

# NOVEL CORONAVIRUS- 2019

a/k/a... **'COVID – 19'** or **'SARS-CoV-2'**

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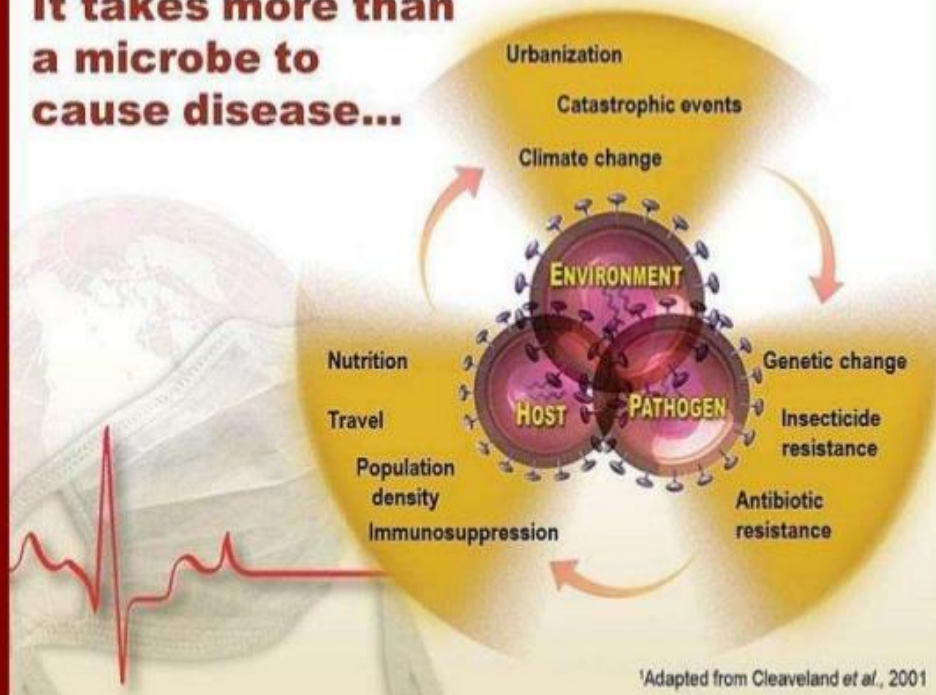
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# ***EMERGING and RE-EMERGING INFECTIOUS DISEASES***

## **DRIVING FORCES TO EMERGE**

**It takes more than  
a microbe to  
cause disease...**



'Adapted from Cleaveland et al., 2001

- **Emerging infectious diseases:** Infectious diseases that have newly appeared in a population.
- Global :
- Regional:
- **Re-emerging Diseases:** Diseases' incidence in human has increased during the last 20 years or threatens to increase in the near future.
- Global:
- Regional:

# WORLD HEALTH ORGANIZATION - WHO



Dr. Tedros Adhanom Ghebreyesus  
Director-General WHO



# CENTER for DISEASE CONTROL and PREVENTION - CDC



# Emerging Infections in the World since 1973

1973	Rotavirus	Enteritis/Diarrhea
1976	Cryptosporidium	Enteritis/Diarrhea
1977	Ebola virus	VHF
1977	Legionella	Legionnaire's dz
1977	Hantaan virus	VHF w/ renal flr
1977	Campylobacter	Enteritis/Diarrhea
1980	HTLV-1	Lymphoma
1981	Toxin prod. S.aureus	Toxic Shock Synd.
1982	E.coli 0157:H7	HUS
1982	HTLV-II	Leukemia
1982	Borrelia burgdorferi	Lyme disease

<b>1983</b>	<b>HIV</b>	<b>AIDS</b>
<b>1983</b>	<b>Helicobacter pylori</b>	<b>Peptic ulcer dz</b>
<b>1988</b>	<b>Hepatitis E</b>	<b>Hepatitis</b>
<b>1989</b>	<b>Hepatitis C</b>	<b>Hepatitis</b>
<b>1990</b>	<b>Guanarito virus</b>	<b>VHF</b>
<b>1991</b>	<b>Encephalitozoon</b>	<b>Disseminated dz</b>
<b>1992</b>	<b>Vibrio cholerae O139</b>	<b>Cholera</b>
<b>1992</b>	<b>Bartonella henselae</b>	<b>Cat scratch dz</b>

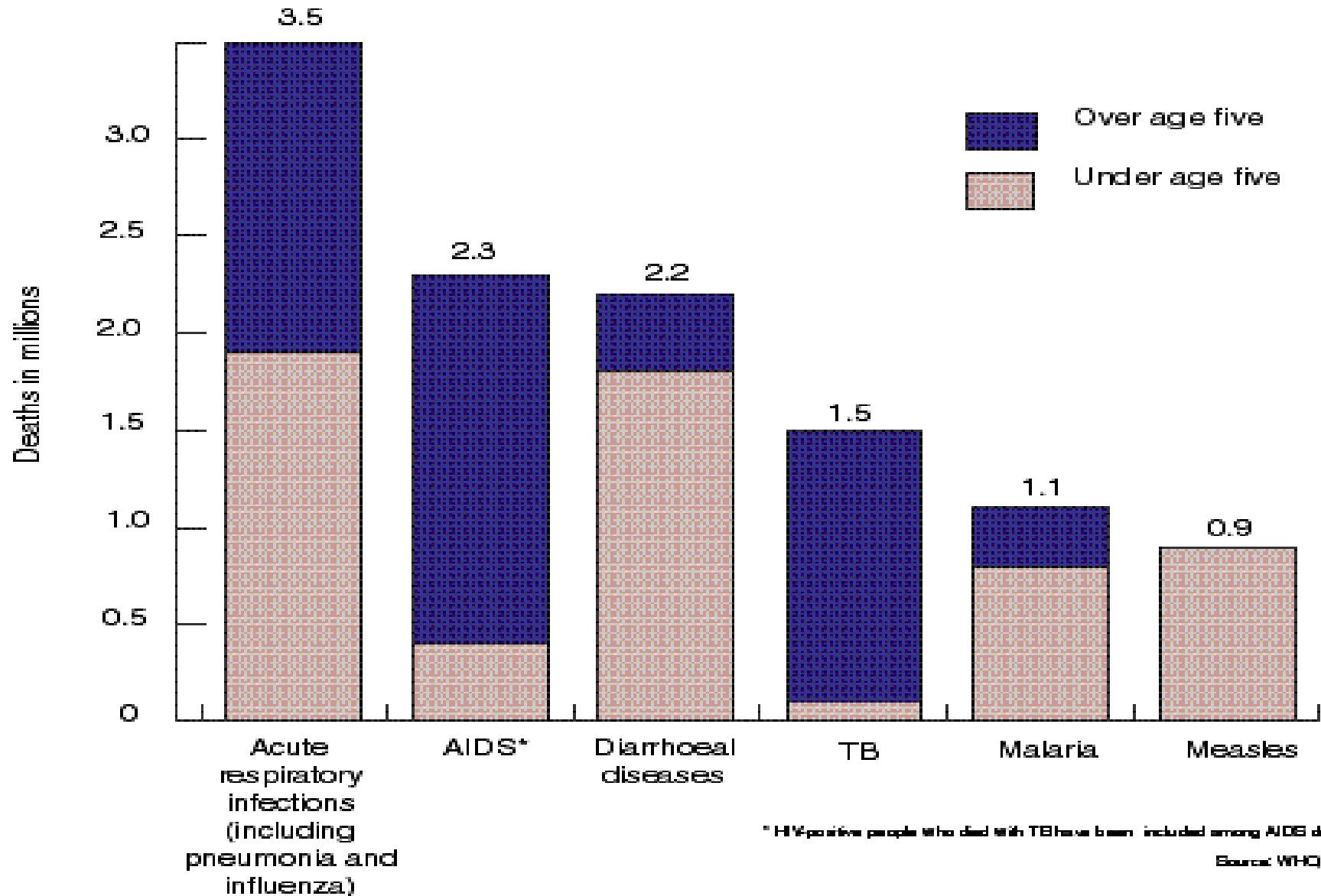
<b>1993</b>	<b>Sin Nombre virus</b>	<b>Hanta Pulm. Synd.</b>
<b>1994</b>	<b>Sabia virus</b>	<b>VHF</b>
<b>1994</b>	<b>Hendra virus</b>	<b>Respiratory dz</b>
<b>1995</b>	<b>Hepatitis G</b>	<b>Hepatitis</b>
<b>1995</b>	<b>H Herpesvirus-8</b>	<b>Kaposi sarcoma</b>
<b>1996</b>	<b>vCJD prion</b>	<b>Variant CJD</b>
<b>1997</b>	<b>Avian influenza (H5N1)</b>	<b>Influenza</b>
<b>1999</b>	<b>Nipah virus</b>	<b>Encephalitis</b>
<b>1999</b>	<b>West Nile virus</b>	<b>Encephalitis</b>
<b>2001</b>	<b>BT Bacillus anthracis</b>	<b>Anthrax</b>
<b>2003</b>	<b>Monkeypox</b>	<b>Pox</b>
<b>2003</b>	<b>SARS-CoV</b>	<b>SARS</b>
<b>2004</b>	<b>H5N1</b>	<b>Avian Influenza</b>
<b>2005</b>		





# Leading infectious killers

Millions of deaths, worldwide, all ages, 1998



# Factors responsible for emerging of infections.

I-Ecological changes and Agricultural development.



Placing the people in contact with a natural reservoir or host of a hitherto unfamiliar, but usually already present,

# Example 1 :

Reforestation in USA

```
graph TD; A[Reforestation in USA] --> B[Increased the number of deer & deer ticks]; B --> C[Increased Human contact with deers]; B --> D[Deer ticks are natural reservoir of Lyme diseases]; C --> E[Human affliction by Lyme disease]; D --> E;
```

Increased the number of deer & deer ticks

Increased Human contact with deers

Deer ticks are natural reservoir of Lyme diseases

Human affliction by Lyme disease

## II- Changes in Human demographics and behaviours

Inflation of population size



Insufficient infrastructures



Use open containers for water



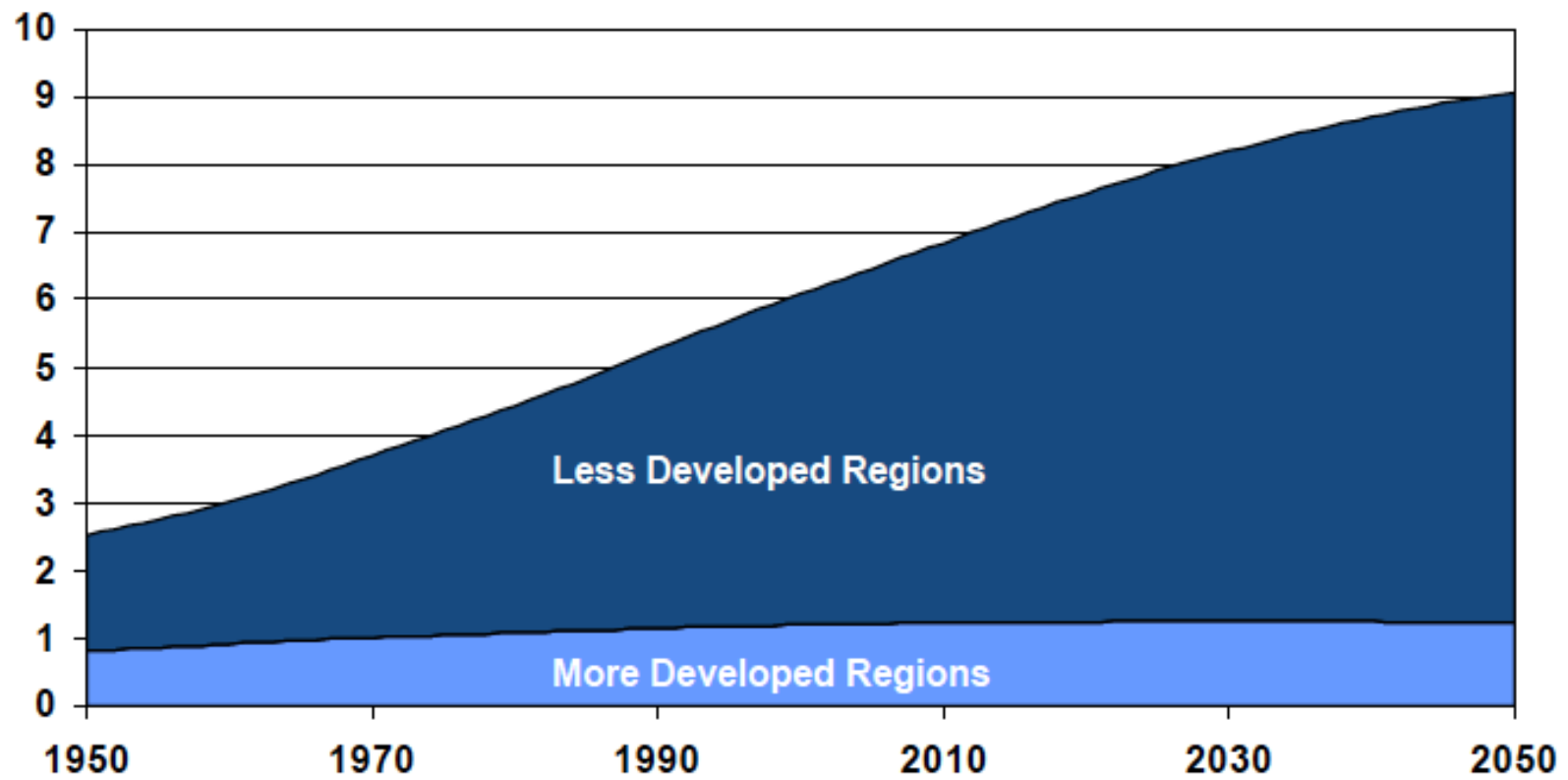
Breeding mosquitos



Dengue fever in Asia

# Growth in More, Less Developed Countries

Billions

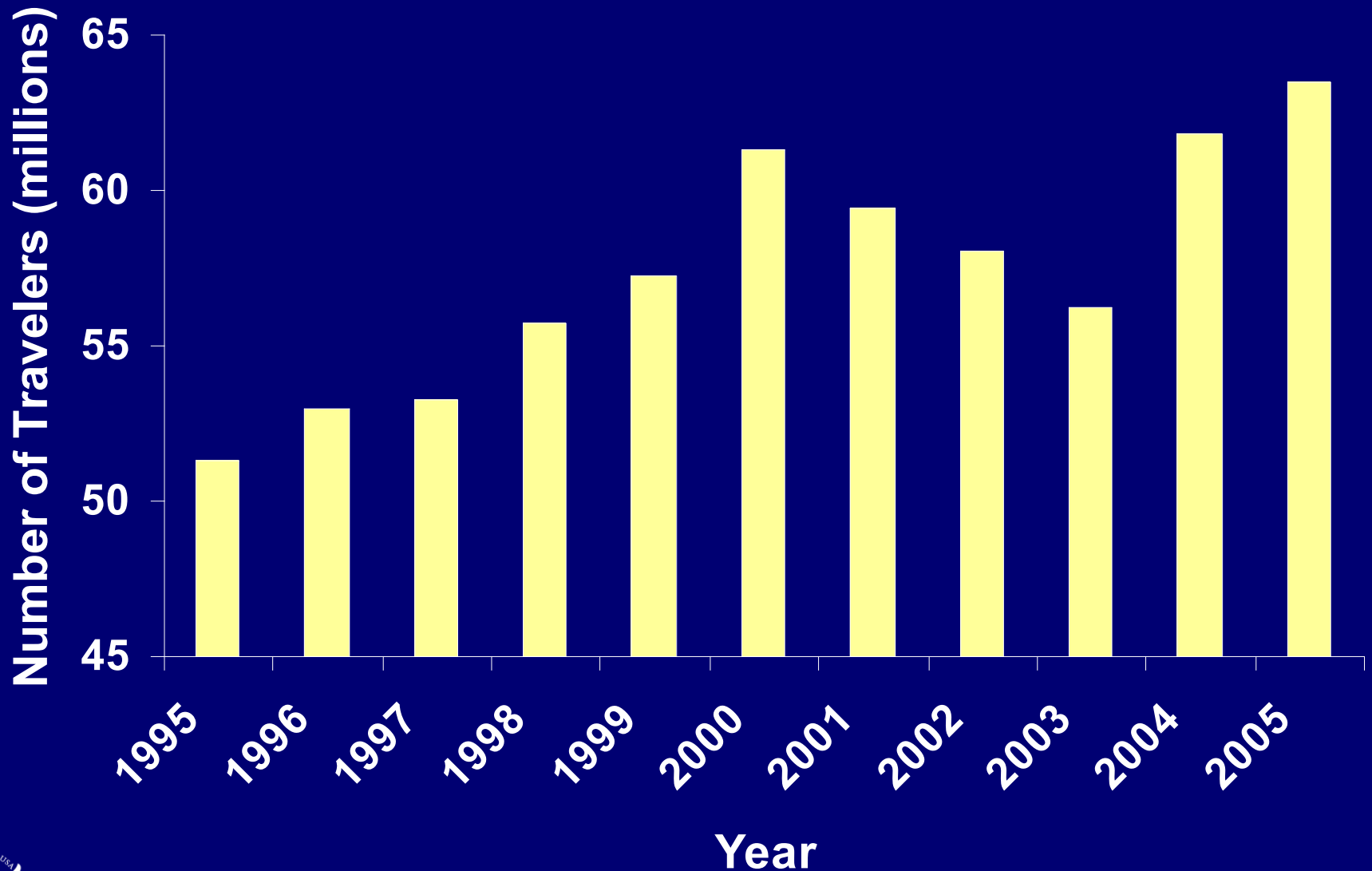


Source: United Nations, *World Population Prospects: The 2004 Revision* (medium scenario), 2005.

***INTERNATIONAL TRAVEL***  
***&***  
***COMMERCE***

***THIS IS MAJOR.....***

# U.S. Residents Traveling Abroad\*



\*ITA, includes travel to Canada and Mexico



# **TRAVEL EPIDEMIOLOGY**

2015 – 1.2 BILLION INTERNATIONAL TOURIST ARRIVALS

2018 – ESTIMATED TO BE 2 BILLION

ASIA, MIDDLE EAST, AND AFRICA TRAVEL INCREASING

14 DAYS – MEDIAN DURATION OF TRIP

22% WERE > 28 DAYS; 3% > 6 MONTHS

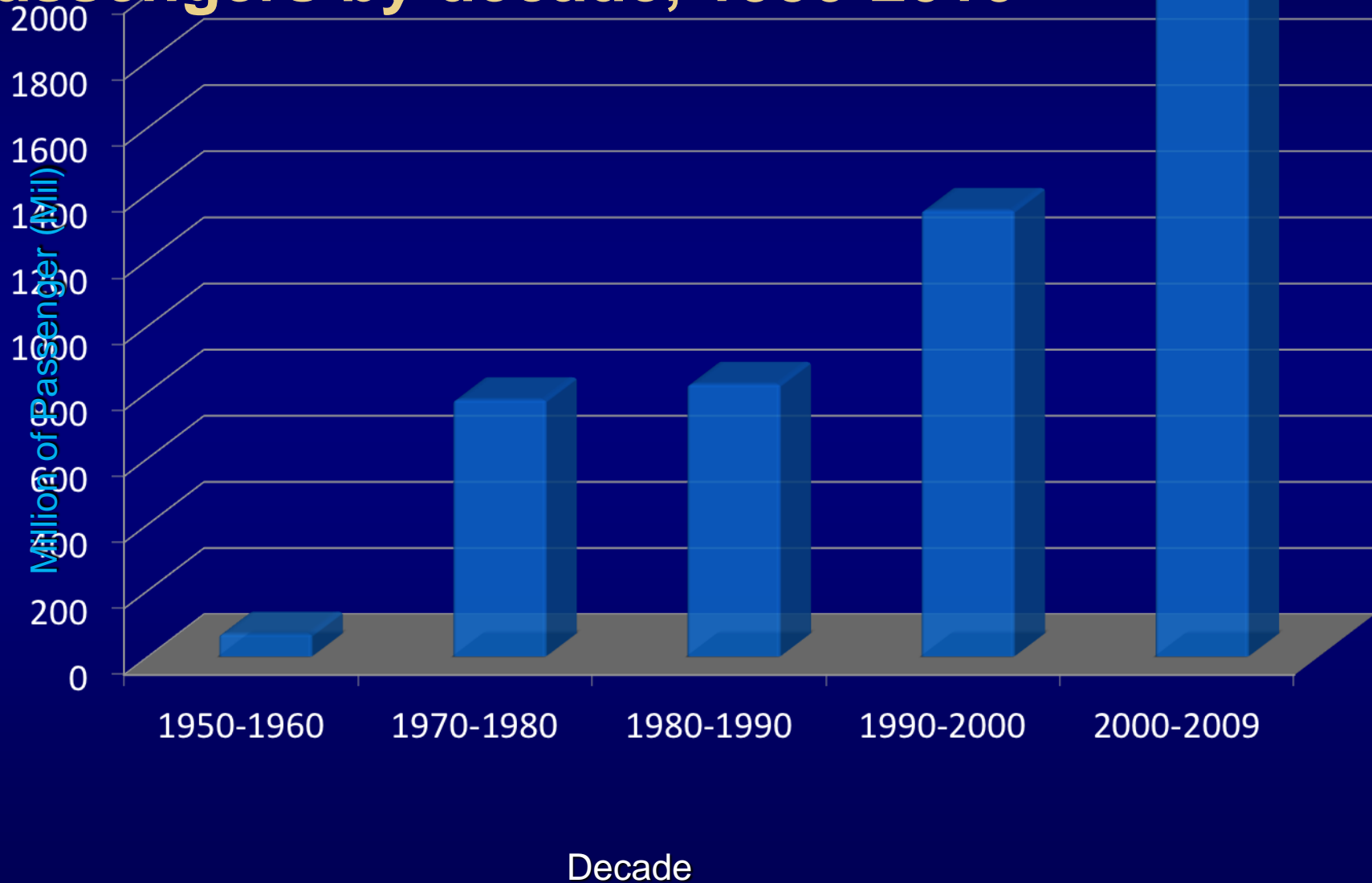
75% TO MALARIA AND 38% TO YELLOW FEVER ENDEMIC COUNTRIES

3% HAVE IMMUNE COMPROMISED CONDITIONS OR MEDICATIONS

***ONLY 40 % SOUGHT OUT PRE-TRAVEL CLINIC CONSULTATION***



# Average annual number of global airline passengers by decade, 1950-2010



# Commercial Air Traffic Over a 24 Hour Period

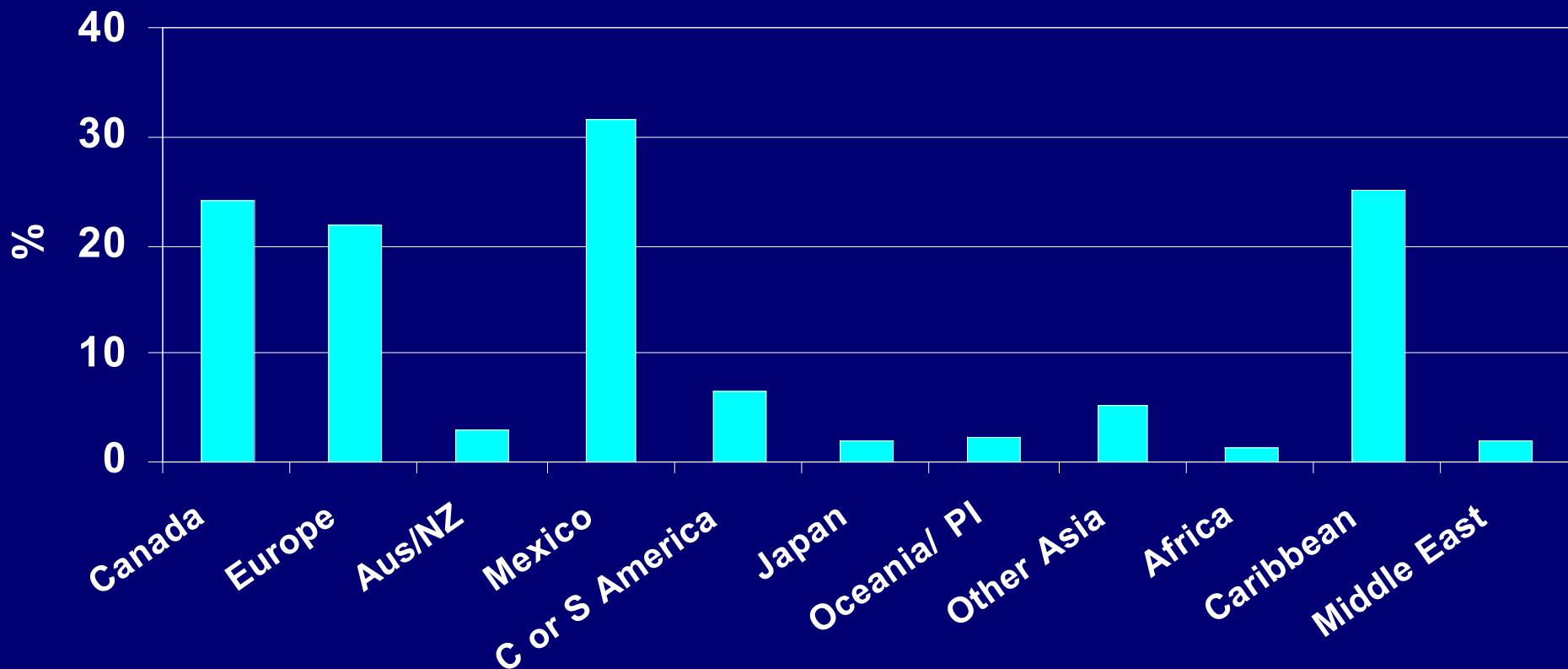


# The global air network

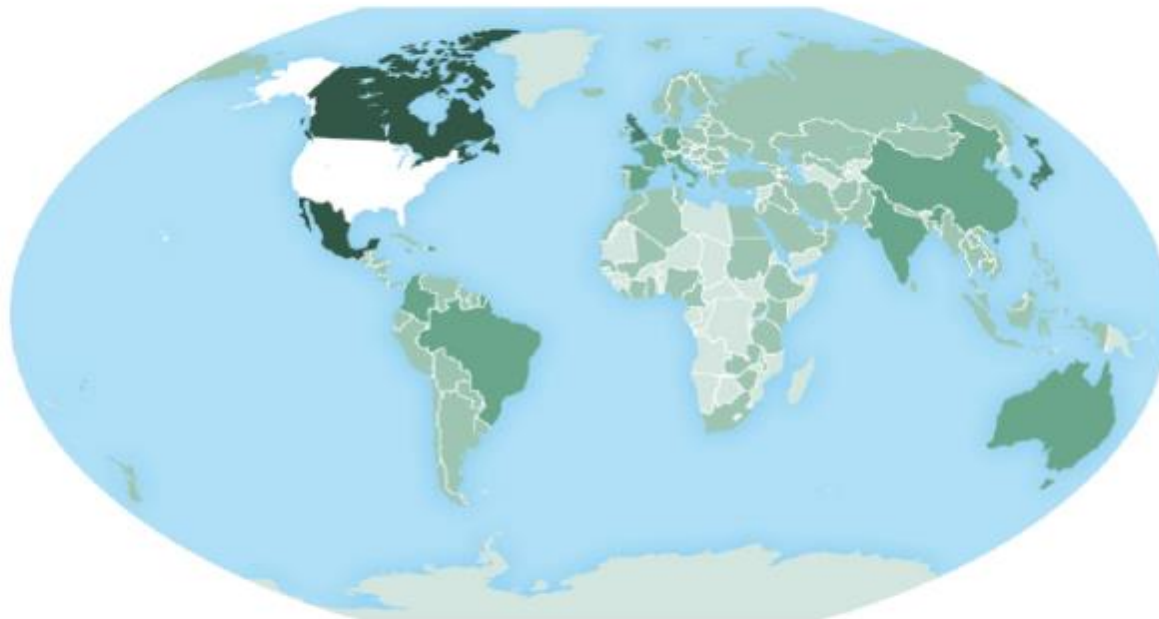


# Where Do U.S. Residents Travel?

Of the 17% who traveled outside the U.S. . . .



Source: HealthStyles Survey 2005



Estimated number of air passengers by destination



MAP 1-1. **Estimated number of US air travelers received<sup>1</sup>**

<sup>1</sup> Diio Market Intelligence, Fares and Market Sizes, Global [at [www.diio.net](http://www.diio.net)]

**Table 1-01. Estimated number of US air passengers departing to the top 10 destination countries, 2015**

Mexico	12,200,000	12.4%
Canada	12,100,000	12.3%
United Kingdom	7,100,000	7.2%
Japan	4,500,000	4.6%
China	3,500,000	3.5%
Dominican Republic	3,100,000	3.1%
Germany	2,800,000	2.8%
Brazil	2,800,000	2.8%
India	2,600,000	2.6%
Italy	2,500,000	2.5%
Other Countries	45,400,000	45.9%

**Table 9-04. International mass gathering events, 2019–2022**

EVENT TYPE	EVENT NAME	LOCATION	UPCOMING DATES	PROJECTED ATTENDANCE
Religious events	Kumbh Mela	Multiple locations in India: Allahbad, Haridwar, Madhya Pradesh, Maharashtra	2019 in Allahbad 2022 in Haridwar	40 million
	Arba'een Pilgrimage	Karbala, Iraq	October 2019	22 million
	Grand Magal of Touba	Touba, Senegal	October 2019	3 million
	Hajj	Mecca, Saudi Arabia	August 10, 2019 July 30, 2020	2.5 million
	Iztapalapa Passion Play	Mexico City, Mexico	Good Friday (annually)	2 million
	Urs of Fariduddin Ganjshakar	Pakpattan, Pakistan	September 2019	500,000
Sporting events	2020 Summer Olympics	Tokyo, Japan	July 24–August 9, 2020	7.5 million
	FIFA World Cup	Qatar	November 21–December 18, 2022	3 million
	2022 Winter Olympics	Beijing, China	February 4–20, 2022	1 million
Art and music festivals	Edinburgh Festival Fringe	Edinburgh, Scotland	August 2–26, 2019	2.5 million
	Street Parade	Zurich, Switzerland	2nd Saturday in August	1 million

# Major Factors Contributing to the Emergence of Infectious Diseases

1. Human demographics and behavior
2. Technology and industry
3. Economic development and land use
4. International travel and commerce
5. Microbial adaptation and change
6. Breakdown of public health measures

*Institute of Medicine Report 1992*



# WHAT IS A PANDEMIC?

**AN EPIDEMIC IS A DISEASE THAT OCCURS WITH  
GREATER FREQUENCY THAN EXPECTED**

**A PANDEMIC IS AN EPIDEMIC THAT SPREADS ALL OVER THE  
WORLD, OR A MAJOR REGION OF THE WORLD (E.G., A CONTINENT)**

## EPIDEMICS AND PANDEMICS

***EPI* = UPON; *DEMIC* = “THE PEOPLE”**

***PAN* = “ALL OVER”; *DEMIC* = “THE PEOPLE”**

**WELL-KNOWN PANDEMICS INCLUDE AIDS, TB, MALARIA (IN ALL  
TROPICAL REGIONS) AND THE “BLACK DEATH” OF THE 14TH  
CENTURY (BUBONIC/PNEUMONIC PLAGUE)**

# World Health Organization Pandemic Phase

Inter-pandemic phase New virus in animals, no human cases	Low risk of human cases	1
	Higher risk of human cases	2
Pandemic alert New virus causes human cases	No or very limited human-to-human transmission	3
	Evidence of increased human-to-human transmission	4
	Evidence of significant human-to-human transmission	5
Pandemic	Efficient and sustained human-to-human transmission	6

**Current Phase is “3”**



# History of Influenza

- 412 BC - first mentioned by Hippocrates
- 1580 - first pandemic described
- 1580 - 1900 - 28 pandemics



<b>Influenza Types</b>	<b>Hosts</b>
<b>Type A</b>	<b>Humans, birds, pigs and horses</b>
<b>Type B</b>	<b>Humans only</b>
<b>Type C</b>	<b>Humans only</b>



# How flu viruses change

*“Some of the commonest infections have a particular ability to change, influenza viruses being the chameleons of the microbial world.”*

Getting Ahead of the Curve – a strategy for combating infectious diseases  
– A report by the Chief Medical Officer, January 2002

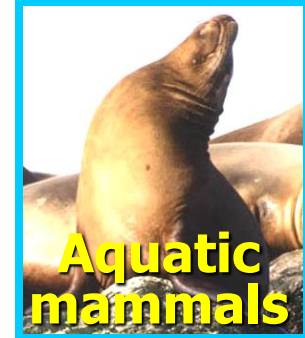
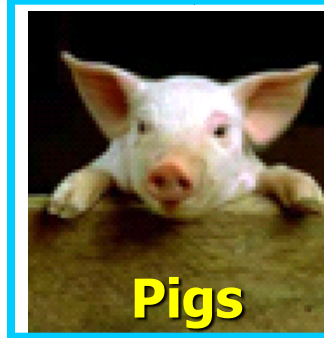


# Influenza's Gonna Do What Influenza Does: **Change!**



## Influenza A

- H1 - H17
- N1 - N10



# History of influenza pandemics





# What is a flu pandemic?

- Flu pandemics are global epidemics of a newly emerged strain of flu (a new influenza **A** subtype)
- Three pandemics in the last century
- Worst killed 20 - 40 million worldwide – more lives lost than during the First World War



# What causes pandemic flu?

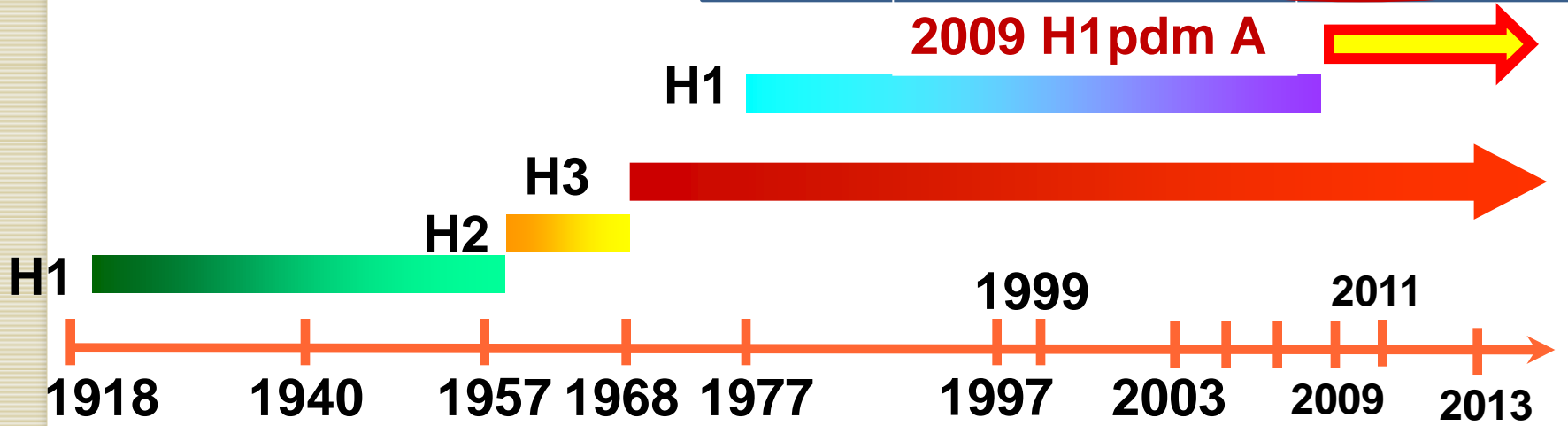
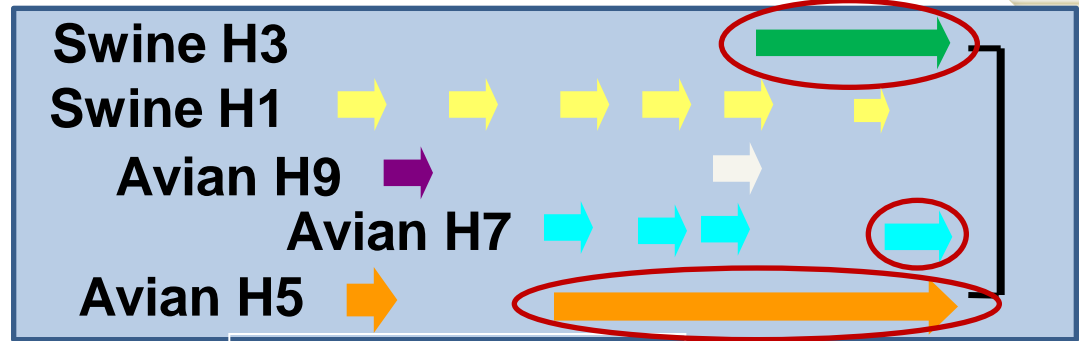
- Emergence of a new flu virus
- New virus passes easily from person to person
- Few, if any, people have any immunity
- This allows it to spread widely, easily and to cause more serious illness



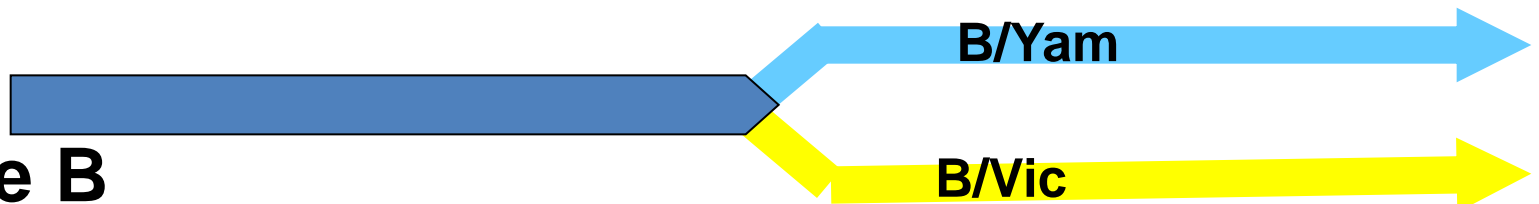


# Timeline of Emergent and Pandemic Influenza Viruses in Humans

## Type A



## Type B



# Change

- Particular characteristic that enables influenza **A** viruses to cause annual epidemics, even pandemics
- Type **A** viruses undergo frequent changes in their surface antigens or proteins
- Minor changes - *antigenic drift*
- Major changes - *antigenic shift*



# Antigenic drift

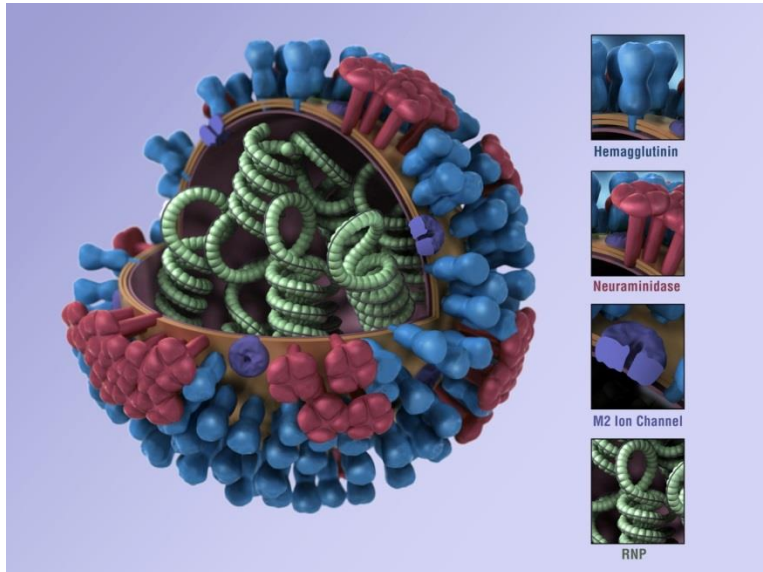
- Occurs among influenza **A** viruses resulting in emergence of new variants of prevailing strains every year
- New variants result in seasonal flu each winter
- Some years are worse than others – partly related to degree of ‘drift’



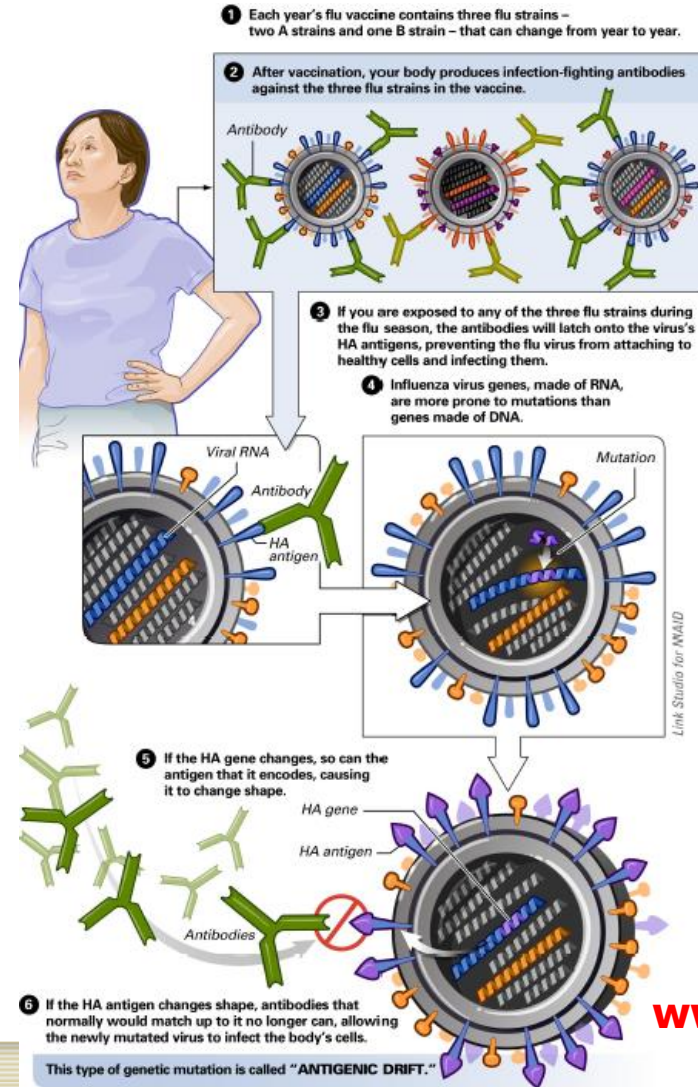


# The Changeability of Influenza

## *Antigenic Drift* → *Seasonal Influenza*



**Antigenic Drift**  
 Manifests in HA and NA as a result of continuous and gradual accumulation of point mutations in the HA and NA genes



[www.flu.gov](http://www.flu.gov)

# Antigenic shift

- Major changes occur in the surface antigens of influenza **A** viruses
- Occurs by mutation or by 'reassortment' between viruses
- Changes are more significant than those associated with antigenic drift
- Changes lead to emergence of potentially pandemic strains by creating a virus that is markedly different from recently circulating strains

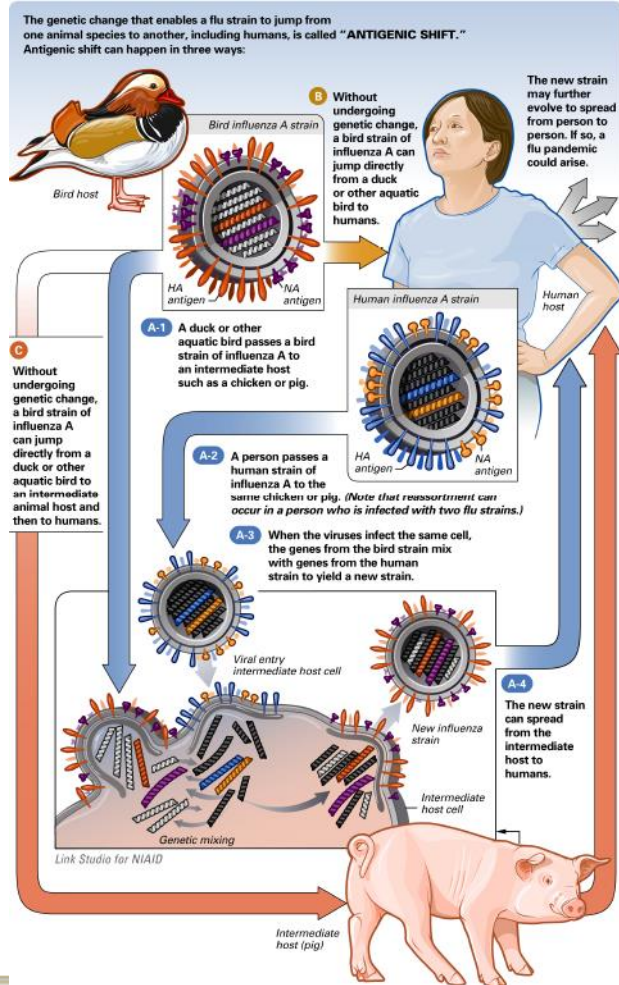




# The Changeability of Influenza

## *Antigenic Shift*

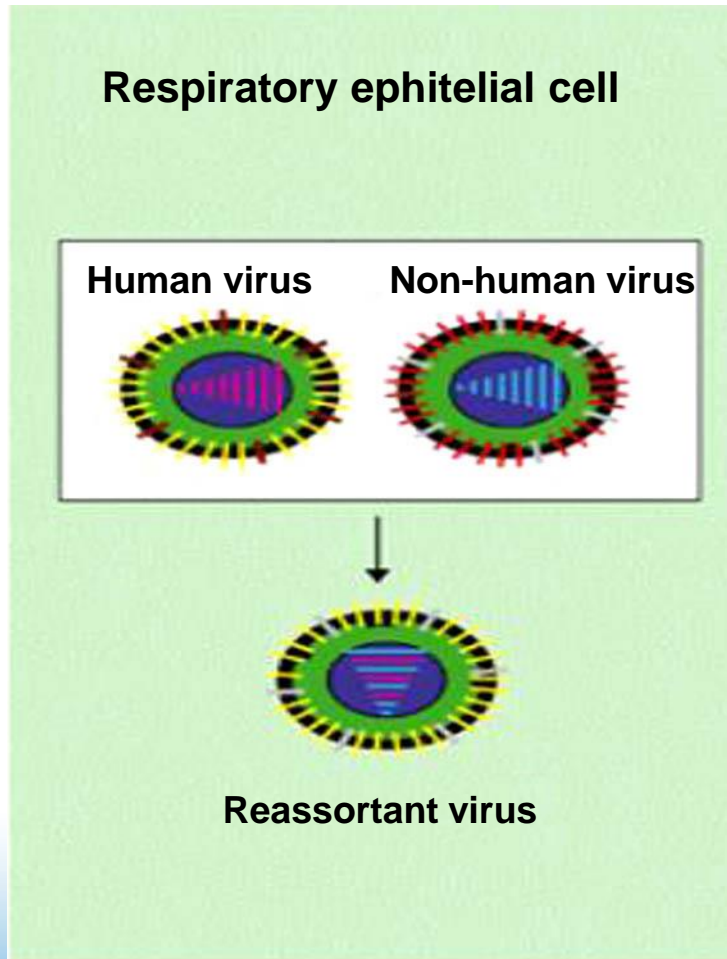
[www.flu.gov](http://www.flu.gov)



**Antigenic Shift**  
When a new subtype (a novel HA and/or NA) of influenza A emerges in the host (humans)

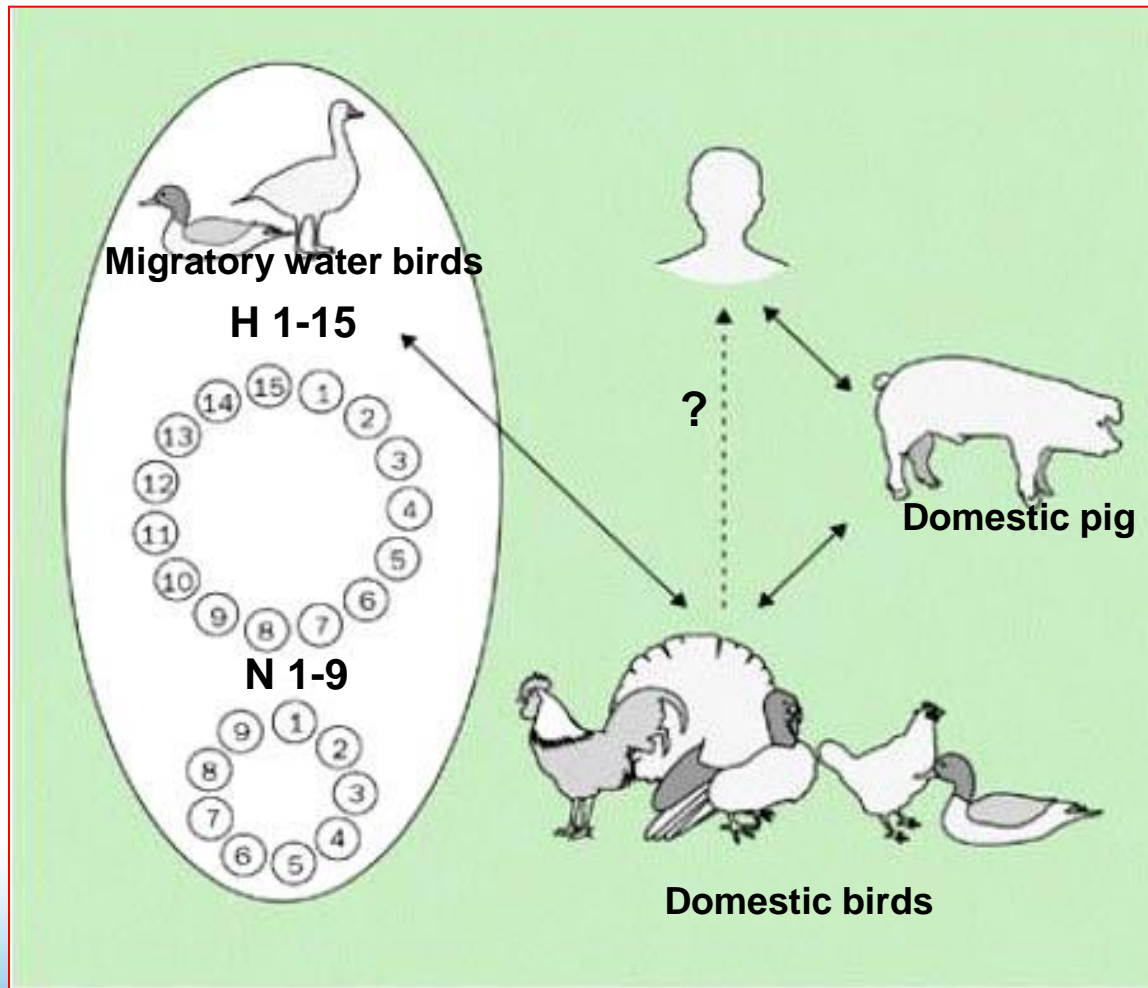


# How antigenic shift can occur



Karl G Nicholson, John M  
Wood, Maria Zambon  
Lancet 2003; 362: 1733-45

# Origin of Pandemic Influenza



Karl G Nicholson, John M Wood, Maria Zambon  
Lancet 2003; 362: 1733-45

# Past Antigenic Shifts: Pandemics in the 20th Century

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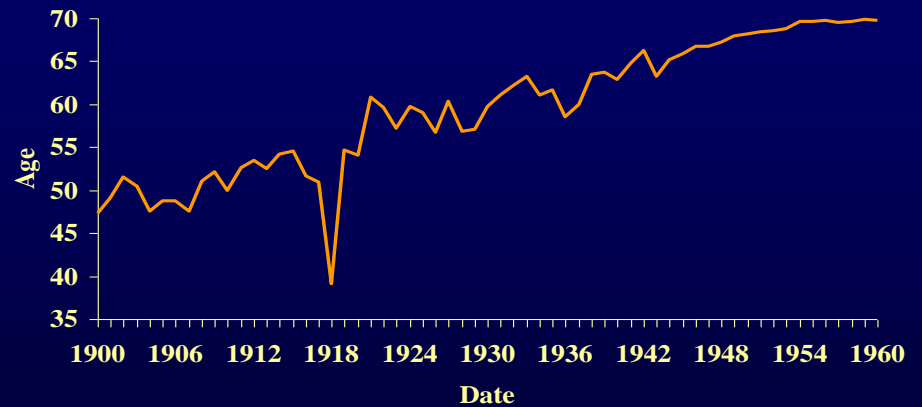
			<b>Global Deaths</b>
<b>1918</b>	<b>H1N1</b>	<b>Spanish Flu</b>	<b>&gt;50 million</b>
<b>1957</b>	<b>H2N2</b>	<b>Asian Flu</b>	<b>1-2 million</b>
<b>1968</b>	<b>H3N2</b>	<b>Hong Kong Flu</b>	<b>700,000</b>



## MOST FATAL EVENT IN HUMAN HISTORY

WORLDWIDE FATALITIES:  
50-100 MILLION

US FATALITIES:  
675,000

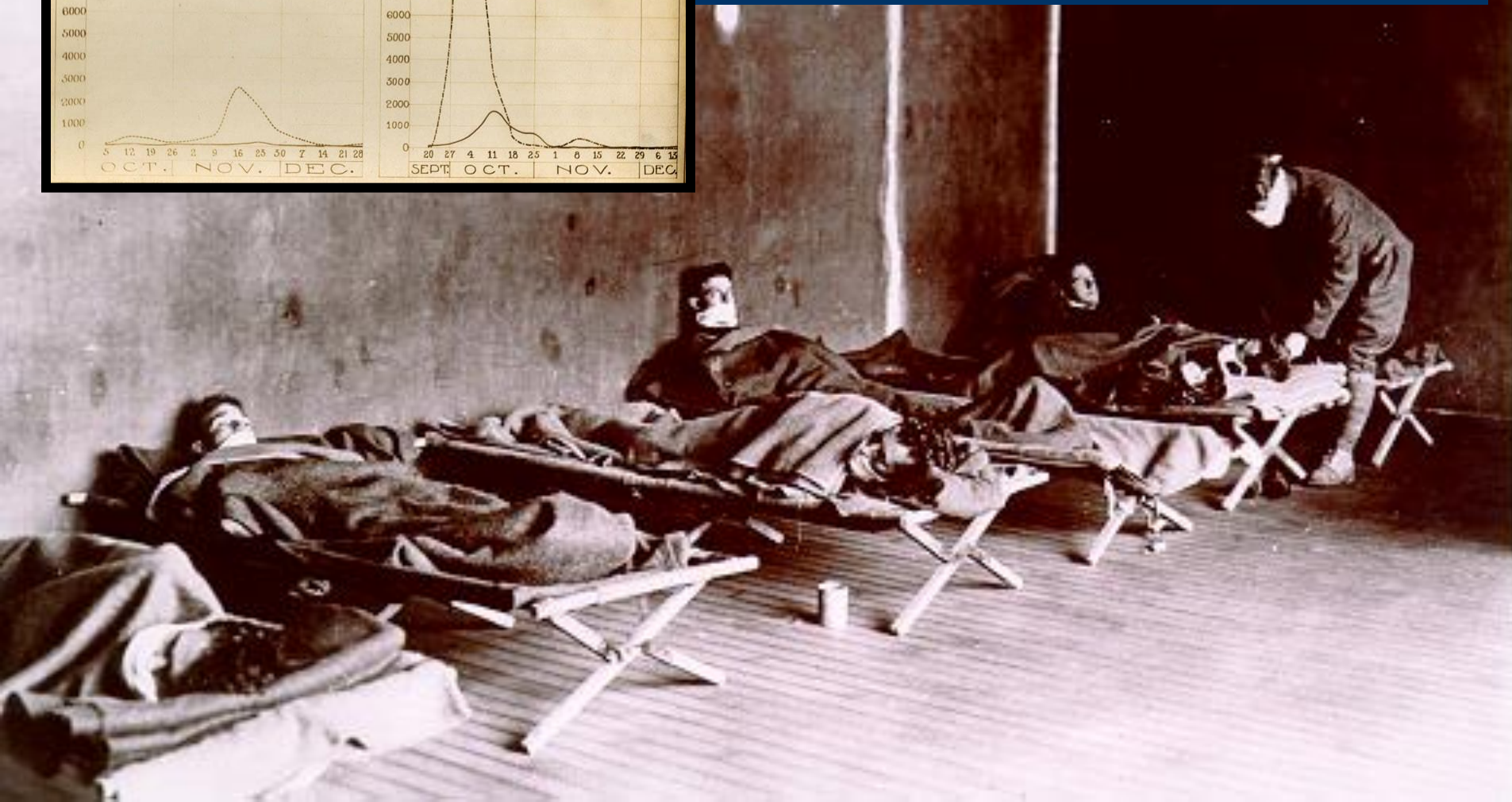
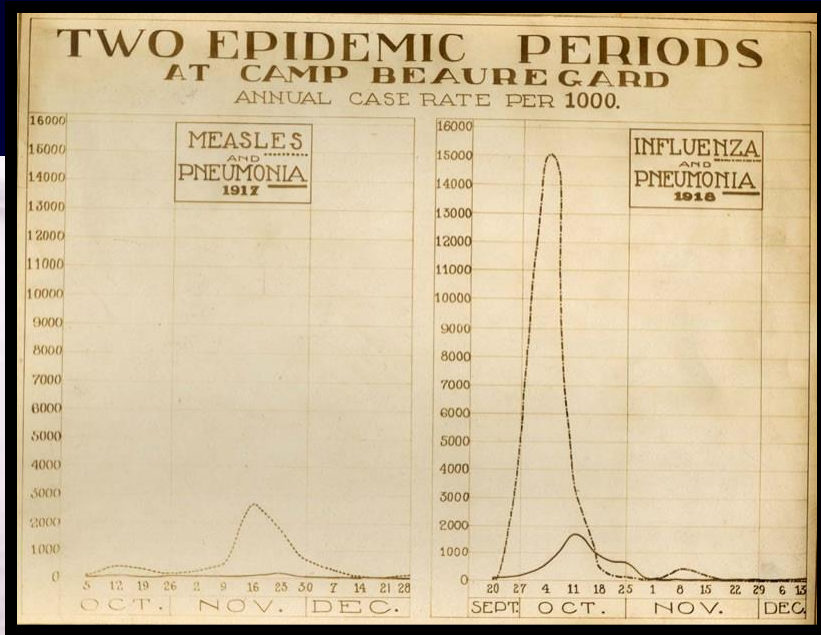


**U.S. LIFE EXPECTANCY AT BIRTH**

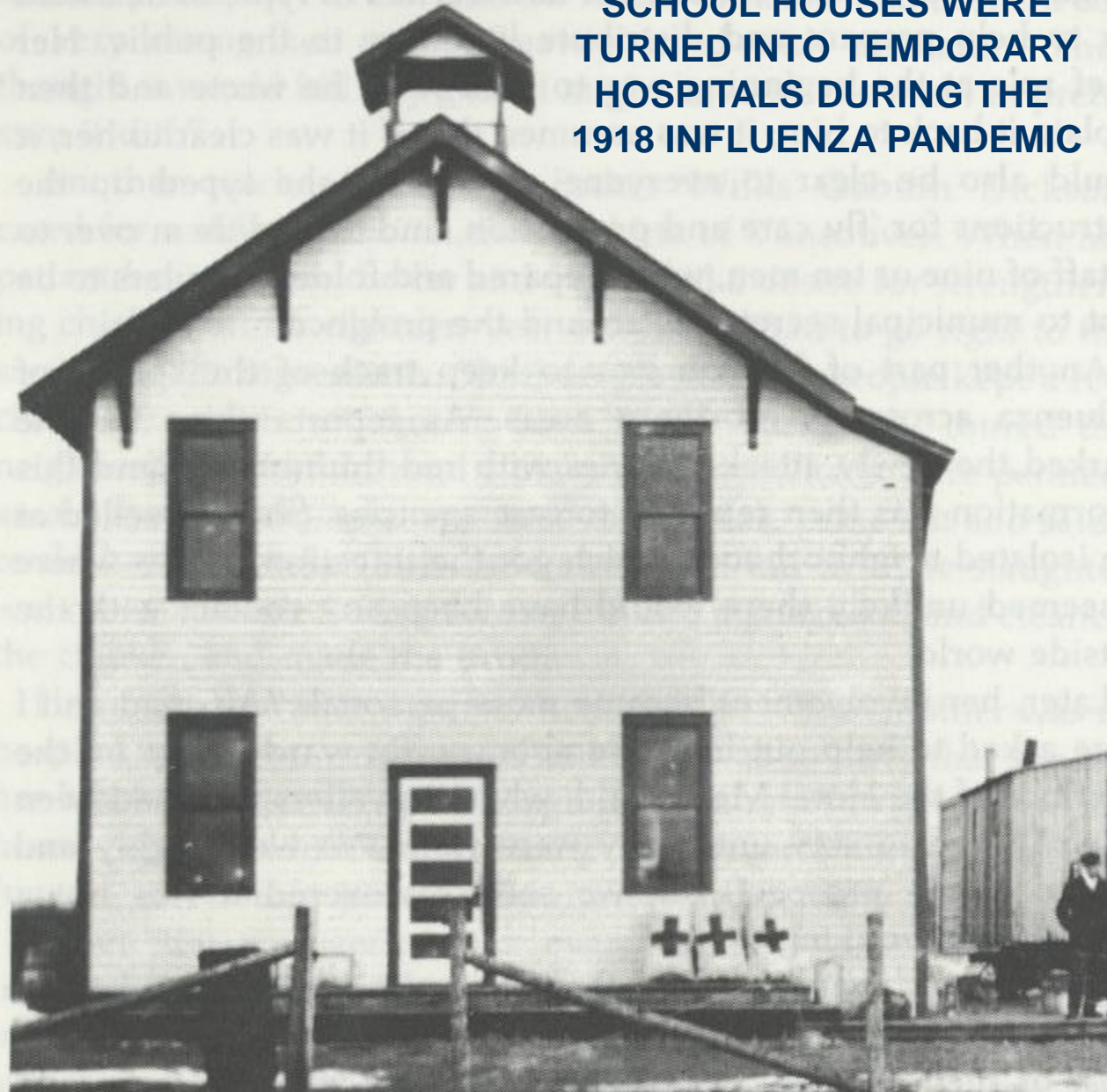
# WHAT KILLED INFLUENZA VICTIMS?



**U. S. Army training camp  
and other military outbreaks  
were deadly but well studied  
medically/epidemiologically**



**SCHOOL HOUSES WERE  
TURNED INTO TEMPORARY  
HOSPITALS DURING THE  
1918 INFLUENZA PANDEMIC**



# 6,000,000 DEATHS FROM INFLUENZA

This Is Estimate For World, For  
Past 12 Weeks:

RECALLS BLACK DEATH

"Flu" Five Times Deadlier  
Than World War.

LONDON, Dec. 18.—Canadian Press, via Reuter's.)—The Times' medical correspondent says that it seems reasonable to believe that about 6,000,000 persons perished from influenza pneumonia during the past 12 weeks. It has been estimated that the war caused the death of 20,000,000 persons in four and a half years.

Thus, the correspondent points out, influenza has proved itself five times deadlier than war, because, in the same

# INFLUENZA DEATH RATE IN ONTARIO

London's Fatality List 326 Per 100,000  
of Population.

Statistics compiled by Dr. J. W. S. McCullough, chief officer of health for Ontario, indicate that in none of the cities in this province was the death rate from Spanish influenza and complications as great as in the United States cities. Toronto's death rate is given as 327 per 100,000. Kingston was the hardest hit in Ontario, the rate being 644 per 100,000. Winnipeg suffered the most of any Canadian city, according to the figures now available. The death rate in that city was 744 per 100,000.

Camp Sheridan, Ohio, where 22,000 soldiers were encamped, had the heaviest death rate of all, it being 2,561 to 100,000 of population.

The figures, which cover an approximate period of six weeks, are:

Cities	Deaths from Influenza and Complications, Chills Pneumonia.	Death Rate Per 100,000 Population
Port William	45	328
Nault Ste. Marie	41	319
Ottawa	570	548
Port Arthur	30	181
Windsor	33	105
Kingston	148	644
London	187	294
Toronto	1,500	327
St. John, N. B.	136	306
Winnipeg	366	744
Montreal	2,135	433
Halifax	152	313
Hamilton	344	333
United States Figures		
Boston	2,064	321
Pittsburg	2,594	721
Philadelphia	12,587	519
Washington	1,544	501
Camp Sheridan, O.	2,561	2,561
New York	22,760	400





**INDOOR CHURCH SERVICES WERE  
BANNED BY HEALTH DEPARTMENTS**



# Lessons from past pandemics

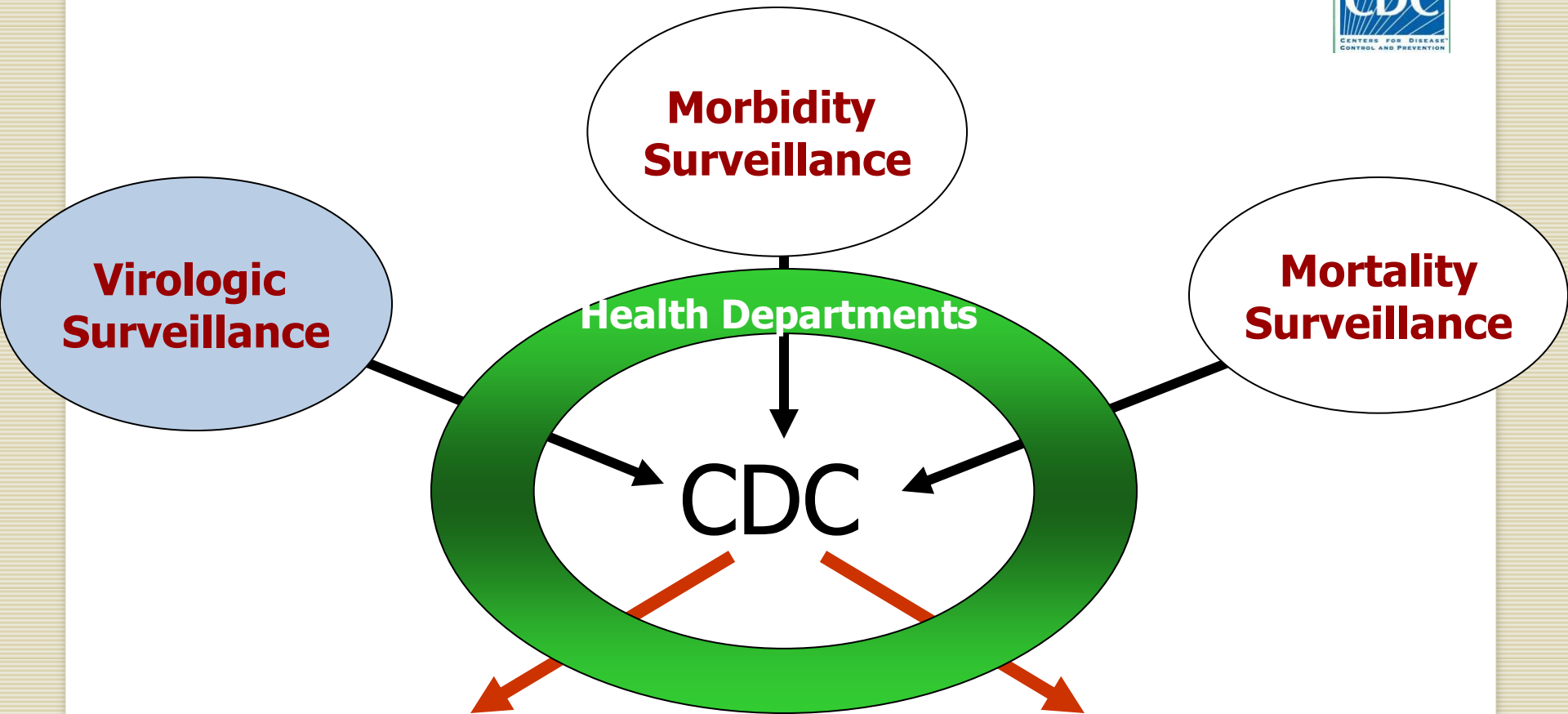
- Occurs unpredictably, not always in winter
- Great variations in mortality, severity of illness and pattern of illness or age most severely affected
- Rapid surge in number of cases over brief period of time, often measured in weeks
- Tend to occur in waves - subsequent waves may be more or less severe

**Key lesson - unpredictability**



# U.S. Influenza Surveillance

[www.cdc.gov/flu/weekly](http://www.cdc.gov/flu/weekly)



**FLUVIEW**

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

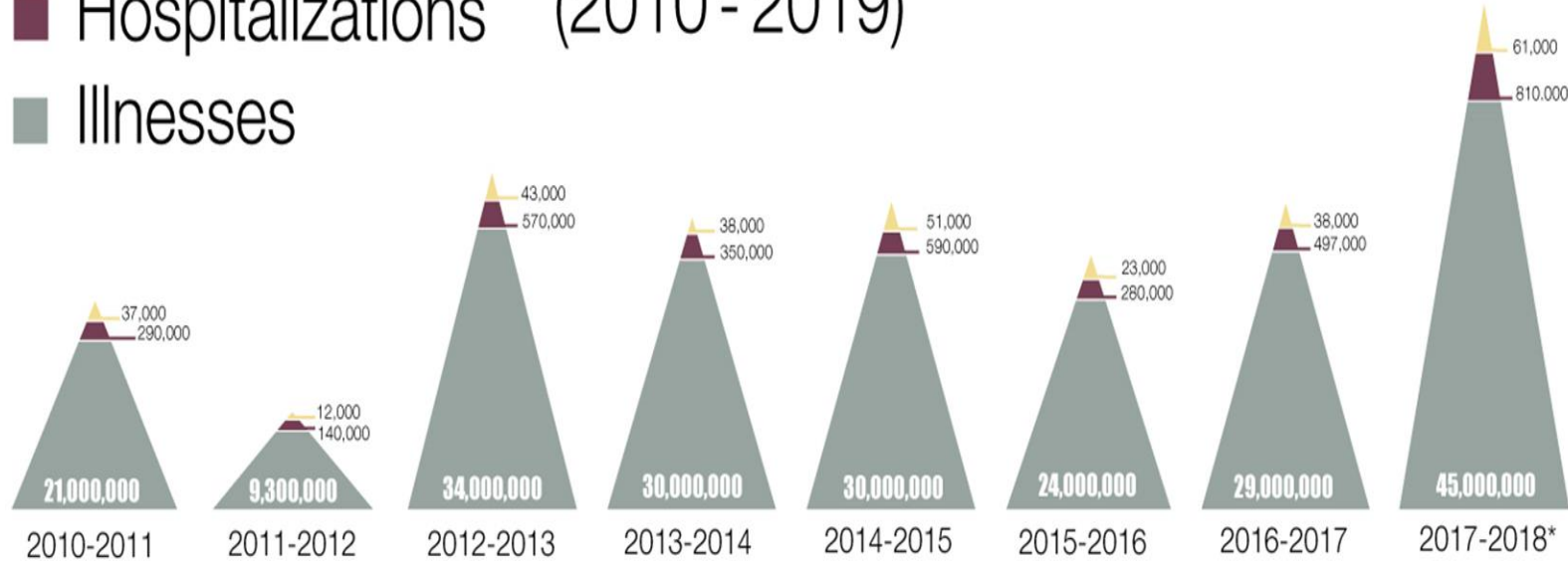
**State-level data to state surveillance coordinators**

WISCONSIN STATE LABORATORY OF HYGIENE - UNIVERSITY OF

# Estimated Influenza Disease Burden, by Season United States, 2010-11 through 2017-18 Influenza Seasons

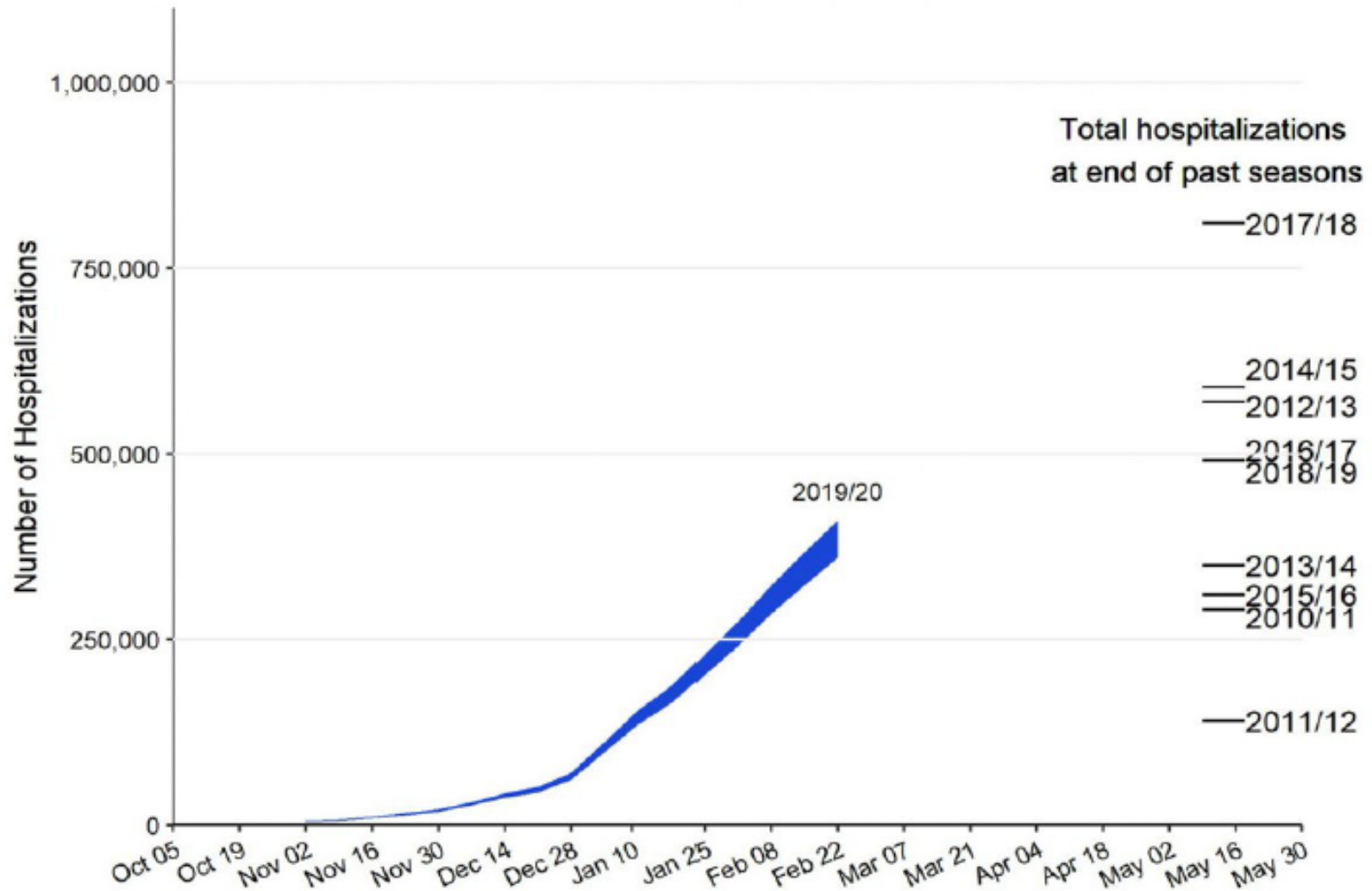
- Deaths
- Hospitalizations
- Illnesses

Estimated U.S. Influenza Burden, By Season  
(2010 - 2019)



\*Estimates for these seasons are preliminary and may change as data are finalized.

# Preliminary Cumulative Estimates of Hospitalizations in the U.S. 2019-2020 Flu Season



# Influenza (Flu)

## 2019 – 2020 U.S. Flu Season: Preliminary Burden Estimates

CDC estimates\* that, from **October 1, 2019**, through **February 22, 2020**, there have been:

**32,000,000 – 45,000,000**  
flu **illnesses**



**14,000,000 – 21,000,000**  
flu **medical visits**



**310,000 – 560,000**  
flu **hospitalizations**



**18,000 – 46,000**  
flu **deaths**



# ***FLU: Everyone 6 months & older needs flu vaccine every year***



Even healthy people can get the flu, and it can be serious.  
Everyone 6 months and older should get a flu vaccine. This means you.  
This season, protect yourself—and those around you—by getting a flu vaccine.

<http://www.flu.gov> • 1-800-CDC-INFO

Get the facts.  
Get vaccinated.

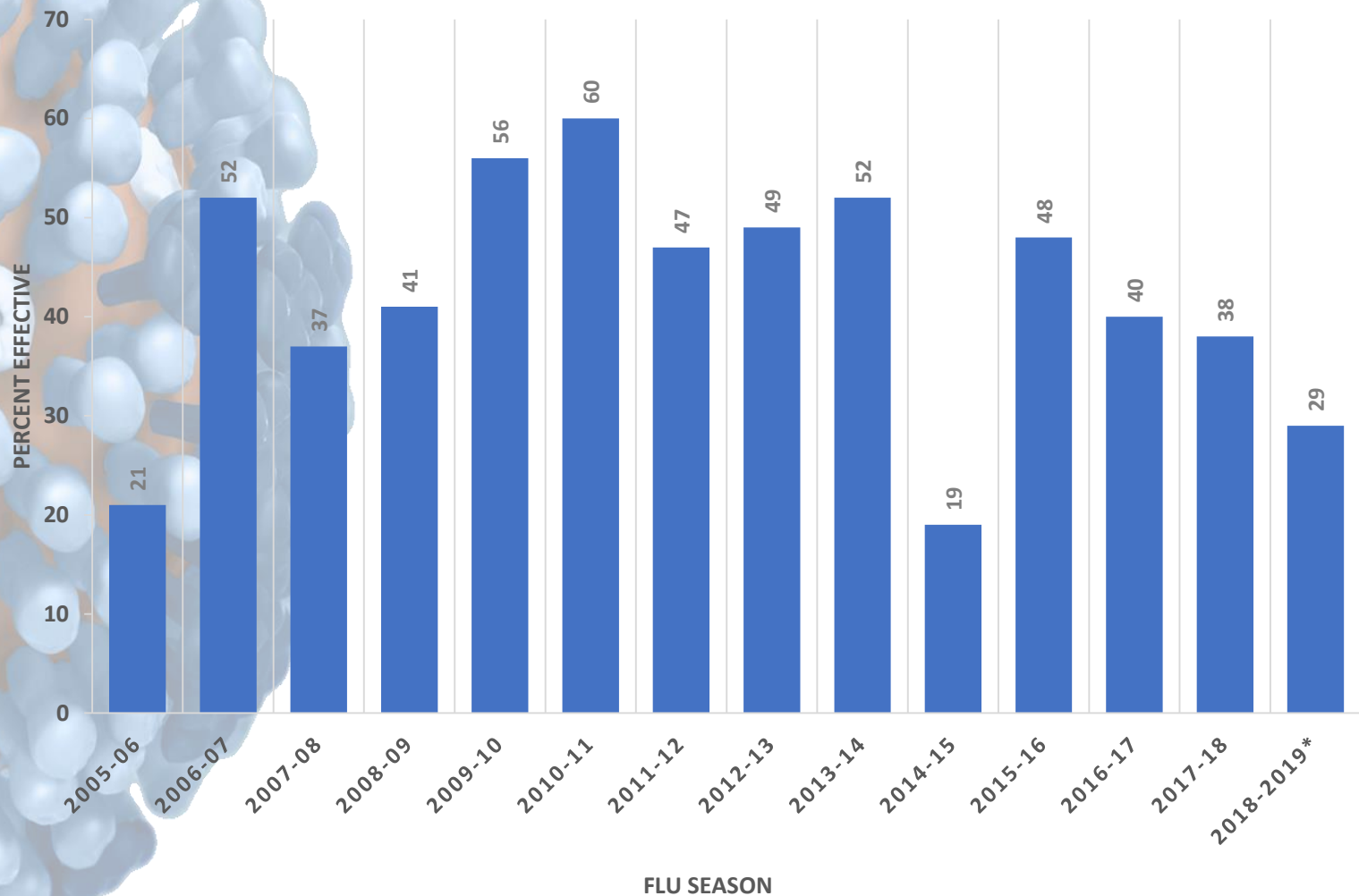


U.S. Department of  
Health and Human Services  
Centers for Disease  
Control and Prevention

CS233062-AB



# Effectiveness of Seasonal Flu Vaccines from the 2005 – 2019 Flu Seasons



\*Vaccine effectiveness estimates for 2018-2019 were presented to [ACIP on June 27, 2019](#).  
Source: <https://www.cdc.gov/flu/professionals/vaccination/effectiveness-studies.htm>

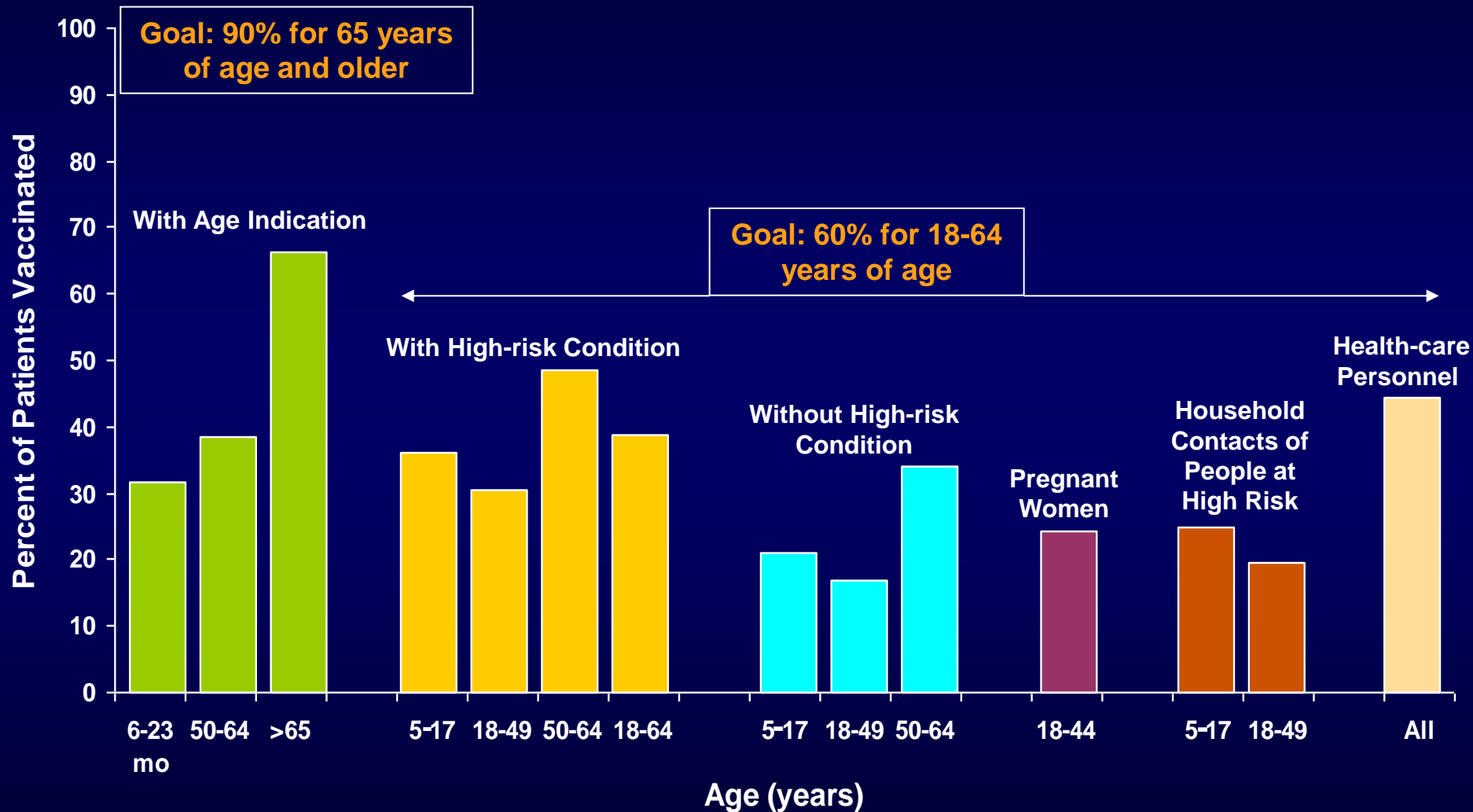
# Adjusted Vaccine Effectiveness Estimates For Influenza Seasons from 2005 – 2019

Influenza Season	Reference	Study Site(s)	No. of Patients	Adjusted Overall VE (%)	95% CI
2005-06	<a href="#">Belongia 2009</a>	WI	346	21	-52, 59
2006-07	<a href="#">Belongia 2009</a>	WI	871	52	22, 70
2007-08	<a href="#">Belongia 2011</a>	WI	1914	37	22, 49
2008-09	Unpublished	WI, MI, NY, TN	6713	41	30, 50
2009-10	<a href="#">Griffin 2011</a>	WI, MI, NY, TN	6757	56	23, 75
2010-11	<a href="#">Treanor 2011</a>	WI, MI, NY, TN	4757	60	53, 66
<a href="#">2011-12</a>	<a href="#">Ohmit 2014</a>	WI, MI, PA, TX, WA	4771	47	36, 56
<a href="#">2012-13</a>	<a href="#">McLean 2014</a>	WI, MI, PA, TX, WA	6452	49	43, 55
<a href="#">2013-14</a>	<a href="#">Gaglani 2016</a>	WI, MI, PA, TX, WA	5999	52	44, 59
<a href="#">2014-15</a>	<a href="#">Zimmerman 2016</a>	WI, MI, PA, TX, WA	9311	19	10, 27
<a href="#">2015-16</a>	<a href="#">Jackson 2017</a>	WI, MI, PA, TX, WA	6879	48	41, 55
<a href="#">2016-17</a>	<a href="#">Flannery 2018</a>	WI, MI, PA, TX, WA	7410	40	32, 46
<a href="#">2017-18</a>	<a href="#">Rolfes 2019</a>	WI, MI, PA, TX, WA	8,436	38	31, 43
2018-19*	<a href="#">Unpublished Final Estimates*</a>	WI, MI, PA, TX, WA	10,041	29*	21, 35

\*Vaccine effectiveness estimates for 2018-2019 were presented to [ACIP on June 27, 2019](#).

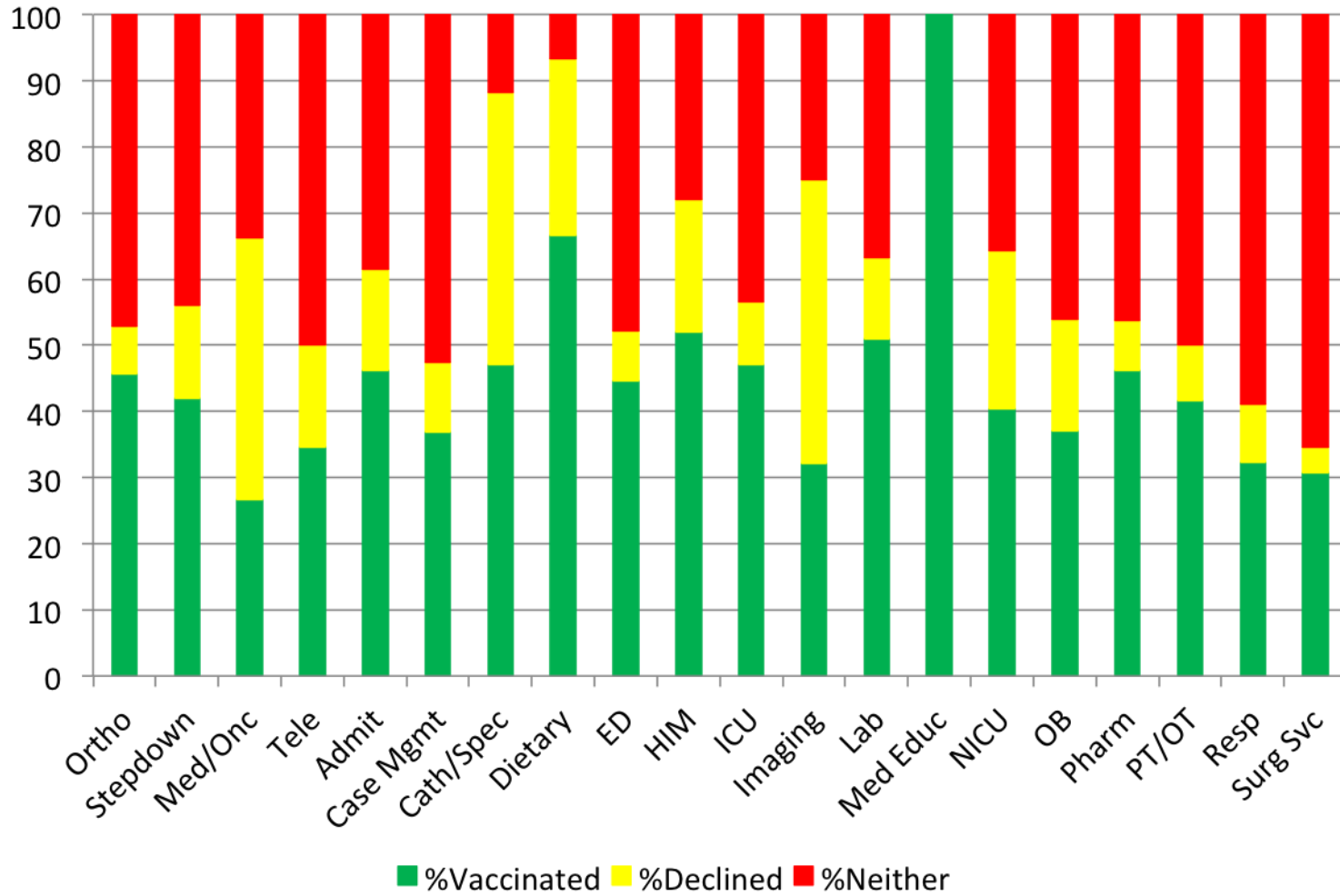
Source: [https://www.cdc.gov/flu/professionals/vaccination/effectiveness\\_studies.htm](https://www.cdc.gov/flu/professionals/vaccination/effectiveness_studies.htm)

# Influenza Immunization Rates:<sup>a</sup> Well Below *Healthy People 2010* Goals<sup>1,2</sup>



<sup>a</sup> All rates are for 2007-2008 influenza season, except 6-23 months of age and health-care personnel (2006-2007).

## Staff Influenza Vaccination





**It's NOT all about influenza....  
other diseases of public health  
importance.....**



# All\* About 2019 Novel Coronavirus (2019-nCoV)



**\* AS FAR AS WE KNOW !!!!!!!!!!!**

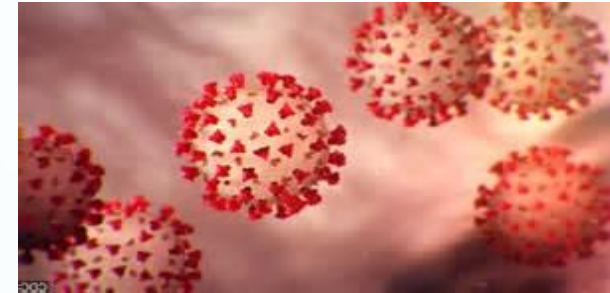
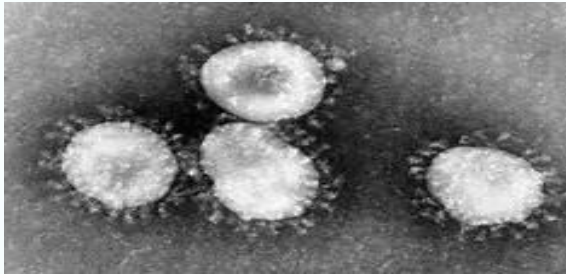


# What is 2019 novel coronavirus?



# HUMAN CORONAVIRUSES

## HCoVs



Historically, Inconsequential pathogens – Common Cold Viruses (10%-30%)

Large, enveloped, **RNA** viruses

4 Genera: **alpha** and **beta** (known to infect humans): delta, gamma

4 **Endemic** Globally (HCoV 229E, NL63, OV43, and HKU1) – URI's

Ecologically diverse; greatest variety in bats (act as reservoirs)

Peri-domestic mammals serve as intermediate hosts  
(facilitate mutation/expansion of genetic diversity)

Surface spike (S) glycoprotein critical for binding to Host cell receptors  
(represent key determinant of host range restriction)





**Little Attention was given due to MILD phenotypes**

**THEN 2002:**

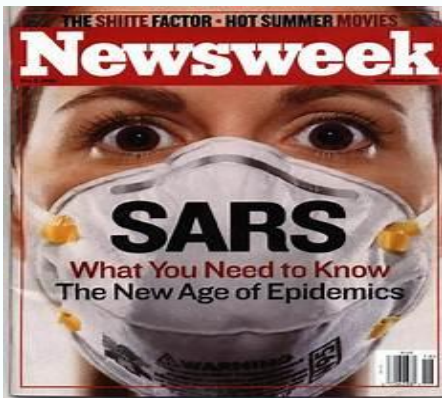
**Several cases of Atypical Pneumonia in Guangdong Province, China**

**SEVERE ACUTE RESPIRATORY SYNDROME (SARS): SARS – CoV (beta HCoV)**

**Spread via international travel >12 countries**

**Human-Animal contact; live game markets; early cases; Zoonotic transmission)**

**Bats were the natural hosts**



**Common Symptoms: Fever, Cough, Dyspnea, occasional watery Diarrhea**  
**20%-30% of those known infected required Mechanical Ventilation**

**10% Mortality: mostly elderly with co-morbidities**

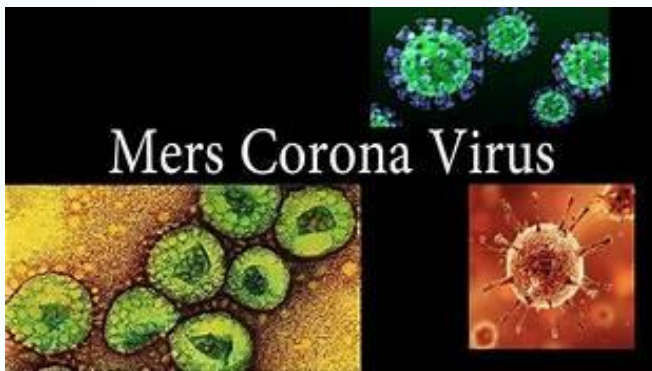
**Human-to-Human transmission: mostly in Healthcare facilities**

**Primary SARS S glycoprotein receptor, Angiotensin-Converting-Enzyme (ACE2)**  
**(found primarily in the lower respiratory tract, explains nosocomial spread)**

**Community Transmission: Hotel Metropole, Hong Kong- travel spread worldwide**

**Evidence that Airborne transmission of SARS-CoV can occur**

**Public Health measures brought the pandemic to an end !**  
**8098 infected persons; 774 died**



**And then  
....2012**



## **Middle East Respiratory Syndrome MERS-CoV**

- highly-pathogenic beta-CoV
- identified in sputum of a Saudi man; died, respiratory failure

**Sporadic zoonotic transmission; bats to dromedary camels to humans**

- limited chains of human spread
- no sustained community spread
- explosive nosocomial transmission

**Severe atypical pneumonia, prominent GI symptoms, acute renal failure**

- MERS-CoV S glycoprotein binds to dipeptidyl peptidase (DPP4)
- DPP4 present in lower airway as well as GI tract and Kidney

**50%-89% Mechanical ventilation, 36% case fatality rate**

**2494 cases; 858 deaths (as of November 2019)**



## MERS-coronavirus

MIDDLE EAST RESPIRATORY SYNDROME

INFOGRAPHICS



### MERS

Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by a coronavirus (MERS-CoV) that was first identified in Saudi Arabia in 2012.

### TRANSMISSION



It is believed that humans can be infected through direct or indirect contact with infected dromedary camels in the Middle East.

INCUBATION PERIOD

2-14 DAYS



### SIGNS AND SYMPTOMS



FEVER



DIARRHEA



VOMITING



COUGH



# HCoV<sub>s</sub> – COMPARE and CONTRAST

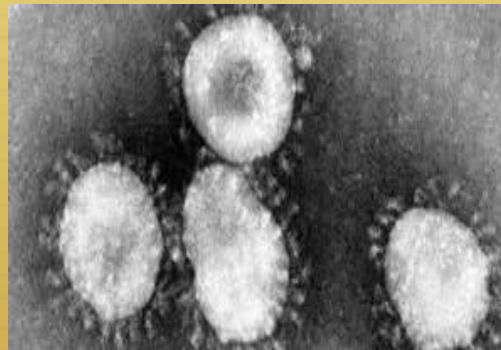
**Table 1. Pathogenicity and Transmissibility Characteristics of Recently Emerged Viruses in Relation to Outbreak Containment.**

Virus	Case Fatality Rate (%)	Pandemic	Contained	Remarks
2019-nCoV	Unknown*	Unknown	No, efforts ongoing	
pH1N1	0.02–0.4	Yes	No, postpandemic circulation and establishment in human population	
H7N9	39	No	No, eradication efforts in poultry reservoir ongoing	
NL63	Unknown	Unknown	No, endemic in human population	
SARS-CoV	9.5	Yes	Yes, eradicated from intermediate animal reservoir	58% of cases result from nosocomial transmission
MERS-CoV	34.4	No	No, continuous circulation in animal reservoir and zoonotic spillover	70% of cases result from nosocomial transmission
Ebola virus (West Africa)	63	No	Yes	

\* Number will most likely continue to change until all infected persons recover.

BRIEF REPORT

# A Novel Coronavirus from Patients with Pneumonia in China, 2019





**AND NOW..**  
**2019-2020**





**December 31, 2019**

**Chinese report cluster of  
Pneumonia cases  
Wuhan, China**



**Most patients reported exposure to a large seafood market selling many species of live animals**

**January 10, 2020; Shanghai Public Health Clinical Center released full genomic sequence of 2019-nCoV; similar to SARS-CoV**

**Named **COVID-19** or **SARS-CoV 2****

**- may use same ACE2 receptor in respiratory tract**

**15 HCWs at Wuhan hospital infected via Nosocomial Transmission**

**Now sustained Human-to-Human community spread**

**First travel related case in USA January 21, 2020; Chinese man visited Wuhan**



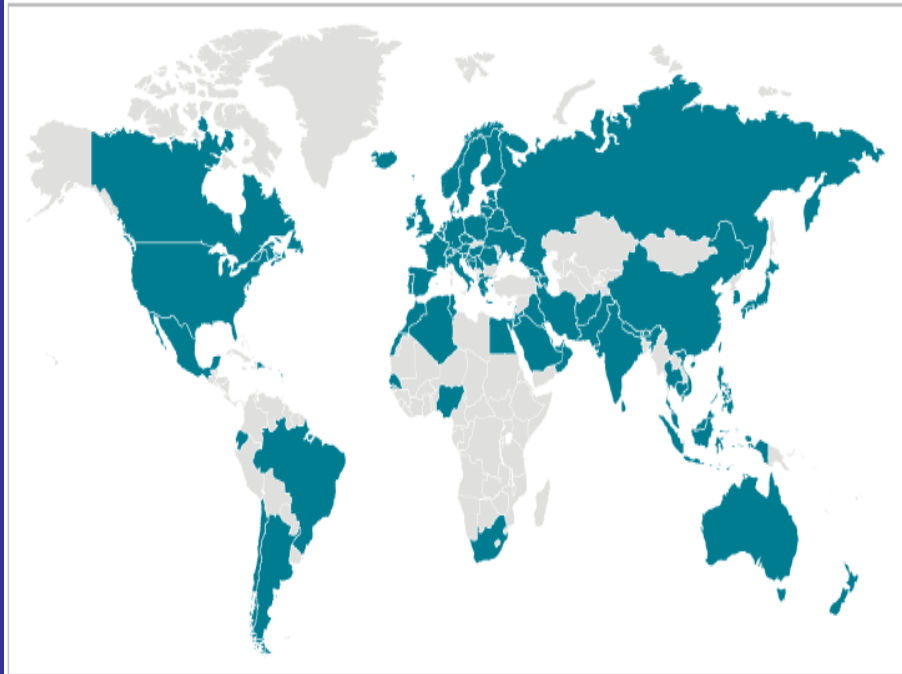
**Table 1. Characteristics of Patients with Novel Coronavirus–Infected Pneumonia in Wuhan as of January 22, 2020.\***

Characteristic	Before January 1 (N=47)	January 1 –January 11 (N=248)	January 12 –January 22 (N=130)
Median age (range) — yr	56 (26–82)	60 (21–89)	61 (15–89)
Age group — no./total no. (%)			
<15 yr	0/47	0/248	0/130
15–44 yr	12/47 (26)	39/248 (16)	33/130 (25)
45–64 yr	24/47 (51)	106/248 (43)	49/130 (38)
≥65 yr	11/47 (23)	103/248 (42)	48/130 (37)
Male sex — no./total no. (%)	31/47 (66)	147/248 (59)	62/130 (48)
Exposure history — no./total no. (%)			
Wet market exposure	30/47 (64)	32/196 (16)	5/81 (6)
Huanan Seafood Wholesale Market	26/47 (55)	19/196 (10)	5/81 (6)
Other wet market but not Huanan Seafood Wholesale Market	4/47 (9)	13/196 (7)	0/81
Contact with another person with respiratory symptoms	14/47 (30)	30/196 (15)	21/83 (25)
No exposure to either market or person with respiratory symptoms	12/27 (26)	141/196 (72)	59/81 (73)
Health care worker — no./total no. (%)	0/47	7/248 (3)	8/122 (7)

## Coronavirus Disease 2019 (COVID-19)

### Locations with Confirmed COVID-19 Cases Global Map

As of 11:00 a.m. ET March 6, 2020



## COUNTRIES : CONFIRMED CASES \*

**AFRICA - 4**

**AMERICAS -9**

**EASTERN MEDITERRANEAN – 15**

**EUROPE – 42**

**SOUTH-EAST ASIA – 5**

**WESTERN PACIFIC – 14**

\*\* as of March 7, 2020

# Coronavirus Disease 2019 (COVID-19)

## Coronavirus Disease 2019 (COVID-19) in the U.S.

Updated March 9, 2020

### COVID-19: U.S. at a Glance\*

- Total cases: 423
- Total deaths: 19
- States reporting cases: 35 (includes District of Columbia)

### COVID-19: Cases in the United States Reported to CDC\*†‡

Travel-related	72
Person-to-person spread	29
Under Investigation	322
<b>Total cases</b>	<b>423</b>

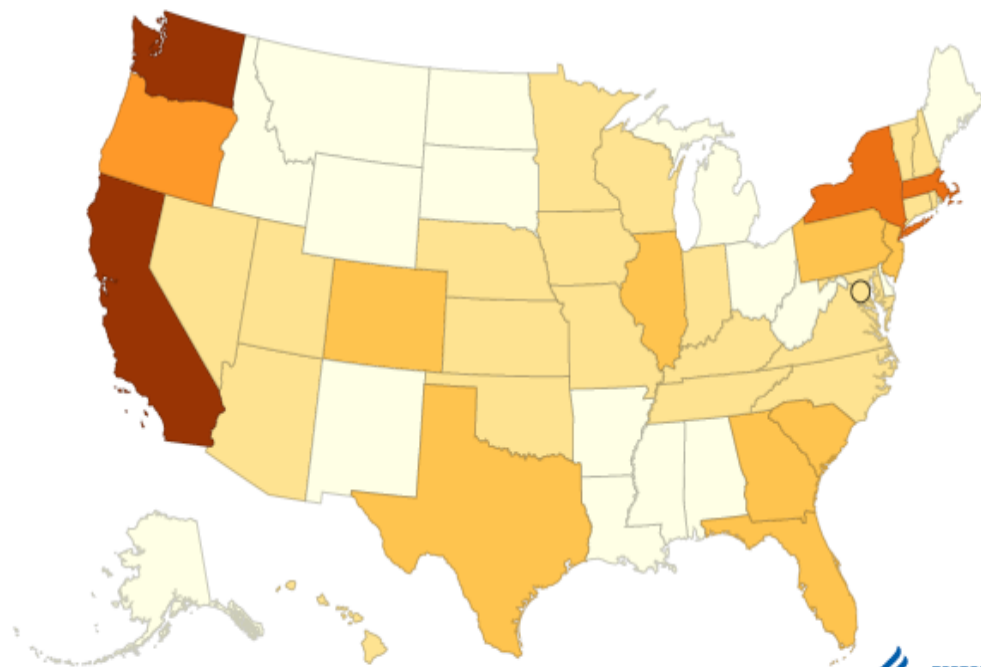
\* Data include both confirmed and presumptive positive cases of COVID-19 reported to CDC or tested at CDC since January 21, 2020, with the exception of testing results for persons repatriated to the United States from Wuhan, China and Japan. State and local

† CDC is no longer reporting the number of persons under investigation (PUIs) that have been tested, as well as PUIs that have tested negative. Now that states are testing and reporting their own results, CDC's numbers are not representative of all testing being done nationwide.

# Coronavirus Disease 2019 (COVID-19) in the U.S.

Updated March 9, 2020

## States Reporting Cases of COVID-19 to CDC\*



### Reported Cases

- None
- 1 to 5
- 6 to 10
- 11 to 20
- 21 to 50
- 101 to 200

Territories

AS

GU

MH

FM

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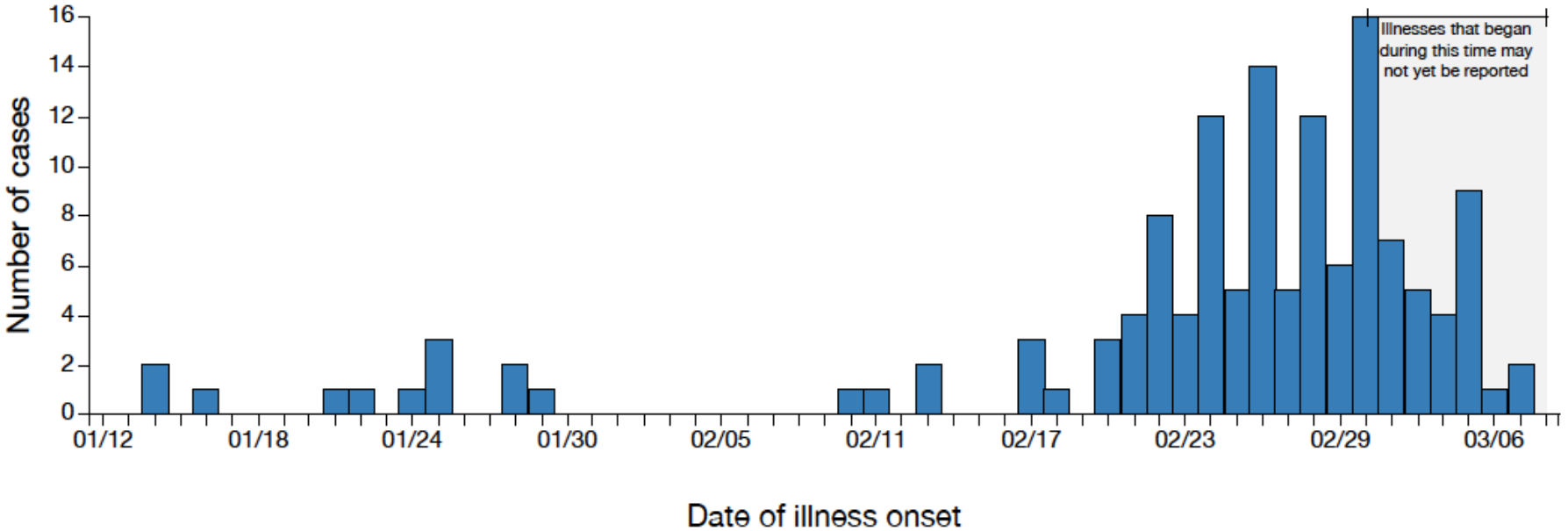
PW

PR

VI



# COVID-19 cases in the United States by date of illness onset, January 12, 2020, to March 8, 2020, at 4pm ET (n=137)\*\*





# COVID-19 Visitor Screening Interim Guidance

for Hospitals and Residential  
Health Care Providers

FloridaHealth.gov/COVID-19 • Florida Department of Health

Screen visitors and restrict entry for those  
who meet the following criteria:

1

Individuals who have returned from international  
travel within the last 14 days to these countries:

China Iran South Korea Italy



2

Individuals who report signs or symptoms  
of a respiratory infection such as:

Fever Cough Sore Throat



3

Individuals who have had **contact** with someone  
who has **OR** is under investigation for COVID-19.



Source:

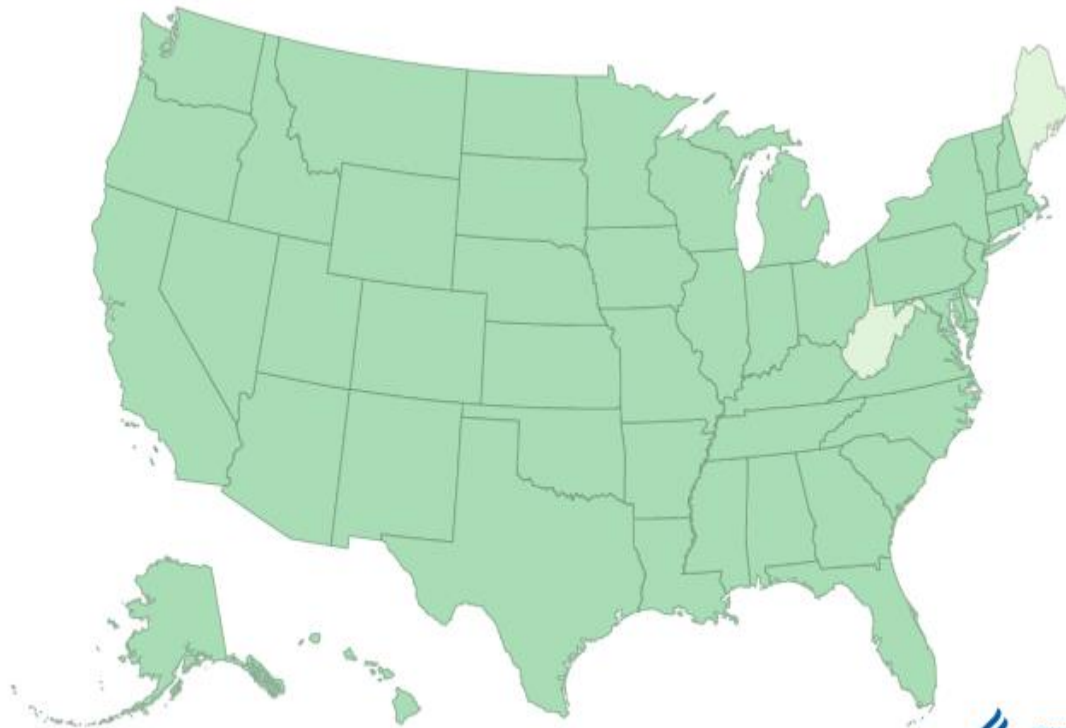
<https://www.ecdc.europa.eu/en/our-work-and-what-we-report/the-strings-of-policy-and-guidance-to-be-controlled-and-prevented-to-avoid-disease-2019-covid-19-main-glossary>

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Local county contact information can be found at FloridaHealth.gov.

05/05/20

# Public Health Laboratory Testing for COVID-19



## Status

-  In progress
-  Currently testing

Territories

GU

PR

VI



# WHO TO CONSIDER FOR TESTING



Clinician Screening Tool for Identifying Persons Under Investigation for Coronavirus Disease 2019 (COVID-19)

Version 2 | February 28, 2020

**Only consider persons with travel to an affected geographic area<sup>1</sup> or close contact<sup>2</sup> with a laboratory-confirmed<sup>3,4</sup> COVID-19 patient within 14 days of symptom onset or persons with severe respiratory illness<sup>5</sup> without an alternative diagnosis.**

- Ask the patient to wear a surgical mask.
- Evaluate the patient in a private room with the door closed, ideally an airborne isolation room, if available.
- Initiate contact and airborne precautions, including use of eye protection (e.g., goggles or a face shield) for all health care professionals and other staff entering the room.
- Visit [www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control.html](http://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control.html) for additional recommendations on infection control recommendations for patients under investigation for COVID-19 in health care settings.

**A. Person traveled to or from an affected geographic area<sup>1</sup> with widespread or sustained community transmission.**

Does the person have fever<sup>6</sup> **and** symptoms of lower respiratory illness (e.g., cough, shortness of breath)?

YES

NO

**B. Person had close contact<sup>2</sup> with a laboratory-confirmed<sup>3,4</sup> COVID-19 patient**

Does the person have fever<sup>6</sup> **or** symptoms of lower respiratory illness (e.g., cough, shortness of breath)?

YES

NO

**C. Person with severe acute lower respiratory illness<sup>5</sup> and fever requiring hospitalization.**

Does the person have an alternative explanatory diagnosis (e.g., influenza)?

YES

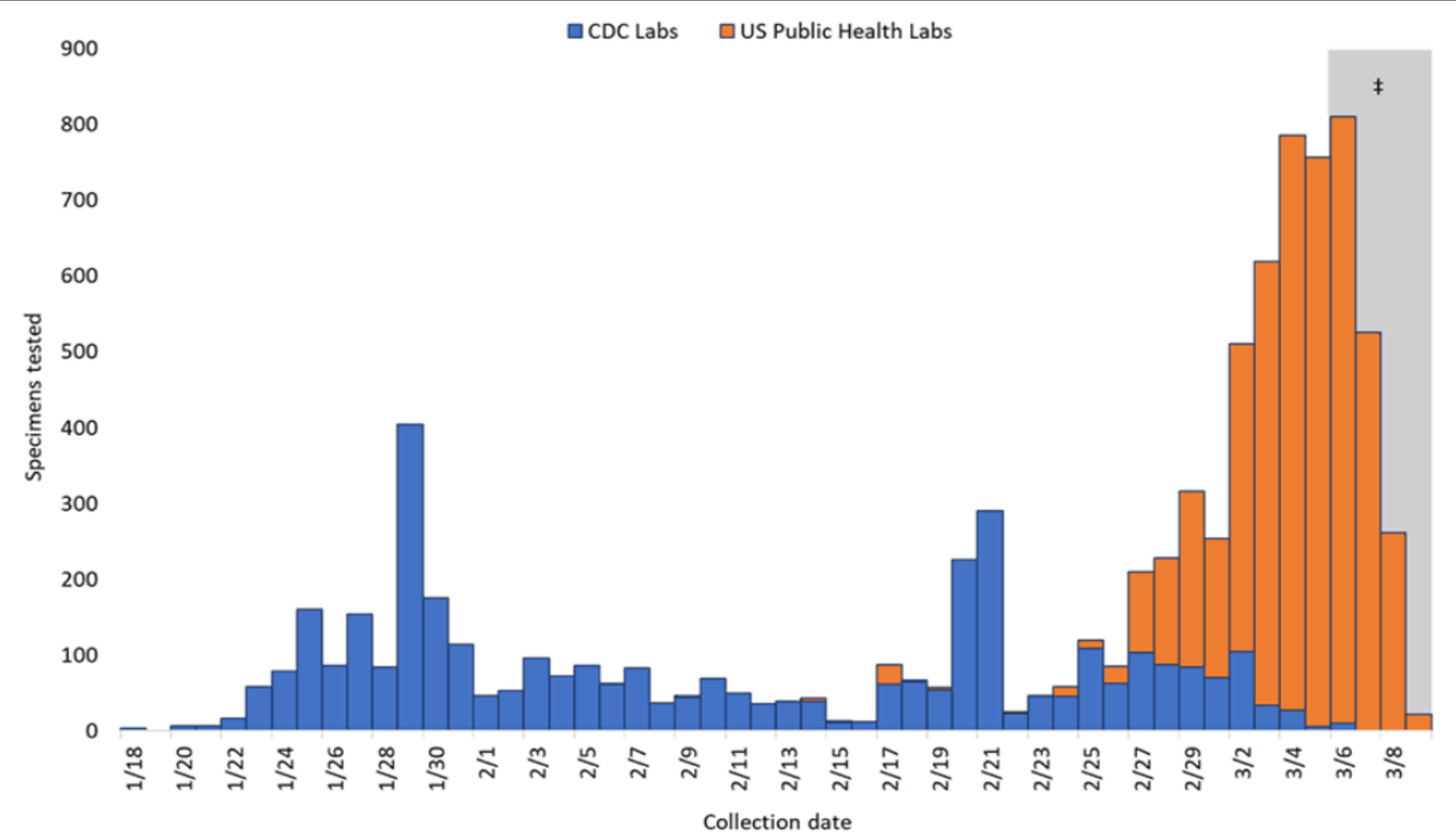
NO

**STOP: No COVID-19 testing needed**  
Continue to treat patient normally.

**This patient meets the criteria for a patient under investigation for COVID-19.** The Florida Department of Health asks that you **immediately** notify both infection control personnel at your health care facility and your county health department ([FloridaHealth.gov/CHDEpiContact](http://FloridaHealth.gov/CHDEpiContact)).



# Number of specimens tested for the virus that causes COVID-19 by CDC labs (N=3,698) and U.S. public health laboratories\* (N=4,856) by date of specimen collection†



\*Reporting public health laboratories are 42 state public health labs (AL, AR, AZ, CA, CO, CT, DE, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, MI, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, TN, TX, VT, WA, WI and WY), New York City, USAF, and 5 California counties.

# Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens from Persons Under Investigation (PUIs) for Coronavirus Disease 2019 (COVID-19)

## I. Respiratory Specimens

### A. Lower respiratory tract

#### Bronchoalveolar lavage, tracheal aspirate

Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

#### Sputum

Have the patient rinse the mouth with water and then expectorate deep cough sputum directly into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

### B. Upper respiratory tract

#### Nasopharyngeal swab AND oropharyngeal swab (NP/OP swab)

Use only synthetic fiber swabs with plastic shafts. Do not use calcium alginate swabs or swabs with wooden shafts, as they may contain substances that inactivate some viruses and inhibit PCR testing. Place swabs immediately into sterile tubes containing 2-3 ml of viral transport media. NP and OP specimens may be kept in separate vials or combined at collection into a single vial.

*Nasopharyngeal swab:* Insert a swab into the nostril parallel to the palate. Leave the swab in place for a few seconds to absorb secretions.

*Oropharyngeal swab (e.g., throat swab):* Swab the posterior pharynx, avoiding the tongue.

#### Nasopharyngeal wash/aspirate or nasal aspirate

Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

# What are the symptoms of 2019-nCoV?



## Coronavirus Disease 2019 (COVID-19)

### Symptoms

#### Watch for symptoms

Reported illnesses have ranged from mild symptoms to severe illness and death for confirmed coronavirus disease 2019 (COVID-19) cases.

The following symptoms may appear **2-14 days after exposure.**\*

- Fever
- Cough
- Shortness of breath

**APPROXIMATE 80% MILD URI or NO SPECIFIC SYMPTOM**

**NO SPECIFIC or LABORATORY FINDING – WBC, PLTS, LFT's**

**2<sup>ND</sup> BACTERIAL PNEUMONIA SEEMS UNCOMMON**

**CHEST CT SEEMS MORE SPECIFIC THAN CXR**

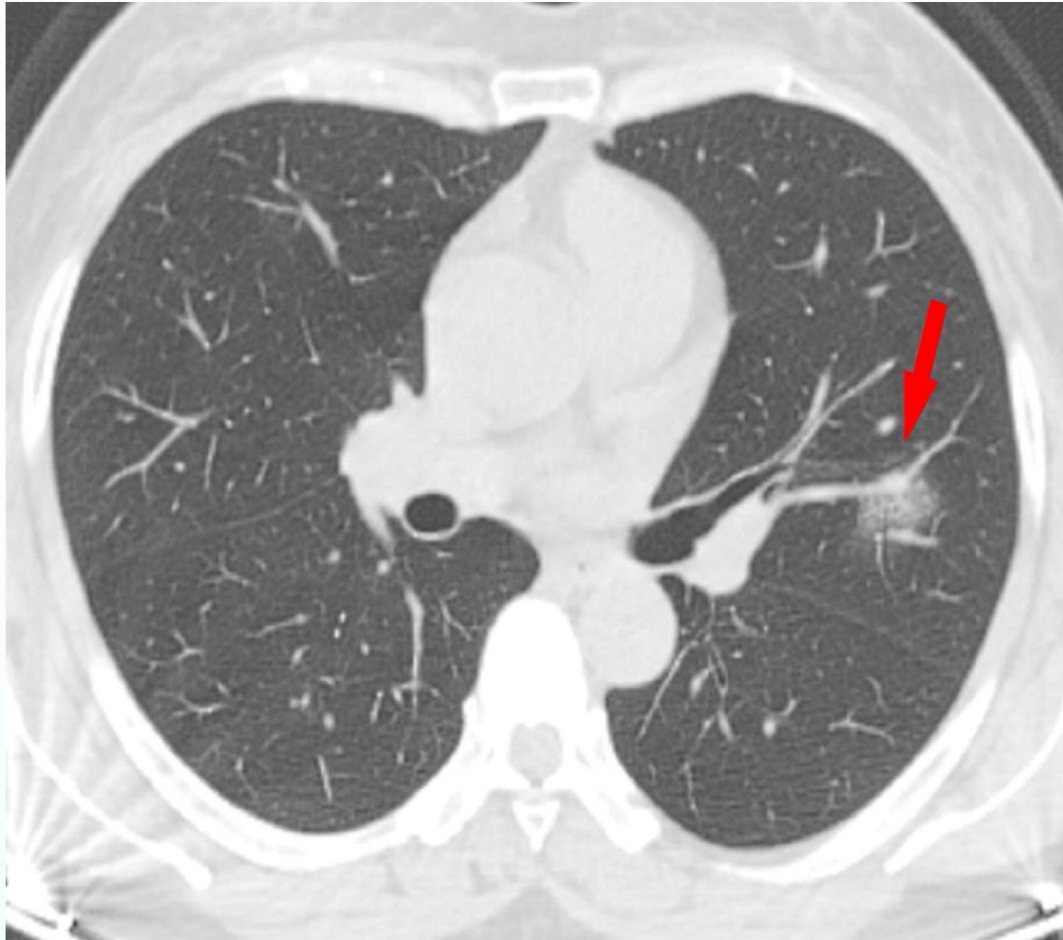


Figure 4a: CT findings of confirmed Coronavirus Disease 2019 (COVID-19) pneumonia Solitary rounded ground-glass opacity (GGO) pattern. A 51-year-old woman presenting without fever had close contact with patients with lab-confirmed COVID-19. a, Baseline axial unenhanced chest CT acquired 6 days before the first positive RT-PCR test showed a rounded GGO in the left lung upper lobe (arrow). b. Follow-up chest CT 4 days later showed the size increase of the lesion (arrow).

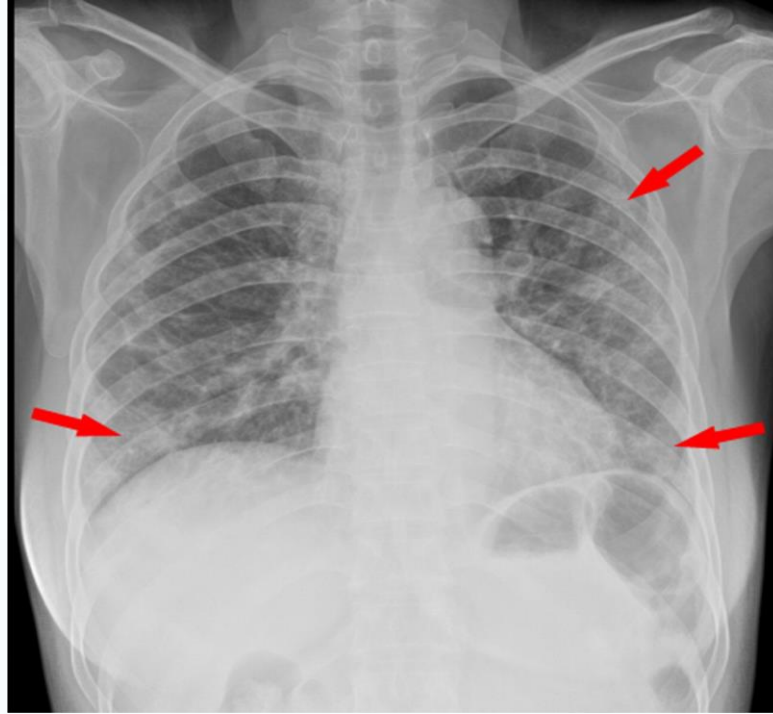


Figure 3: Chest radiography of confirmed Coronavirus Disease 2019 (COVID-19) pneumonia. A 53-year-old female had fever and cough for 5 days. Multifocal patchy opacities can be seen in both lungs (arrows).

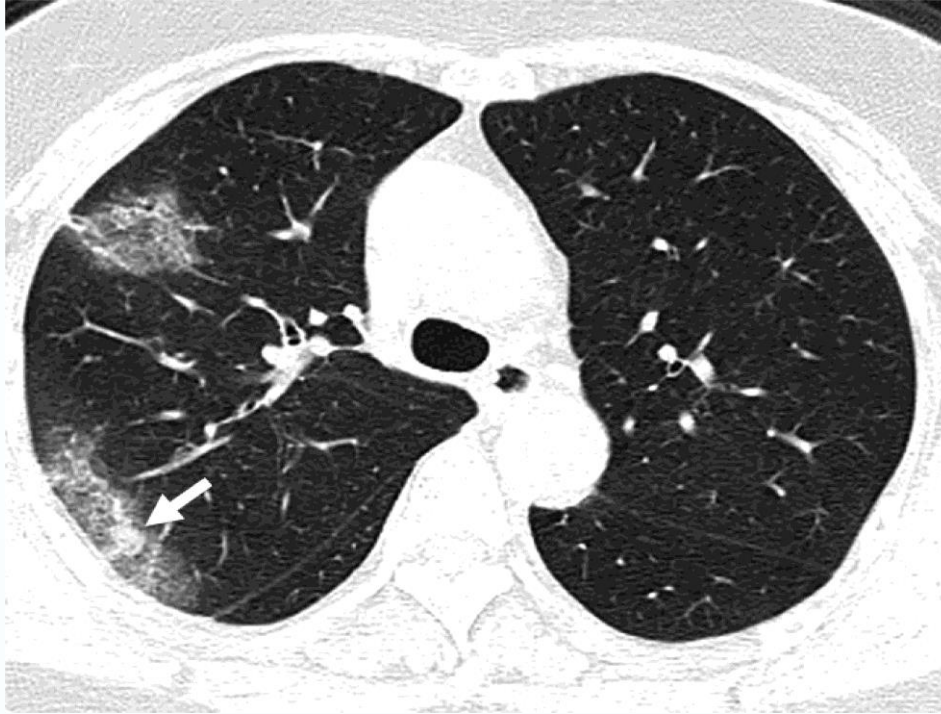


Fig 2e: Further increase in extent of ground glass changes with new cavity in right lung (arrow, 2d) as well as new areas of consolidation (arrow, 2e) are seen on CT 5 days after presentation.



Fig 1b: Axial (1b) and sagittal (1c) chest CT images demonstrate peripheral right lower lobe ground-glass opacities.



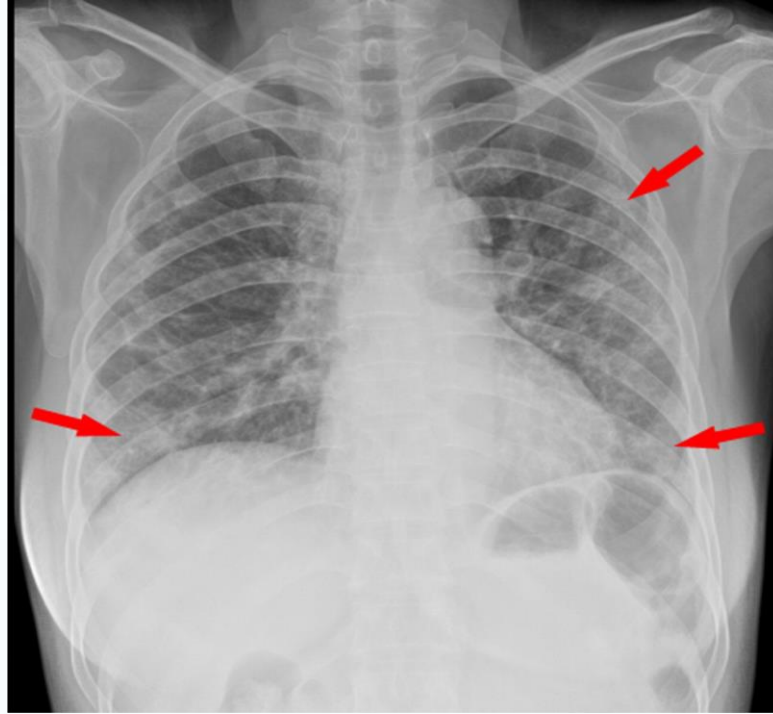


Figure 3: Chest radiography of confirmed Coronavirus Disease 2019 (COVID-19) pneumonia. A 53-year-old female had fever and cough for 5 days. Multifocal patchy opacities can be seen in both lungs (arrows).

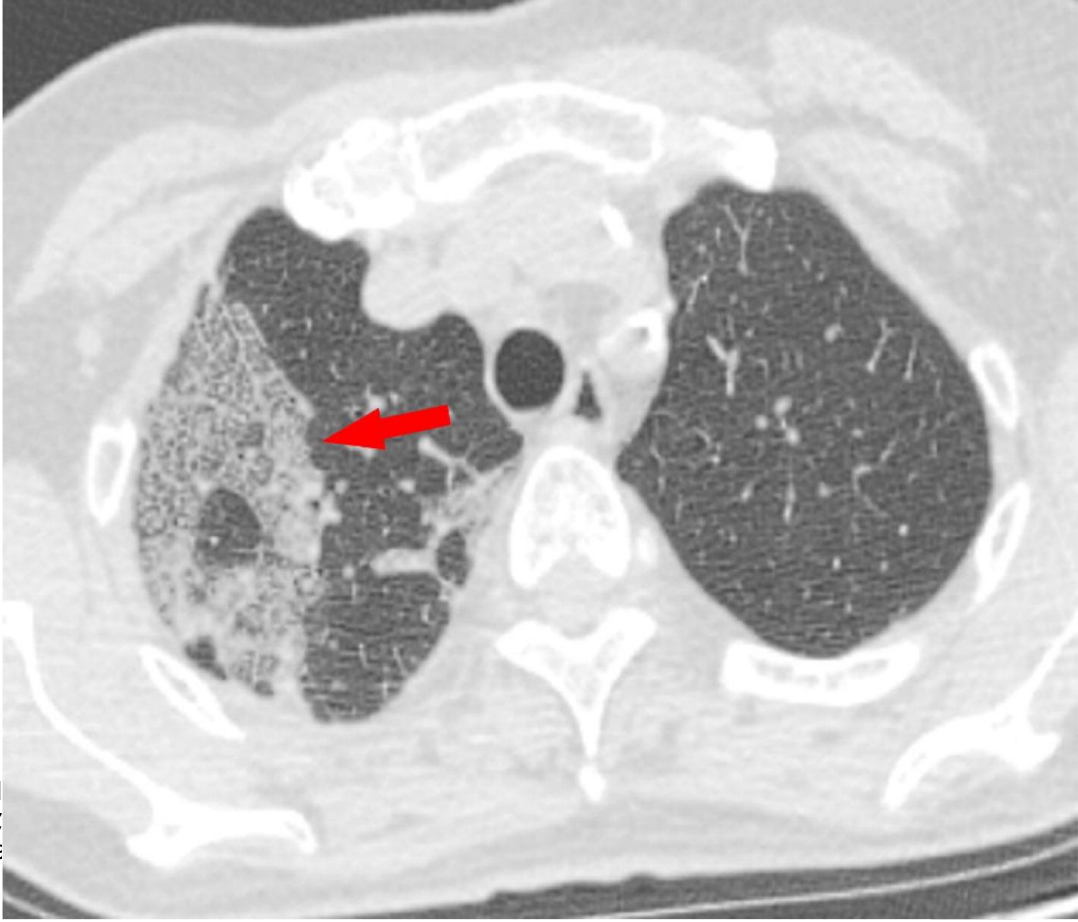


Figure 6a: CT findings of conf  
fever, cough, and muscle sore  
with typical crazy paving patte  
(arrows).

er woman presenting with  
2020 showed patchy GGO  
pleural distributed GGOs

# Interim Infection Prevention and Control Recommendations for Patients with Confirmed Coronavirus Disease 2019 (COVID-19) or Persons Under Investigation for COVID-19 in Healthcare Settings



1. Minimize Chance for Exposures

BEFORE and DURING ARRIVAL

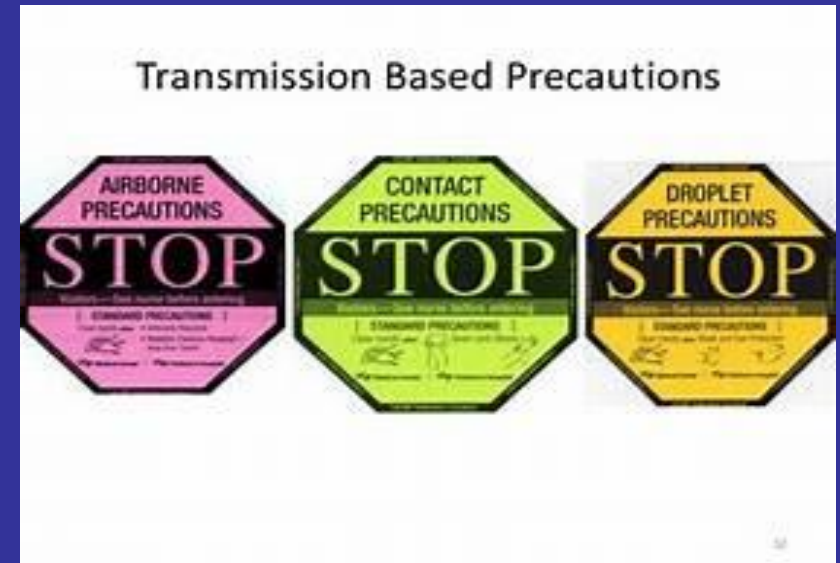
2. Adherence to Standard, Contact, and Airborne Precautions, Including the Use of Eye Protection

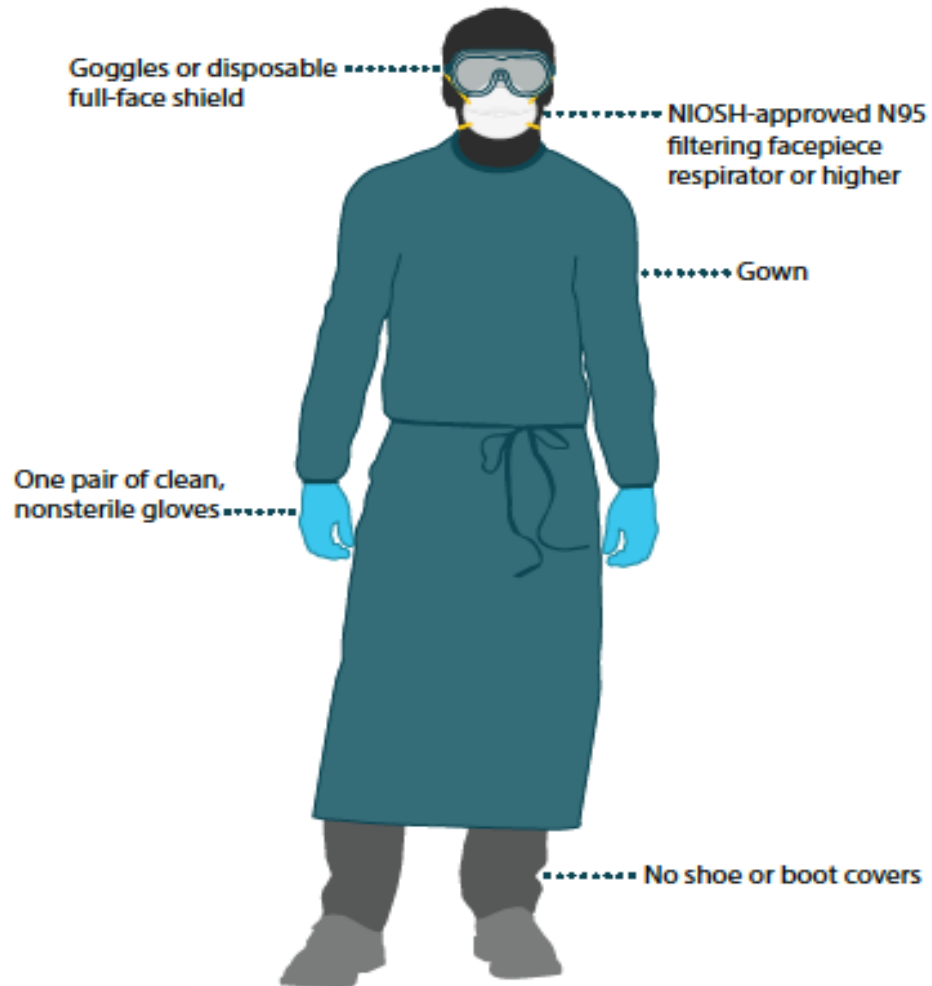
ClickTime™ and a  
license are needed to see this picture.

AIRBORNE ISOALTION ROOM

PERSONAL PROTECTIVE EQUIPMENT

ENVIROMENTALINFECTION CONTROL





# Antiseptics and disinfectants

- a group of drugs that are able to inhibit the growth, development or leads to death of microorganisms in the environment surrounding the patient or on the surface of the body.

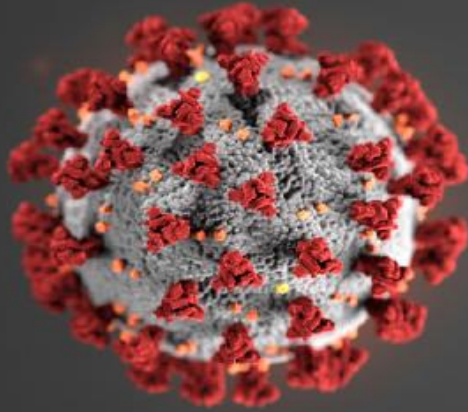
**Sterilization:** *the complete elimination or destruction of all forms of microbial life (i.e., steam under pressure, dry heat, gas.etc.) ABSOLUTE*

**Disinfectants:** *eliminates many or all pathogenic microbes on inanimate objects (+/- sporicidal)*

**Antiseptics:** *germicidal agents like disinfectants but applied to the skin (i.e., ethyl alcohol >60%)*

**Cleaning:** *removal of visible soil (e.g., organic and inorganic)*

# Coronavirus Disease 2019 (COVID-19)



**TREATMENT : SUPPORTIVE**

**CHLOROQUINE ; NO CONFIRMED PROOF  
LOPINAVIR / RITONAVIR (+/- in-vitro effect)  
INTERFERON BETA - ???**

**REMDESIVIR : BROAD-SPECTUM ANTIVIRAL, RNA POLYMERASE  
INHIBITOR**

LIVE

**BREAKING NEWS**

# COCAINE KILLS CORONAVIRUS

15:09

SCIENTISTS DISCOVER HOW A CLASS A DRUG CAN ERADICATE AN EPIDEMIC

A woman in a blue lab coat and hairnet is working in a laboratory setting. She is wearing white gloves and is focused on her work. The background shows laboratory equipment and another person in a blue lab coat. The text 'CORONAVIRUS VACCINE UNDERWAY' is overlaid on the image in a blue box with white text. The 9 NEWS logo is in the bottom left corner.

# CORONAVIRUS VACCINE UNDERWAY

  
NEWS



# Coronavirus Disease 2019 Information for Travel

## Risk Assessment Level for COVID-19



- Widespread sustained (ongoing) transmission and restrictions on entry to the United States
- Widespread sustained (ongoing) transmission
- Sustained (ongoing) community transmission
- Risk of limited community transmission

### Widespread sustained (ongoing) transmission and restrictions on entry to the United States

CDC recommends that travelers avoid all nonessential travel to the following destinations. Entry of foreign nationals from these destinations has been suspended.

- China ([Level 3 Travel Health Notice](#))
- Iran ([Level 3 Travel Health Notice](#))

### Widespread sustained (ongoing) transmission

CDC recommends that travelers avoid all nonessential travel to the following destinations:

- South Korea ([Level 3 Travel Health Notice](#))
- Italy ([Level 3 Travel Health Notice](#))

### Sustained (ongoing) community transmission

CDC recommends that older adults or those who have chronic medical conditions consider postponing travel to the following destinations:

- Japan ([Level 2 Travel Health Notice](#))

### Risk of limited community transmission

Travelers should practice usual precautions at the following destination:

- Hong Kong ([Level 1 Travel Health Notice](#))

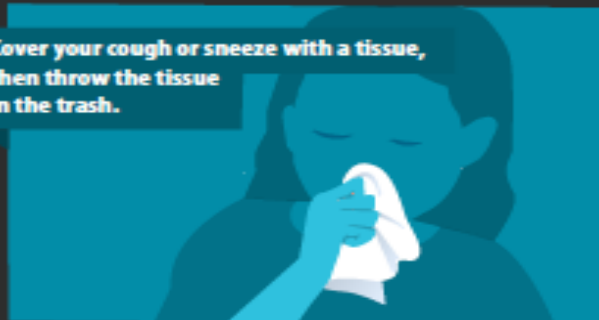
# STOP THE SPREAD OF GERMS

Help prevent the spread of respiratory diseases like COVID-19.

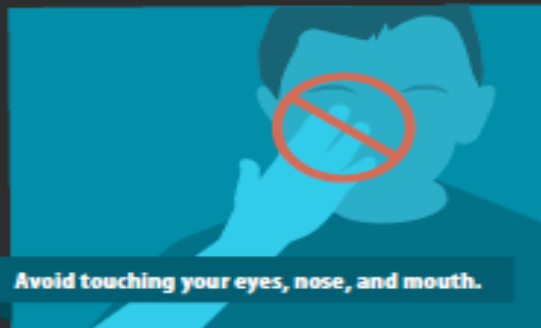
Avoid close contact with people who are sick.



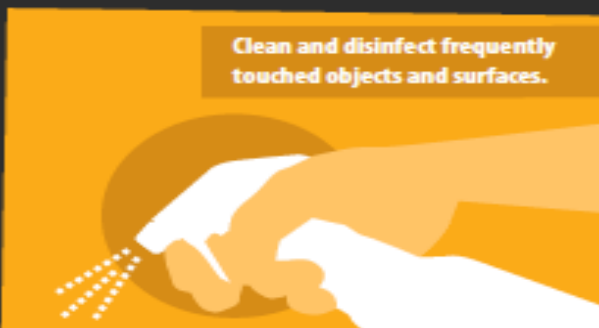
Cover your cough or sneeze with a tissue, then throw the tissue in the trash.



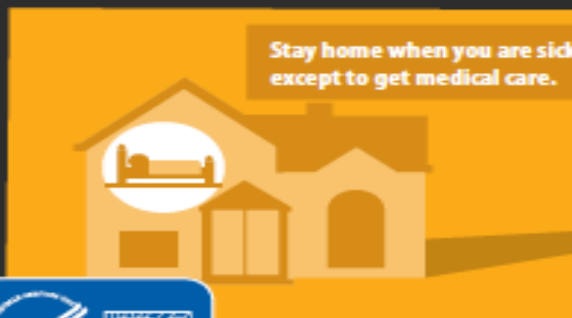
Avoid touching your eyes, nose, and mouth.



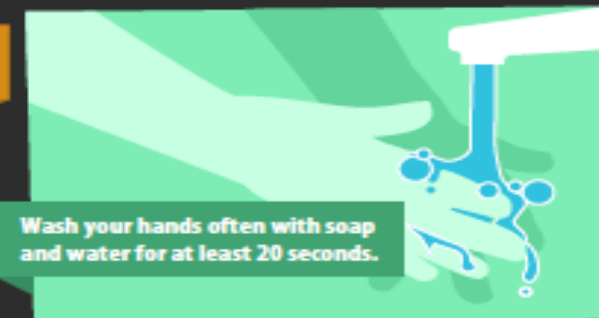
Clean and disinfect frequently touched objects and surfaces.



Stay home when you are sick, except to get medical care.



Wash your hands often with soap and water for at least 20 seconds.



For more information: [www.cdc.gov/COVID19](http://www.cdc.gov/COVID19)

## Coronavirus Disease 2019 (COVID-19)

### Travelers from Countries with Widespread Sustained (Ongoing) Transmission Arriving in the United States

Stay home for 14 days from the time you left an area with widespread, ongoing community spread (Level 3 Travel Health Notice countries) and practice social distancing.

Take these steps to monitor your health and practice social distancing:

1. Take your temperature with a thermometer two times a day and monitor for fever. Also watch for cough or trouble breathing.
2. Stay home and avoid contact with others. Do not go to work or school for this 14-day period. Discuss your work situation with your employer before returning to work.
3. Do not take public transportation, taxis, or ride-shares during the time you are practicing social distancing.
4. Avoid crowded places (such as shopping centers and movie theaters) and limit your activities in public.
5. Keep your distance from others (about 6 feet or 2 meters).

### What To Do If You Get Sick

If you get sick with fever (100.4°F/38°C or higher), cough, or have trouble breathing:

- Seek medical care. Call ahead before you go to a doctor's office or emergency room.
- Tell your doctor about your recent travel and your symptoms.
- Avoid contact with others.

If you need to seek medical care for other reasons, such as dialysis, call ahead to your doctor and tell them about your recent travel to an area with widespread or ongoing community spread of COVID-19.



# Health Alert: Coronavirus Disease 2019 (COVID-19)

You have traveled to a country with an outbreak of COVID-19 and are at higher risk.  
COVID-19 is a respiratory illness that can spread from person to person.

## Stay Home

Stay home for the next 14 days and monitor your health.  
Take your temperature with a thermometer two times a day and watch for symptoms.

## If you feel sick and have symptoms:

- Call ahead before you go to a doctor's office or emergency room.
- Tell the doctor about your recent travel and your symptoms.
- Avoid contact with others.
- Do not travel while sick.

## Symptoms

Illnesses have ranged from mild symptoms to severe illness and death. Symptoms may appear 2–14 days after exposure.

## Symptoms can include:



Fever (100.4°F/38°C or higher)



Cough



Shortness of breath

Visit the website for more information on monitoring your health and how to contact local public health officials. Visit: [www.cdc.gov/COVIDtravel](http://www.cdc.gov/COVIDtravel)



CS 115495-8 February 29, 2020 4:11 PM

SO....WHAT WILL HAPPEN AND HOW WILL THIS END-----

LIKE ALL PREVIOUS PANDEMICS HAVE ENDED

'HUMAN EXPERIMENT'

ORGANIZED ASSESSMENT  
SELECTIVE QUARANTINE  
HERD IMMUNITY  
NATURAL SELECTION

PERHAPS EFFECTIVE ANTI-VIRALS

...an

EFFECTIVE VACCINE

