

# **Avian Influenza and Other Communicable Diseases: Implications for Port Biosecurity**

**David Kim, MD, MA  
Division of Global Migration and Quarantine  
Centers for Disease Control and Prevention  
Atlanta, GA  
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# Overview

- Maritime traffic background
- Foreign quarantine regulations
- Illness monitoring and response principles
- Influenza primer
- Avian influenza and pandemic influenza
- Implications for ports

# World Merchant Fleet Ship Types



**Container Ship**



**Bulk Carrier**

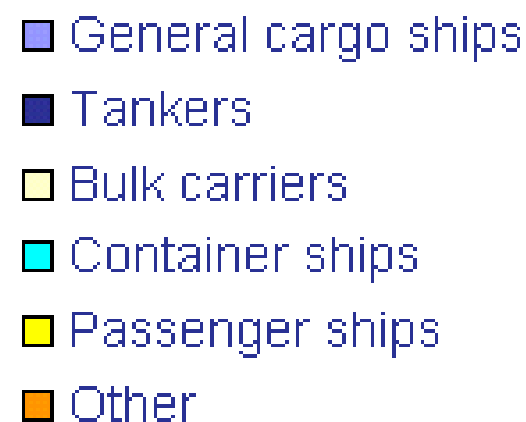
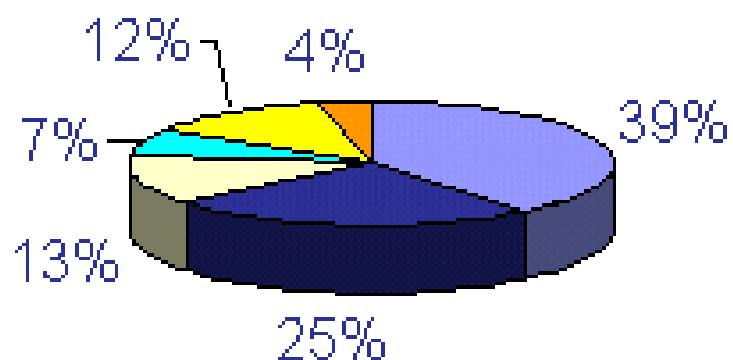


**Tanker**



**Cruise Ship**

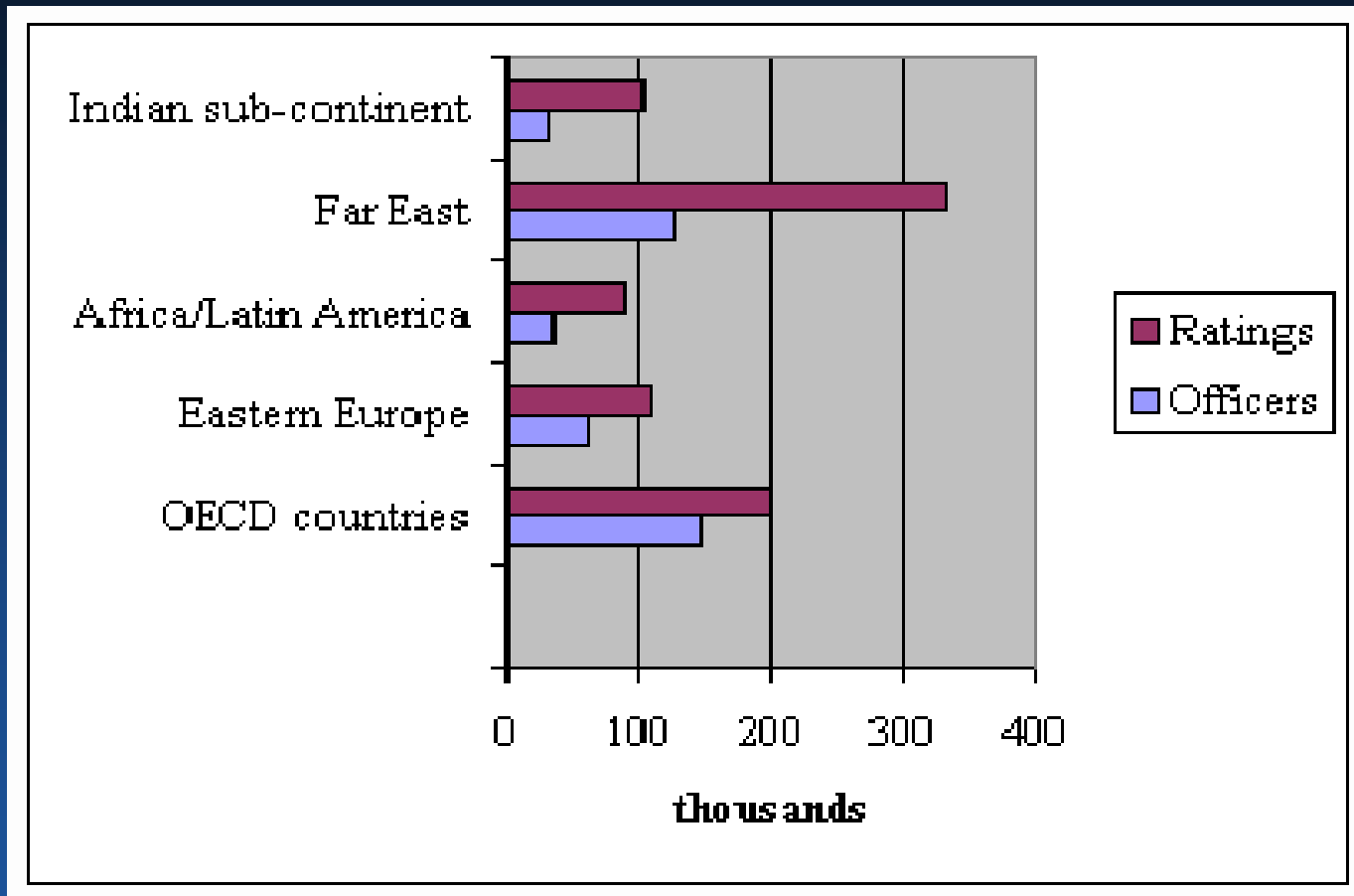
## Different sectors as percentage of total number of ships in world fleet: 1 January 2005



Total number of ships: 46,222 (597,709,000 gross tons)

Source: Lloyd's Register Fairplay, January 2005

# Seafarer Domicile, 2000\*



\*Excludes catering and hotel staff

Source: International Shipping Federation, Manpower Update, 2000

# Cruise Traffic, 2003

- 10.5 million passengers (7.5 million from U.S.)
- Destination (% of 77 million bed-days)
  - ▶ Caribbean (46)
  - ▶ Mediterranean (13) > Europe (9) > Alaska (8) > Mexico (6)  
> Trans-Canal (4) > Hawaii (3) > South America



# Maritime Conditions

- Many ship types and functions
- International crew and itinerary
- Diverse exposure risk
- Closed quarters and prolonged contact
- Inconsistent healthcare
- Port-to-port transition

# 42 CFR §71: Foreign Quarantine

- **Reporting requirements**
  - ▶ Master to Quarantine Station
  - ▶ Any death or illness
- **Definition: Illness**
  - ▶ Fever >48 hours
  - ▶ Fever AND rash, swollen glands, or jaundice
  - ▶ Diarrhea
- **Quarantinable diseases**
  - ▶ Cholera, diphtheria, plague, smallpox, infectious tuberculosis, viral hemorrhagic fever, yellow fever
  - ▶ Severe Acute Respiratory Syndrome (SARS), novel influenza



# Diseases Reported

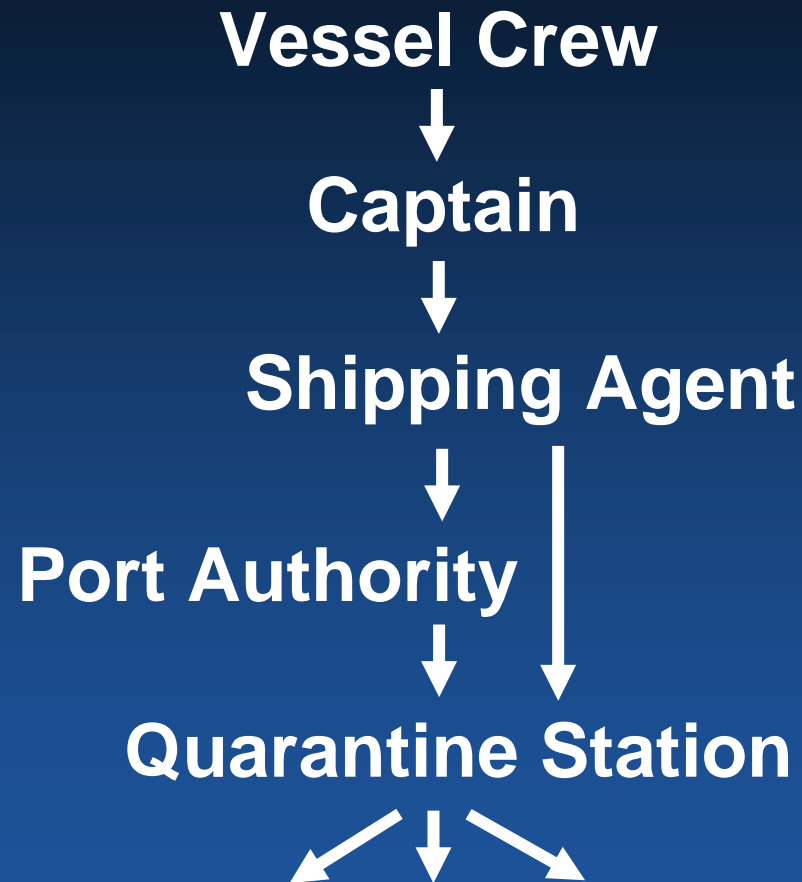
- Tuberculosis
- Meningococcal Meningitis
- Influenza
- Measles
- Rubella
- Varicella
- Legionella
- Hepatitides
- Gastroenteritis
- Vector-borne Diseases (malaria, dengue, etc.)



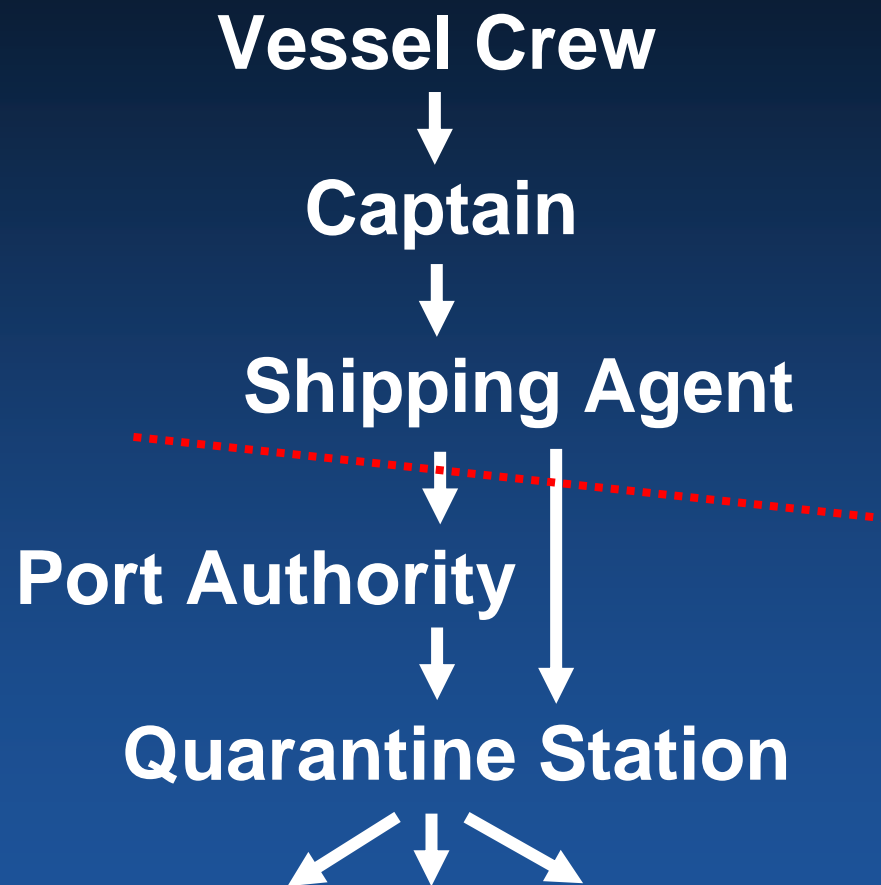
# Illness Notification & Monitoring



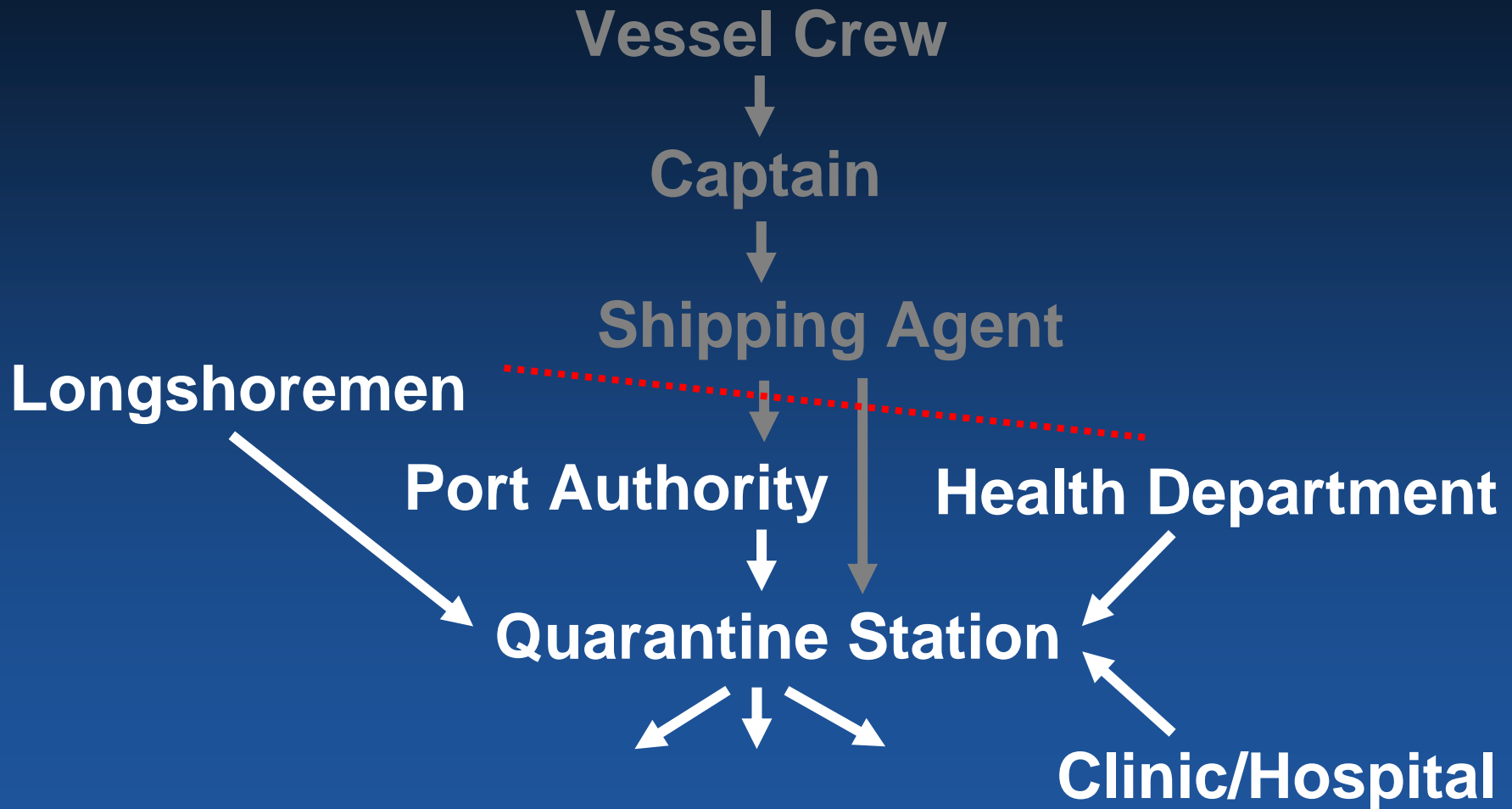
# Maritime Illness Notification: Perfect World



# Maritime Illness Notification: Breakdown



# Maritime Illness Notification: Reality



# Maritime Vessel Illness Response Principles

- Confirm disease
- Search for additional cases
- Hypothesize exposure risks
- Determine potential for spread
- Identify susceptible individuals
- Consider environmental factors
- Find etiologic agent
- Apply intervention
  - ▶ Notification
  - ▶ Engineering and administrative controls
  - ▶ Surveillance
- Communicate

IT'S A SMALL  
WORLD AFTER ALL!...  
IT'S A SMALL  
WORLD AFTER ALL!...  
IT'S A SMALL  
WORLD AFTER ALL!...  
IT'S A SMALL  
WORLD AFTER ALL!...

MODERN  
GLOBAL  
MOBILITY

**INFLUENZA**

# Influenza Disease

- **Incubation: 1-4 days**
- **Symptoms: Fever, cough, sore throat, fatigue, runny nose, muscle aches, headache**
- **Contagious: 5 days after onset (longer in children)**
- **Treatment: Rest, fluids, meds for symptoms, antiviral, avoid tobacco and alcohol**
- **At risk for complications: Young, old, or with health problems**
- **Prevention: Vaccination, personal hygiene**



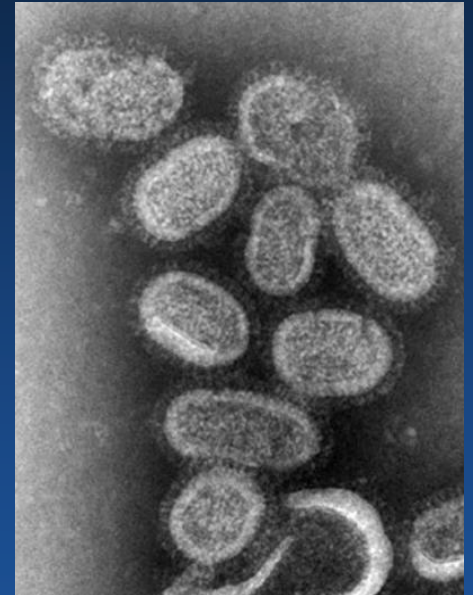
# Seasonal Influenza

- Contagious respiratory disease
- Caused by influenza virus
- Spread by coughing, sneezing
- Season: Dec-Mar
- Annual burden in US
  - 5-20% population get sick
  - 200,000 hospitalizations
  - 36,000 deaths
- Global burden
  - 250,000-500,000 deaths



# Influenza Types

- Humans infected by types A and B
- Birds infected by type A
- Type A has different subtypes
  - Based on surface protein (HA, NA)
- Other animals subject to influenza include pigs, horses, dogs, seals, whales



# Avian Influenza (“Bird Flu”)

- Identified in Hong Kong 1997
- Did not previously infect humans
- Caused by type A (H5N1)
- Spread by close contact with infected birds (bird-to-human)



# H5N1 Human Infection

- **Flu-like: fever, respiratory symptoms**
- **Difficulty breathing, pneumonia**
- **Diarrhea, vomiting, abdominal pain**
- **Multiple organ problems (kidneys, heart)**
- **Rapid deterioration, death**
- **Supportive care**
- **Antiviral drug (oseltamivir) might help**
- **No vaccine**

# Why Worry about Avian Influenza?

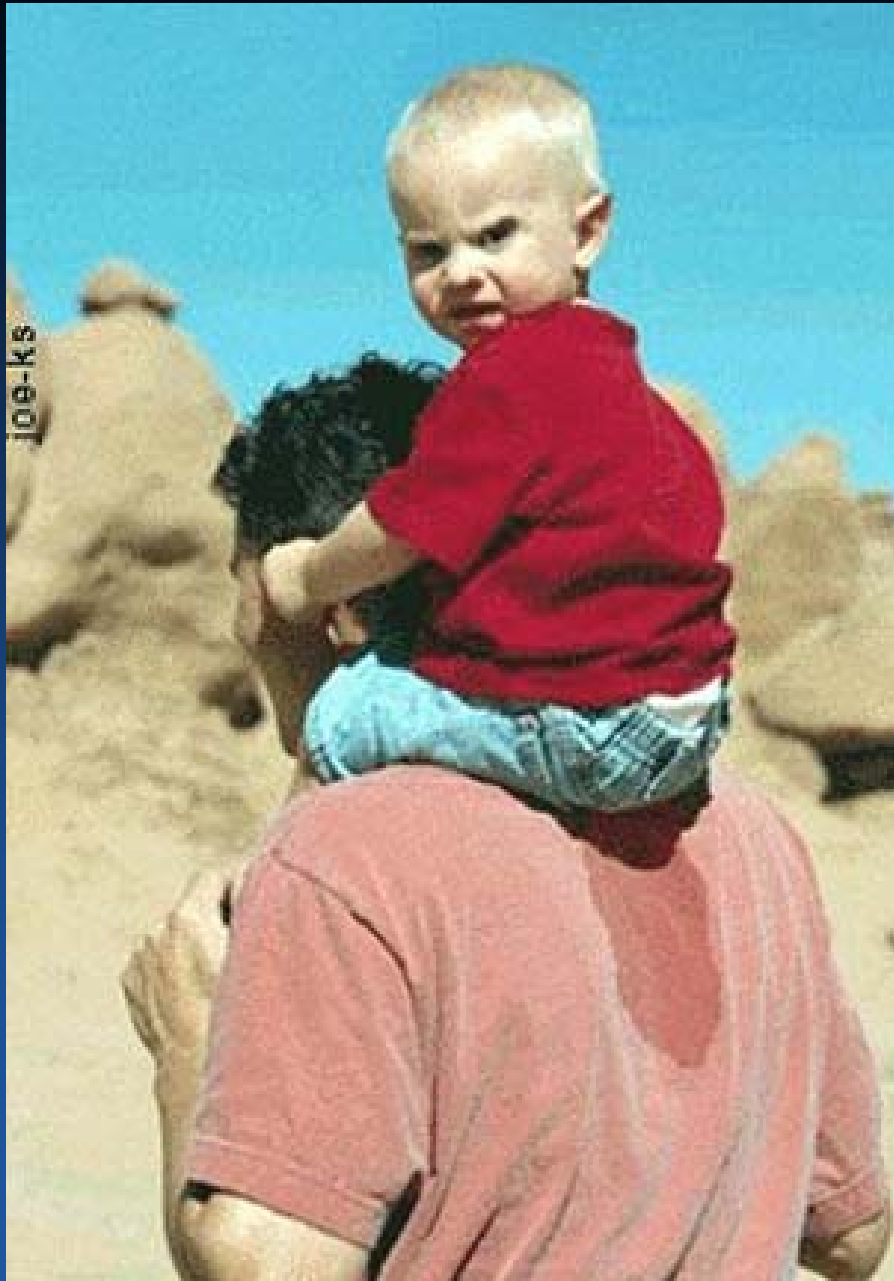
- Causes serious illness in humans
- Could develop ability to spread easily between people
- Substantial risk for pandemic influenza

# 1918 Pandemic Spanish Flu

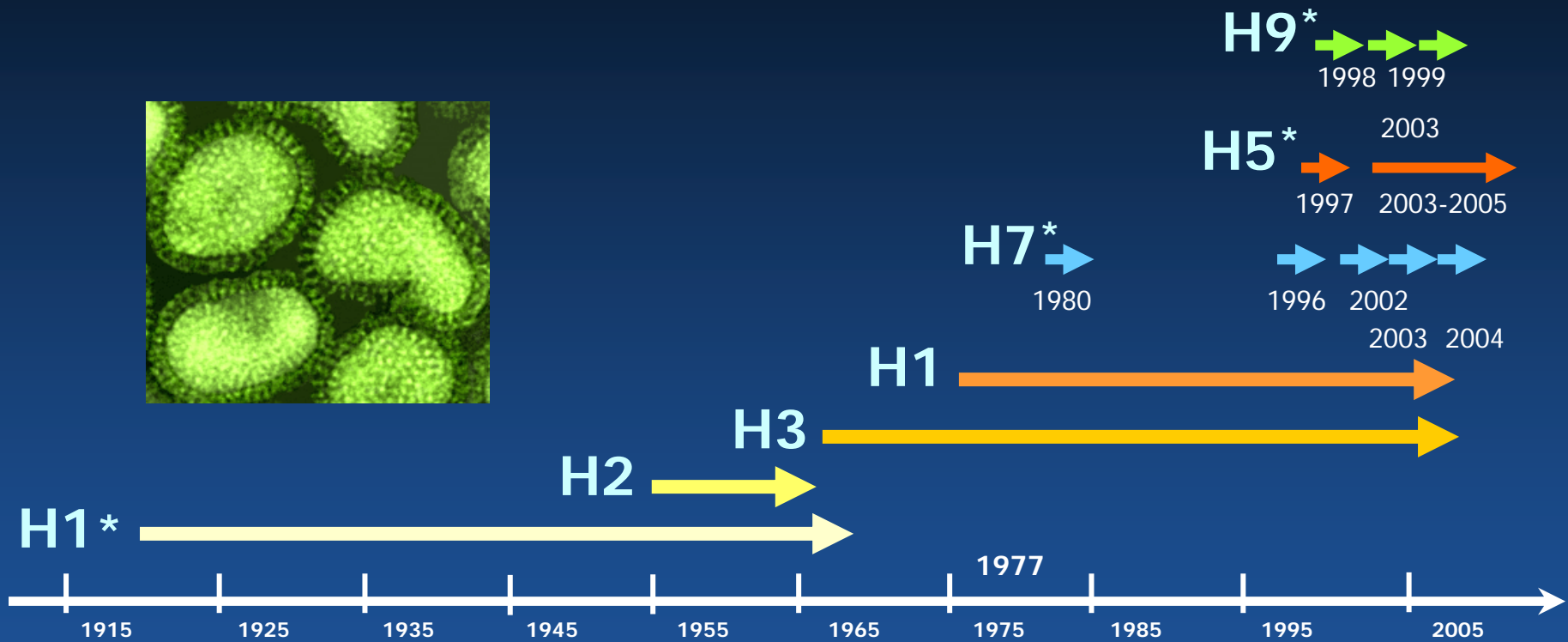
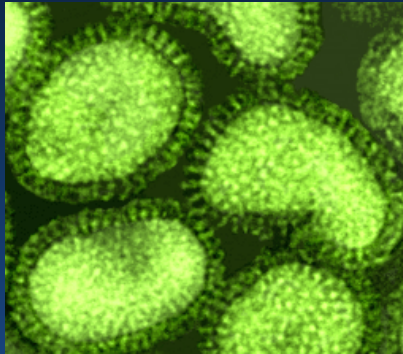
- 500,000 deaths in U.S.
- 20-50 million deaths globally
- Half were young, healthy adults
- Type A virus (H1N1)



Influenza: Past and Present Danger



# Pandemic Influenza



1918  
Spanish  
Flu H1N1

1957  
Asian  
Flu H2N2

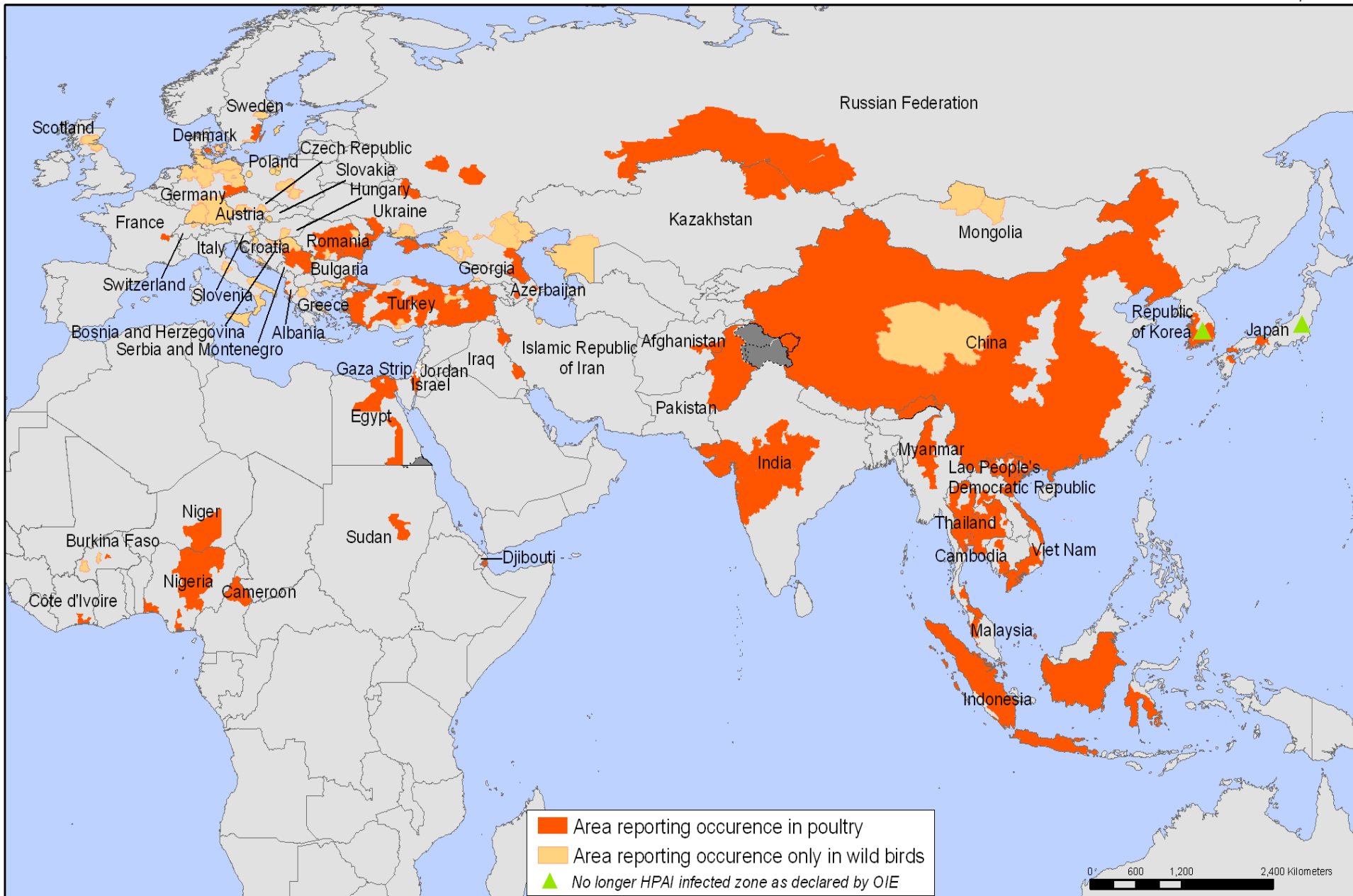
1968  
Hong Kong  
Flu H3N2

\* Avian Flu



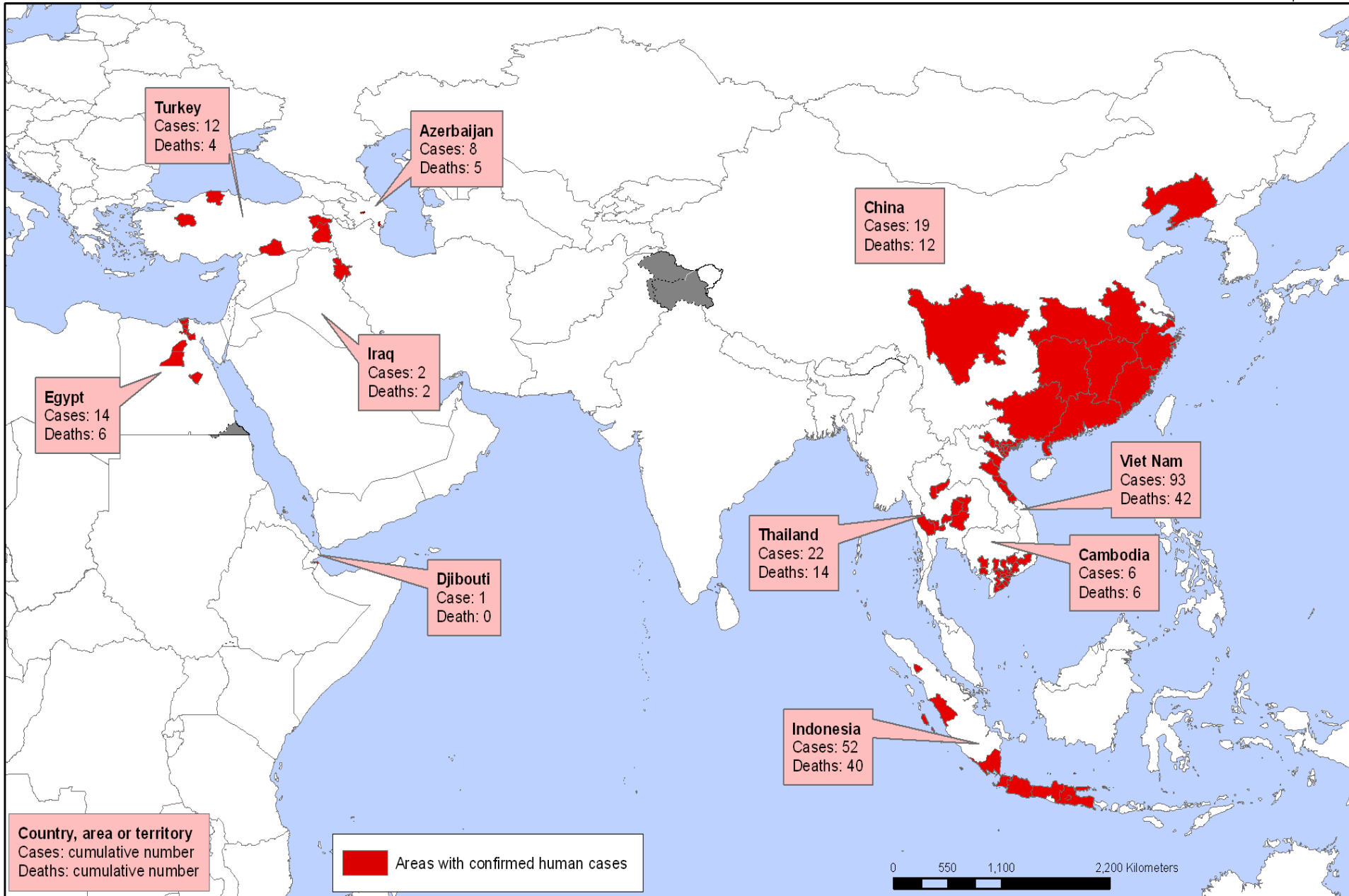
# Stages of a Pandemic

Interpandemic	Phase 1	No new influenza subtypes Animal flu poses little risk to humans
	Phase 2	Animal flu poses substantial risk to humans
Pandemic alert	Phase 3	New human infection Limited or no human-to-human spread
	Phase 4	Localized human-to-human spread Small clusters
	Phase 5	Still localized spread but larger clusters
Pandemic	Phase 6	Increased and sustained spread in general population

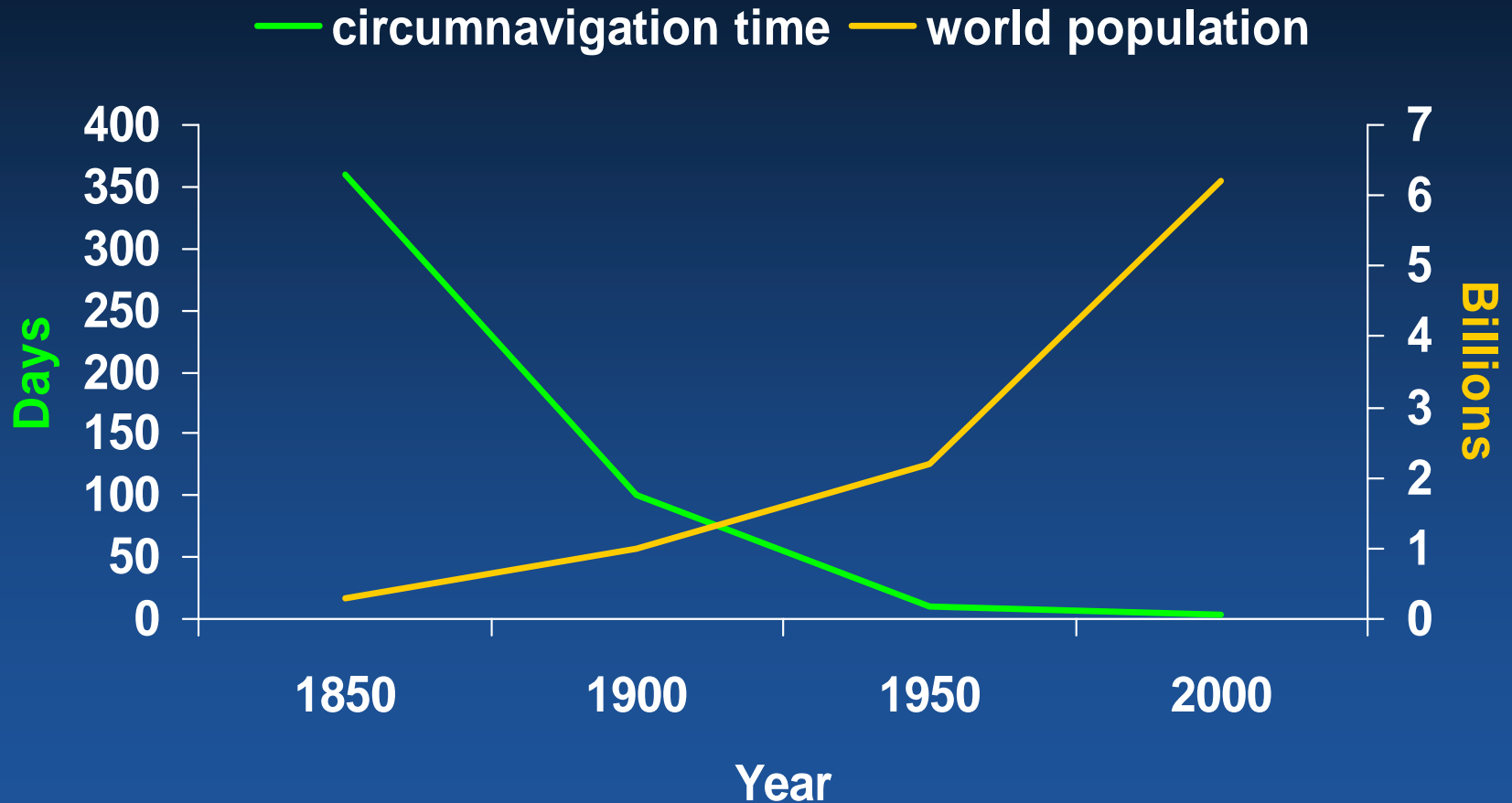


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Organisation for Animal Health (OIE) and national governments  
Map Production: Public Health Mapping and GIS  
Communicable Diseases (CDS) World Health Organization



# Global Travel Time & World Population



From: Murphy and Nathanson. Sem in Virol 5:87, 1994

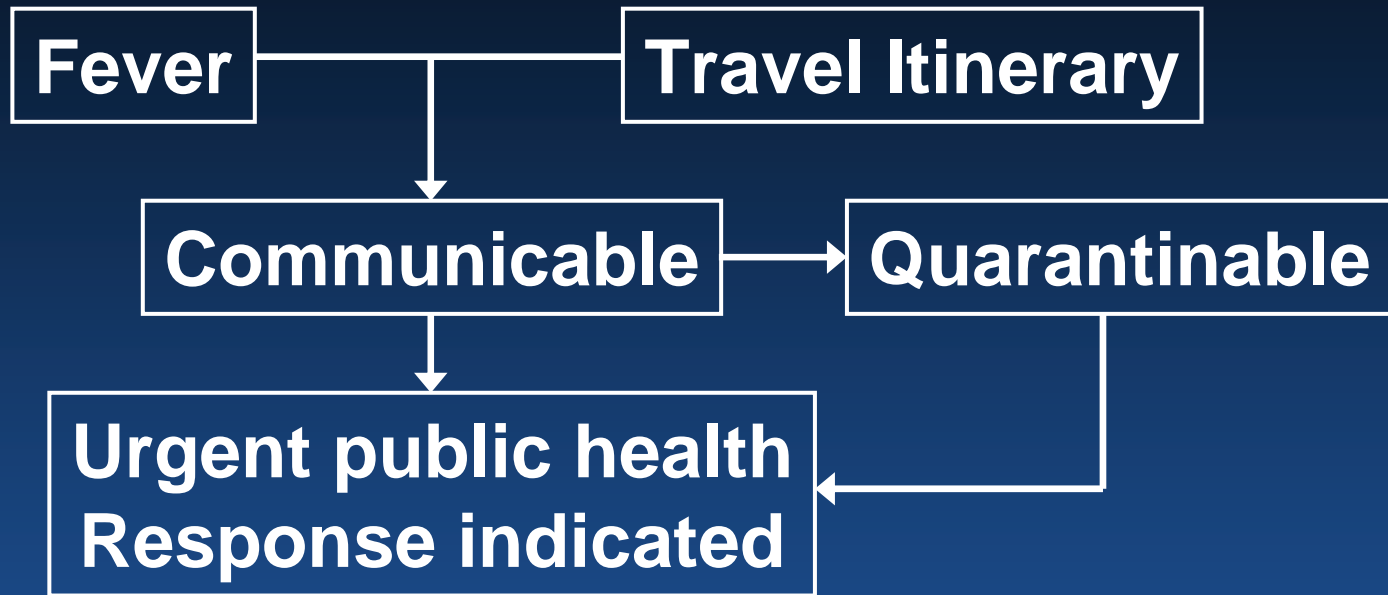
IT'S TIME AGAIN FOR  
EVERYONE'S LEAST FAVORITE  
GAME... FEAR OF THE WEEK!

TODAY, WE WELCOME JOHN  
SMIDDLESDORF, A DAIRY FARMER  
FROM WISCONSIN... JOHN,  
GIVE 'ER A SPIN!!

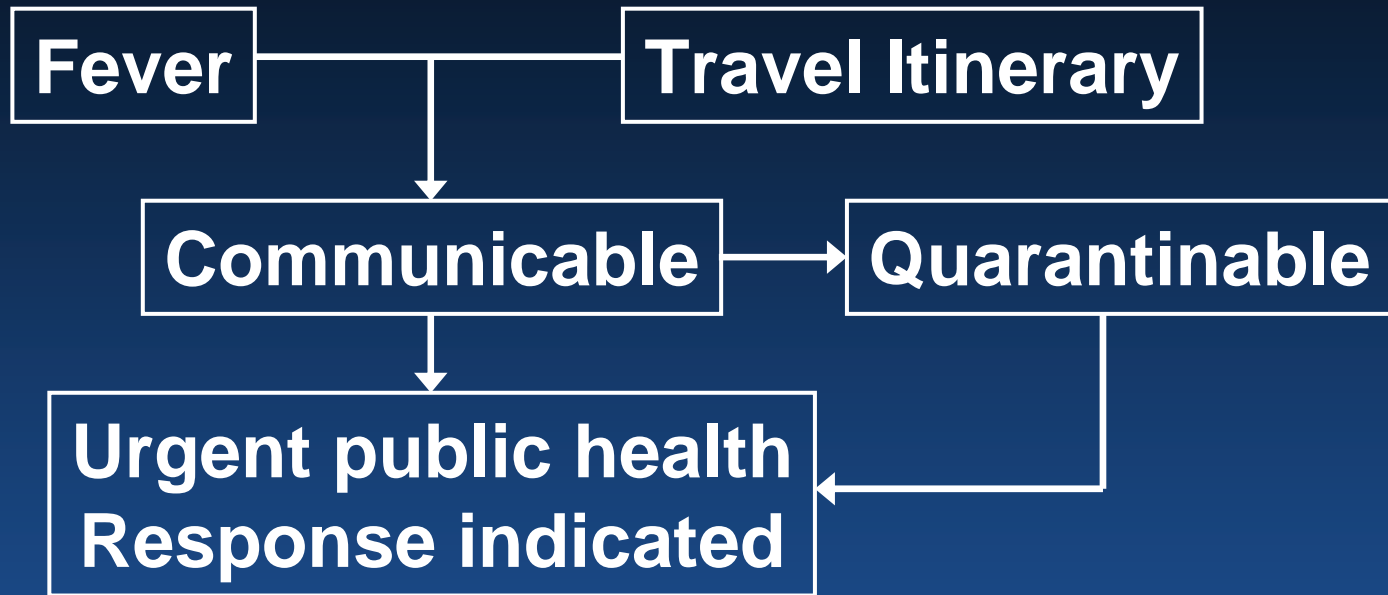


KOTERBAU  
OMAHA WORLD HERALD

# Illness Monitoring at Ports



# Illness Monitoring at Ports



- **Information available on disease**
- **Severity of disease**
- **Rapidity of disease spread**
- **Vulnerability of population**
- **Available treatment and prevention modalities**
- **Potential for public panic**

# Preparation and Response

## Collective Effort

- **Monitoring and surveillance**
- **Notification and communication**
- **Isolation and quarantine**
- **Education and training**
- **Plan and practice**



# Shipping Industry “Community”

- Shipping industry is big and global
- Unique features
  - ▶ International
  - ▶ Transient
- Each ship is a mini-community
  - ▶ Self-contained
  - ▶ Interactive with other communities
- Illness response similar to community models
- Success depends on relationships built

# Port Authority Allies

- Local or state health department
- CDC Quarantine Stations  
[http://www.cdc.gov/ncidod/dq/quarantine\\_stations.htm](http://www.cdc.gov/ncidod/dq/quarantine_stations.htm)
- U.S. Coast Guard
- U.S. Customs and Border Protection



# Summary

- Maritime traffic background
- Foreign quarantine regulations
- Illness monitoring and response principles
- Influenza primer
- Avian influenza and pandemic influenza
- Implications for ports
  - ▶ Illness monitoring and response
  - ▶ Develop and strengthen relationships with public health authorities
  - ▶ Port health critical to community health

# Case Review



# Hypothetical Case: M/V Czars

In the last three weeks, the Hong Kong Department of Health reported to WHO 32 SARS-coronavirus cases (2 deaths) but maintains that the outbreak is under control.

M/V Czars is a container ship with 27 crew members that completed a 2-week Asian voyage (Singapore > Ho Chi Minh City > Guangzhou > Hong Kong > Shanghai). Everyone on board had spent time off the ship in Hong Kong. Since leaving Shanghai, a crew member developed fever, cough, and shortness of breath, and 4 others are ill with low-grade fever and cough.

The shipping agent for M/V Czars relays the illnesses on board to you because the vessel is due to arrive at your port in 2 days.  
What do you do?