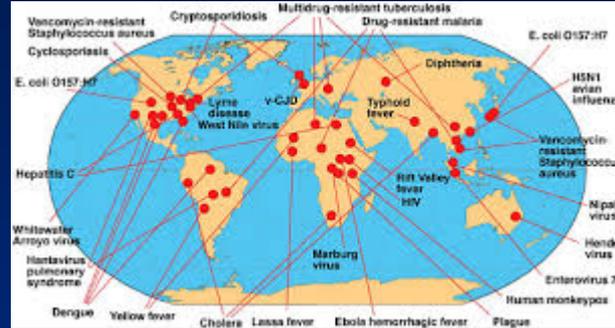


# Infectious Disease Disasters – Emerging, Reemerging, Deliberately Emerging Threats



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# DISCLOSURE and DISCLAIMER

Boris D. Lushniak, MD, MPH

- No relationship with commercial supporters
- No off-label discussion of drugs or devices
- Work supported by US Government (1988-2016)
- Maryland State government employee (2017-)
- The views expressed in this presentation are those of the author and do not reflect the official policy or position of the State of Maryland or the US Government.

# Preview

- Infectious disease disasters
- Bioterrorism attack
- Pandemic
- Outbreak of emerging infectious disease

# 10 Great Public Health Achievements-US 1900-1999

- Vaccination
- Motor-vehicle safety
- Safer workplaces
- **Control of infectious diseases**
- Decline in deaths from heart disease and stroke
- Safer and healthier foods
- Healthier mothers and babies
- Family planning
- Fluoridation of water
- Recognition of tobacco as a health hazard

MMWR 1999 Apr 2;48(12):241-3.

# The Age of Infectious Diseases

- One of the most infamous quotes in the history of biomedicine: “It is time to close the book on infectious diseases, and declare the war against pestilence won.”
- Attributed to the US Surgeon General Dr. William H. Stewart (1965-1969)
- Urban legend -- the primary source for the quote has never been identified.

Spellberg and Taylor Blake, *Infectious Diseases of Poverty*, 2013, 2:3

# The Age of Infectious Diseases

- “The emphasis of epidemiologic investigation has shifted markedly in the last two decades. A decline in the interest in the infectious diseases and increase in concern with the noninfectious diseases has resulted from the change in relative importance of these categories of disease in many parts of the world, including the United States. It is also recognized that, although major tasks still remain in the improvement of control over the infectious diseases [emphasis added]...the identification of cigarette smoking as the major cause of this century’s epidemic of lung cancer...[and] chronic diseases...now constitute the predominant health problems in this country [9].”

PHS Publication No.1000, Series 4, No. 7, March 1968.

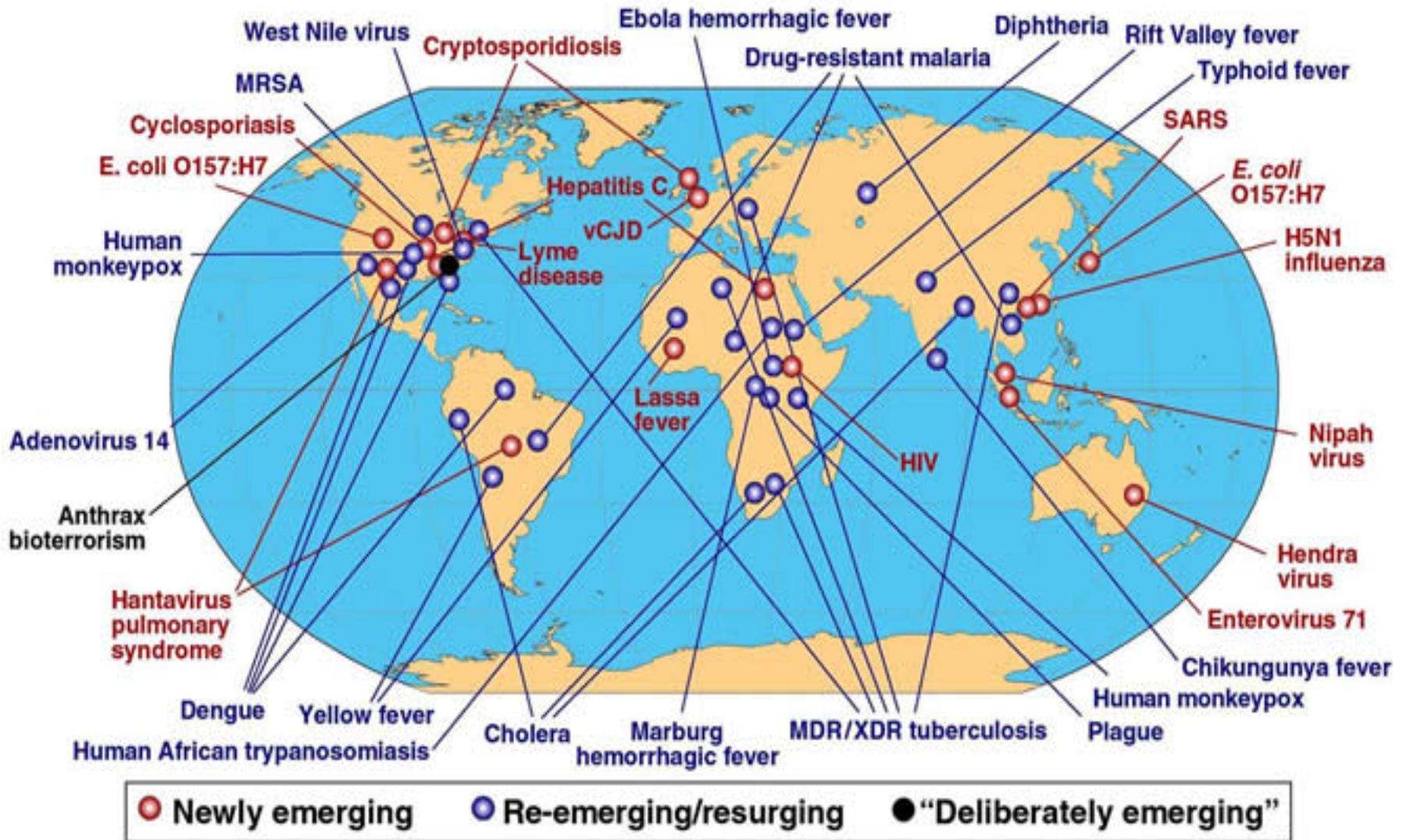
# Communicable Diseases Post Disasters

- Waterborne
  - Diarrheal diseases
  - Hepatitis A and E
  - Leptospirosis
- Crowding
  - Measles
  - Meningitis
  - Acute Respiratory Infections
- Vector-Borne
  - Malaria
  - Dengue
- Other
  - Tetanus
  - Coccidiomycosis
- Dead bodies
- Safe water, sanitation, site planning
- Healthcare services
  - Early diagnosis and treatment
- Surveillance/early warning
- Immunization
- Prevention
  - Vector control

[www.who.int/diseasecontrol\\_emergencies](http://www.who.int/diseasecontrol_emergencies)

# Infectious Disease Disasters

- Events that involve a biological agent/disease and that result in mass casualties
  - Bioterrorism attack
  - Pandemic
  - Outbreak of emerging or reemerging infectious disease
- Four principles of emergency management – specialized mitigation, preparedness, response, recovery



Adapted from Morens DM et al 2004, Nature 430:242-49

# Emerging and Reemerging Infectious Diseases

- New organisms cause new disease
  - SARS, MERS, HIV
- Known organisms cause new disease
  - Hantavirus 1993 (respiratory)
- Known organism & disease, increased incidence
  - Whooping cough, diphtheria, measles
- Known organism & disease, more virulent/new route of transmission
  - Cholera, toxic shock syndrome, Zika
- Known organism & disease in new geographic area
  - Ebola, Zika, West Nile
- Known organism and disease, new species (zoonoses)
  - Influenza from birds or swine (H5N1, H7N9)
- Known organism and disease, new resistance
  - MDR-TB

# Factors that Drive Emergence or Reemergence

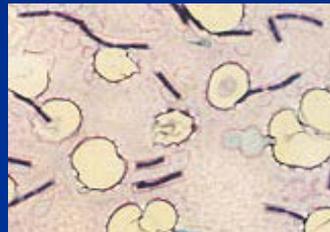
- Microbial adaptation
- Human Susceptibility
- Climate and weather
- Changing ecosystem
- Human demographics and behavior
- Economic development and land use
- Technology and industry
- International travel and commerce
- Breakdown of public health infrastructure
- Poverty and social inequality
- War and famine
- Lack of will (political and societal)
- Intent to harm (bioterrorism)

# Biological Agents of Highest Concern (Category A)

- *Bacillus anthracis* (Anthrax) \*
- *Variola major* (Smallpox) \*
- *Yersinia pestis* (Plague) \*
- *Francisella tularensis* (Tularemia) \*
- Filoviruses and Arenaviruses (Viral Hemorrhagic Fevers) \*
- Botulinum toxin (Botulism)
- ALL suspected or confirmed cases should be reported to health authorities immediately

# Anthrax

- Zoonotic disease in herbivores (e.g., sheep, goats, cattle) follows ingestion of spores in soil
- Three clinical forms
  - Cutaneous, Inhalational, Gastrointestinal
- *Bacillus anthracis* -- Gram-positive, spore-forming, non-motile bacillus

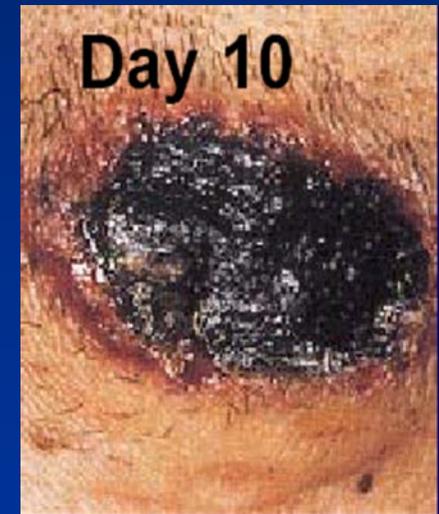
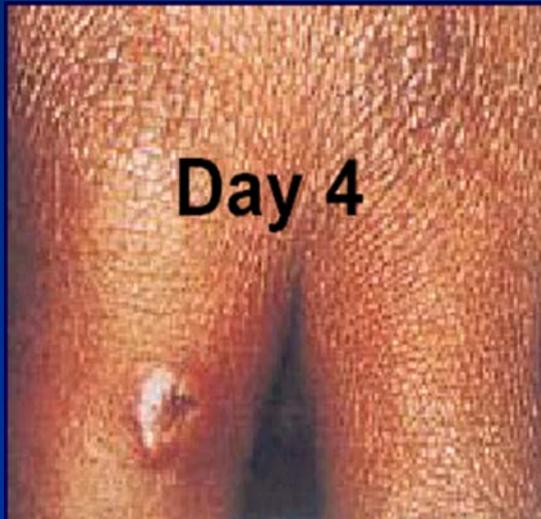


# Inhalational Human Anthrax

- Extremely rare in United States
- Feb 2006 single case associated with dried animal skins (NY, PA)
- Incubation period: 1–7 days (up to 42 days?)
- Case fatality (prior to 2001):
  - Without antibiotic treatment--97%
  - With antibiotic treatment--75%
- Production of toxins made up of 3 proteins
  - Protective antigen, edema factor, and lethal factor
  - Toxins do not respond to antibiotics
- Dec 2012 – Raxibacumab approved for treatment (monoclonal antibody that neutralizes toxins)

# Cutaneous Anthrax

- Form most commonly encountered in naturally occurring cases
- Incubation period: 1–12 days



# Anthrax, U.S.

## October 4-November 19, 2001

- 11 inhalational, 11 cutaneous
- 5 deaths (all inhalational)
- 20 exposed to worksites where contaminated mail processed or received
- Post-exposure chemoprophylaxis initiated for 32,000 media, government, and mail workers (full course recommended for 10,300)

# Anthrax *Vaccine*



- Anthrax Vaccine Adsorbed
- Induces immunity to protective antigen
- 6-dose series (0-2-4 wks, 6-12-18 mos, qy)
- Over 600,000 doses to US military
- Some controversy -- but, studied by Institute of Medicine and approved by FDA
- Supplies are limited

# Influenza

- I had a little bird, its name was Enza, I opened the window and in-flu-Enza.-- American Skipping Rhyme circa 1918
- Latin 'influentia' – influence of the stars

# Terminology

- Seasonal or common influenza
- Avian influenza - H5N1, H7N9
- Pandemic influenza
- Novel 2009 H1N1 Influenza Virus (Swine flu)

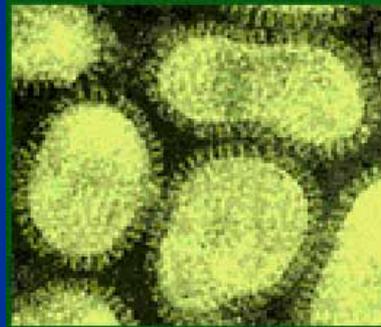


# Seasonal Influenza

- Annual respiratory illness transmitted from person to person
- Impact
  - Globally 250,000-500,000 deaths each year
  - As high as 20% morbidity in the US
  - Approx 36,000 deaths and over 200,000 hospitalized in US
    - 20,000 hospitalized are <5 years old
    - 90% of deaths and 60% of hospitalized in >65 years old
  - Total annual cost in US over \$10-30 billion

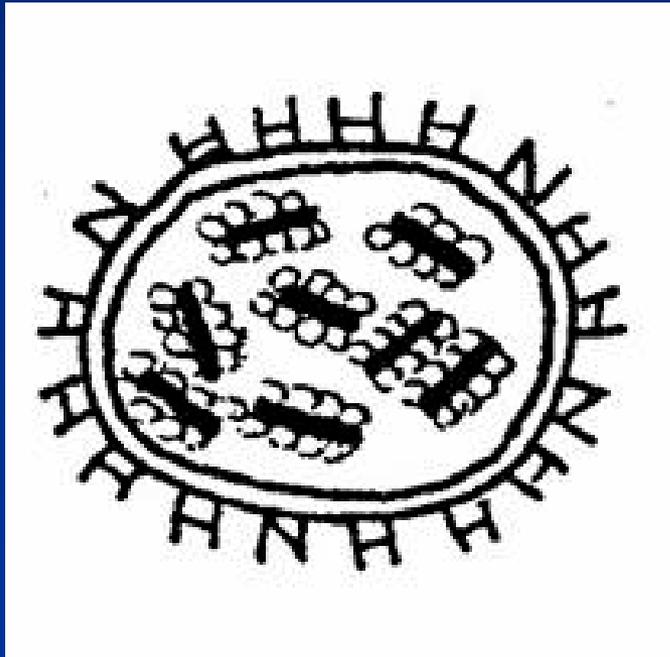
# Seasonal Influenza

- Caused by orthomyxovirus
  - Negative stranded RNA viruses
  - Type A classified by subtype and strain
  - Type B found only in humans, less severe epidemics
  - Type C may cause mild illness in humans and do not cause epidemics



# Orthomyxovirus Type A

- Subtypes determined by viral proteins on surface
  - Hemagglutinin (H) – latch onto cells (16 subtypes)
  - Neuraminidase (N) – enzyme that helps virus spread (9 subtypes)



# Orthomyxovirus Type A

- Wild birds are natural hosts for all known subtypes of A
  - Low pathogenic avian influenza (H7N7, H9N2, H7N2)
  - Highly pathogenic avian influenza (H5N1, H7N7, H7N3, H7N9)
- Can infect people, birds, pigs, horses, other animals



# How Influenza Viruses Change

- Dynamic and continuously evolving viruses
- Antigenic drift -- small changes to surface proteins through point mutations produces different strains
- Antigenic shift – large fragments of genetic material replaced with genes from other influenza subtypes results in new subtype which is perceived by immune system as new

# Influenza Virus Transmission

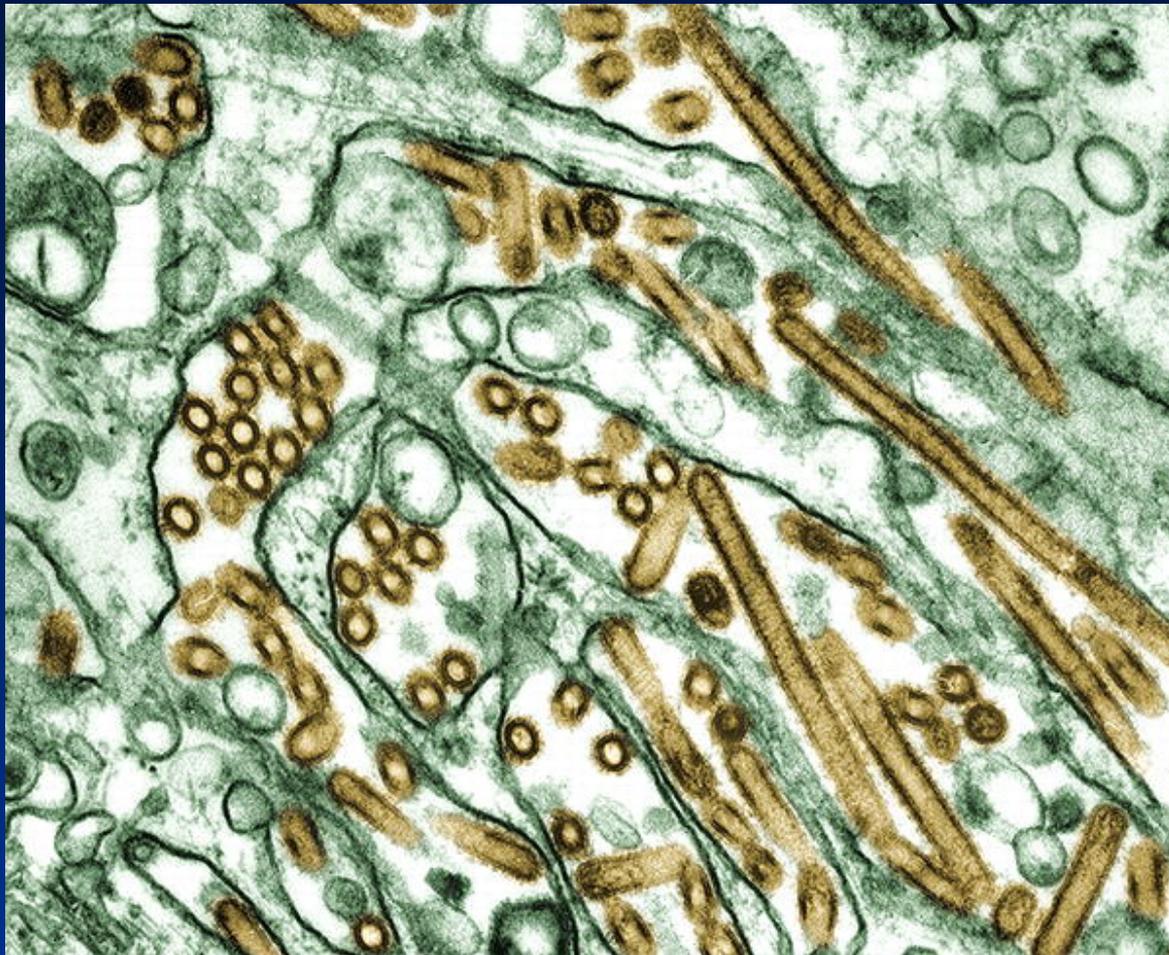
- Respiratory route
  - Primarily by large droplets
  - Possibly small particle “short distance” aerosols
- Contact
  - Hand contact with secretions



# Avian Influenza

Avian or bird flu –  
caused by influenza  
viruses that occur  
naturally among wild  
birds





**Colorized Transmission Electron Micrograph  
of Avian Influenza A H5N1 Viruses Grown in MDCK Cells**  
*The viruses are gold, and the MDCK cells are green.*  
*(Photo: CDC/C. Goldsmith, J. Katz, and S. Zaki)*

# H5N1 Avian Influenza

- 1996 – H5N1 isolated from a goose in China
- 1997 – Outbreaks in poultry in Hong Kong
- May 21, 1997 – 3 yr old boy dies from H5N1 in Hong Kong
- By Dec 1997 – 18 people infected in Hong Kong and 6 die
  - 1.5 million chickens in Hong Kong culled
- February 2003 – 2 human cases in Hong Kong (father/son)
- 2004 – 47 cases in Thailand and Viet Nam and 34 die
- From 2003 to March 30, 2010 -- 492 confirmed human cases and 291 deaths (59.1%) in 15 countries

# H5N1 Avian Influenza

## Why be concerned?

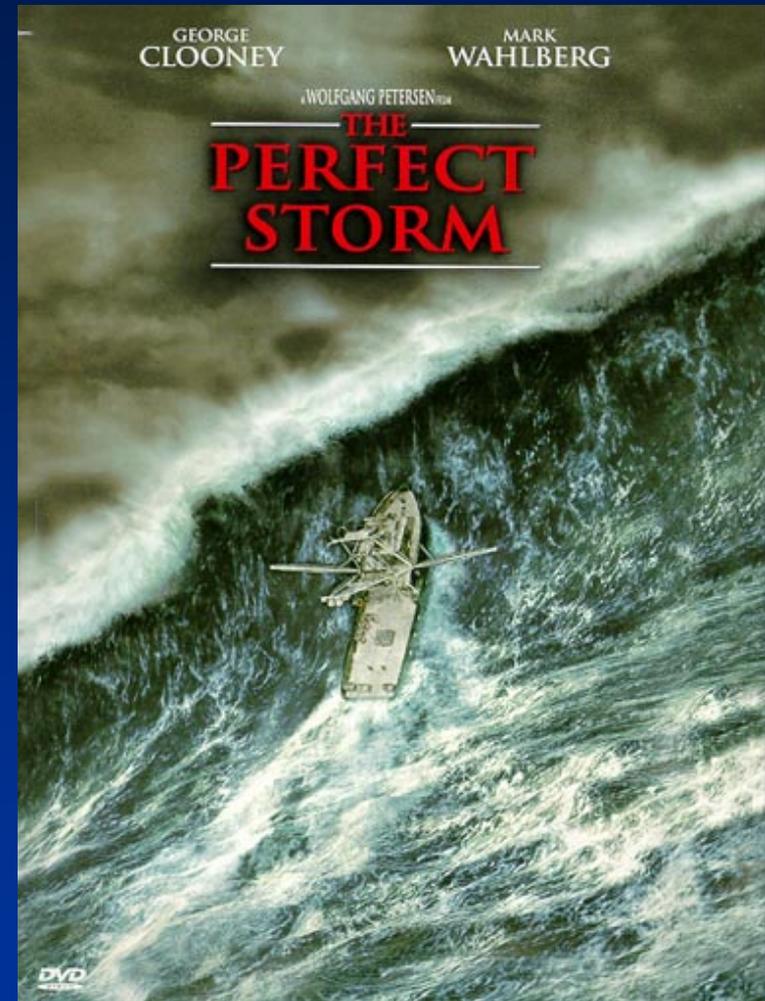
- Especially virulent
- Spread by migratory birds
  - In saliva, secretions, feces
  - Found in birds in nations in Asia, Europe, Africa
- Can be transmitted from birds to mammals (in some cases humans)
  - Concern: May 2006 – Indonesia reports large family cluster (7 cases from 4 households)
- Like other influenza viruses, it continues to evolve
  - Additional strains of H5N1 – clades 1 and 2 which are antigenically different

# Avian Influenza

- There are other subtypes of concern—
  - H9N2 (mild symptoms; China/ Hong Kong 1999; 2003)
  - H7N2 (Virginia, New York 2002; 2004)
  - H7N7 (conjunctivitis; Netherlands 2003)
  - H7N3 (Canada 2004)
  - H10N7 (Egypt 2004)
  - H7N9 (China 2013)
    - 623 human infections (5/1/17) in this the 5<sup>th</sup> epidemic started 10/16
    - Mortality 40%

# Pandemic Influenza

- Pandemic flu – virulent human flu that causes a global outbreak
- Viral equivalent of “the perfect storm”
  - Explosive, global event in which most (if not all) of the world population is at risk
  - Believed to have occurred at unpredictable intervals at least over the last 300 years



# Pandemic Influenza

- Three essential conditions
  - A new subtype of influenza virus must emerge from the animal reservoir (no immunity in humans)
  - Virus produces serious illness in humans
  - Virus must be able to spread efficiently from person to person

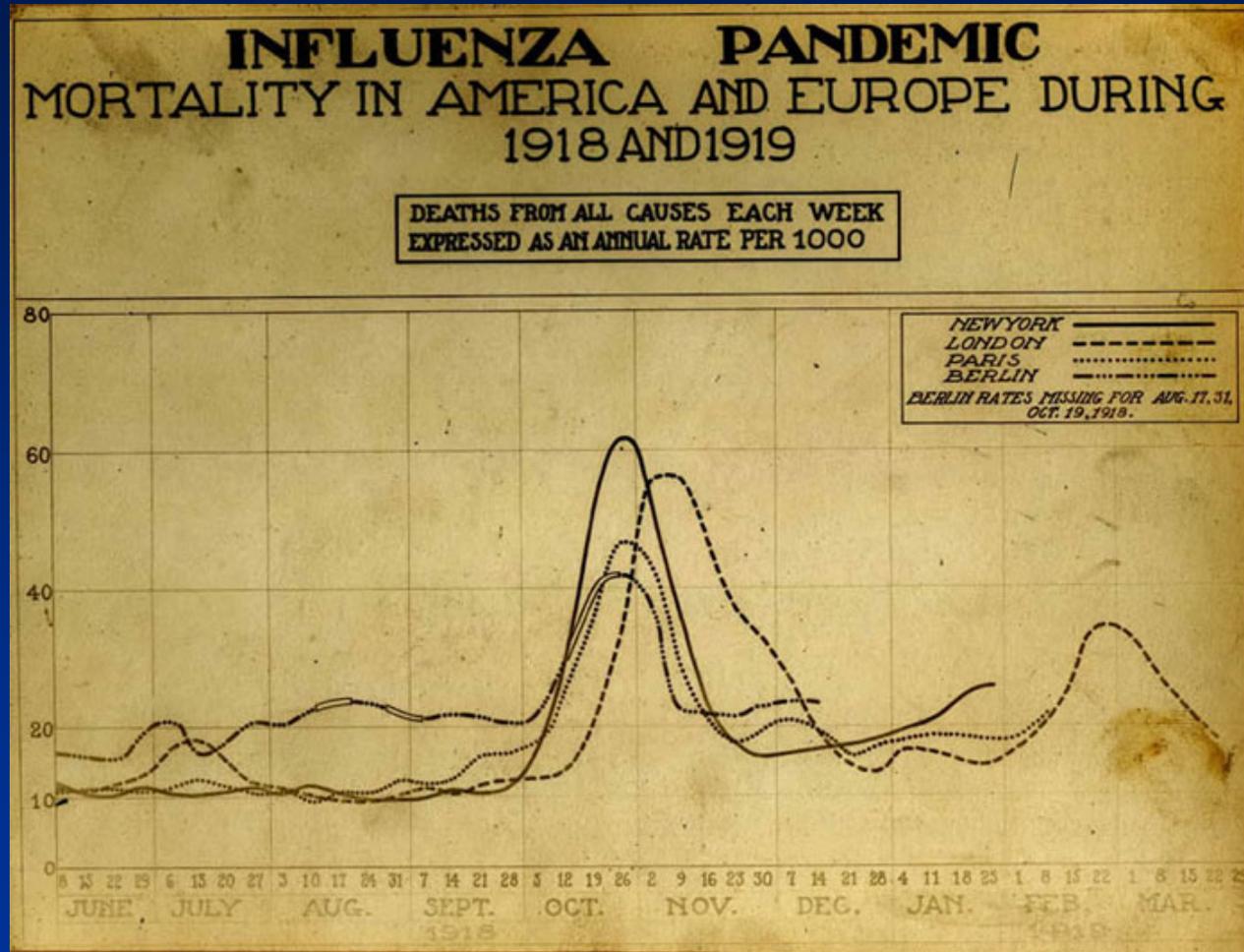
# Pandemics 20<sup>th</sup> Century

	1918-19	1957-58	1968-69	?
<b>World Deaths</b>	40-50 million +	1-2 million	700,000	
<b>US Deaths</b>	675,000 (young adults)	70,000+ (infants, elderly)	34,000+ (infants, elderly)	209,000 to 1.9 million ?
<b>Type</b>	Spanish flu H1N1	Asian flu H2N2	Hong Kong flu H3N2	H?N?
<b>Other</b>	Infected 20-40% of world	To US in 4-5 mos; Global in 8 months	To US in 2-3 mos	865,000 to 9.9 million hospitalized?

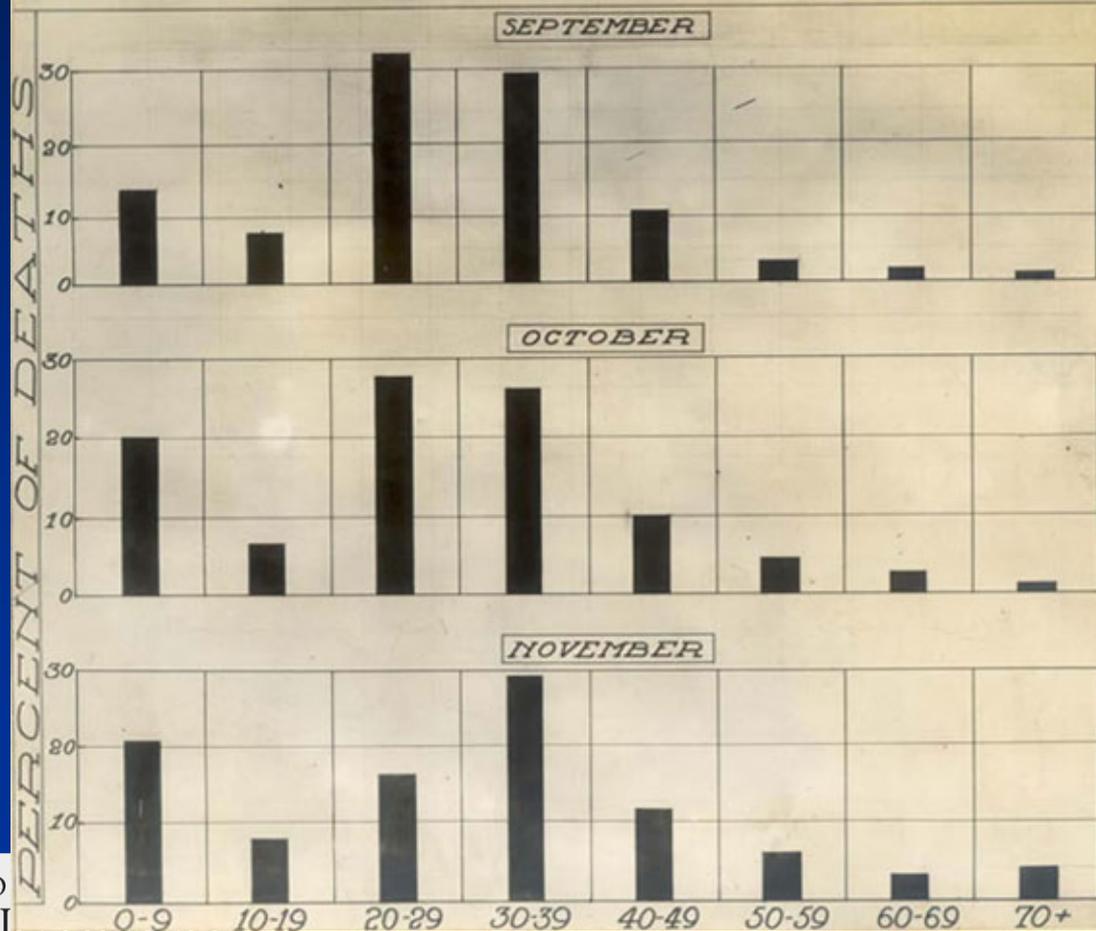
# Pandemic Influenza 1918-1919

- JAMA Dec 1918 – “The 1918 has gone: a year momentous as the termination of the most cruel war in the annals of the human race; a year which marked, the end at least for a time, of man’s destruction of man; unfortunately a year in which developed a most fatal infectious disease causing the death of hundreds of thousands...Medical science for 4 ½ years devoted itself to putting men on the firing line and keeping them there. Now it must turn with its whole might to combating the greatest enemy of all – infectious disease.”

# Pandemic Influenza 1918-1919



# AGE DISTRIBUTION OF INFLUENZA AND PNEUMONIA DEATHS AT BOSTON DURING SEPT.-OCT.-NOV. 1918.



# EXCESS MORTALITY IN U.S. CITIES DURING INFLUENZA EPIDEMIC

## PERCENT OF POPULATION DYING

CITY	1918-1919																			
	SEPT. 8 - NOV. 23 10 WEEKS					NOV. 24 - FEB. 1 10 WEEKS					FEB. 2 - MAR. 29 8 WEEKS					TOTAL 28 WEEKS				
	0	.2	.4	.6	.8	0	.2	.4	.6	.8	0	.2	.4	.6	.8	0	.2	.4	.6	.8
PHILADELPHIA	.69	██████████				.01					.03					.73	██████████			
FALL RIVER	.59	██████████				.05	█				.04	█				.68	██████████			
PITTSBURGH	.59	██████████				.12	██			.06	██			.77	██████████					
BALTIMORE	.57	██████████				.03	█				.0					.60	██████████			
SYRACUSE	.55	██████████				.02	█				.02	█				.58	██████████			
NASHVILLE	.55	██████████				.16	███			.12	██			.83	██████████					
BOSTON	.50	██████████				.12	██			.0					.62	██████████				
NEW HAVEN	.49	██████████				.13	██			.0					.61	██████████				
NEW ORLEANS	.49	██████████				.21	███			.0					.71	██████████				
ALBANY	.48	██████████				.03	█				.02	█				.53	██████████			
BUFFALO	.47	██████████				.10	██			.04	██			.61	██████████					
WASHINGTON	.45	██████████				.12	██			.0					.54	██████████				
LOWELL	.44	██████████				.10	██			.03	██			.56	██████████					
SAN FRANCISCO	.42	██████████				.31	█████			.02	█				.74	██████████				
CAMBRIDGE	.39	██████████				.12	██			.0					.50	██████████				
NEWARK	.38	██████████				.11	██			.04	██			.53	██████████					
PROVIDENCE	.38	██████████				.13	██			.03	██			.53	██████████					
RICHMOND	.35	██████████				.18	███			.02	█				.55	██████████				
DAYTON	.33	██████████				.02	█				.03	██			.37	██████████				
OAKLAND	.33	██████████				.22	███			.01	█				.56	██████████				
CHICAGO	.32	██████████				.09	██			.04	██			.46	██████████					
NEW YORK	.30	██████████				.09	██			.08	██			.47	██████████					
CLEVELAND	.27	██████████				.11	██			.04	██			.42	██████████					
LOS ANGELES	.27	██████████				.26	███			.01	█				.55	██████████				

# Pandemic 1918

- “Our beds were filled as fast as emptied”
- US PHS Officer Jo Cobb, Chicago Marine Hospital



# SPRAY !



TALK ABOUT BULLETS  
SPRAYED FROM MACHINE  
GUNS — THEY ARE  
NOT MORE DEADLY  
THAN THE MUCUS  
SPRAYED IN MILLIONS OF  
DISEASE-BEARING DROPLETS  
FROM PEOPLE'S MOUTHS !

**DON'T** COUGH OR SNEEZE INTO ANYTHING  
BUT YOUR HANDKERCHIEF !  
**DON'T** TALK OR LAUGH INTO ANYONE'S  
FACE !

*During the statewide influenza epidemic, health agencies used many resources for alerting the public to the contagion. Illinois Health News carried this pictorial message in the October, 1918. issue.*

Obey the laws  
And wear the gauze  
Protect your jaws  
From septic paws

# 1,177 NEW CASES OF "FLU" REPORTED

Health Department Announces 12  
Deaths And 6 From

TURSDAY MORNING, OCTOBER 5, 1918

## ORDERS SCHOOLS CLOSED

Cumberland Board Of Health Shuts  
Theatres Also.

## "FLU" IS SPREADING RAPIDLY

Physicians Are Overwhelmed With  
Cases—1,000 Employees Of The  
B. & O. Reported Unable To Work

Cumberland, Md., Oct. 4.—Owing to  
the great number of cases of Spanish in-  
fluenza in the city, which are being aug-  
mented almost hourly, the Board of  
Health this afternoon passed an order  
closing at once all the schools, theatres,  
public and private dance halls and other  
public assemblages and to

## ACCUSED OF ST

More Than 20 To  
On F

Frederick, Md., C  
Lee Hagan, Spencer  
Ohrem were arrested  
in \$250 bail for the  
court charged with  
tons of coal from  
Ohio Railroad in  
Mt. Airy Junction.

When three dep  
arrest the men the  
scene and the third  
wagon for more coal  
were found in two  
with bushes at the  
The men have  
some ties and  
suspicion. After

## "FLU" HITS FIRE DEPARTMENT

200 Men Short Because Of Illness  
And Vacancies.

Because of the situation in the Fire  
Department, which is crippled through  
the illness of 200 or more men and many  
vacancies, the Fire Board yesterday  
suspended the order allowing regular  
days off and revoked all special leaves  
of absence.

All the companies are running short  
600 men doing the work of 800



# 21<sup>st</sup> Century Trends Affecting Pandemic Impact

- Global population larger and more urbanized
- Levels of international travel greater
- Increased population of elderly and those with chronic conditions

# A 1918 Pandemic Today Would Exact a Horrible Toll

- 50% or more of those who become ill will seek medical care

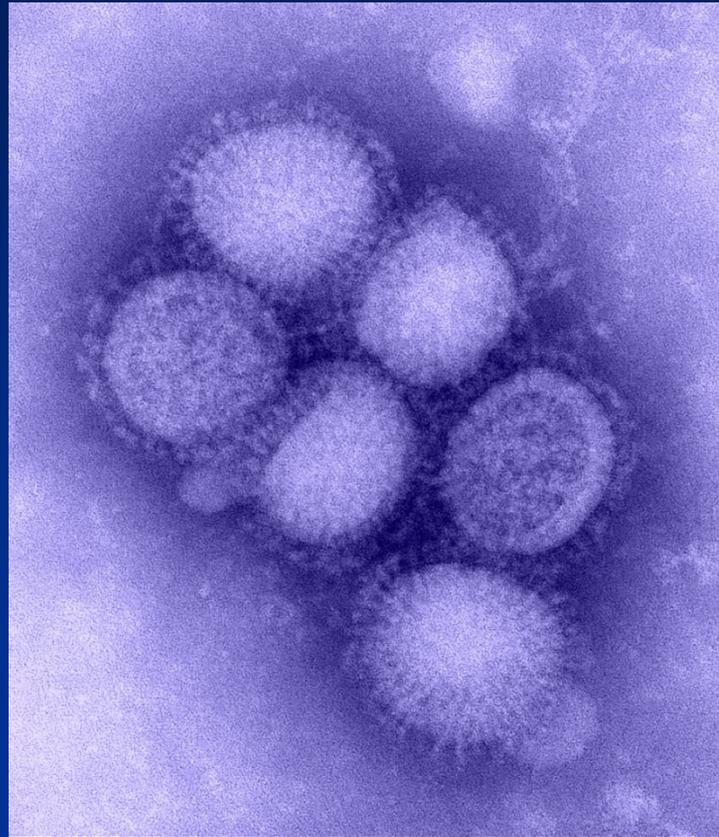
Severe Pandemic (1918-like)	
Illness	90 million (30%)
Outpatient medical care	45 million (50%)
Hospitalization	9,900,000
ICU care	1,485,000
Mechanical ventilation	745,500
Deaths	1,903,000

# Pandemic Impact

- May come and go in waves lasting 6-8 weeks
- High levels of illness, death, health care system overload, social disruption, basic service disruption, and economic loss
- Limited vaccine and antiviral supplies



# Then H1N1 Happened



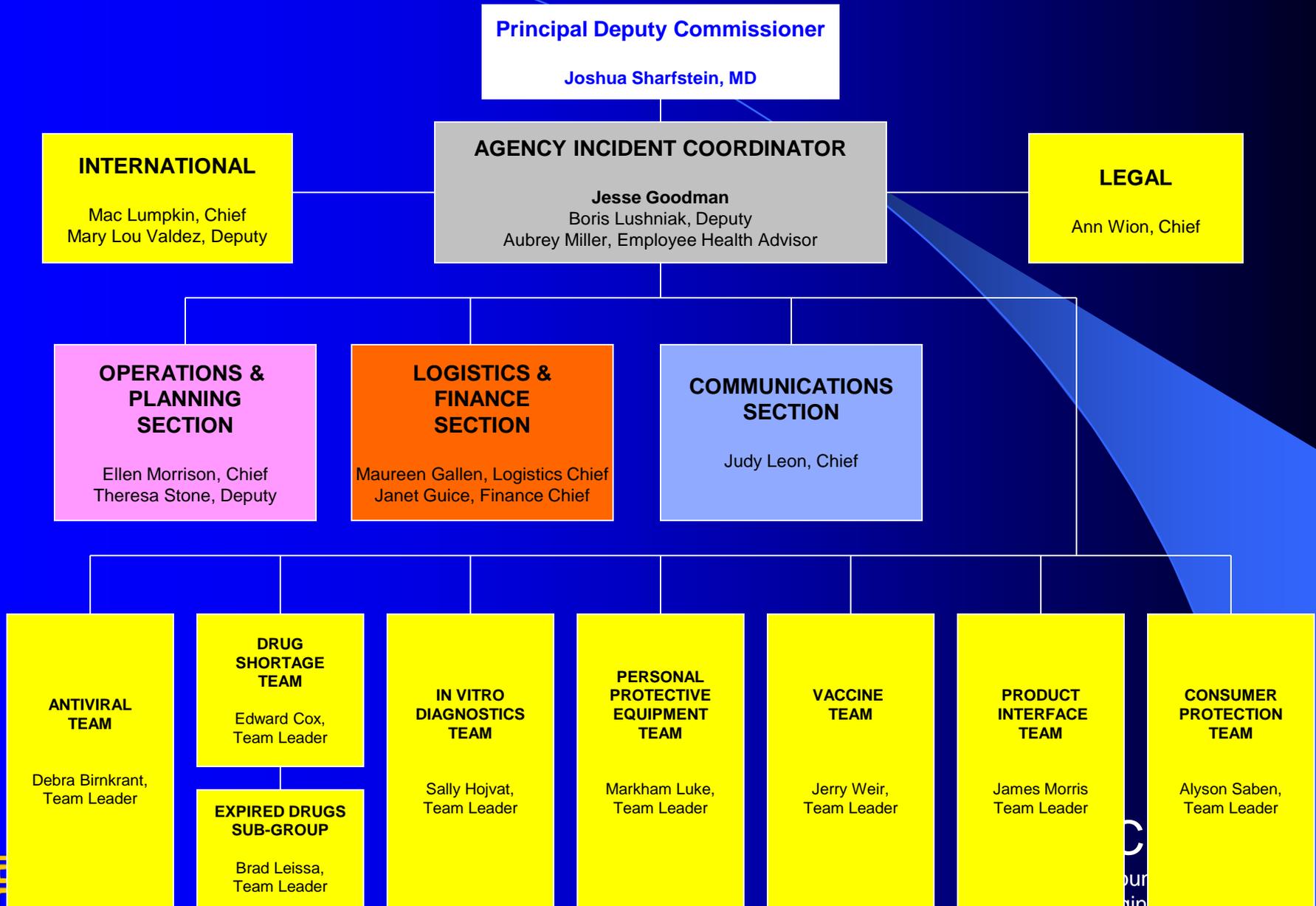
# Novel H1N1 Influenza

- New flu virus antigenically and genetically distinct from human H1N1 in circulation since 1977
- Quadruple reassortant virus – 2 genes from swine flu in Europe and Asia, one gene segment human influenza, gene segments North American avian and swine flu
- First caused illness in Mexico and US
  - March/April 2009
- First case confirmed in US (CA) in 10 yo old by lab testing at CDC on April 15 (clinical lab study)
- Second case confirmed April 17 in 8 yo (130 miles away)
- Quickly determined that there was person-to-person spread
  - Secondary attack rate 8-12% in household contacts

# Novel H1N1 Influenza 2009

- April 21 – work on candidate vaccine virus
- April 22 - CDC activated its Emergency Operations Center (EOC)
- April 23 – 2 cases in Texas, Mexico and Canada cases confirmed
- April 24 - FDA activated its EOC
- April 25 – WHO declares a public health emergency of international concern;
  - NYC cluster, case in Kansas and Ohio
- April 26 - US Government declared a public health emergency and implemented the national pandemic response plan
  - release of 11 mill regimens of antiviral stockpile and 39 mill resp prot devices to States
  - FDA issues EUAs for antiviral peds use < 1

# 2009 H1N1 FLU VIRUS FDA IMS



# Novel H1N1 Influenza 2009

- April 27 -- WHO pandemic alert level to Phase 4 (human to human, community level outbreaks)
- April 28 – real-time PCR cleared by FDA under EUA
- April 29 – WHO pandemic alert level to Phase 5 (2 nations in one region, pandemic imminent)
- June 11 – WHO pandemic alert level to Phase 6 (pandemic affecting 70 nations reporting, level not based on severity)
- June 19 – All 50 States, DC, Puerto Rico, and US Virgin Islands report cases
- July 6 – 122 countries reporting 94,512 cases with 429 fatal
  - US 33,902 with 170 fatal
- July – case counts stopped, > 1 million in US; reporting of hospitalizations and deaths
- July 23 – start of clinical trials with new vaccine; FDA licensure pathway under strain change pathway (similar to seasonal)

# Novel H1N1 Influenza 2009

- July 29 – target groups for vaccination (ACIP): pregnant, caretakers of infants < 6 mos, health care workers, age 6 mos-24 yrs, age 25-64 at high risk
- September 15 – FDA licenses 4 vaccines (a fifth added on Nov 16)
- September 30 – States place order for vaccine
- October 5 – first doses of vaccine administered
- October – peak of activity, launch of vaccination campaign
- October 23 – FDA issues EUA for peramivir IV
- November/December – easing of restrictions on vaccines
- December – preliminary safety results for vaccine (3783 reports, 5 % serious, similar to seasonal)

# Novel H1N1 Influenza 2009

- Two waves (peak in June and Oct)
- Hospitalization rates highest in children age 0-4 and working adults
- Estimated 60.8 million cases in US
  - 274,304 hospitalizations and 12,469 deaths
  - 151,700 to 575,400 deaths worldwide
- Higher burden of disease in young might be due in part to previous exposure of older persons to antigenically similar viruses
- Pandemic declared over on August 10, 2010

Shrestha et al, Clin Infect Dis 2011, 1; 52, Suppl 1:S75-82

# National Framework for H1N1 Public Health Response

- Four major pillars
  - Surveillance
  - Community mitigation
  - Vaccine delivery
  - Communication
- Main messages
  - Cover your nose and mouth with a tissue when you cough or sneeze
  - Wash your hands
  - Avoid touching eyes, nose, mouth
  - Stay home if sick
    - Community setting 24 hours post fever
    - Healthcare setting 7 days from symptom onset or resolution of symptoms
  - Avoid close contact (< 6 ft) with persons with ILI

# Pandemic Influenza

“It is clear that pandemic influenza has the potential to pose disease control challenges unmatched by any other natural or intentional infectious disease event.” -- DHHS





## Background

- The 2014 Ebola outbreak -- largest in history and the first Ebola outbreak in West Africa
- Multiple countries in and around West Africa
  - Sierra Leone, Liberia and Guinea
- Strategy -- to diminish the threat of Ebola in the US and the world by defeating it at its source
- The US significantly ramped up efforts to fight the virus in West Africa



# Initial Outbreak Response

December 2013 – July 2014

- HHS/CDC begins to deploy personnel
- USAID requests HHS participation
- Proposal for USPHS Corps to serve in multiple roles, to include direct patient care were presented to NSC

08 August 2014

- WHO declares Ebola outbreak a public health emergency of international concern (PHEIC)

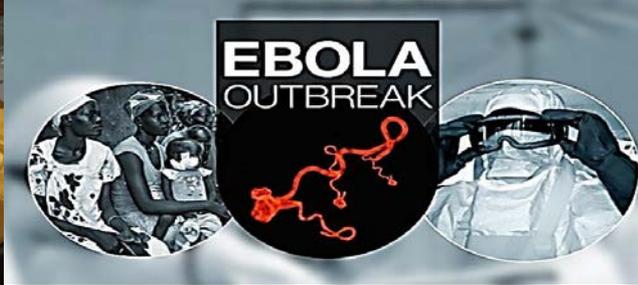


# Synergy of Mission

## U.S. Strategy

**POTUS:** “Ebola epidemic in W. Africa and the humanitarian crisis there is a top national security priority for the United States”

- Strategy is predicated on four key goals:
  1. Controlling the epidemic at its source in West Africa;
  2. Mitigating second-order impacts, including blunting the economic, social, and political tolls in the region;
  3. Engaging and coordinating with a broader global audience; and
  4. Fortifying global health security infrastructure in the region and beyond.



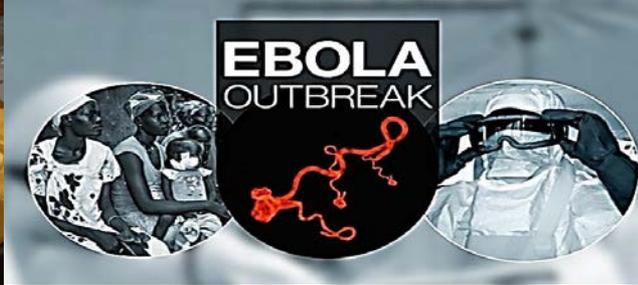
# Mobilization of USPHS Commissioned Corps

16 SEPT 2014 President of the United States

“The U.S. Public Health Service Corps is preparing to deploy a team of 65 officers to Liberia to manage and staff a previously announced Department of Defense (DoD) hospital to care for healthcare workers who become ill.”

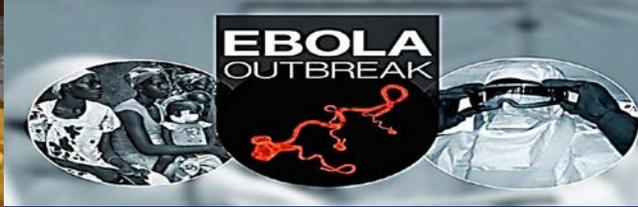
# Timeline

- Aug 2014 – Corps worked with OGC and Secretary to confirm authorities in 42 USC 204(a)
- Sept 2014 – Activation/Deployment memo signed.
  - Includes broad language for multiple Corps roles.
- Sept 2014 - White House Principals Committee Conclusions:
  - HHS with USAID support, will deploy Commissioned Corps to Liberia to staff the DoD-provided 25-bed medical unit for EVD care.
- Oct 2014 – ADVON team deploys to build partnerships and stand up facility followed by Team 1
- Nov 7 2014 – MMU operational



# USPHS Commissioned Corps Mission Taskers

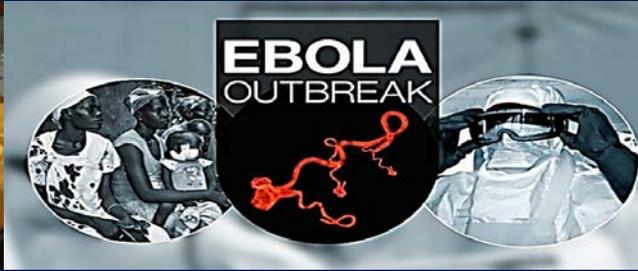
- Roster public health care professionals, administrators, and clinical staff to manage/operate a 25-bed Ebola treatment unit (ETU) in Monrovia, Liberia -- Monrovia Medical Unit (MMU)
- Services required - to provide a high level of treatment/ supportive care to national and international health care workers considered to be infected by Ebola virus disease (EVD)
- The MMU will not provide trauma care or non-Ebola related care to those not infected with EVD



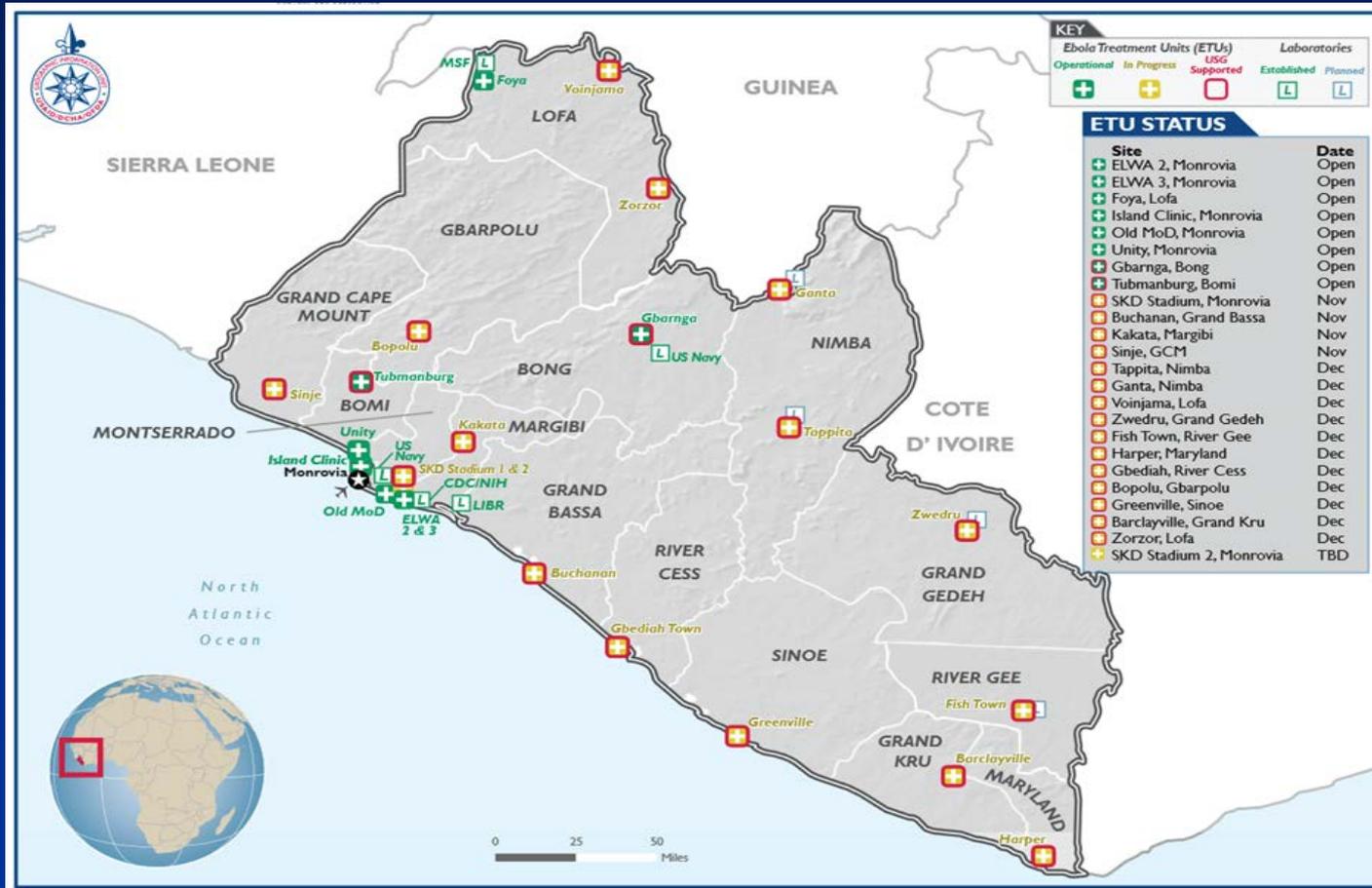
## MMU Mission

Provide hope through care to healthcare workers in Liberia who may have the Ebola Virus Disease and continue efforts with the Liberian government and international partners to build capacity for additional care.





# Liberia and Ebola Treatment Units (ETUs)





# Overall USG Response in partnership with Govt of Liberia

United Nations  
Mission for  
Emergency Ebola  
Response (UNMEER)

DOD Operation  
United Assistance



CoM /  
USAID-  
DART



Commissioned Corps  
Ebola Response



# Interagency Planning

## Within Dept of Health and Human Services

- Eligibility
- Liability (Bilats) for provision of direct care in Liberia
- Level of care

## With USAID

- Overall roles and coordination
- Fiscal resources

## With DoD

- Deployment requirements
  - Force Protection, Life-support, Air Mobilization
- Command and control integration

## With CDC

- Training requirements and in-country epidemiology

## With International Partners

- Additional in-country “hot-zone” training

# Challenges

- DoD facility staffed by Corps with a dangerous pathogen, in international environment with force health threats
- Funding streams differ
- High risk and high visibility
- In-country operational realities with communications and movement
- Expectation management (politics v operations)
- Op tempo shifts
- Personnel challenges of 70 officers in austere conditions
- MMU Exit Strategy



# PHS Commissioned Corps Ebola Command Structure



**Commander**  
Corps Ebola Response  
RADM Scott Giberson

**Commanding Officer/Liberia**  
RADM Boris Lushniak

**Deputy Commander**  
Corps Ebola Response  
CAPT Dan Beck

**AFRICON LNO**  
CAPT Brad Austin

**Executive Officer**  
CDR Bill Pierce

**ADVON Team**  
(10/3/14)  
CAPT Mike Schmoyer  
CAPT Ed Dieser  
CAPT Mike Bourg

**RMT LNO**

**ERTF**  
Executive Assistant

**Public Affairs**  
LCDR Kate Migliaccio

**Overall Ebola Response**  
**In-Country Command**

**Field Ops (MMU Team)**  
**Officer-in-Charge**  
CAPT Dean Coppola

**Deputy Officer-in-Charge**  
CAPT Sean Boyd

**Chief Medical Officer**  
CDR Sigh

**Response and Deployment Ops**  
CAPT Sean-David Waterman

**Family Support Network**  
LT Tracy Tilghman

**HQ Operations**  
CAPT Scott Helgeson

**Training**  
LCDR Elizabeth DeGrange (Lybarger)

**Interagency Collaborations**  
OGA – CAPT Mitch Wolfe  
ASPR/EMG – Mr. Mike Vineyard  
CDC – CAPT Inger Damon, John Brooks  
DoD – Commanding General – MG Volesky  
RMT/DART – Mr Doug Mercado  
OFDA – Jeremy Konyndk  
CoM – AMB Deb Malac

# USPHS Staffing for the MMU

## Team Composition

- ~ 10 Medical Providers
  - MDs/NP or PAs
- ~ 20 nurses
- ~ 4 pharmacists
- ~ 3 laboratorians
- ~ 10-15 safety officers
- ~ 5 behavioral health providers
- ~ 15-20 Admin, logistics, planning staff
- Command
  - Officer in Charge, XO and the Commanding Officer



# Monrovia Medical Unit USPHS Feb 27, 2015

MMU Hot Zone

MMU Cold Area



MWR  
Rec,  
Conf Room

Contractor (PAE) Tents

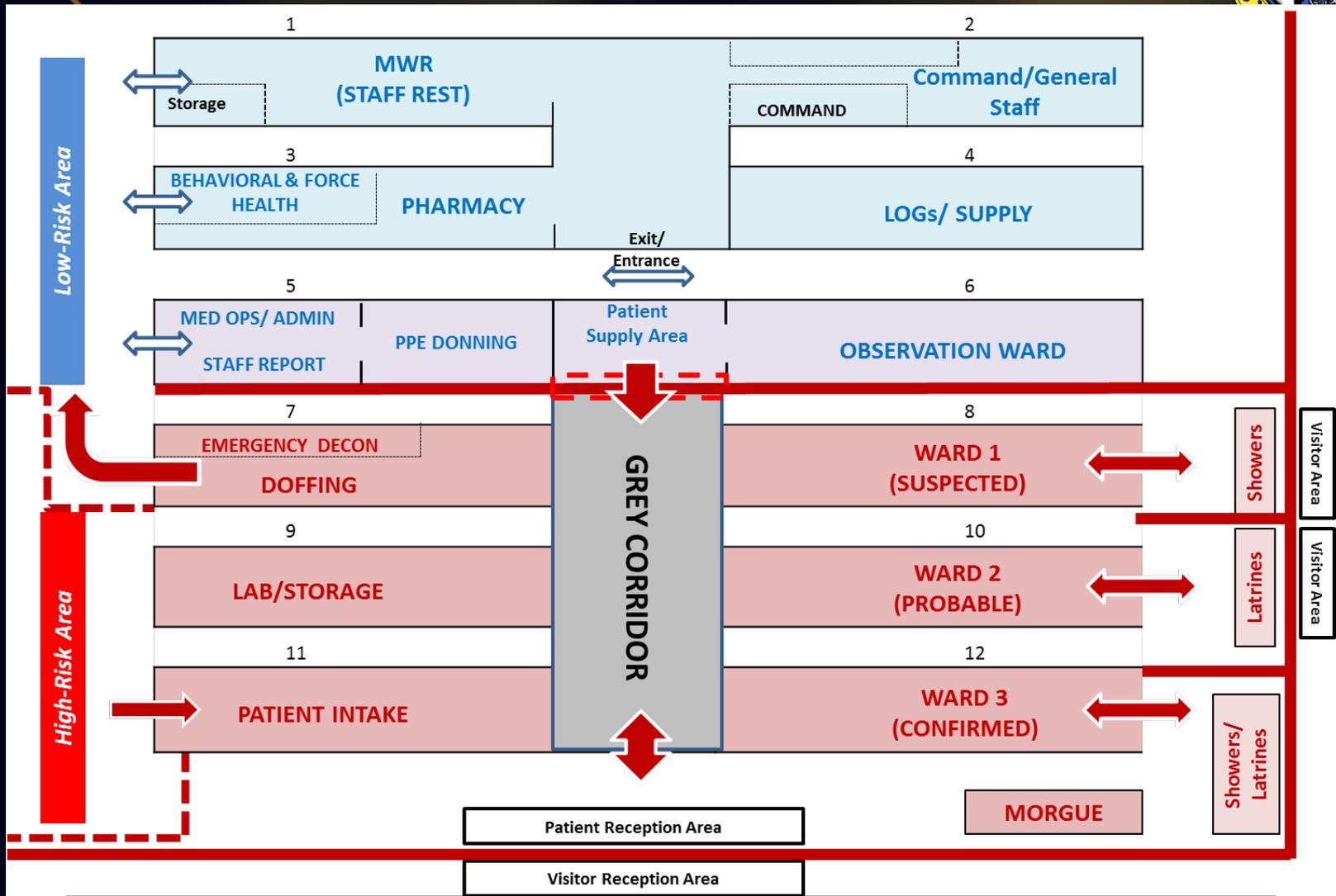
Kitchen/Mess Tent Accomodations

Latrines/Showers

Latrines/Showers/Laundry



# Schematic of the MMU



UNCLASSIFIED//FOR OFFICIAL USE ONLY

## Monrovia Medical Unit (Interior)

Rev. 12JAN2015

# Ambulance Entry



02-12-2015 08:22

# Patient Intake



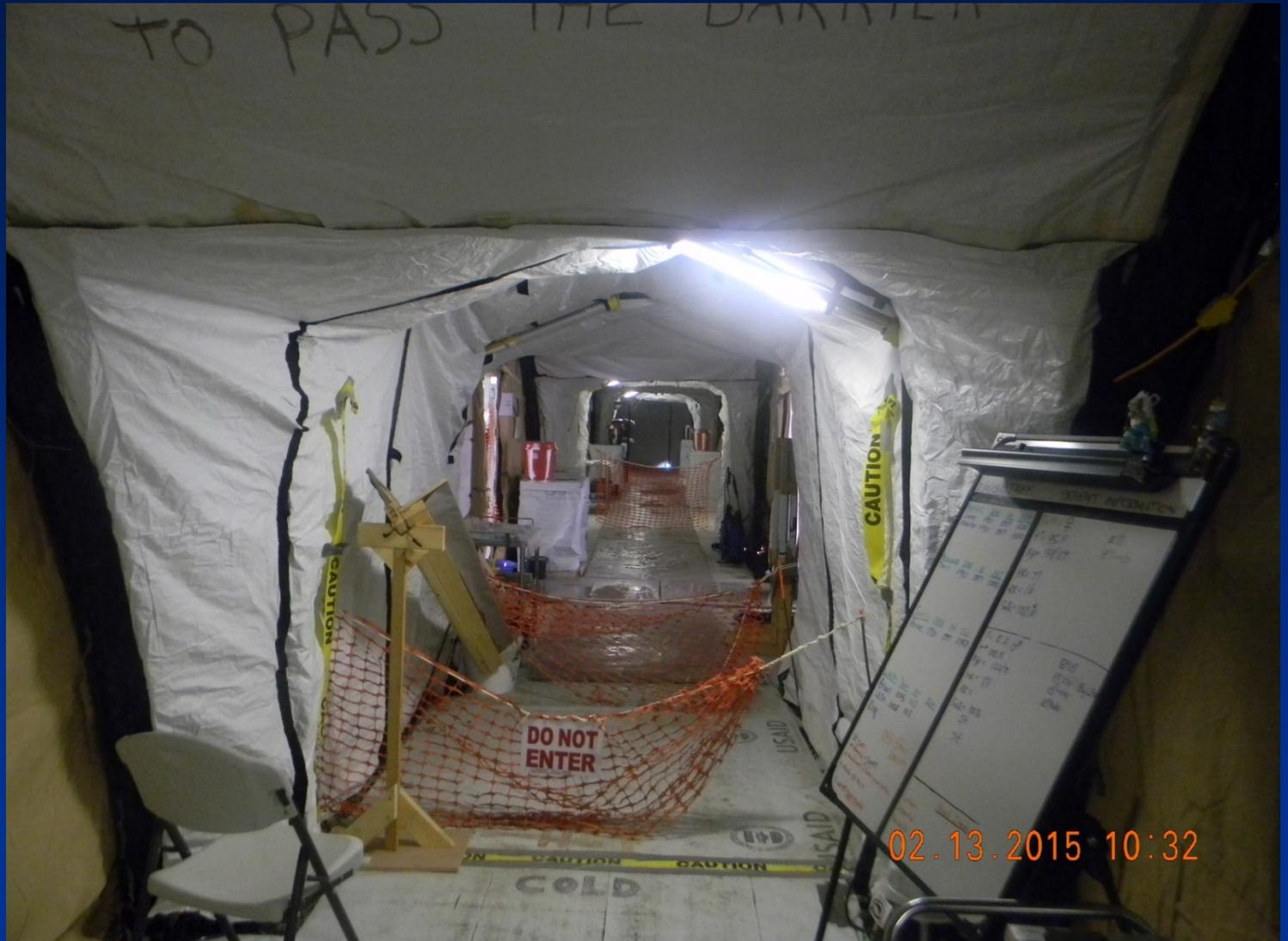
# Donning PPE



**HR >100= NO GO**



# A look down the Grey hall



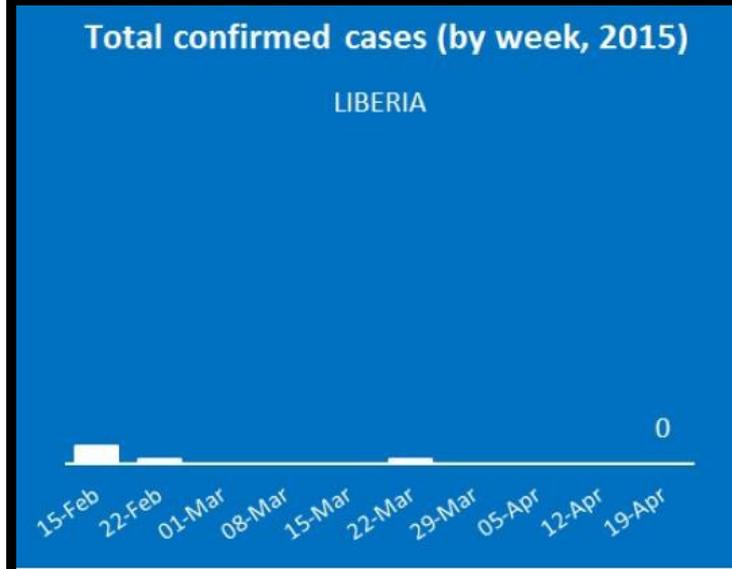
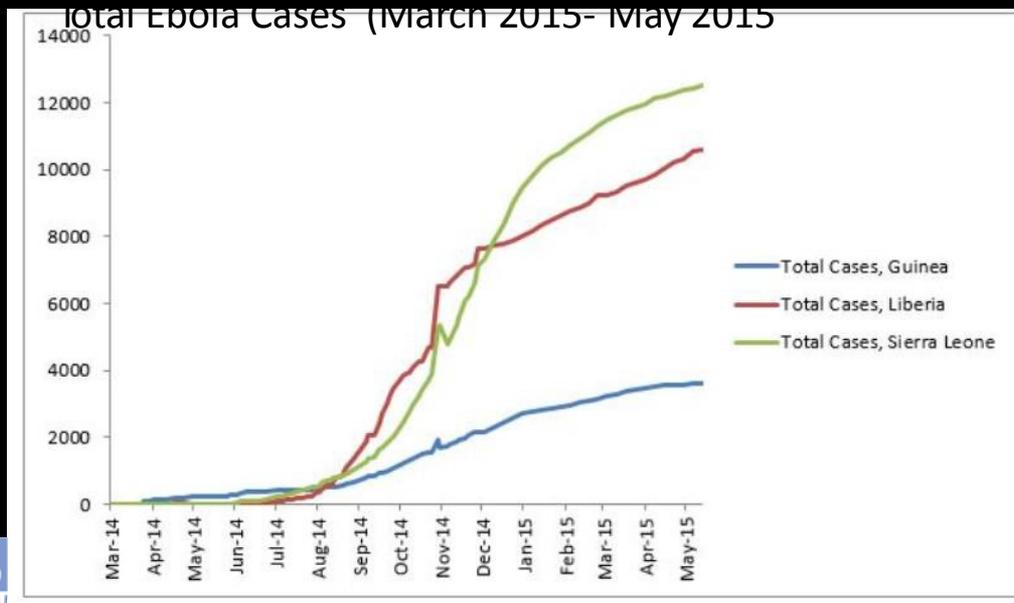
# Doffing

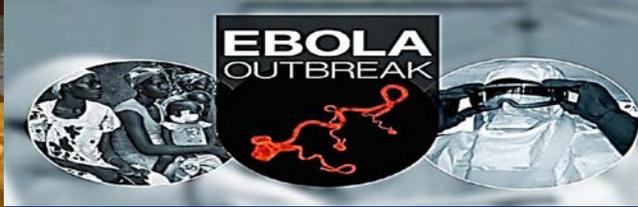




# Successful Mission

- The MMU and its PHS Officers were the only US government entity providing direct patient care to patients infected with Ebola in West Africa
- All 300 team members returned home safe
- Liberia Declared Ebola free initially May 9<sup>th</sup>, 2015





# Commissioned Corps Officers stood ready and provided *steadfast treatment and enduring hope* in the fight against Ebola Virus Disease



Honored to serve!

# Review

- Infectious disease disasters
- Bioterrorism attack -- Anthrax
- Pandemic -- Influenza
- Outbreak of emerging infectious disease -- Ebola