Emerging Infectious Diseases: SARS and Avian Influenza

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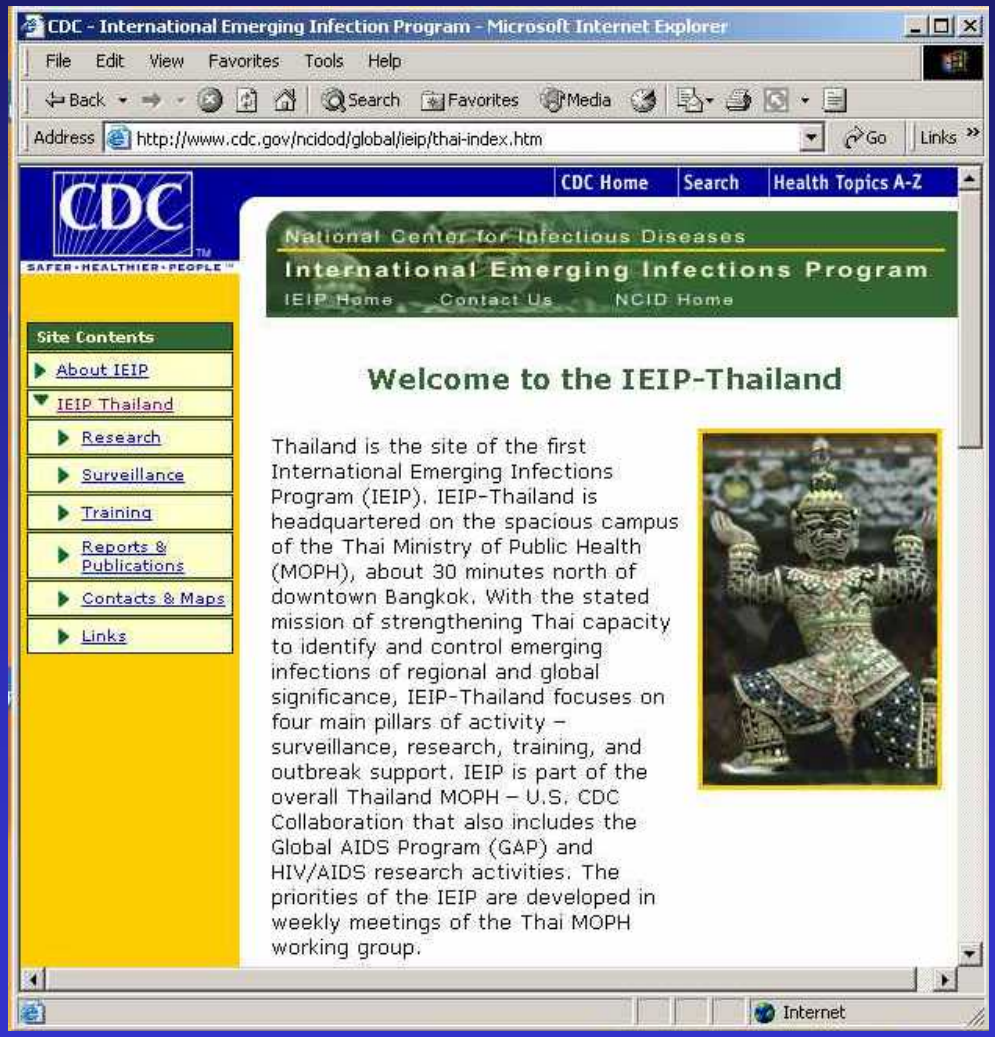
Recent Outbreaks in SE Asia

- 1997
  - Influenza A (H5N1) in Hong Kong
  - Spread from chickens to humans, 6 deaths
- 1999
  - Large outbreak of encephalitis in Malaysia
  - Spread from pigs to humans
  - Newly emergent paramyxovirus, Nipah virus

International Emerging Infections Program



http://www.cdc.gov/ncidod/global/ieip/index.htm

Recent Outbreaks in SE Asia

- 2002-3
  - Outbreak of Severe Acute Respiratory Syndrome
  - Likely spread from animals to humans
- 2003-4
  - Avian influenza A (H5N1)
  - Spread from chickens to humans
  - Human cases in Viet Nam and Thailand

ANALYSIS / SEVERE ACUTE RESPIRATORY SYNDROME

Sars: Four months that shook Asia

After four traumatic months, Asia appears to have brought Sars under control, ending for now early fears the outbreak would escalate into a pandemic to rival the 1918 influenza.

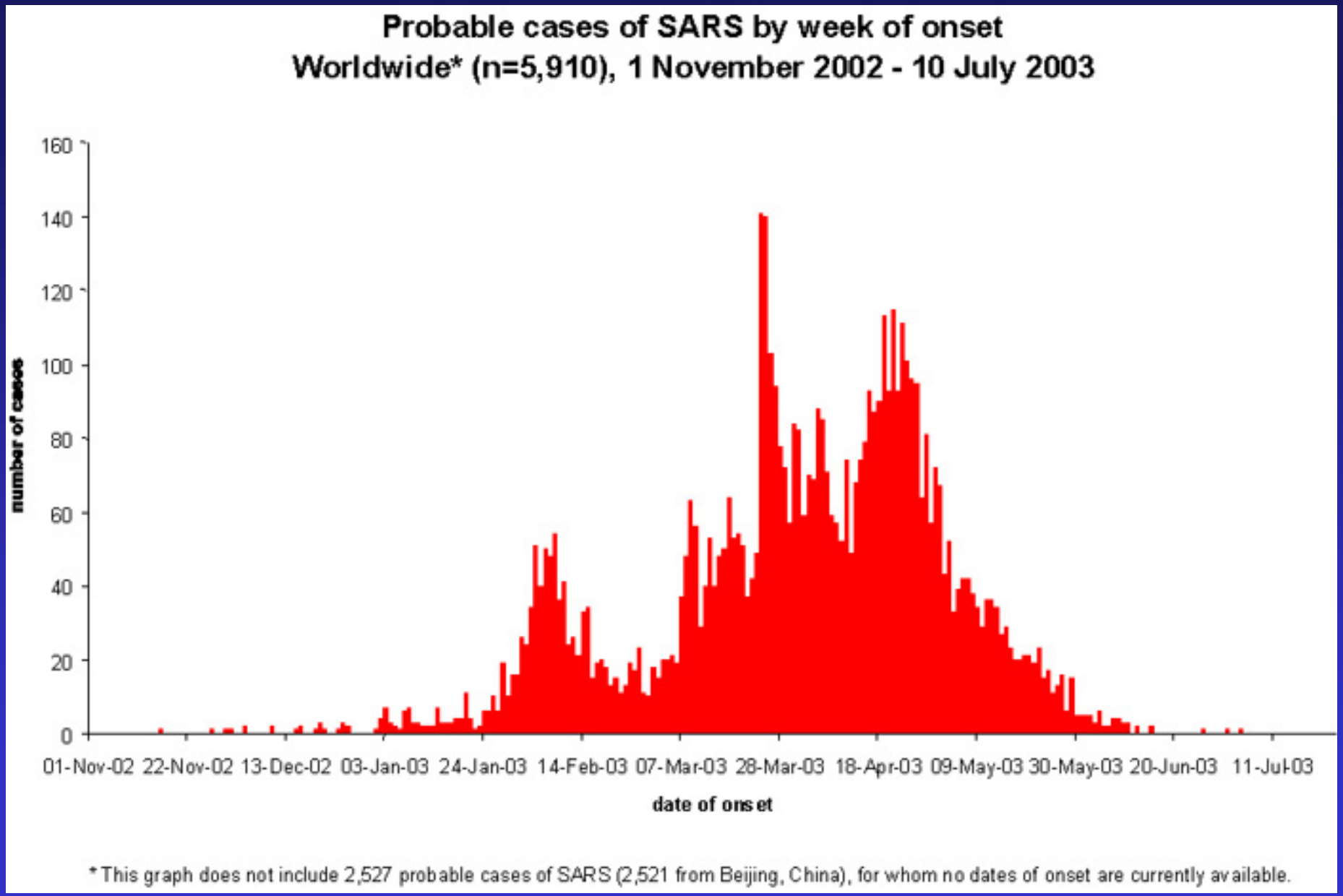
But as the region breathes a sigh of relief and a palpable optimism returns to Asia's streets, its leaders have begun picking through the economic and

Everyone is feeling a lot better the epidemic is dying down, but a full recovery cannot be expected for quite some time yet. In the meantime, there has been the silver lining of Beijing being more open with the world.

a team of its experts from travelling there to investigate and even denied any Sars problem on the mainland.

The April 2 advisory, however, turned international ire on China and pressure to come clean on a cover-up arguably responsible for what had by then become a full-blown worldwide outbreak with 180 dead and 3,000 infected was immense.

Bangkok Post



http://www.who.int/csr/sars/epicurve/epiindex/en/index1.html

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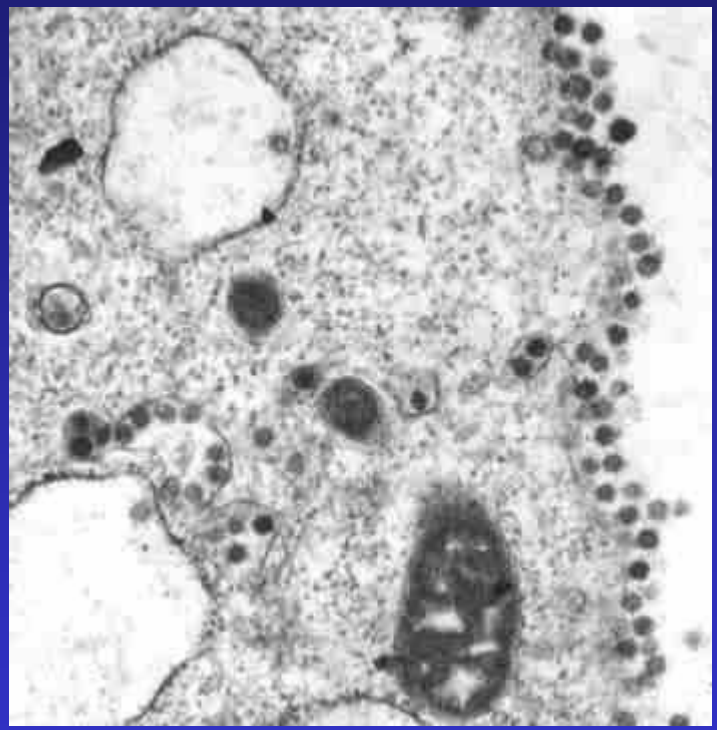
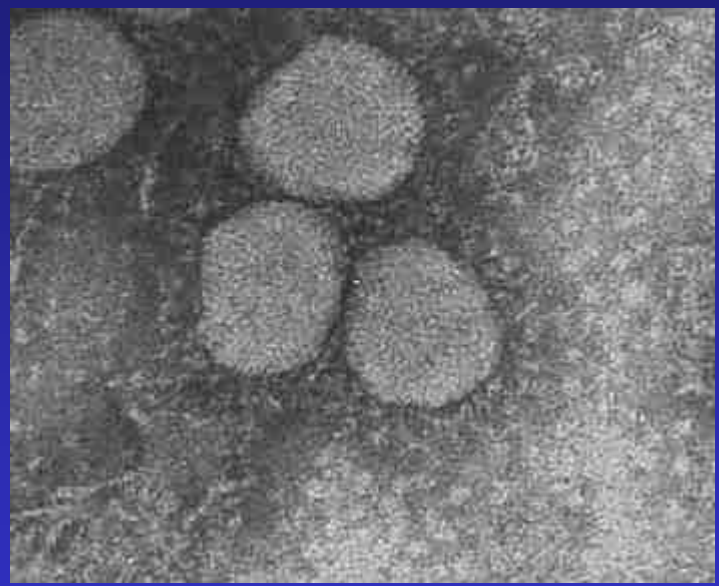
SARS Caused by a Coronavirus





http://www.who.int/csr/sars/coronavirus/en/

Origin of SARS

- Animal origin
  - Masked palm civet
  - Raccoon dog
  - Chinese ferret badger
- Studies in China
  - Animals
  - Humans who work with animals

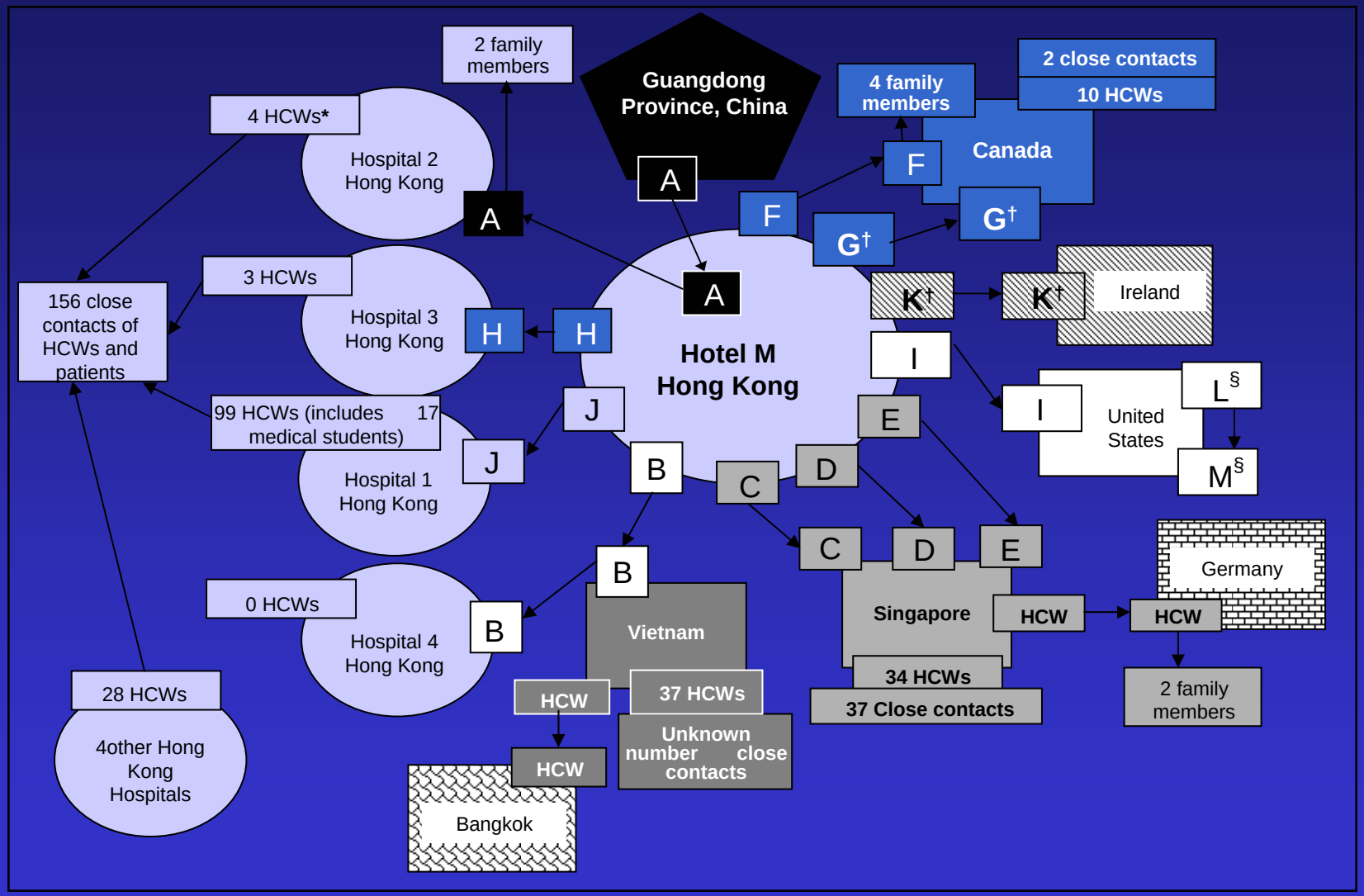
Epidemiologic Characteristics

- Incubation period 4 days (range, 2-10)
- Transmission through direct contact or droplet spread
  - Most transmission to close contacts
  - 21% of cases in health care workers
  - Infectious period peaks on days 5-15
- Mortality 15% overall
  - 0%(0-24), 6%(25-44), 15%(45-64), 52%(>64)

SARS Highly Infectious

Event	Number of secondary infections
Hotel M	16
Apartment Complex	321
Airline	22 (+41 in Beijing)

Chain of Transmission at Hotel M



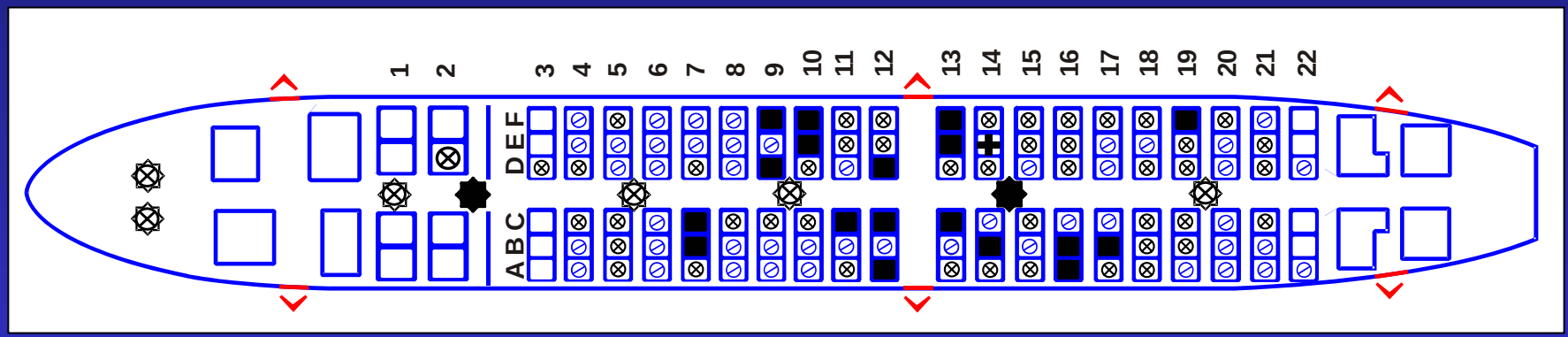
MMWR March 28, 2003

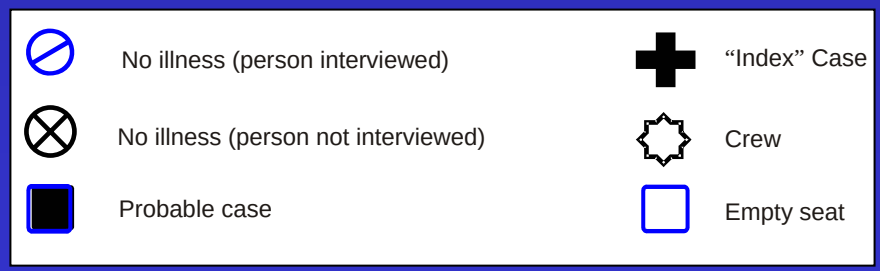
Apartment Complex

- 321 cases identified
  - 66% reported having diarrhea
  - 4% reported contact with SARS patient
  - 8% reported recent travel to mainland China
- Transmission
  - Sewage system – small droplet, airborne
  - Person-to-person
  - Shared communal facilities

Airline Transmission of SARS

22 infections
5 deaths



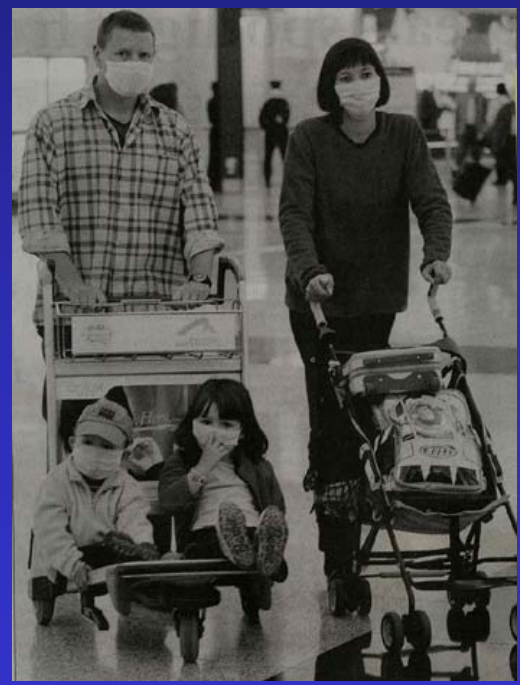


Olsen et al. New Engl JMed 2003;349:2416

Measures to Reduce Airline Transmission of SARS

Aircraft Decontamination

Voluntary Use of Masks



Fever Screening

Bangkok Post

Good Infection Control

Full airborne precautions

Double gloves

Double Gown

Tight-fitting mask (N100) (N95)

Cap and Goggles

Shoe covers

Repercussions of SARS

- Large economic impact

Airlines to lose US$10 billion: IATA

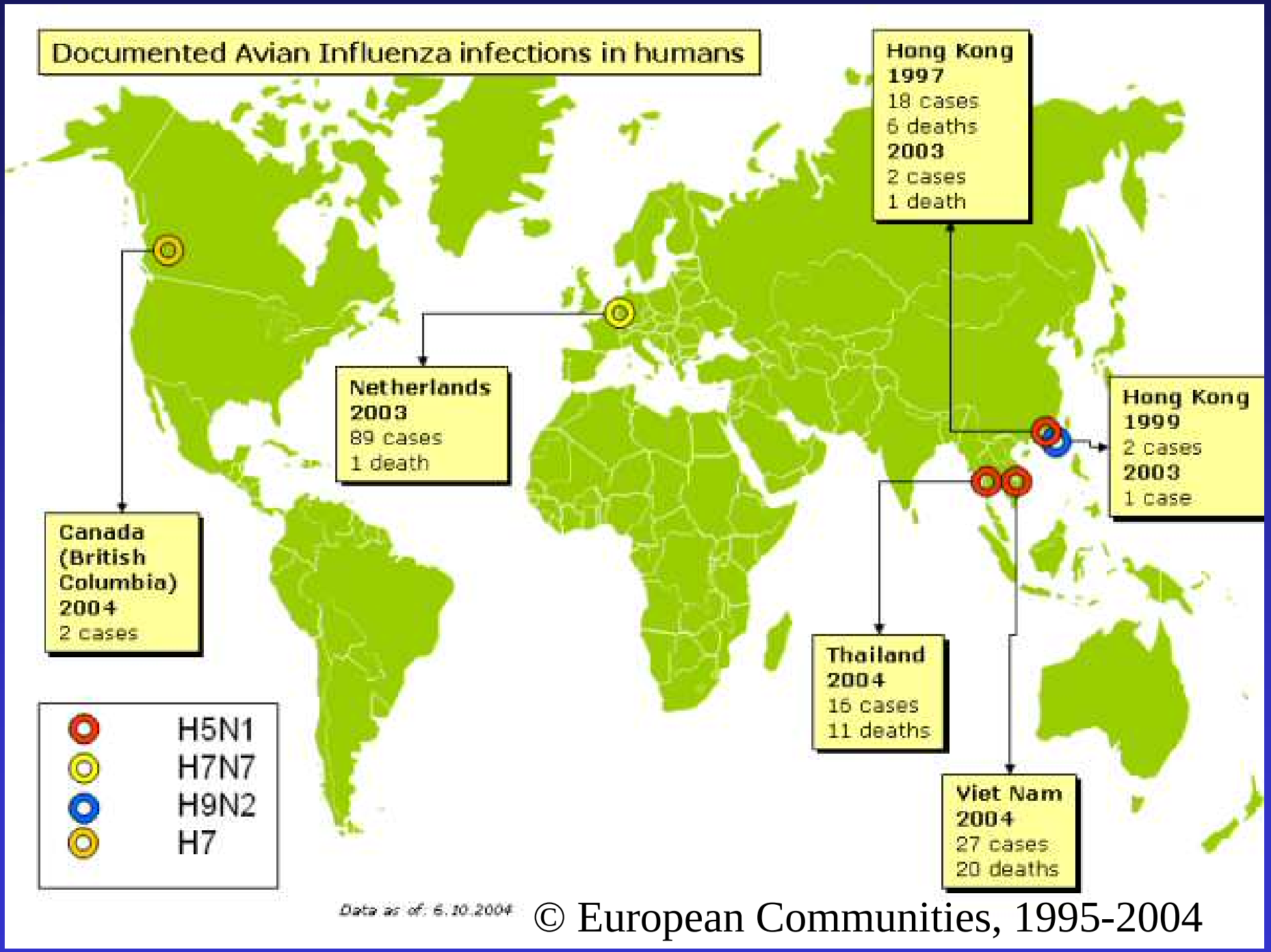
- Strain on health care

SARS drives nurses and doctors to quit in Taiwan

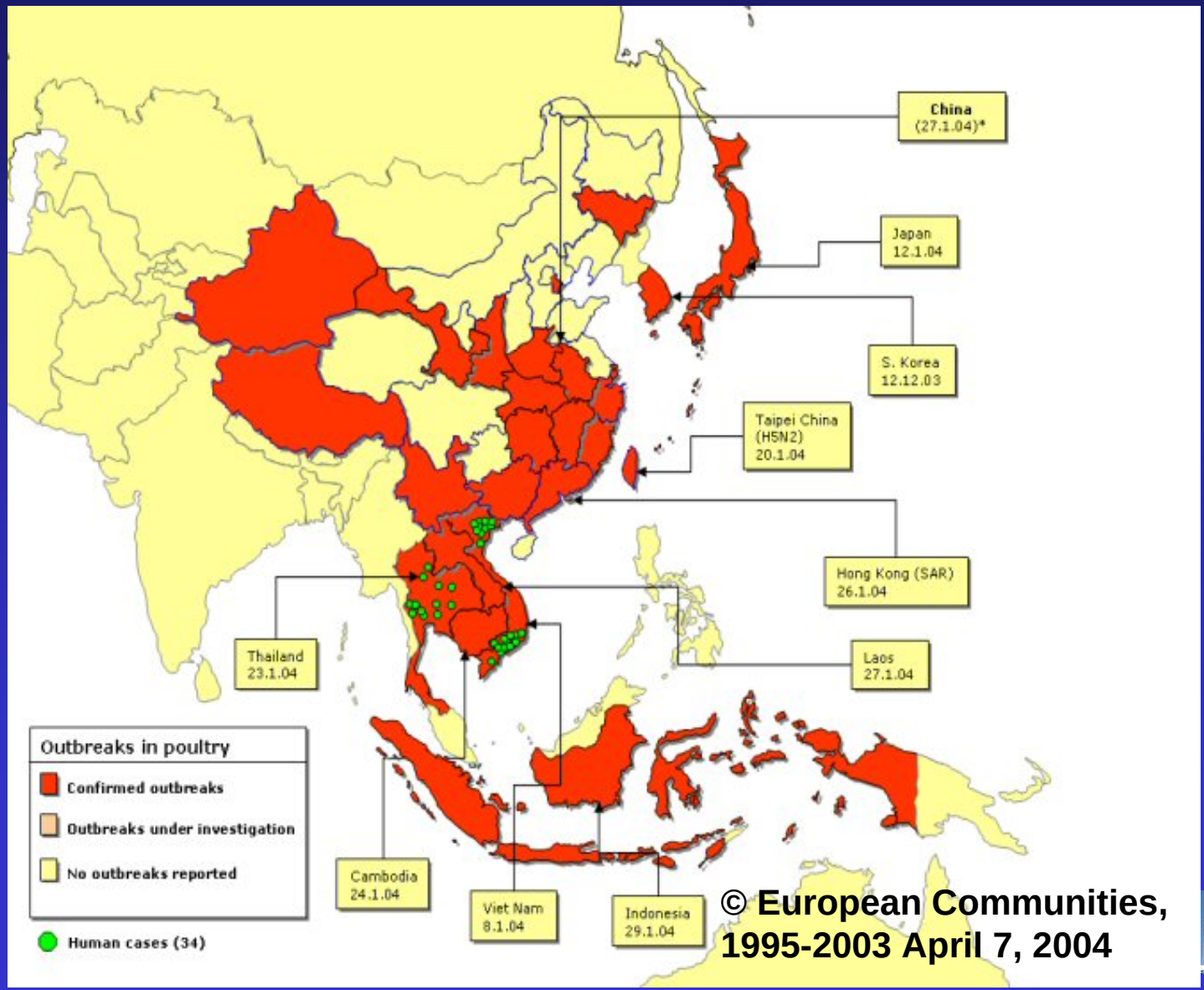
- High profile

Avian Influenza

- Discovered in Italy over 100 years ago
- Can occur in most species of birds
- Outbreaks have occurred throughout the world
- Viruses vary widely in pathogenicity



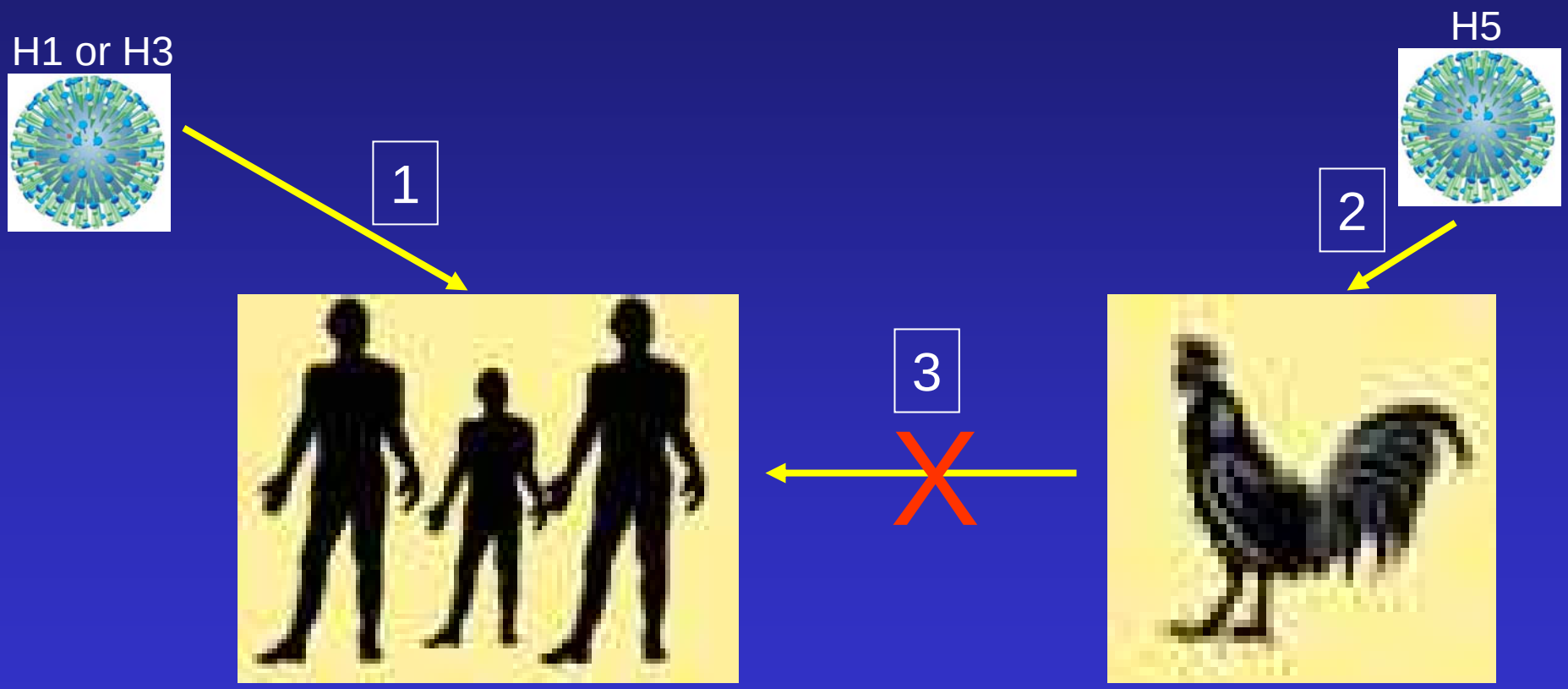
Avian Influenza A (H5N1) in Asia



Current H5N1 Outbreak

- H5 avian disease is widespread across Asia
  - A least 9 affected countries in 2004
  - >100 million birds culled or died
- Human infections limited to Viet Nam and Thailand
  - 40 cases
  - 73% mortality
- Concerns about a pandemic if H5 reassorts with H1 or H3

Three Possible Control Points to Prevent Reassortment



1 Prevent Human Infection Through Vaccination

- Key factors
  - Burden of influenza is substantial
    - 42,371 cases reported in passive surveillance system (2003)
    - True burden 92-fold greater
  - Seasonal coincidence of avian and human influenza
  - Vaccine not currently recommended

Human Influenza Burden is Substantial in Thailand

Data source	Sa Kaeo annual rate/100,000	Number in Thailand (population 62m)
Influenza-like illness (Household survey in Sa Kaeo*)	39,095	24,238,900
Proportion of influenza-like illness caused by influenza virus**	16%	
Influenza	6,255	3,878,224

*Annualized

**Prospective population-based virologic surveillance for influenza in patients with influenza-like illness

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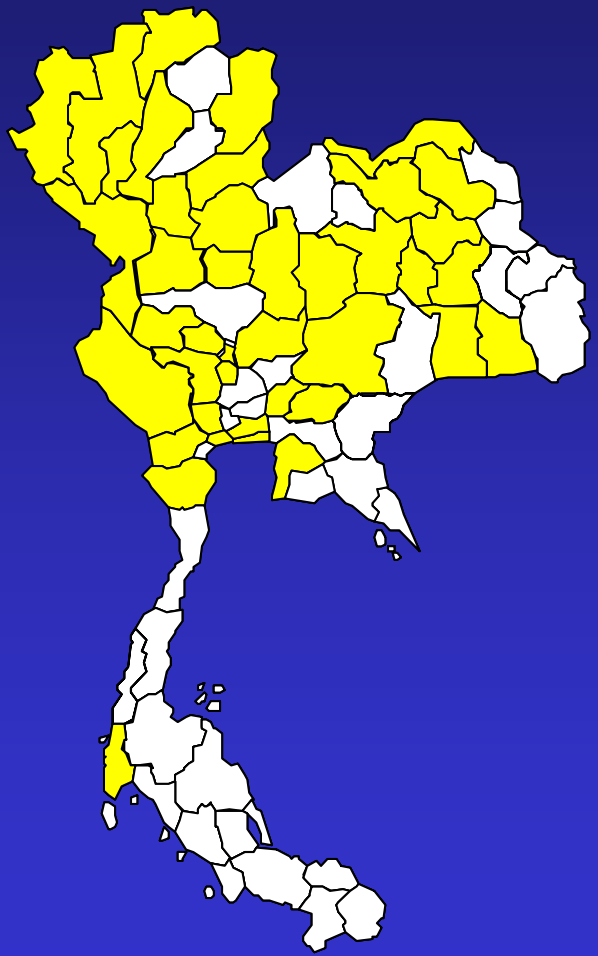
2 Control avian H5 disease

- Key factors
  - Bird surveillance shows avian disease is widespread in Thailand
  - Culling has not eradicated the disease
  - Substantial economic costs due to infection and culling
  - Poultry vaccine currently banned in Thailand

January - May 2004



- 61 affected provinces
- Poultry culled in 5km radius around H5 infected poultry
  - 30 million dead or culled

http://www.dld.go.th/home/bird_flu/birdflu.html

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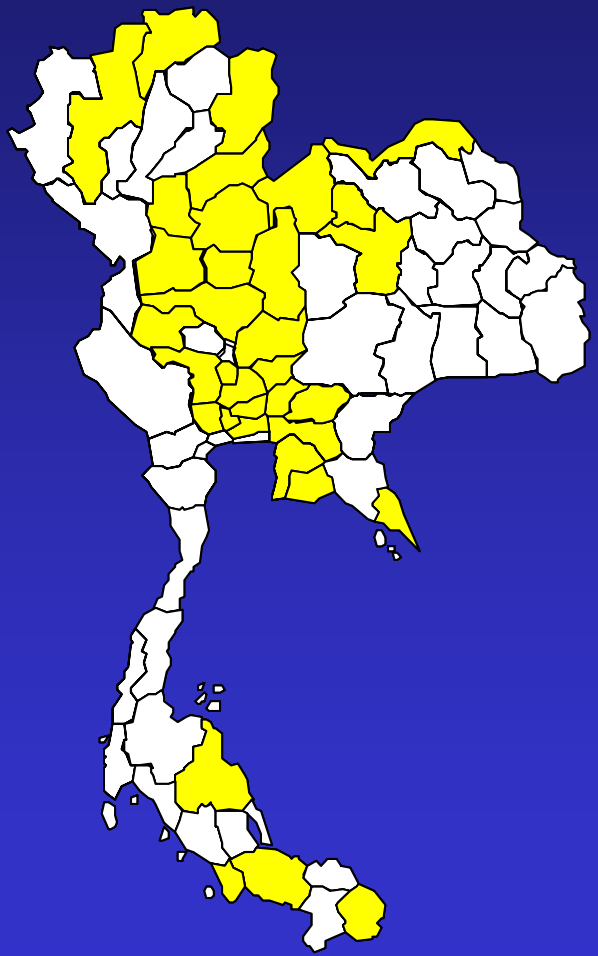
July - September 2004



- 34 affected provinces
- Culled only infected poultry
  - 1 million dead or culled

http://www.dld.go.th/home/bird_flu/birdflu.html

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Broadened Species Range in 2004

- Poultry
  - Chicken
  - Ducks
  - Geese
  - Turkeys
  - Ostriches
  - Quails
  - Peacocks
  - Pigeons
  - Crows
- Other animals
  - Domestic cats
  - White tiger
  - Clouded leopard
  - Humans

3 Reduce human-avian interaction through public education

- Key factors
  - Poultry exposure is extremely common
  - Most cases are in children
  - Public is knowledgeable about bird flu yet some risk remains
  - Difficult to change behavior

Poultry Exposure is Common

Sa Kaeo, Thailand

178 farms

81,695 households with backyard birds

- 1.3% of poultry is on commercial farms
  - 178 farms
  - 31,221 poultry
- 98.7% of poultry is in backyards
  - 73% of households have backyard birds
  - 2,410,820 poultry

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Recent Development

- Family cluster
  - 3 family members, 1 lived in another province
  - H5N1 confirmed infection
- Person-to-person transmission
  - No further spread
  - No significant mutation to virus

Summary: SARS and Avian influenza

- SARS redefined emerging zoonoses
  - Broad economic and public health impact
- Avian flu: unprecedented & unpredictable
  - Scale of the epizootic unprecedented
  - Ongoing potential for re-assortment event

Expect the Unexpected

- Monkeypox
- West Nile virus
- Nipah virus
- Avian influenza
- SARS