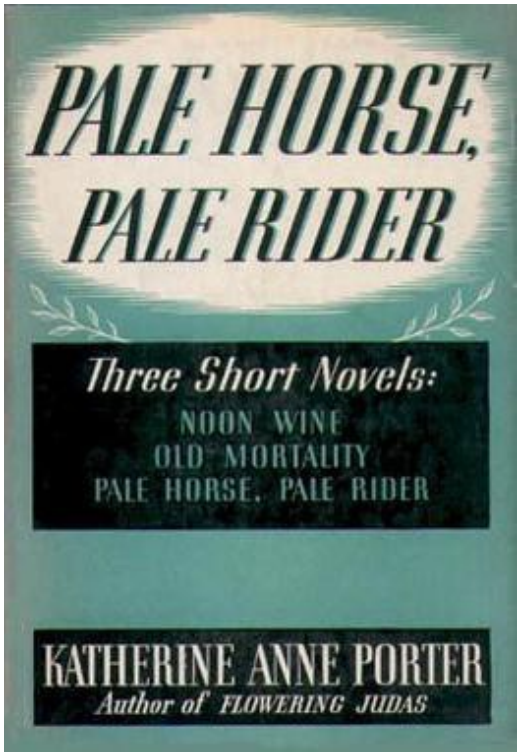

SPANISH FLU GLOBAL DEATH TOLL
675,000
50,000
CANADA
USA
250,000
UK
400,000
FRANCE
SPAIN
260,000
JAPAN
390,000
INDIA
17,000,000
GHANA
100,000
BRAZIL
300,000
INDONESIA
1,500,000
Dee Andrews The Daily STAR UK 2019

Famous Ones Who Survived the Flu

- Haile Selassie I
- John J. Pershing
- Edvard Munch
- Lillian Gish
- Clementine Churchill
- Alfonso XIII of Spain
- Walt Disney
- Mary Pickford
- David Lloyd George
- Franklin D. Roosevelt
- Woodrow Wilson
- Katherine Anne Porter

Katherine Anne Porter

1890-1980



THE 1918 FLU and the COVID PANDEMIC

DÉJÀ VU, ALL OVER AGAIN?

2020 OLLI Classroom Rhyme

The Spanish Flu,
Is it Déjà Vu?
All is old, nothing's new;
I don't want to get blue,
Neither do you!

Ramírez 2019

Soldiers and Masks

The U.S. Army 39th regiment wearing masks to prevent influenza in Seattle in December 1918.

Photo from Everett Historical/Shutterstock

Taylor, A. (2018, April 10). Photos of the 1918 Flu Pandemic. Retrieved from https://www.theatlantic.com/photo/2018/04/photos-the-1918-flu-pandemic/557663/

Recruits wearing masks to prevent the spread of COVID-19 at Marine Corps Recruit Depot, San Diego, CA (MCRDSD) in April 2020.

Photo from Lance Cpl. Zachary T. Beatty/ Marine Corps

Snow, S. (2020, April 10). Marine drill instructors and recruits now training with skivvy shirt face masks. Retrieved from https://www.marinecorpstimes.com/news/coronavirus/2020/04/10/marine-drill-instructors-and-recruits-now-training-with-skivvy-shirt-face-masks/

Mask-makers

Women from the Red Cross making masks during the flu pandemic in 1918.
Photo from Bettmann Archive/Getty Images

Little, B. (2020, May 6). When Mask-Wearing Rules in the 1918 Pandemic Faced Resistance. Retrieved from https://www.history.com/news/1918-spanish-flu-mask-wearing-resistance

1st Special Forces Group (Airborne) medical professionals and logisticians at Joint Base Lewis-McChord, WA manufacturing personal protective equipment on March 31, 2020.
Photo from U.S. Army 1st Special Forces Group Public Affairs Office

U.S. Army. (2020, April 2). Soldiers make protective masks in fight against COVID-19. Retrieved from https://www.army.mil/article/234223/soldiers_make_protective_masks_in_fight_against_covid_19

PPE Then and Now (1)

A Red Cross nurse wearing a mask during the flu pandemic in 1918.
Photo from Paul Thompson/FP, via Getty Images

Bense, K. (2020, March 20). We Should All Be More Like the Nuns of 1918. Retrieved from https://www.nytimes.com/2020/03/20/opinion/coronavirus-nuns.html

Respiratory Therapist Robertino Rodriguez wearing personal protective equipment during the COVID-19 pandemic in 2020.
Photo from captain_wolf82/Instagram

Lakritz, T. (2020, April 9). Healthcare workers are taping photos of themselves to their protective gear to help put COVID-19 patients at ease. Retrieved from https://www.insider.com/coronavirus-doctors-photos-over-protective-gear-2020-4

PPE Then and Now (2)

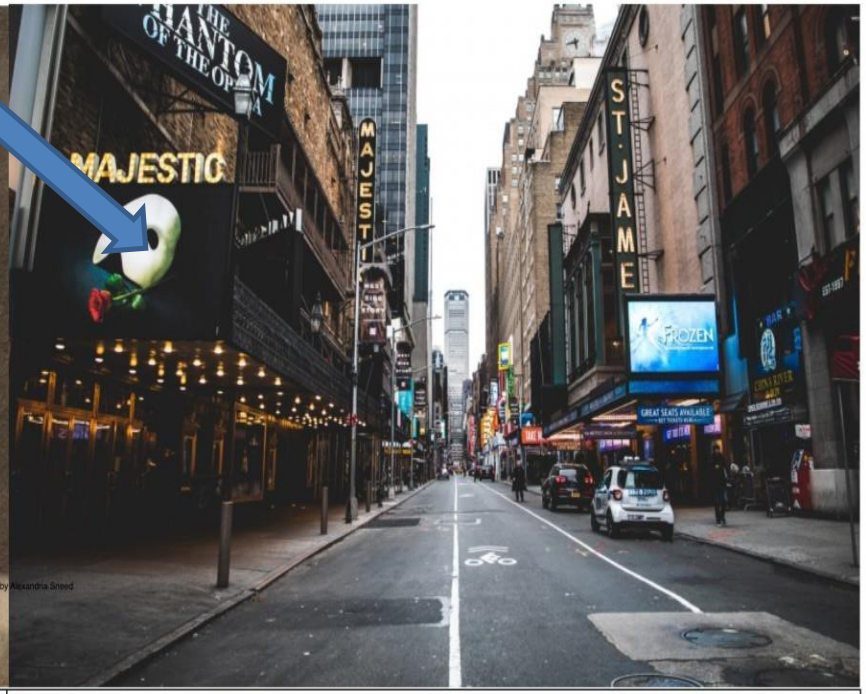
A nurse taking the pulse of a patient in the influenza ward of the Walter Reed hospital in Washington, D.C., in November 1918.
Photo from Library of Congress via AP

Taylor, A. (2018, April 10). Photos of the 1918 Flu Pandemic. Retrieved from https://www.theatlantic.com/photo/2018/04/photos-the-1918-flu-pandemic/557663/

A nurse wearing personal protective equipment during the COVID-19 pandemic in 2020.
Photo from Shutterstock

Spetz, J. (2020, March 31). There Are Not Nearly Enough Nurses To Handle The Surge Of Coronavirus Patients: Here's How To Close the Gap Quickly. Retrieved from https://www.healthaffairs.org/do/10.1377/hblog20200327.714037/full/

Even the Phantom is Lonely



A newspaper boy in front of a closed theater in 1918.
Museum of History & Industry (MOHAI)

McCarty, E., Davis, B., Secaira, M., Weinberger, H., Lombard, E., Berger, K., & Sapna Cheryan &. (2020, May 18). Podcast: What the 1918 flu can tell us about life after COVID-19. Retrieved from https://crosscut.com/podcast/changes-everything/1/3/podcast-what-1918-flu-can-tell-us-about-life-after-covid-19

44th Street in New York City, NY in April 2020.
Photo by Playbill Staff

McPhee, R. (2020, April 8). Broadway Theatres Extend Shutdown as Coronavirus Outbreak Looms Over New York City. Retrieved from https://www.playbill.com/article/broadway-theatres-extend-shutdown-as-coronavirus-outbreak-looms-over-new-york-city

New News are Old News

Influenza Epidemic Closes Schools, Churches, Theatres

DRUG STORES SWAMPED WITH "FLU" VICTIMS

Trade at Pharmacies is Exceedingly Heavy; Clerks Are Worn Out by Hard Work.

HEALTH COMMISSIONER ISSUES PROCLAMATION ORDERING DRASTIC METHODS TO CHECK DISEASE SPREAD

Drastic measures, including the closing of all schools, churches, moving picture theaters, and the prohibiting of all public gatherings until further notice were adopted [illegible] epidemic of Spanish influenza [illegible] way in Evanston.

NORTH END PUTS NEW PUNCH INTO WAR BOND DRIVE

Workers Take Steps to Prevent North End from Lag-

Compiled by Alexandria Sneed

Date	New Cases	Deaths
January 10	612	37
January 11	365	43
January 12	520	26
January 13	363	40
January 14	469	41
January 15	510	50
January 16	538	46
*January 17	519	39
January 18	504	26
January 19	490	16
January 20	366	41
January 21	170	19
January 22	162	11
January 23	118	11
January 24	83	20
January 25	35	9

*Mask law became effective.

100 Mask Slackers Held on Charge of Disturbing Peace

hundred persons had been ar- ed in San Francisco up to 11 o'clock last night for failing to wear influenza masks.

Of this number ninty-two were registered at the City Prison and eight at the Southern Police Station.

THREE SHOT IN STRUGGLE WITH MASK SLACKER

Blacksmith Strikes Health Inspector Striving to Enforce Order

Two men and a woman were shot yesterday at Powell and Market streets when Henry D. Miller, an inspector in the city Health Department, discharged his revolver in a battle with James Wiser, a blacksmith, who refused to don a gauze influenza mask at the order of the health officer.

Wisser was one of the wounded, being shot in the arm and leg. Henry Appleton, 63 years old, 124 Belvedere street, was shot in the leg by one of the four bullets fired by Miller, as was a woman whose name could not be learned by the police, she having gone at once to her home after learning her wound was slight.

The police report that Miller found Wisser standing at the corner w- ving his arms and urging a crowd dispense with the masks. "They the bunk," he is reported to have said.

INFLUENZA MASKS PLAY BIG PART IN CURBING EPIDEMIC

MARKED DROP IN NEW CASES IS OBSERVED

Pneumonia Only Barrier to Successful Fight Against Spread Here

HUNDREDS INOCULATED

Entire State Looks to S. F. for Vaccine; Supplies of Serum Sent Out

SCENES AT THE SAN FRANCISCO HOSPITAL YESTERDAY AFTERNOON WHEN NURSES, STEWARDS [illegible] AND SAILORS [illegible] Children's Hospital. In the picture at upper left is shown Miss Martha Hubbard, nurse, holding little Evelyn Downey of 528 Hyde street. On the Van, Red Cross war nurses, waiting at the wheel of a motor car for the visiting board (left to right) are Miss L. S. Wilson, nurse; Howard J. C. L. S. Tilley, each holding a convalescent child. Below is Miss Clara Bronson, head of social service department at the hospital, holding Bessie Connors.

False Statements as To Epidemic Made by Mayor Are Refuted

Photos from San Francisco Chronicle Archive, San Francisco Examiner

Gilmore, N. (2020, May 6). The Mask Slackers of the 1918 Influenza Pandemic: The Saturday Evening Post. Retrieved from https://www.saturdayeveningpost.com/2020/05/the-mask-slackers-of-the-1918-influenza/

Hartlaub, P. (2020, May 8). Anti-Mask League: San Francisco had its own shutdown protests during 1918 pandemic. Retrieved from https://www.sfchronicle.com/oursf/article/Anti-Mask-League-San-Francisco-had-its-own-15255495.php

Sherman, A. (n.d.). PolitiFact - Yes, San Francisco residents formed Anti-Mask League during 1918 flu. Retrieved from https://www.politifact.com/factchecks/2020/apr/24/facebook-posts/yes-san-francisco-residents-formed-anti-mask-leagu/

Zimmerman, D. (2020, April 10). San Francisco forced people to wear masks during the 1918 Spanish flu pandemic. Did it help? Retrieved from https://www.sfgate.com/coronavirus/article/1918-pandemic-masks-bay-area-california-15185425.php#photo-19182677

Lining up, Then and Now

Americans wait in line for flu masks on Montgomery Street in San Francisco, CA, USA in 1918.

Photo from Hamilton Henry Dobbin / California State Library

Los Angeles Times. (2020, April 19). California lessons from the 1918 pandemic: San Francisco dithered; Los Angeles acted and saved lives. Retrieved from https://www.latimes.com/california/story/2020-04-19/coronavirus-lessons-from-great-1918-spanish-flu-pandemic

Canadians wait in line to enter Walmart in Sault Ste. Marie, ON, Canada on April 24, 2020.

Photo by Darren Taylor/SooToday

SooToday. (2020, March 24). Shoppers line up to enter stores due to virus concerns (9 photos). Retrieved from https://www.sootoday.com/coronavirus-covid-19-sault-ste-marie-news/shoppers-line-up-to-enter-stores-due-to-virus-concerns-9-photos-2197114

Trimming the Quarantine Mane

A barbershop in Chicago, IL circa 1918.

Chicago Sun-Times/Chicago Daily News Collection/Chicago History Museum/Getty Images

Little, B. (2020, May 6). When Mask-Wearing Rules in the 1918 Pandemic Faced Resistance. Retrieved from https://www.history.com/news/1918-spanish-flu-mask-wearing-resistance

A barbershop in Atlanta, GA on April 27, 2020.

Photo by Dustin Chambers Bloomberg via Getty Images

Whyte, L. E., & Npr. (2020, May 12). As Georgia Lifts Restrictions, Its Hospitals May Be Unready For A COVID-19 Surge. Retrieved from https://www.kpbs.org/news/2020/may/12/as-georgia-lifts-restrictions-its-hospitals-are/

Rumore, K., & Mather, M. (2020, April 25). How the 1918 flu pandemic mirrors today's coronavirus crisis. Retrieved from https://www.chicagotribune.com/coronavirus/ct-opinion-flashback-1918-flu-pandemic-timeline-htmlstory.html

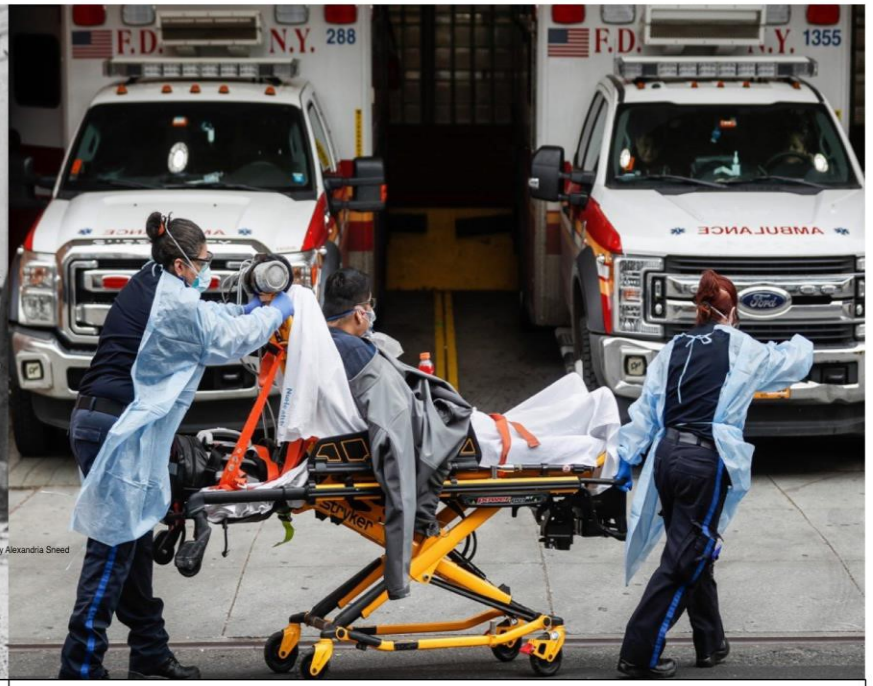
Marfin, C. (2020, May 18). How long can the coronavirus live on various surfaces? Curious Texas investigates. Retrieved from https://www.dallasnews.com/news/curious-texas/2020/05/15/how-long-can-the-coronavirus-live-on-various-surfaces-curious-texas-investigates/

First–Line Health Workers

Nurses in Washington, D.C. wearing masks while carrying an influenza patient on a stretcher in 1918.

Photo from Library of Congress

Magill, J. (2020, March 27). 100 years ago, the Spanish flu pandemic tore through New Orleans in. Retrieved from https://www.hnoc.org/publications/first-draft/100-years-ago-spanish-flu-pandemic-tore-through-new-orleans-three

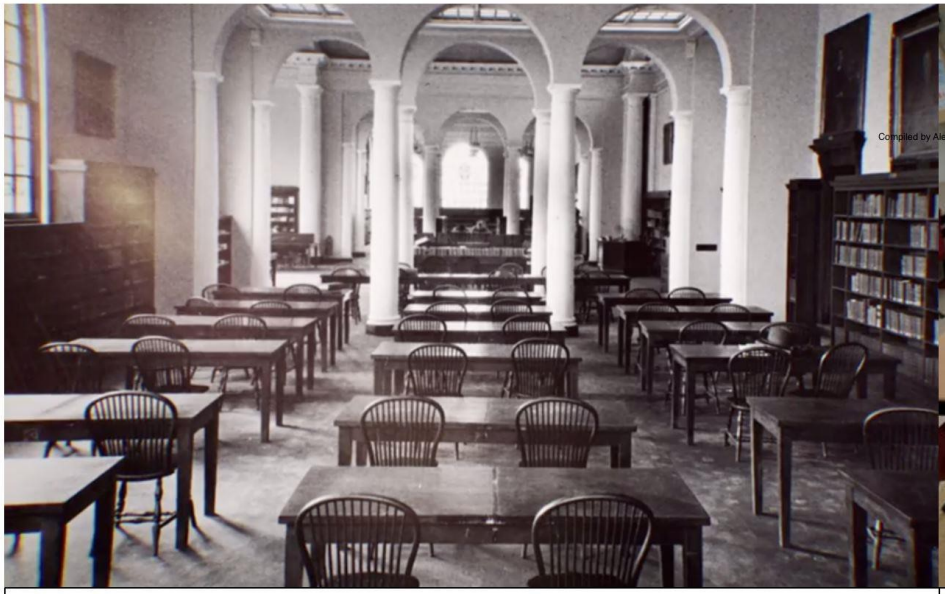


Staff from Wyckoff Heights Medical Center in Brooklyn, New York City, NY bring in a patient on a gurney while wearing personal protective equipment on April 7, 2020.

Photo from AP Photo/John Minchillo

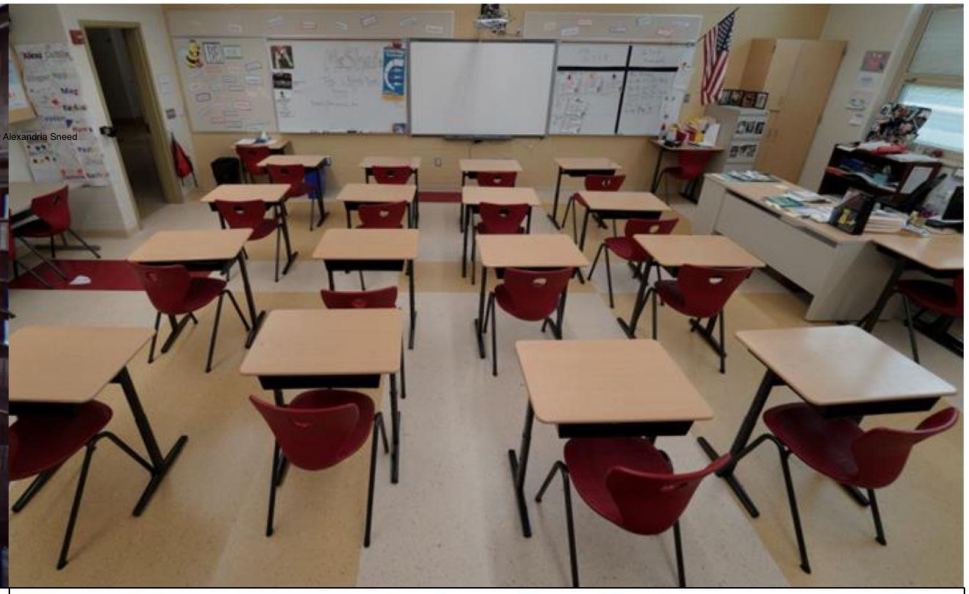
Associated Press. (2020, April 18). Virus-fueled conspiracy theories take aim at hospitals. Retrieved from https://fox59.com/news/virus-fueled-conspiracy-theories-take-aim-at-hospitals/

Empty Schoolrooms



An empty room with tables and chairs in 1918.
Photo from "The Spanish Flu Was Deadlier Than WWI" via HISTORY

Little, B. (2020, May 6). Retrieved May 20, 2020, fromhttps://www.history.com/news/1918-spanish-flu-mask-wearing-resistance



An empty classroom with desks and chairs in 2020.
Photo from Kyle Grillot/Reuters

Al Jazeera. (2020, April 14). Lockdowns, closures: How is each US state handling coronavirus? Retrieved from https://www.aljazeera.com/news/2020/03/emergencies-closures-states-handling-coronavirus-200317213356419.html

A letter carrier in New York City, NY wearing a mask on October 16, 1918.
Photo from National Archives

Denver Post. (2016, June 13). The 1918 influenza outbreak: An unforgettable legacy. Retrieved from https://www.denverpost.com/2009/04/30/the-1918-influenza-outbreak-an-unforgettable-legacy/

Mail carrier Oscar Osorio wearing a mask in Los Angeles, CA on April 29, 2020.
Photo from VALERIE MACON/AFP via Getty Images

Bauman, A., & Chakrabarti, M. (2020, May 20). Facing Privatization Battle And Economic Trouble, What's Next For The Postal Service? Retrieved from https://www.wbur.org/onpoint/2020/05/20/economic-troubles-privatization-postal-service

Neither snow nor rain nor heat nor gloom of night stays these couriers from the swift completion of their appointed rounds.

Nor some big bad Influenza!

Garbage is Still Trash

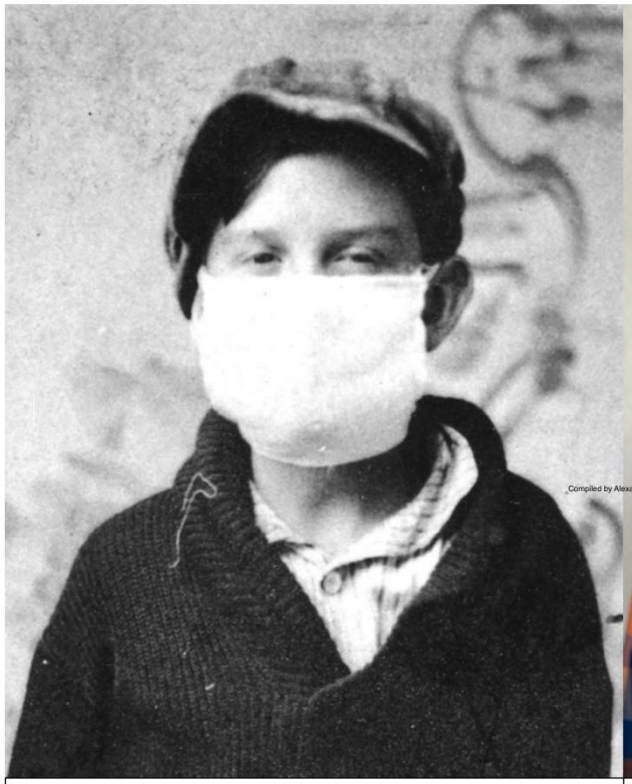
A street cleaner in New York wearing a mask in 1918.
Photo from Bettmann Archive

Nevius, J. (2020, March 19). New York's built environment was shaped by pandemics. Retrieved from https://ny.curbed.com/2020/3/19/21186665/coronavirus-new-york-public-housing-outbreak-history

A man collecting trash while wearing a mask in 2020.
Photo by Marco Bertorello/AFP/Getty Images

Minter, A. (2020, March 23). The U.S. is unlikely to see a trash crisis like the one in 1918, but better safety guidelines and protective gear are needed to maintain collection. Retrieved from https://www.bloomberg.com/opinion/articles/2020-03-23/coronavirus-outbreak-is-challenge-to-garbage-worker-safety

Children and Masks



A child wears a mask in Starke, FL in 1918.
Photo from State Archives of Florida

Calise, G. (2020, March 4). Long before coronavirus, Florida caught Spanish flu. How bad was it? Retrieved from https://www.tampabay.com/news/health/2020/03/04/long-before-coronavirus-florida-caught-spanish-flu-how-bad-was-it/

A child wears a mask in 2020.
Photo from Etsy

Magdirila, P. (2020, May 1). 20 Adorable and Stylish Face Masks for Kids. Retrieved from https://walyou.com/20-adorable-and-stylish-face-masks-for-kids/

Wear a Mask, Wash Your Hands

Newspaper clippings from 1918 that stress the importance of wearing a mask and hand washing (before the CDC was founded in 1946).
Photo courtesy of MyHeritage.com

Haynes, S. (2020, March 27). Newspaper Ads on the Spanish Flu Echo Coronavirus Messaging. Retrieved from https://time.com/5810695/spanish-flu-pandemic-coronavirus-ads/

Current CDC (Centers for Disease Control and Prevention) guidelines for face coverings and stopping the spread of germs from the COVID-19 virus.
Photo from CDC (current as of 5/20/2020)

CDC. (n.d.). Coronavirus Disease 2019 (COVID-19). Retrieved from https://www.cdc.gov/coronavirus/2019-ncov/index.html

Gargling Salt water to Prevent FLU

Feeding the Hungry

Volunteers at a street kitchen in Cincinnati, OH serving food to children during the flu pandemic in the winter of 1918-1919.

Photo Courtesy of Spokesman-Review Archives

Deshais, N., NWPB News, & NPR News. (2020, April 3). When The Pandemic Came To The Inland Northwest - 102 Years Ago. Retrieved from https://www.nwpb.org/2020/04/03/when-the-pandemic-came-to-the-inland-northwest-102-years-ago/

Davina Garcia and others serving meals to students outside of Rowland Elementary School in Victoria, TX in March 2020.

Photo from Emree Weaver

Douty, S. (2020, April 3). VISD opens food distribution sites. Retrieved from https://www.victoriaadvocate.com/covid-19/visd-opens-food-distribution-sites/article_acfe563c-6d4a-11ea-bdb5-1b6a446e9111.html

Spray and Clean

A public health worker carrying a spray pump filled with cleaning spray in March 1920.

Photo from Hulton-Deutsch Collection/Corbis/Getty Images

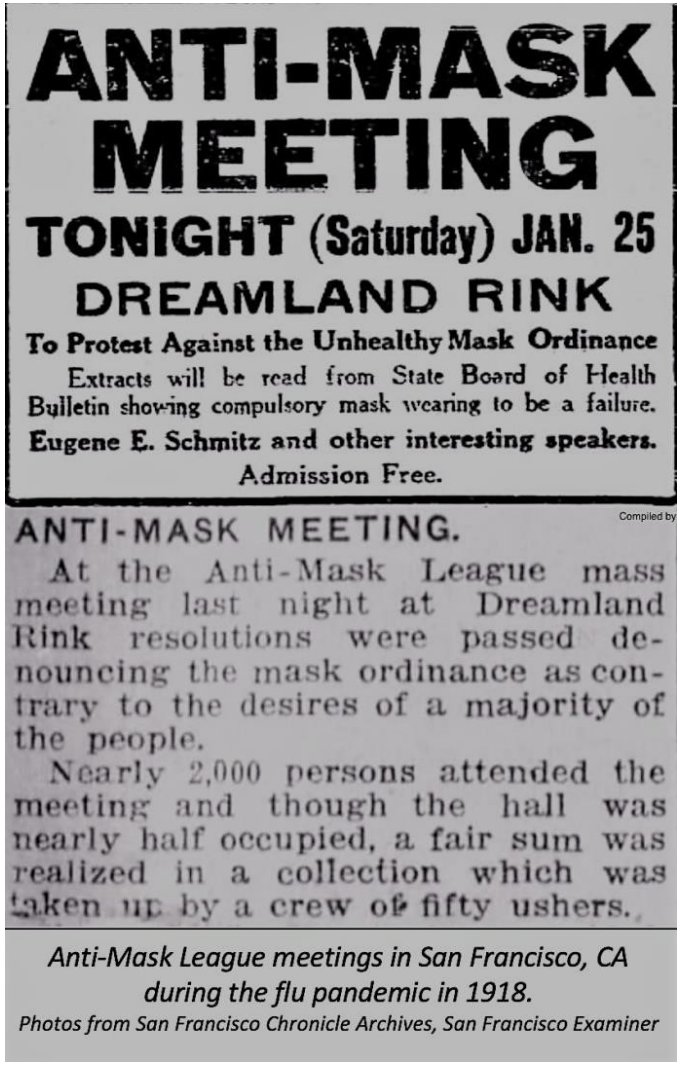
Greenwood, G. (2020, March 25). Spanish Flu v coronavirus: how The Times reported the 1918 pandemic. Retrieved from https://www.thetimes.co.uk/article/spanish-flu-v-coronavirus-how-the-times-reported-the-1918-pandemic-zn3rzztk9

A specialist spraying disinfectant to sanitize a street to prevent the spread of COVID-19 in Moscow on April 12, 2020.

Photo from Maxim Shemetov/Reuters

Chung, E. (2020, April 18). Is spraying disinfectant in public spaces a good way to fight COVID-19? | CBC News. Retrieved from https://www.cbc.ca/news/health/disinfectant-sprays-1.5536516

Anti-Masking Alive Again!



ANTI-MASK MEETING

TONIGHT (Saturday) JAN. 25

DREAMLAND RINK

To Protest Against the Unhealthy Mask Ordinance

Extracts will be read from State Board of Health Bulletin showing compulsory mask wearing to be a failure.

Eugene E. Schmitz and other interesting speakers.

Admission Free.

Compiled by

ANTI-MASK MEETING.

At the Anti-Mask League mass meeting last night at Dreamland Rink resolutions were passed denouncing the mask ordinance as contrary to the desires of a majority of the people.

Nearly 2,000 persons attended the meeting and though the hall was nearly half occupied, a fair sum was realized in a collection which was taken up by a crew of fifty ushers.

Anti-Mask League meetings in San Francisco, CA during the flu pandemic in 1918.

Photos from San Francisco Chronicle Archives, San Francisco Examiner

People protesting wearing masks and stay-at-home orders in Harris County, TX and Indianapolis, IN in April 2020.

Photos from Melissa Phillip/Houston Chronicle, SOPA Images/LightRocket Via Getty Images

Children Wearing Camphor Bags

Don’t Kiss Me !

Spanish Flu prevention?

Don’t Spit !


Spanish Influenza
has endangered the prosecution
of the WAR in Europe.
There are 1500 cases in the Navy Yard
30 deaths have already resulted
SPITTING SPREADS SPANISH
INFLUENZA DONT SPIT

Spanish Flu Pandemic

Policemen in Seattle, WA.

December 1918

(Masks made by the Red Cross)

National Archives at College Park, Maryland, US.

Questions? 2

2. ASIAN FLU

Asian Flu (1)

- In 1957, an ***H***2***N***2 virus appeared in China.
- Recombinant of avian (geese) and human.
- The “Asian flu” swept through the population killing 1-2M people worldwide.
- Spread quickly in US with returning sailors.

Asian Flu (2)

- June 1957, reached the US, with initially few infections.
- US Navy personnel at destroyers docked at Newport NAS and new military recruits.
- First wave peaked in October and affected children returning to school.
- Second wave, in January and February 1958, was more pronounced among elderly people and so was more fatal.

Asian Flu (3)

- Number of deaths peaked week ending October 17 with 600 in England & Wales.
- Vaccine was available that month in the UK.
- Its rapid deployment helped contain the pandemic.

Asian Flu (4)

- Case fatality rate was approximately 0.67%.
- 3% complication rate and 0.3% mortality in UK.
- Could cause pneumonia by itself.
- May have infected as many as or more people than the 1918 Spanish flu, but lower mortality due to:
  - the vaccine
  - improved health care
  - antibiotics to manage opportunistic bacterial infections

Asian Flu (5)

- Caused many infections in children, spread in schools, and led to many school closures.
- Virus was rarely fatal in children.
- Most deadly in pregnant women, the elderly, and those with pre-existing heart and lung disease.

Asian Flu (6)

- Estimates of deaths worldwide vary:
  - UK government estimates between 1 and 4 million
  - US CDC estimates 1.1 million
- In the US about 70K to 116K deaths .
- In the UK, about 33K people died.
- In Germany, around 30K people died.

1957 Flu Virus

- In the 1960s the human ***H***2***N***2 strain went through a series of slight *antigenic drifts.*
- These minor genetic modifications produced periodic epidemics.
- Through *antigenic shift,* the 1957 flu virus became a brand new influenza A subtype.
- This was ***H***3***N***2, which gave rise to the 1968 flu pandemic (Hong Kong flu).

1968-1969

3. HONG KONG FLU

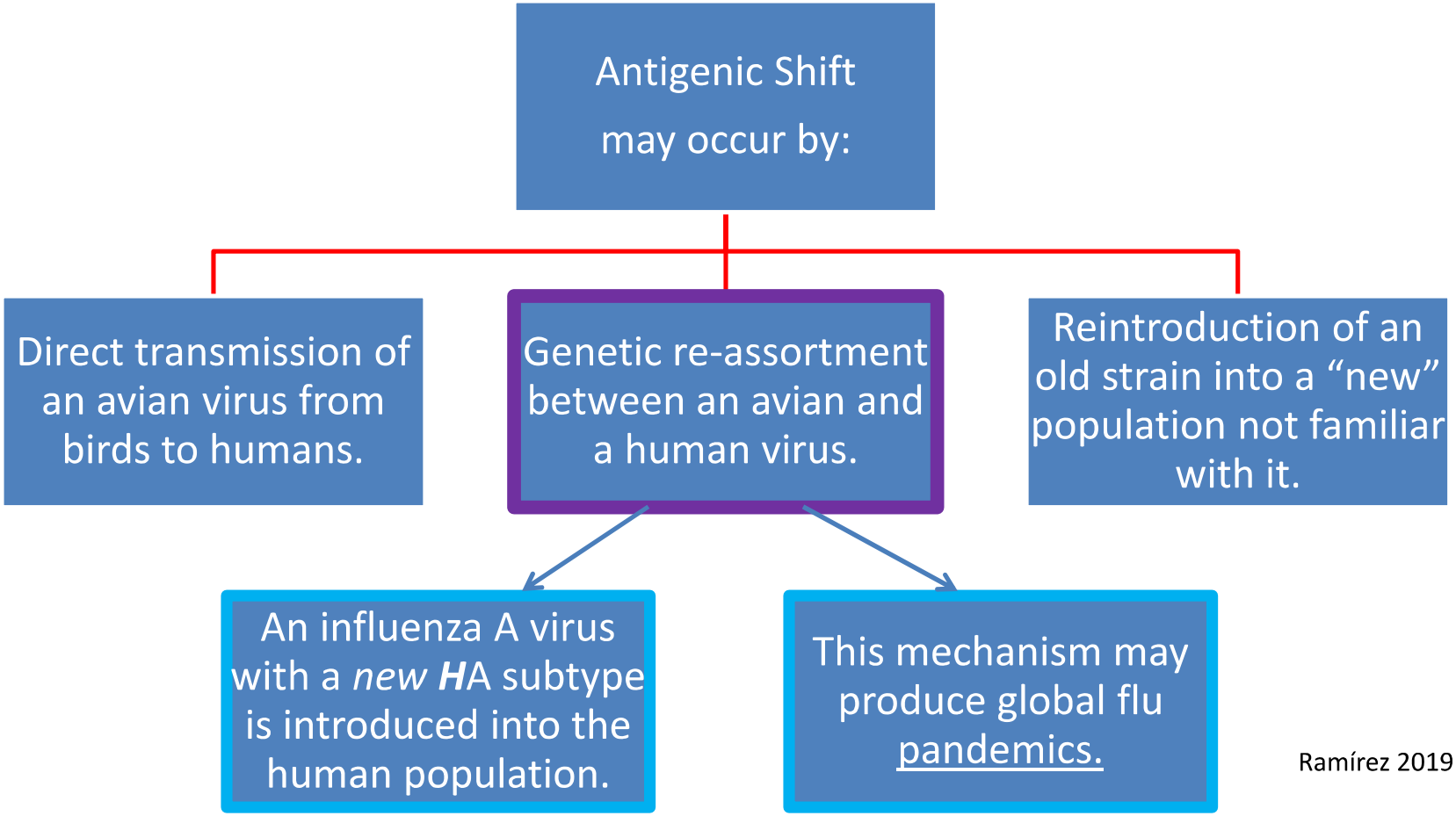
The Hong Kong Flu Pandemic (1)
(1968-1969)

- **H3N2 Influe**nza A virus converted by antigenic shift from **H**2**N**2.

- The subtype contained genes from avian influenza viruses.

- Arose in pigs co-infected with avian and human viruses.

Antigenic Shift (**H2N2** to **H3N2**)



Ramírez 2019

The Hong Kong Flu Pandemic (2)
(1968-1969)

- Began in Mainland China before spreading to Hong Kong?
- First instance 13 July, 1968 in Hong Kong.
- End of July 1968, outbreaks in Vietnam and Singapore.
- September 1968 reached India, Philippines, northern Australia, and Europe.
- October 1968 entered California carried by troops returning from Vietnam.
- Widespread in the US in December, 1968.
- Reached Japan, Africa, and South America by 1969.

The Hong Kong Flu Pandemic (3)
(1968-1969)

- CDC estimates total worldwide mortality at 1M from July 1968 to winter 1969-70.
- Estimated US deaths about 34K-100K.
- Most excess deaths were in 65 & older.

The Hong Kong Flu Pandemic (4)
(1968-1969)

- Hong Kong flu shared internal genes and the **N**euraminidase with the ***H***2***N***2 1957 Asian flu.

- Residual antibodies to the ***N***euraminidase or internal proteins may have resulted in far fewer casualties than other pandemics.

Basic Reproduction Number
R_0

- Basic reproduction number, R_0 of an infection is the number of cases generated by 1 case in a population where all individuals are susceptible to the infection.

- if R_0 is <1, the outbreak will die out

- If R_0 is >1, the outbreak will expand

- The *basic reproduction number* of the flu in this period was estimated at **1.80**

Basic Reproduction Number

- $\mathbf{R_0}$ cannot be modified through vaccinations or changes in population susceptibility.

- It can be modified by non-pharmacological interventions like physical distancing.

- Other public policy or social interventions like handwashing, masking, surface disinfection or barrier strategies may modify $\mathbf{R_0}$.

Influenza by the Numbers

Name	Subtype	R_0	Deaths (Est.)	Fatality (Est.)	Severity
Spanish 1918	H1N1	**1.8**	17 M - 100 M	3-8%	5
Asian 1957	H2N2	**1.65**	1 M - 4 M	<0.2%	2
Hong Kong 1968	H3N2	**1.8**	1 M - 4 M	<0.1%	2
1977 Russian	H1N1	**?**	700K	?	?
2009 swine Pandemic	H1N1/09	**1.46**	550 K	0.01%	1
Seasonal	H1N1-H3N2 Influenza B	**1.28**	290K – 650K Per year	<0.1%	1

Ramirez 2019

2017 CHINESE AVIAN FLU

Avian Influenza A

- Two categories:
  - Low Pathogenicity Avian Influenza (LPAI) A viruses cause mild or asymptomatic infections in birds
  - Highly Pathogenic Avian Influenza (HPAI) A viruses have the ability to cause severe disease and mortality in chickens in a laboratory setting

- Both LPAI and HPAI A viruses have caused mild to severe illness in infected humans.

- There are genetic and antigenic differences between the influenza A virus subtypes that typically infect only birds and those that can infect birds and people.

Chinese H7N9 Avian Flu

- Chinese government reported:
  - 2015 - 226 cases
  - 2016 - 123 cases
  - 2017 - 759 cases with 281 deaths (37%)

- The cumulative total for the 7 outbreaks since the 1st epidemic in 2013 is 1,223 cases with 490 deaths (40%)

Human Avian Co-infection

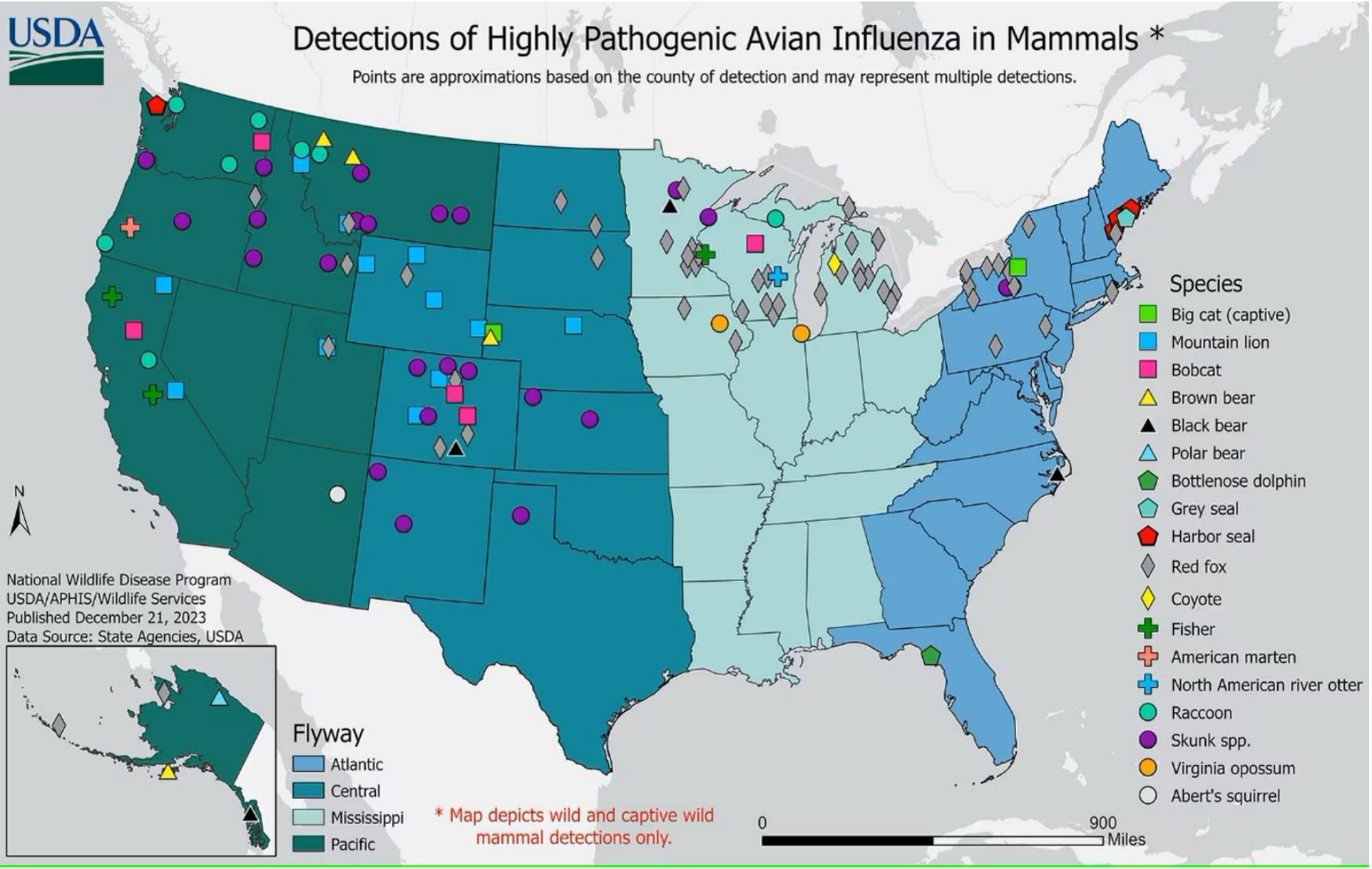
- On January 27, 2024, the China National Health Commission informed WHO of 1 confirmed case of human coinfection with influenza A(**H**10**N**5) and seasonal influenza A(**H**3**N**2) viruses.

- This is the ***first*** reported case of human infection with avian influenza A(**H**10**N**5) virus.

- Avian influenza infections in humans can cause high fever, cough, sore throat, muscle aches, and may quickly progress to pneumonia, acute respiratory distress syndrome and altered mental status or seizures.

Human Avian Co-infection

- Patient bought a live duck in November, 2023.
- From the duck meat stored in the fridge, seven samples tested positive for **H**10**N**5.
- The patient had not had the seasonal influenza vaccine.


USDA
Detections of Highly Pathogenic Avian Influenza in Mammals *
Points are approximations based on the county of detection and may represent multiple detections.
Species
Big cat (captive)
Mountain lion
Bobcat
Brown bear
Black bear
Polar bear
Bottlenose dolphin
Grey seal
Harbor seal
Red fox
Coyote
Fisher
American marten
North American river otter
Raccoon
Skunk spp.
Virginia opossum
Abert's squirrel
N
National Wildlife Disease Program
USDA/APHIS/Wildlife Services
Published December 21, 2023
Data Source: State Agencies, USDA
Flyway
Atlantic
Central
Mississippi
Pacific
* Map depicts wild and captive wild mammal detections only.
0
900
Miles

CHOLERA and ITS PANDEMICS

Cholera

Cholera and its pandemics were discussed in Session 3 of this course on March 12, 2024.

Encephalitis Lethargica

“THE ASLEEP EPIDEMIC”

Encephalitis Lethargica (EL) (1)

The "Forgotten" Epidemic

Von Economo's disease

World Pandemic in early 20th century

Patients fell asleep indefinitely

Called *Nona*: "the living dead"

Not comatose, just would not wake

Affected **5M** with a 40% mortality

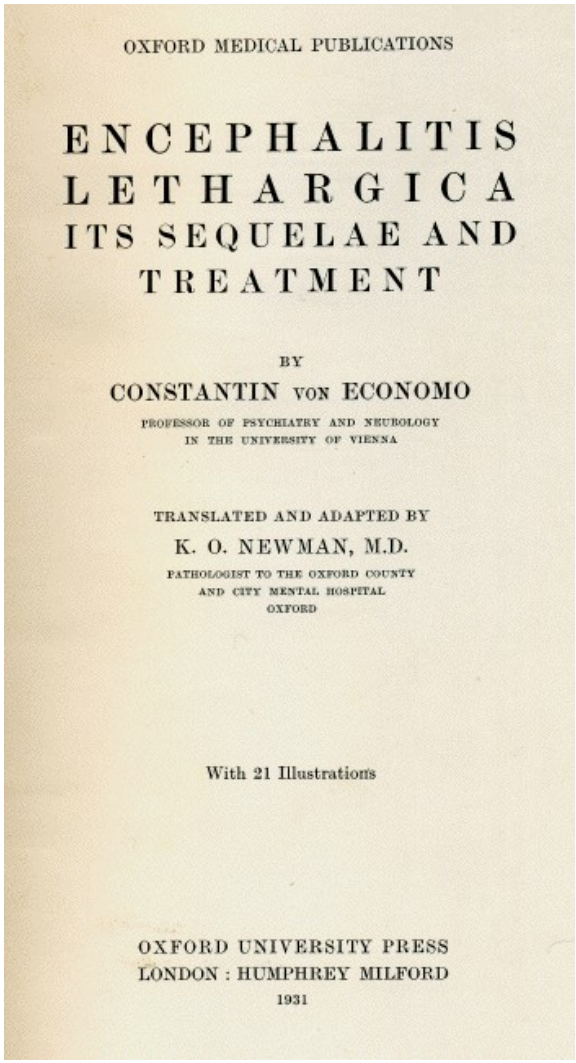
About **1.6M** deaths from 1915-1926

Encephalitis Lethargica (EL) (2)

- Between 1750 and 1800, France & Germany experienced minor epidemics of "*coma somnolentum*".
- In Italy, after the influenza epidemic of 1889–1890, a severe epidemic of somnolent illness (*Nona*) appeared.
- Parkinsonism, myoclonus, hyperkinetic hiccough, tics, chorea and other sequelae developed in the few who survived the *Nona*.

Encephalitis Lethargica (EL) (3)

- Attacks the brain, leaving victims in a statue-like condition, speechless and motionless.
- Between 1915 and 1926 an epidemic of EL spread around the world.
- Many survivors never returned to their pre-morbid vigor.


OXFORD MEDICAL PUBLICATIONS

ENCEPHALITIS LETHARGICA ITS SEQUELAE AND TREATMENT

BY

CONSTANTIN von ECONOMO

PROFESSOR OF PSYCHIATRY AND NEUROLOGY IN THE UNIVERSITY OF VIENNA

TRANSLATED AND ADAPTED BY

K. O. NEWMAN, M.D.

PATHOLOGIST TO THE OXFORD COUNTY AND CITY MENTAL HOSPITAL OXFORD

With 21 Illustrations

OXFORD UNIVERSITY PRESS
LONDON : HUMPHREY MILFORD
1931

Encephalitis Lethargica (EL) (5)

- Constantin Economo von Van Serff (1876-1931), Austrian psychiatrist and neurologist.
- Investigated the neuronal cytoarchitecture of the human brain.

- Was a flying enthusiast and flew as an Army pilot in WWI.
- Described and studied EL in 1916.

Encephalitis Lethargica (EL) (4)

- In 1917 Vienna, clinics were full of patients nodding off, and nervous spouses or parents explaining how they'd fall asleep walking or while chewing food.

- They had tics, repeated words and their eyes seemed disconnected from their brain, unfocused and unable to register neighboring surroundings.

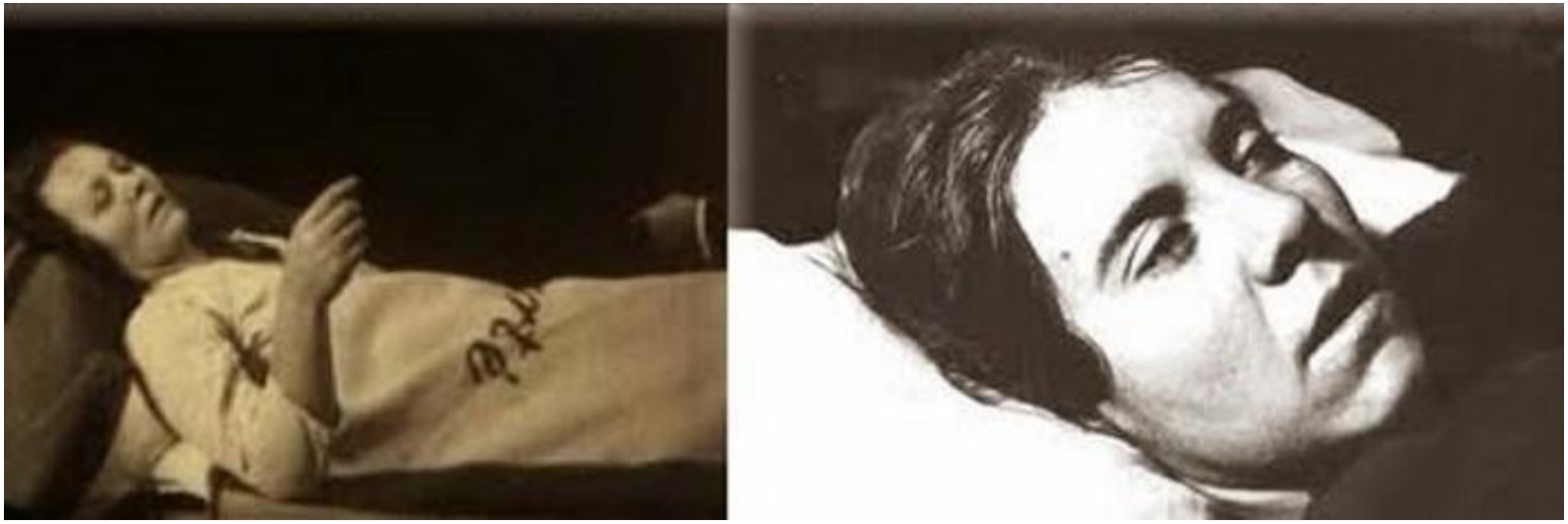
- Similar cases were reported in London and New York.

*Encephalitis Lethar*gica (5)
(Signs & Symptoms)

- High fever
- Sore throat
- Headache
- Lethargy
- Double vision
- **Delayed** physical response
- **Slow** mental response
- Sleep inversion

- *Akinetic mutism*
- Catatonia
- Parkinsonism
- Oculogyric crises
- Upper body weakness
- Muscular pains
- Neck rigidity
- Behavioral changes
- *Klazomania*

Encephalitis Lethargica (EL) (6)



Encephalitis Lethargica (EL) (7)

"Entranced"

"Awakened"

"Blocked"

Rose R.

Encephalitis Lethargica (EL) (8)

- Most virulent between October, 1918 and January, 1919, and disappeared in 1927 as abruptly and mysteriously as it first appeared.

- EL pandemic paralleled the 1918 Spanish influenza pandemic.

- Maybe the influenza virus potentiated the effects of the encephalitis virus or lowered resistance to it.

Encephalitis Lethargica (EL) (9)

- Since then, it has been only sporadic.
- Autopsy pathology definitely showed areas of lesions in various areas of the brain tissue.
- ⅓ of those affected died in the acute stages, ⅓ developed post-encephalitic Parkinson's, and the remaining ⅓ recovered almost completely.
- To date, scientists do not agree on the cause.

AWAKENINGS

Awakenings

- In 1969, Oliver Sacks worked with catatonic patients in a mental hospital in the Bronx.
- He extensively documented the patients' issues and reactions to treatment.
- He used a medication, L-DOPA, that had recently been described for Parkinson's.
- Wrote a book about his experiences: *Awakenings*

Awakenings

- “They would be conscious and aware – yet not fully awake; they would sit motionless and speechless all day in their chairs, totally lacking energy, impetus, initiative, motive, appetite, affect or desire.

- They registered what went on about them without active attention, and with profound indifference.

- They neither conveyed nor felt the feeling of life; they were as insubstantial as ghosts, and as passive as zombies.”

Oliver Sacks, Awakenings, 1990

Awakenings

- 1997 movie about Dr. Oliver Sacks' experiences with EL in a hospital in The Bronx, New York City.
- Shows the very transient improvement in symptoms after starting L-dopa in several EL chronic patients.
- Main character, Leonard (Robert DeNiro) has amazing, albeit temporary, improvement, only to have symptoms recur.

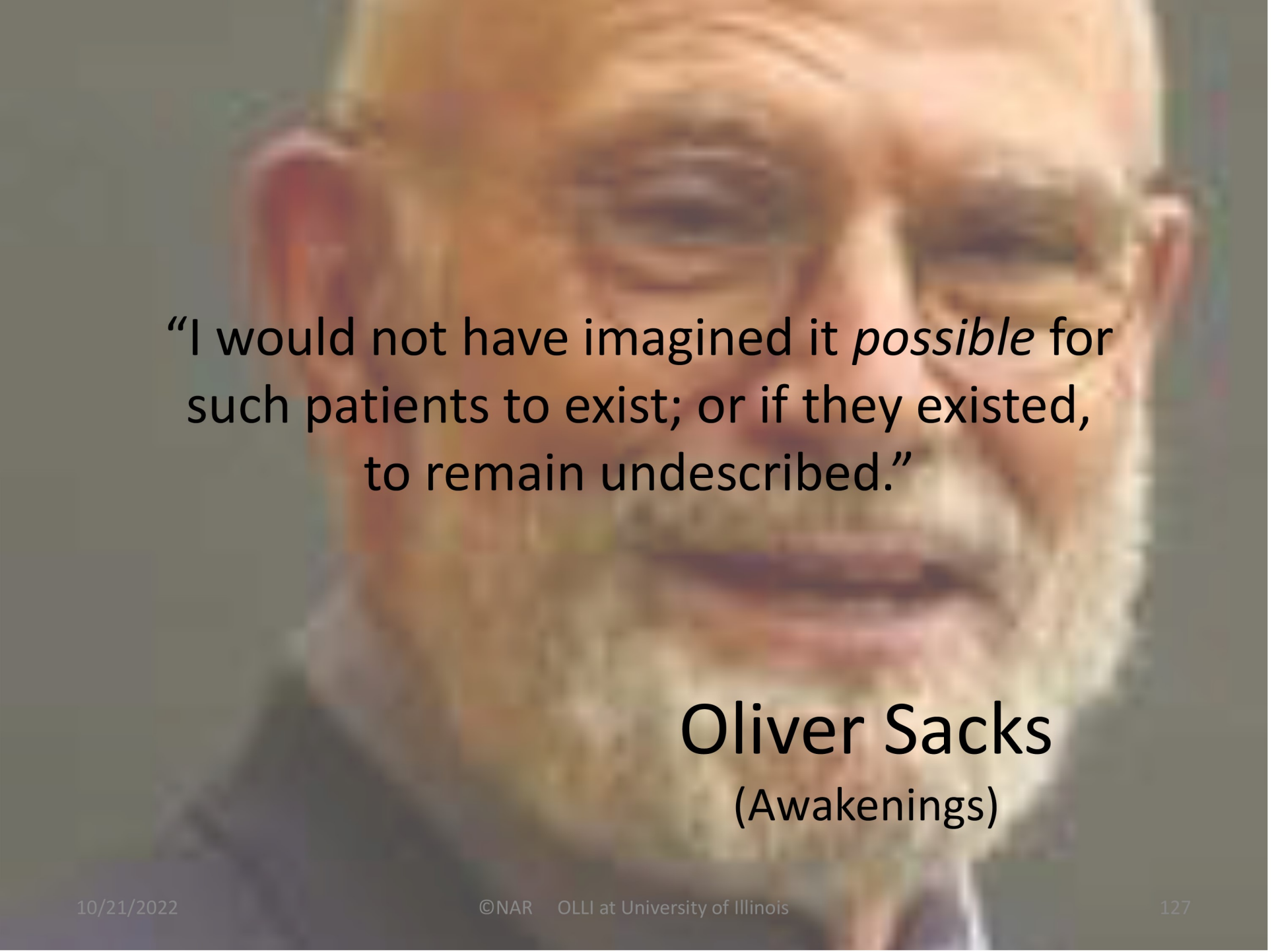
Awakenings

- Several patients showed an astounding and very rapid improvement.
- It was as if they had suddenly awakened after many years of catatonic lethargy, and regained their lost life.
- Leonard, the main patient in the movie called the drug L-dopamine “resurrectamine”.
- The effect was short-lived.

Awakenings

Robin Williams as
“Dr. Malcom Sayer”

Dr. Oliver Sacks


"I would not have imagined it *possible* for such patients to exist; or if they existed, to remain undescribed."
Oliver Sacks
(Awakenings)

Recap of Session 5

- Review of Definitions
- The "Big 4" of the 20th Century
- The Influenza Virus and its quirks
- Spanish Flu Pandemic of 1918
- Asian Flu Pandemic of 1957
- Hong Kong Flu Pandemic of 1968
- Encephalitis Lethargica

Last Questions?


THANK YOU

Next Week

- Session 1 February 27: Definitions, Biblical Plagues.
- Session 2 March 5: The PLAGUE through time & place.
- Session 3 March 12: Other epidemic diseases.
- Session 4 March 19: The Columbian Exchange.
- Session 5 March 26: 20th Century Pandemics Past & Current
- Session 6 April 2: HIV/AIDS
- Session 7 April 9: 20th and 21st Century Viruses.
- Session 8 April 16: Crystal Ball into the Future?

And People Stayed at Home

CoVid pandemic poem

And people stayed at home
And read books
And listened
And they rested
And did exercises
And made art, and played
And learned new ways of being
And stopped
And listened more deeply
Some meditated, some prayed
Some met their shadow
And people began to think differently
And people healed.

And in the absence of people who
Lived in ignorant ways
Dangerous, meaningless and heartless
The earth also began to heal
And when the danger ended

And people found themselves
They grieved for the dead
And made new choices
And dreamed of new visions
And created new ways of living
And completely healed the earth
Just as they were healed.

Catherine O'Meara, 2020