

An Assessment of H5N1 situation, Trends and Epidemiological Insights

Dr Jai P. Narain
WHO Regional Office for South-East Asia
New Delhi



**World Health
Organization**

Three types of influenza viruses

- Seasonal influenza virus
 - A contagious respiratory illness caused by influenza viruses
 - Viruses circulating in the human population-Influenza A (H3N2, H1N1 and B strains)
- Avian influenza virus
 - Animal influenza viruses infectious for humans under special circumstances.
 - Current H5N1 infections
- Pandemic influenza virus
 - Flu that causes a global outbreaks and spread easily from human to human
 - Currently there is no pandemic flu



3 pre-requisites for a Pandemic

1. The emergence of a new virus strain with no circulating immunity within the human population
2. The ability of this strain to infect humans
3. The potential for the new virus to be easily transmitted from person to person

At present, two of the prerequisites for a pandemic have already been met – a new virus capable of infecting humans is circulating.

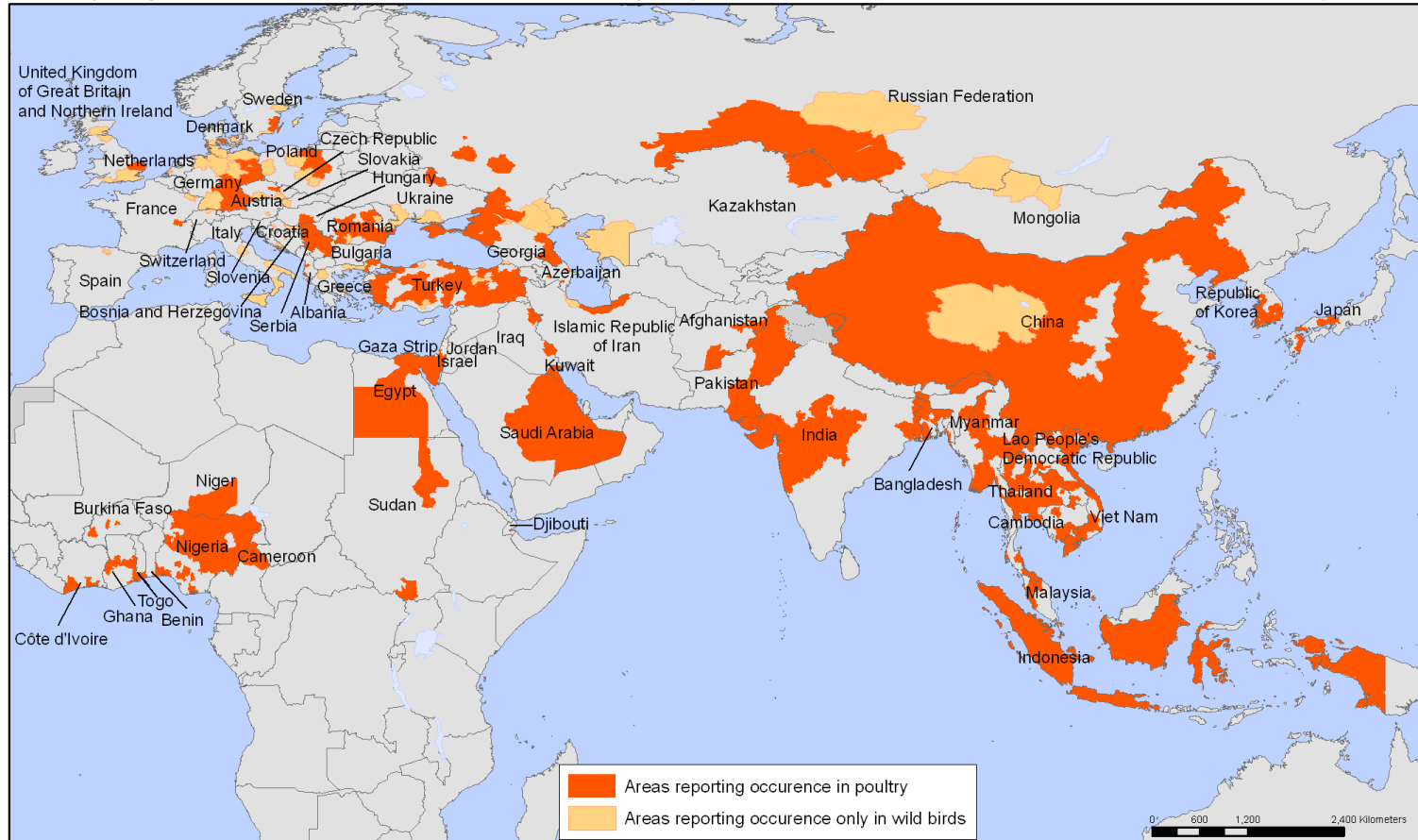
The first outbreak of H5N1, Hong Kong, 1997

- 18 cases, 6 deaths (CFR 33%), age range 1-60
- Illness was more severe among those > 12 years of age
- Six (12%) out of 51 household contacts had H5N1 antibodies and most had a history of exposure to poultry
- Nearly 4% (8 / 217) HCW exposed to human cases and 0.7% (2 / 309) non-exposed HCW were H5N1 sero-positive ($P = .01$)

Areas reporting confirmed occurrence of H5N1 in Poultry and wild birds since 2003

Areas reporting confirmed occurrence of H5N1 avian influenza in poultry and wild birds since 2003

Status as of 03 March 2008
Latest available update

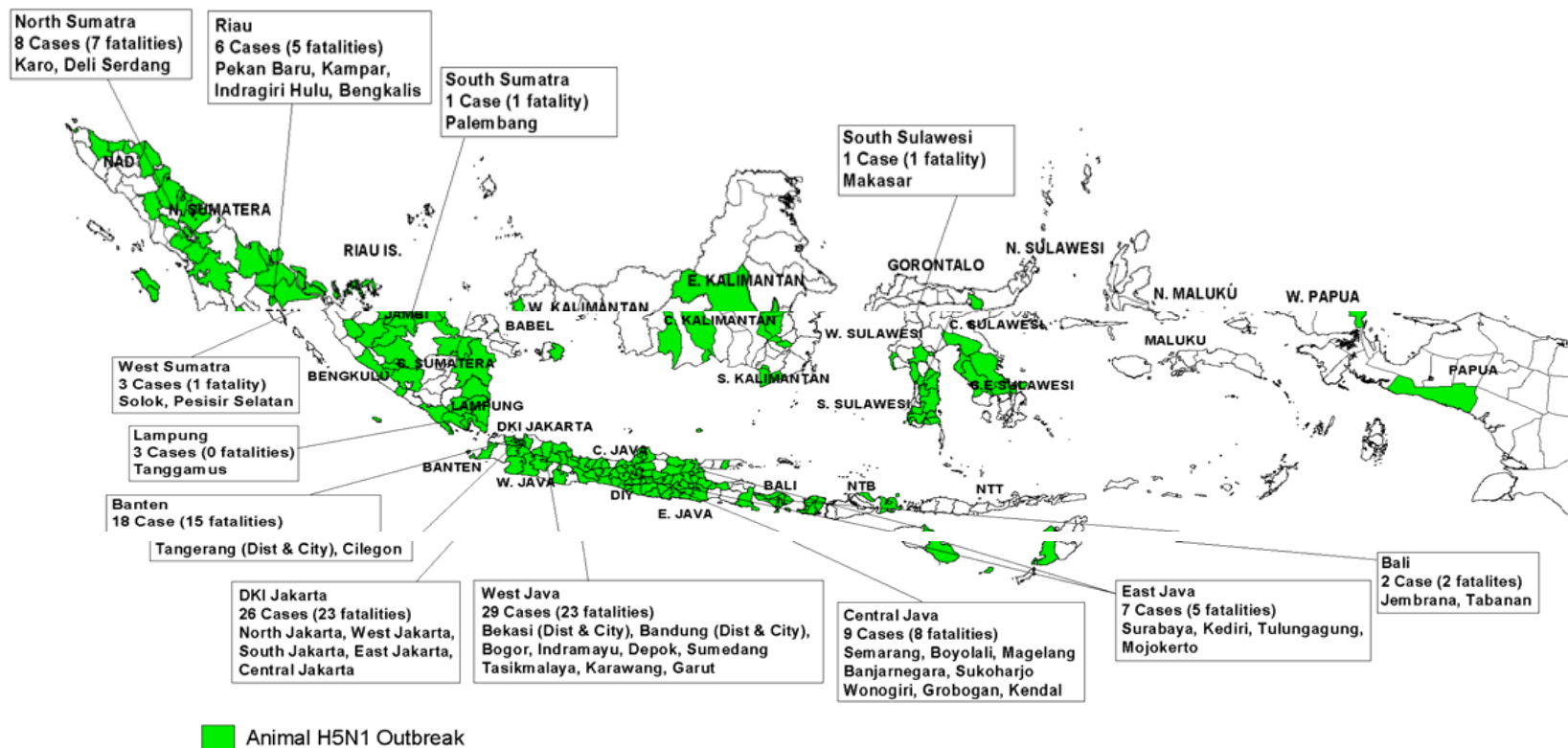


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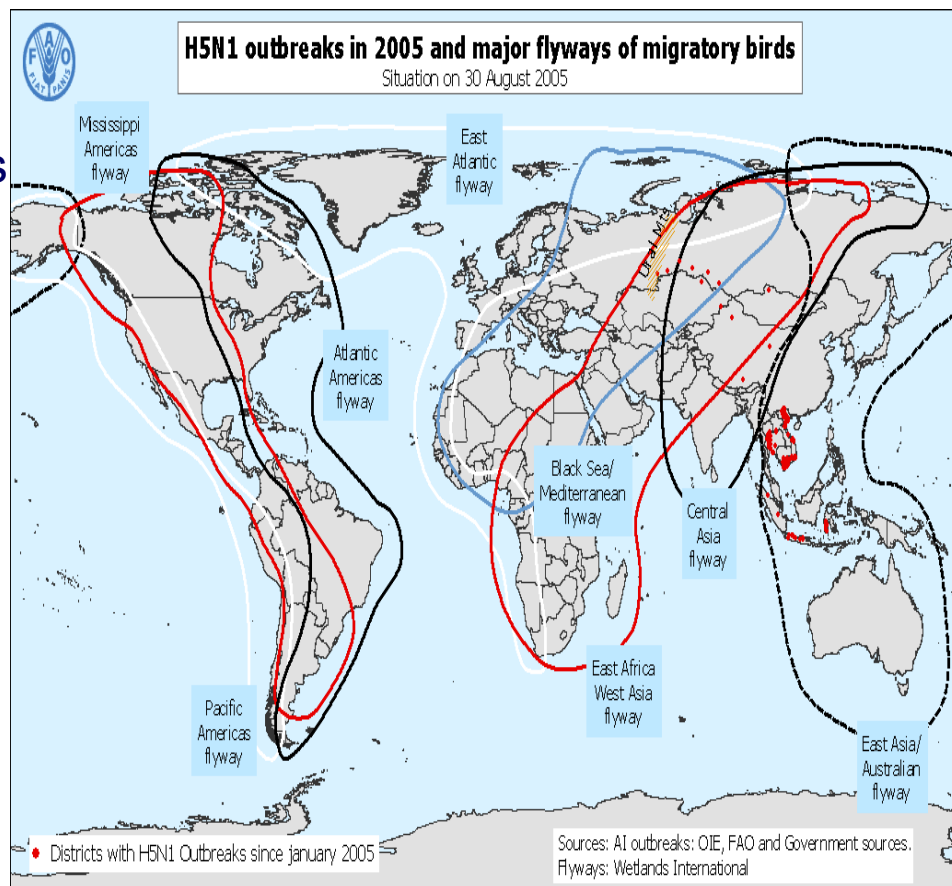
Data Source: World Organisation for Animal Health (OIE) and national governments
Map Production: Public Health Mapping and GIS
World Health Organization

Poultry outbreaks in Indonesia (29 November 2007)



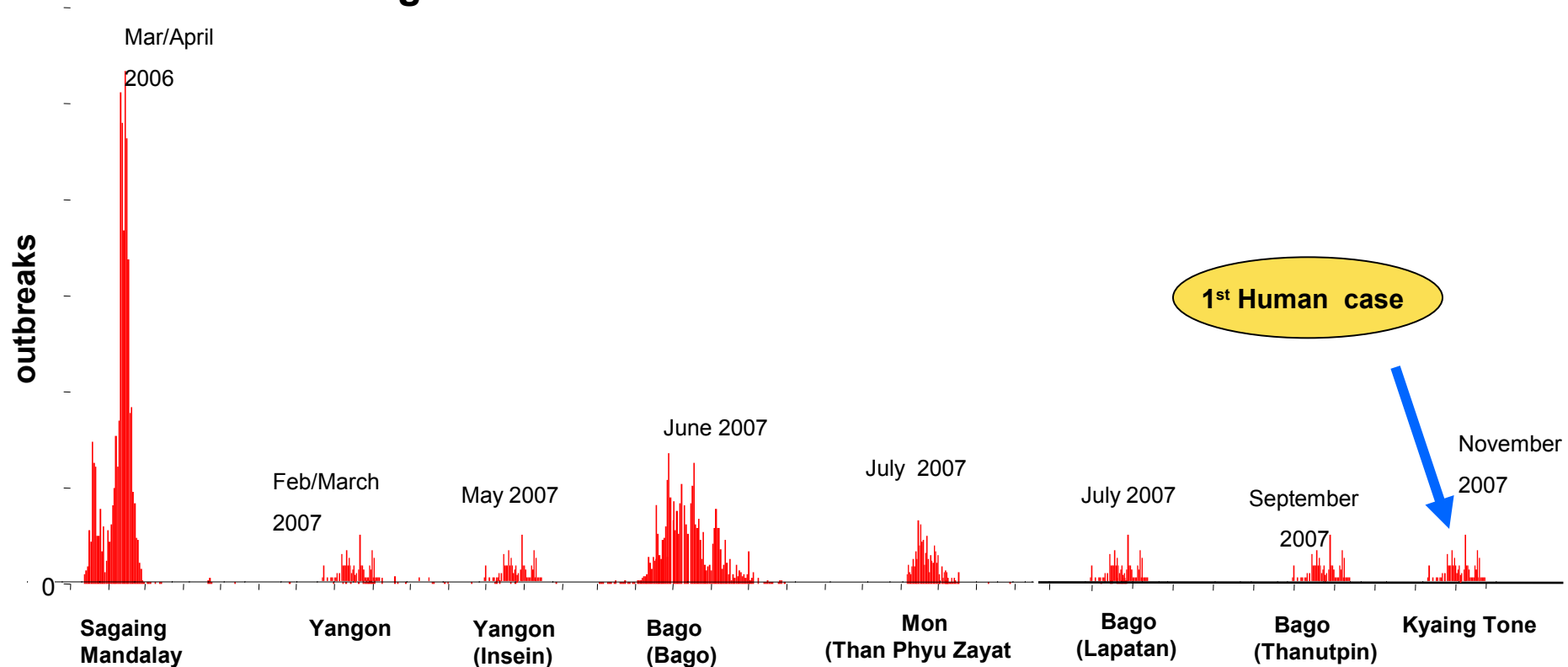
Risk factor for global spread: major flyways of migratory birds

- Three main flight pathways are associated with AI spread
 1. Northern to Southern Hemispheres
 2. Asia to Europe
 3. Asia to Africa
- The hot zones for spread of HPAI coincide with route of wild birds migration and water bodies in deltas
 - Bengal,
 - Nigeria,
 - Egypt,
 - Vietnam

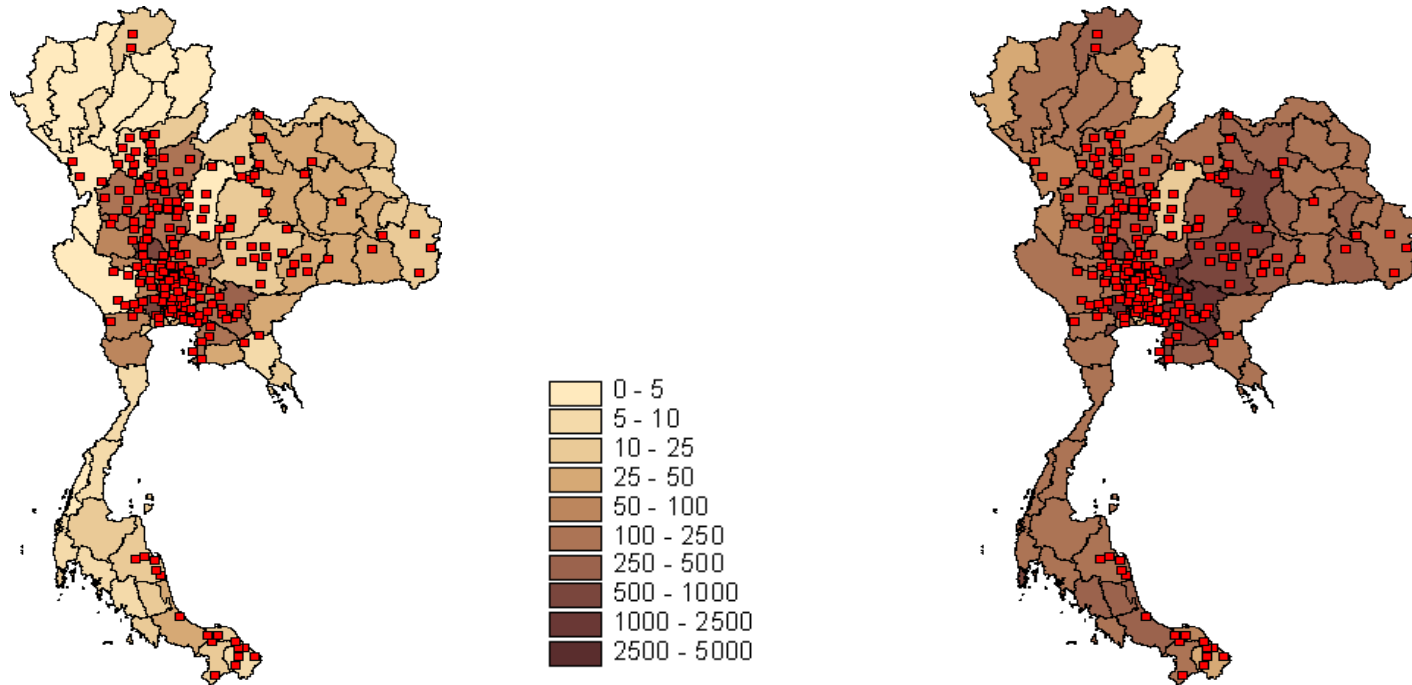


Human Behaviour as a risk factor for the transmission of Avian Influenza

- The epidemic kept propagating from one area to another by the movement of infected poultry to avoid culling
- Culminating in a human case



The poultry outbreaks and distribution of ducks (birds/ km²)



Chicken outbreaks over duck distribution

Chicken outbreaks over chicken distribution

Insights from an evolving situation of H5N1 Outbreaks in Thailand

Indicators	1 st wave	2 nd wave	3 rd wave	4 th wave
Outbreaks	190	1,539	75	2
Province	42	51	11	2
District	89	264	27	2
Sub-District	190	784	55	2
Culled	30 M	3 M	417,146	393,750
Compensation	100%	75%	75%	75%
Compensation (USD)	~ 130 M	~ 5 M	~180,000	~ 1.39 M
Backyard	63%	58%	76%	50%
Human case	8/12	4/5	2/5	3/3

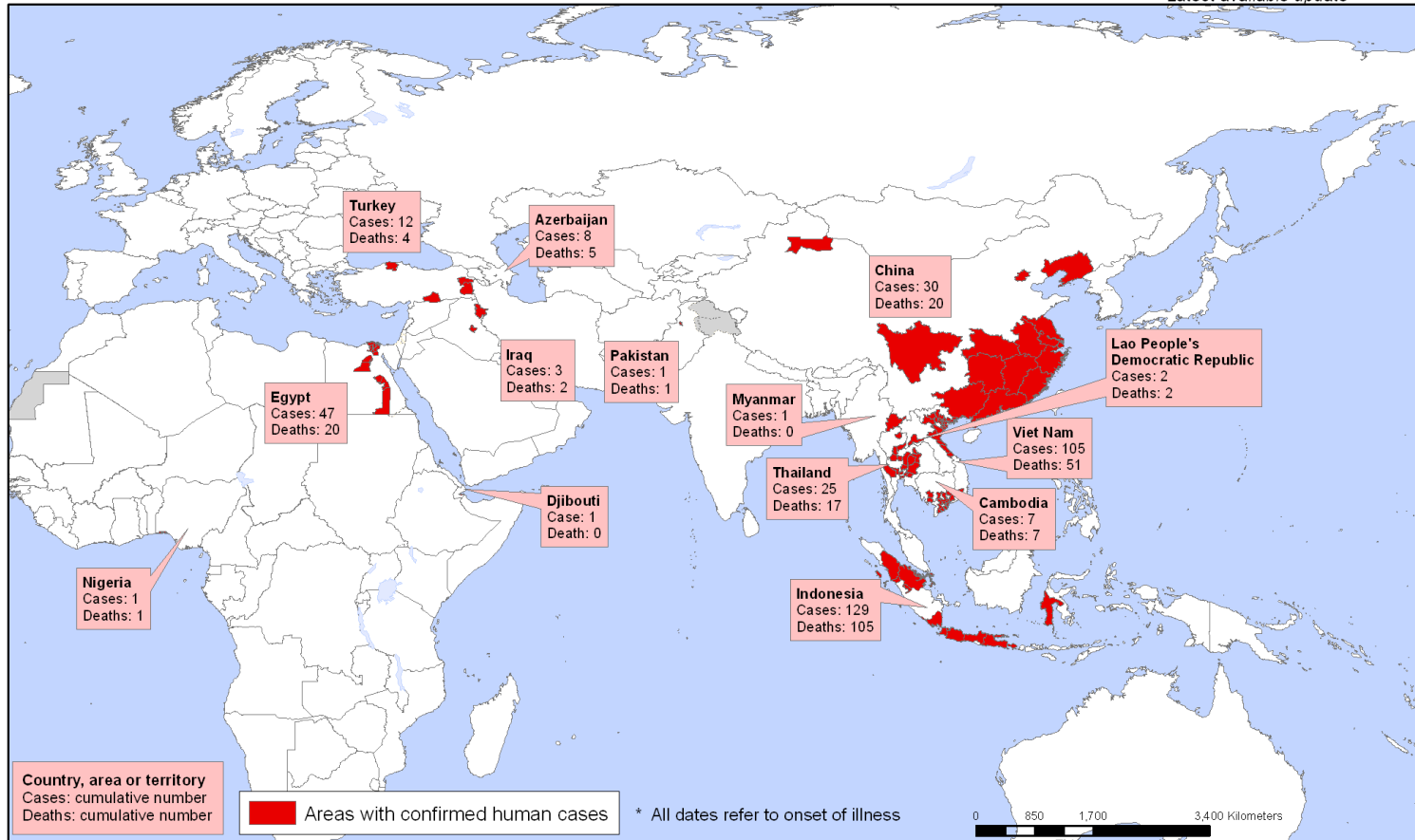
H5N1: From Epizootics to "entrenchment "

- Large epizootics in Vietnam, South Korea, Japan, Indonesia, Thailand, Laos, China, Taiwan, India, and Bangladesh etc
- From poultry to wild birds: Migratory birds were infected and participated to the spread of the virus
- Expanding host range: Infection of other species including mammals (Tigers, cats, dogs, swan, parrot...) may represents an increased risk for further adaptation to humans
- H5N1 has caused a global epi-zootic with huge economical impact
- The control of spread of the infection in the animal population is difficult (backyard flock, informal trade, migratory birds)

Areas with Human A (H5N1) infection

Areas with confirmed human cases of H5N1 avian influenza since 2003 *

Status as of 11 March 2008
Latest available update



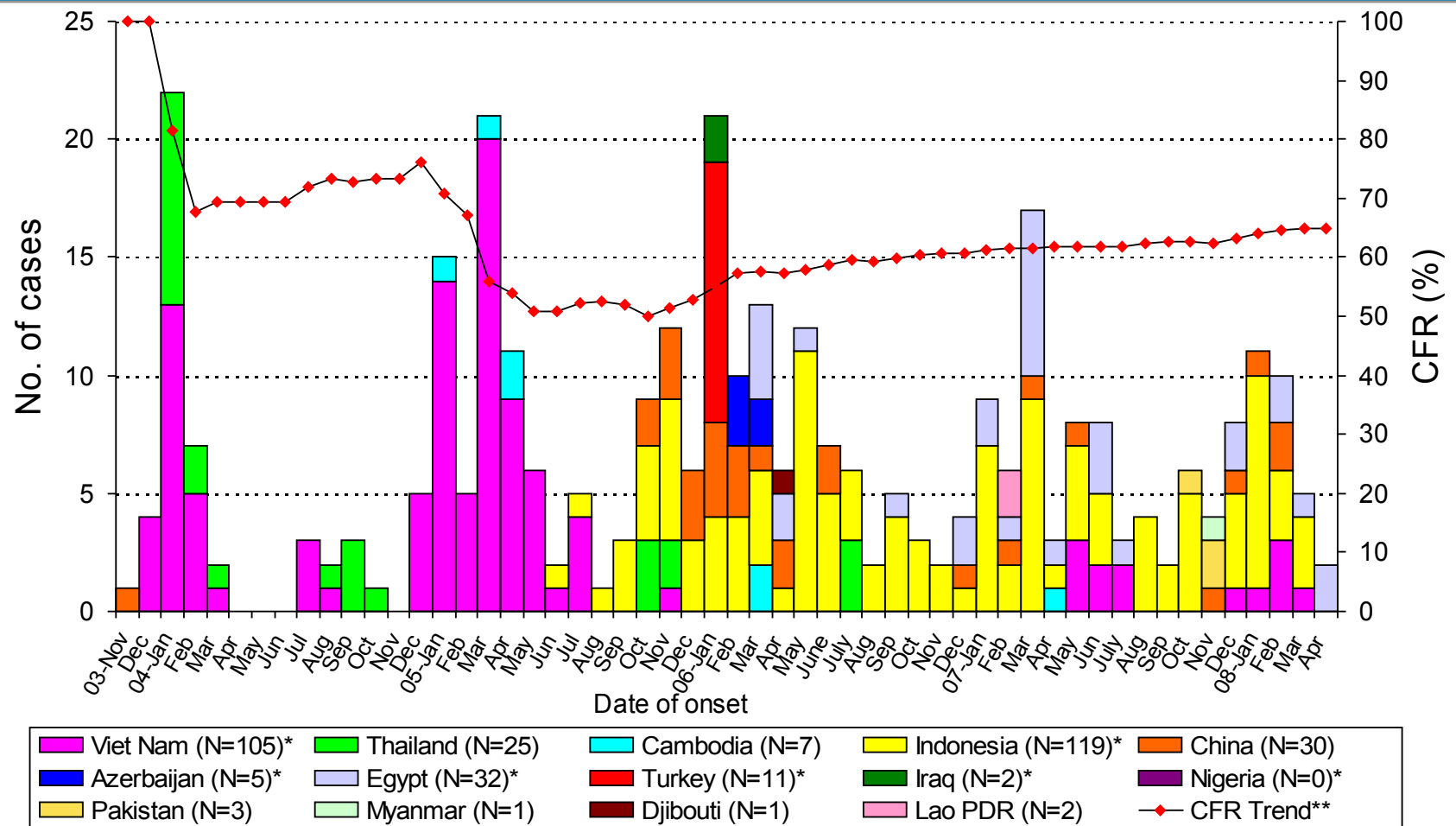
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Data Source: WHO
Map Production: Public Health Mapping and GIS
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Review of the current H5N1 situation

- 383 cases and 241 deaths recorded since February 2003
- 15 countries affected in 3 continents (Africa, Asia, Europe)
 - Azerbaijan, Bangladesh, Cambodia, China, Djibouti, Egypt, Indonesia, Iraq, Lao People's Democratic Republic, Myanmar, Nigeria, Pakistan, Thailand, Turkey, Viet Nam
- SARS outbreak: mid-March 2003- 5 July 2003
 - 8098 cases, 774 deaths
 - 26 countries affected

Cumulative Human Cases: (2005-2008)



Major modes of transmission

- Primarily transmission from infected birds (poultry)
- Sporadic cases and small family clusters
- No evidence of sustained human to human transmission
- Limited un-sustained human-to-human transmission
 - Intimate prolonged contact at a critical stage of illness
 - Probable in Thailand in 2004 - *NEJM*; 2005 Jan 27;352(4):333-40

WHO Pandemic phases

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

Threat related to the virus?

- The widespread occurrence of H5N1 increases the chances of mutations into a readily H to H transmissible strain and provides more opportunities for H5N1 virus to re-assort with another virus A influenza sub-type in a susceptible species during dual infection
- Virus A (H5N1) has changed since 1997 and continues to evolve (drifts)
- A(H5N1) clades (10 clades some divided in sub-clades)
 - Clade 1 Viet Nam, Thailand, Cambodia
 - Clade 2
 - 2.1 Indonesia
 - 2.2 Middle east, Europe, Africa
 - 2.3 Laos China

Exposure data from Indonesia

- 133 cases, 108 deaths: CFR = 81%
- 83% (110 cases) associated with poultry contact

43% had direct exposure to sick birds (slaughtered sick birds, handled sick/dead poultry, exposed to H5N1 positive animals or their by products, poultry deaths in the home)

40% had indirect exposure (poultry deaths in the environment, healthy poultry in the environment)

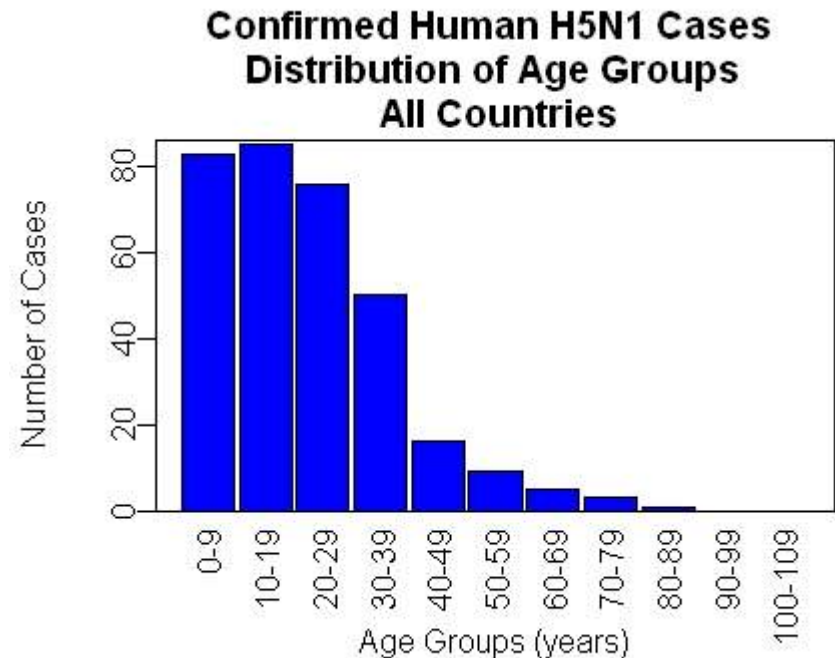
- 17% (23 cases) the source of exposure was inconclusive

(unpublished data, Indonesia, 8 May 2008)

Distribution by age

- All age groups affected
 - 90% of patients in age group < 40 years
- The median age of confirmed cases = 18 years
- Case fatality
 - Highest in 10 – 19 year olds
 - Lowest in those 50 years and older

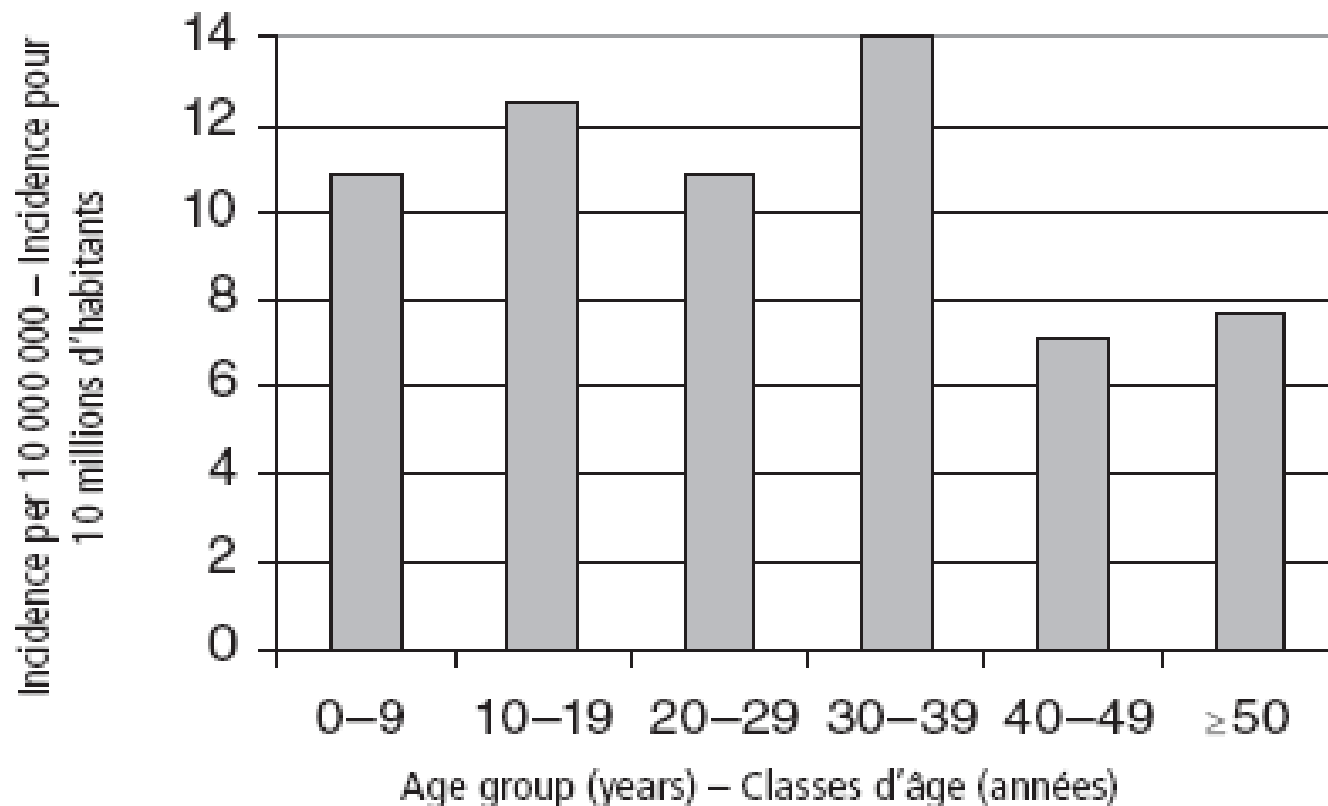
[Update on Avian Influenza A (H5N1) Virus Infection in Humans NEJM 2008; 358 (3): 261-73]



Laboratory-Confirmed H5N1 Cases

Age-Specific Incidence in Viet Nam (n=91)

25 Nov 03 to 24 Nov 06



(Denominator: United Nations demographic data population projection (median variant for 2005)

H5N1 case fatality rates by country, April 2008

	cases	deaths	(%) CFR
Azerbaijan	8	5	62.5
Cambodia	7	7	100
China	30	20	66.7
Djibouti	1	0	0
Egypt	50	22	44.0
Indonesia	133	108	81.2
Iraq	3	2	66.7
Laos	2	2	100
Myanmar	1	0	0
Nigeria	1	1	100
Pakistan	3	1	33.3
Thailand	25	17	68
Turkey	12	4	33.3
Viet Nam	106	52	49.1
Sum	382	241	63.0

- Overall Case Fatality Ratio: **63.0%**

- Significant differences across age groups: *WER N°6, 2007, 82 41-48*

- Highest CRF (76%) among those aged 10-19 Years
- Lowest CFR (40%) among those aged >50Years

- **CFR may vary**

e.g. Viet Nam :

Jan. - April 2004 CFR=70%

Dec. 2004 – Sept.2005 CFR = 33%

- Ascertaining reasons for differences in CFR remains a priority!

Distribution of human cases by gender

- Sex ratio of male (n=185) to female (n=195) = 0.95

- Differences among countries

- Egypt Sex ratio = 0.4 (15/34)

- Thailand Sex ratio = 1.8 (16/9)

- No statistical difference in gender distribution among age group

WER N°6, 2007, 82 41-48

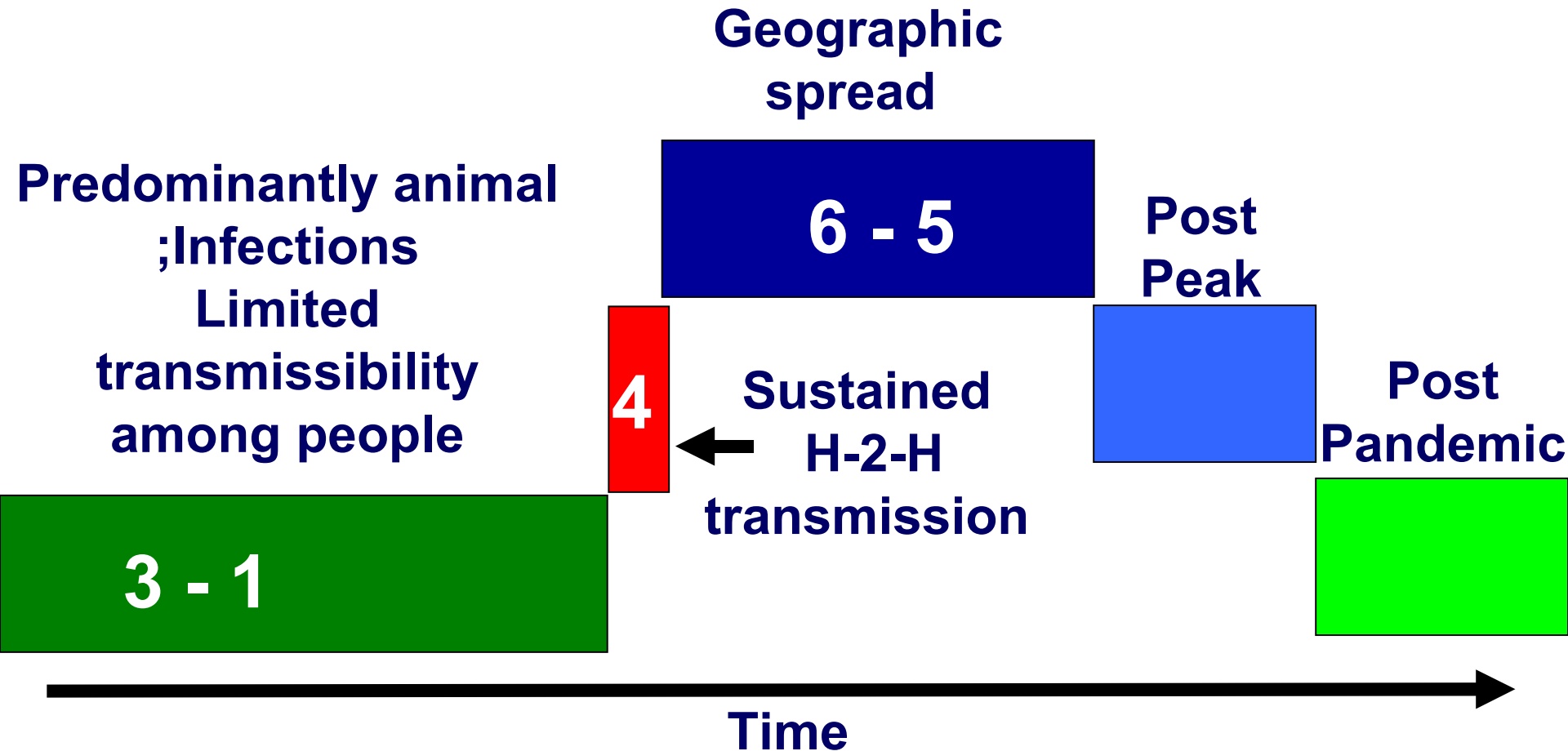
	M	F	ratio M/F
Azerbaijan	2	6	0.3
Cambodia	2	5	0.4
China	15	15	1.0
Djibouti	0	1	0.0
Egypt	15	34	0.4
Indonesia	67	65	1.0
Iraq	2	1	2.0
Laos	0	2	0.0
Myanmar	0	1	0.0
Nigeria	0	1	0.0
Pakistan	3	0	Inf
Thailand	16	9	1.8
Turkey	7	5	1.4
Viet Nam	56	50	1.1
All Countries	185	195	0.9

In the context of Asia...

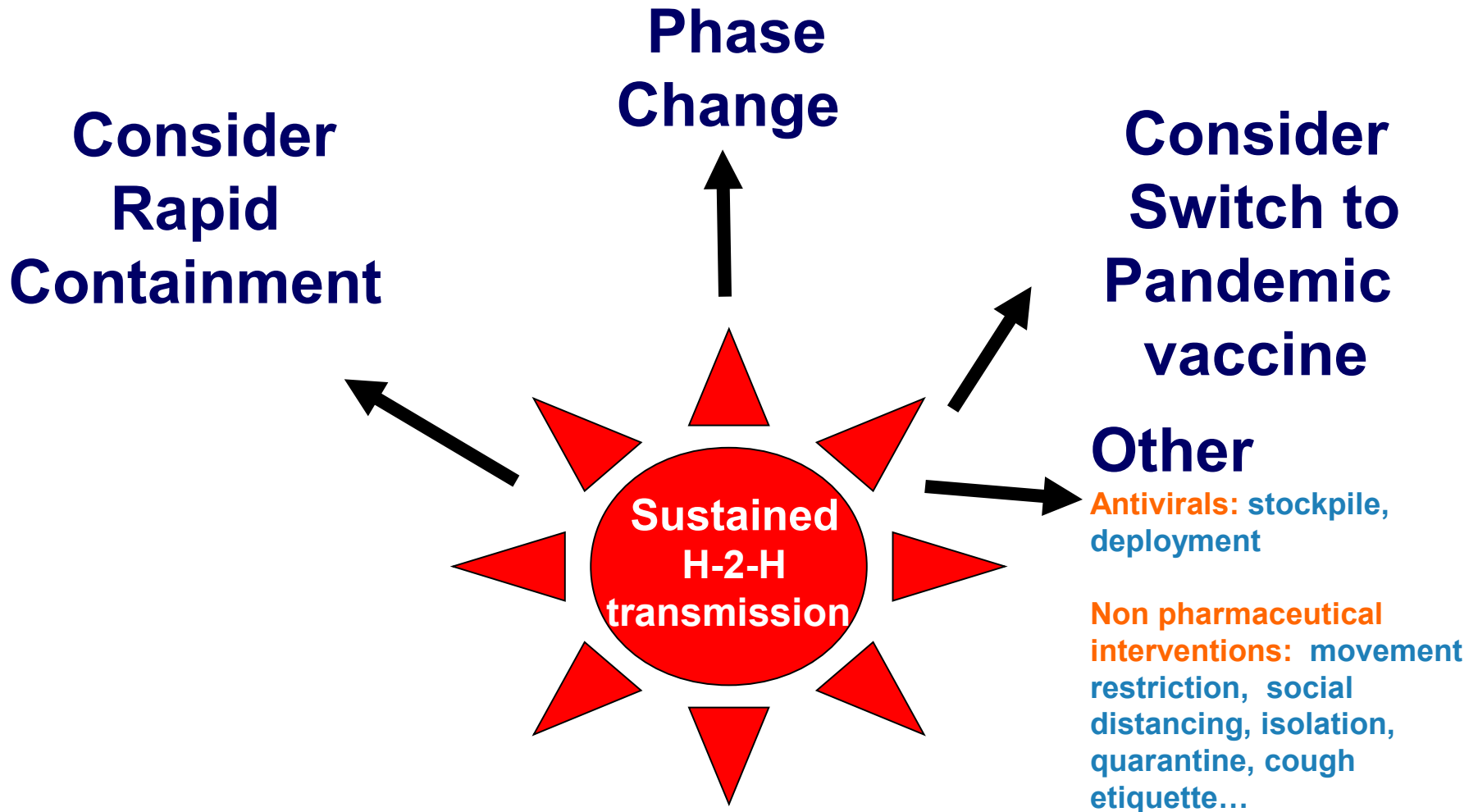
- Greatest number of human cases and deaths
- Intense human-animal interface
- Virus firmly entrenched in poultry in Asia and now considered endemic in some areas
- Public health capacity limited in many countries



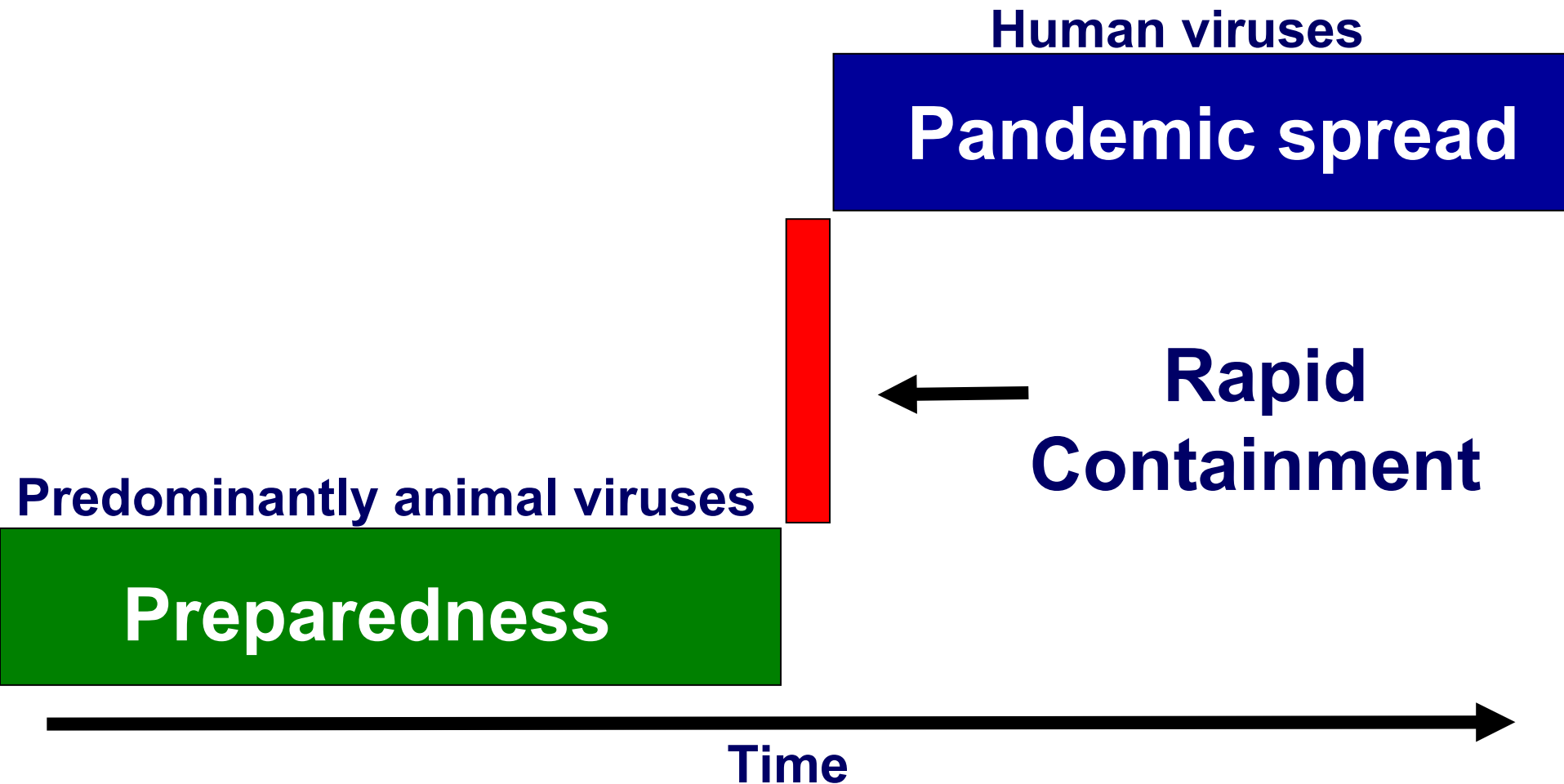
Pandemic phases and transmission patterns



Phase 4 actions



Containment of Initial Emergence of Pandemic Influenza



A whole-of-society approach

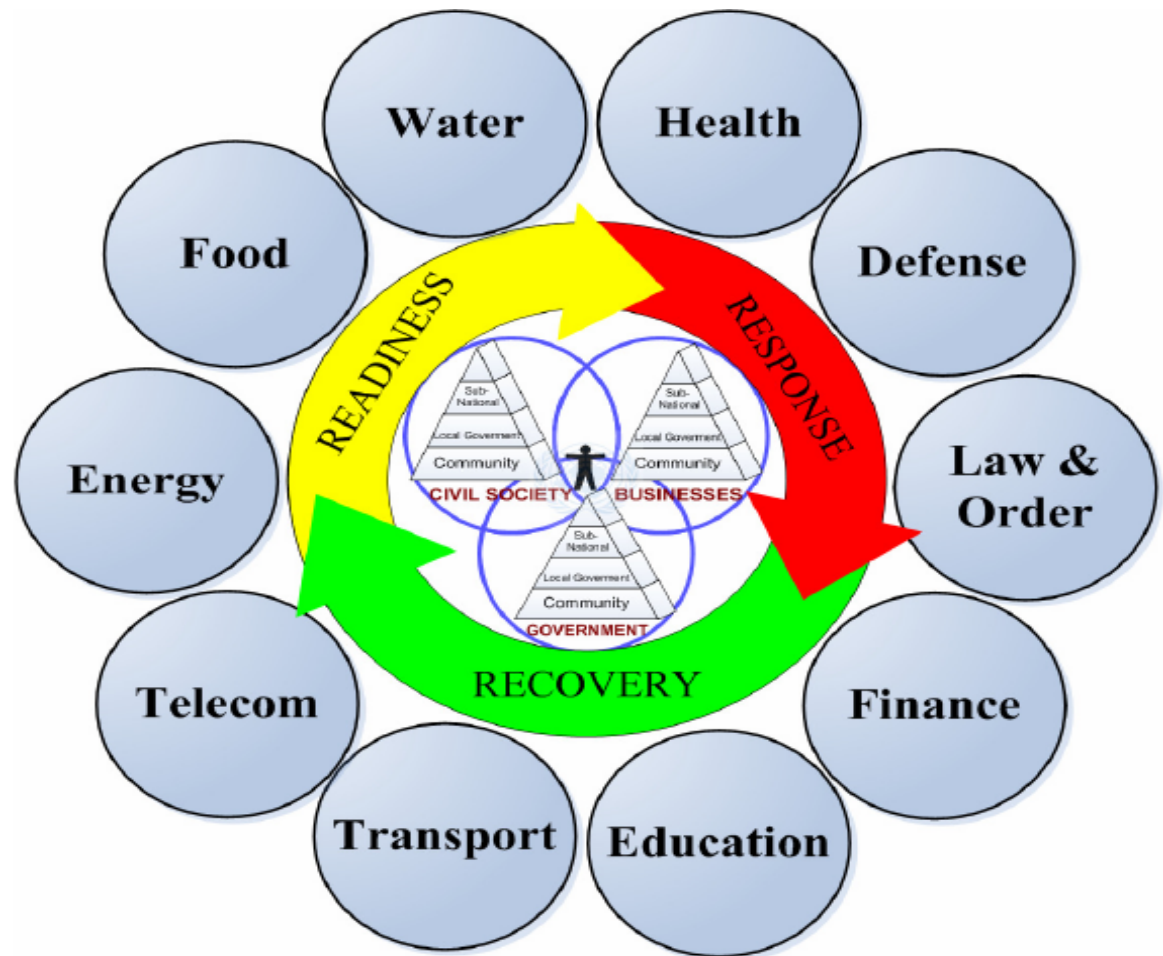
**Business
continuity**

Surge capacity

**Critical
interdependencies**

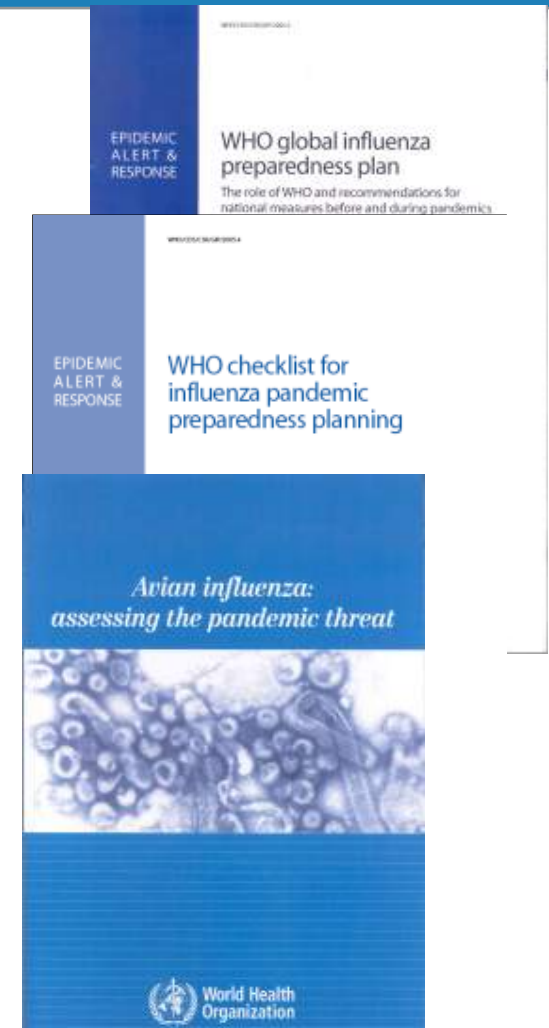
**Clear command
and control**

Social distancing



WHO pandemic plan: strategic elements

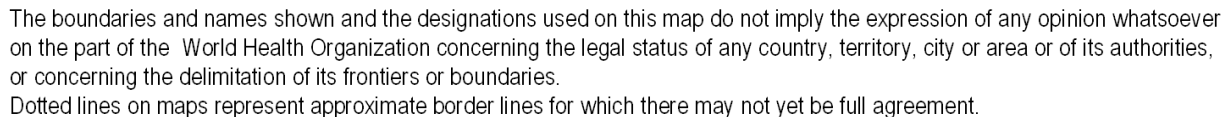
1. Reduce human exposure to H5N1
2. Strengthen early warning system
3. Intensify rapid containment measures
4. Build capacity to cope with pandemic
5. Coordinate a broad multi-sectoral response



Annual output~ 175-200k samples; 15-40k isolates; 2-6000 viruses characterized

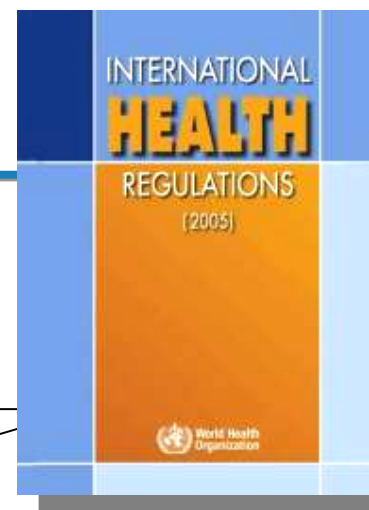
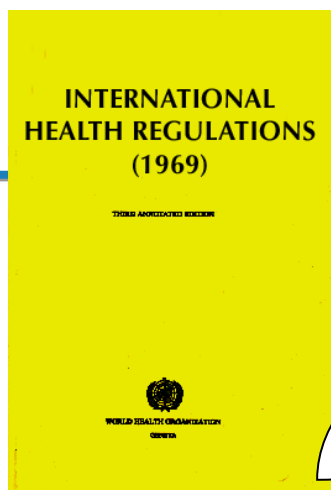
Legend

- ▲ WHO National Influenza Centres
- WHO Collaborating Centre for Studies on the Ecology of Influenza in Animals
- WHO Collaborating Centres for Reference and Research on Influenza



Data Source: WHO FluNet, GISN
Map Production:
CDS/EPR/GIP, CDS/EPR/GIS
World Health Organization
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A paradigm shift



From only **control at borders** to **containment at source**

From **diseases list** to **all public health threats**

From **preset measures** to **tailored responses**

New focus on **national capacity**

To summarise..._

- Underlying threat of a pandemic remains
- We do not know if it is going to be H5N1. We have never been as close to the next one since 1968
- Pandemic may cause global health emergency, damage of which can be reduced
- National pandemic preparedness is key!
- We have a window of opportunity to act: right now!



Thank You !

www.who.int/csr/disease/avian_influenza
www.searo.who.int/avianflu