Infectious diseases

WHAT IS IN THE NEWS?

Clinical Review and Up-date

Avian Influenza COVID-19 Measles

MOA Spring Conference
May 15-18, 2025

Friday May 16,2925

1:45 - 2:45 PM

Somerset Inn
2601 W. Big Beaver Road
Troy, Mi

ANTHONY OGNJAN DO FACP

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Sterling Heights, Michigan, 48314
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Fax: 586 446-9994

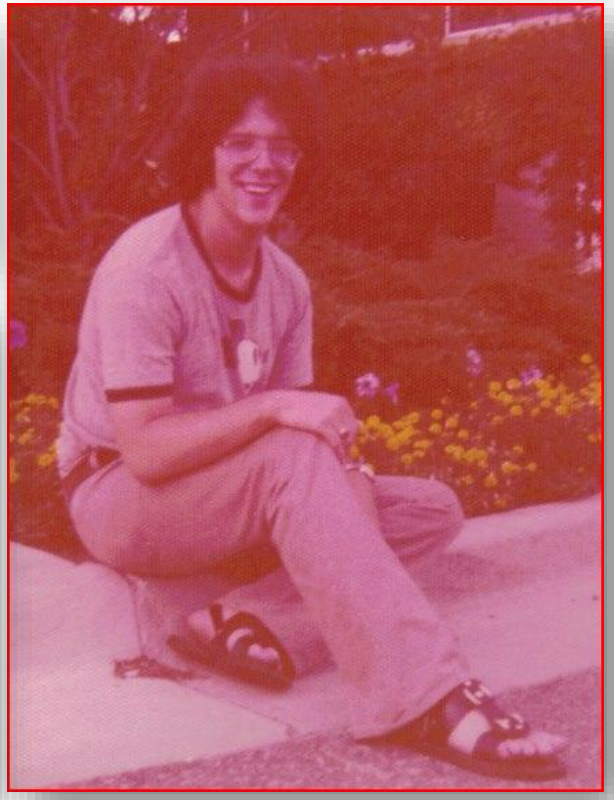
MIDC Metro Infectious Disease Consultants, L.L.C.

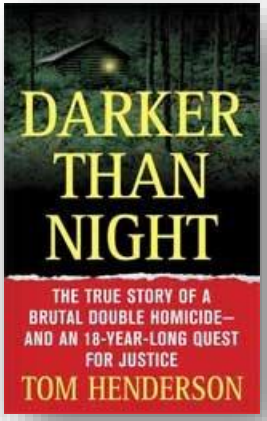
A few personal observations …

What is the QAAP tax in Michigan?
A QAAP is a process authorized by the Legislature that levies an assessment on Physician service to, leverage additional federal dollars into the Medicaid program, theoretically allowing higher reimbursement rates to be paid when providing services to Medicaid recipients

Michigan state capital steps

"Norma Rae" [1979 Sally Fields]
"Brothers & Sister"





Anthony Ognjan, D.O., FACP

Serbo-Croatian - French Canadian)




Diploma. Algonac High School (Long time ago!)
B.S. Microbiology & Public Health MSU 1975
B.S. Pharmacy, Ferris State College 1978
MSU College of Osteopathic Medicine 1983
Board Certified IM: 1987 [ABIM]
Board Certified Infectious Diseases: 1991 [ABIM]

Past President, Macomb County Osteopathic Medical Association
Chairman, Michigan Osteopathic Association [MOA] Political Action Committee
Member, Counsel of Governmental Affairs (MOA)
Vice-Chair MOA House of Delegates (MOA)
Associate Professor of Medicine MSU-COM

Staff Emergency room Physician
Henry Ford hospital System
- Staff physician HIV/ID Clinic
Macomb County Jail
- **Staff physician**
Wound Care Center
Mclaren Macomb hospital

Hospital Orderly: (Orthopedics), Ingham Medical Center
Pharmacist: Children's Hospital of Michigan
Internship: Detroit Osteopathic Hospital / BCCH
Resident: Internal Medicine, Henry Ford Hospital, Detroit
Infectious Disease Fellowship: Henry Ford Hospital, Detroit

MIDC Metro Infectious Disease Consultants, L.L.C.

1989 McLaren Macomb Hospital / Ascension Macomb-Oakland

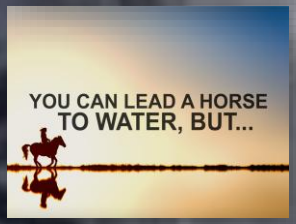
DISCLOSURES

Anthony Ognjan, DO FACP

- *No Financial or corporate Relationships*
- *Irony: Began 1983 HIV Pandemic - Ending with COVID-19 Pandemic*
- *1993: MOA Education Committee ("Hotel California")*

- *I am a "Vaxer": I encourage ALL Vaccines ** **[What Happened to H influenza?]**

- **I don't believe in Mandatory COVID-19 Vaccination.*



Lecture Outline

I. **Introduction**

- A few random thoughts
- Contagious Disease
- Miscellaneous I
- Natural "rules" and evolution

II Microbial Ecology

- Gaussian Distribution [Bell shaped Curve]
- Viral infection; Human Ecology
- Viral Variance [Natural / artificial-Vaccine]
- Herd Immunity
- Random Thoughts: "Vaccines"

III IN THE NEWS COVID-19, Avian Influenza, Measles

- Epidemiology
- Endemic/ Epidemic/ Pandemic
- "Selected" Michigan Endemic diseases
- Importance "Reproduction Numbe

IV COVID-19

- COVID-19 Variance : Noval, Delta, Omicron

V Influenza A

- "It' Back"
- Effect of COVID-19 Pandemic
- Impact Influenza Vaccination
- Clinical Influenza [Brief!]
- Historical Origins of "New" Influenza Virus
- Influenza Virology [Brief Anatomy Naming

VI INFLURNZA Virus; [H N]

- Influenza viral Shifting / drifting
- Viral Mutations
- Scientific and social implications
- "1918 Spanish Influenza"
- Mother of all pandemics" [Brief]

VII Avian Influenza

- H5N1 "Origin" clinical significance
- Worldwide / U.S. / Michigan significance
- Vaccine Considerations

VIII MEASLES

Let the GAMES begin….

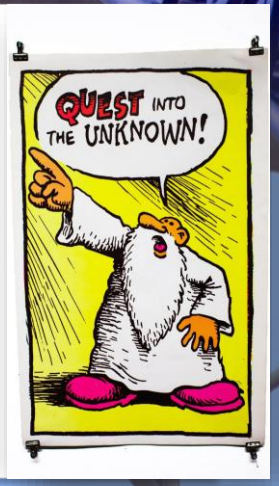
I know….

I talk fast…

I have too many slides…

Respectfully of your attention…..

Buckle Up…..Here we go….



But First…

Just

A few…

random thoughts

Personal and Professional

Fear factors

Myths and Legends

Just

A few… random thoughts 40+ rears

First and foremost

Personally…

"I never intend, to Die from a Contagious Infectious Disease"

Anthony Ognjan, DO FACP
Infectious Disease

Google University of Medicine

This certifies that Dr: John & Jane Q Public on recommendation of the faculty of the Google University of Medicine has conferred the degree of:

Internet Doctor of Medicine

Who has honorably fulfilled all the requirements prescribed by the university for that degree.

President

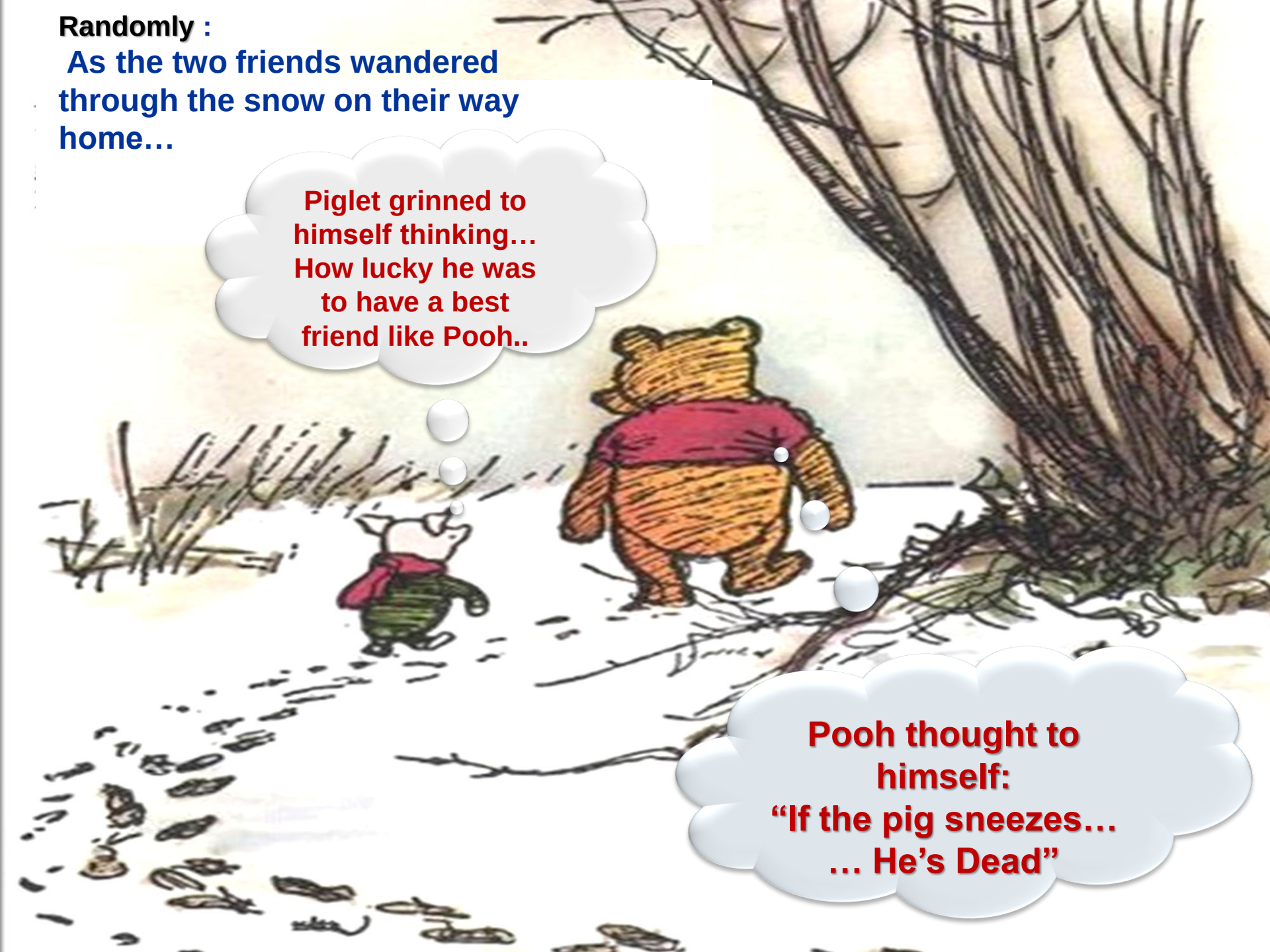
Director

Date

Since COVID-19
Every patient and *ALL* family members are graduates of the University of Google® Medical school?

Randomly :

As the two friends wandered through the snow on their way home…



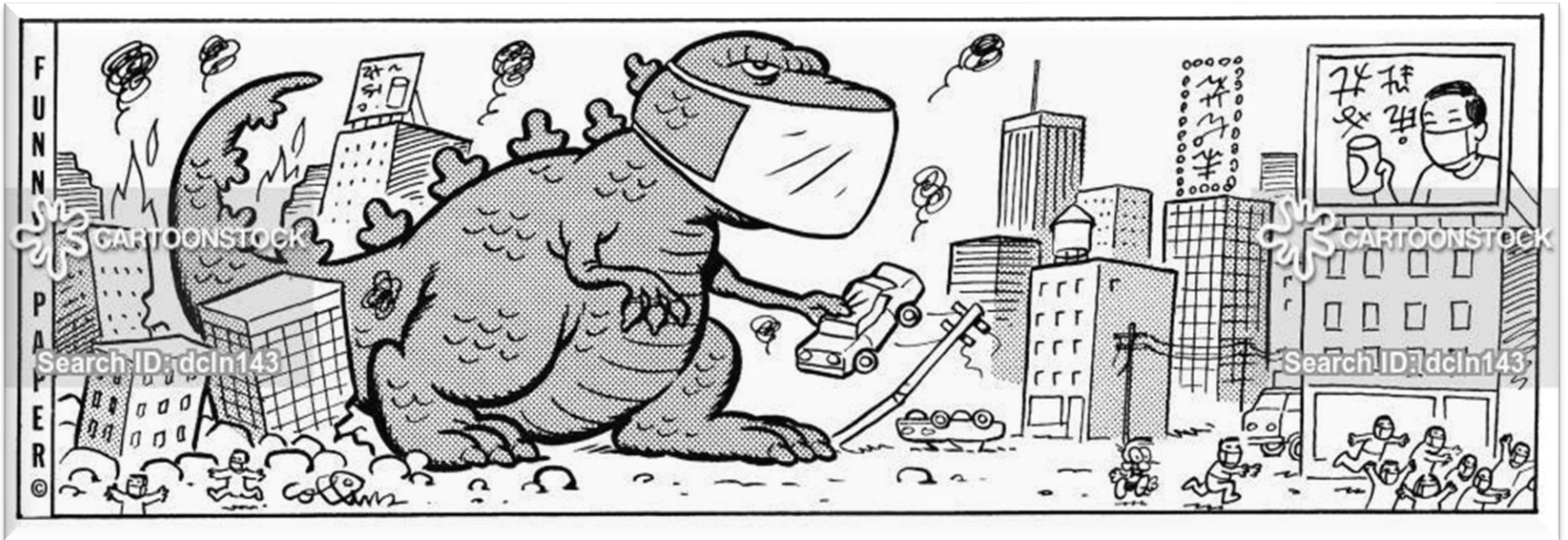
Randomly…

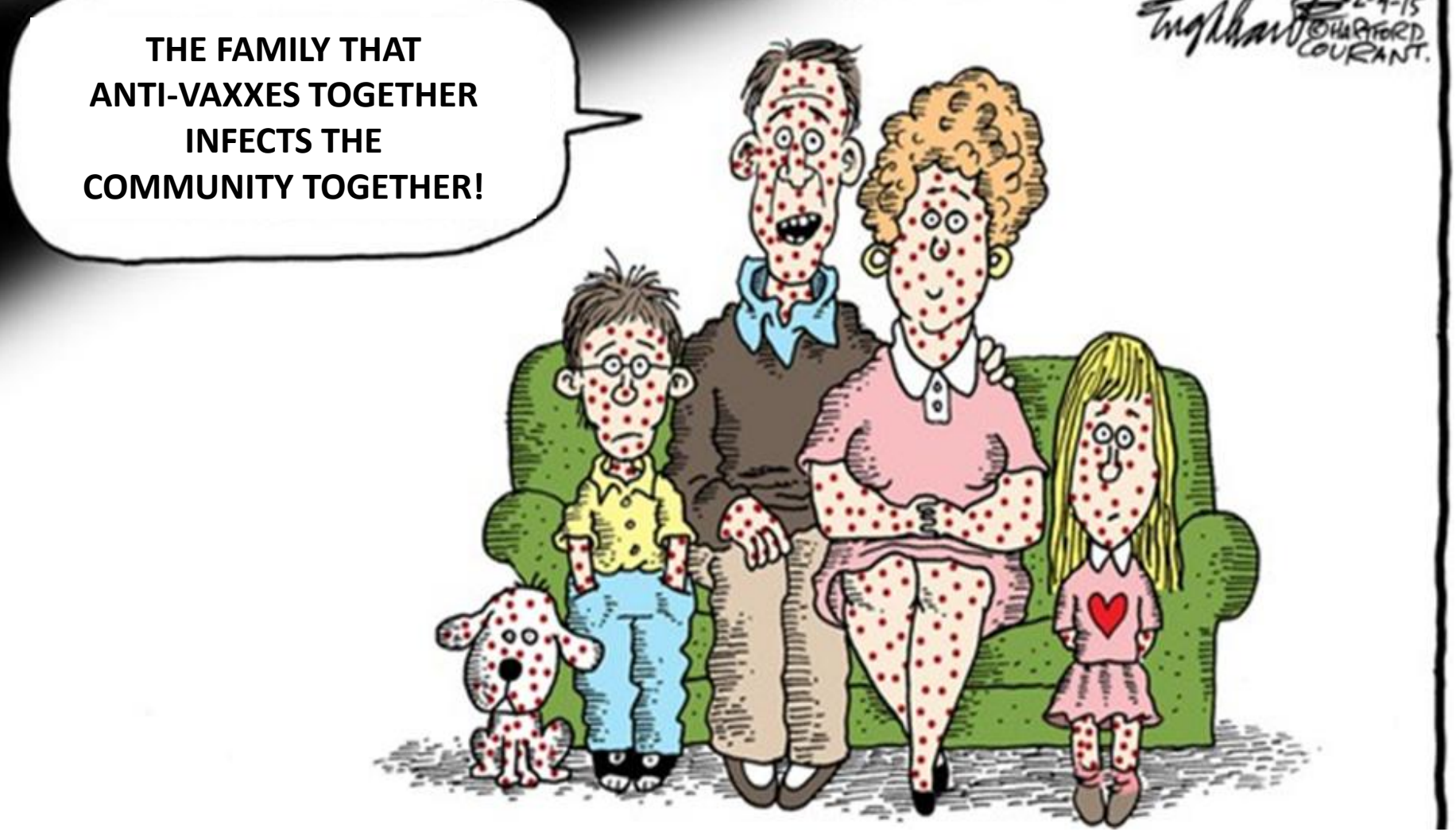
Seeing someone walking down the street wearing a mask …

2 good reasons for crossing the street

#1. They might be Bat-shit crazy….

#2. They may have something I don't want…

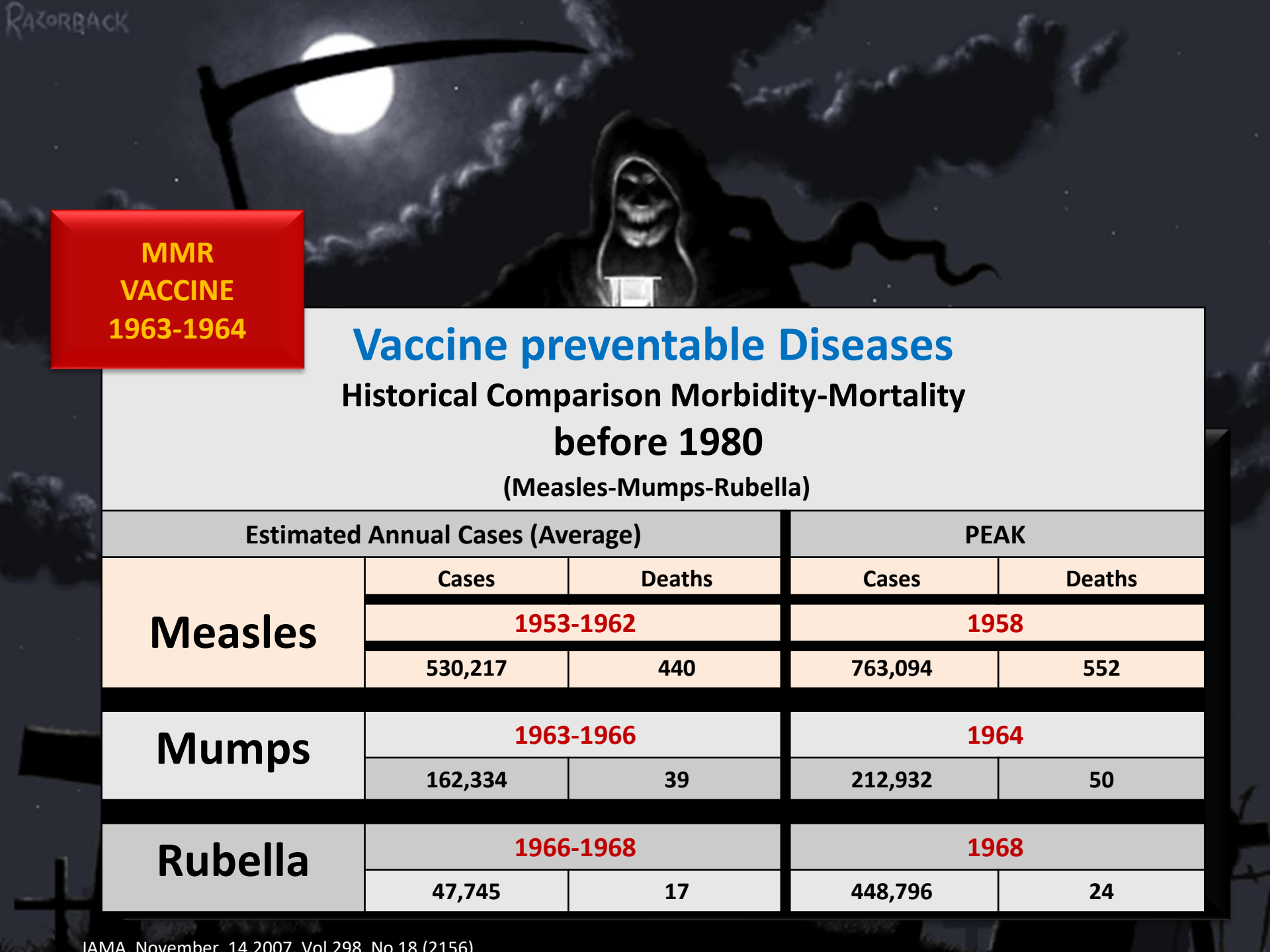




Humans are social creatures…

”HERD Immunity”

What is /should be the “price of admission” to belong to Society?



MMR VACCINE 1963-1964

Vaccine preventable Diseases

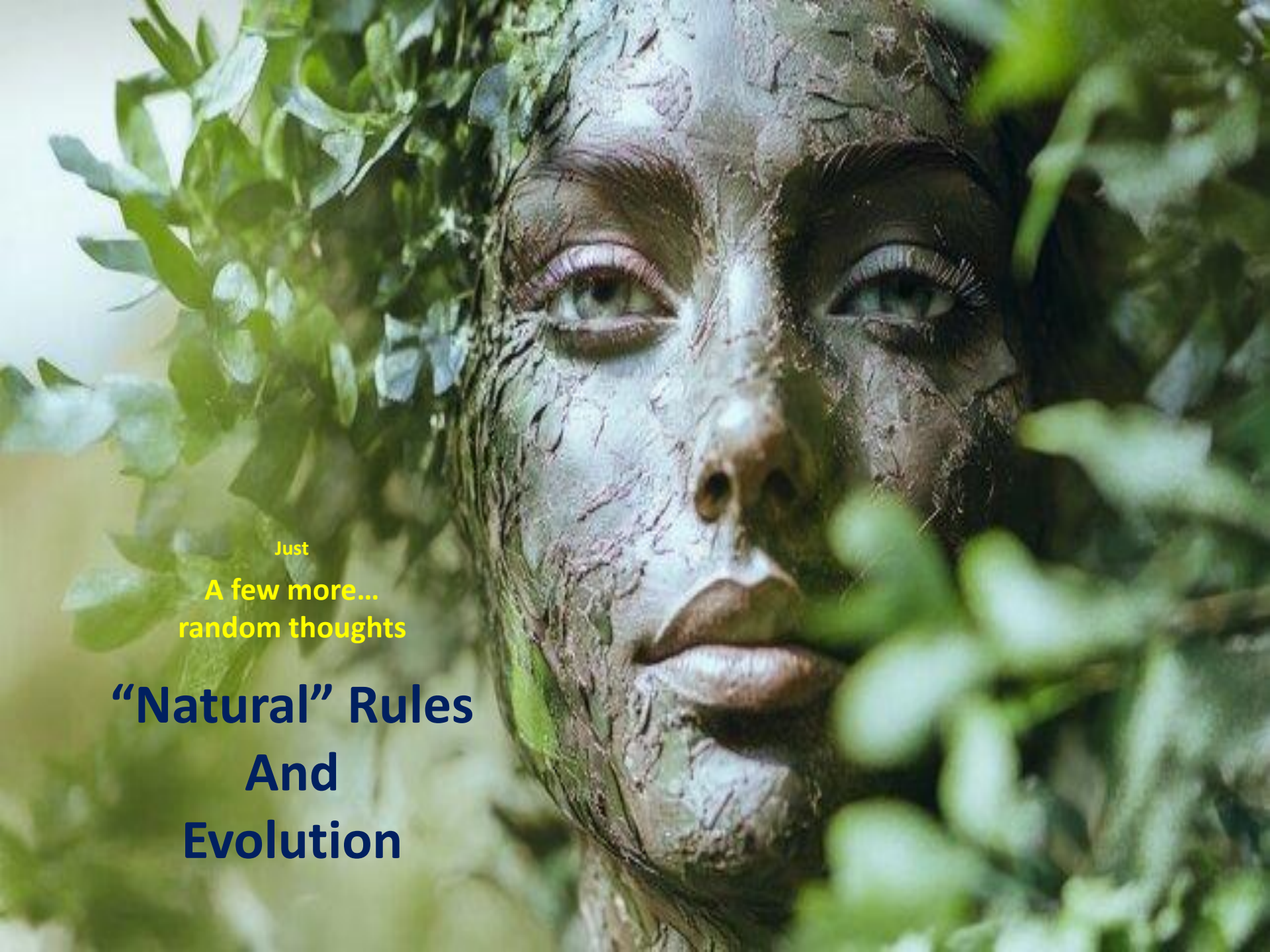
Historical Comparison Morbidity-Mortality

before 1980

(Measles-Mumps-Rubella)

	Estimated Annual Cases (Average)		PEAK	
	Cases	Deaths	Cases	Deaths
Measles	1953-1962		1958	
	530,217	440	763,094	552
Mumps	1963-1966		1964	
	162,334	39	212,932	50
Rubella	1966-1968		1968	
	47,745	17	448,796	24

JAMA, November 14 2007, Vol 298, No 18 (2156)



Just

A few more…
random thoughts

“Natural” Rules And Evolution

Microbial Ecology

The study of Microbial interactions with each other and their environment

Encompassing both living and nonliving components

About Microbial Ecology Antimicrobial Resistance CDC [Accessed 04/27/2025] https://www.cdc.gov/antimicrobial-resistance/about/about-microbial-ecology.html

“GENERAL”
Viral Infection / Human Ecology

48 + hour
Peak Virus
Replication

Viral Antigen
Shed Several days

Viral Load

Exposure

2-6 days
Little virus Shed

INCUBATION
(Asymptomatic)
3-5 days

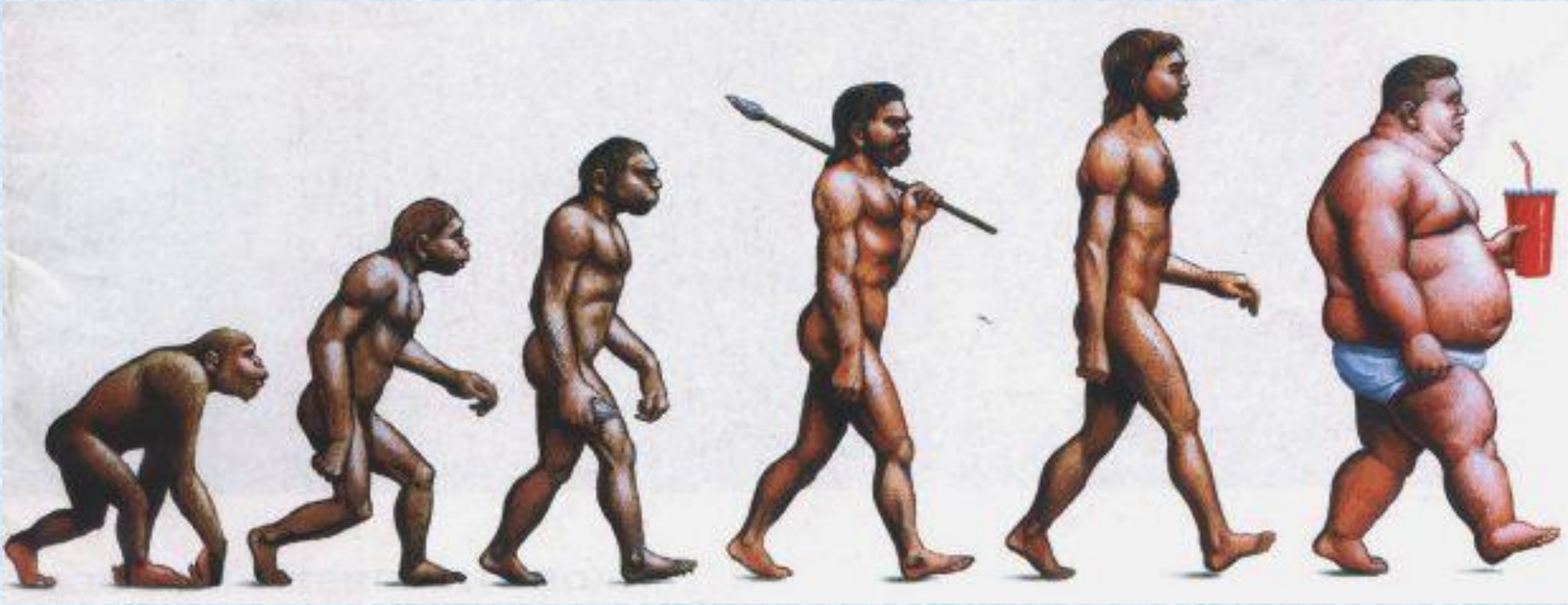
SYMPTOMS

Recovery

Just

A few more…
random thoughts
[I promise]
Natural Science

As Humans Evolve…..



…..So do viruses :
“Viral variances”

Viral Variance

Natural evolution [survival] Artificial evolution [Vaccine]

CONSIDER:

- Viruses constantly change through mutations ….
- Occasionally these mutations result in “new viral variants”
- Some variants emerge and disappear while others persist.

Be certain New virus variants ***will*** continue to emerge.

I know what you are thinking

Holy cats…..

Doc O??? "New Viral variants"

Concerns ??

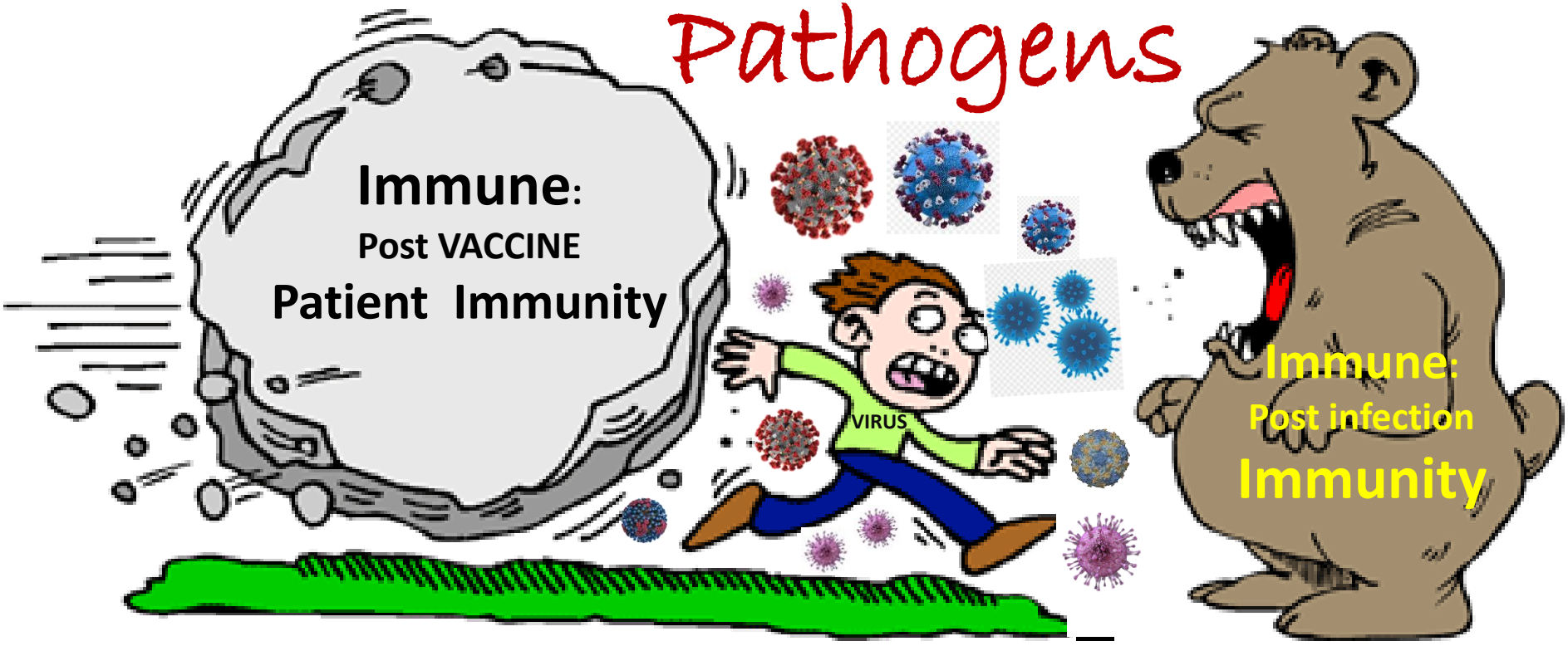
* "Having scored a trillion dollars, made a run back home…
Found him slumped across the table…a gun and me alone
I ran to the window…looked for a plane or two…
Panic in Detroit…he'd left me an autograph…
Let me collect dust…I wish someone would phone…
Panic in Detroit…
Panic in Detroit…
Panic in Detroit….."

*Songwriters: David Bowie (1973 album, Aladdin Sane)

Viral Variances:
Represent Dynamic Viral "Evolution"

Virus are often trapped between

"Between a Rock and a Hard place"



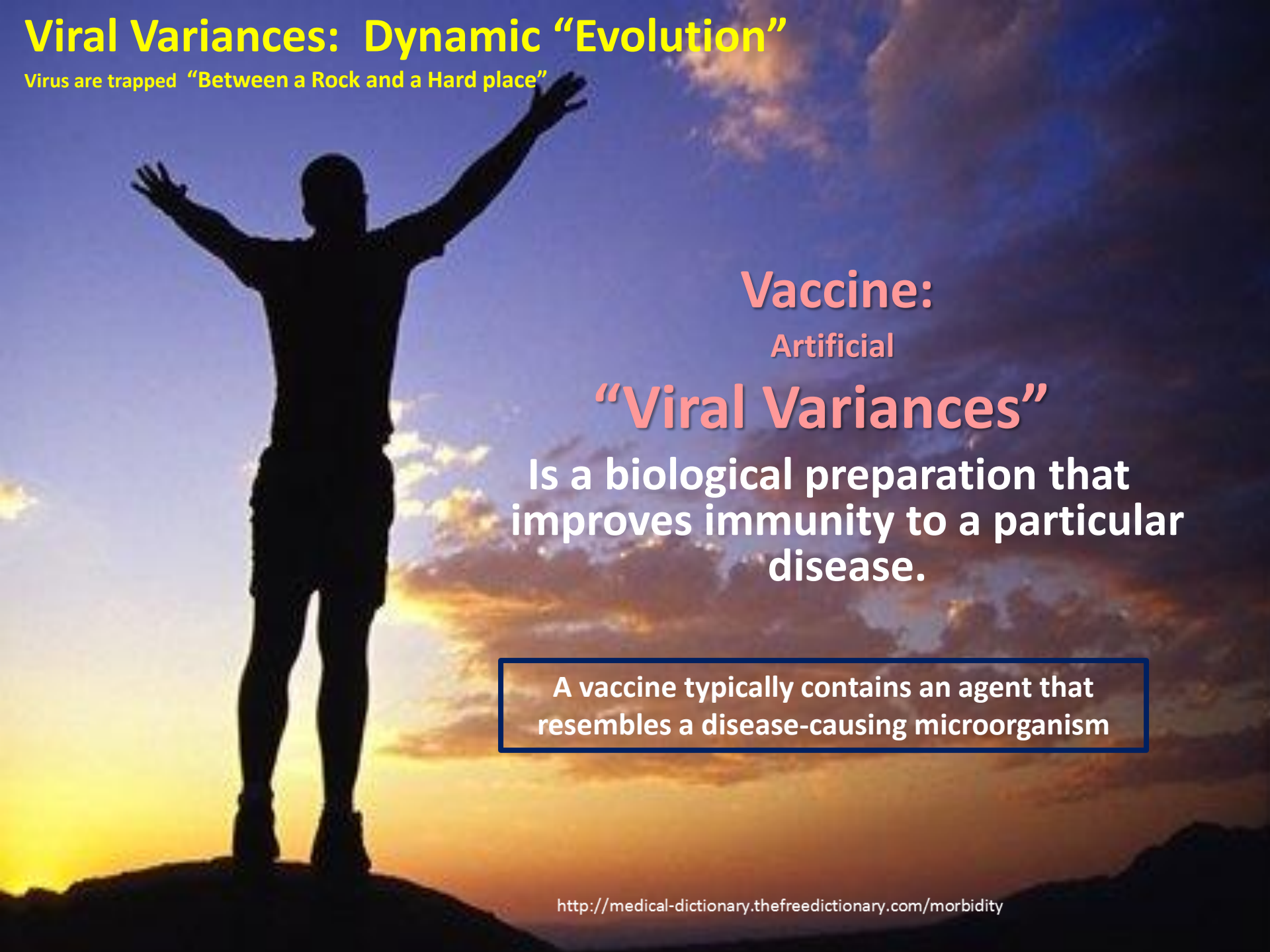
Immune from vaccine
(+/- Infection)

Viral Survival outcomes:
Greater "Genetic Variance"
Pathology / Clinical disease

Immune from Infection
(+/- vaccine)

Viral Variances: Dynamic "Evolution"

Virus are trapped "Between a Rock and a Hard place"



Vaccine:

Artificial

"Viral Variances"

Is a biological preparation that improves immunity to a particular disease.

A vaccine typically contains an agent that resembles a disease-causing microorganism

http://medical-dictionary.thefreedictionary.com/morbidity

Herd Immunity

Just

A few…

random thoughts

Endemic Epidemic Pandemic

Measles Vaccines
Public Health Principles

Why Vaccinate? "Herd Immunity"

Definition

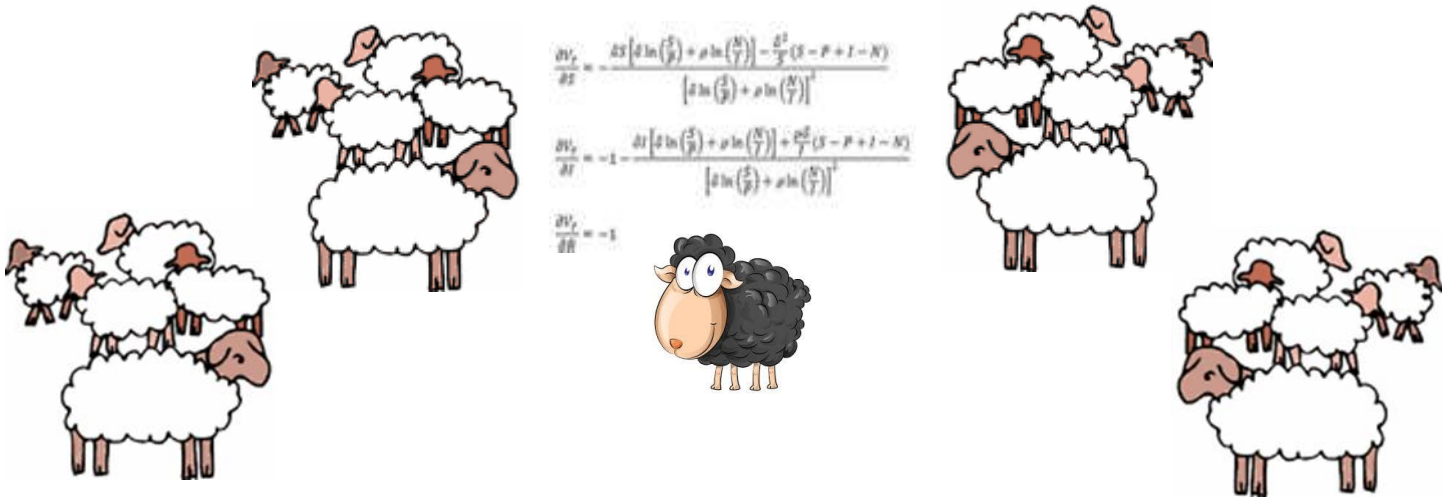
Herd immunity (or Community immunity)

A form of immunity that occurs

Vaccination of a significant portion of a population (or herd)

provides a measure of protection for individuals

who have not developed immunity.*



* John TJ, Samuel R (2000). ***"Herd immunity and herd effect: new insights and definitions".*** *Eur. J. Epidemiol.* **16** (7): 601–6

Endemic – Epidemic - Pandemic

What drives

Endemic---> Epidemic---> Pandemic

Herd Immunity

*** Reproduction Number**

Rø **(“R naught”):**

Herd Immunity

What drives

Endemic---> Epidemic---> Pandemic

Rø ("R naught") : Reproduction Number

- **Predicts the average number of people who will catch a disease from *ONE* contagious person.**

Specifically applies to a population previously free of infection and haven't been vaccinated.

Herd Immunity

What drives

Endemic---> Epidemic---> Pandemic

If the Reproduction number

RØ **("R naught") Is:**

- **If Rø <1 : Epidemic will burn out.**
- **If Rø = 1 : Epidemic will continue at a steady pace.**
- **If Rø >1 : Epidemic will increase exponentially.**

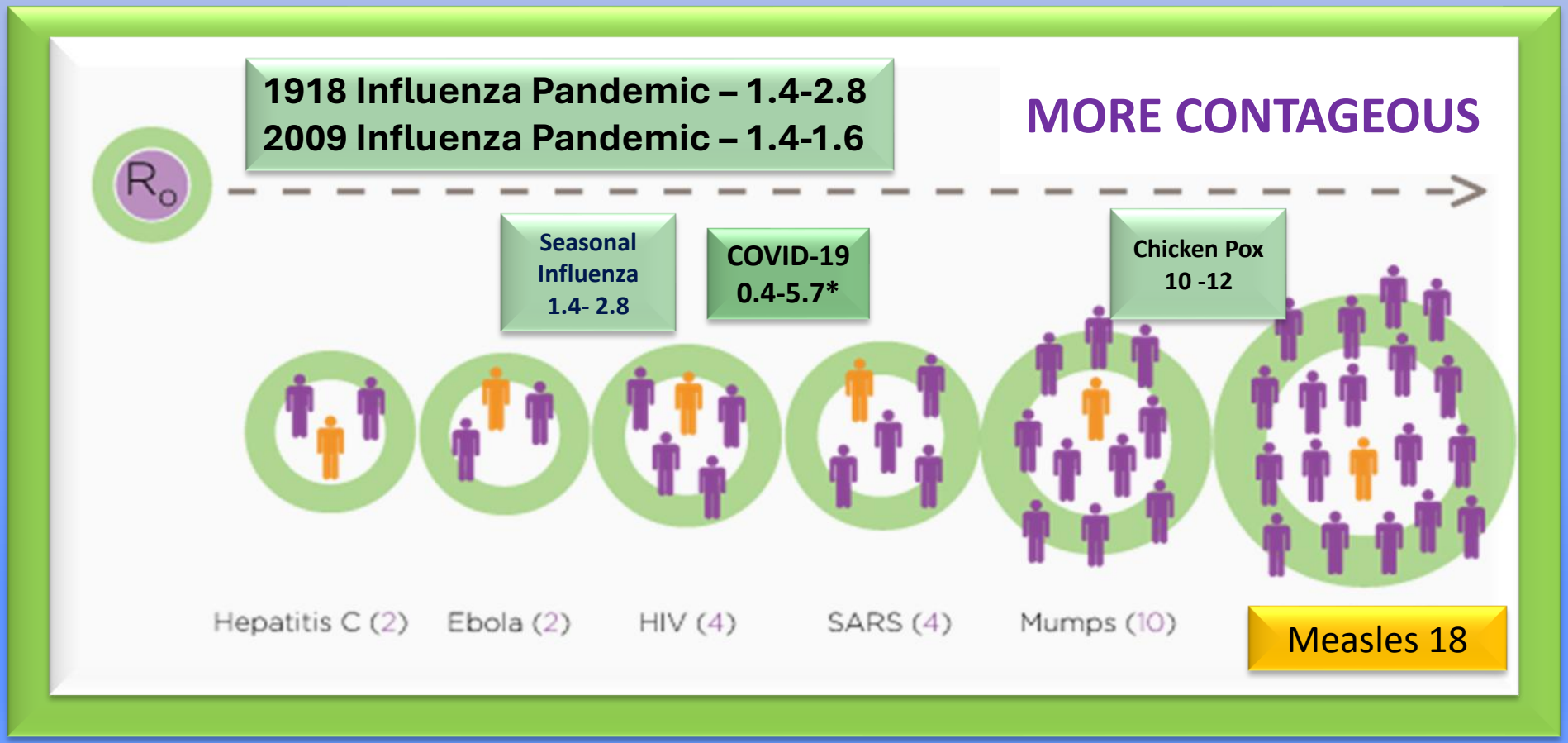
Rø can predict the ***extent of immunization required*** in a population to achieve herd immunity

Herd Immunity

What drives

Endemic---> Epidemic---> Pandemic

Rø **(“R naught”):**



Herd Immunity

Estimated Herd Immunity Thresholds for vaccine preventable diseases [1]

Effective Immunity Rates

*Considerations:

Unvaccinated individuals are indirectly protected by vaccinated individuals

- **No vaccine offers complete protection**, but the spread of disease from person to person is much higher in those who remain unvaccinated
- **Only a small fraction of the population (or herd) can be left unvaccinated** for this method to be effective
- **Considered those who cannot safely receive vaccines** (Immune disorders or organ transplant recipients)

AGENT	Transmission	Herd Immunity Threshold
Smallpox	Airborne-Social Contact	83-85%
Pertussis	Airborne-Droplet	92-94%
Measles	Airborne	83-94%
Mumps	Airborne-Droplet	75-86%
Rubella	Airborne-Droplet	80-85%
COVID- 19	Droplet / Aerosol	40-60% (?)
Diphtheria	Saliva	85%
Polio	Fecal - Oral	80-86%

*_**Herd immunity**_ http://en.wikipedia.org/wiki/Herd_immunityHistory and Epidemiology of Global Smallpox Eradication (Accessed 10/15/2011)

1 From the training course titled "Smallpox: Disease, Prevention, and Intervention". The CDC and the World Health Organization. Slide 16-17 (Accessed 10/15/2011)

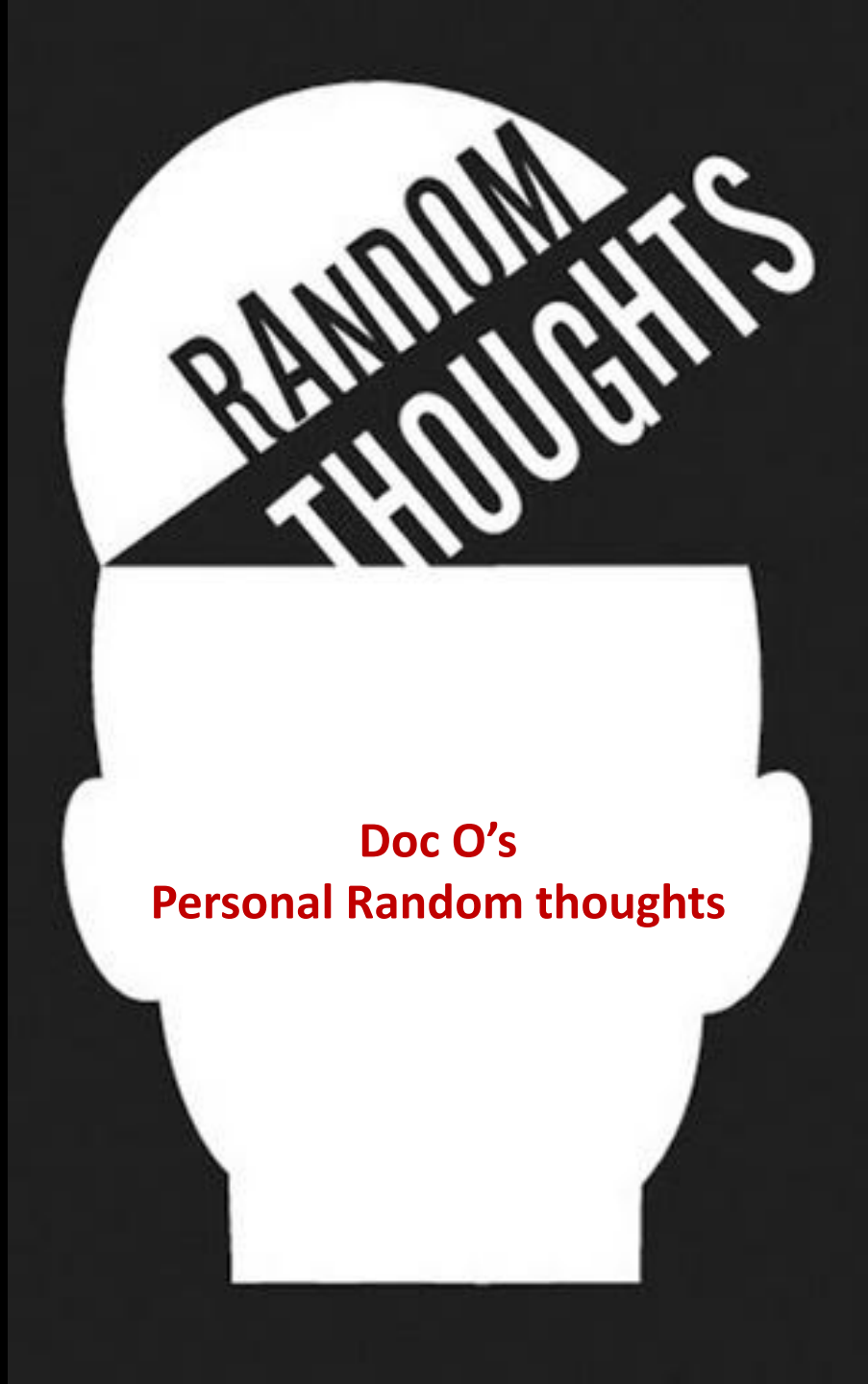
Declining Rates of Michigan Vaccinations

MICHIGAN VACCINE RATES		
YEAR	2020	2025
OVERALL	75%	70%
MMR Vaccine	85%	79%

Immunization Data and Statistics Michigan Department of Health and Human Services. [Accessed 04/26/2025] https://www.michigan.gov/mdhhs/adult-child-serv/childrenfamilies/immunizations/data-statisticsImmunization Data and Statistics

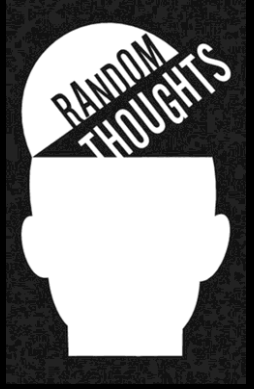
Vaccines:

Staying current with vaccines



Vaccines:

Staying current with vaccines



Personal Random thoughts

Admittedly, some physicians aren't well versed in the science or technology of vaccines….

This opens the attacks, and fuels the controversy upon vaccine medicine by opponents of vaccinations…

"Celebrity scientists", "Free choice advocates", Alternate Medical, and certain Religious groups… "I forgot"…

But Vaccine technology does not function in a vacuum…

Vaccine science has come a long way since Edward Jenner and others first immunized people against "Smallpox" using "a wooden stick" smeared with Cowpox "pus" …

Vaccines:

Staying current with vaccines

Personal Random thoughts

Today's vaccines are created using modern technology, and involve many *scientific disciplines including :*
Microbiology, Microbial Genetics, Biochemistry, Pharmacology, Pathophysiology, Computer Science, Epidemiology, Immunology Statistics and on and on….

AND…..The safety and effectiveness of vaccines are "time tested" and "clinically" validated by the Millions of vaccine recipients….

Vaccinations are scrutinized on a continuous basis **("VAERS"*) …** and, I might add… by the most modern and most sophisticated system of statistical analysis developed to date….

Vaccine Adverse Event Reporting System

Vaccines:

Staying current with vaccines

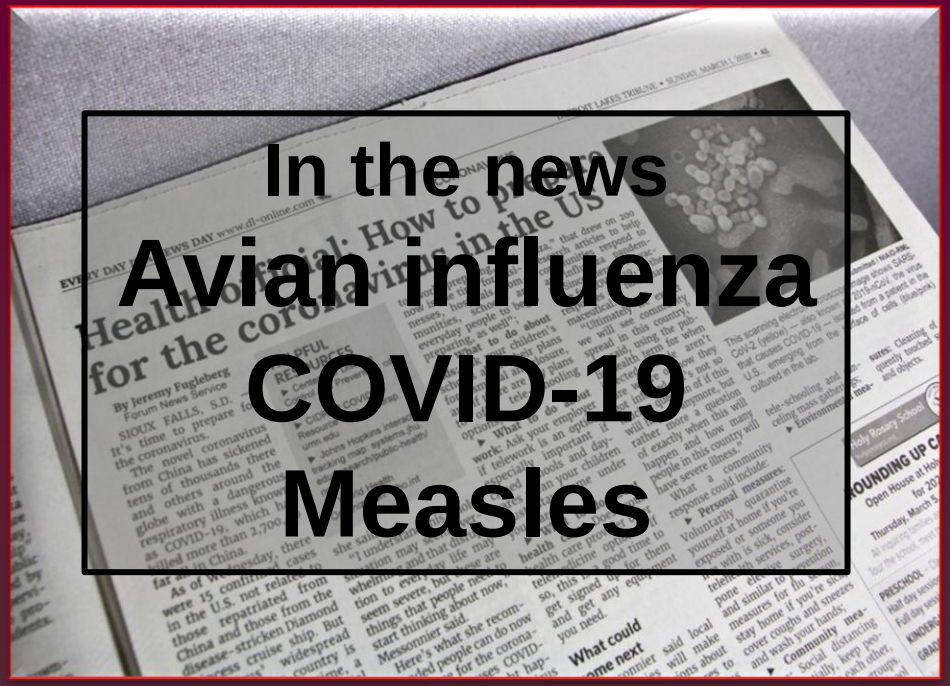
Personal Random thoughts

Our patients and their families should feel confident that the "How to, and Wherefores" of vaccine administration is greatly understood….

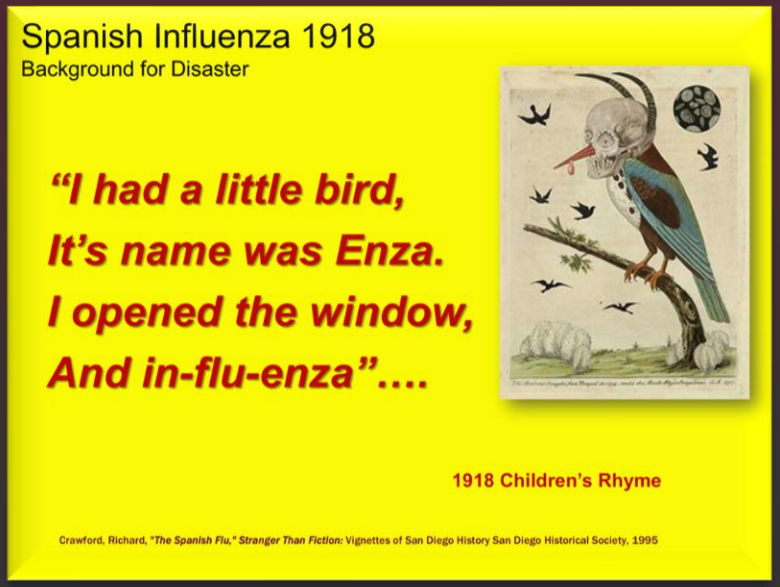
...And the techniques involved, for safe and effective vaccination delivery, have been simplified for the average physician by consensus, of multiple, and an incredibly large, and diverse groups of Scientists, Physicians and Clinical Practitioners

You are in good hands

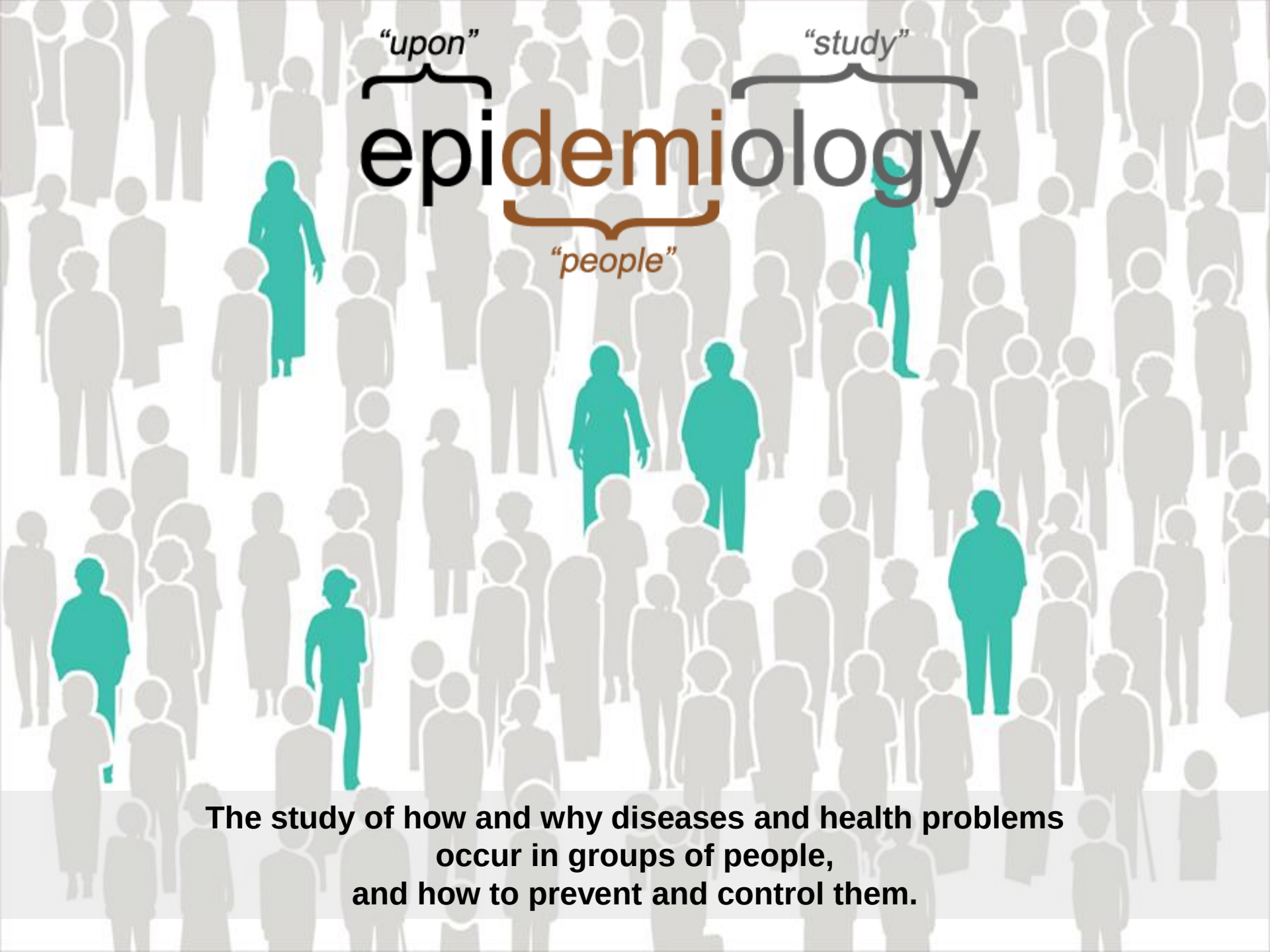
- Anthony F. Ognjan, D.O., FACP


In the news
Avian influenza
COVID-19
Measles


February 11, 2020
The World Health Organization (WHO) designated the disease / syndrome caused by the "novel" coronavirus SARS-CoV-2 :
CO = Corona
VI = Virus
D = Disease
19 = 2019
"COVID-19"

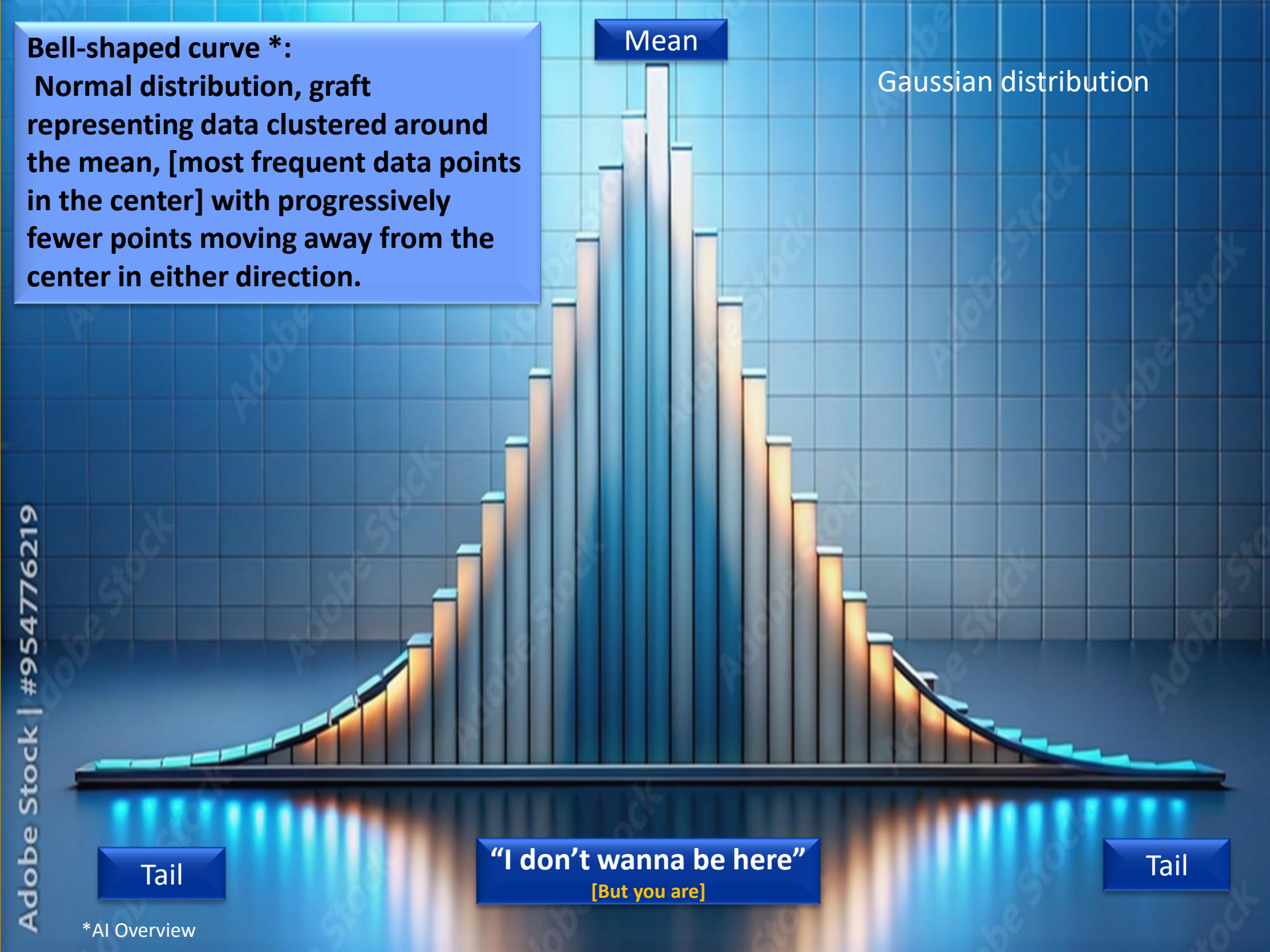

Spanish Influenza 1918
Background for Disaster
"I had a little bird,
It's name was Enza.
I opened the window,
And in-flu-enza"....
1918 Children's Rhyme
Crawford, Richard, "The Spanish Flu," Stranger Than Fiction: Vignettes of San Diego History San Diego Historical Society, 1995


Histological examinations :
The rash can potentially be explained by Measles virus infection of the dermal endothelial cells and keratinocytes....
Koplik's spots are similar to those of the skin rash
Which are subsequently cleared by the virus-specific host cellular immune response
Koplik spots



The study of how and why diseases and health problems occur in groups of people, and how to prevent and control them.

Bell-shaped curve *:
Normal distribution, graft representing data clustered around the mean, [most frequent data points in the center] with progressively fewer points moving away from the center in either direction.



*AI Overview

What's the difference between an endemic, epidemic and pandemic disease?

ENDEMIC DISEASE

Consistently present in certain populations or region, with relatively low spread ability

EPIDEMIC DISEASE

Sudden increase in cases spreading through a large population. Outbreak is similar usually a smaller geographic area

PANDEMIC DISEASE

A sudden increase in cases spreading through several countries, Continents or the planet

CLINICAL CONSIDERATIONS

Where in the "world" Are we today?

Susceptible Population Changes:

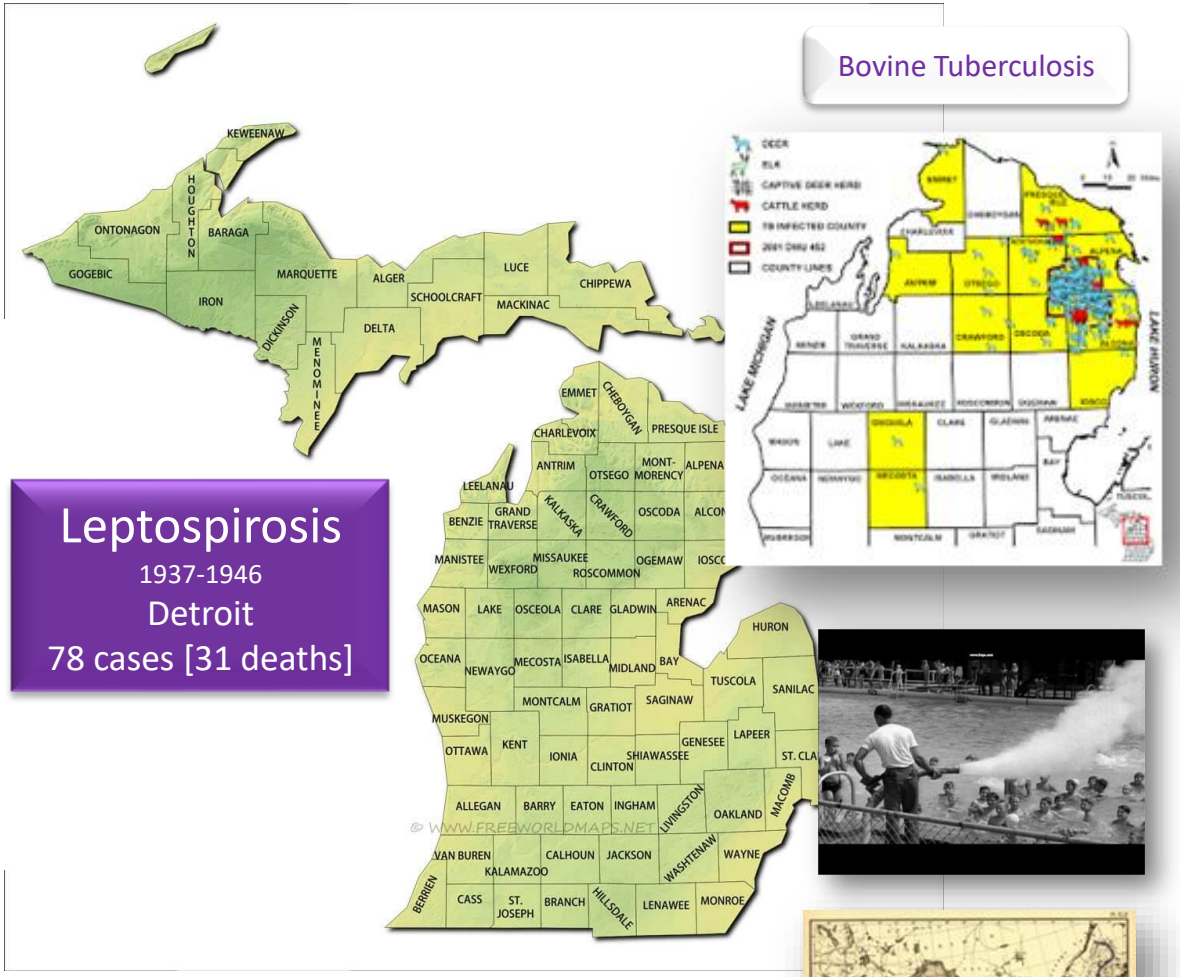
- Immune by Disease
- Immune by Vaccination
- Immune by Disease / Vaccination

Short List:

Michigan

Endemic Contagious disease

- Avian Influenza [2022]
- Bovine Tuberculosis [1994]
- COVID-19
- HIV [~1982]
- MRSA [1980s] Presently "65-70%
- Legionella ["Pontiac Fever"1968]
- Leptospirosis [Dogs, Rat urine]
- Lyme Disease [1980s?]
- Rabies [1990s]
- Tuberculosis [1990s; 2022?]
- Eastern Equine Encephalitis [1980]
- West Nile Virus [~2002]



Bovine Tuberculosis

Leptospirosis
1937-1946
Detroit
78 cases [31 deaths]

Michigan Mosquitoes: 60 Species

- Malaria: Anopheles crucians; Anopheles quadrimaculatus; Anopheles walkeri; Culex pipiens
- Virus: West Nile Virus, Eastern Equine Encephalitis
- Dog Heart: Worm: Dirofilaria immitis

Malaria 1870

Michigan 1936-42
411 cases 28 counties

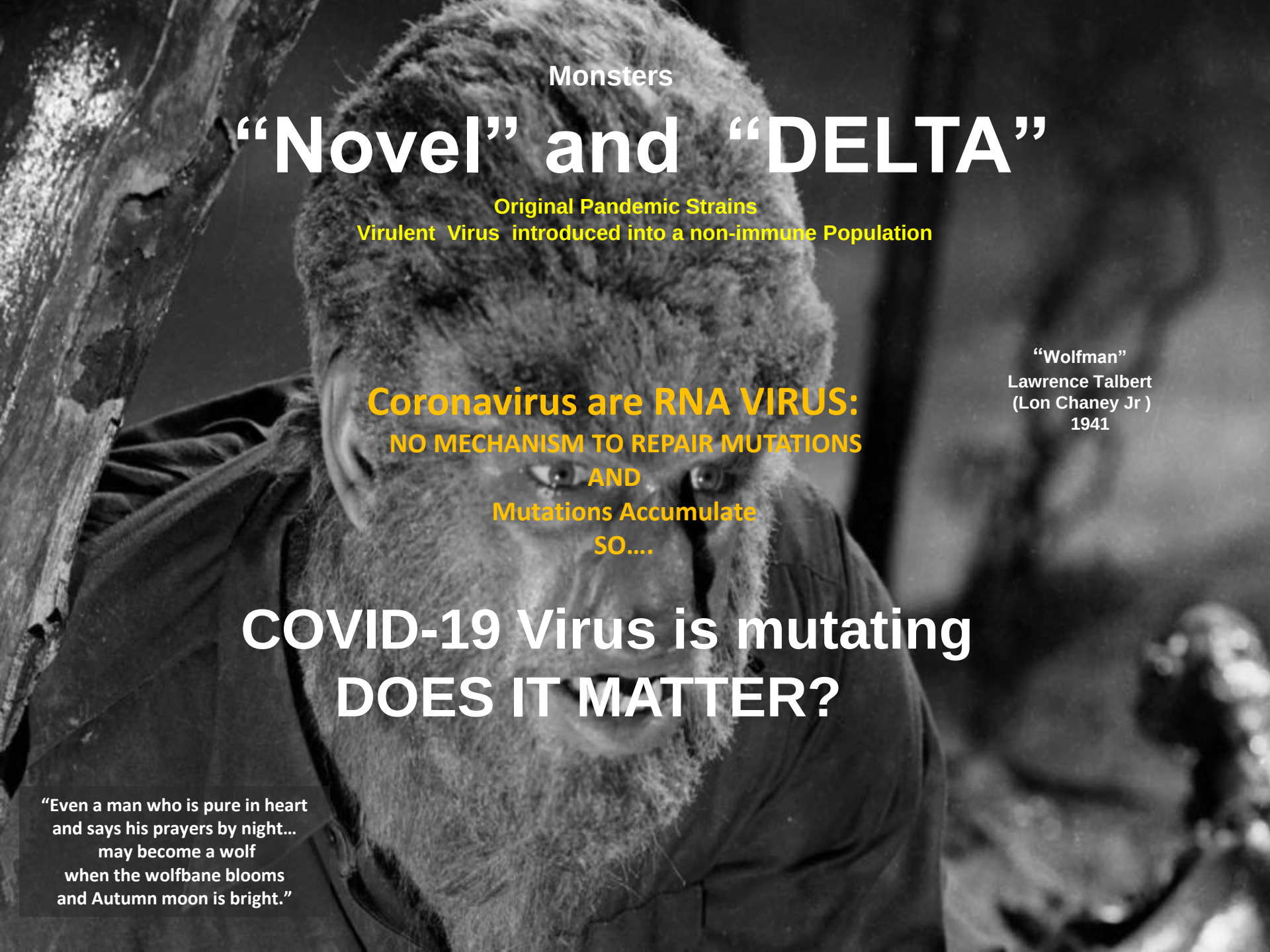
Reportable Diseases In Michigan-by Condition: A guide for Physicians, Health Care providers and Laboratories [Accessed 04/16/2025]
https://www.michigan.gov//media/Project/Websites/mdhhs/Folder2/Folder97/Folder1/Folder197/Reportable_Diseases_Michigan_by_Condition.pdf?rev=2675c95cf938417ebad8a6398b681a8a

•COVID

February 11, 2020
The World Health Organization (WHO) designated the disease / syndrome caused by the “novel” **coronavirus SARS-CoV-2 :**

CO = Corona
VI = Virus
D = Disease
19 = 2019

“COVID-19”



Monsters

“Novel” and “DELTA”

Original Pandemic Strains
Virulent Virus introduced into a non-immune Population

“Wolfman”
Lawrence Talbert
(Lon Chaney Jr)
1941

Coronavirus are RNA VIRUS:

NO MECHANISM TO REPAIR MUTATIONS
AND
Mutations Accumulate
SO….

COVID-19 Virus is mutating
DOES IT MATTER?

“Even a man who is pure in heart
and says his prayers by night…
may become a wolf
when the wolfbane blooms
and Autumn moon is bright.”

“Omicron”

Civilized patient Friendly

COVID-19 is mutating

(Viral Variance)

Question:

– Does it matter?

Omicron(s) Variants

- Are MORE CONTAGEOUS
- Less severe disease

“Lawrence Talbert”
(Lon Chaney Jr)

Long COVID-19

COVID-19 Viral Strains And Variance (Ro ; Incubation)

COVID-19 (SARS-CoV-2)					
Strain	**Varient**	**Date**	**Location**	**R_o** **Incubation**	**FACTOIDS**
Novel	SARS-CoV-2) β-CoV	December 2019	**Wuhan China**	**~1.4 - 2.4** **5.0 Days**	❖ Beta Coronovirus "Sub type B' -same subgenus SARS & MERS virus ❖ "Bat" coronaviruses (Different clade) ❖ **Severe Disease**
Alpha *	B.1.1.7	November 2020	**United Kingdom**	**~2.0 - 3.0** **5.0 days**	❖ 50-70% more transmissible (Novel strain) ❖ More severe Disease (But Regional)
Beta *	B.1.351	July 2020	**South-Africa**	**~4.5** **4.5 days**	❖ 50% more transmissible ❖ Did not become predominant Pandemic strain
Gamma *	P.1	December 2020	**Japan Brazil**	**~2.8-4.8** **6.0 days**	❖ Widespread "Endemic" infection early 2021; ❖ City of Manaus, the capital of Amazonas, Brazil (But Endemic) Some cases "traveling to Japan
Delta	B.1.617.2	December 2020	**India**	**~5.0 -7.0** **4.41 Days**	**Predominant until Omicron ("Pandemic")** ❖ More transmissible than alpha ❖ **Severe Disease / Hospitalizations – was a problem**
Omicron	B.1.1.5 And Subvariants	November 2021	**Botswana South-Africa**	**~10.0** **(?18.0)** **3.42 Days**	❖ Greater Replication advantage ❖ Replaces previous Viral linages (Above) ❖ BA.2, BA.4 and BA.5 ❖ BQ.1, BQ.11, BF.7, BA.2.75, XBB, XBB.1, XBB.1.5,

***VIRAL EXTINCTION :** March 2022, World Health Organization listed the previously circulating Alpha, Beta and Gamma COVID-19 variants as "extinct": citing lack of any detected cases in the prior weeks and months

Long COVID-19
COVID-19 Viral Strains And Variance (Ro ; Incubation)

COVID-19 (SARS-CoV-2)					
Strain	**Varient**	**Date**	**Location**	**R_o** **Incubation**	**FACTOIDS**
Omicron	**B.1.1.5** And Subvariants	**November 2021**	**Botswana South-Africa**	**~10.0** **(?18.0)** **3.42 Days**	❖ Greater Replication advantage ❖ Replaces previous Viral linages (Above) ❖ BA.2, BA.4 and BA.5 ❖ BQ.1, BQ.11, BF.7, BA.2.75, XBB, XBB.1, XBB.1.5
Omicron "Eris" EG.5 February 2023 → Present					
Omicron	**EG.5** Descendant lineage of XBB.1.9.2	**February 2023**	**China, Japan and South Korea**	**~10.0** **(?18.0)** **~3-5 days**	❖ August 2023: EG.5 made up 20.6% of new infections. ❖ September 2023 estimates increased 21.5% ❖ EG.5 and FL.1.5.1 are XBB (mutation F456L) -- appears to be helping them spread more than other Virus ❖ **No evidence of increased disease severity** from the new EG.5 strain

***VIRAL EXTINCTION :** March 2022, World Health Organization listed the previously circulating Alpha, Beta and Gamma COVID-19 variants as "extinct": citing lack of any detected cases in the prior weeks and months

Long COVID-19

Viral strain and Variance "Omicron"

Omicron and OMICRON Subvarience

- **Omicron Infections trigger cross-protective immunity to the more pathogenic Delta variant**
- ***Omicron's advantage in transmissibility, may set previous variants on the path to extinction***

Omicron **Spike protein mutations :** **2 X more infectious**

Omicron **Nucleocapsid protein mutations:** **30 X more infectious**

Severity of disease "Omicron" COVID-19 Variants

Observational data*

- **Risk of severe disease or death lower than with prior variants [~30% of Delta infections]**
- **Evolving Omicron variants have disease severity comparable earlier Omicron sublineages**

Respectfully:

Emerging "Varient " Case surges may lead to significant increases in hospitalizations and deaths (Shear Infection Numbers)

CDC Observations and Recommendations

Breakthrough infections in vaccinated people are to be expected

CDC recommends getting vaccinated

* Adjusted for age, sex, vaccination status, and prior infection

-Kenneth M, Hirsch MS, Allyson Bloom A .***COVID-19: Epidemiology, virology, and prevention***. UpToDate®. January 2023

-Cele, S. et al. ***Omicron extensively but incompletely escapes Pfizer BNT162b2 neutralization***. Nature https://doi.org/10.1038/s41586-021-04387-1 (2021)

-Syed AM, Ciling A, Taha Y, Jennifer A. Doudna JA. ***Omicron mutations enhance infectivity and reduce antibody neutralization of SARS-CoV-2 virus-like*** particles. Edited by Peter Sarnow, Stanford University School of Medicine, Stanford, CA. 119 (31) e220059211.https://doi.org/10.1073/pnas.2200592119

Long COVID-19
Changing face of the COVID-19 Pandemic
Brave New world "Today"

2020 - 2022
"Novel"- Delta COVID-19

2022→
Omicron COVID-19

COVID-19 VARIANCE

Novel / Delta	VS	Omicron
❖ Predilection for complicated Pneumonia ❖ Range of symptoms in adults: -- Asymptomatic; Mild to Severe. -- Inflammatory / Cardiogenic "Sepsis" -- Vascular thrombosis -- Neurological "Syndromes" -- Fever, Chills, Fatigue -- Diarrhea ❖ Long COVID-19 -- Increasing with Omicron as well		❖ Predilection For Upper Airways "URIs" ❖ Less olfactory / Taste Disturbances ❖ Does not seem to replicate "readily" in Lung tissues ❖ Omicron infections can be associated with more severe outcomes compared to influenza **Pediatric** ❖ Mild asymptomatic infections ❖ Rarely severe Pneumonia ❖ More Croup Syndromes ❖ <4yr Serous obstruction 'Laryngeal tissues" ❖ Diarrheal Syndromes

Omicron Not Necessarily a Trivial infection

Elderly, immunocompromised, or unvaccinated at risk more severe form of the disease

2025

Hey Doc….

Which Infection are we / you dealing with?

"CLINICAL OVERLAP":

"Seasonal Influenza"

"Common Cold"

"COVID-19"

Influenza / Common cold / COVID-19 [Omicron]
Can cause **mild** to **severe illness**,
and at times can lead to death.

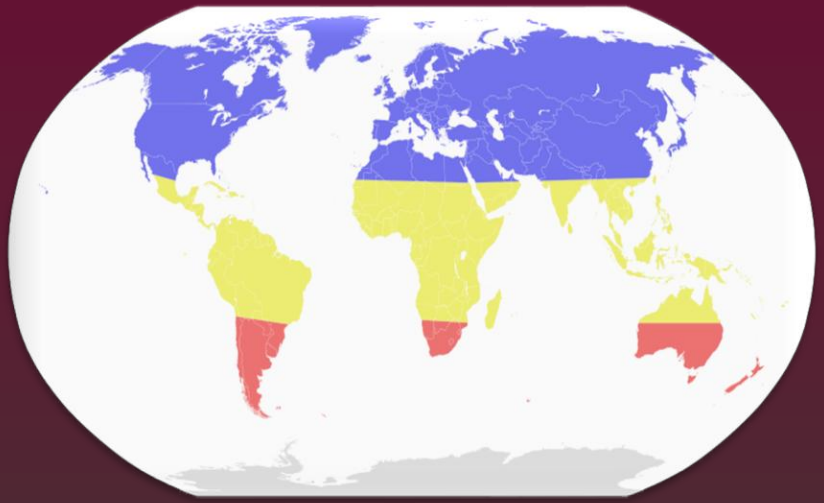
Did You Miss Me?

Where Did Influenza go?

Epidemics and Pandemics

It's Back! INFLUENZA

Worldwide "Flu seasons"



October–April All Year April - November

Vaccine "Season"

- Influenza seasons vary in the timing and duration from year to year.
- In general, to ensure optimal immunity prior to onset of the season vaccination should preferably occur during September or October (in the United States)

Northern Hemisphere Flu Season October - May *

Since 1976: 80% of influenza peak influenza activity has not occurred until January or later

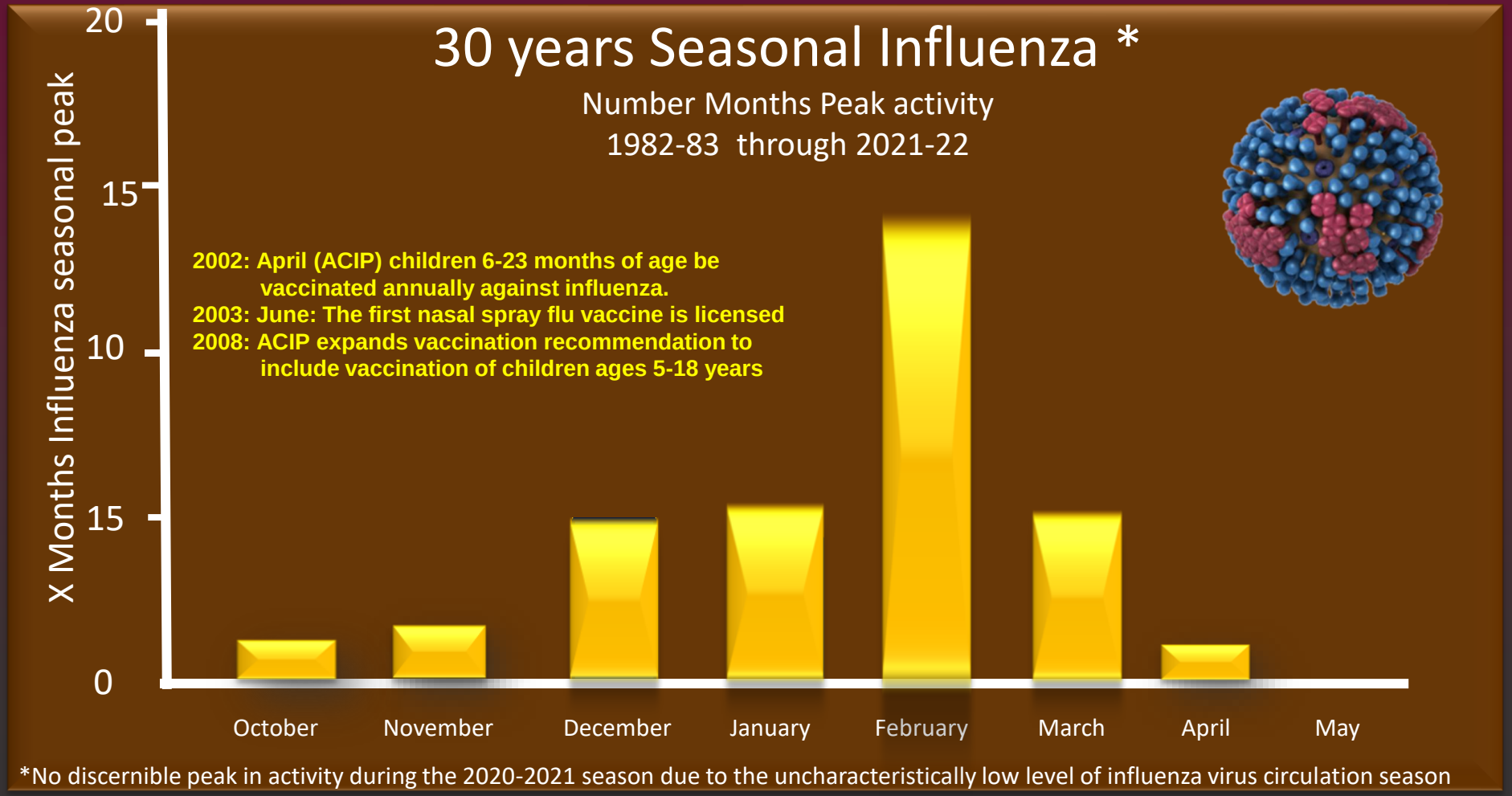
****Sporadic cases all year round***

Past Flu Seasons Questions an answers from past flu Seasons. Seasonal Influenza (Flu) Centers for Disease Control http://www.cdc.gov/flu/pastseasons/index.htm

Influenza
IT'S BACK!

GROUND RULES™

Endemic-Epidemic-Pandemic
30 years Seasonal Influenza [Monthly peak activity]



Key Facts About Influenza (Flu) CDC, Center for Disease Control and Prevention https://www.cdc.gov/flu/about/keyfacts.htm

Influenza / COVID-19
Endemic-Epidemic-Pandemic

Influenza / COVID-19 Co-infection

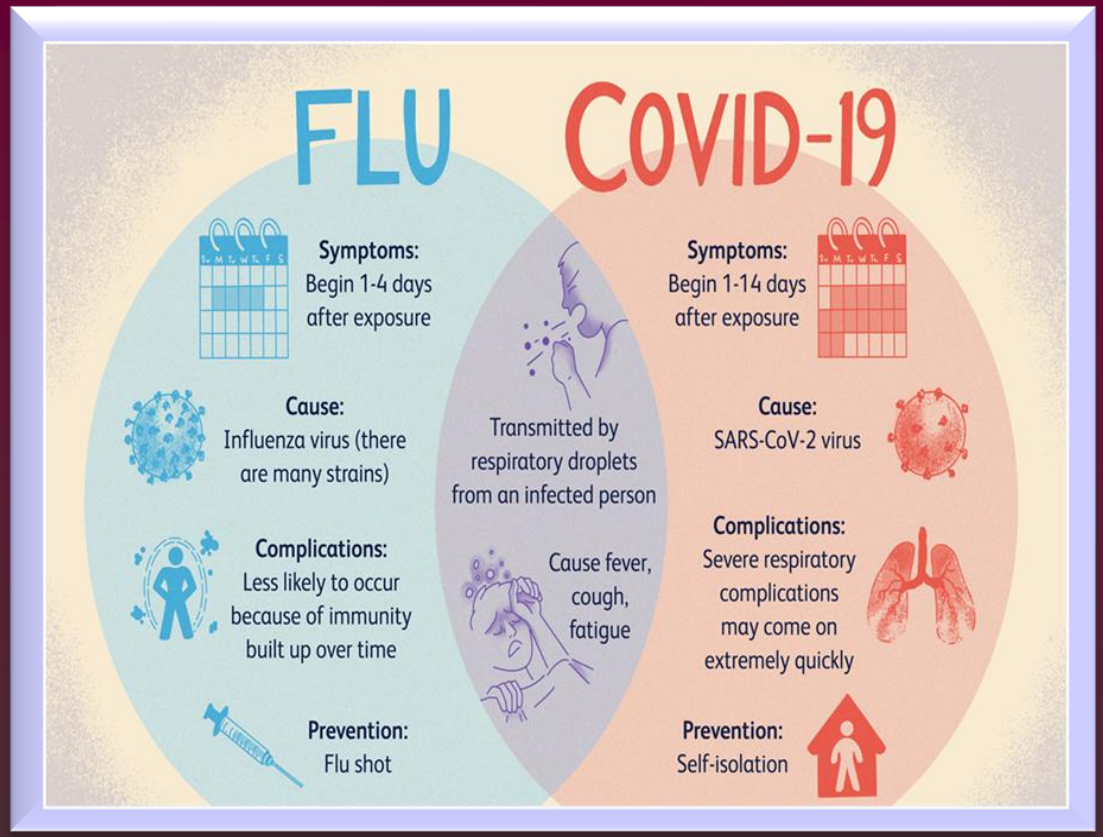
"Flurona"

CLINICAL OVERLAP


"Seasonal Influenza"


"Common Cold"


"COVID-19"



The only difference is loss of smell and loss of taste ...
has not been reported with influenza virus infection

Influenza COVID-19 Co-infections
21 published studies: available data [2021]
3,070 Hospitalized Patients
- Mean **16.3%** [0.04% to 58.3%]
- Median **4.9%**

2023-2024 U.S. Flu Season:

IT'S BACK !

2023-2024 U.S. Flu Season: * To Date October 1, 2023 - April 13, 2024 Preliminary In-Season Burden Estimates CDC estimates*	
Epidemic	**Case Estimates**
❖ Flu Illnesses	33 - 61 Million cases
❖ Medical Visits	15 - 28 Million
❖ Hospitalizations	370,000 – 770,000
❖ Deaths	24,000 – 67,000

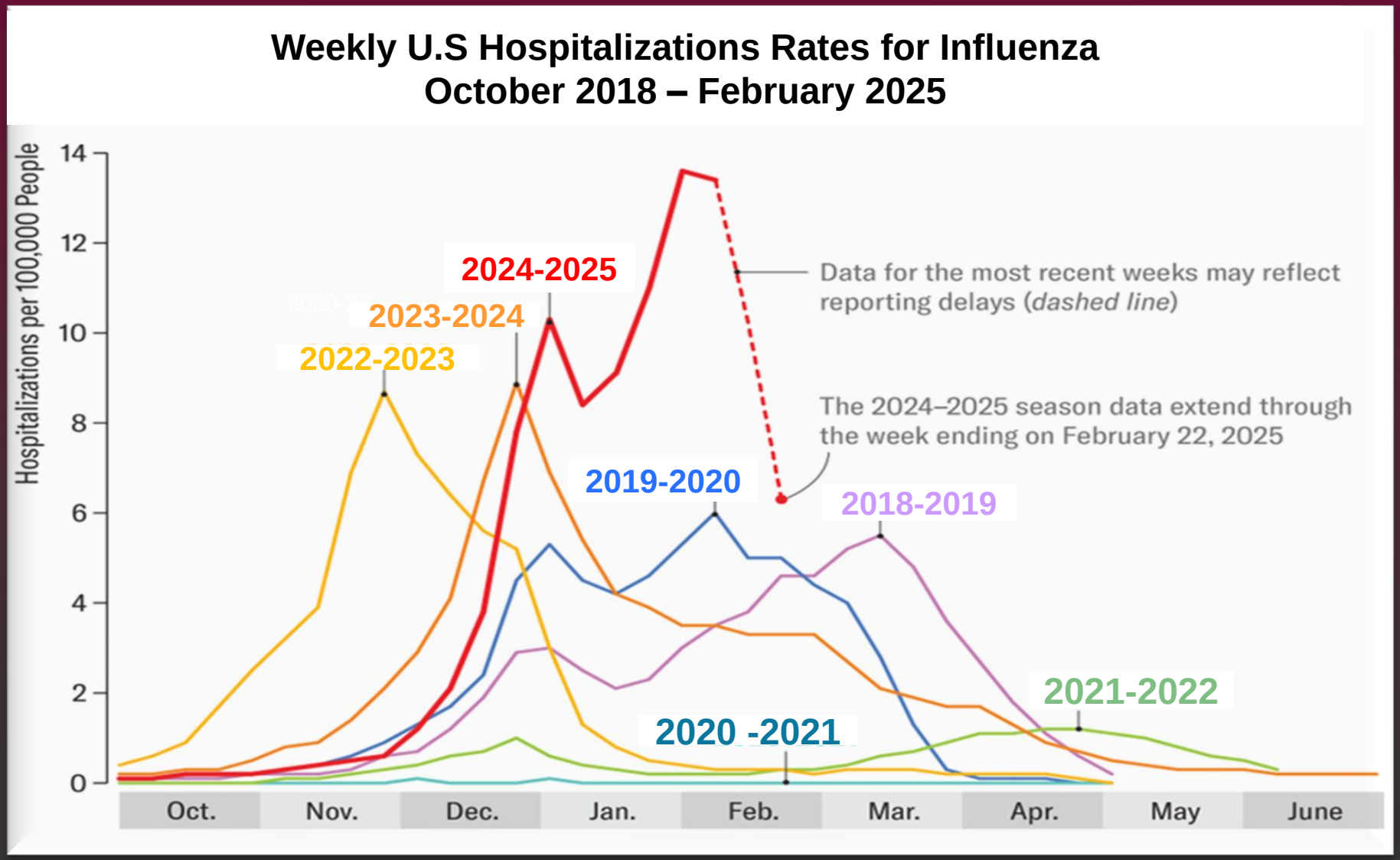
*On average, ~ 8% of the United States population develops symptomatic influenza illness each season.

2023-2024 U.S. Flu Season: Preliminary In-Season Burden Estimates. CDChttps://www.cdc.gov/flu/about/burden/preliminary-in-season-estimates.htm

US Seasonal Influenza

IT'S BACK! INFLUENZA [FLURONA?]

Seasonal influenza October 2018 -2025



Amanda Montañez; Source: Centers for Disease Control and Prevention (data)

US Seasonal Influenza

IT'S BACK!

Seasonal influenza 02/08/2025
Vaccine administration

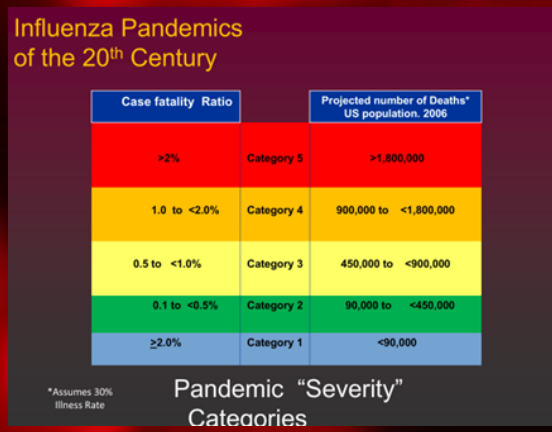
2024-2025 Influenza Vaccine Composition
Egg Based Vaccine • **A/Victoria /4897/2022/ (H1N1)pdm09-like** • **A/Thailand/8/2022 / (H3N2)-like** • **B/Austria/1359417/2021 (Victoria linage)-like**
Cell Culture-Based and Recombinant Vaccines • **A/Wisconsin/67/2022 (H1N1)pdm09-like** • **A/Massachusetts/18/2022 (H3/N2)pdm09-like** • B/Austria/1359417/2021 (Victoria lineage)-like

Despite the recent decrease, the 2024–2025 flu season has been classified as "high severity" for all age groups, marking the first such designation since the 2017–2018 season.

Influenza Vaccines for 2024-2025. The Medical letter on Drugs and Therapeutic's. The Medical letter, Issue 1711, September 16, 2024 The Influenza Vaccine for 2024-2025

2024-2025 U.S. Flu Season:

IT'S BACK !



2024-2025 U.S. Flu Season: * To Date October 1, 2024- April 26 2025 Preliminary In-Season Burden Estimates CDC estimates*	
Epidemic	**Case Estimates**
❖ Flu Illnesses	47-87 Million cases
❖ Medical Visits	21-37 Million
❖ Hospitalizations	610,000 -1.3 Million
❖ Deaths	26,000 – 130,000
❖ Pediatric Deaths	04/26/2025: 216

2024–25 influenza season

97% Identified as Influenzas A:

- ❖ 52% A(H3N2) Variant
- ❖ 47% A(H1N1)pdm09 viruses Variant

As of 02/27/2025 analysis

Despite the recent decrease, the 2024–2025 flu season has been classified as "high severity" for all age groups, marking the first such designation since the 2017–2018 season.

*On average, ~ 8% of the United States population develops symptomatic influenza illness each season.

Influenza Hospitalization Surveillance Network (FluSurv-NET) flu Review CDC [Accessed -5/06/2025] https://www.cdc.gov/fluview/overview/influenza-hospitalization-surveillance.html

"No vaccine for me"

Really?

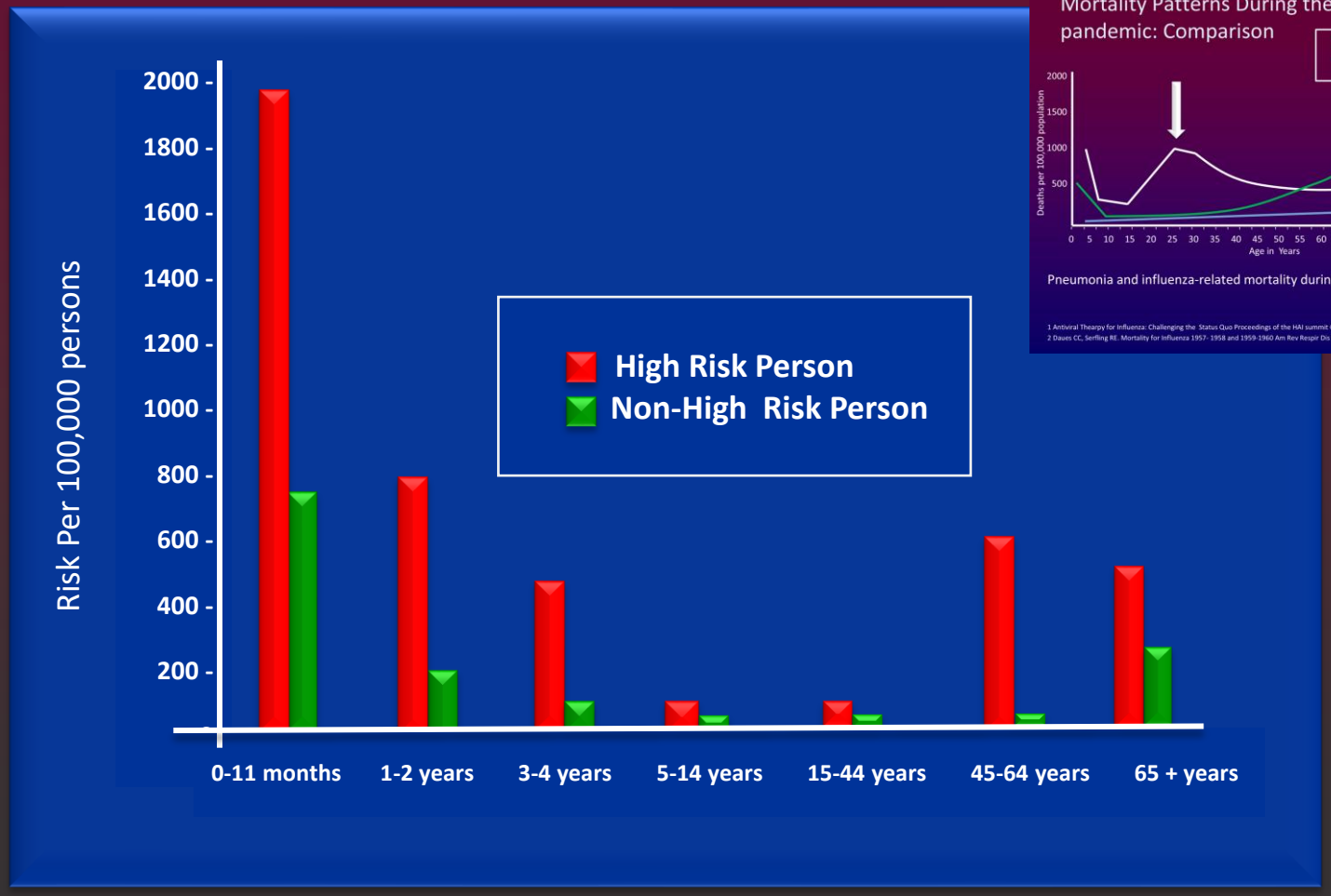
Influenza:

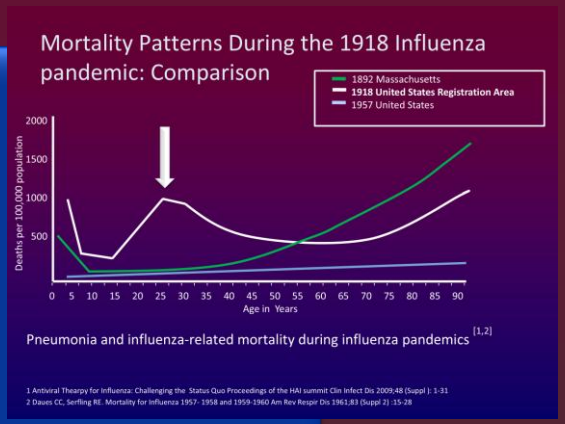
Influenza Clinical issues

“Am I Dead Yet?”

Influenza: Age Related Complications

Annual Risk of Hospitalization for High-Risk and Non–High-Risk Persons





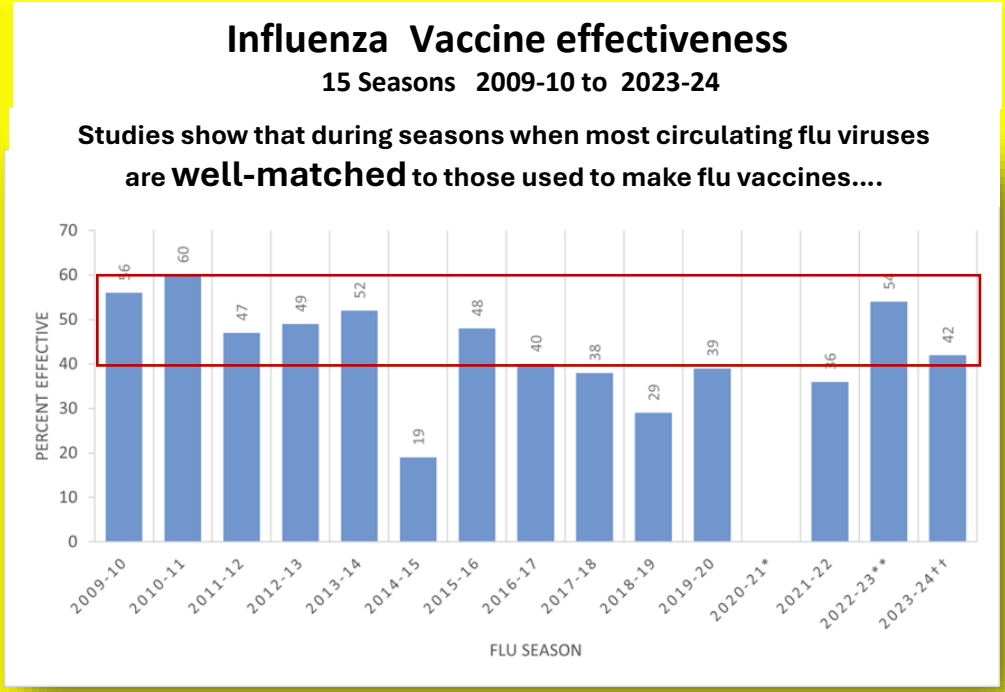
Rothberg MB, Sarah D. Haessler SD, Brown RB ***Complications of Viral Influenza***. The American Journal of Medicine, Vol 121, No 4, April 2008 pg 259

Influenza
It's Back!
Endemic-Epidemic-Pandemic
Vaccine Effectiveness 15 Seasons 2009-2024

Influenza vaccines U.S. 2024-2025 influenza season :
- **A/Victoria/4897/2022 (H1N1)pdm09-like virus;**
- **A/Thailand/8/2022 (H3N2)-like virus; and.**
- **B/Austria/1359417/2021 (B/Victoria lineage)-like virus.**

What factors can affect the results of flu vaccine efficacy and effectiveness studies?

- **Virus factors**
- **Host Factors**
- **Study design factors**
- **Factors Related to measuring Specific Vs Non-Specific Outcomes**



- **Flu vaccination can reduce the risk of flu illness by between 40% and 60% among the overall population**

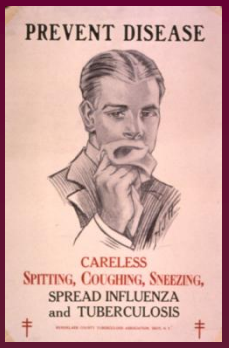
*Vaccine effectiveness is generally measured by **comparing the frequency of cases in vaccinated and unvaccinated people.**

CDC Seasonal Flu Vaccine Effectiveness studies. Seasonal Flu. Influenza(Flu) CDC Centers for disease control and Prevention. https://www.cdc.gov/flu/vaccines-work/effectiveness-studies.htm (Accessed 03/29/2024)

Influenza

Vaccine

Who to vaccinate: Priority Patients



RECOMMENDED

- People >6 months
- Residents of nursing homes / chronic care
- Chronic pulmonary / Cardiovascular disease
- Chronic disease: DM,CRF,HIV
- Children / Teens on Aspirin therapy (6mo - 18yr) "Reye's syndrome"
- Women: 2 - 3 trimester: During the "flu season"

WHO ELSE????

Humans:

Kids, Pregnancy Reservoirs

Influenza Vaccine

Guillain-Barré syndrome (GBS)

Is a rare disorder where the body's immune system damages nerve cells, causing muscle weakness and sometimes paralysis.

While its cause is not fully understood, the syndrome often follows infection with a virus or bacteria.

In the United States, an estimated 3,000 to 6,000 people develop GBS each year.

Most people recover fully from GBS, but some have permanent nerve damage.

CDC Vaccine Safety Common Concerns **Guillain-Barré Syndrome Center for Disease Control and Prevention https://www.cdc.gov/vaccinesafety/concerns/guillain-barre-syndrome.html**

Influenza Vaccine

Vaccine Safety

Risk of **Guillain-Barré syndrome**

Vaccination is the safer option!

1 in a million	17 in a million
	
Risk of **Guillain-Barré syndrome after an Influenza vaccine**	Risk of **Guillain-Barré syndrome after and Influenza Infection**

Kwong JC, Vasa PP, Campitelli MA, et al. Risk of Guillain-Barré syndrome after seasonal influenza vaccination and influenza health-care encounters: a self-controlled study. Lancet Infect Dis. 2013 Sep; 13(9):769-76.

Guillain-Barré syndrome and Flu Vaccine : Questions & Answer Seasonal Influenza. Centers for Disease Control and Prevention
https://www.cdc.gov/flu/protect/vaccine/guillainbarre.htm
Salmon DA, Proschan M, Forshee R et al Association between Guillain-Barrésyndrome and influenza A (H1N1) 2009 monovalent inactivated vaccines in the USA: a meta-analysis. Lancet. 2013;381(9876):1461. Epub 2013 Mar 13

Influenza

Virology : Virus Defination

BACKGROUND

Influenza A detection by direct fluorescent antibody (DFA).

- Green: Influenza A.
- Red: Uninfected cells stained with Evans Blue dye

Virus*

Submicroscopic infectious agent, typically consists of a nucleic acid molecule in a protein coat, that replicates only inside the living cells of an organism.

* "Sickening Things" from Greek term for virus: ios, derives from ancient Greek verb "iimi", meaning 'to move, to cause movement, to put something into something else, to throw the arrow, the poison, the toxin

/

Influenza

Epidemic and Pandemics

Viral Origins

Origins of Influenza virus

(Including Human Disease)

Highest concentration of humans on the planet

Agrarian societies are

Natural Reservoirs

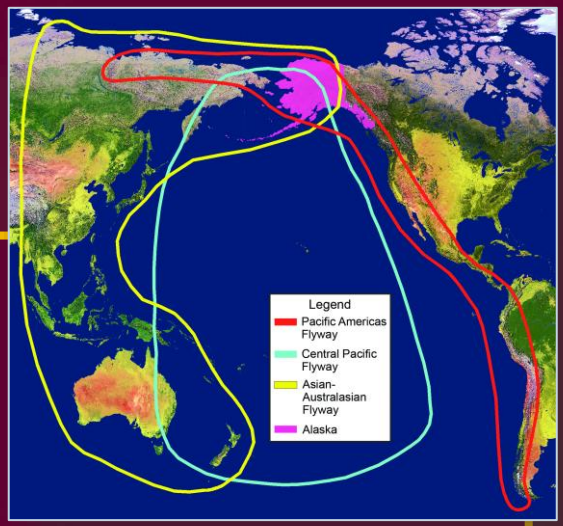
Orthomyxovirus Virus [influenza A Virus]

Avian (Ducks, Chickens, Wild fowl)

Swine, Humans

Humans with,
close associations and interactions with Symptomatic
or
Asymptomatic
Infected Animal "host" Species

Origins of Influenza virus (Including Human Disease)



Agrarian societies

Duck farming is a prevalent practice in Southeast Asia, with various farms offering unique experiences and contributions to the region's agricultural landscape.

Influenza Virology

Orthomyxoviridae Virus

Influenza Virus

Human	FACTOID
Orthomyxoviridae Virus	
A Influenza	**Moderate to Severe Disease** ❖Large number of antigenic subtypes ❖Occurs in nature in Pigs, Horses, Birds, Human et al.
B Influenza Human only	**"Milder" Disease : Predominantly Children** ❖ More Stable : Less antigenic Drifting-Shifting
C Influenza Human only	❖ "Rarely" Reported [Subclinical?]
D Influenza	❖ Does not infect Humans

Influenza

Viral Classification and Naming

Viral Anatomy

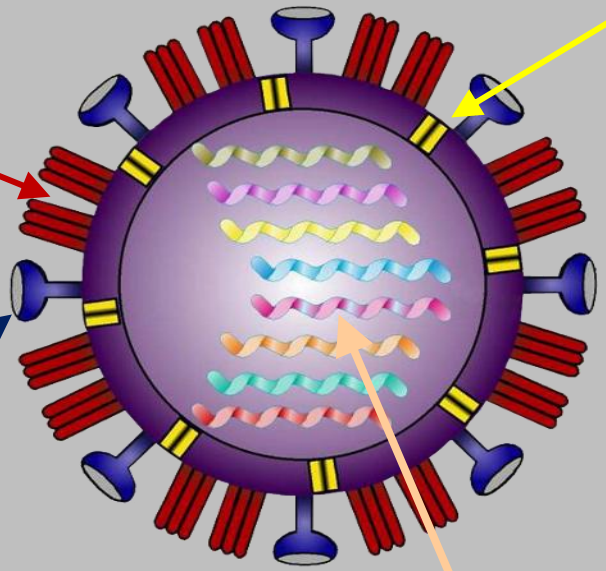
Hemagglutinin (HA): Allows the virus to adhere to epithelial cells in the upper respiratory tract. The name hemagglutinin was originally used because the virus was found to agglutinate red blood cells, and this formed the basis of an assay for flu viruses

Neuraminidase (NA): Removes sialic acid receptors from the host cell (and from other newly made virus particles), allowing the virus to escape from the cell in which it grew, and spread in the body to infect other cells.

HA
Hemagglutinin
18 subtypes
(Attachment, Penetration)

Fairly Simple RNA Virus With Accumulating Mutations

M2 protein
(Cell Penetration)
Tamiflu® (Oseltamivir)



NA
Neuraminidase
(11 subtypes)
(Release)

8 viral RNA genes
(Assembly, Replication)

8 genes
- PB2
- PB
- PA
- HA
- NP
- NA
- MP
- NS

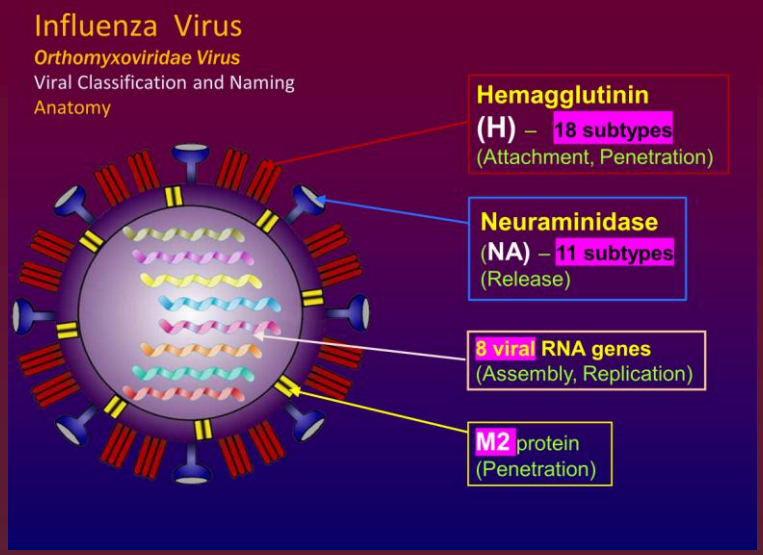
Laver WG, Bischofberger N, Webster RG. The origin and Control of Pandemic influenza. Perspective in Biology and Medicine, 43,2, Winter 2000
https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=b2a1d34e7e72802b8b56d3fecdacf0a7b2865d7e

Influenza

Viral Classification and Naming

Naming Influenza "A" Virus

- **Host of Origin:**
- **Geographic Location** (First found):
- **Stain Number:**
- **Year of Isolation:**
- **Antigenic description** (HA, NA):



VACCINE DEVELOPMENT						
Type	**Origin**	**Location**	**Strain #**	**Year**	**Antigen**	**Years**
A	Swine	Iowa	15	30	(H1N1)	
A	Human	Puerto Rico	8	34	(H1N1)	
A	Swine	Australia- Darwin	67	2022	(H3N2)	23-2024
A	Swine	China-Victoria	4897	2022	(H1N1) Pdm09-Like	23-2024
A	Swine	China-Victoria	4897	2022	(H1N1) Pdm09-Like	24-2025
A	Swine	Thailand	8	2022	(H3N2) like	24-2025

Pdm09 : "Pandemic 2009"

Types of Influenza Virus. Influenza (flu) CDC. Center for Disease Control and Prevention

Influenza

Six Influenza Pandemics of the 20th century

Antigenic "Shifts" * [Subsequent Drifts]

Year	Subtype	Rø	Severity	Deaths "world-wide"	Case fatality Rate	Severity Index	Miscellaneous
1889-1892	❖ H2N8 ❖ Coronavirus?		Severe	1 million	0.15%	NA	"1889-1890 flu Pandemic"
1918	H1N1* ** Avian origin 1st A virus	1.8	Severe	500 million (50 million deaths) (one third world population) [675,000 US deaths]	2%	5	"Spanish Influenza" Mother of all Pandemics
1957	H2N2 2nd A virus	1.65	Severe	1-2 Million [116,000 US]	0.13%	2	"Asian Influenza"
1968	H3N2 Avian origin	1.8	Moderate	1 million [34,000 US]	<0.1%	2	"Hong Kong Influenza"
1977	H1N1*		Mild	~700,000	NA	NA	"Russian Flu"
2009	H1N1* 2nd A virus pdm09-like virus	1.46	Moderate	105,700 - 395,000 [12,000 US]	0.03%	NA	"2009 Flu Pandemic"

**H1N1 strain - did not originate in Spain but rather in Kansas in the United States (Due to war rime censorship)

Pandemic Flu History. Flu.gov. http://www.flu.gov/pandemic/history/

Influenza

Viral Origins:

Creating a contagious Pandemic virus

Humanizing the Influenza Virus

Influenza

Epidemic and Pandemics

Influenza Viral Adaptations

Mutations Virus Genetic Shifts and Drifts

Orthomyxovirus "Influenza A Virus"

Species specific Avian (Ducks, Chickens), Swine, Humans

KEY is:

Genetic adaptability:

For interspecies transmission And Human contagion

KEY :

Influenza Virus : Is an RNA virus

There fore lacks Mutation repair enzyme systems [DNA virus]

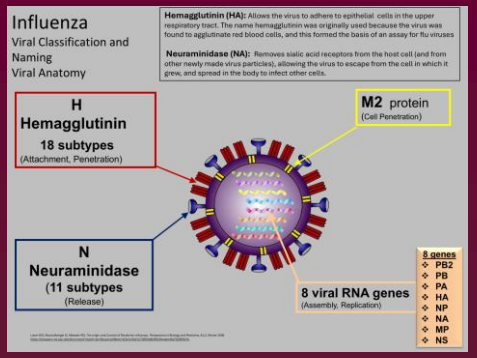
Mutations can accumulate- Virus genetic Shifting and Drifting

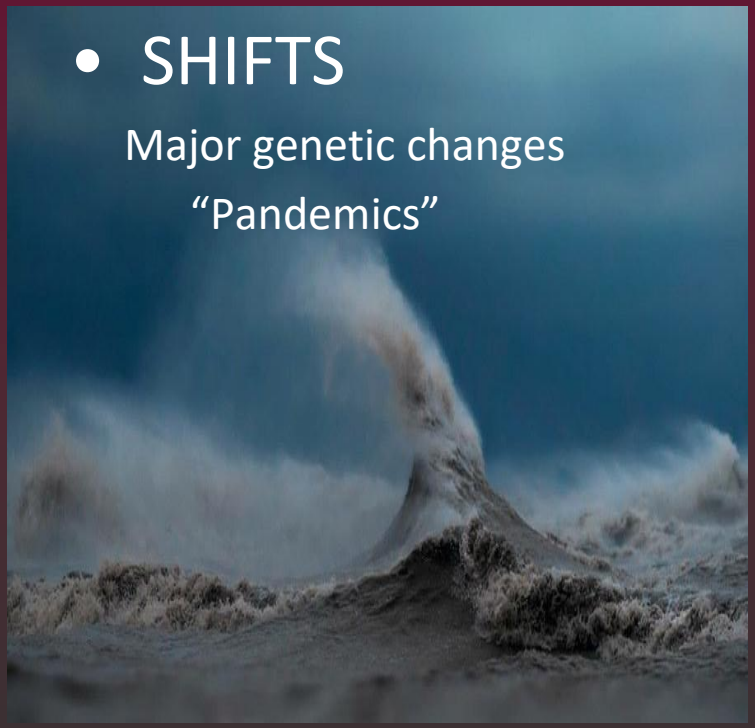
Influenza

Epidemic and Pandemics

Influenza Viral Adaptations

Mutations Virus Genetic Shifts and Drifts





Results in "New" virus in which the Population Has No experience or Immunity

Minor Genetic Viral changes
in an existing Virus
Which the population has experience and some immunity
"Seasonal Influenza"

Influenza

Epidemic and Pandemics

Viral Origins Creating Infectious virus

Genetic Shifts and Drifts

Why Genetic Drifting and Shifting?
"Viral species survival!!"

- **Genetic SHIFTS**
- **Genetic Drifts**

ANTIGENIC SHIFTS [HA; NA]	ANTIGENIC DRIFTS [HA; NA]
Major Genetic Variability Reassortment of Influenza viruses [Swine, Avian and Human Origin]	**Minor Genetic Variability** Insertion, deletions of HA, NA genes Nucleotide substitutions
Periodic Pandemics	**Seasonal Epidemics**

Pandemic year	Antigen change
1918	H1N1*
1957	H2N2
1968	H3N2
1977	H1N1 [Return]*
2009	H3N2

KEY:

Influenza Virus (RNA) lack Mutation repair enzyme systems found in DNA virus Resulting in genetic alterations

Influenza

Epidemic and Pandemics

Viral Origins Creating Infectious virus

Genetic Shifts and Drifts

2009 Recent Influenza Genetic "Shift"s

April 2009

A new virus **"A/(H1N1) pdm09"** appeared in Mexico and California (US)

[Responsible for the 1st pandemics of the 21st century]

The virus Rapidly spread

BUT

Independently circulating among the interpandemic virus of that season.

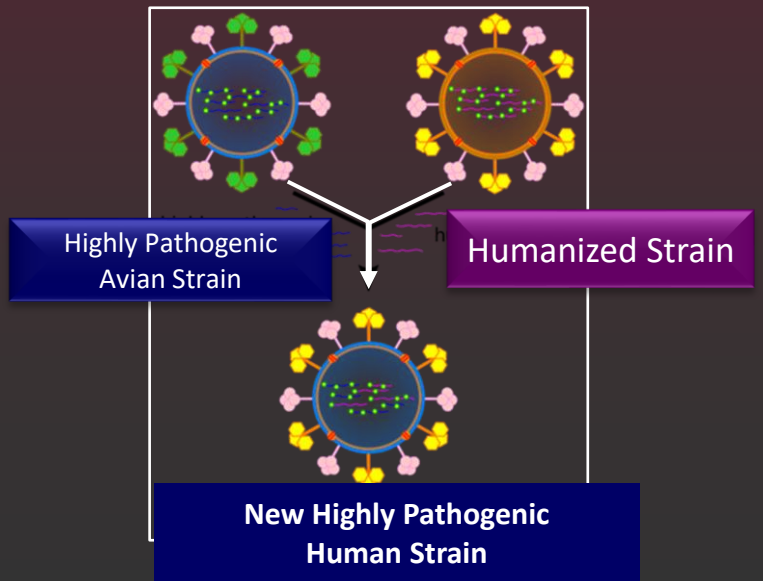
OOPS!!: Relative "Vaccine Mismatch' for that season

GENETICS INVOLVED

"A/(H1N1) pdm09"

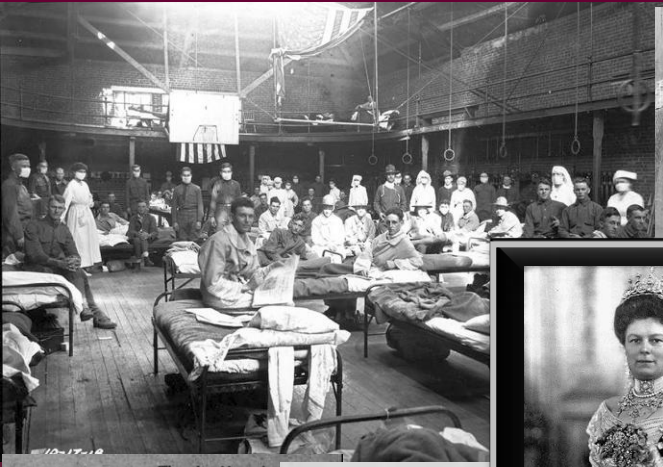
Quadruple re-assortment virus:

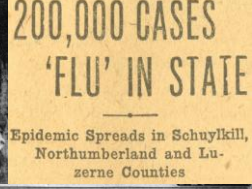
- 2 Swine-origin viruses
- 1 Avian-origin virus
- 1 Human-origin virus.

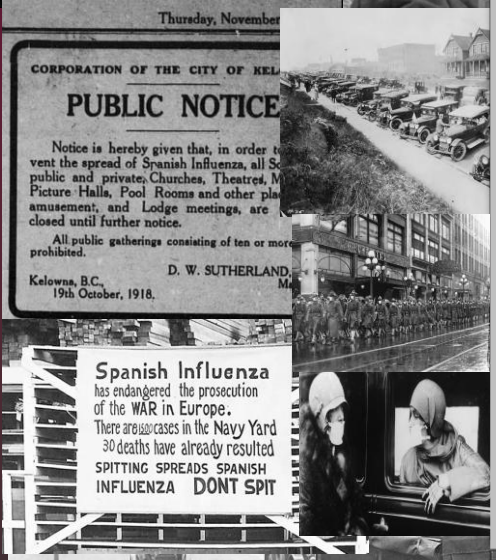


Brief Influenza Background

Spanish Influenza







Sophie Maria
1868 – 28 June 1914

Duchess of Hohenberg

June 28,1914

Sarajevo, capital
Austro-Hungarian province
Bosnia and Herzegovina

Gavrilo Princip
1894 – 28 April 1918
Member "Young Bosnia"
Revolutionary Organization

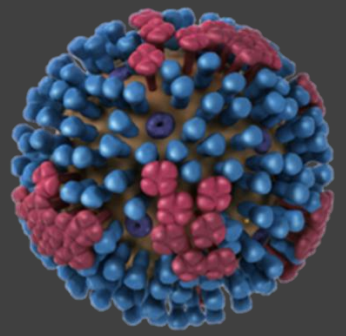
Archduke Franz Ferdinand
1863 -June 28, 1914

Heir apparent to the
Austro-Hungarian throne

His dying words to Sophie: "Don't die darling, live for our children

1918

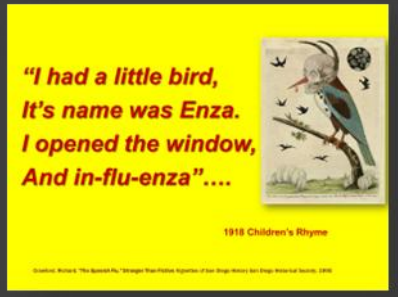
Spanish Influenza 1918



1918 “Spanish Influenza” [“H1H1]

“The Mother of All Pandemics”

- Jeffery K Taubenberger
- David M Morens



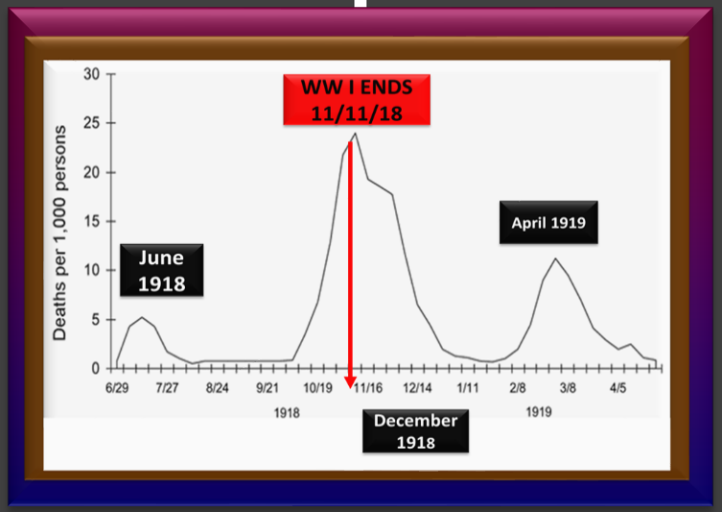
In 1918….

H1N1 ”Spanish” Influenza circled to globe 3 times in 18 months using 1918 transportation systems…..

Infecting One fifth of the world's population

500 Million People….40 million deaths…675,000 US Deaths

Then…



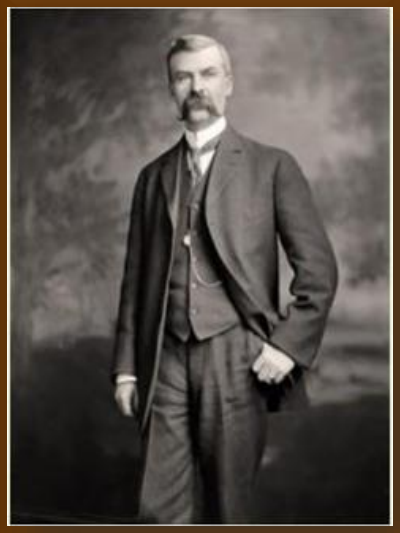
Now…

Spanish Influenza 1918

Background for Disaster

The beginning…

Haskell county; Kansas
1910: Population 993
1920: Population 1,455
Presently: 3,780



Loring Vinton Miner
(1860–1935)

Reported March 30,1918

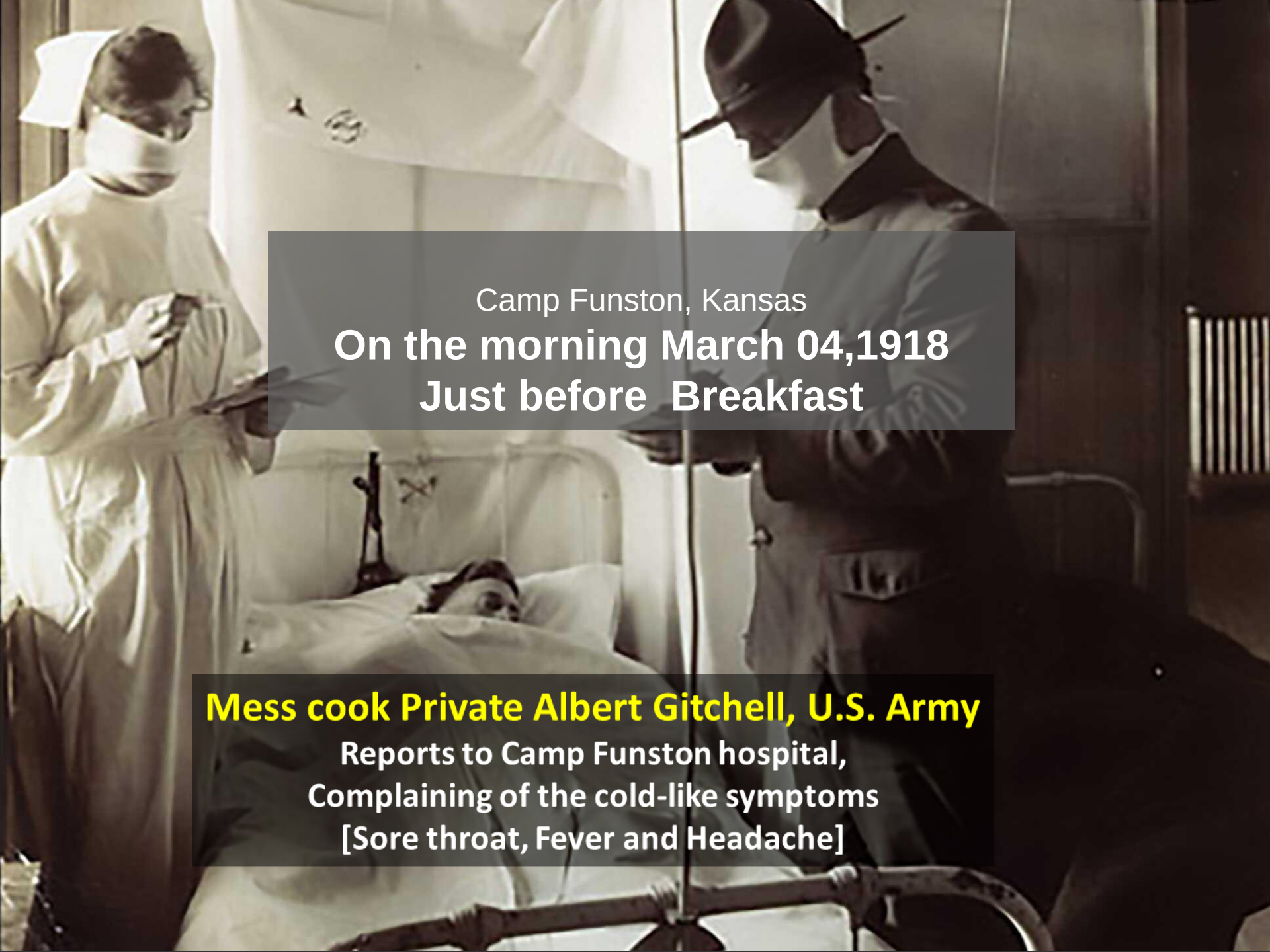
"U.S. Public health Service-Health Alert"
Published April 5, 1918

Dr. Loring Miner

Haskell County, Kansas
Described the year's first influenza cases of unusual severity

18 cases with 3 deaths occurring during the months of January and February 1918

--***The Great Pandemic: The United States in 1918-1919***. United State Department of Health and Human Services --http://www.flu.gov/pandemic/history/1918/index.ht
--**U.S. Census Bureau History: The 1918 Influenza Pandemic.** ***History, March 2023 United states Census bureau*** ***https://www.census.gov/history/www/homepage_archive/2023/march_2023.html*** (Accessed 03/29/2024)


Camp Funston, Kansas
On the morning March 04,1918
Just before Breakfast
Mess cook Private Albert Gitchell, U.S. Army
Reports to Camp Funston hospital,
Complaining of the cold-like symptoms
[Sore throat, Fever and Headache]

Spanish Influenza 1918
Background for Disaster

The beginning…

Camp Funston

situated within Fort Riley, Kansas
located remotely on 20,000 acres of land
Southwest of Manhattan, Kansas.

A military training facility
Housing 26,000 Military Recruits / Draftees

"Doughboys"- soon to-be Soldiers Preparation for WW I European deployment

The camp was noted for:
"Dreaded frigid winters, grueling hot summers
severe dust storms in between"

Doughboy was a popular nickname for the American infantryman during World War I,

By noon,

Over 100 of his fellow soldiers
reported to the hospital with similar symptoms

Within one week

522 men admitted to the camp hospital
suffering from the same severe symptoms

Within a few weeks

Thousands of soldiers were confined to bed and infirmaries
>1,100 Hospitalized 237 cases of pneumonia 38 deaths

Army and navy reported similar outbreaks of severe influenza and pneumonia
among their personal and crews:
Virginia, South Carolina, Georgia, Florida, Alabama and California

Spanish Influenza 1918

Background for Disaster

Pandemic spread

Trains

Troop ships

Trenches

Hospitals, Aid stations

[H1N1] spread through the United States, with soldiers moving from the Midwest to the East Coast For WWI Deployment

EXPOSURE

Railroad hubs
Embarkation, and debarkation ports in Europe
Traveling Soldiers: Infecting Soldiers : Neighboring civilians

By the end of April 1918

Influenza was spreading rapidly through line trenches along **Europe's Western front**.

Africa, India, and Japan
reported widespread influenza infections,
May 2018 China, and Australia by July 1918

U.S. Census Bureau History: The 1918 Influenza Pandemic. *History, March 2023 United states Census bureau*
https://www.census.gov/history/www/homepage_archive/2023/march_2023.html (Accessed 03/29/2024)

Spanish Influenza 1918

Background for Disaster
Presenting Morbidity / Mortality

1918 "Spanish" Influenza Morbidity -Mortality

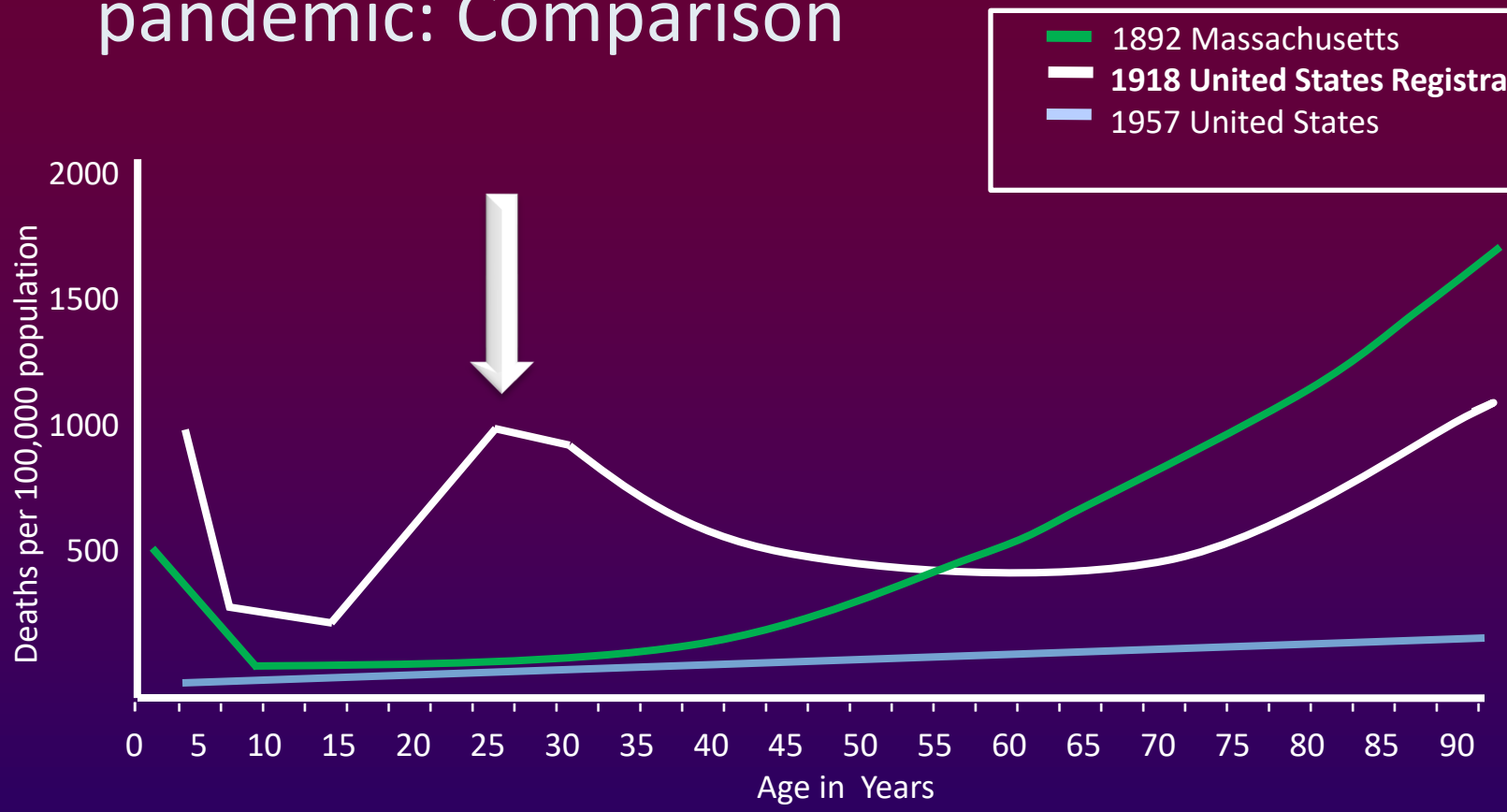
- **Many people died within the first few days after infection**
  - Many others died of complications later (Secondary bacterial pneumonias)

- **Nearly half of those who died were young, Healthy Adults**
  - Symptoms often associated with severe Cyanosis
  - Many people died within the first few days after infection
  - Many others died of complications later (Secondary bacterial pneumonias)

"Spanish" Influenza A (H1N1) viruses still circulate today as "drifted" strains.

The Great Pandemic: The United States in 1918-1919. United State Department of Health and Human Services http://www.flu.gov/pandemic/history/1918/index.html

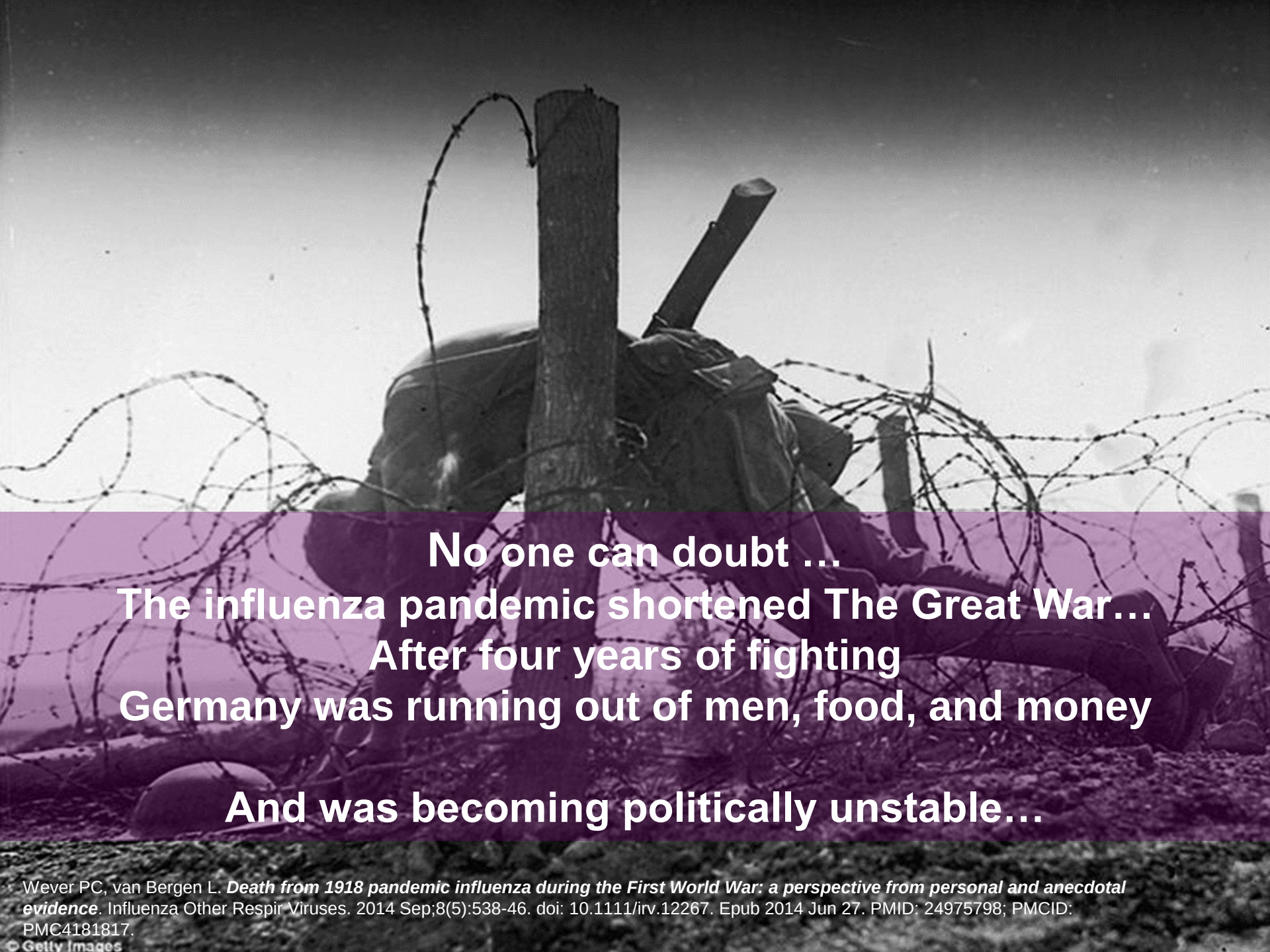
Mortality Patterns During the 1918 Influenza pandemic: Comparison



Pneumonia and influenza-related mortality during influenza pandemics [1,2]

1 Antiviral Thearpy for Influenza: Challenging the Status Quo Proceedings of the HAI summit Clin Infect Dis 2009;48 (Suppl): 1-31

2 Daues CC, Serfling RE. Mortality for Influenza 1957- 1958 and 1959-1960 Am Rev Respir Dis 1961;83 (Suppl 2) :15-28



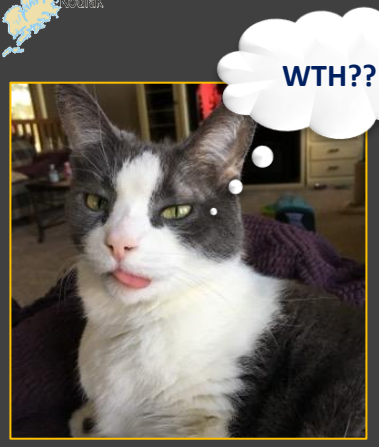
No one can doubt …
The influenza pandemic shortened The Great War…
After four years of fighting
Germany was running out of men, food, and money

And was becoming politically unstable…

Wever PC, van Bergen L. ***Death from 1918 pandemic influenza during the First World War: a perspective from personal and anecdotal evidence***. Influenza Other Respir Viruses. 2014 Sep;8(5):538-46. doi: 10.1111/irv.12267. Epub 2014 Jun 27. PMID: 24975798; PMCID: PMC4181817.

Spanish Influenza 1918

Epilog Viral Studies and Research



Between 1918-1920

American Indian and Alaska Native populations were hard hit by the Spanish influenza pandemic.
The Alaska Native village of **Brevig Mission**:
72 of 80 residents died over a 5-day period

Decades later,

Tissue samples from exhumed Brevig Mission's influenza victims [Permafrost] helped researchers sequence the Spanish Flu's virus Genetics....

Spanish Influenza 1918

Epilog Viral Studies and Research

1997

Frozen and formalin-fixed lung tissue from Spanish flu victims were used to extract nucleic acid and sequence the 1918 influenza genome

The viral samples Obtained: Shared 99% Sequence Identity			
Subject	**Age**	**Death**	**Location**
❖ **U.S soldier**	21 yrs	Sept 1918	Camp Upton, New York
❖ **US soldier**	30 yrs	Sept 1918	Fort Jackson, S Carolina
❖ **Inuit women**	Mid 20s	Nov 1918	Brevig Mission, Alaska
❖ **UK Female**	50 yrs	Nov 1918	Royal London Hospital UK
❖ **UK Male**	25 yrs	Feb 1919	Royal London Hospital, UK

Complete coding sequence of the 1918 virus took 9 years

2005

Using the virus reverse genetics approach, the viral RNA sequences subsequently permitted reconstruction and sequency of the complete 1918 pandemic influenza virus.


H5N1
H5N1
H7N9
H7N9
H5N1
“Bird” Avian Influenza


But
First...
Just
A few MORE random thoughts:
Influenza Virus Interspecies
Transmission-- infections

Influenza Virus

Interspecies Infection

Influenza Virus

Interspecies Infection

Orthomyxovirus virus

Influenza viruses do not just affect humans.

Are found in many different animals

Mammals

- [Wild, and domesticated “Farm” : animals Pigs, Whales, Horses, Seals, and Cats et al.]

Birds

Avian Influenza virus Isolated from more than 100 different species of wild birds.

Wild birds

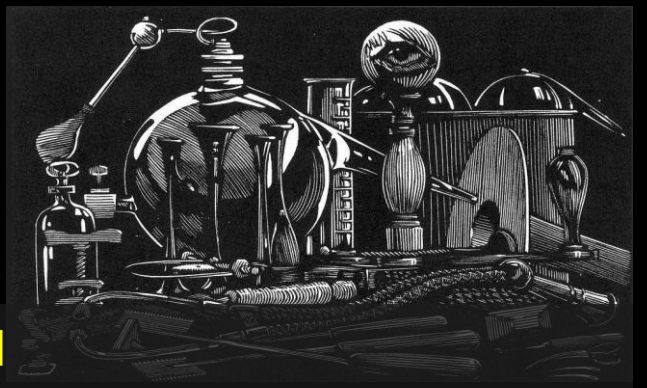
- **Are often viewed as reservoirs (hosts) for avian influenza A viruses**
- All known subtypes of influenza A viruses can be found in wild birds,
- Exception of two subtypes which have only been found in bats
- **All flu pandemics in the past 100 years have been caused by influenza viruses of avian origin.**

Sencer DJ. ***Influenza in animals*** CDC Museum, Digital [Accessed 04/30/2025] https://cdcmuseum.org/exhibits/show/influenza/influenza-viruses/influenza-in-animals

Avian Influenza Virus

Interspecies Infection

Orthomyxovirus virus
are generally Species specific



Influenza Virus [Orthomyxovirus]
Infections OR colonization's
Are Species SPECIFIC

Species specific influenza virus strains develop via genetic variances,

Appreciating

- **Regular "Cross species" transmission influenza strains *Not a Frequent event***
- **Virus exposure, "selected" host factors occasional *"Dead end" transmission***

Endemic-Epidemic-Pandemic Virus transmission

- **"Major or Minor" Genetic Variations Supporting "Novel" Virus variance**
  Able spread among secondary species

.

*** Recall Orthomyxovirus-"Influenza Virus" are RNA virus, inherently without the ability to repair genetic mutations, or developing variances**

Avian Influenza Virus

Interspecies Infection “Birds”

Orthomyxovirus virus

Avian Influenza Virus

Interspecies Infection "Birds"

Orthomyxovirus virus

Influenza A viruses

- Worldwide 100 different species of wild birds
- "Natural" Influenza A infections among aquatic birds
- Domestic poultry; Animal species

Avian Influenza A Virus

- Highly contagious among bird species
- Wild aquatic birds considered virus reservoirs
- Symptomatic and Asymptomatic infections occur
  -- Intestinal and respiratory tract
- **Infected birds viral Shedding:**
  -- Saliva
  -- Nasal secretions
  -- Feces

Viral Transmission

-- Shedding Virus contact infected birds
-- And contaminated fomites and surfaces

Wild aquatic birds

Waterbirds (waterfowl):

- **Ducks, geese, swans, gulls, terns**

Shorebirds

- **Storks, plovers, sandpipers.**

Domestic Birds

- **Chickens, Ducks, Turkeys et.al**

Avian Influenza in Birds: Causes and How It Spread: What to know. Bird Flu (Avian Influenza) CDC [Accessed 05/11/2025]
https://www.cdc.gov/bird-flu/virus-transmission/avian-in-birds.html

Avian Influenza Virus

Interspecies Infections

Zoonotic* Human Cases of Avian Influenza

Caused by viruses HPAI A (H5N1) and other Avian Virus

Human infections with HPAI A(H5N1) virus AND other Avian Influenza virus are rare events:

- **Unprotected exposure to any infected animal or to an environment in which infected birds or other infected animals are or have been present**
- **People with work or recreational exposures to H5N1 virus-infected animals are at increased risk of infection should follow recommended precautions.**

Webster RG. **Influenza virus: transmission between species and relevance to emergence of the next human pandemic**. Arch Virol Suppl. 1997;13:105-13. doi: 10.1007/978-3-7091-6534-8_11. PMID: 9413531

Avian Influenza Virus Interspecies Infections

Zoonotic* Human Cases of Avian Influenza

Caused by viruses other than HPAI A (H5N1)

Zoonotic* Human Cases of Avian Influenza
caused by avian viruses other than HPAI A(H5N1)

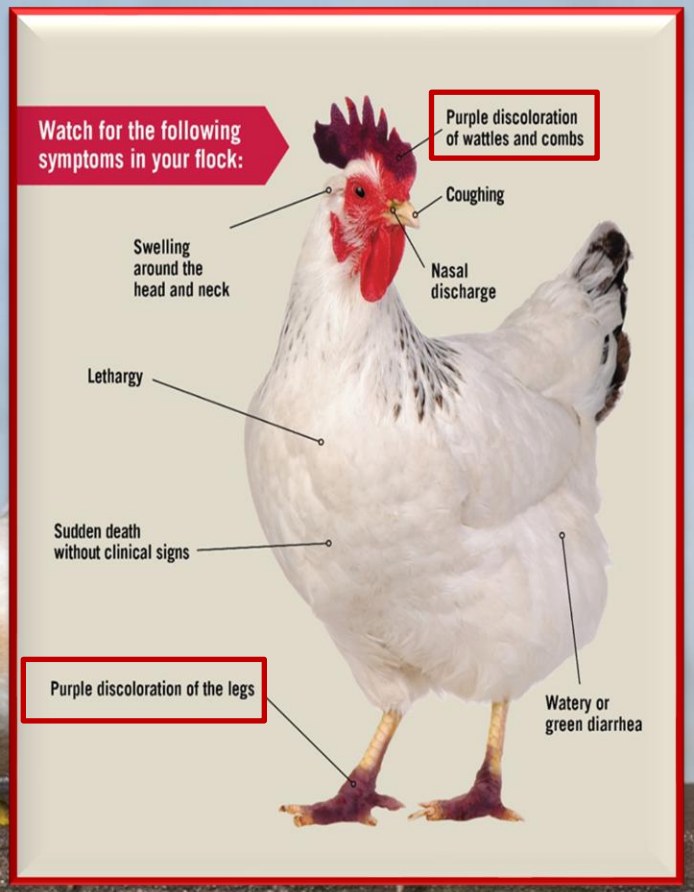
Virus Sub type	Year	Location	Cases (deaths)	Clinical Features
H7N7	1980	United States	3 (0)	Conjunctivitis
H7N7	1995	United Kingdom	1 (0)	Conjunctivitis
H9N2	1999	Hong Kong	2 (0)	Mild Influenza
H9N2	1999	Guangdong, China	5 (0)	Mild Influenza
H9H2	2003	Hong Kong	1 (0)	Mild Influenza
H7N7	2003	Netherlands	89 (1)	Conjunctivitis 78; Mild Influenza 5
H7N7	2003	Egypt	2 (0)	Fever cough
H7N3	2004	Canada	2 (0)	Conjunctivitis; Mild Influenza

* Zoonotic Diseases: Disease Transmitted from Animals to Humans. A zoonosis (zoonotic disease or zoonoses -plural) is **an infectious disease that is transmitted between species from animals to humans (or from humans to animals)**

Seasonal and Pandemic Influenza At the Cross roads a Global Opportunity, IDSA, New York Medical school August 2006: Luke et.AL Vaccines for pandemic influenza. Emerg Infect Dis.2006;12:66-72;Wong Andreen Avian influenza infections in Humans

GENERALLY

"WILD TYPE Avian Influenza A viruses arise
And can be transmitted to domestic poultry
2 of 15 subtypes [H5 and H7] can become
"Highly Pathogenic Influenza A" *
with the capacity to decimate commercial poultry flocks.



*"HPAI"

Avian influenza

Worldwide Virus dissemination

“Spreading the Avian Viruses”

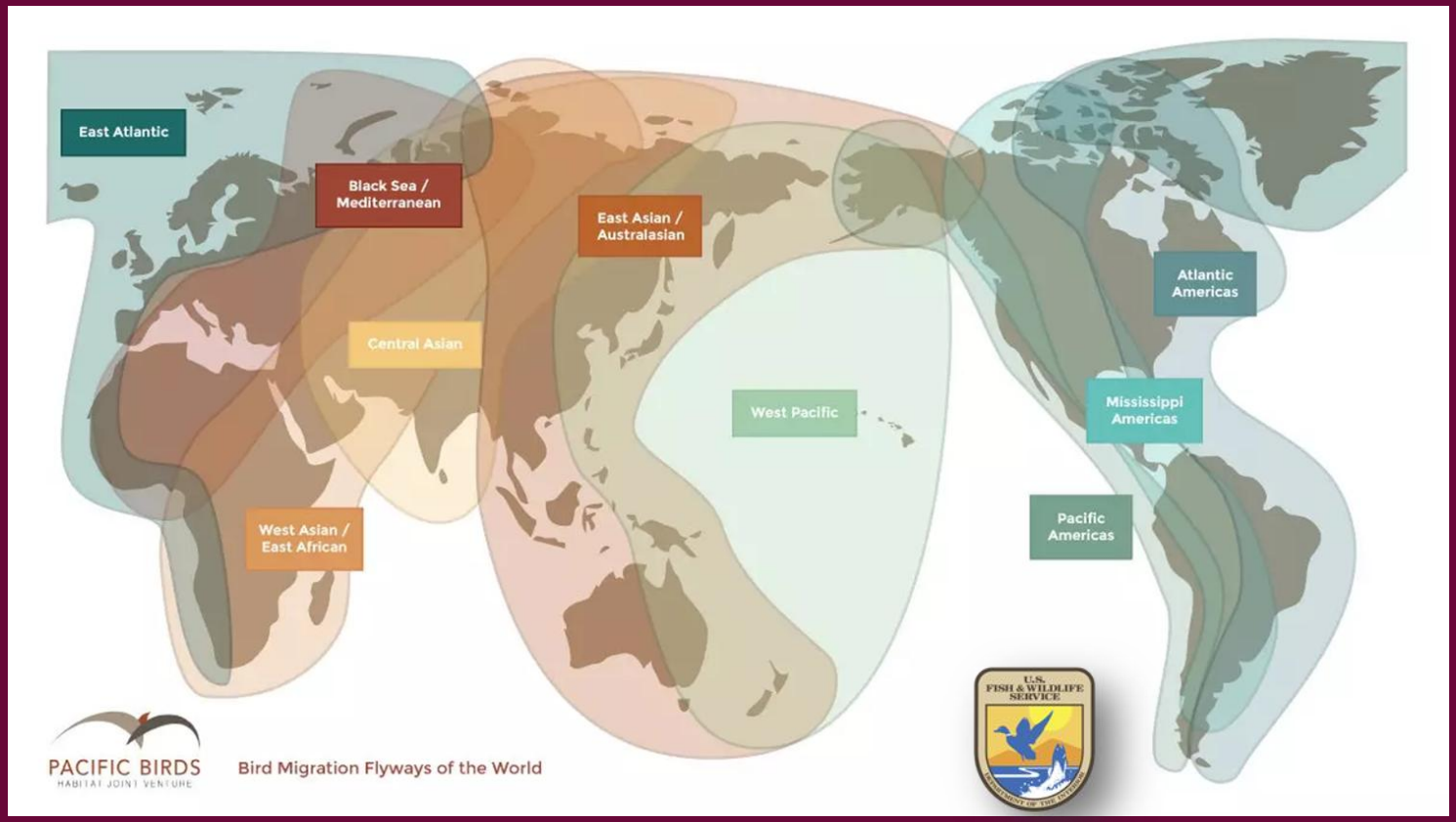
HPAI A(H5N1)*

Avian Influenza [“Bird Flu”]

*“Highly Pathogenic Avian influenza virus”

Avian influenza
World's flyway Map
"Spreading the Avian Viruses"

- **Americas Flyway**
- **African-Eurasian Flyway**
- **East Asian-Australasian Flyway**



World's flyway map 03/30/2023 U.S. Fish & Wildlife service [Accessed 05/10/2025] https://www.fws.gov/media/worlds-flyway-map

Avian influenza

Worldwide Virus dissemination Distribution

"Spreading the Avian Viruses"

From 2003 to 10 April 2025, [WHO]*

- **972 cases of human infections HPAI A(H5N1)**
- **24 countries.**

**** Disease Outbreak News Avian Influenza A(H5N1) – Mexico***. World Health Organization –WHO [Accessed 05/11/2025} https://www.who.int/emergencies/disease-outbreak-news/item/2025-DON564

Avian Influenza

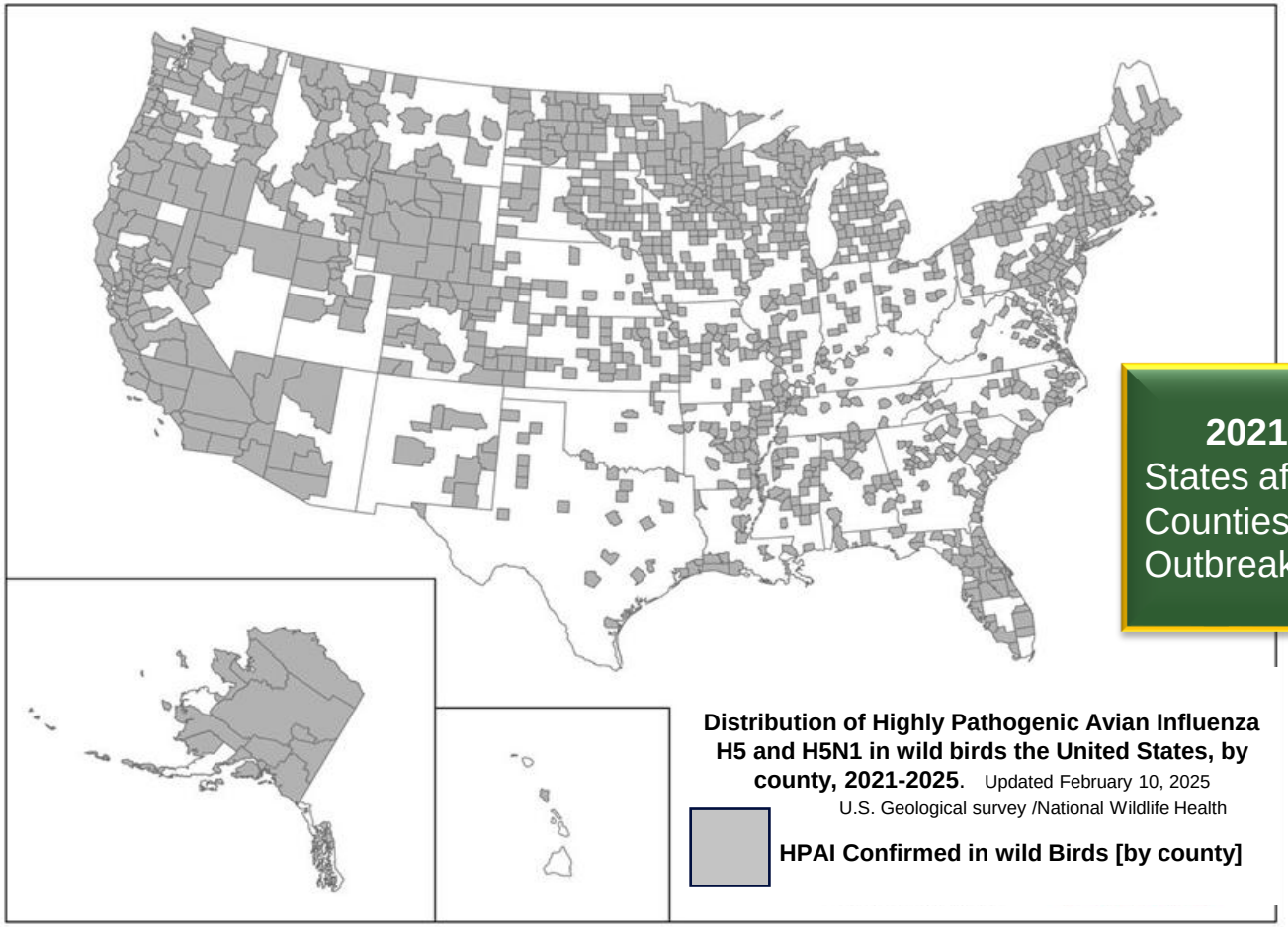
Migratory bird flyways in North America

"Spreading the Avian Viruses

Migratory bird flyways in North America. Photo credit North Dakota Game and Fish Department, U.S Fish and Wildlife Service [Accessed 05/10/2025] https://www.fws.gov/media/migratory-bird-flyways-north-america

Avian Influenza

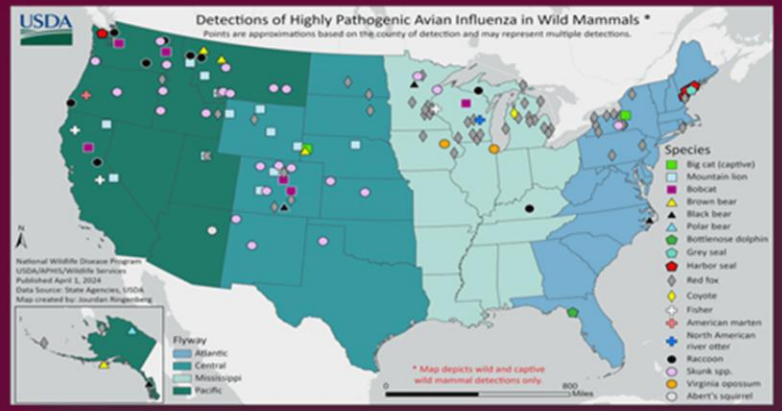
Distribution of HPAI H5 and H5N1 in wild birds the United States, by county, 2021-2025. Updated February 10, 2025



Distribution of Highly Pathogenic Avian Influenza H5 and H5N1 in wild birds the United States, by county, 2021-2025. Updated February 10, 2025 National Wild life Health center, February 10,2025 USGH {Accessed 05/10/2025] https://www.usgs.gov/media/images/distribution-highly-pathogenic-avian-influenza-h5-and-h5n1-north-america-20212022

Avian Influenza

Distribution U.S and Michigan Mammals



Points are approximations based on county of detection and may represents multiple detections

Last Modified: April 01, 2024

Michigan Mammal Infections

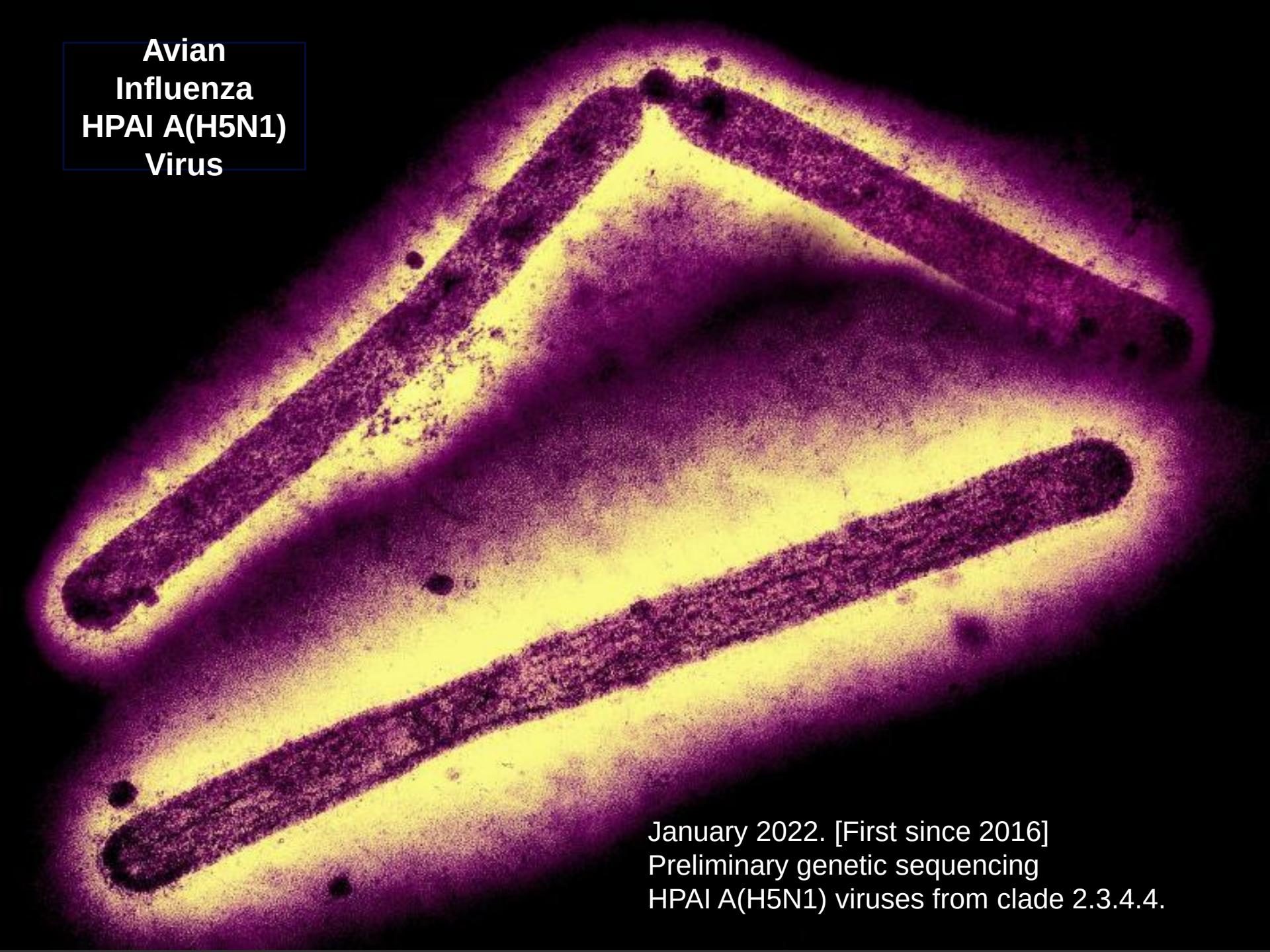
February 2022, [21 Michigan counties]

- Bay, Branch, Cass
- Eaton, Genessee, Ingham
- Ionia, Kalamazoo, Lapeer
- Livingston, Macomb, Menominee
- Montmorency
- Muskegon, Newaygo, Oakland
- Saginaw, Sanilac, Tuscola
- Washtenaw, Wexford

U.S Mammal Infections found

- Big Cat
- Mountain Lion
- Bobcat
- Brown Bear
- Black Bear
- Polar bear
- Bottlenose dolphin
- Grey Seal
- Red Fox
- Coyote
- Fisher
- American marten
- North American River Otter
- River Otter
- Raccoon
- Skunk spp.
- Virginia opossum
- Abert's squirrel

Detection of Highly Pathogenic Avian Inlluenza in Mammals (Last update April 01, 2024). Animal and Plant Health Inspection Services U.S. DEPARTMENT OF AGRICULTURE https://www.aphis.usda.gov/livestock-poultry-disease/avian/avian-influenza/hpai-detections/mammals


Avian
Influenza
HPAI A(H5N1)
Virus
January 2022. [First since 2016]
Preliminary genetic sequencing
HPAI A(H5N1) viruses from clade 2.3.4.4.

Avian Influenza

Current U.S Situation 05/10/2025 [CDC] *

HPAI A(H5N1) Avian influenza virus Animal Detection 01/01/2022 - 05/07/2025	
Factoid	**Statistic**
Wild birds	13,001
Jurisdiction with (States") "bird flu" in wild birds	51
Affected poultry **	169,329,161
Jurisdictions ("State") poultry outbreaks	51
Affected Dairy Herds	1,053
States with dairy cow outbreaks	17

** Highly pathogenic avian influenza (HPAI) A(H5) viruses have been detected in U.S. wild aquatic birds, commercial poultry and backyard or hobbyist flocks beginning in January 2022

** Cumulative data on wild birds have been collected since January 20, 2022. Cumulative data on poultry have been collected since February 8, 2022. Cumulative data on humans in the U.S. have been collected since April 28, 2022. Cumulative data on dairy cattle have been collected since March 25, 2024.*

H5 Bird Flu: Current Situation. Bird flu. Avian influenza (bird flu) CDC [Accessed 05/10/2025] https://www.cdc.gov/bird-flu/situation-summary/index.html


DUH

Question:

True **False**

White milk comes from White cows…..

Chocolate milk comes from Brown cows……

Avian Influenza HPAI A(H5N1)
Farm animals











- Farm animals can acquire HPAI A(H5N1) or other avian influenza viruses
- Direct contact with infected birds or contaminated environments.
- Contact with infected poultry, waterfowl, Surfaces soiled with infected droppings or secretions.
- Avian influenza viruses May spread through the air via droplets or dust

Current Situation: Bird Flu in Dairy Cows 05/07/2925 Bird Flu CDC [Accessed o5/02/2925] https://www.cdc.gov/bird-flu/situation-summary/mammals.html

Avian Influenza

“Wild animals”

Goats, alpacas, pigs, chickens (including those in backyard flocks), and in herds of dairy cows in North America.

A harbor seal and a Chilean flamingo died from the bird flu at the Lincoln Park Zoo in Chicago

Bird Flu in Pets and Other Animals Bird flu CDC accessed [09/09 2025]
Bird Flu in Pets and Other Animals

Avian Influenza HPAI A(H5N1)
CATS

Cat Dies of Bird Flu After Eating Infected Frozen Food

Farm cats

How do cats become infected?

- Recent investigations implicate food as a source of infection for cats,
- Most often **unpasteurized milk and raw or undercooked meat** (e.g., poultry).

Other potential sources include:

- Raw colostrum and other unpasteurized dairy products (like cream)
- Exposure to infected wild birds or poultry
- Exposure to infected livestock and their environments
- Exposure to people who work on affected farms and to their clothing or other fomites

Avian influenza A (H5N1) in cats. AVMA (American Veterinary Medical Association. (Accessed 05/10/2025) https://www.avma.org/resources-tools/animal-health-and-welfare/animal-health/avian-influenza/avian-influenza-h5n1-cats


How Bad can a – "Bird Flu" -Pandemic be?
HPAI A(H5N1)

Influenza
H5N1 “Avian Influenza
Viral Origins

1997 Hong Kong H5N1 “Bird Flu”

Outbreak of avian influenza

- A(H5N1) virus,
- 18 human infections,
- 6 deaths

First recognized instance of human infection and death caused by the H5N1 virus

December 28, 1997:

With continued HPI A(H5N1) outbreaks among poultry farms, **Hong Kong Department of health**, authorized the culling **1.6 million birds** living around Hong Kong poultry markets; Stopped the importation of poultry from neighboring markets, instituted strict policies regarding the trade of poultry in markets.

The measures were successful

no further cases of H5N1 in humans or poultry occurred in 1998.

Avian Influenza

History H5N1 "Bird Influenza" Outbreak Recognized 1997

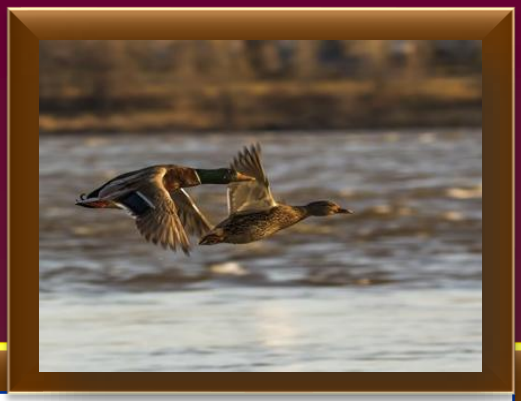
1.6 million fowl

Influenza

Epidemics and Pandemics

History Of Avian Influenza (Bird flu) I

Timeline – 1960 – 1994 I



Year	Events
1960s	❖ Several Low Pathogenic Avian Influenza Viruses [LPAI] were identified [Different subtypes [turkeys, chickens, ducks, quail, pheasants and partridges] ❖ Associated with Respiratory and reproductive disease ❖ "Natural wild reservoir" of these viruses was not been identified
1961	❖ Avian Influenza A "outbreak" in wild birds ("Common Tern") South Africa ❖ Wild birds as a possible "reservoir" for the Avian Influenza A viruses
1968	❖ "Hong Kong" Influenza Pandemic A (H3N2) virus ▪ Reassortment virus 1957 Human A(H2N2) AND (LPAI) Avain A (virus10) ▪ INVOLVING: 2 genes; creation of a "new" H3 hemagglutinin; AND N2 from the "1957" virus Neuraminidase from the 1957 "Human" A(H2N2)
1983	❖ LPAI A (H5N2) virus found circulating among US bird flocks ❖ Later evolving "Highly pathogenic strain" * / high mortality in affected flocks
1994	❖ LPAI found in Mexico : Chickens ❖ LPAI Out breaks Pakistan

* Low Pathogenic Avian Influenza Viruses [LPAI] ; High Pathogenic Avian Influenza Virus [HPAI]

Highlights in the History of Avian Influenza (Bird Flu) Timeline – 1960 – 1999. Avain flu. Influenza (flu). CDC, Centers for Disease control and prevention. https://www.cdc.gov/flu/avianflu/timeline/avian-timeline-1960-1999.htm

Influenza

Epidemics and Pandemics

History Of Avian Influenza (Bird flu)

Timeline – 1996 – Present II

Year	EVENTS
1996	❖ HPAI H5N1 virus first identified in farmed waterfowl (geese) in Southern China
1997	**HPAI H5N1 virus outbreaks in Hong Kong poultry** ❖ Zoonotic transmission: Human infections ❖ First recognized H5N1 human infections with fatal outcomes [6 Death /18 Cases] ❖ Case Fatality rate ~30%
1999	❖ March 1999, a LPAI H7N1 virus was isolated from chickens in Italy
2003-13	**Resurgent HPAI AH5N1 [Including Human Infections]** ❖ East / South-east Asia: Korea, Vietnam, Hong Kong, Japan, Thailand ❖ Human cases: 889 cases / 463 deaths / Across 23 countries Case fatality rate 52% 
2001 2024	❖ Emerging viruses of low and high pathogenicity continued to emerge in birds. ❖ Sea Mammals, Dairy cows

* Low Pathogenic Avian Influenza Viruses [LPAI] ; High Pathogenic Avian Influenza Virus [HPAI

** Zoonotic Diseases: Disease Transmitted from Animals to Humans. A zoonosis (zoonotic disease or zoonoses -plural) is **an infectious disease that is transmitted between species from animals to humans (or from humans to animals)**

Highlights in the History of Avian Influenza (Bird Flu) Timeline – 1960 – 1999. Avain flu. Influenza (flu). CDC, Centers for Disease control and prevention. https://www.cdc.gov/flu/avianflu/timeline/avian-timeline-1960-1999.htm

Avian Influenza A [H5N1] 2003-2025

Global Influenza Program Cumulative Human Cases Report.

Avian Influenza A [H5N1]

Year	Cases	Deaths	CFR *
2003	4	4	100%
2004	46	32	70%
2005	98	43	44%
2006	115	79	69%
2007	88	59	67%
2008	44	33	75%
2009	73	32	44%
2010	48	24	50%
2011	62	34	55%
2012	32	20	63%
2013	39	25	64%

Year	Cases	Deaths	CFR *
2014	52	22	42%
2015	145	42	29%
2016	10	3	30%
2017	4	2	50%
2018	0	0	N/A[
2019	1	1	100%
2020	1	0	0%
2021	2	1	50%
2022	6	1	17%
2023	12	4	33%
2024	81	4	5%
2025 (to date)	11	5	45%

Update 04/09/2025

Total Cases	Deaths	Case fatality rate *
974	470	48%

Source: ***World Health Organization Global Influenza Program Cumulative Cases Report. Avian Influenza A [H5N1].*** Update 04/09/2025
https://www.who.int/publications/m/item/cumulative-number-of-confirmed-human-cases-for-avian-influenza-a(h5n1)-reported-to-who--2003-2025--20-january-2025

Avian Influenza HPAI A (H5N1)

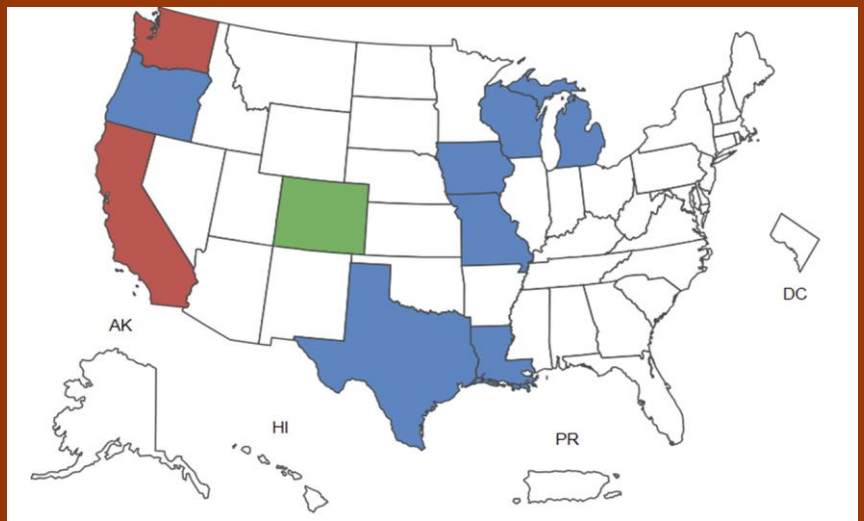
U.S. cases Human infection

April 2025

Avian Influenza

U.S. cases Human infection HPI A(H5N1) [outbreak 2024]

April 2025



U.S. states that have reported human case(s) of influenza A(H5) virus infection

State	Human Case reports [70]
California	37
Washington	11
Colorado	10
Michigan	**2**
Iowa	1
Louisiana	1
Missouri	1
Oregon	1
Texas	1
Wisconsin	1

Update April 2025 CDC

- **First human case California September 2024**
- **70 confirmed or probable human cases [66]**
- **1 fatality**
- **Most cases have been mild**
- **No person-to-person**
- **CDC considers the current risk to the general\ public to be low.**

41 exposure to sick dairy cows
24 Poultry Farms / Culling operations
2 other animal exposures
3 could not be determined

Current Situation: Bird Flu in Dairy Cows 05/07/2925 Bird Flu CDC [Accessed 05/02/2925] https://www.cdc.gov/bird-flu/situation-summary/mammals.html

Avian Influenza [H5N1]

Michigan Department of Natural resources

Ongoing surveillance Up date April 2025

Highly pathogenic avian influenza (HPAI) H5N1

- Cases are now confirmed in domestic birds, wild birds, and wild mammals throughout most of North America.

Since late February 2022, Michigan

- Has experienced die-offs in wild birds and mammals across the state due to HPAI.

Monitoring of sick and dead wildlife for HPAI

- Continues across Michigan and North America. The Michigan Department of Agriculture and Rural Development is closely monitoring and responding to reports of sick domestic birds
- Death in a range of wild bird species waterfowl, raptors, scavengers, gulls and terns have been affected.

Michigan DNR focuses surveillance

- by prioritizing testing dead birds from die-offs of six or more birds, bald eagles, and abnormal acting hawks, owls, and wild mammals.

Positive Michigan cases of HPAI in Domestic animals Avian influenza updates. Results updated as of 04/04/2025. Michigan Department of Natural Resources. https://www.michigan.gov/dnr/managing-resources/wildlife/wildlife-disease/disease-monitoring/avian-influenza-updates [Accessed 04/13/2025]

* Highly pathogenic avian influenza (HPAI)
Low Pathogenic anian influenza (LPAI

Avian Influenza

Public Health

PUBLIC HEALTH

For more information and full recommendations, visit

- ***Highly Pathogenic Avian Influenza A(H5N1) Virus: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations,*** **Avian influenza** CDC 12/26/2024; https://www.cdc.gov/bird-flu/prevention/hpai-interim-recommendations.html

Avian Influenza [H5N1]
PUBLIC HEALTH CDC Recommendations *

At this time

CDC considers the human health risk to the U.S. public from HPAI A(H5N1) viruses to be low

With caution

people with close or prolonged, unprotected exposures to infected birds or other animals, or to environments contaminated by infected birds or other animals, are at greater risk of infection.

CDC considers HPAI A(H5N1) viruses to have the potential to cause severe disease in infected humans

- Poultry and dairy and other livestock farmers and workers
- Veterinarians and veterinary staff
- Animal health responders
- Public health responders
- Dairy laboratory workers
- Food processing workers handling raw milk or potentially contaminated materials
- Slaughterhouse workers

* Highly Pathogenic Avian Influenza A(H5N1) Virus: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations, Avian influenza CDC 12/26/2024; https://www.cdc.gov/bird-flu/prevention/hpai-interim-recommendations.html

Avian Influenza [H5N1]
PUBLIC HEALTH CDC Recommendations *

Recommendations for the Public

- **Avoid exposure to sick or dead animals [wild birds, poultry, other domesticated birds, wild or domesticated animals]**
- **With care: animal feces, litter, or materials contaminated by birds or other animals with suspected or confirmed HPAI A(H5N1) virus infection**

Avoid unprotected exposure: PPE: Use respirator and eye protection

-- In direct or close contact (within about six feet) with sick or dead animals
-- Disposable gloves, boots or boot covers
-- Caution : Unpasteurized (raw) milk and products made from raw milk, including soft cheese, ice cream, and yogurt

For more information and full recommendations, See below

"Highly Pathogenic Avian Influenza A(H5N1) Vir: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations, Avian influenza" CDC

* Highly Pathogenic Avian Influenza A(H5N1) Virus: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations, Avian influenza CDC 12/26/2024; https://www.cdc.gov/bird-flu/prevention/hpai-interim-recommendations.html

Avian Influenza [H5N1]
PUBLIC HEALTH CDC Recommendations *
Recommendations for Clinicians

Recommendations for Clinicians

Consider the possibility of HPAI A(H5N1) virus infection

- Persons showing signs or symptoms of acute respiratory illness or conjunctivitis [who have relevant exposure history].
- Persons who have had contact with potentially infected sick or dead birds, livestock, or other animals within 10 days before symptom onset (e.g., handling, slaughtering, defeathering, butchering, culling, preparing for consumption or consuming uncooked or undercooked food or related uncooked food products, including unpasteurized (raw) milk or other unpasteurized dairy products),
- Direct contact with water or surfaces contaminated with feces, unpasteurized (raw) milk or unpasteurized dairy products, or parts (carcasses, internal organs, etc.) of potentially infected animals; and persons who have had prolonged exposure to potentially infected birds or other animals in a confined space.

SEE BELOW CDC recommendations *
Highly Pathogenic Avian Influenza A(H5N1) usVir: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations, Avian influenza

* Highly Pathogenic Avian Influenza A(H5N1) Virus: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations, Avian influenza CDC 12/26/2024; https://www.cdc.gov/bird-flu/prevention/hpai-interim-recommendations.html

Avian Influenza [H5N1]
PUBLIC HEALTH CDC Recommendations *
Recommendations for Clinicians II

Recommendations for Clinicians

- Clinicians should contact the state public health department to arrange testing for influenza A(H5N1) virus, collect recommended respiratory specimens
- CONSIDER SUGGEST using PPE
- Consider starting empiric antiviral treatment
- Encourage the patient to isolate at home away from their household members
- Not go to work or school until it is determined they do not have avian influenza A virus infection.

- Testing for other potential causes of acute respiratory illness should also be considered depending upon the local epidemiology of circulating respiratory pathogens, [COVID-19, Influenza]

SEE BELOW CDC recommendations *
Highly Pathogenic Avian Influenza A(H5N1) usVir: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations, Avian influenza

* Highly Pathogenic Avian Influenza A(H5N1) Virus: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations, Avian influenza CDC 12/26/2024; https://www.cdc.gov/bird-flu/prevention/hpai-interim-recommendations.html

Influenza

Pre-pandemic Bird flu Vaccines [H1N1]
Just in case

Humanized

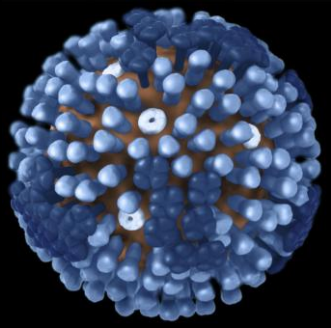
Avian influenza viruses

Can be ***sources of potential future human Influenza Pandemics***.

Outbreaks and worldwide spreading of avian influenza viruses among poultry and wild bird populations have prompted increased interest in pandemic preparedness.

Where's the "Bird Flu" Vaccine?

"The World Wonders"



- **Available data indicate:** inactivated vaccines are poorly immunogenic and require a high concentration of HA [or co-administration with an adjuvant] to achieve the desired antibody response **Investigating the MRNA vaccine platforms**

- **Problematic The HA and (NA)** glycoproteins of influenza viruses are the main targets of the protective immune response.
16 subtypes of HA and 9 subtypes of NA glycoproteins among avian influenza viruses and the genetic and antigenic diversity present unique challenges for the generation of broadly cross-protective vaccines.

- **Alternate Vaccines "Platforms** : Inactivated virus / live attenuated virus /and plasmid-based reverse-genetics /virus vectors and DNA vaccines are being studied

Avian Influenza
Vaccination status [AH5N1] 2025

While specific, worldwide vaccination numbers for H5N1 are difficult to pinpoint, here's a breakdown of what's known:

Several countries are using veterinary vaccines to control H5N1 avian influenza in poultry

- China, France, Egypt, and Mexico.
- Netherlands [one of the world's largest egg exporters] and Finland are implementing vaccination programs for both poultry and humans at risk
- The US is also investing in poultry vaccine development and has conditionally licensed a new vaccine [Presently, no approved vaccine]

Influenza

Vaccines

Prepandemic Vaccines “Bird Flu”

ANTICIPATION:

Pandemic-specific vaccines must be distinguished from **pre-pandemic vaccines**:

- **Pandemic-specific** vaccines are developed only once a pandemic has been declared and the culprit virus has been characterized.
- **Prepandemic** vaccines are developed and authorized for use (but not marketed)
- In the event of a pandemic, the manufacturer can include the emerging virus subtype in the previously authorized vaccine then apply for final authorization.
- Ideally, this would facilitate expedition of the approval process since the safety and efficacy of the vaccine have already been assessed.
- There are several pre-pandemic vaccines authorized for human use in the United States and European Union that could be modified into pandemic-specific vaccines if a pandemic is declared.

Stephenson I, Hirsch MS, Baron EL. ***Avian Influenza Vaccines.*** UpToDate®. Up dated 07/31/2023 [Current literature Review Apr 2024]

Influenza

Vaccines

Pre-pandemic Vaccines “Bird Flu”

ANTICIPATION:

Prepandemic avian influenza vaccines authorized for human use in the United States and European Union

Authorization	Year	Name	Form	Manufacturer
United States	2007	Pandemic influenza H5N1 vaccine	Monovalent subunit (nonadjuvanted)	Sanofi
European Union	2009	Pandemic Influenza Vaccine	Whole-virion Vaccine H5N1 Baxter Ag	Baxter
European Union United States	2009 2013	Adjupanrix®	Monovalent recombinant H5N1 subunit vaccine adjuvanted with AS03	GSK
European Union	2010	Aflunov®	Monovalent subunit H5N1 vaccine adjuvanted with MF59	Novartis
European Union	2011	Foclivia®	Monovalent subunit H5N1 vaccine adjuvanted with MF59	Seqirus
European Union	2016	Pandemic Influenza Vaccine	Live attenuated nasal vaccine H5N1 AstraZeneca	AstraZeneca
United States	2020	Audenz®	Monovalent subunit H5N1 vaccine adjuvanted with MF59	Seqirus

Graphic 141146 Version 3.0

THANK YOU!!!!


QUESTIONS??
Baby

MEASLES II

Measles and Measles vaccines MMR
Myths and Legends I

Measles Key factoids

- Inhaled Corticosteroids do not treat or cure measles
- Clarithromycin [antibacterial antibiotics] cannot treat measles
- Vitamin A does not cure measles
- Measles is not a mild disease, and not part of a normal childhood
- Measles outbreaks still happen

References
IDSA: Measles
IDSA: Immunization
CDC: Measles
CDC: MMR Vaccine Information Sheet
WHO: Measles Fact Sheet
HistoryofVaccines.org: Misconceptions About Vaccines
PublicHealth.org: Vaccine Myths Debunked

Measles and Measles vaccines MMR Myths and Legends II

Measles Key factoids

- Spread of measles CANNOT be controlled with proper sanitation alone
- MMR vaccine prevents serious illness and death
- Getting MMR Vaccine is much safer than getting measles
- MMR Rarely causes Measles
- MMR is a “live” attenuated vaccine…harmless infection in the vaccinated; possibly very few symptoms

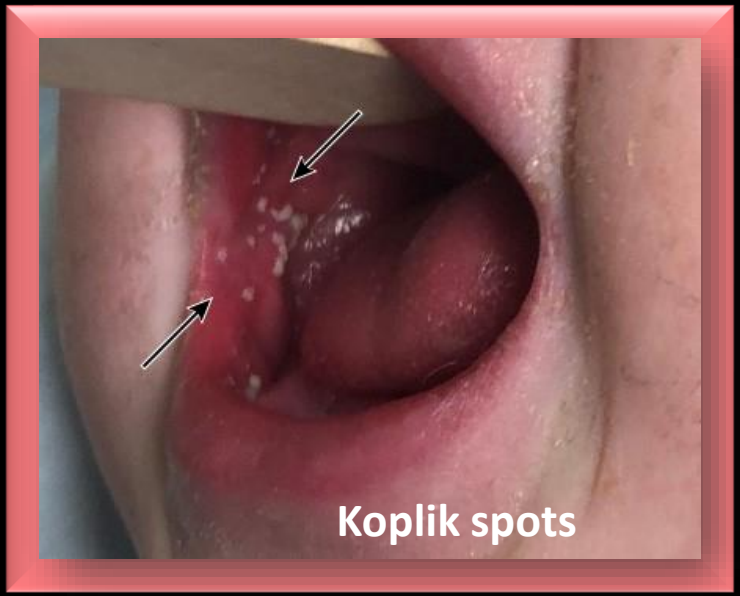
References
IDSA: Measles
IDSA: Immunization
CDC: Measles
CDC: MMR Vaccine Information Sh
WHO: Measles Fact Sheet
HistoryofVaccines.org: Misconcept
PublicHealth.org: Vaccine Myths D

MEASLES [Rubeola]

Histological examinations :

- Rash caused by Measles virus infection of the dermal endothelial cells and keratinocytes…
- **Koplik's spots** are similar to those of the skin rash

Henry Koplik (1858-1927), American pediatrician



“Measles is one of the most important infectious diseases of humans….

Has caused millions of deaths since its emergence as a zoonotic disease thousands of years ago…..

For infectious disease epidemiologists…

measles has served as a model of an acute infectious disease, particularly for understanding the nature of epidemics”

-Kenneth Maxcy

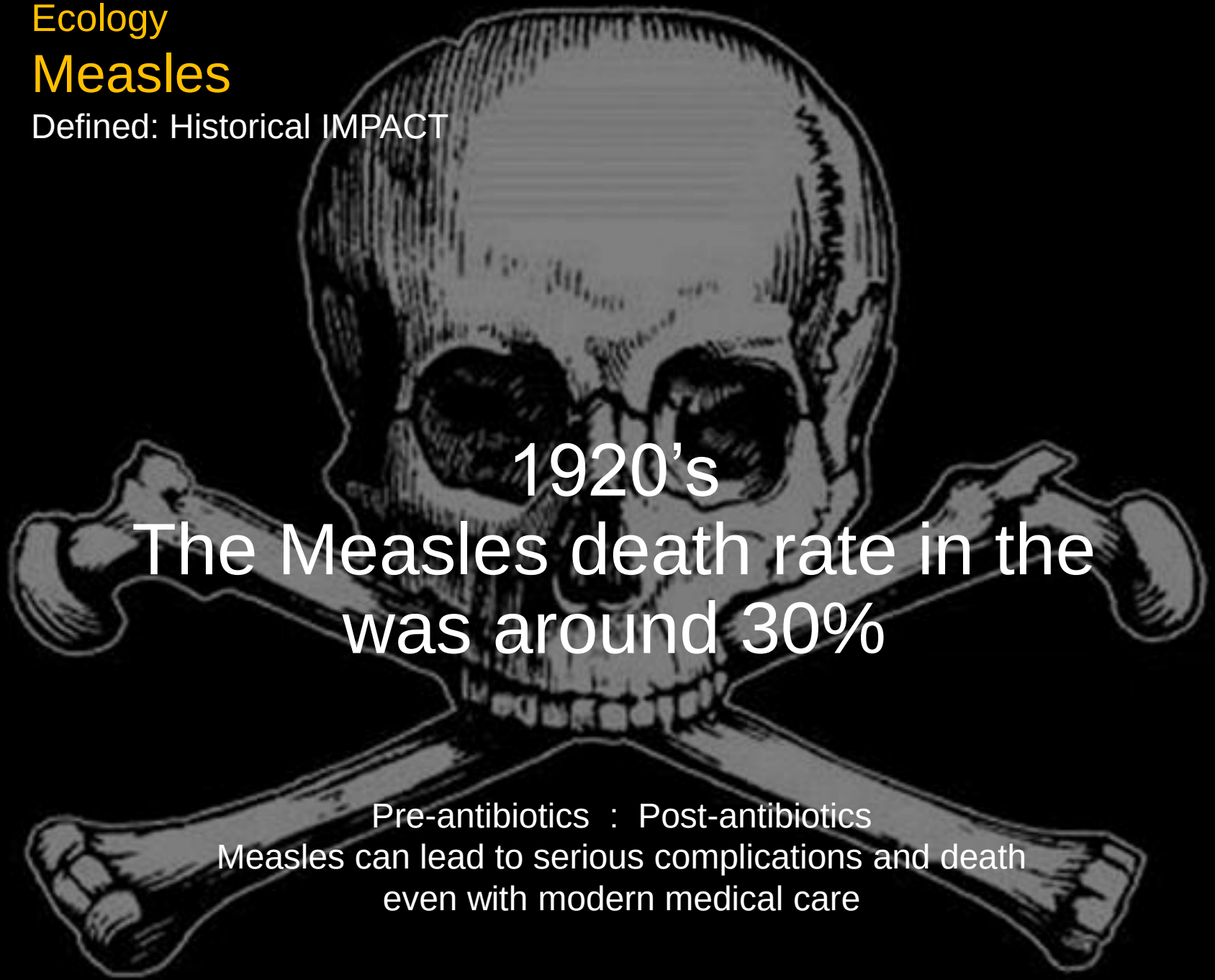
Johns Hopkins University School of Public Health, 1948

*Ecology is the branch of biology which studies the interactions among organisms and their environment

Ecology

Measles

Defined: Historical IMPACT



1920’s
The Measles death rate in the was around 30%

Pre-antibiotics : Post-antibiotics
Measles can lead to serious complications and death even with modern medical care

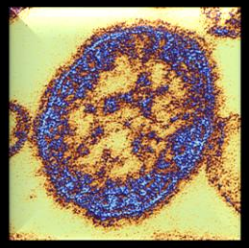
Ecology

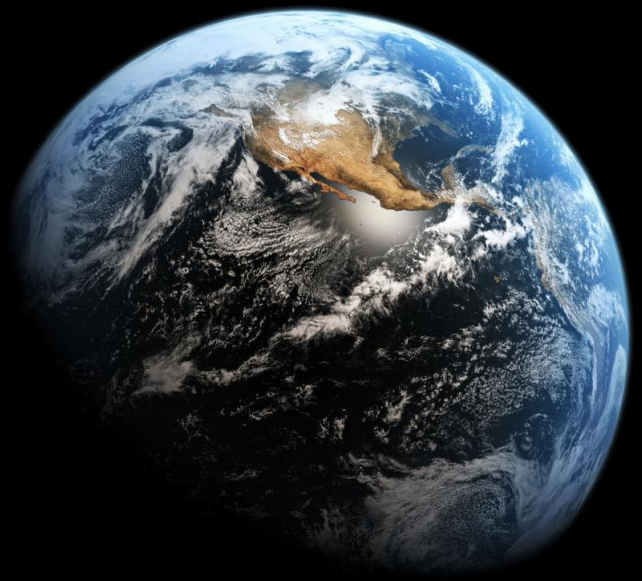
Measles

Defined: Clinical

Rø : 18

("R naught")





Measles [Rubeola]

- A **"Highly contagious"** RNA viral illness characterized by Fever, Malaise, Rash, Cough, Coryza, and Conjunctivitis that occurs worldwide….

- **Natural measles** infection is thought to confer lifelong immunity.
- Immunity due to **Measles vaccination** is also highly protective against clinical infection.

U.S MEASLES:

ENDEMICLY ELIMINATED IN U.S.

2000

Ecology

Measles

Defined: Clinical

Measles Morbidity Mortality
has declined in developed countries
in association with economic development,
improved nutritional status, and supportive care….

And **Vaccines**

Particularly **antibiotic therapy**
to control secondary bacterial pneumonia….

World Health Organization

VIRAL ECOLOGY:

Measles has been targeted for eradication
given the favorable biologic characteristic that

Humans are the only virus reservoir.

Ecology

Measles

Elimination / Extinction

U.S. 2024-2025
UNFORTUNATELY

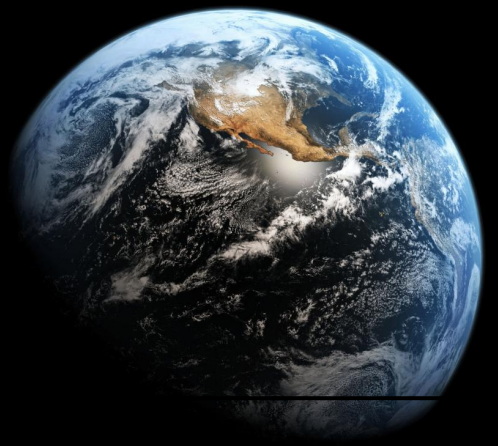
Elimination of measles
has been achieved
in very *few* areas of the world…

High viral transmissibility
Global – Local- Regional
Social-Political economical factors

Ecology

Measles

"Baby boomers" immunity



U.S How does being born before 1957 confer immunity to measles?

People born before 1957

lived through several years of epidemic measles

before the first measles vaccine was licensed in 1963.

Surveys suggest 95% - 98% of those born before 1957

are immune to measles.

Therefore:

Persons born before 1957

can be presumed to be immune.

Measles

U.S May 2024- 2025 Out Break

STATE	Cases
Texas	717
Louisiana	2
Florida	1-9
New Mexico	63
Arizona	0
California	11
Ohio	9
Pennsylvania	13
Michigan	**9**
United States	**1,001**

Measles Cases and Outbreaks Measles (Rubeola) Updated on May 9, 2025. CDC {Accessed 05/14/2025https://www.cdc.gov/measles/data-research/index.html

Measles

U.S Measles cases May 2025

05/09/2025

05/09/2025

- Total Cases 1001
- Deaths 3

Vaccination Status	
Unvaccinated or Unknown	96%
One MMR	2%
Two MMR	2%

Age Years	Cases	Percent
<5	299	30%
5-19	376	38%
20+	15	1%

CASE Summaries

Hospitalization % Age Group		
Age Years	Percent	Number
<5	23%	69/299
5-19	9%	32/376
20+	13%	2/15
Age unknown	13%	2/15

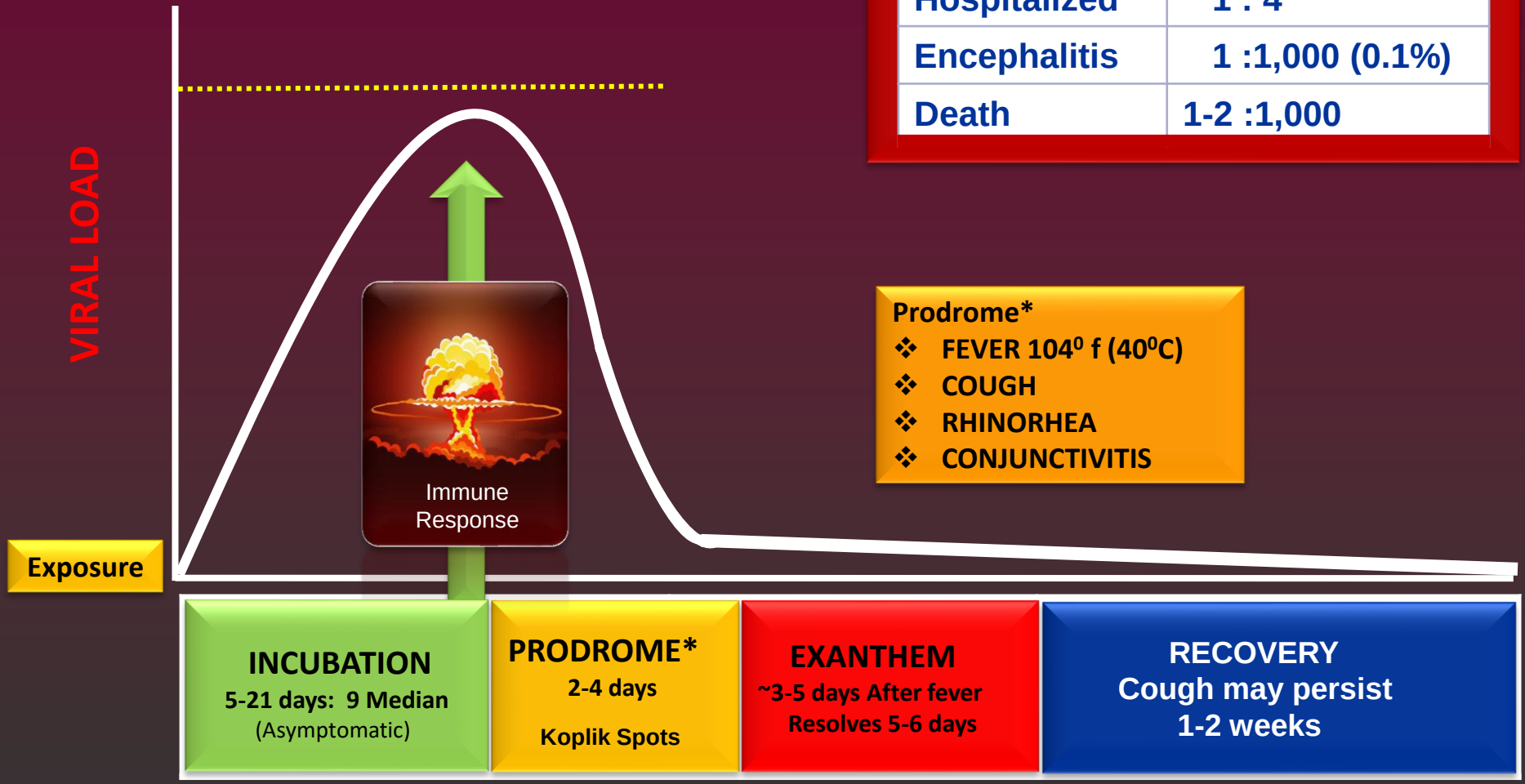
Measles Cases and Outbreaks Measles (Rubeola) Updated on May 9, 2025. CDC {Accessed 05/14/2025https://www.cdc.gov/measles/data-research/index.html

Measles

Measles

Viral Human Ecology

Measles Morbidity	
Hospitalized	1 : 4
Encephalitis	1 :1,000 (0.1%)
Death	1-2 :1,000



Prodrome*

- FEVER 104^0 f (40^{0}C)
- COUGH
- RHINORHEA
- CONJUNCTIVITIS

Contagious ~4 days before
4 days after the rash appears

Measles

Clinical Exanthems

Search carefully for **Koplik spots** in patients with suspected measles, since they can improve the accuracy of clinical diagnosis …..
However, this enanthem does not appear in all patients with measles.

Measles Exanthem:

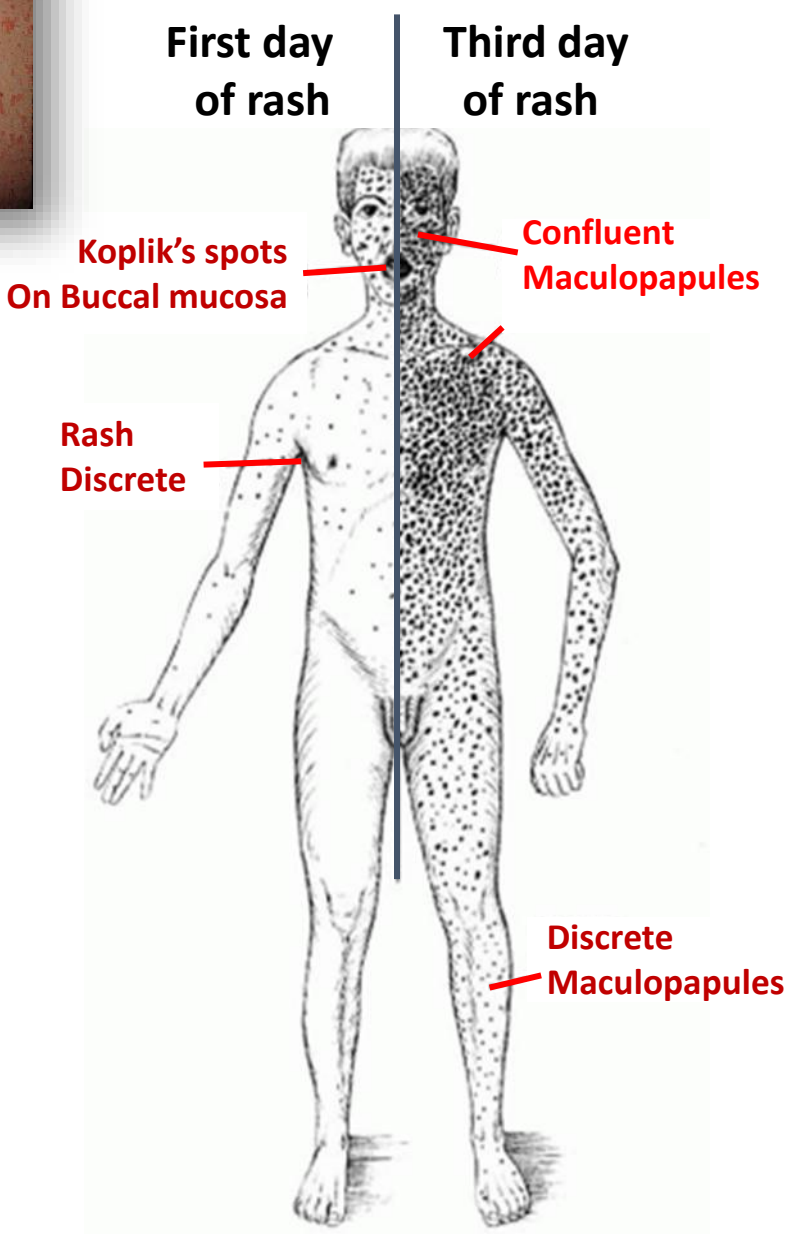
- **Arises ~ 2- 4 days after onset of fever**
- **Erythematous, Maculopapular, Blanching rash**
- Classically begins
  - **Begins about the face and ears**
  - **Spreads cephalocaudally** and **centrifugally**
  - **Neck, upper trunk, lower trunk & extremities**

- Early on, lesions are blanching…
- Later stages….they are not
- May include petechiae
- Severe cases, may appear hemorrhagic

Children:

Extent of the rash & degree of confluence **generally correlate with the severity of the illness.**

- **The palms and soles are rarely involved**.



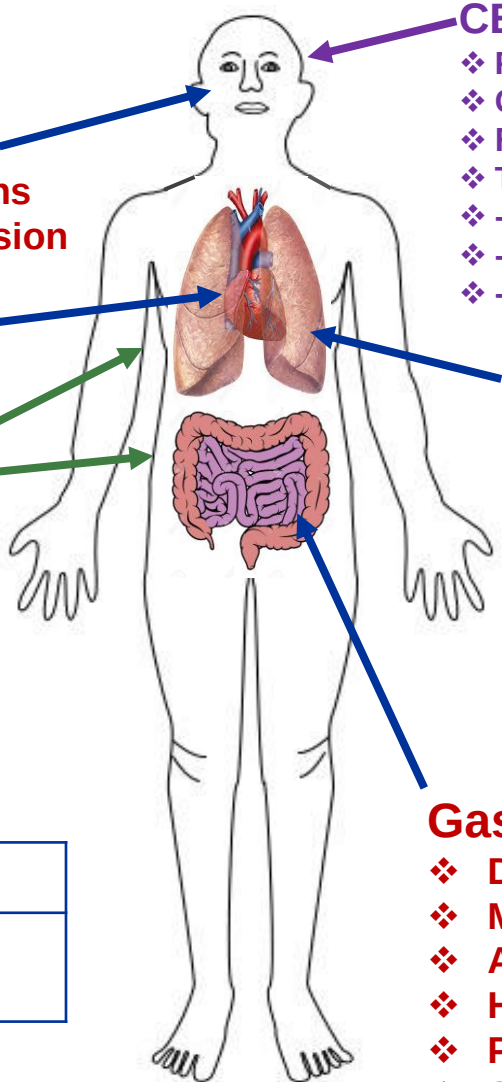
Development and distribution of measles rash. Reproduced from Perry RT and Halsey NA. The clinical significance of measles. J Infect Dis 2004;189(Suppl 1):S5

MEASLES
COMPLICATIONS

- Corneal Ulceration
- Corneal Perforations
- Central Vein Occlusion

- Myocarditis
- Pericarditis

IMMUNE SYSTEM
Reticuloendothelial or Macrophage system:
- Dysfunction
- Suppression
  - TTP
  - DIC



CENTRAL NERVOUS SYSTEM
- Febrile Convulsions
- Guillain-Bare syndrome
- Reye's Syndrome
- Transverse myelitis
- - Encephalitis
- - Acute Disseminated Encephalomyelitis
- - Subacute Sclerosing Panencephalitis

Respiratory Infections*
- Otitis Media
- Mastoiditis
- Bronchopneumonia
- Laryngotracheobronchitis (croup)
- Bronchiolitis
- Giant cell pneumonia

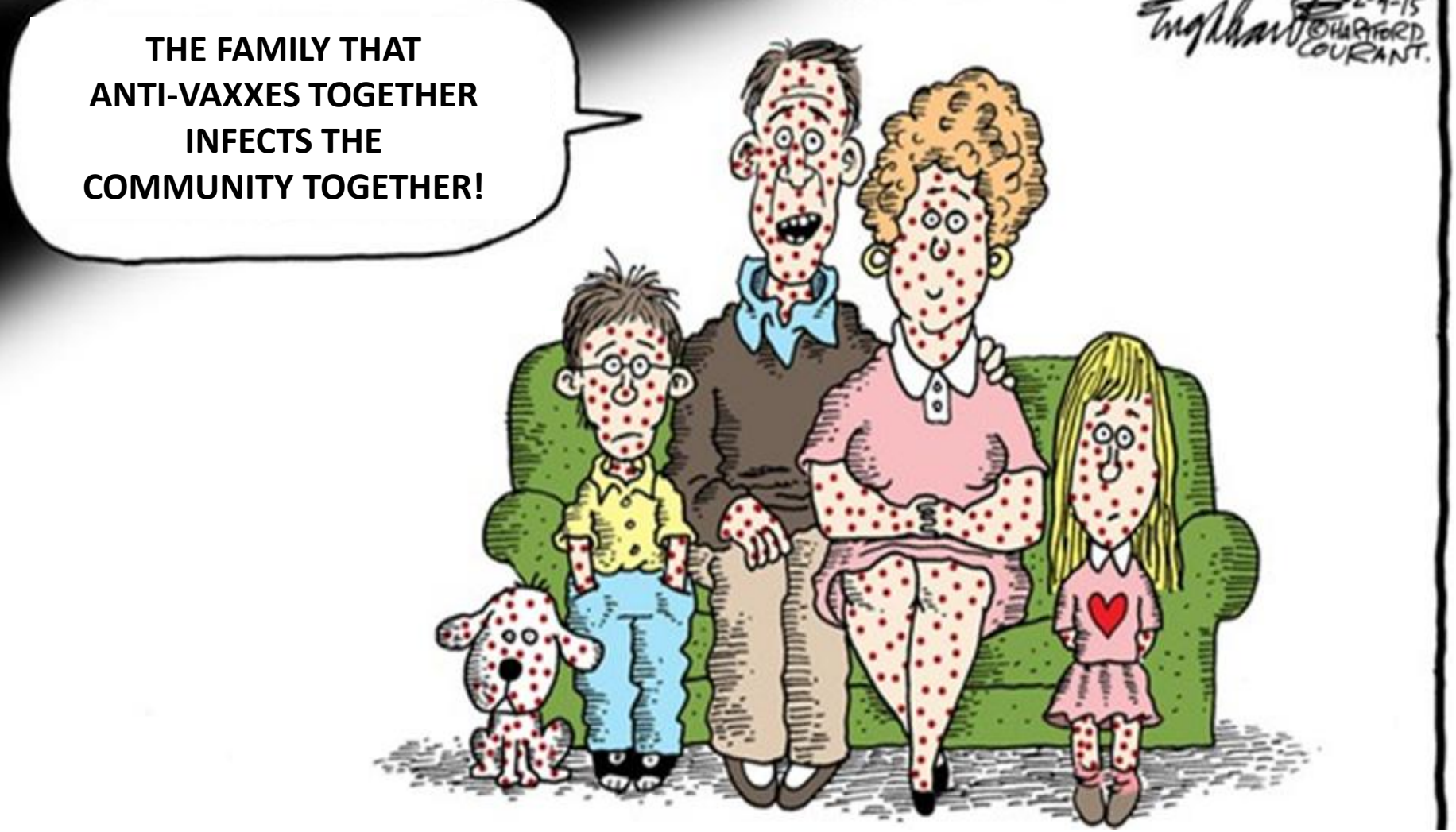
Gastrointestinal
- Diarrhea (Most common)
- Mesenteric Enteritis
- Appendicitis
- Hepatitis
- Pancreatitis

*Bacterial Superinfections ~5%	
S. pneumoniae S pyogenes	H influenzae S. aureus

Symptoms
- severity ranges from mild and less serious
- First 4–6 wks. after an acute phase (and upon the immune functions are disturbance)
- **Complications are usually more severe in adults CASES**
- **And malnourished and immune compromised individuals.**

MEASLES
Vaccine : MMR
(Measles, Mumps Rubella)
Measles Immunosuppression

Measles Vaccination	Long-term benefits of Measles Vaccination:
	Preventing measles-associated immune memory loss: ❖ **Vaccination protects polymicrobial herd immunity: Measle Infections; Secondary Infection Complications** ❖ **There-by preventing all-cause infectious disease**

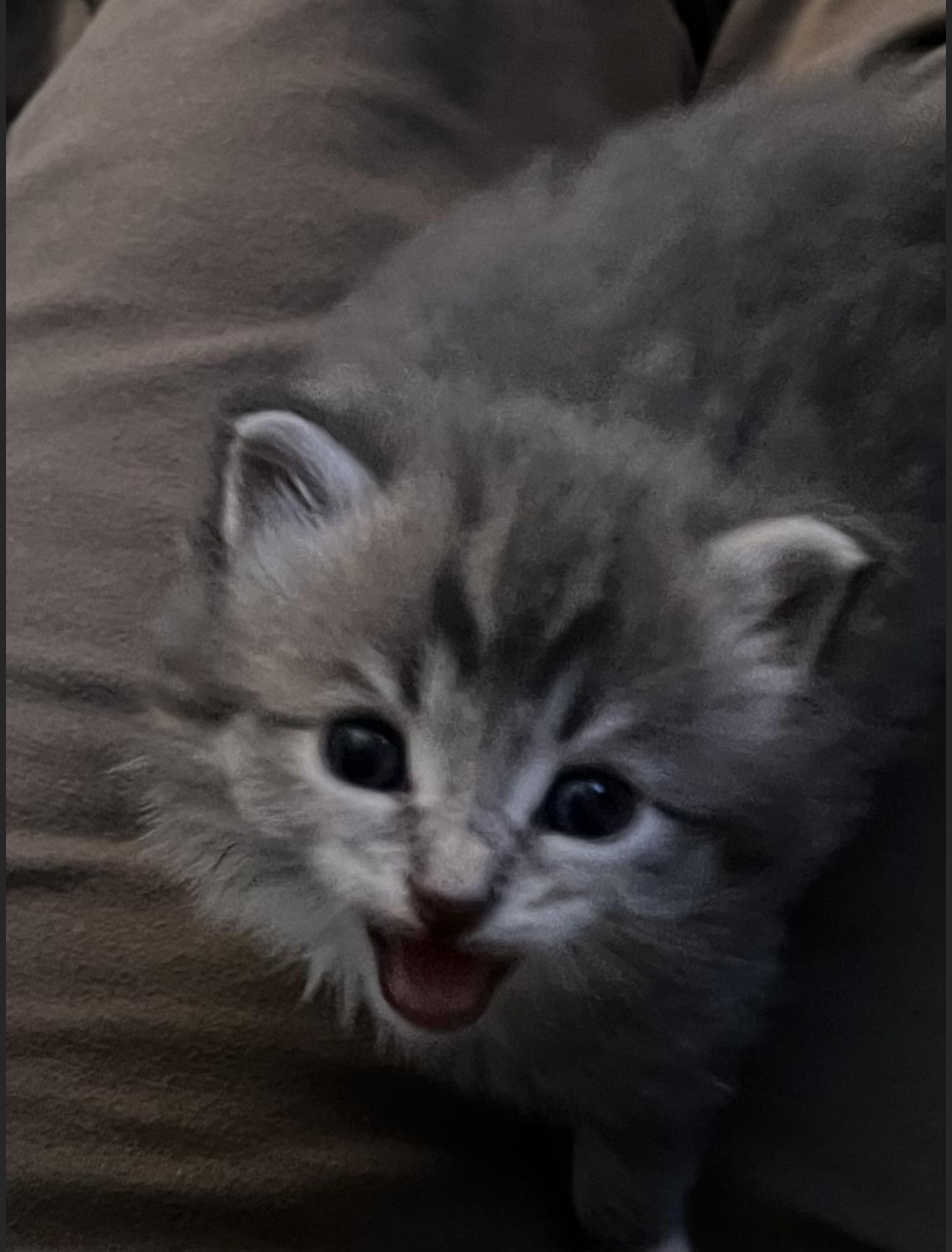


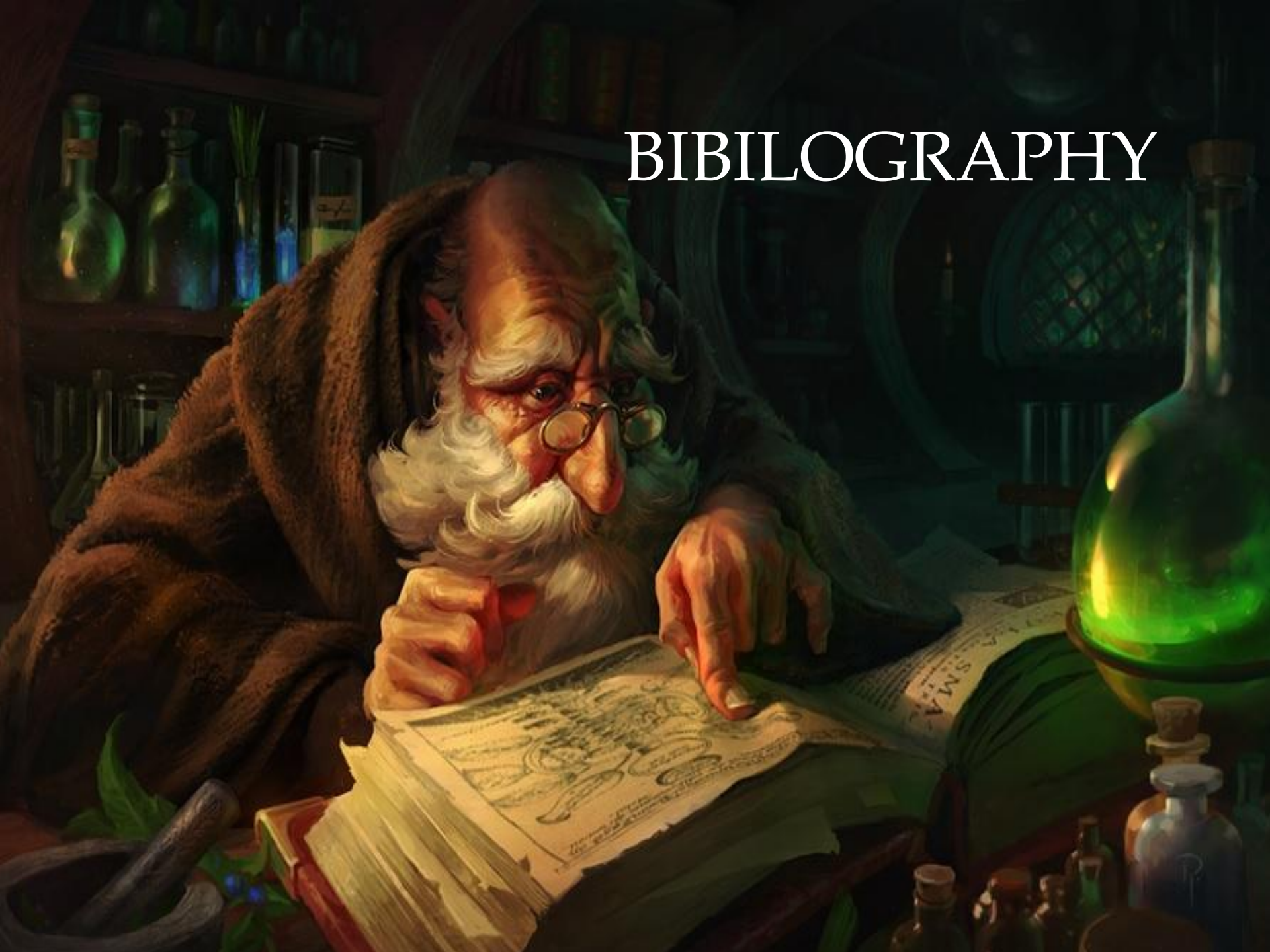
Humans are social creatures…

”HERD Immunity”

What is the price of admission to belong to Society?


FIN





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