

# Analysis of the geographic distribution of H5N1 events

By

Guilan Huang

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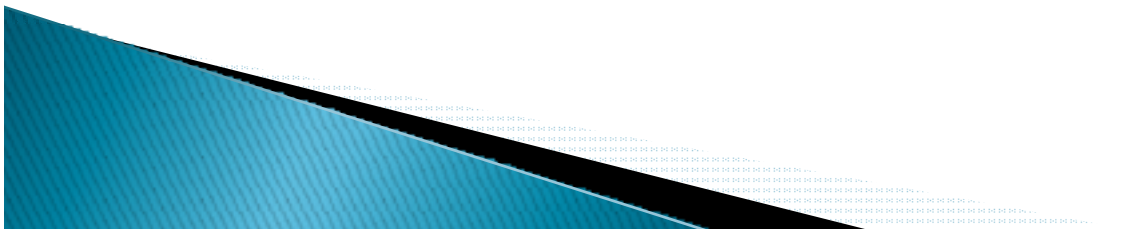
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# Outline

- ▶ Introduction
- ▶ Materials
- ▶ Global H5N1 Analysis
- ▶ Analysis of H5N1 in Vietnam
- ▶ Summary



# Materials: websites of OIE, WHO...

Avian Influenza - Windows Internet Explorer

http://www.oie.int/Eng/info\_ev/en/ai\_factsoids\_H5N1\_Timeline.htm

Avian Influenza

**Oie** Organisation Mondiale de la Santé Animale

Avian Influenza: H5N1 Timeline

Avian Influenza

AI Home | Events | **Communications** | Strategy | Technical Expertise | International References | Prevention and control

Facts & Figures: H5N1 Timeline

H5N1 Reported in 2000 | H5N1 Reported 2003-2008 | H5N1 Reported in Domestic Poultry 2003-2008 | H5N1 Outbreaks Resolved | **H5N1 Timeline**

**September, 2008**

- Togo reports one outbreak of H5N1 in the Lakes Prefecture. The previous outbreak was 31/12/2007.
- Laos reports two outbreaks in domestic poultry, the first since February 2008.

**August, 2008**

- Berlin reports two birds from a live market in Lokossa tested positive for H5. This is the first report of avian influenza since December 2007.

World Health Organization

**H5N1 avian influenza: Timeline of major events**

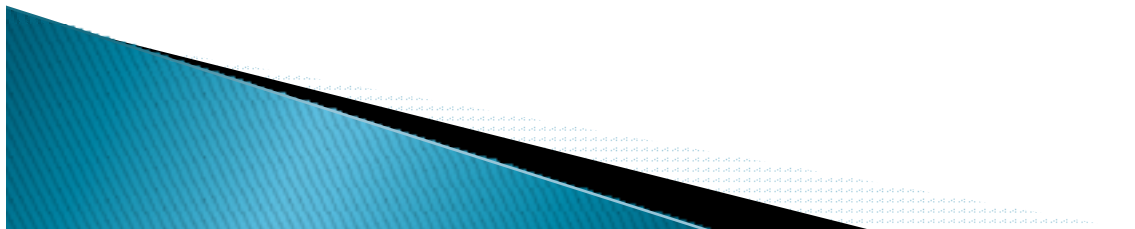
**8 September 2008**

Early Events

Date	Events in Animals	Events in Humans
1996	Highly pathogenic H5N1 virus is isolated from a farmed goose in Guangdong Province, China.	
1997	Outbreaks of highly pathogenic H5N1 are reported in poultry at farms and live animal markets in Hong Kong.	Human infections with avian influenza H5N1 are reported in Hong Kong. Altogether, 18 cases (6 fatal) are reported in the first known instance of human

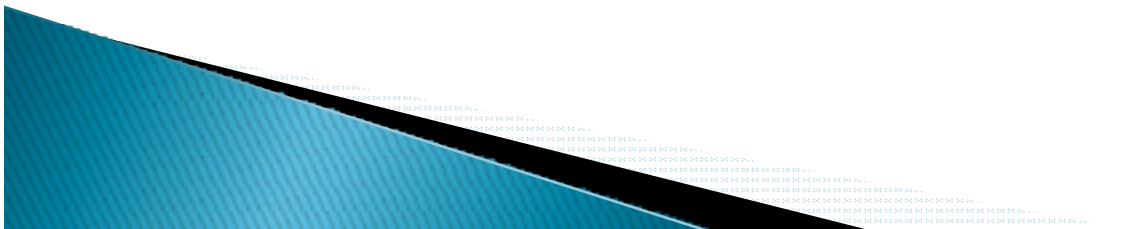
# **Analysis of Global H5N1 Events at Country Level**

**(Three years: 12/2004—11/2007)**



# Wildlife vs. Poultry

- ▶ 16 countries have wildlife H5N1 occurrences (*United States, Switzerland, Spain, Slovenia, Slovakia, Poland, Mongolia, Italy, Iran, Greece, Georgia, Croatia, Bulgaria, Bosnia & Herzegovina, Austria*).
- ▶ 20 countries have poultry H5N1 occurrences (*Albania, Bangladesh, Burkina Faso, Cambodia, Cameroon, Djibouti, Ghana, India, Indonesia, Israel, Jordan, Laos, Malaysia, Myanmar, Niger, South Korea, Sudan, Thailand, Togo, West Bank*).
- ▶ 24 countries have wildlife & poultry H5N1 occurrences.

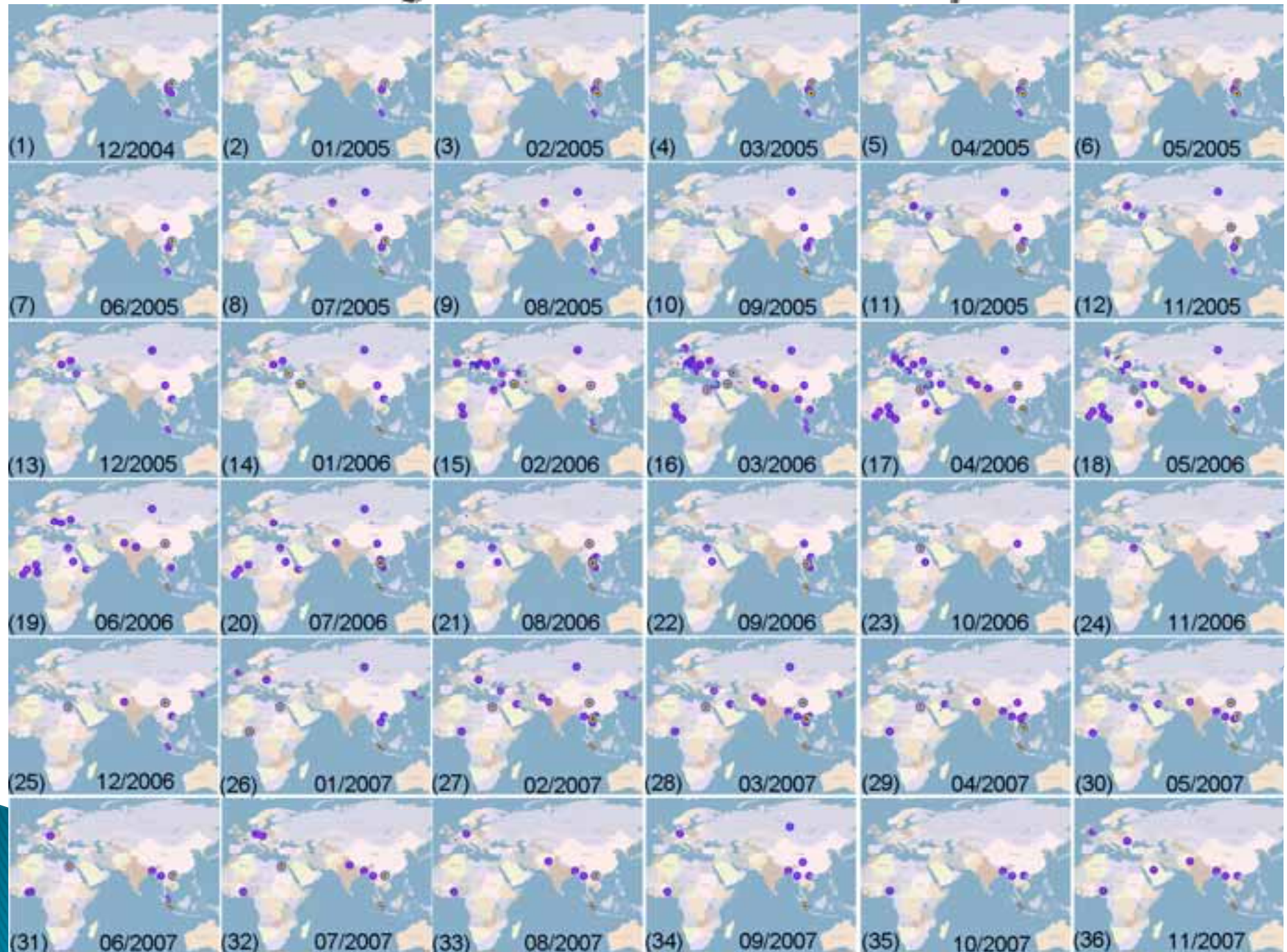


# Odds ratio

Country poultry density	#Country w/H5N1 Reported	#Country w/o H5N1 Reported	Sum	Odds Ratio	Reject H0?
Greater than average*	45	58	103		
Less than average*	14	76	90		
Total	59	134	193	4.21	Yes

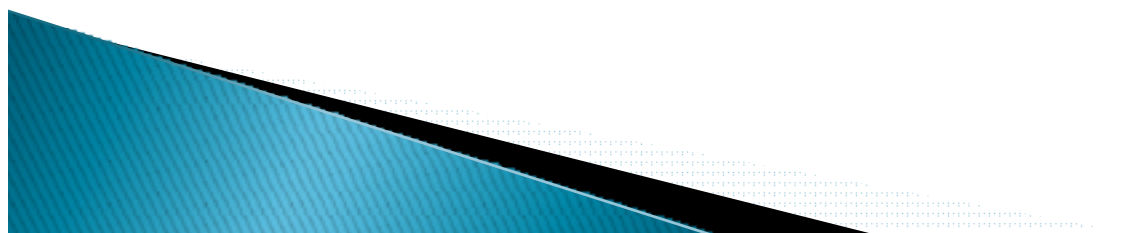
Average is the global poultry average. Source credit: [www.fao.org](http://www.fao.org)

# Distribution of global H5N1 events analysis



# **Analysis of H5N1 events in Vietnam**

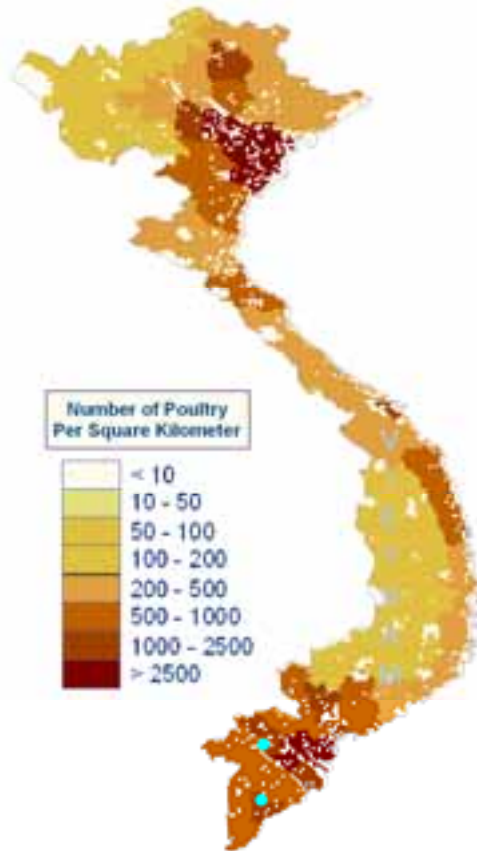
**(Oct., 2005 – Jan., 2006)**



# Source of Data and Geo-visualization

## HIGHLY PATHOGENIC AVIAN INFLUENZA IN VIETNAM Follow-up report No. 15 (covering the period from 1 October to 23 November 2005)

Bird Flu Reported :10/01/2005



### Details of new outbreaks:

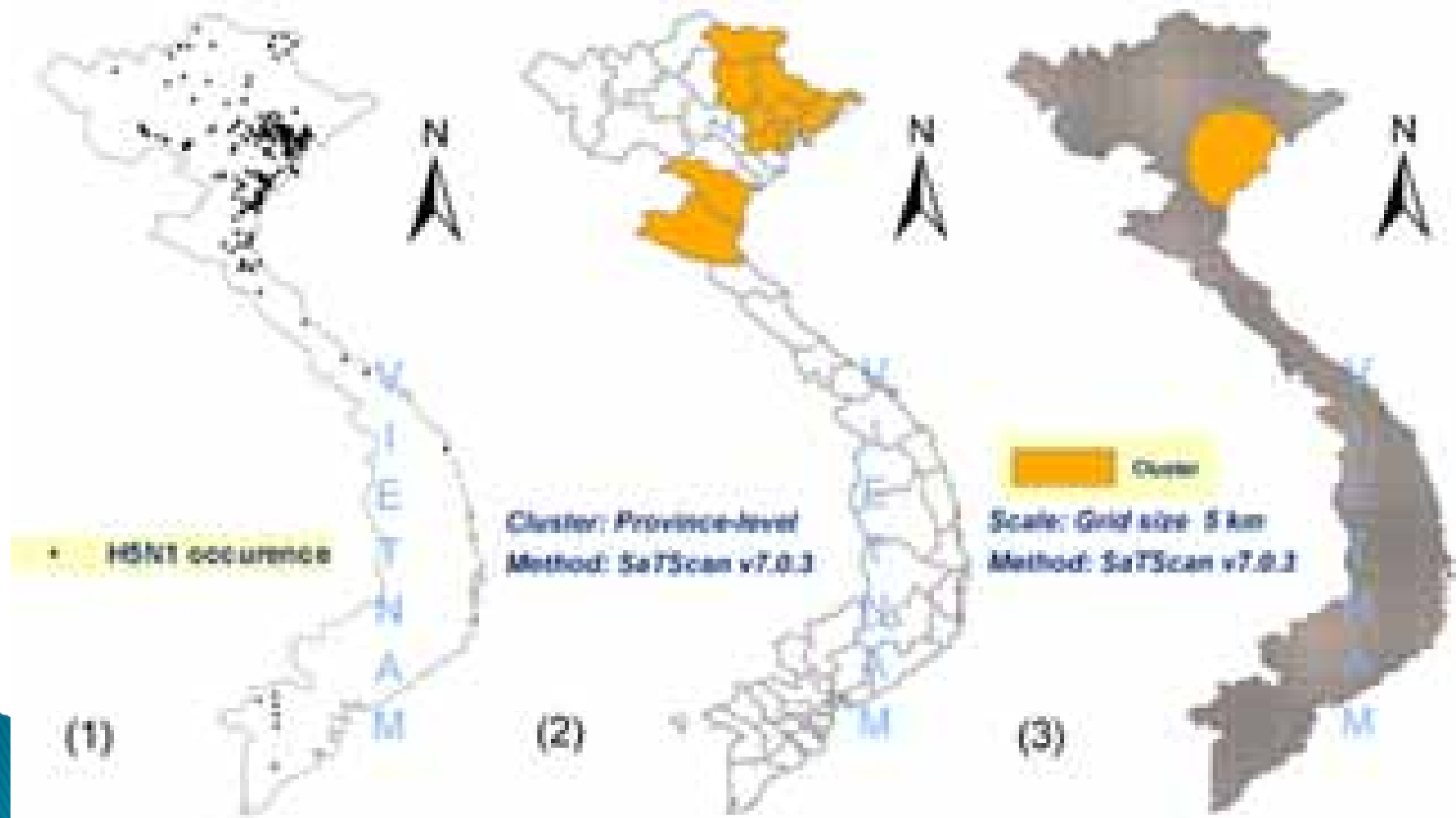
First administrative division	Lower administrative division	Type of epidemiological unit	Name of the location	Date of start of the outbreak	Species	Number of animals in the outbreaks				
						susceptible	cases	deaths	destroyed	slaughtered
Bac Giang	Hiep Hoa	village	...	15 Nov. 05	avi	...	...	15	89	...
Bac Giang	Lang Giang	village	Dinh Tri	8 Nov. 05	avi	...	...	15	118	...
Bac Giang	Lang Giang	village	Tan Thinh	9 Nov. 05	avi	...	...	50	723	...
Bac Giang	Luc Ngan	village	Phuong Son	9 Nov. 05	avi	...	...	140	525	...
Bac Giang	Son Dong	village	Giao Lien	13 Nov. 05	avi	...	...	50	575	...
Bac Giang	Son Dong	village	...	16 Nov. 05	avi	...	...	50	575	...
Bac Giang	Tan Yen	village	...	15 Nov. 05	avi	...	...	42	1,080	...

## HIGHLY PATHOGENIC AVIAN INFLUENZA IN VIETNAM Follow-up report No. 16 (covering the period from 24 November 2005 to 23 January 2006)

### New outbreaks:

First administrative division	Lower administrative division	Type of epidemiological unit	Name of the location	Date of start of the outbreak	Species	Number of animals in the outbreaks				
						susceptible	cases	deaths	destroyed	slaughtered
Bac Can	Bach Thong	village	Vi Huong	1 Dec. 2005	avi	...	...	3	1,142	...
Cao Bang	Cao Bang	village	Hoa Chung	24 Nov. 2005	avi	...	...	14	0	...
Cao Bang	Ha Lang	village	Kim Loan	26 Nov. 2005	avi	...	...	185	1,696	...
Cao Bang	Ha Lang	village	Thanh Nhat	28 Nov. 2005	avi	...	...	10	25	...
Cao Bang	Phuc Hoa	village	Hong Dai	15 Dec. 2005	avi	...	...	74	323	...
Cao Bang	Phuc Hoa	village	My Hung	1 Dec. 2005	avi	...	...	1,320	1,377	...
Cao Bang	Phuc Hoa	village	Trieu Au	1 Dec. 2005	avi	...	...	0	1,003	...

# Spatial scale vs. Clusters

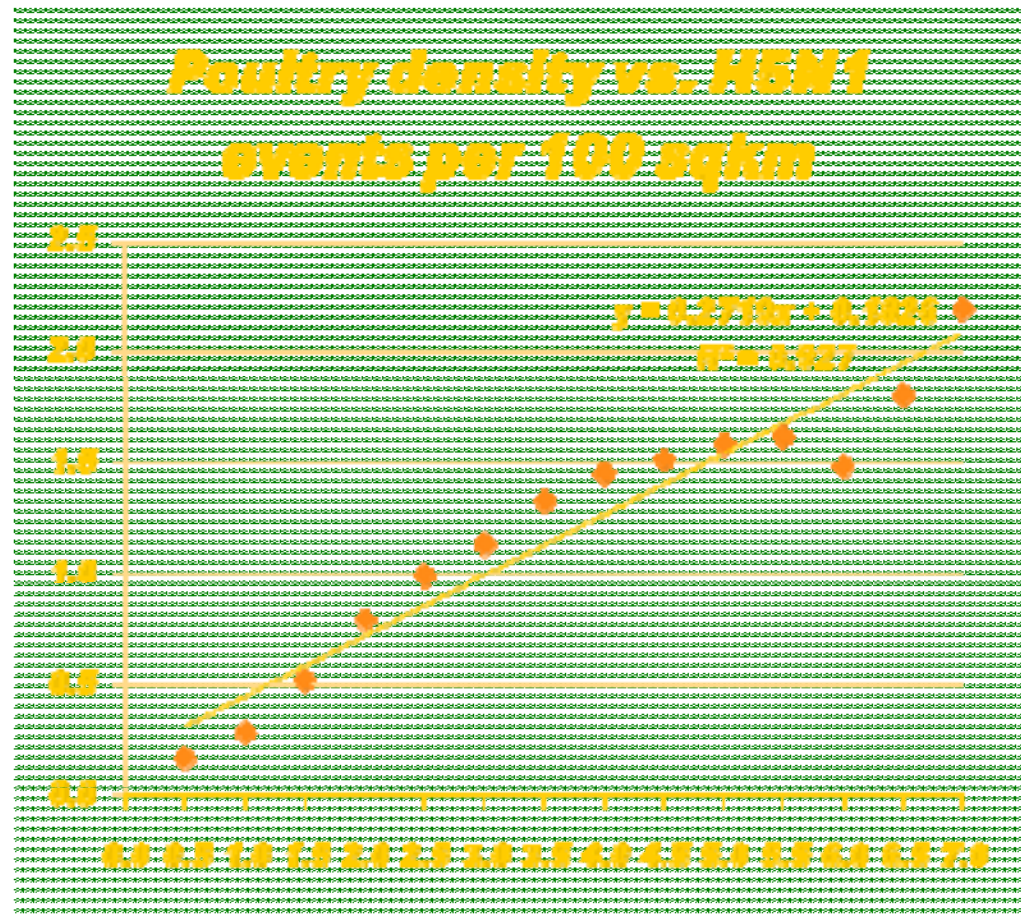


Poisson-based model

# Poultry Density vs. Date of H5N1

Poultry density	Times	H5N1per100sqkm
greater than 0.5*594	0.5	0.16
greater than 1*594	1	0.28
greater than 1.5*594	1.5	0.52
greater than 2*594	2	0.79
greater than 2.5*594	2.5	0.99
greater than 3*594	3	1.13
greater than 3.5*594	3.5	1.33
greater than 4*594	4	1.45
greater than 4.5*594	4.5	1.51
greater than 5*594	5	1.58
greater than 5.5*594	5.5	1.61
greater than 6*594	6	1.48
greater than 6.5*594	6.5	1.81
greater than 7*594	7	2.19

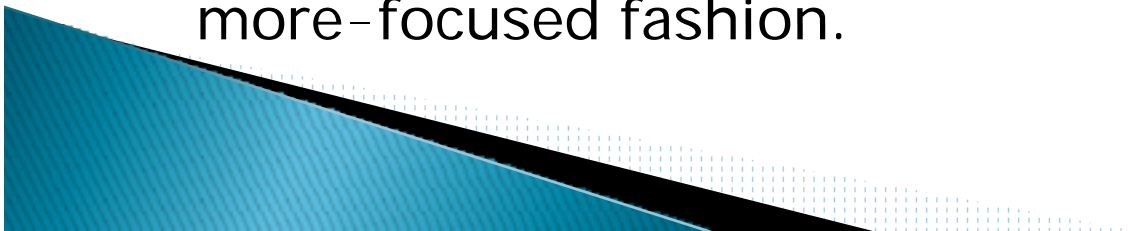
Gridded poultry density source:  
<http://www.fao.org>



Average poultry density in Vietnam is 594

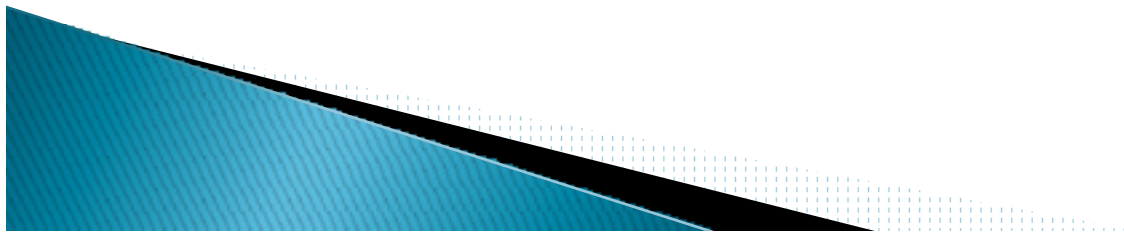
# Summary

- ▶ H5N1 events are strongly associated with spatial and temporal factors, GIS improves the effectiveness in understanding and responding to disease outbreaks.
- ▶ With GIS-Grid-based spatial statistics analyse, we can explore the relationship between the gridded poultry density and the rate of H5N1 events. This could have implications for weighing/quantifying risk factor.
- ▶ GIS gives us the ability to delineate spatial clusters of H5N1 in a more effective way than political-boundary-based spatial statistics analyse. This could have implications for public health efforts, potentially enabling health workers to direct scarce resources in a more-focused fashion.



# Questions?

[guilan.huang@fda.hhs.gov](mailto:guilan.huang@fda.hhs.gov)



**Thank You!**

