The Long History of What We Do

Looking Back Over Developments in Preventing the Spread of Communicable Diseases through Air Travel

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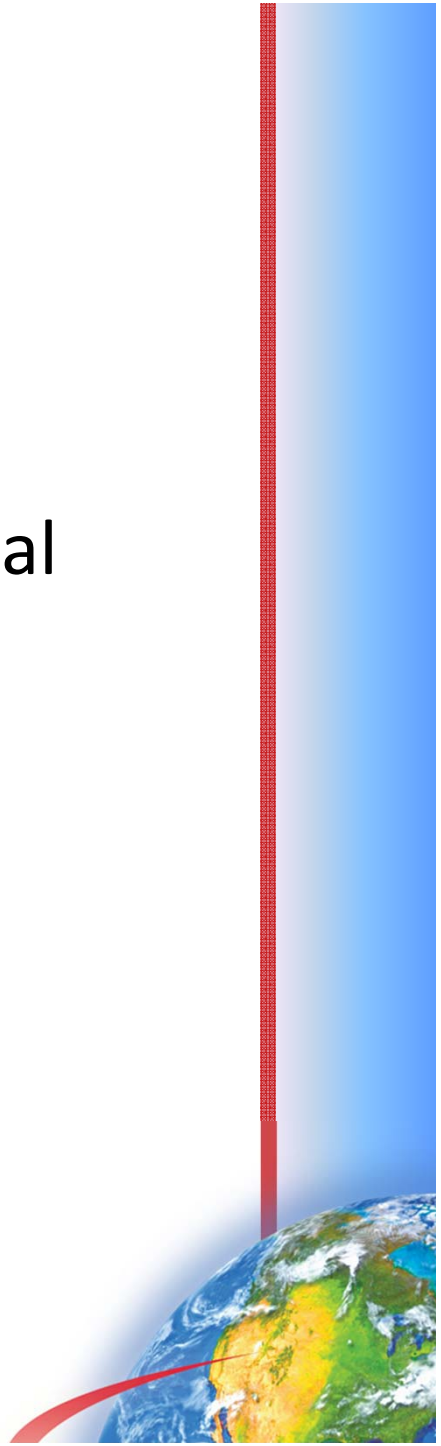
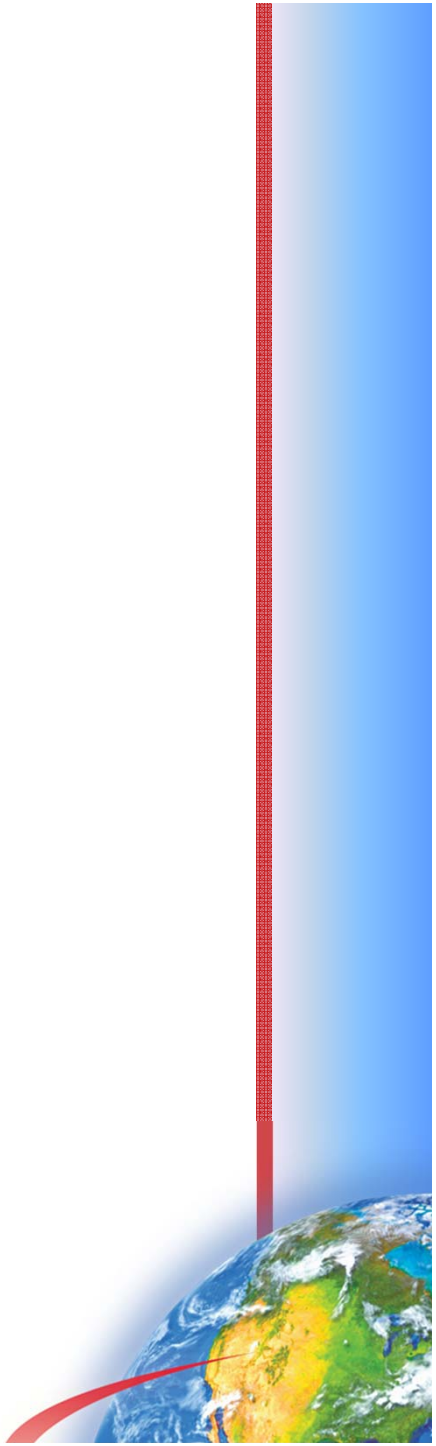
Agenda

- Distant history
- The situation in the 20th century
- New threats and the revised International Health Regulations 2005
- Influenza A H5N1
  - ✓Ambitious early plans
  - ✓Realization of limitations
  - ✓The H1N1 experience
- CAPSCA



7th Century & earlier

The roots of what we do today



Long before the germ theory, persons with leprosy were isolated to protect the community

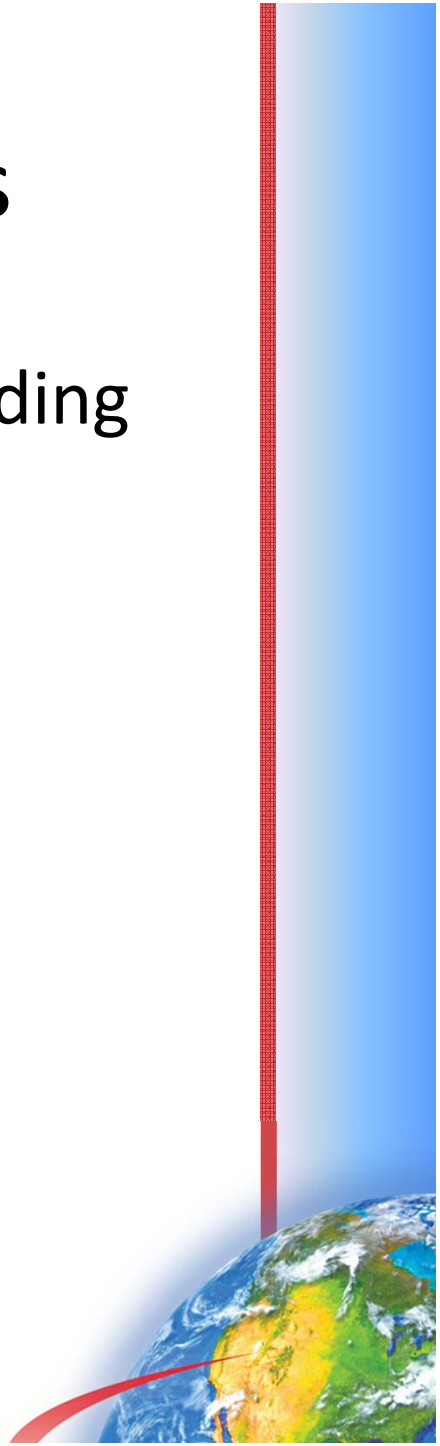
Emperor Justinian
Constantinople

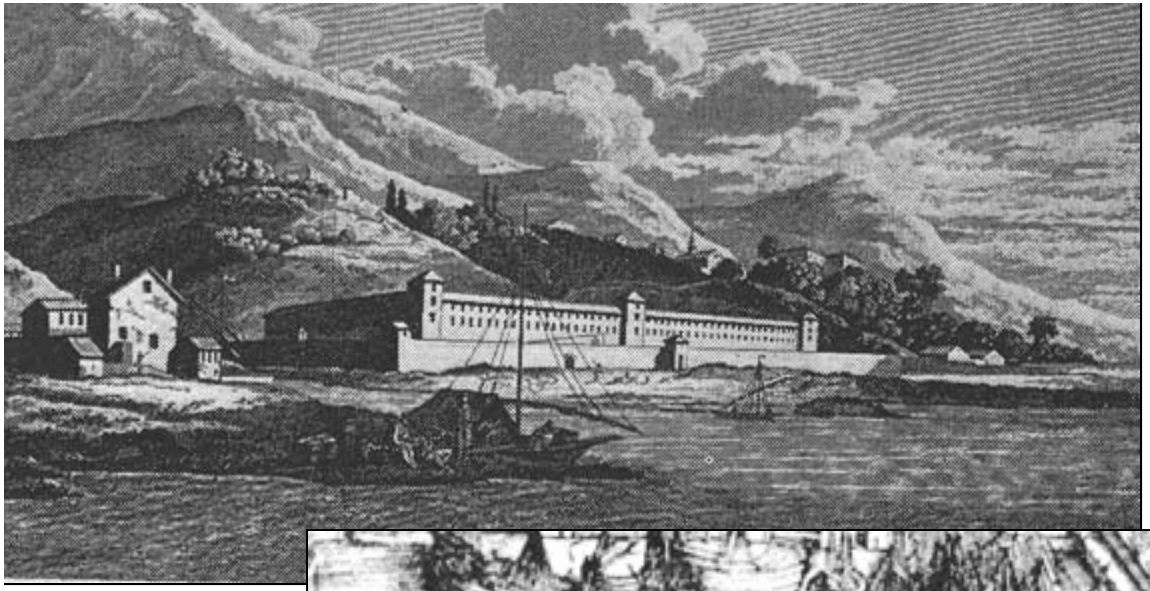
542, first known plague pandemic to affect Europe
Moves along trade and land travel routes

12th through 17th Centuries

A New Method to Accommodate Expanding Maritime Trade:

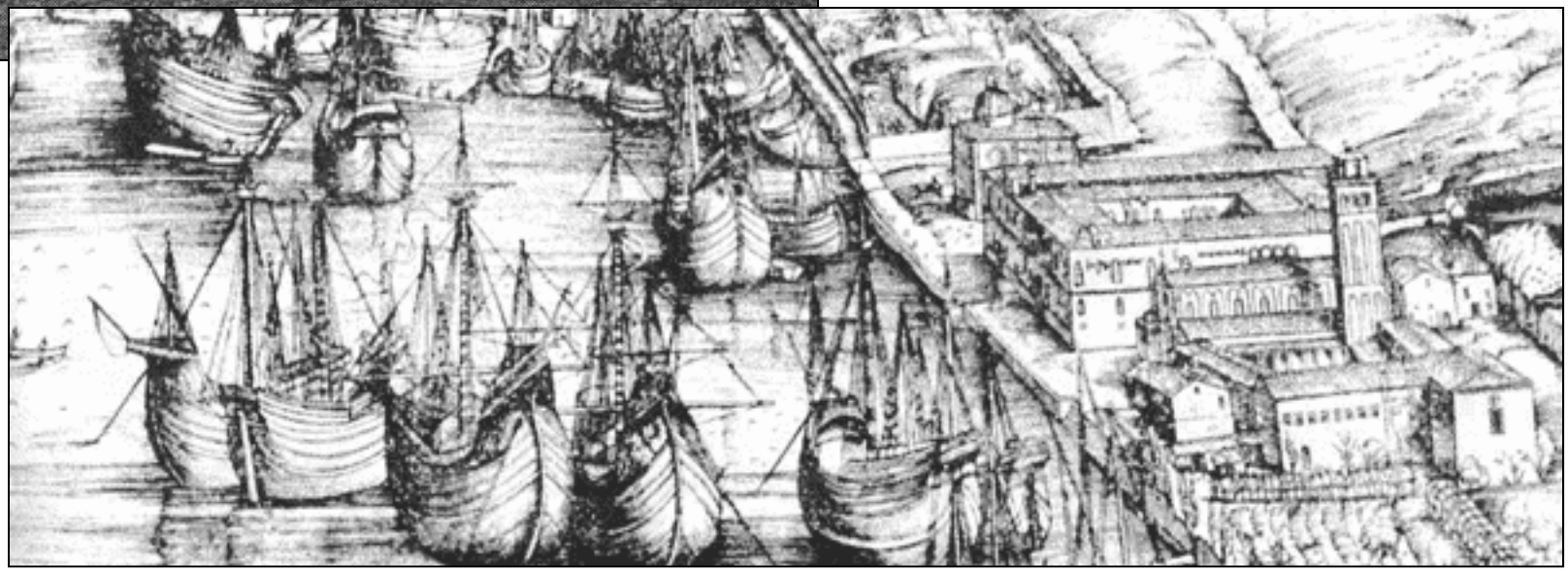
Quarantine





Genoa

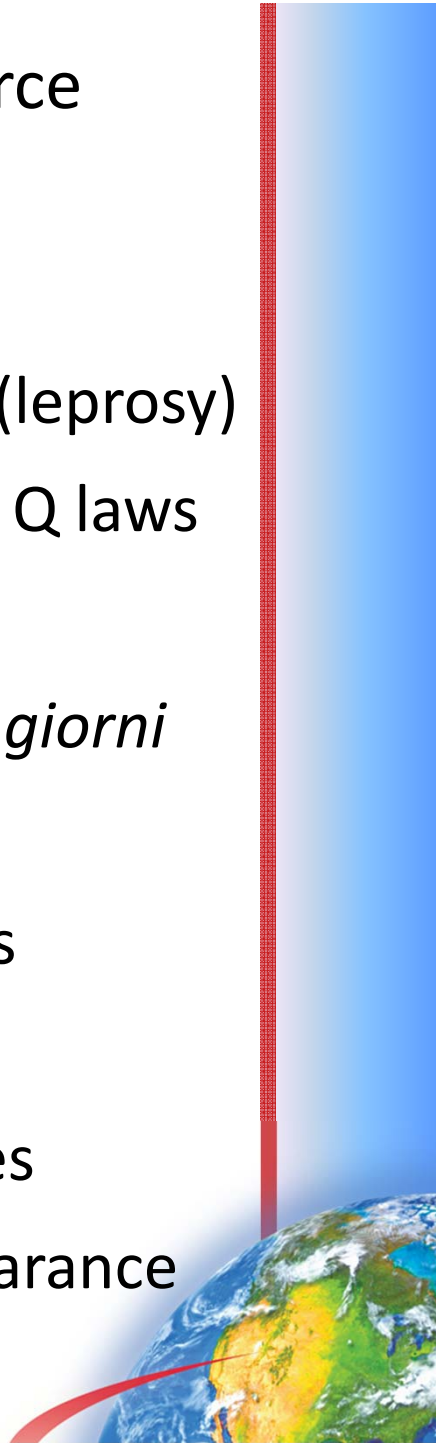
Venice



- Large crews, sustained shipboard outbreaks (cholera/plague)
- 1st quarantine stations *Lazzaretti*)

Shipboard outbreaks impede commerce

- Laws & policies to stop disease introduction
- 1179: 1st international quarantine convention (leprosy)
- 1300s: China & Venice, armed enforcement of Q laws
- 1350-1630: Italy, hub of Q activity (plague)
  - Detain ships, cargoes, & persons, *quaranta giorni*
  - 1st maritime quarantine stations
  - Health officers evaluate & isolate ill persons
- 1520-1620: France (plague & cholera)
  - 1st maritime quarantine station at Marseilles
  - All visitors need medical examination & clearance

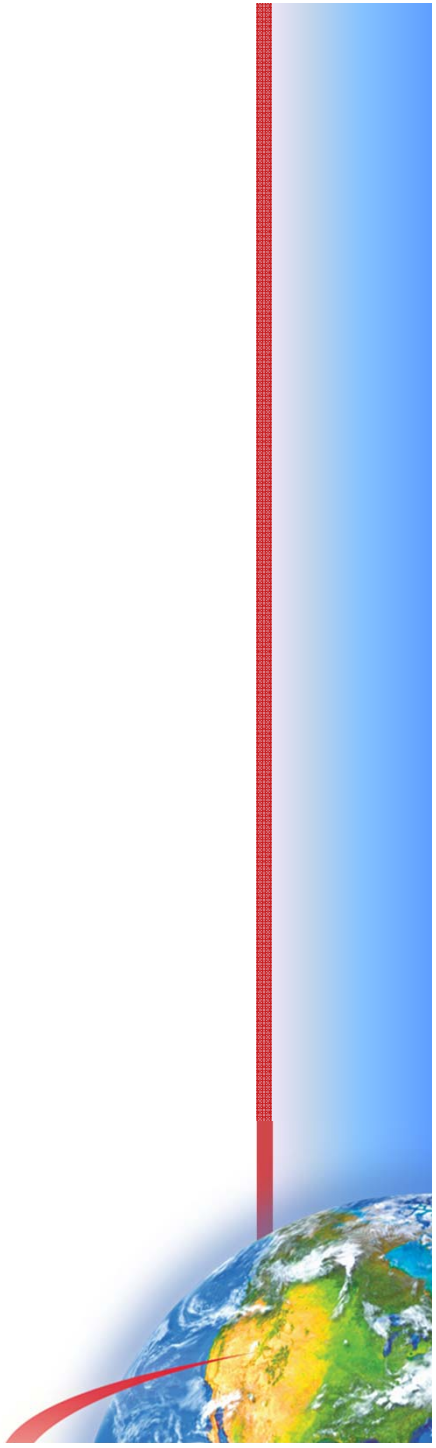


20th Century

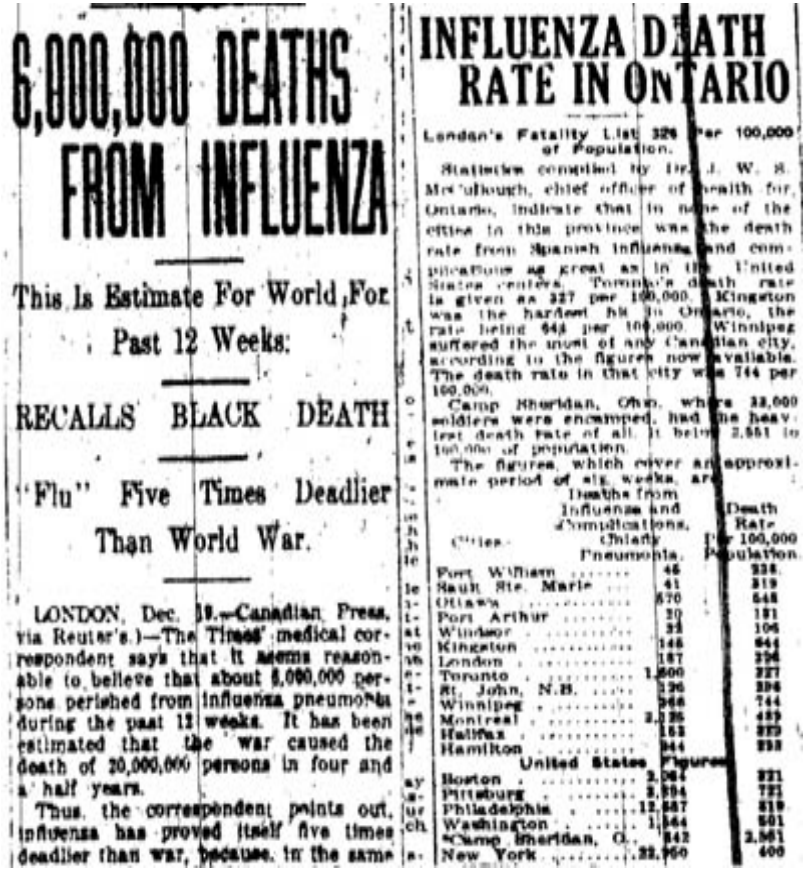
The 1918-1919 Influenza Pandemic

The Rise of International Air Travel

The Decline of Quarantine



Prototype Pandemic: Spanish Flu, 1918-19. 20+ Million Deaths



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. 19.—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 centers. 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 33,000 soldiers were encamped, had the heaviest death rate of all, it being 2,561 to 100,000 of population.

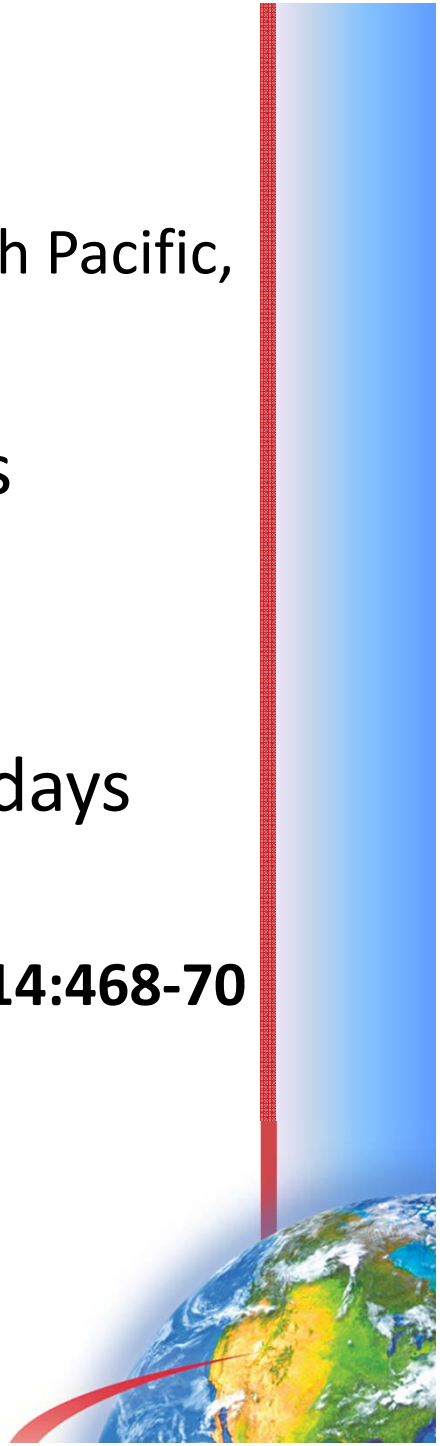
The figures, which cover an approximate period of six weeks, are:

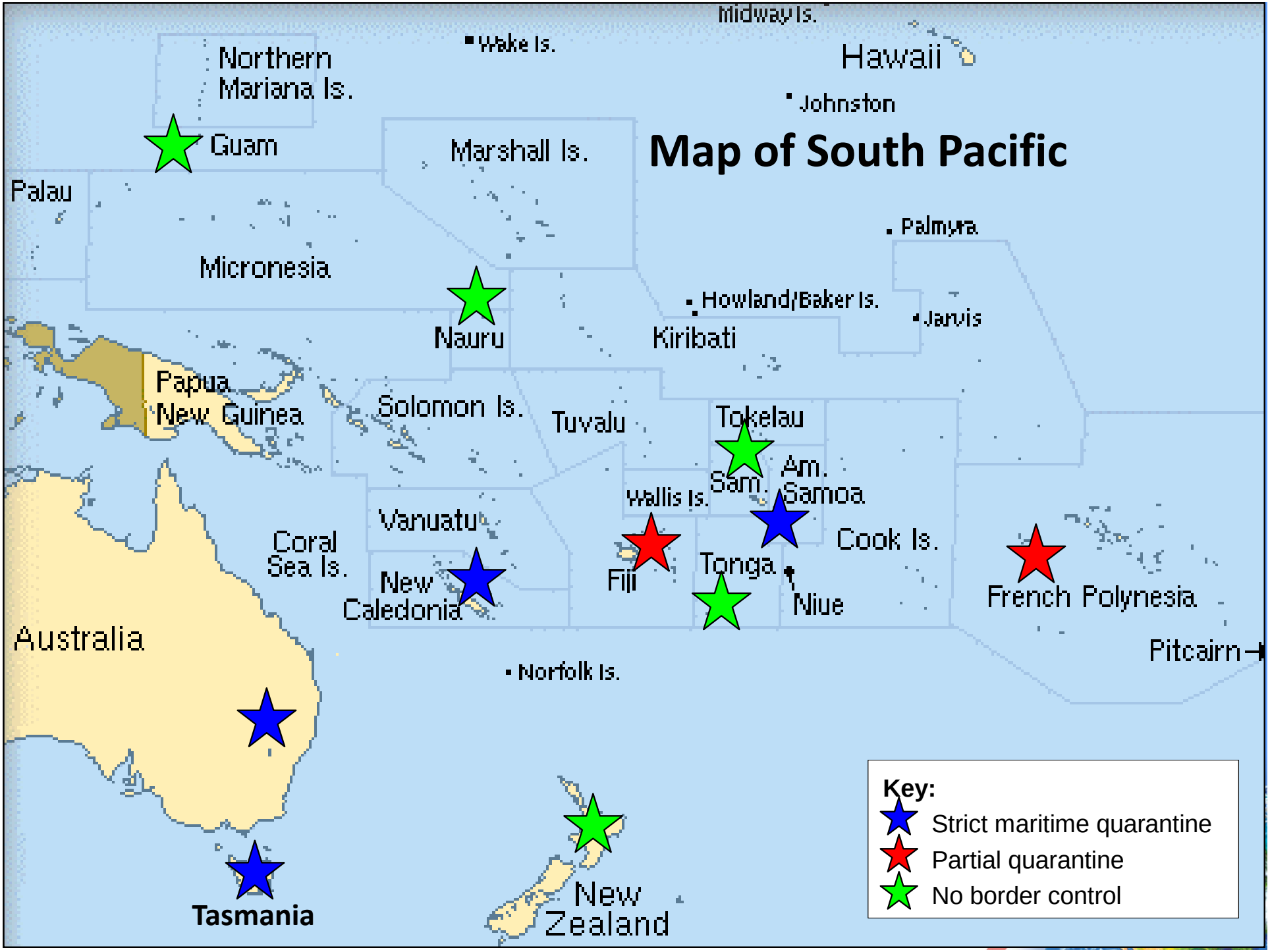
Cities.	Deaths from Influenza and Complications, Chiefly Pneumonia.	Death Rate Per 100,000 Population.
Port William	46	338.
Sault Ste. Marie	41	319
Ottawa	570	648
Port Arthur	30	181
Windsor	33	106
Kingston	148	644
London	187	326
Toronto	1,800	327
St. John, N.B.	196	394
Winnipeg	966	744
Montreal	2,196	483
Halifax	153	373
Hamilton	344	393
United States Figures		
Boston	2,767	321
Pittsburg	3,894	721
Philadelphia	12,587	519
Washington	1,344	501
Camp Sheridan, O.	342	2,561
New York	22,960	400

Protective Effect of Maritime Quarantine in South Pacific, 1918-19 Influenza Pandemic

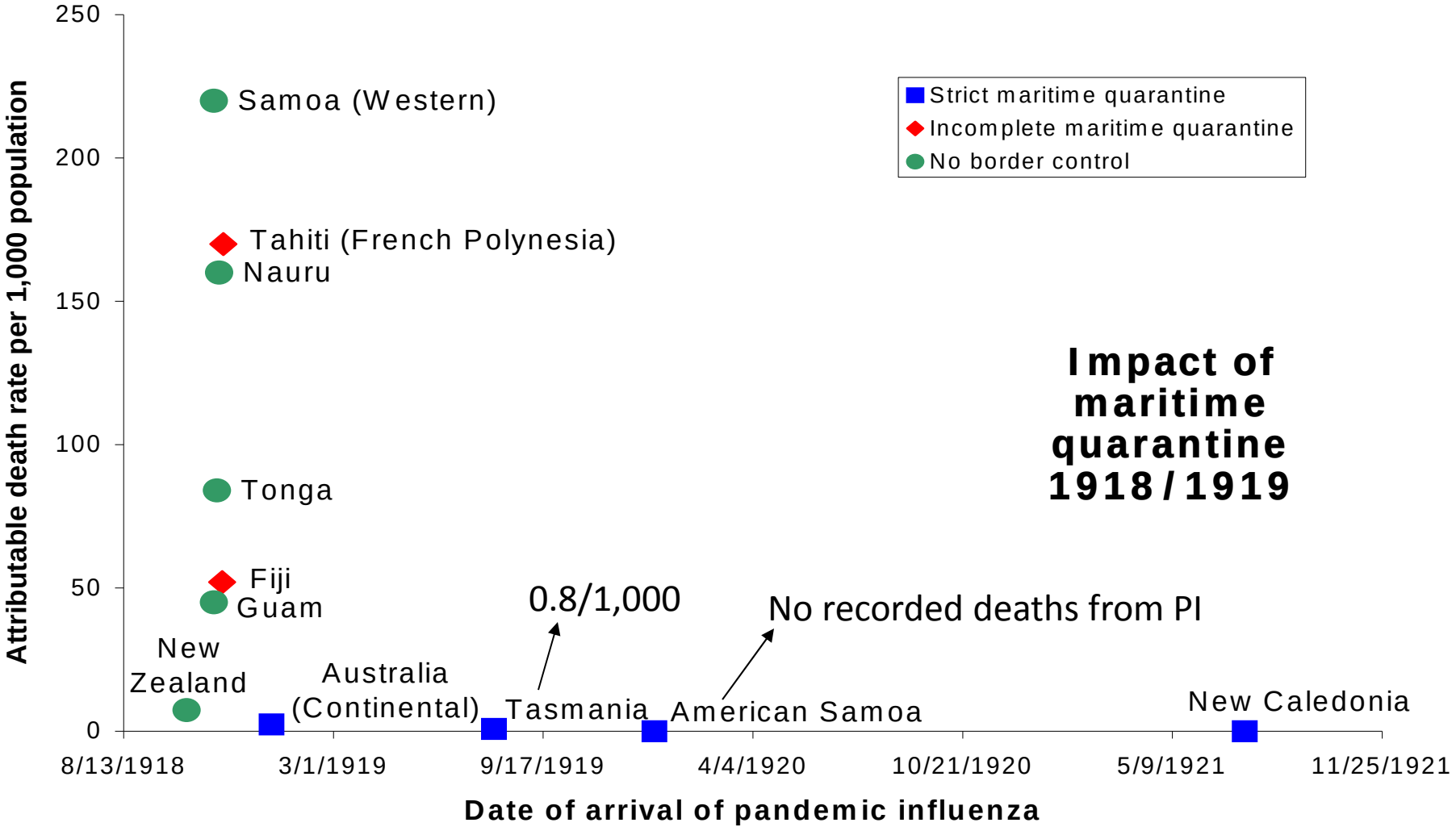
- Historical look at 11 Pacific jurisdictions
- Four had strict maritime quarantine
- American Samoa: 5 days
- Australia, Tasmania, New Caledonia: 7 days

McLeod et al. Emerging Infectious Diseases. 2008;14:468-70




Map of South Pacific
Midway Is.
Wake Is.
Hawaii
Johnston
Northern Mariana Is.
Guam
Marshall Is.
Palau
Micronesia
Palmyra
Howland/Baker Is.
Jarvis
Nauru
Kiribati
Papua New Guinea
Solomon Is.
Tuvalu
Tokelau
Am. Samoa
Sam.
Wallis Is.
Vanuatu
Cook Is.
Coral Sea Is.
New Caledonia
Fiji
Tonga
Niue
French Polynesia
Pitcairn
Australia
Norfolk Is.
Tasmania
New Zealand
Key:
Strict maritime quarantine
Partial quarantine
No border control

Pandemic Arrival Time and Death Rates, 11 Pacific Jurisdictions, 1918-19



US Quarantine Program, 1960s

Increase air travel

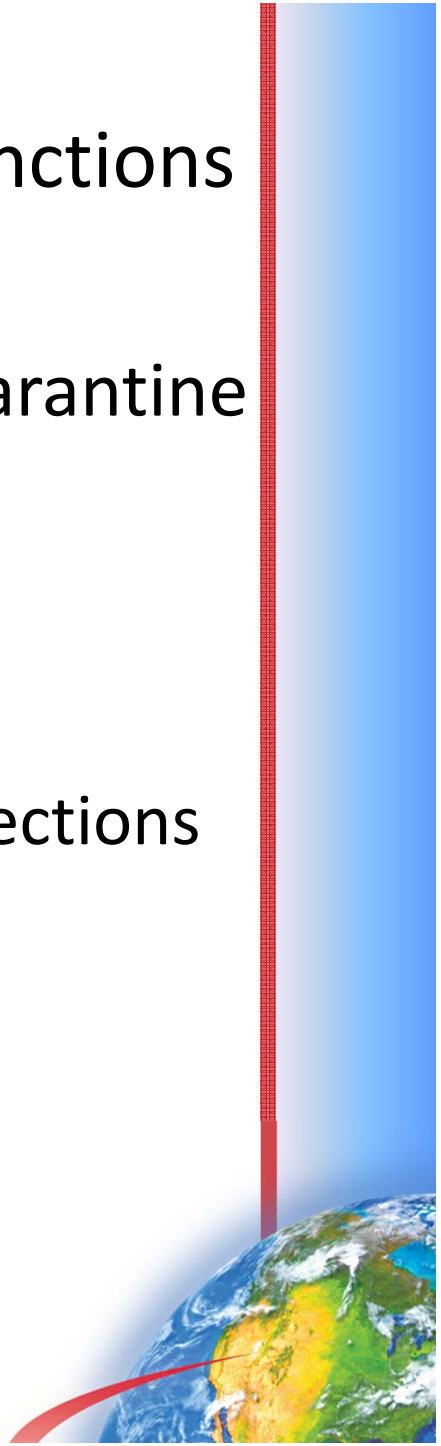
Board aircraft

Review documents

Monitor illness

1960s-1970s: Decline of Quarantine functions

- Antibiotics & vaccinations, ↓ need for quarantine
- 1970s
  - Smallpox eradicated
  - Reduced size of CDC DQ; end routine inspections



Decline of the U.S. Quarantine Program

1953

- **52 seaports**
- **41 airports**
- **17 border stations**
- **33 territory stations**
- **Panama Canal**
- **41 U.S. consulates**
- **50 maritime vessels**

1967-70

~600 staff -> ~60

6 airports + HQ

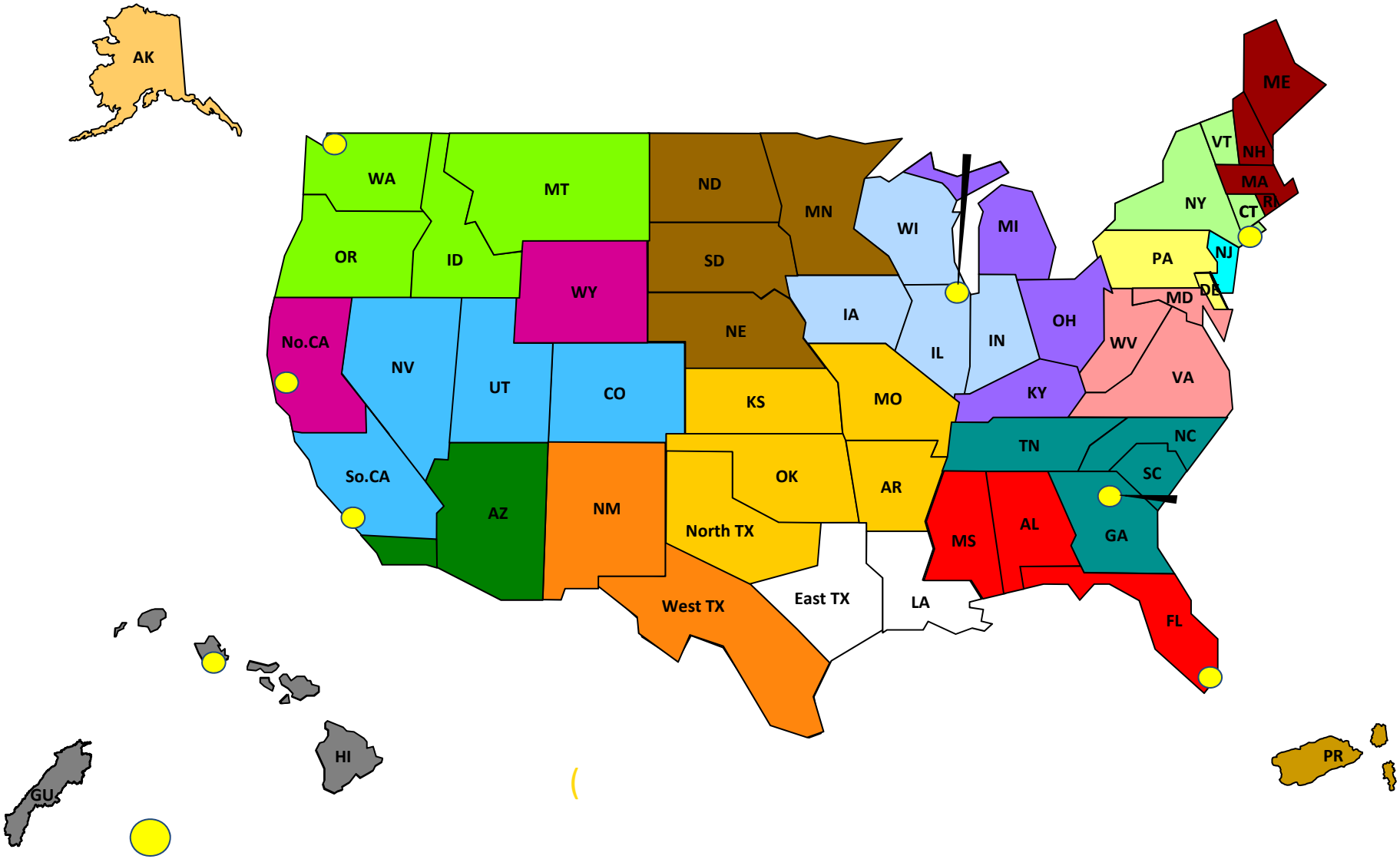
1 medical officer

1996-2004

~60-80 staff

8 airports + HQ

8 CDC Quarantine Stations in 1990's



Influenza Pandemic, 1957

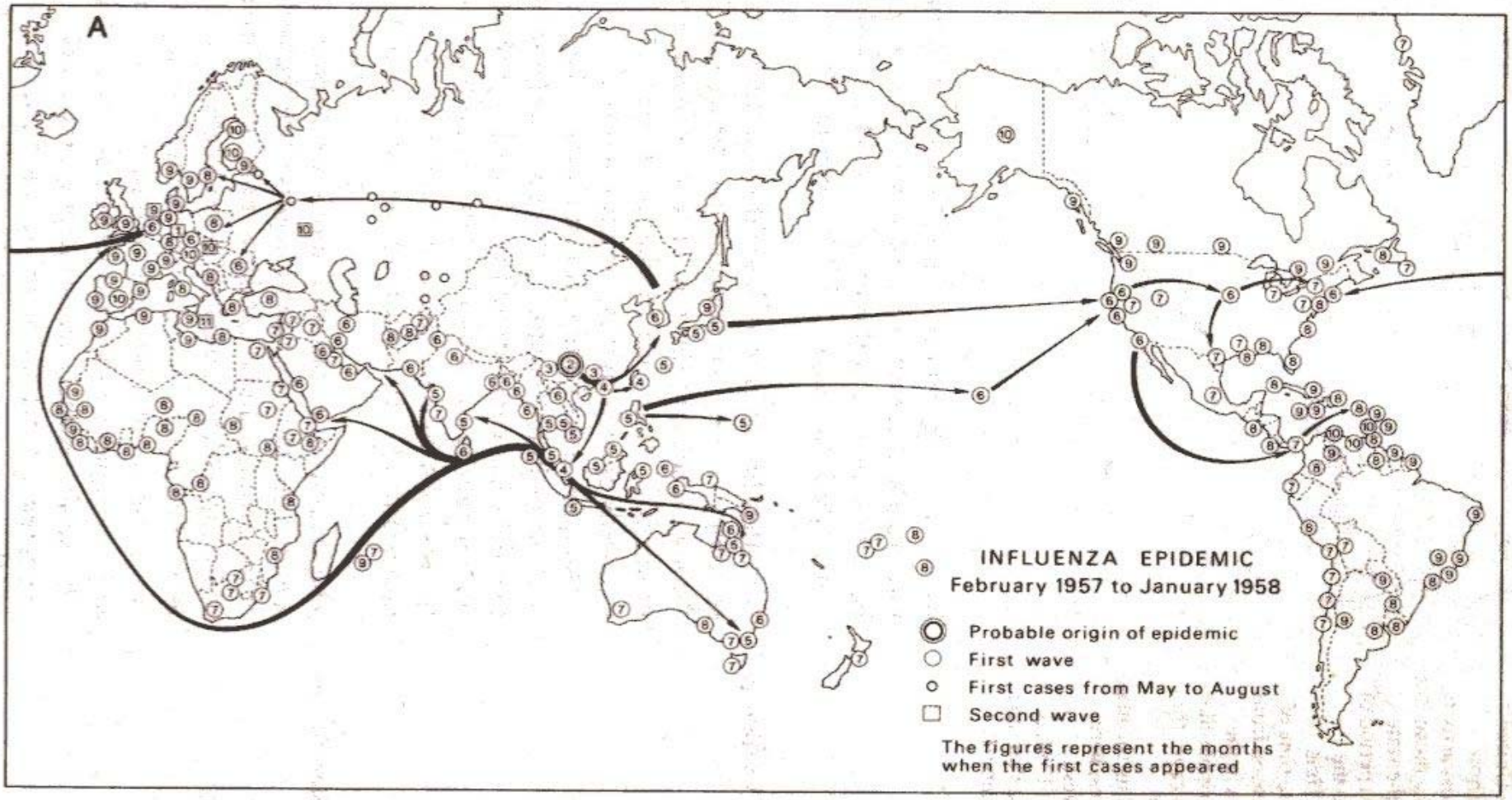


Fig. 2.7(A) Spread of the world influenza epidemic, 1957–8. *Source:* Stuart-Harris (1965, p. 103). (B) Diffusion of same epidemic on a local scale in northern England. *Source:* Hunter and Young (1971, p. 647).

Fast and Frequent Travelers

Few Cities are More than Two Stops from Anywhere Else

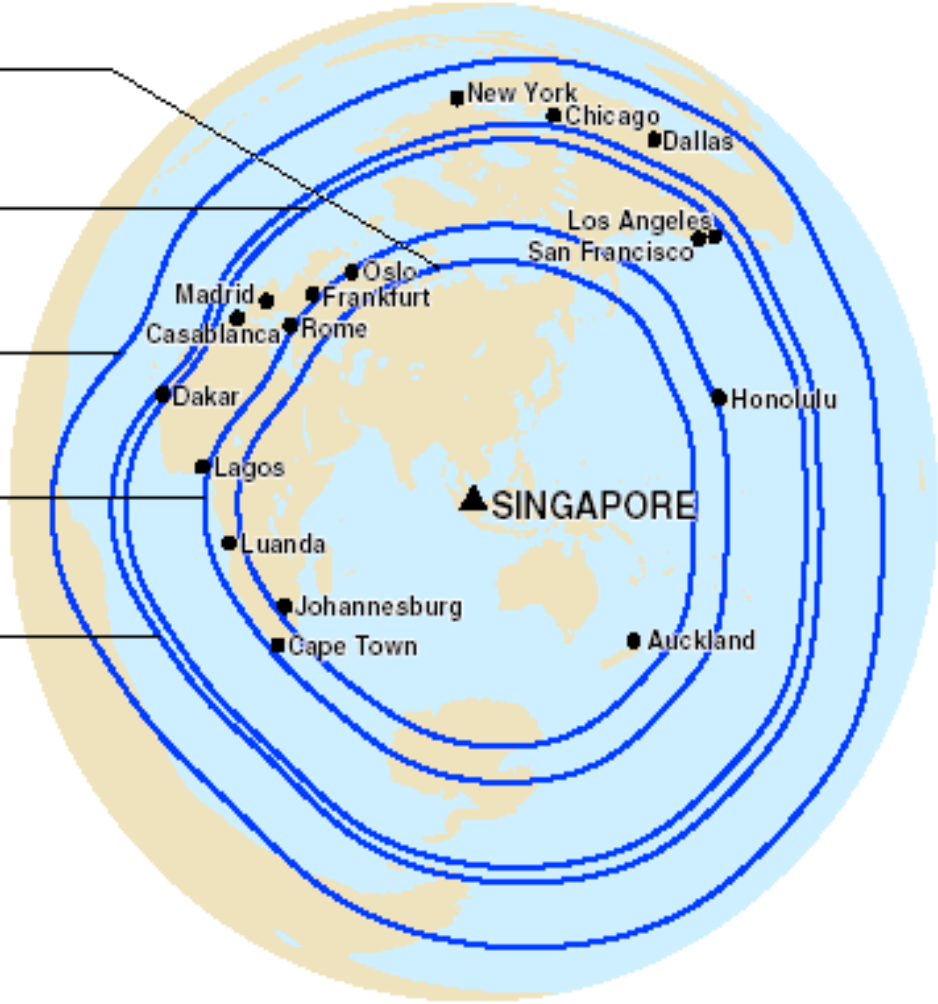
777-200
545,000-lb (247,210-kg) MTOW
305 three-class passengers

777-200ER
656,000-lb (297,556) MTOW
301 three-class passengers

777-200LR*
766,000-lb (347,450) MTOW**
301 three-class passengers

777-300
660,000-lb (299,370) MTOW
368 three-class passengers

777-300ER
775,000-lb (351,535) MTOW**
365 three-class passengers

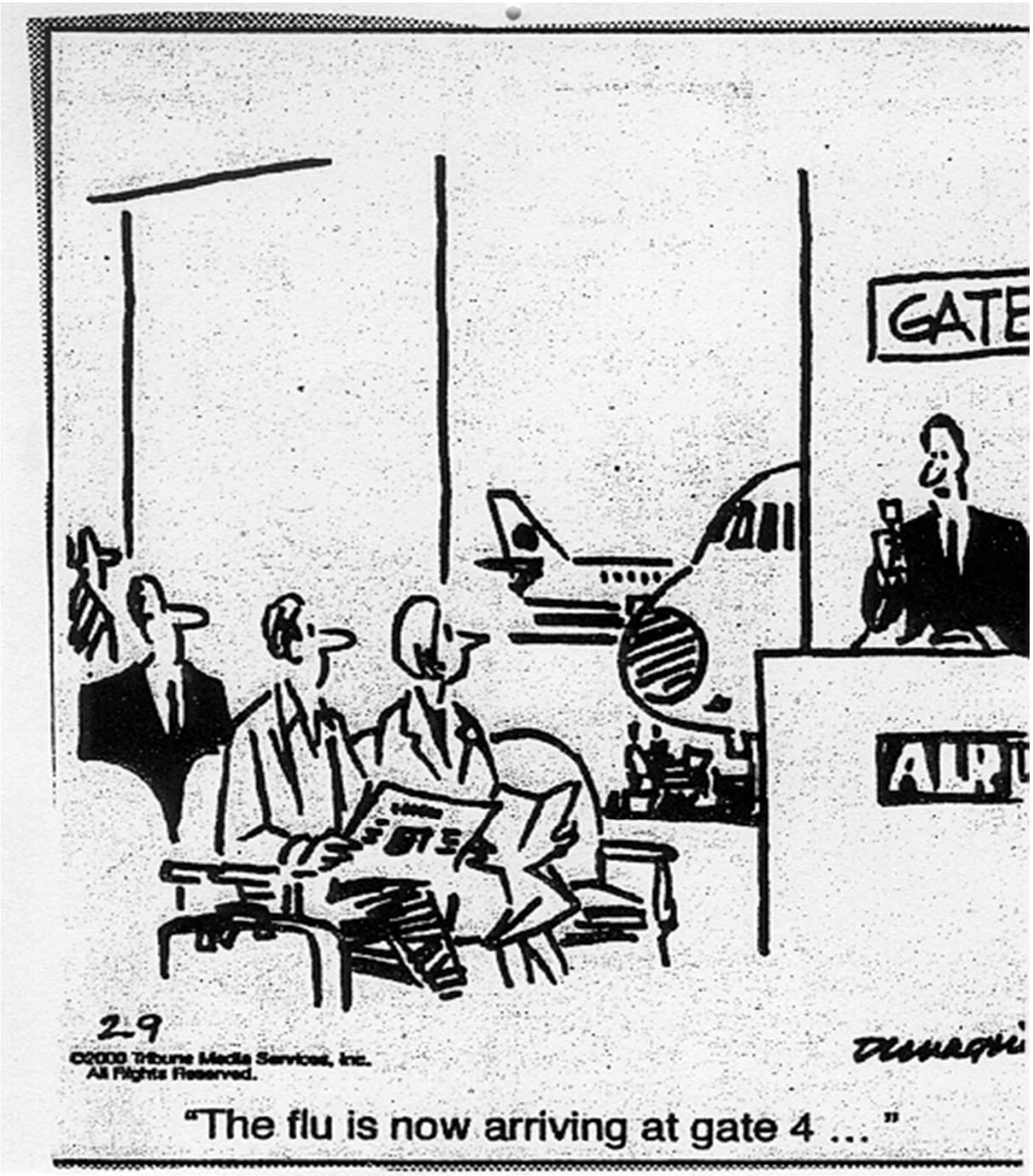


- Typical mission rules
- Airways and traffic allowances included
- 85% annual winds

* Three auxiliary fuel tanks
** Fuel volume limited

Global Spread, 2000-2001

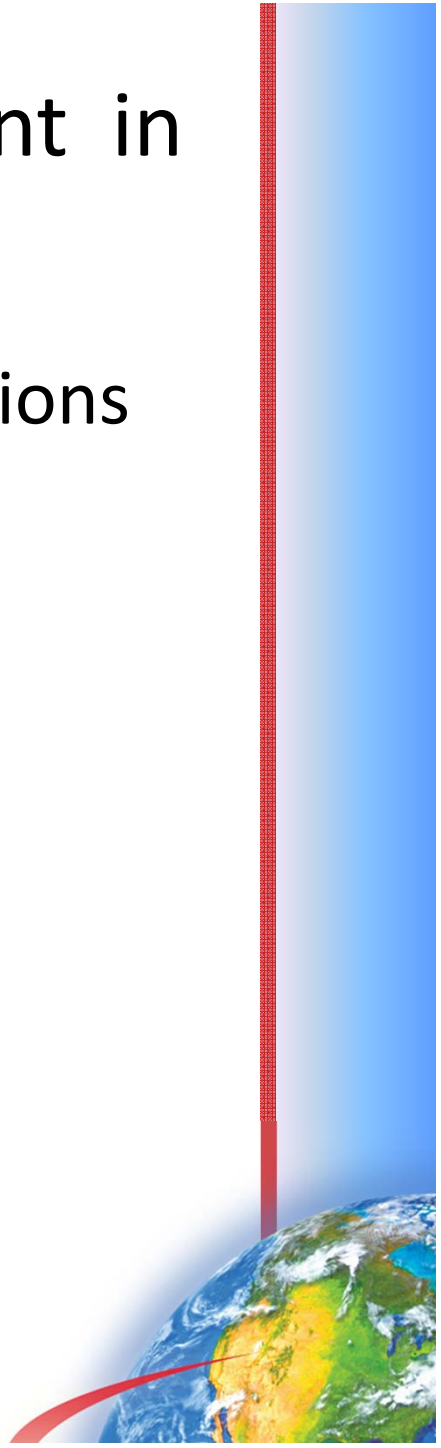
- Viral strains often originate in Asia
- Importance of international air travel
- Implications for pandemics



"The flu is now arriving at gate 4 ..."

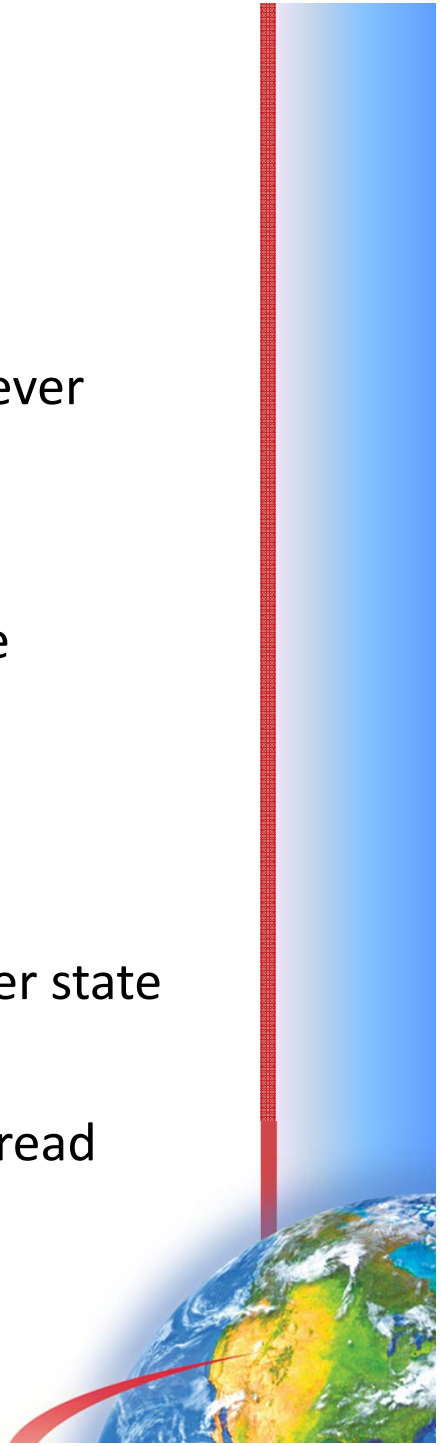
? The Most Important Development in the Past Decade

Revision of International Health Regulations



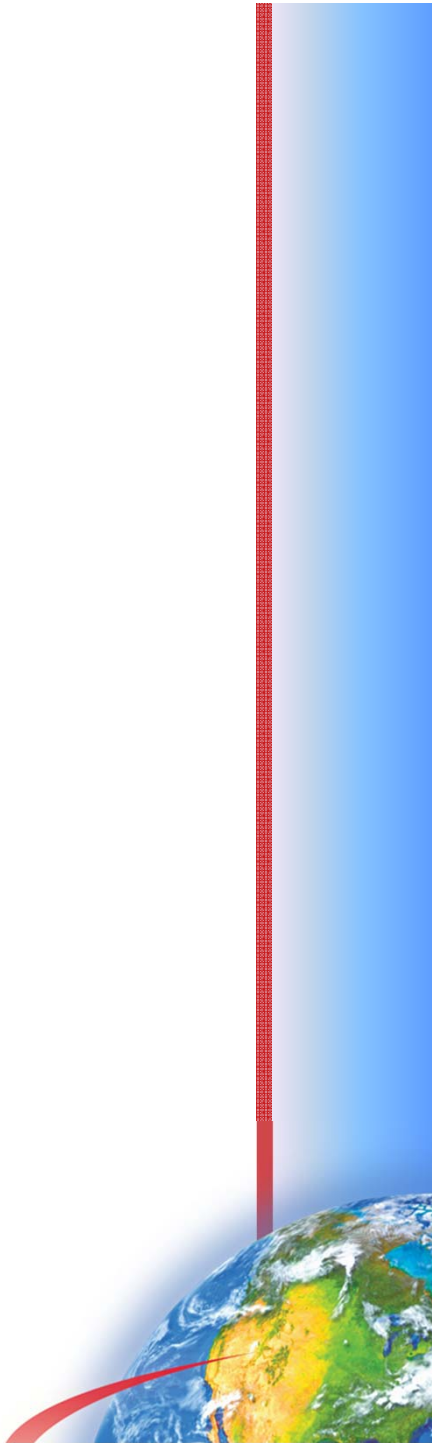
Limitations of IHR 1969

- Concerned only a few diseases: Cholera, plague, yellow fever
  - The old paradigm of case-based surveillance
  - Difficult to revise disease list
- Dependent on official notification from the member state
- No incentives to notification
  - Very few notifications
  - Notification seen by states as a very serious act
- No formal mechanisms for collaboration between member state and WHO
- No dynamic in the response for stopping international spread



The Revision Process

- 1995 (WHA 48): Decision to revise IHR
- 1995-2003: Worskhops, consultations etc. (**stalled**)
- January 2004: First draft for consultation
- May 2005 (WHA 58): Adoption of the IHR
- June 2007: Entry into force



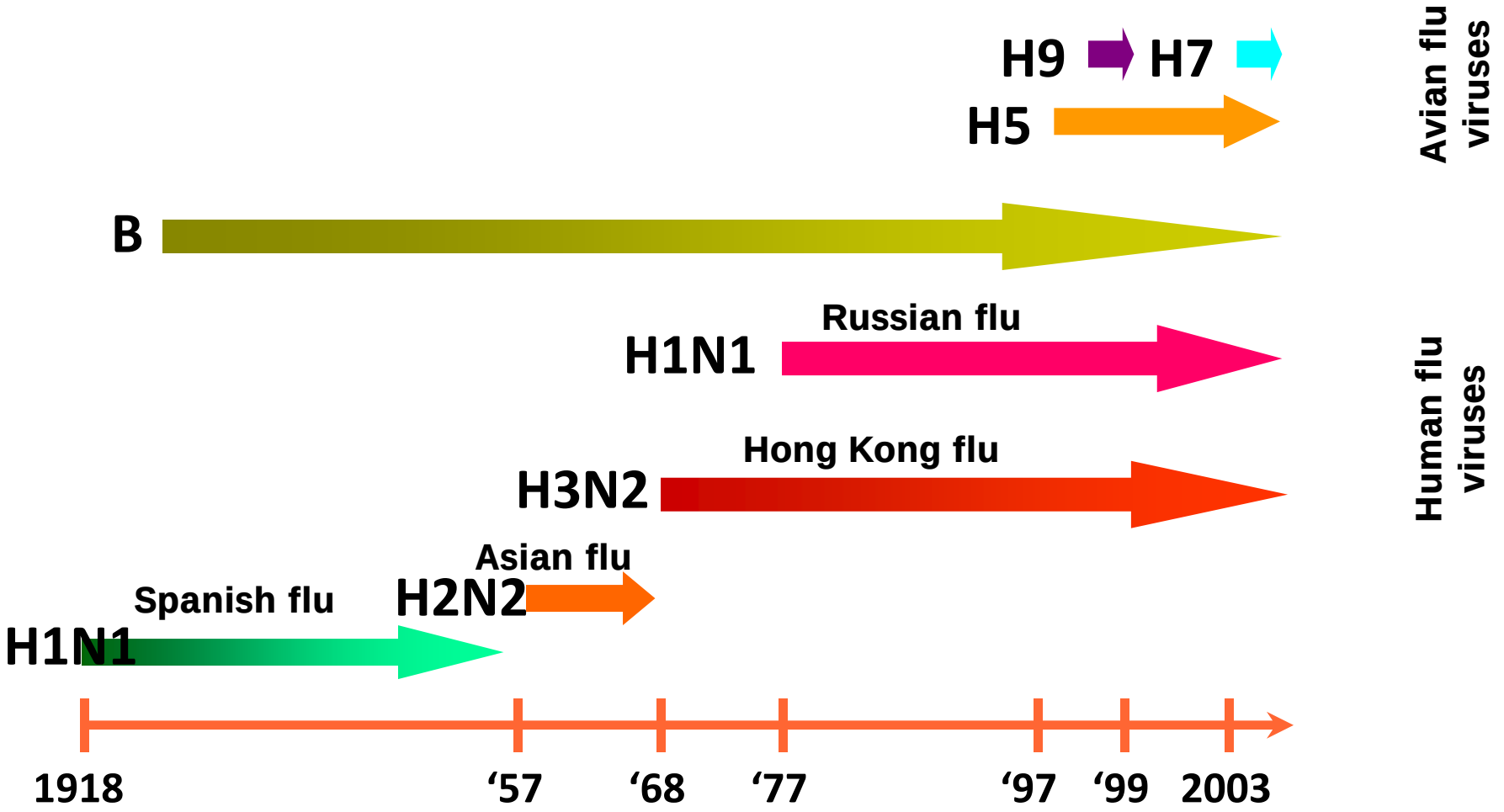
This Caught the World's Attention

This Caught Public Health's Attention

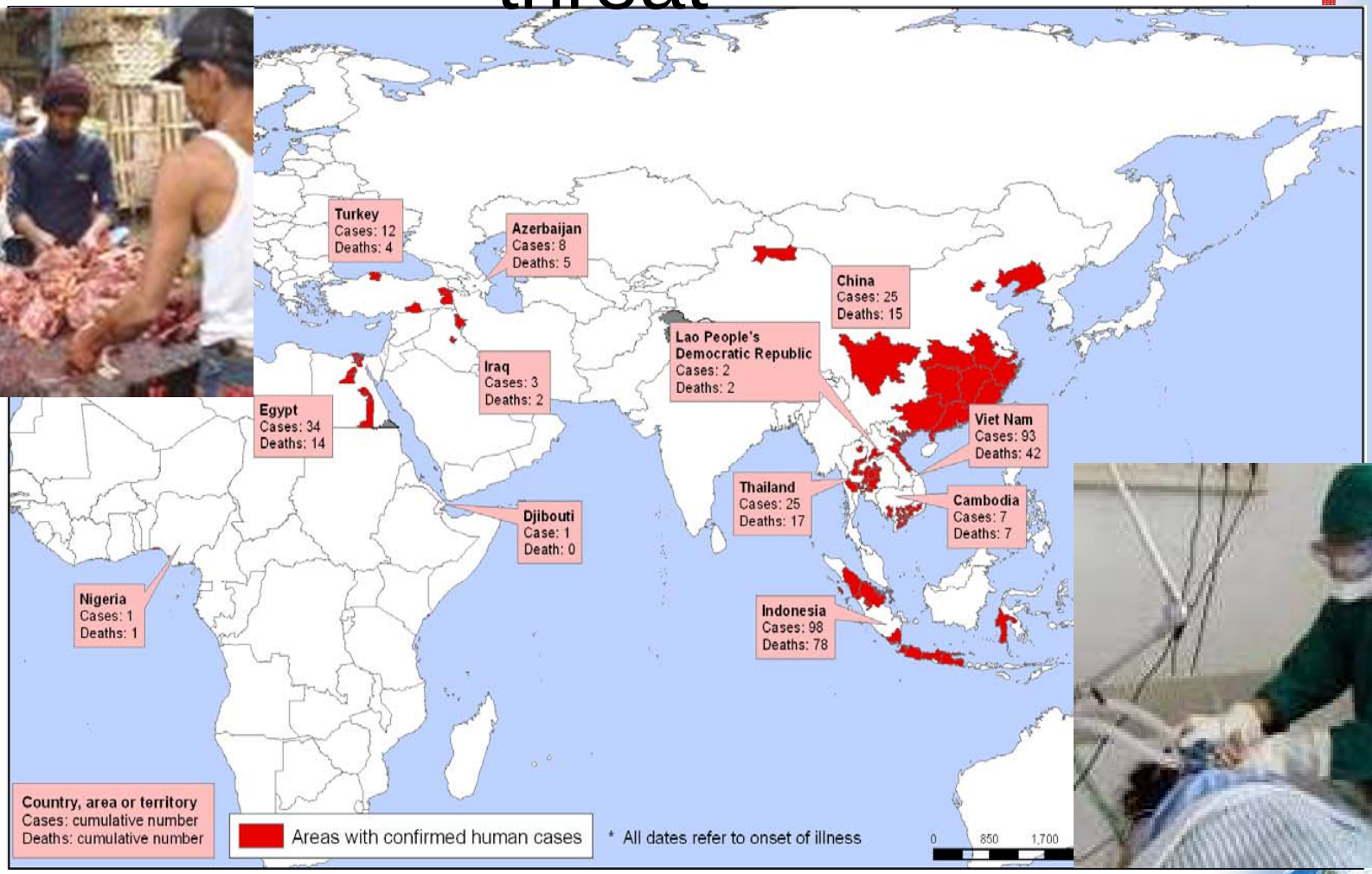
This Caught Civil Aviation's Attention

Emerging Communicable Diseases….Lots of them

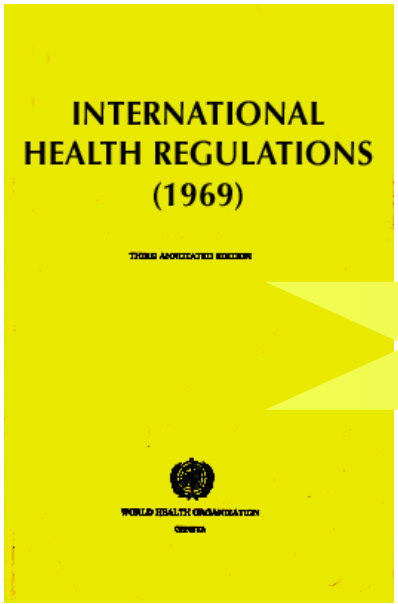
Emergence of Human Influenza Viruses



H5N1: Avian influenza, a pandemic threat



What's new?



- From **three diseases** to **all public health risks**
- From **preset measures** to **tailored response**
- From **control of borders** to also include **containment at source**

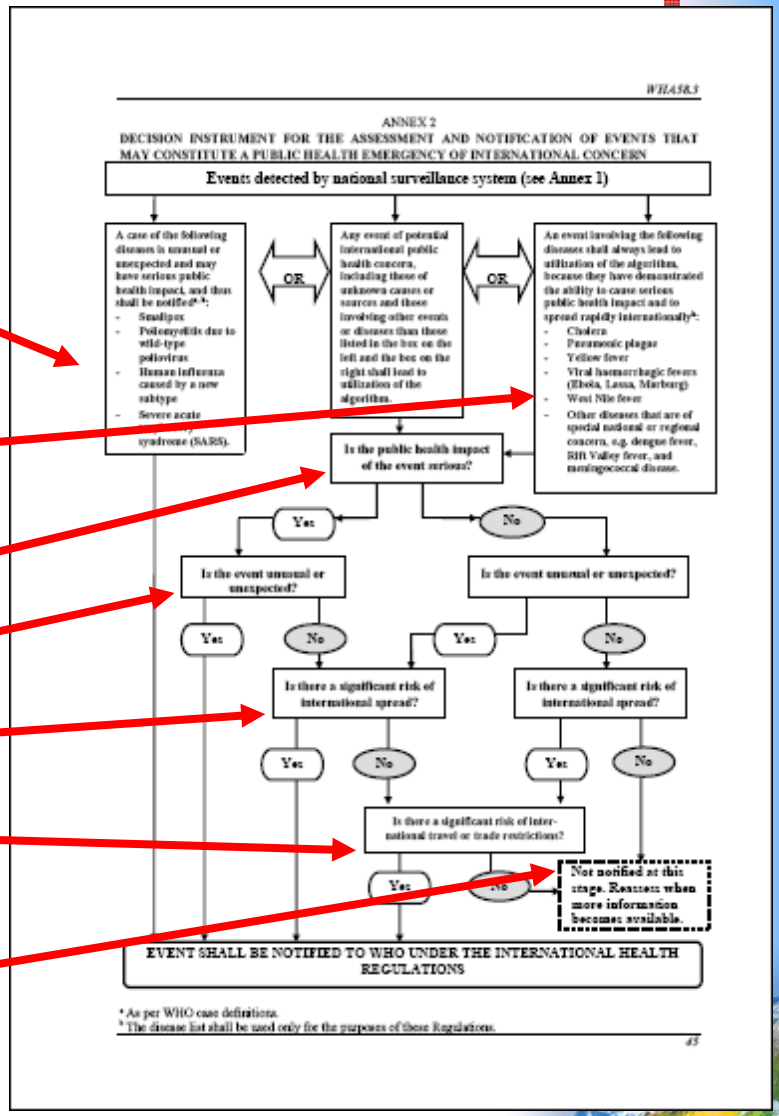
Decision instrument (Annex 2) of IHR (2005) for Assessment and Notification

4 diseases that shall be notified polio (wild-type polio virus), smallpox, human influenza new subtype, SARS.

Disease that shall always lead to utilization of the algorithm: **cholera, pneumonic plague, yellow fever, VHF (Ebola, Lassa, Marburg), WNF, others**

Q1: public health impact serious?
Q2: unusual or unexpected?
Q3: risk of international spread?
Q4: risk of travel/trade restriction?

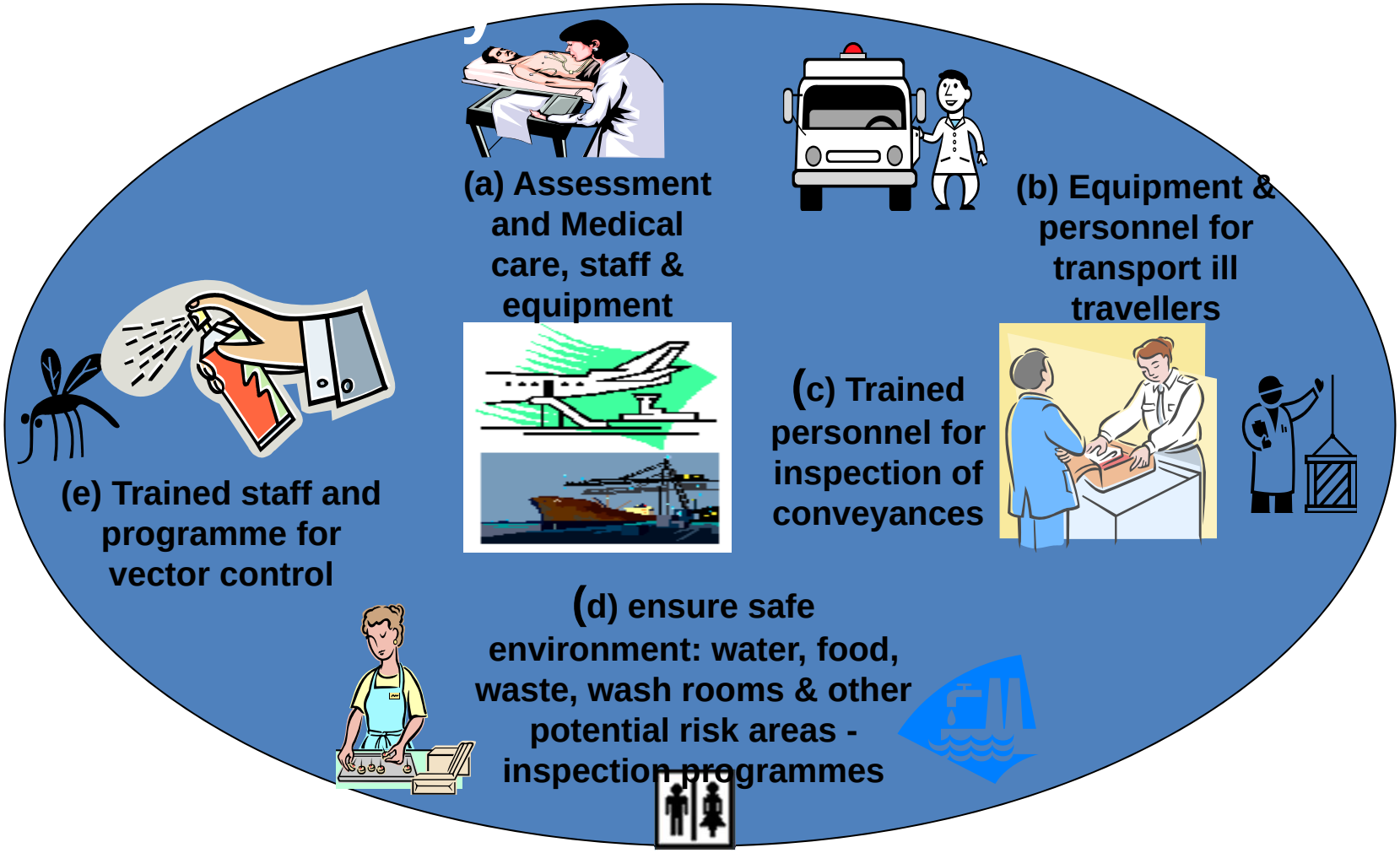
Insufficient information: reassess



Events detected by national surveillance systems →	**Any event of potential international public health concern**, including those of unknown causes or sources		A case of the following diseases **is unusual** or unexpected and **may have serious public health impact**, and thus shall be notified: Smallpox, Poliomyelitis due to wild-type poliovirus, Human influenza caused by a new subtype, Severe acute respiratory syndrome (SARS).	
	Yes	No	Yes	No
Is the public health impact of the event serious?				
Is the event unusual or unexpected?				
Is there a significant risk of international spread?				
Is there a significant risk of int. travel and trade restrictions?				

Two or more yes → notify WHO. Other events → consult WHO.

PoE Core capacity requirements at all times (routine)



PoE Capacity requirements for responding to potential PHEIC (emergency)

a

Public Health Emergency Contingency plan: coordinator, contact points for relevant PoE, PH & other agencie

b

Provide assessment & care for affected travellers, animals: arrangements with medical, veterinary facilities for isolation, treatment & other services

c

Provide space, separate from other travellers to interview suspect or affected persons

d

Provide for assessment, quarantine of suspect or affected travellers

e

To apply recommended measures, disinsect, disinfect, decontaminate, baggage, cargo, containers, conveyances, goods, postal parcels etc

f

To apply entry/exit control for departing & arriving passengers

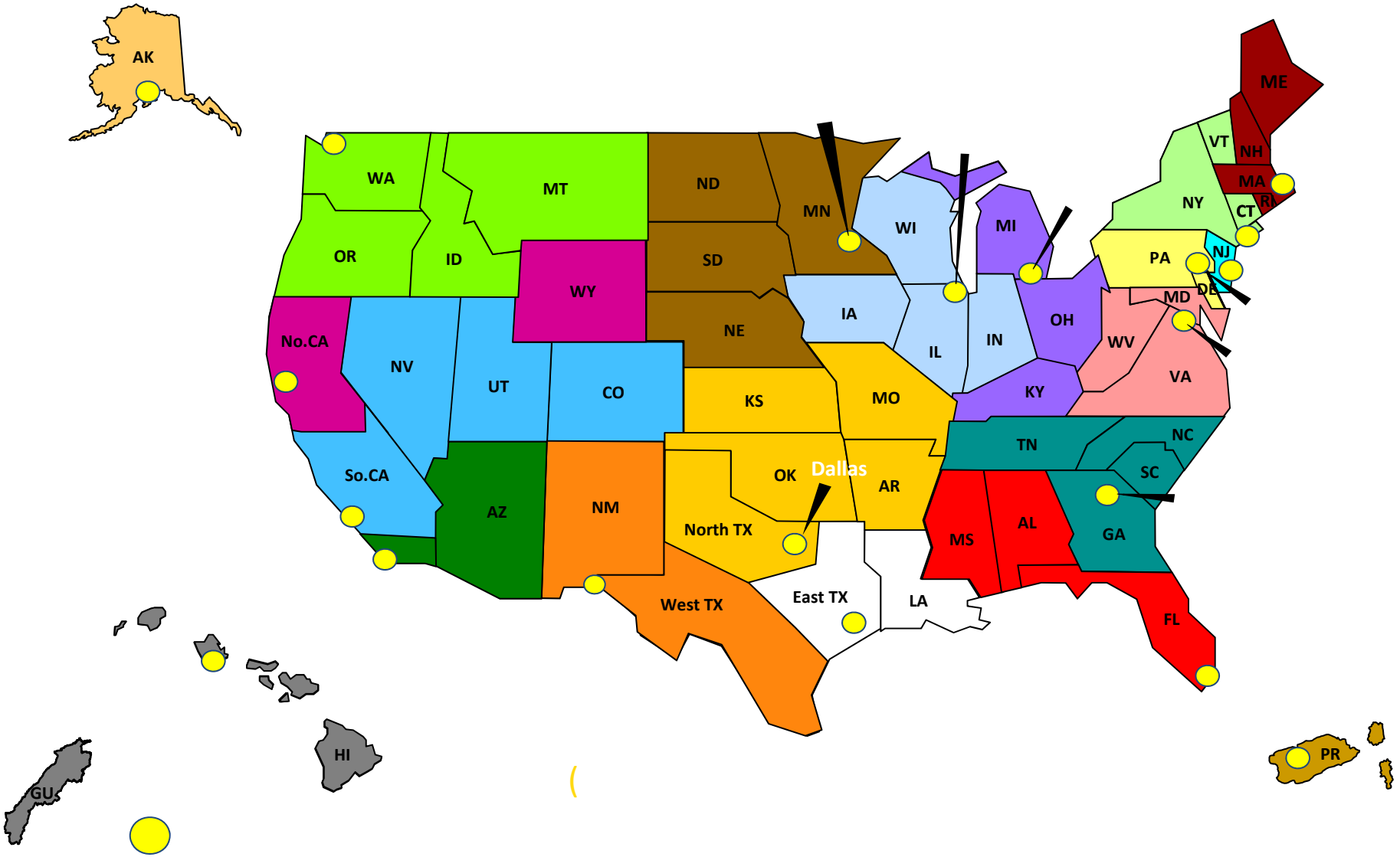
g

Provide access to required equipment, personnel with protection gear for transfer of travellers with infection/ contamination

Containment at source

- **Rapid response at the source is:**
- the most effective way to secure maximum protection against international spread of diseases
- key to limiting unnecessary health-based restrictions on trade and travel

Impact on CDC: 20 CDC Quarantine Stations



Contributed to Development of CAPSCA

CAPSCA Origin

- SARS - 2003
- Avian Influenza (H5N1) - 2005
- CAPSCA launched in Asia-Pacific – 2006
- WHO International Health Regulations IHR (2005) – 2007
- ICAO Public Health Emergency related SARPs in Annexes 6, 9, 11, 14 and PANS-ATM (Doc 4444) – 2007 & 2009
- Influenza A(H1N1) – 2009
- Haiti cholera outbreak - 2010
- Fukushima nuclear power plant accident – 2011
- E. Coli in Europe – 2011
- Novel Corona Virus - 2012

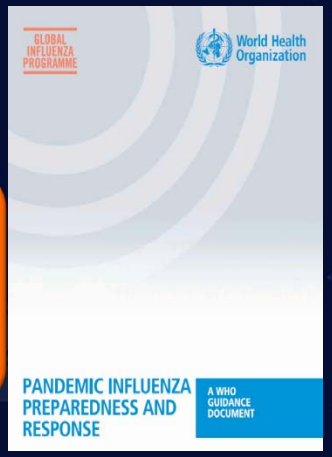
Interlinking guidelines

A guide for public health Emergency contingency planning at designated points of entry

Guide to hygiene and Sanitation in aviation

Case Management of Influenza A(H1N1) in air transport

World Health Organization International Health Regulations (2005)



International Civil Aviation Organization civil aviation authority guidelines

Airports Council International airport guidelines

International Air Transport Association airline guidelines

CAPSCA Partner Organisations

CAPSCA Regional Projects

	Asia-Pacific	Africa	Americas	Europe	Middle East
					
Year of Establishment	2006	2007	2009	2011	2011
No. Member States	20	25	32	6	10
State Technical Advisors Trained by ICAO (OJT completed)	2	4	12	0	2
State & Airport Assistance Visits Completed	10	8	28	0	4

ICAO/WHO Collaboration for ICAO Annex SARPs and IHR (2005) Implementation

1+1=3

(2+1 added value)

Preparedness Challenges in Real Life

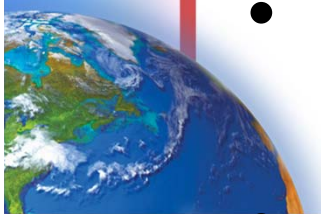
- Pre-H1N1
- The H1N1 experience

Adding New Quarantine Stations

- Very time consuming ….a year
- Very expensive…money ran out
- Finding staff was difficult…attrition became equal to hiring before the 21st station was added
- Facilities for quarantining large numbers of passengers often not available

Pandemic Preparedness

- Most public health staff in US are state or local….they already had responsibilities
- Passenger screening at 20 quarantine stations would require several thousand people
- Thermal imaging alone would require 200-500 people
- We concluded thermal imaging would not work
- Training would be continuous because of attrition
- Deployment to remote locations would be

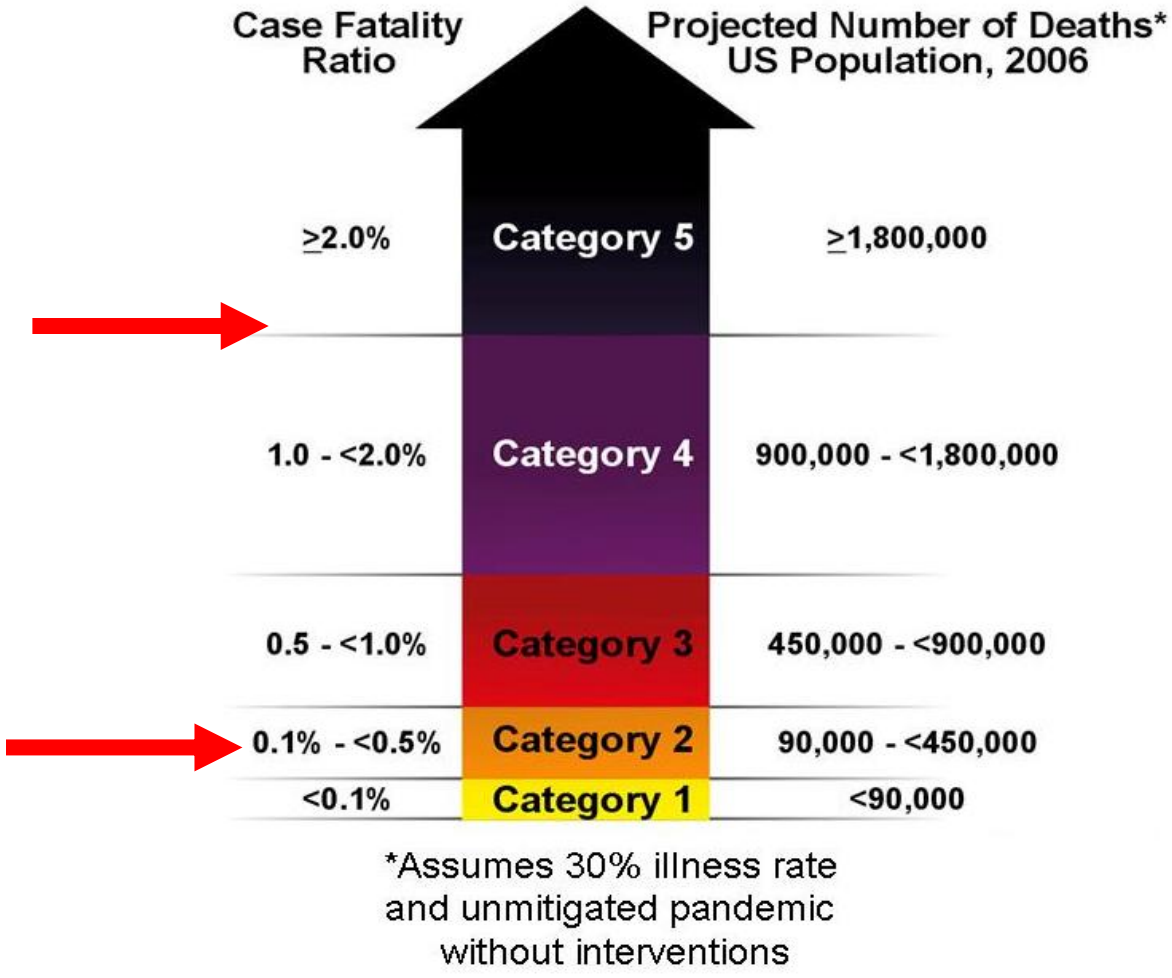


What Did We Expect?

Previous Influenza A Pandemics

- 1918-19, "Spanish flu" (H1N1)
  - 20-50M died world-wide (~500K in U.S.)
  - ~50% of deaths in young, healthy adults
  - Hemorrhagic pneumonia
- 1957-58, "Asian flu" (H2N2)
  - ~70,000 attributable deaths in U.S.
- 1968-69, "Hong Kong flu" (H3N2)
  - 34K excess U.S. deaths per year

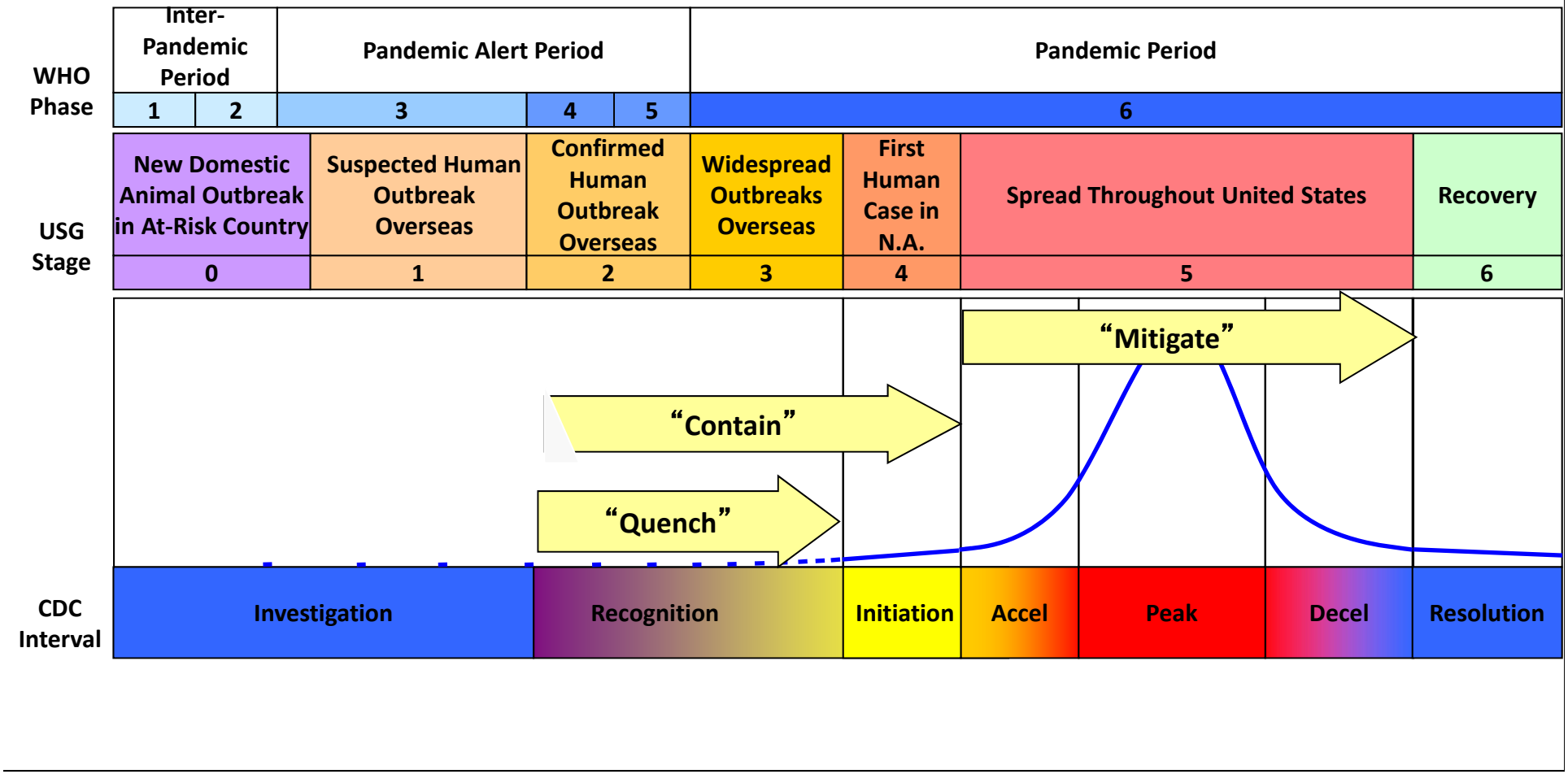
Pandemic Severity Index



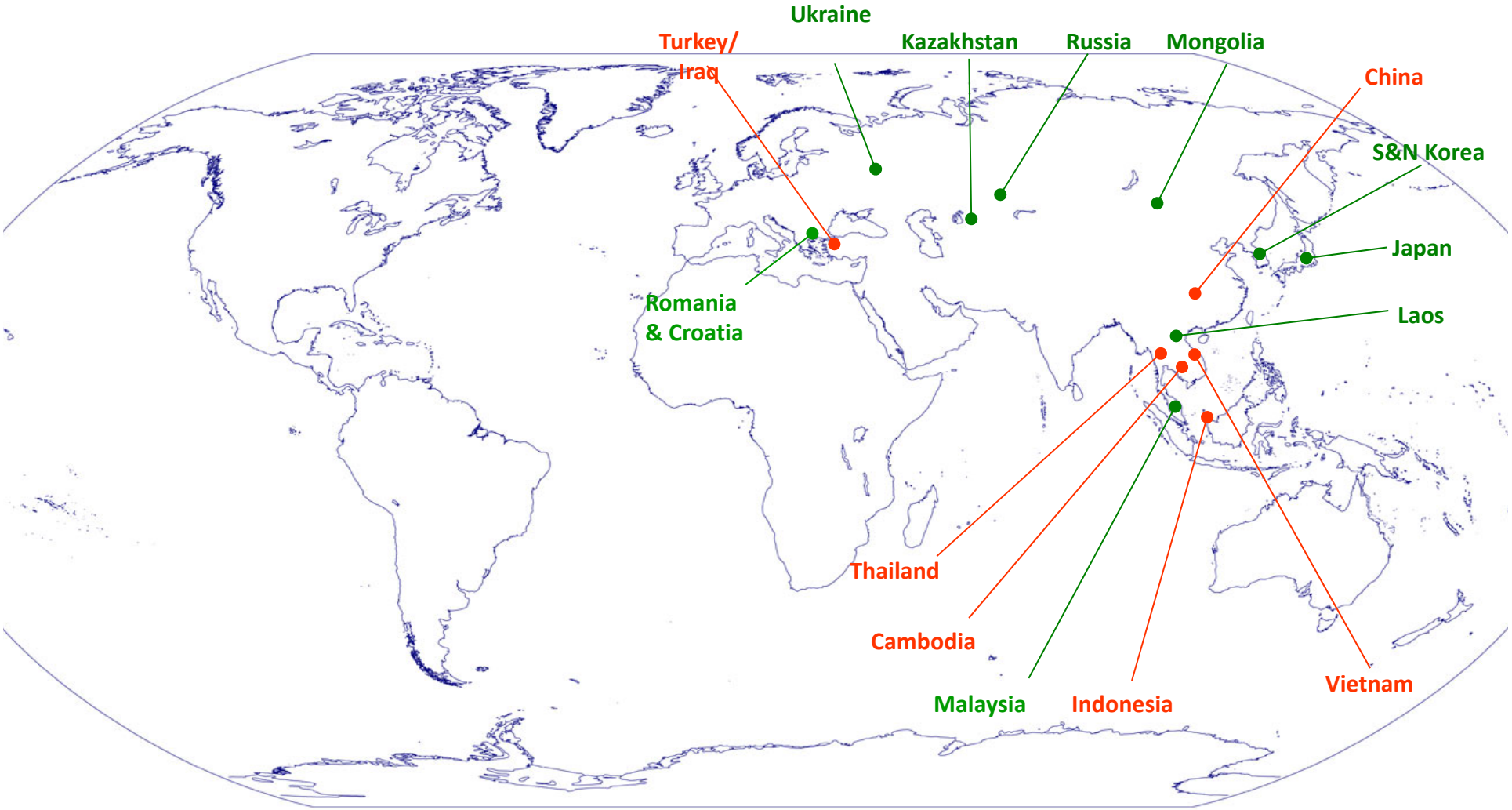
*Assumes 30% illness rate and unmitigated pandemic without interventions


JAL

Pandemic Intervals



Countries reporting confirmed animal and/or human A/H5N1 infections in Dec 2003 – Jan 2006*

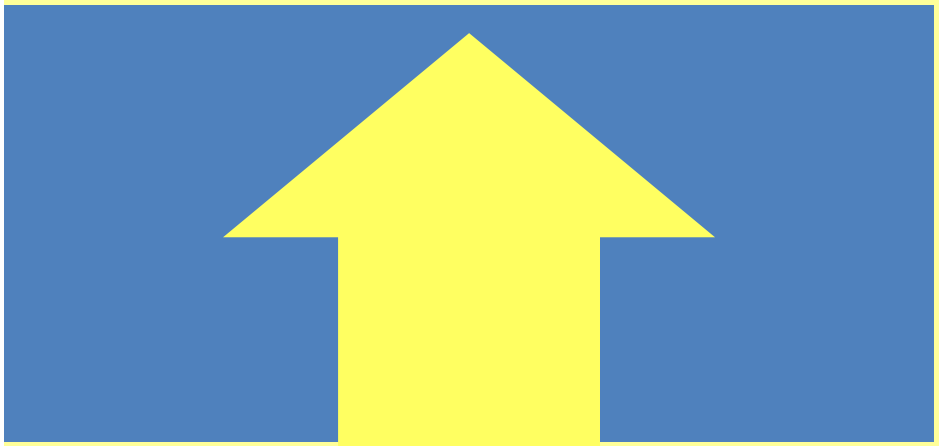


Human & animal infections Animal infections only Under investigation

** WHO & FAO as of January 2006*

Layered Defense Against a Pandemic

- Quarantine and isolation
- Health screening at ports of entry
- Distribution of inbound flights
- En route screening
- Health screening at ports of embarkation
- Possible travel restrictions from affected regions

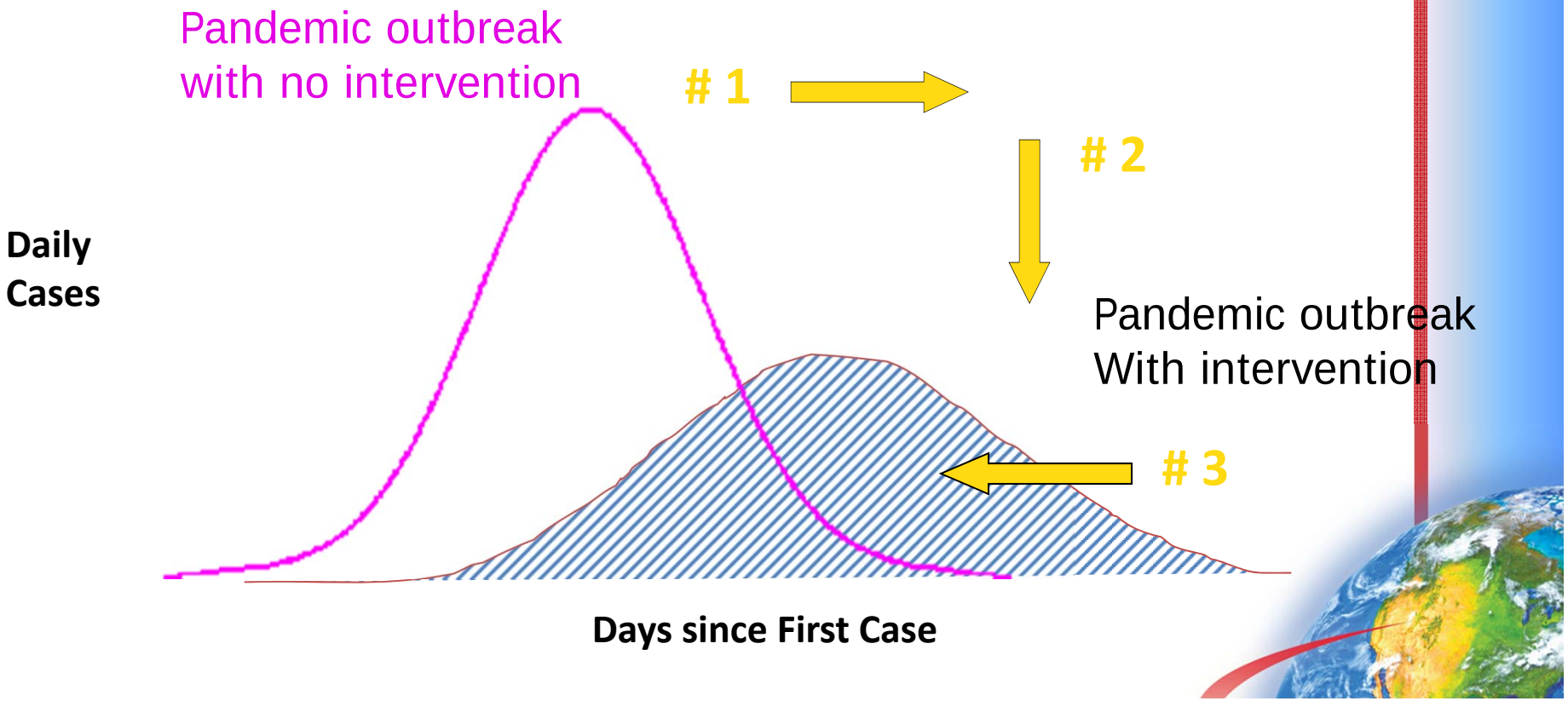


- Containment at source: travel restrictions, antivirals, quarantine, and isolation (World Health Organization Rapid Reaction)

Most likely candidate for next pandemic influenza?
Influenza A H5N1

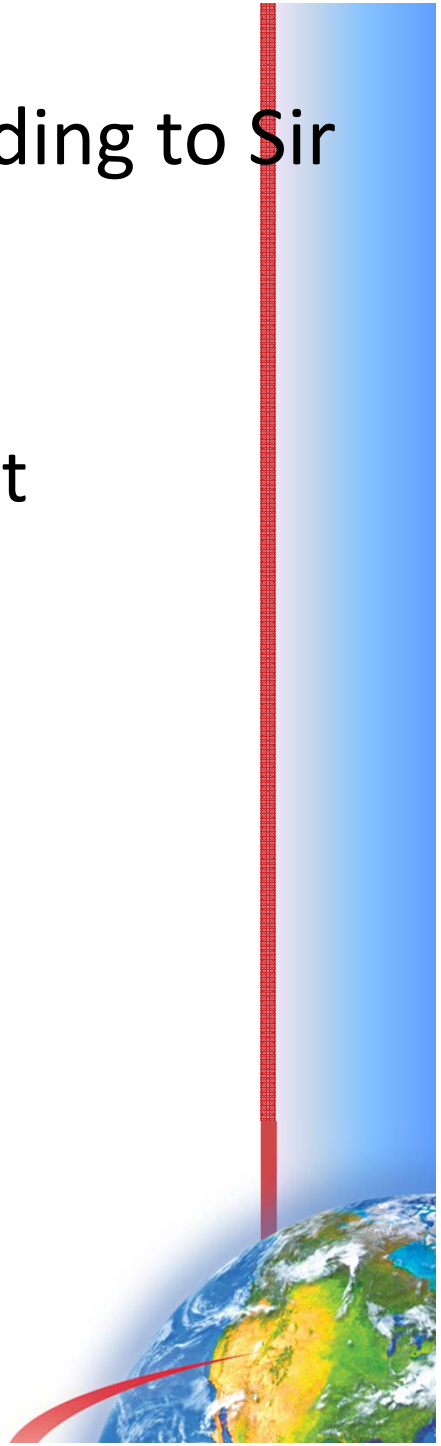
Lucky We had Changed Our Goals

1. **Delay disease transmission and outbreak peak**
2. **Decompress peak burden on healthcare infrastructure**
3. **Diminish overall cases and health impacts**



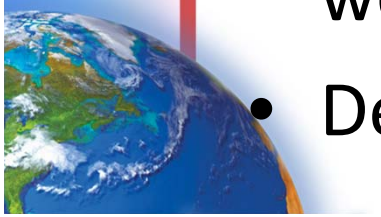
Real-Life Outbreak Epidemiology According to Sir Mick

"No, you can't always get what you want
You can't always get what you want
You can't always get what you want…



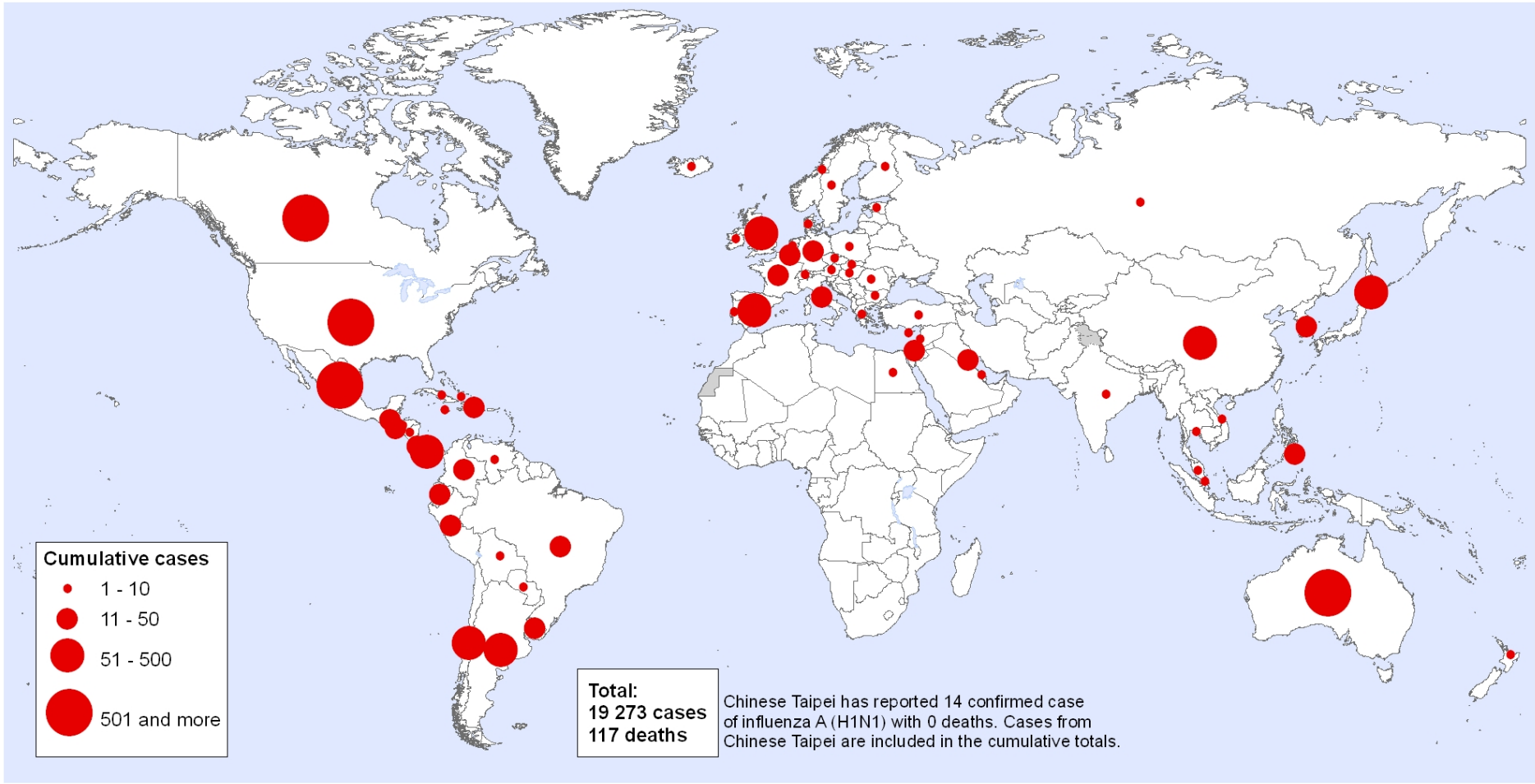
Some Challenges

- An unexpected virus was in the country and spreading internationally before we knew it existed
- Most of our previous plans didn't apply
- State and local public health was overwhelmed
- Because it was mild, much of the public became complacent or…worse…thought we were intentionally exaggerating
- Decisions made without full data



New Influenza A (H1N1),
Number of laboratory confirmed cases as reported to WHO

Status as of 03 June 2009
06:00 GMT



Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

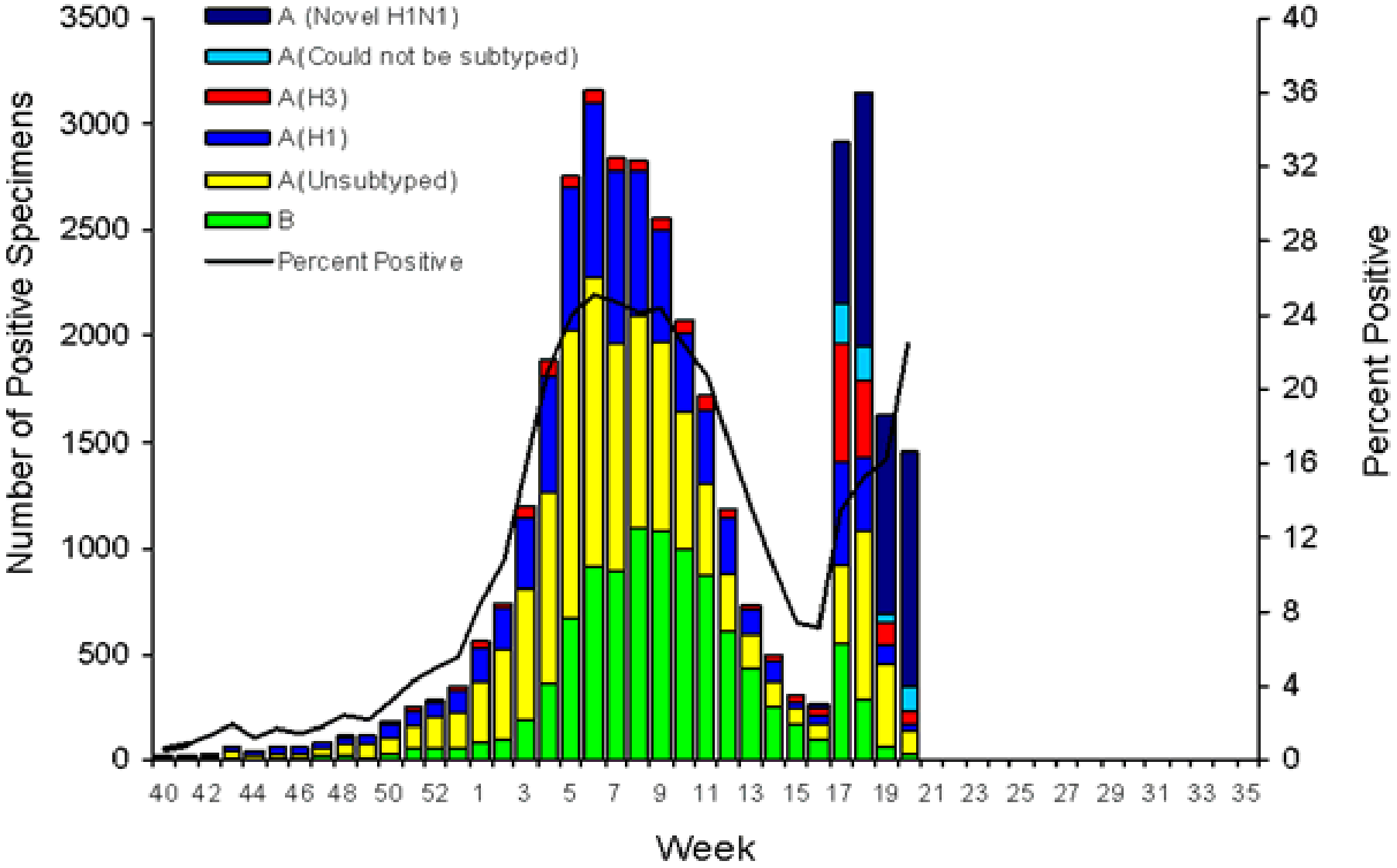
World Health Organization

Map produced: 03 June 2009 07:28 GMT

Community Mitigation Activities

- Universal cough/hand hygiene
- Voluntary self-isolation of confirmed or probable cases and people with influenza-like illness
- Self-monitoring of contacts
- Enhanced surveillance at schools, health care facilities etc
- School closures--no longer recommended
- No restrictions on workplaces
- No restrictions on large gatherings

Influenza Positive Tests Reported to CDC by U.S. WHO/NREVSS Collaborating Laboratories, National Summary, 2008-09

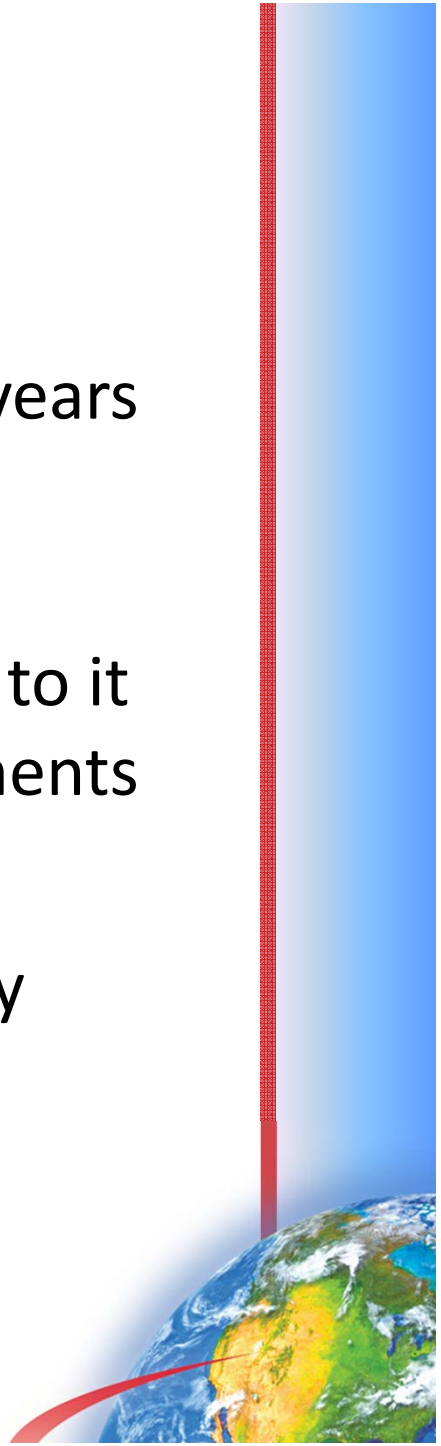


A Big Issue…

- Even though we reacted well, many people believed that we had “cried wolf” in order to get more funding.
- Quarantine has fallen out of favor

Summary

- What we do is based on several thousand years of experience
- The revision of the International Health Regulations and the circumstances leading to it were among the most important developments
- Preparedness is difficult…flexibility is key
- CAPSCA goes back to the dawn of humanity



Thank You!