

Latest Research Findings on Avian and Human Influenza A(H7N9): a Knowledge Exchange Media Briefing

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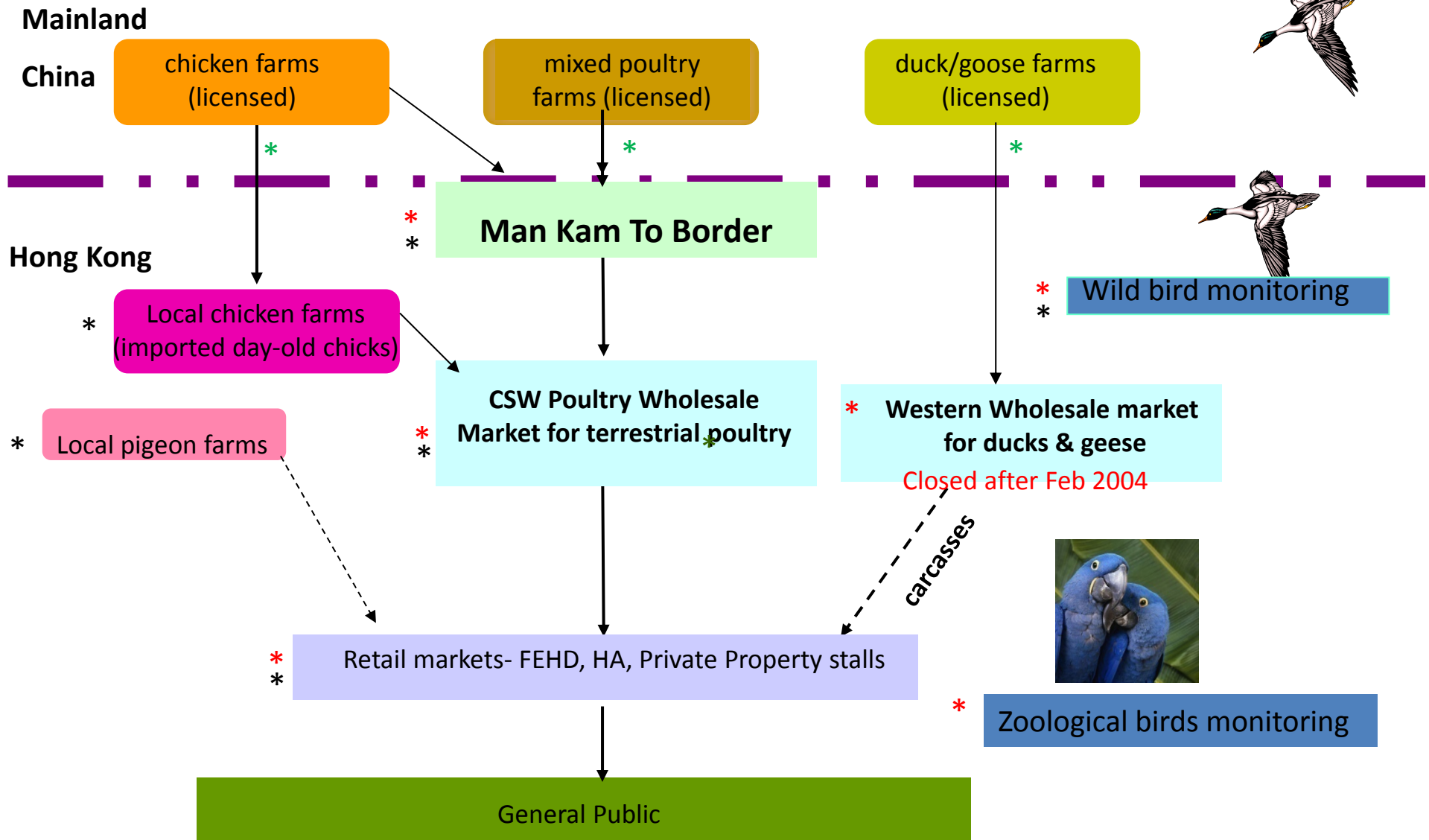
Surveillance of the Live Poultry Supply Chain

Number of Live Chickens Imported from Mainland China to Hong Kong

<u>Year</u>	<u>Heads/year</u>	<u>Heads/day</u>
2007	9,148,600	25,065
2008	6,384,460	17,492
2009	3,723,250	10,201
2010	3,835,857	10,482
2011	3,545,667	9,714
Jan-Mar, 2013		~7,000
15, April 2013		6,000
16, April 2013		3,000

Figures released by Food and Environmental Hygiene Department

Avian Influenza Surveillance in Hong Kong



* Surveillance by HKU and HKSAR Government * Surveillance by HKSAR Government * Surveillance by Mainland Government

HKSAR Government has also adopted several evidence-based practices (e.g. ban on overnight poultry storage in wet markets and farm licensing) to control the risk of H5N1 or H7N9 outbreaks in poultry

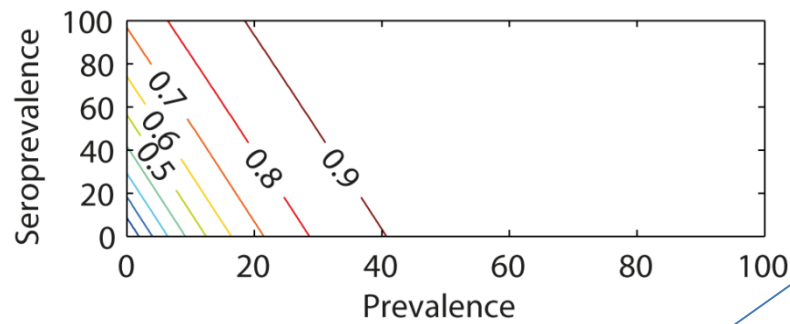
Early detection of the H7N9 virus among poultry imports is essential for reducing the risk of H7N9 bird-to-human transmissions because:

1. Disease transmission can take place among the chickens during their 1-2 days of stay in the wholesale facility and the wet markets. This can substantially increase the disease prevalence and hence the risk of human infections at the downstream of the supply chain. For example, a recent study of H7N3 and H7N1 transmission among turkeys in farms of Italy estimated that one infected turkey infected 5 other turkeys when the whole flock was susceptible.

2. The upstream source of infected chickens can be traced and identified as soon as possible to prevent further imports.

Detection probability = Probability of detecting at least one chicken in the batch is or has been infected

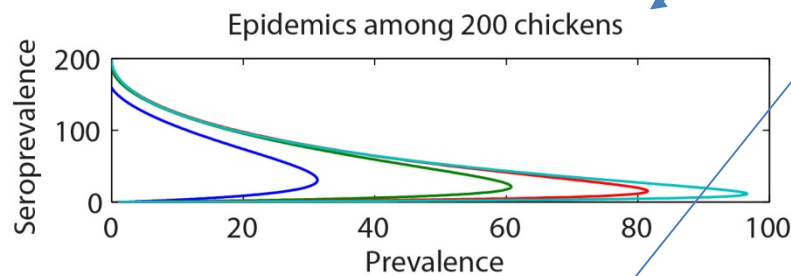
No. of chickens for RT-PCR	RT-PCR sensitivity	No. of chickens for serology	Serology sensitivity
60	90%	20	60%



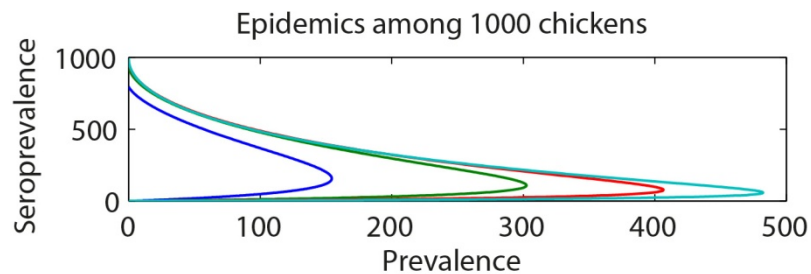
Each batch has 1,000 chickens

Batch comprises multiple flocks

Batch comprises only 1 flock



- Basic reproductive number = 2
- Basic reproductive number = 3
- Basic reproductive number = 4
- Basic reproductive number = 5

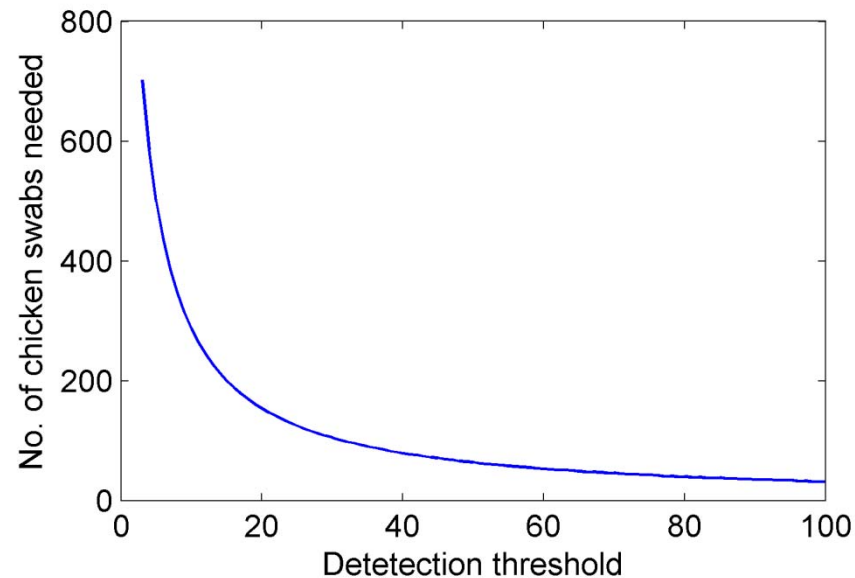


Detection threshold x^* = The smallest prevalence with detection probability >95%



Expected number of human cases = $0.05 \times \text{Detection threshold} \times y$

Expected number of human cases $< 1 \Leftrightarrow y < 20/\text{Detection threshold}$



Conclusions

- The baseline scenarios have high detection probability if the prevalence is around 10% and the batch comprises a single flock of chickens (e.g. from only one farm).
- If the batch comprises multiple flocks, enhanced strategies such as clustered sampling should be considered for early detection. This would require increased sampling, perhaps with larger RT-PCR pool size to maintain logistical feasibility.
- Timing of sample collection along the supply chain should be taken into account, given the dynamics of infection
- Screening on either side of the border should be considered together with other surveillance and biosecurity measure upstream, i.e. from the farm level since hatching

Psycho-Behavioural Survey of the General Population

Survey methodology

Date of Survey: April 10-13, 2013

Method: Random telephone survey

Sample Size: 1,035 to ensure $\pm 3\%$ margin of error

Target population: Cantonese-speaking population of age 18 or above.

Response rate: 69%

* Results are weighted by age and sex according the mid-year 2012 population of Hong Kong



Comparison with end of SARS and start of 2009 pandemic

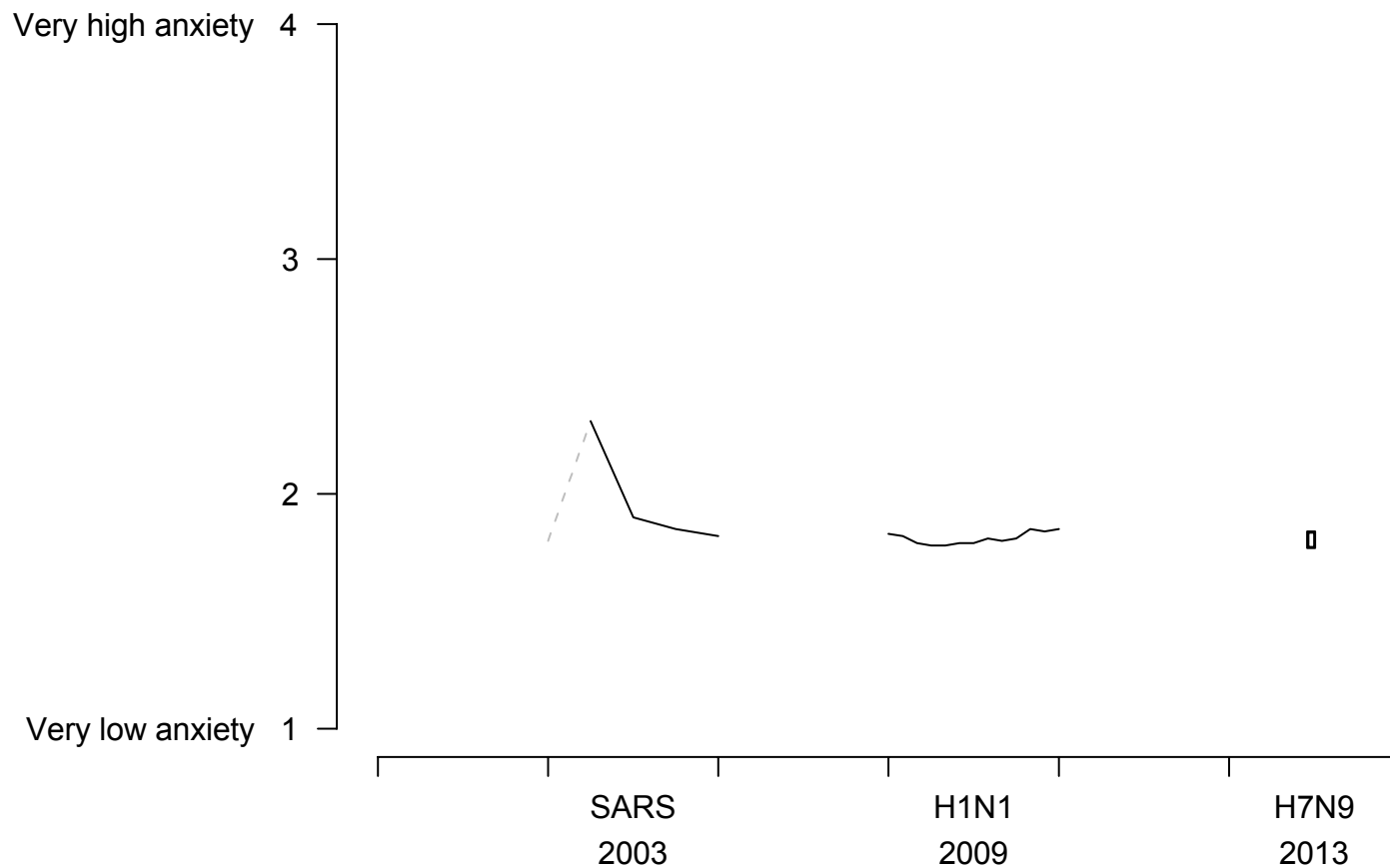
- Low self-perceived risk of infection
- Similar perceived severity of infection compared to SARS
- Much greater perceived severity of infection than seasonal influenza

	SARS	H1N1	H7N9
Date	Dec 1-30, 2003	Apr 29-May 1 2009	Apr 10-13 2013
Sample size	2,574	1,009	1,035
<u>Risk perception</u>			
Perceived personal risk of infection in the next 1 month (likely/very likely/certain)	20%	21.3%	11.5%
Perceived severity compared with SARS (more/much more serious)	-	24.4%	18.0%
Perceived severity compared with seasonal influenza (more/much more serious)	-	-	71.2%
Perceived severity compared with avian influenza H5N1 (more/much more serious)	-	-	50.3%
Perceived severity compared with the new middle-east coronavirus (more/much more serious)	-	-	33.9%

*sources: Leung GM et al. 2005 Clin Infect Dis; Cowling BJ et al. 2010 J Infect Dis

General level of anxiety

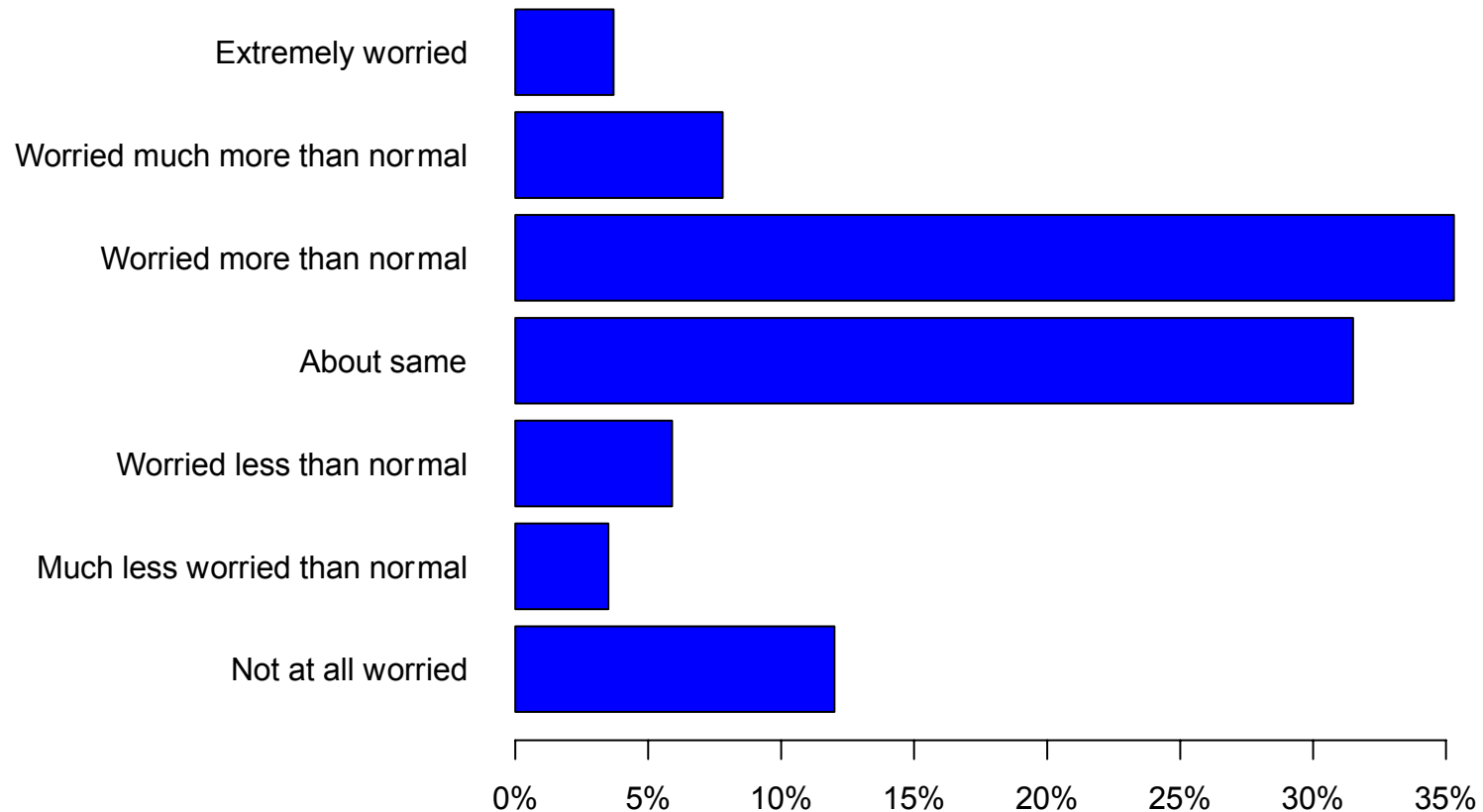
- State-Trait Anxiety Inventory (10 questions about general level of anxiety) currently at baseline level



*sources: Leung GM et al. 2005 Clin Infect Dis; Cowling BJ et al. 2010 J Infect Dis

Level of anxiety about flu

- If you were to develop flu-like symptoms tomorrow, would you be ...?



Preventive behaviors

- Similar levels of personal protective measures

	H1N1	H7N9
Date	Apr 29 - May 1 2009	Apr 10-13 2013
Sample size	1,009	1,035
<u>Adoption of preventive measures in the 3 days preceding survey</u>		
Covered mouth when sneezing or coughing (usually/always)	75.0%	69.1%
Washed hands after sneezing, coughing or touching nose (usually/always)	65.1%	59.8%
Wore face mask (usually/always)	7.8%	8.9%
Used serving utensils when dining with others (usually/always)	40.6%	43.8%
Adopted preventive measures when touching common objects (usually/always)	11.0%	9.6%

Preventive behaviors at home

- 25% of respondents reported at least one household member had flu-like symptoms in the past week.
Among those households:

	H7N9
Date	Apr 10-13 2013
Sample size	259
<u>Preventive measures adopted when an ill person at home</u>	
Washed hands more frequently	67%
Sick person wore face mask	37%
Used serving utensils when eating	48%

Government performance

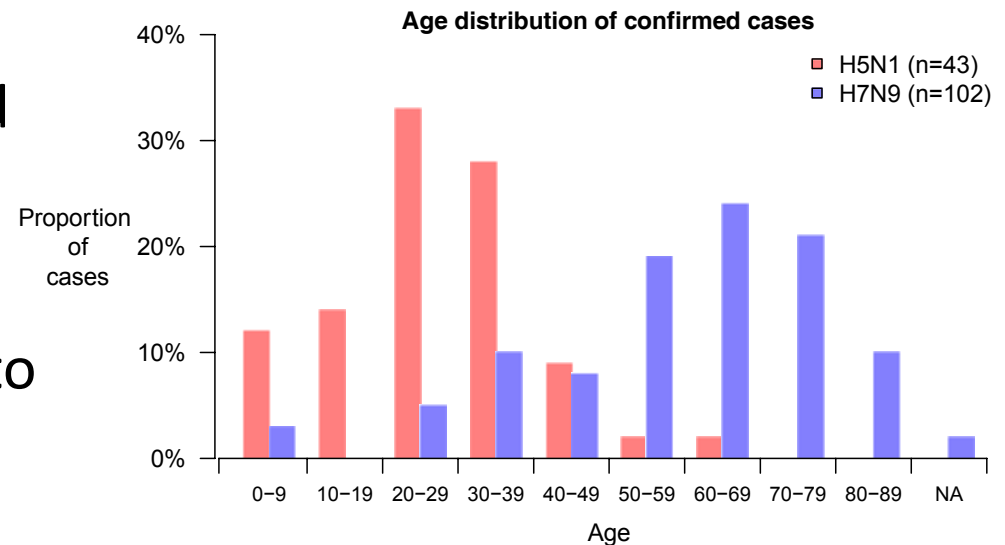
- Evaluate the current performance of the government in controlling H7N9 (scale of 0-10: 0=extremely poor, 5=moderate, 10=excellent)

	H7N9
Date	Apr 10-13 2013
Sample size	1,035
<u>Government performance</u>	
Mainland central government	5.1
Mainland provincial governments	4.3
Hong Kong government	6.5

Epidemiologic inference from the age distribution of H7N9 compared with H5N1

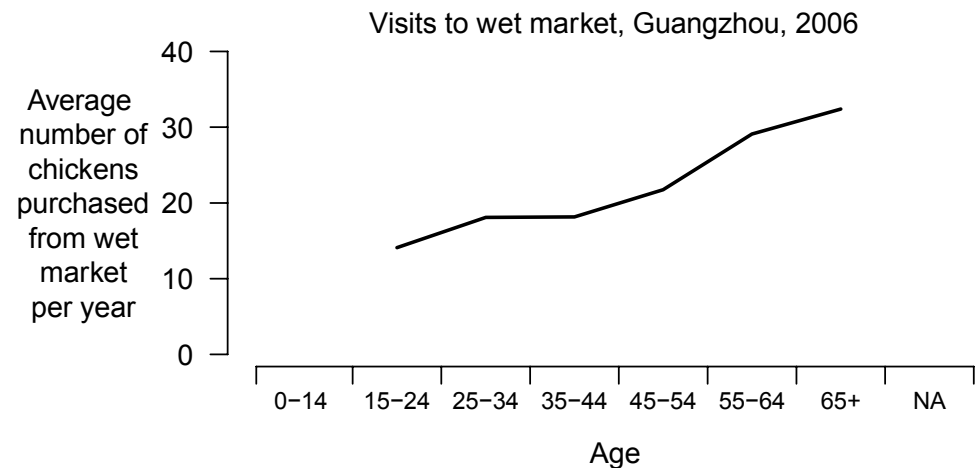
Confirmed human H7N9 cases

- 102 H7N9 infections confirmed to date – the age distribution of cases is very different to 43 H5N1 cases on the mainland
- Half of the confirmed H7N9 cases above 60y of age
- Mild infections are unlikely to be detected – laboratory testing is mainly focused on hospitalised patients
- Does the seriousness of H7N9 infection increase with age (like seasonal flu)?



Age pattern of serious H7N9 cases

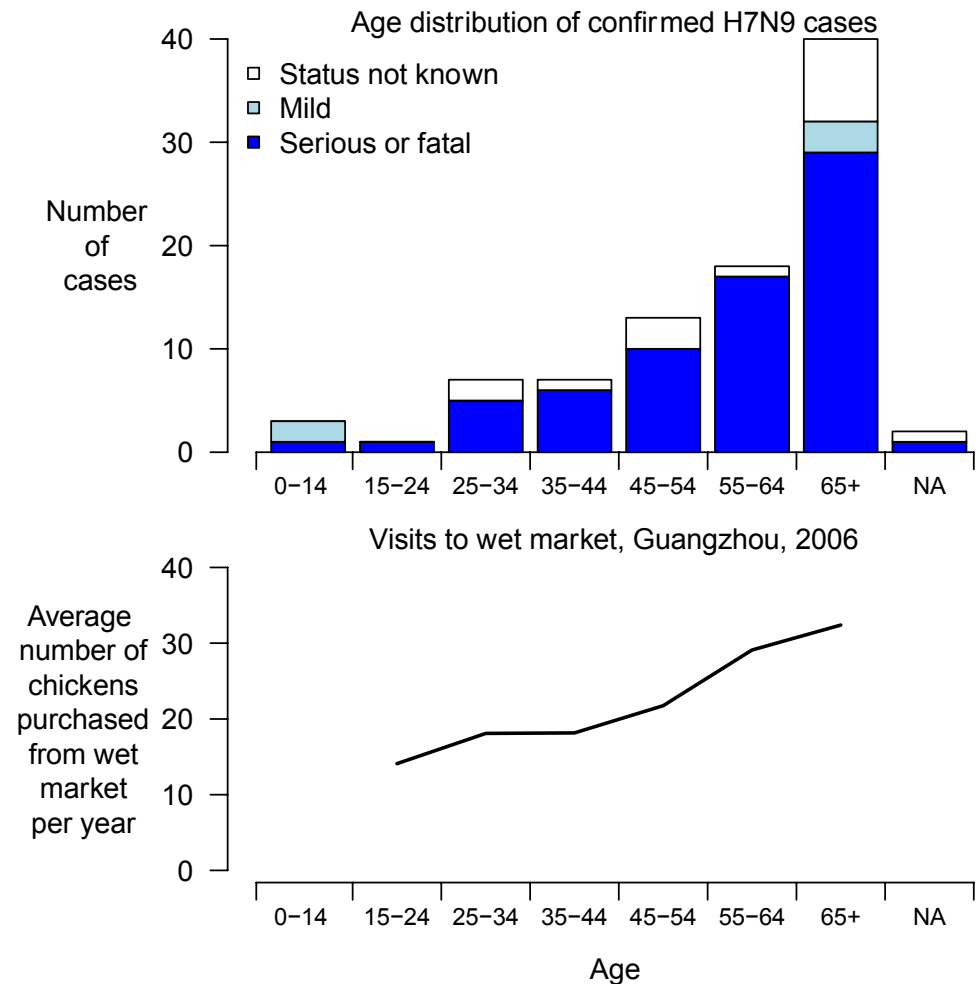
- We assume that the risk of H7N9 infection varies by geographic location, but that the age pattern of infection matches the age pattern of exposure we measured in Guangzhou in 2006 (below).
- We can then use the details of confirmed serious H7N9 infections to infer the relative severity of H7N9 infections by age, with a Bayesian statistical model.



source: Liao Q, Lam WWT, Leung GM et al. 2009 Epidemics

Age pattern of serious H7N9 cases

- The results of our analysis suggest that the risk of serious illness increases substantially with age
- Implication of our analysis – at least another 90-120 unidentified mild H7N9 infections in adults
- Detailed seroepidemiology studies will be definitive in time

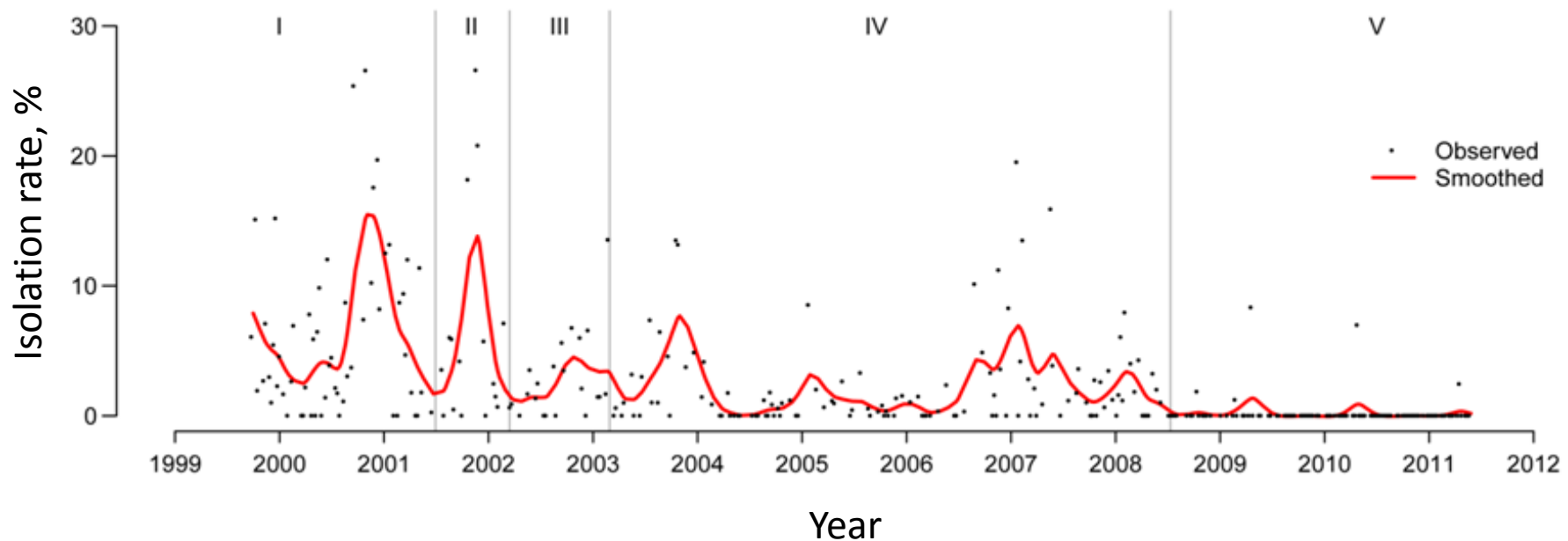


*source: Liao Q, Lam WWT, Leung GM et al. 2009 Epidemics

Questions

Effects of Ban on Overnight Poultry Storage in Live Poultry Markets

- I: no rest day;
- II: 1 rest day/month with quails in markets;
- III: 1 rest day/month without quails in markets;
- IV: 2 rest days/month;
- V: ban on overnight poultry storage



A highly significant reduction (84%) of H9N2 virus isolation rate after banning of over-night poultry storage