

Biological Futures in a Globalized World

# Convenient Illusions

The Political Economy of Influenza Research

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# H5/H7, no HPAI before

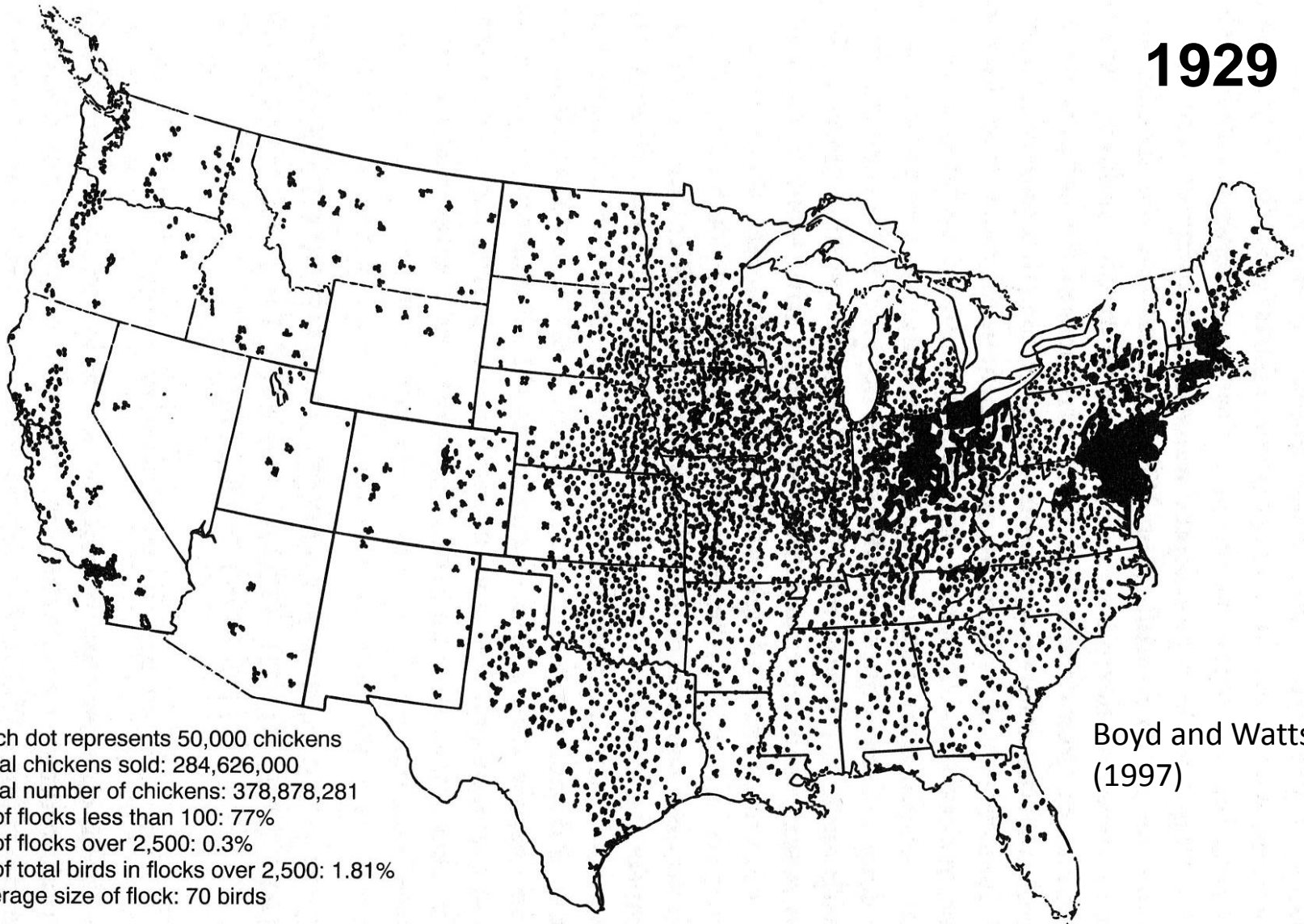
Country	Year	HPAIV Type	Index Flock Type	Refs
Australia (Victoria)	1976	H7N7	Combined broiler and egg layer farm	Westbury (1998)
USA (Pens.)	1983	H5		Bean <i>et al.</i> (1985), J. Virol 54; Henzler <i>et al.</i> (2003)
Australia (Victoria)	1985	H7N7	Multi-aged chicken farm (120k) (broiler-breeders, broilers, layers & pullets)	Westbury (1998)
Australia (Victoria)	1992	H7N3	Broiler-breeders (>13k)	Westbury (1998)
UK Norfolk	1994	H5N1	Turkeys	Wood <i>et al.</i> (1994), Archives of Virology 134:185-194
Mexico	1994	H5N2	Commercial layers	Horimoto <i>et al.</i> (1995), Virology 213
Australia (Queensland)	1994	H7N3	Egg layer (22k) (Multi-age)	
Pakistan	1995	H7N3		
China	1996	H5N1	First isolated from Geese	Comment: different from other instances in that it is the only reassortant (check origin of different genes)

Australia	1997	H7N4	Commercial broiler-breeder (128k birds)	Sellek <i>et al.</i> (2003), Avian Dis 47
Italy	1997	H5N2	Backyard	Capua <i>et al.</i> (1999) cited in Capua & Alexander (2004)
Italy	1999	H7N1	Meat turkey flock	Banks <i>et al.</i> (2001), Arch Virol 146
Chile	2002	H7N3	Broiler breeder (app 560k hens)	Suarez <i>et al.</i> (2004)
Holland	2003	H7N7	Commercial layers, 2 flocks (7k and 21k)	Stegeman <i>et al.</i> (2004), JID 190
Pakistan	2003	H7N3	Commercial layer (41 flocks with 700k birds)	Naeem <i>et al.</i> (2007), Avian Dis 51
Canada (Brit. Col.)	2004	H7N3	Broiler breeders (2 flocks, 9k and 8k)	Bowes <i>et al.</i> (2004) Avian Dis 48, Pasik cited in Berhane
USA Texas	2004	H5N2	Broiler chicken flock (6.6k)	Pelzel <i>et al.</i> (2006), JAVMA (virus only pathogenic in birds co-infected with <i>M. gallisepticum</i> )
Canada (Saskatchewan)	2007	H7N3	Broiler breeders (53k)	Berhane <i>et al.</i> (2009) EID 15
UK	2008	H7N7	Free-range layers (25k)	DEFRA, SCoFAH Mtg, 18/06/08 ('possible mutation')
Spain	2009	H7N7	Laying hens (308k)	Anon., SCoFAH Mtg, 03/05/10

Atkins *et al.* (2010)

# Before WWII

1929



- \* Each dot represents 50,000 chickens
- Total chickens sold: 284,626,000
- Total number of chickens: 378,878,281
- % of flocks less than 100: 77%
- % of flocks over 2,500: 0.3%
- % of total birds in flocks over 2,500: 1.81%
- average size of flock: 70 birds

Boyd and Watts  
(1997)

Source: Dept. of Commerce 1939, Bugos 1992, p. 149



Boyd and Watts  
(1997)

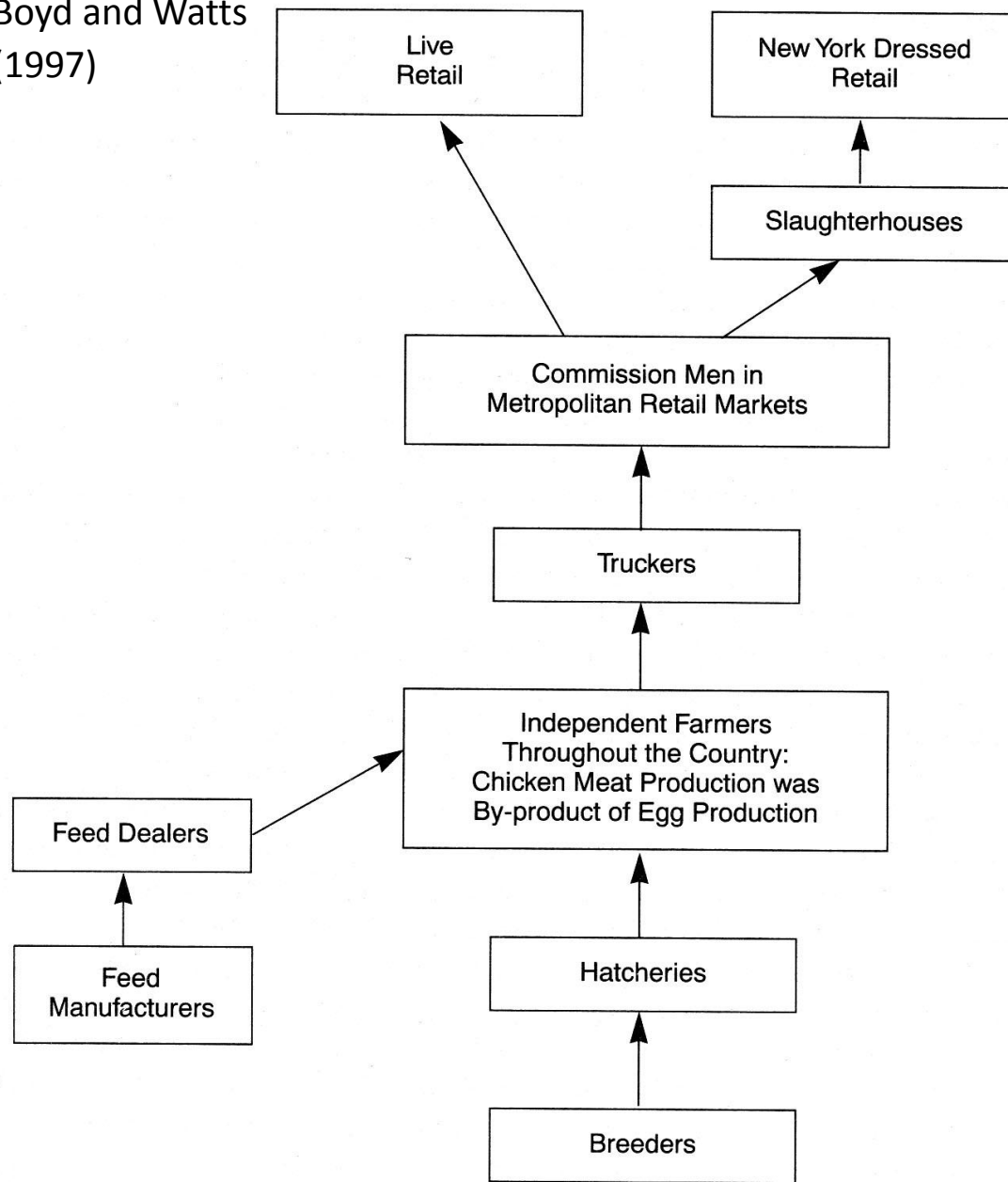


Figure 8.2 US chicken meat filière c. 1929



FILIERE

PRODUCTION

INTEGRATOR

CONSUMPTION & DISTRIBUTION

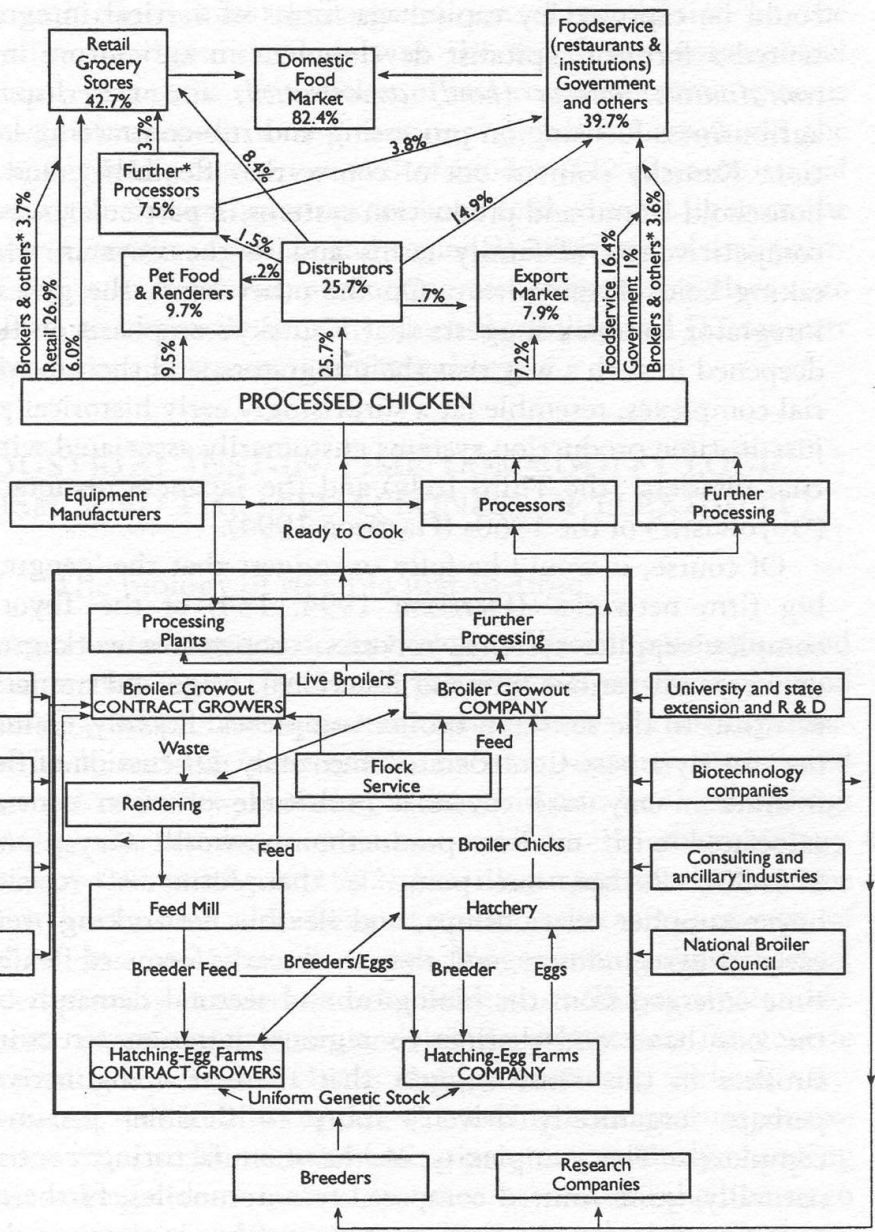
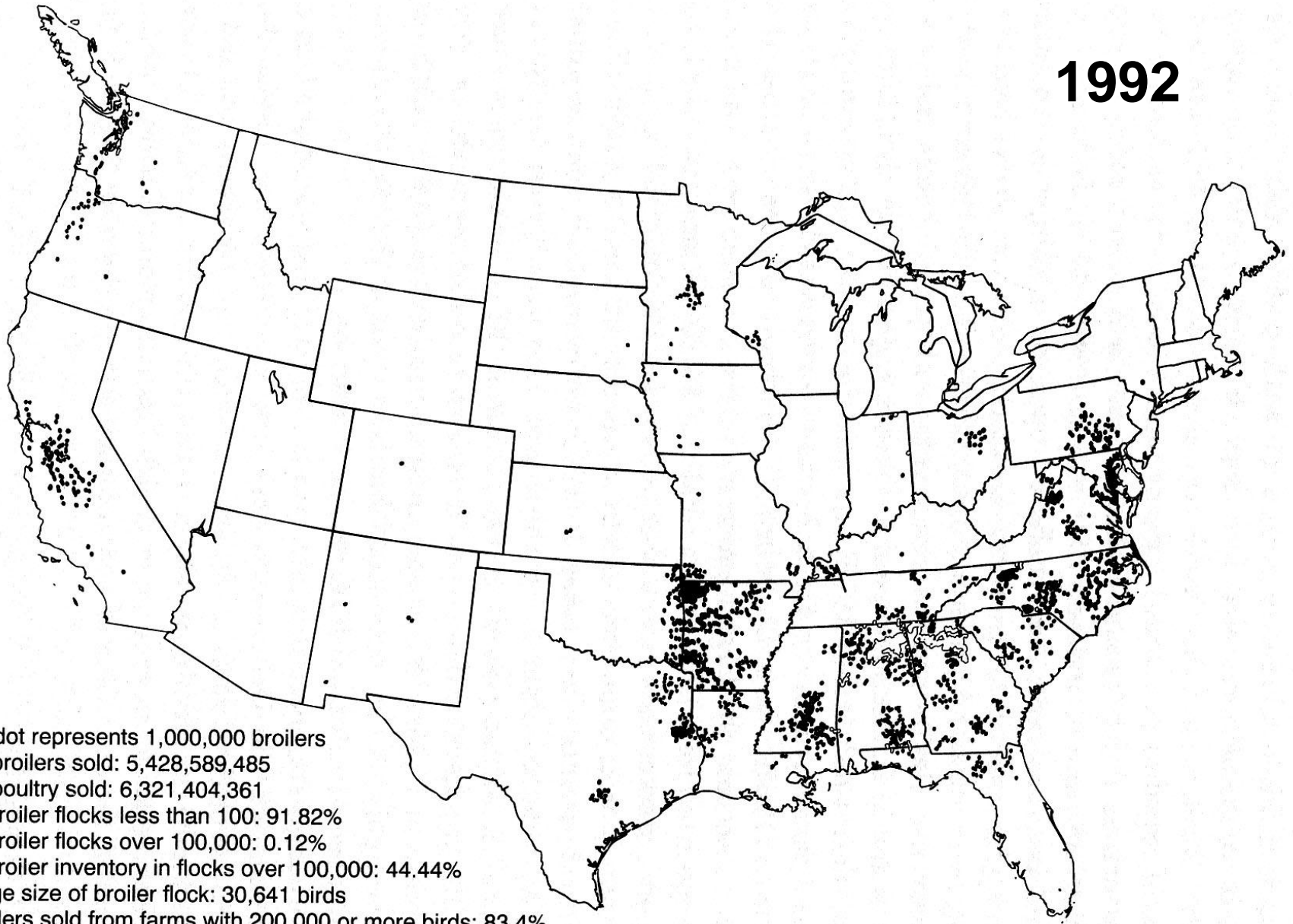


Figure 8.4 The broiler filière c. 1993

Boyd and Watts (1997)

1992



- \* Each dot represents 1,000,000 broilers
- Total broilers sold: 5,428,589,485
- Total poultry sold: 6,321,404,361
- % of broiler flocks less than 100: 91.82%
- % of broiler flocks over 100,000: 0.12%
- % of broiler inventory in flocks over 100,000: 44.44%
- average size of broiler flock: 30,641 birds
- % broilers sold from farms with 200,000 or more birds: 83.4%

Source: USDA, Agricultural Census, 1994

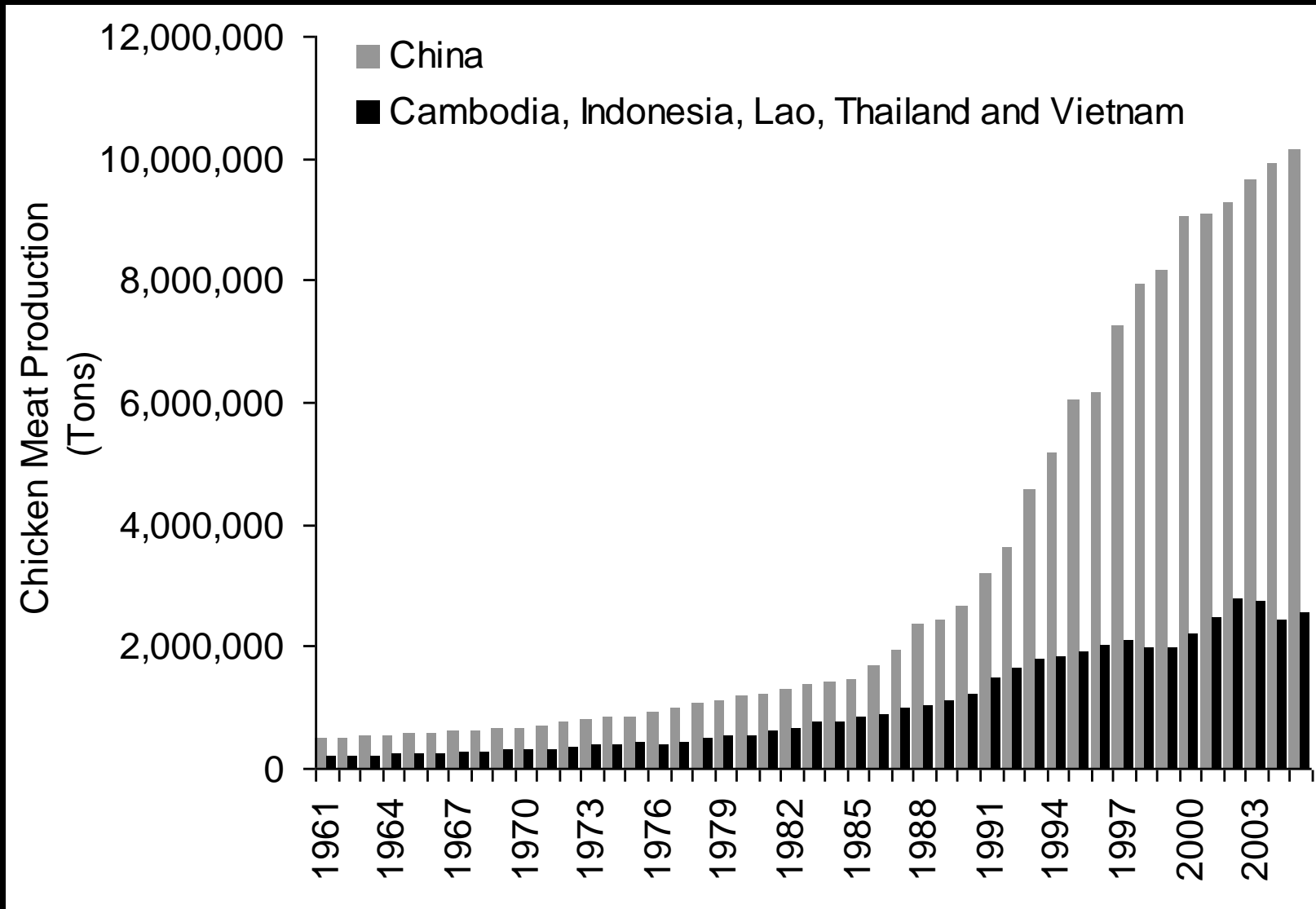
Boyd and Watts (1997)

Figure 8.3 Broilers and other meat-type chickens sold, 1992

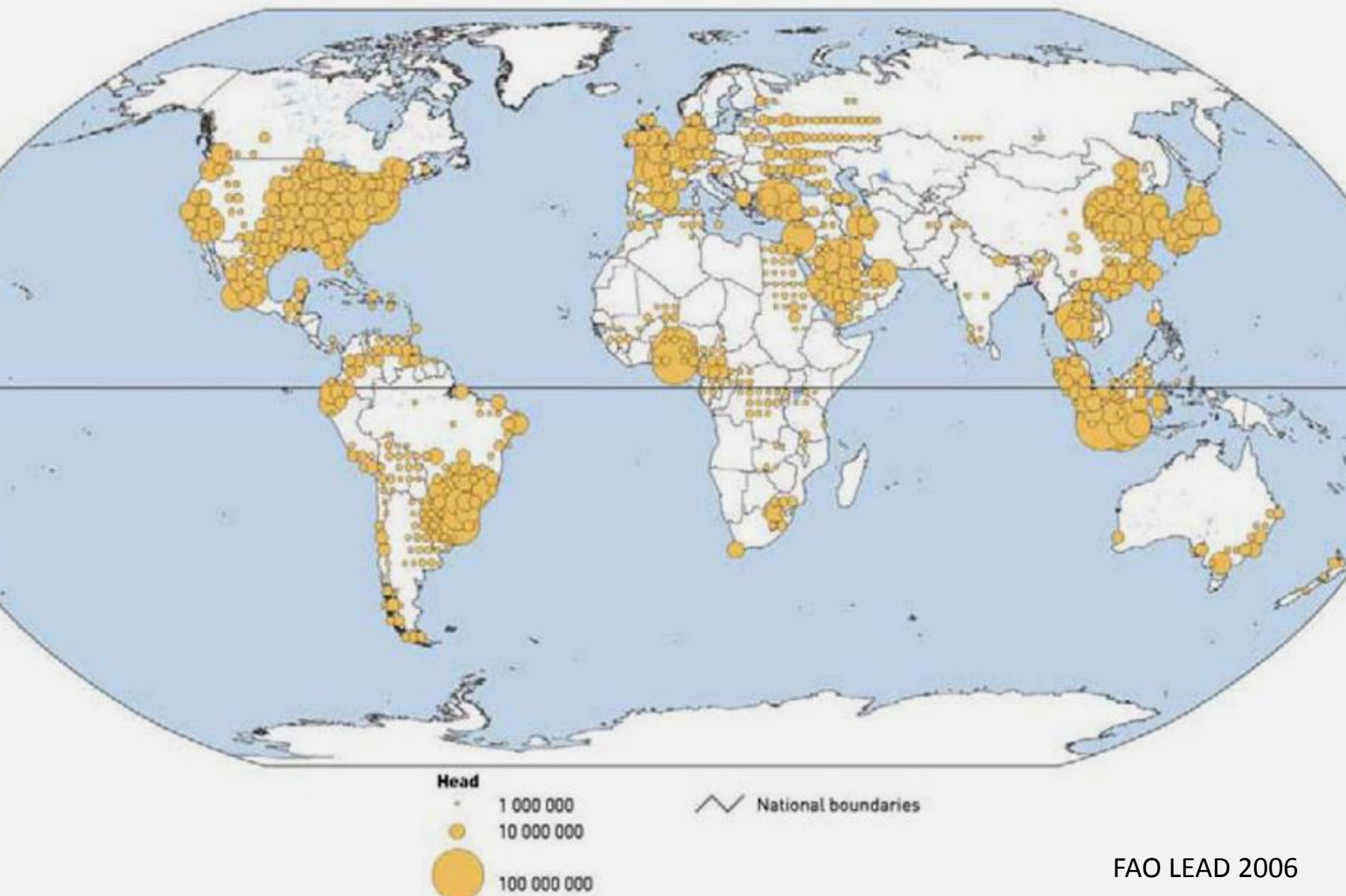




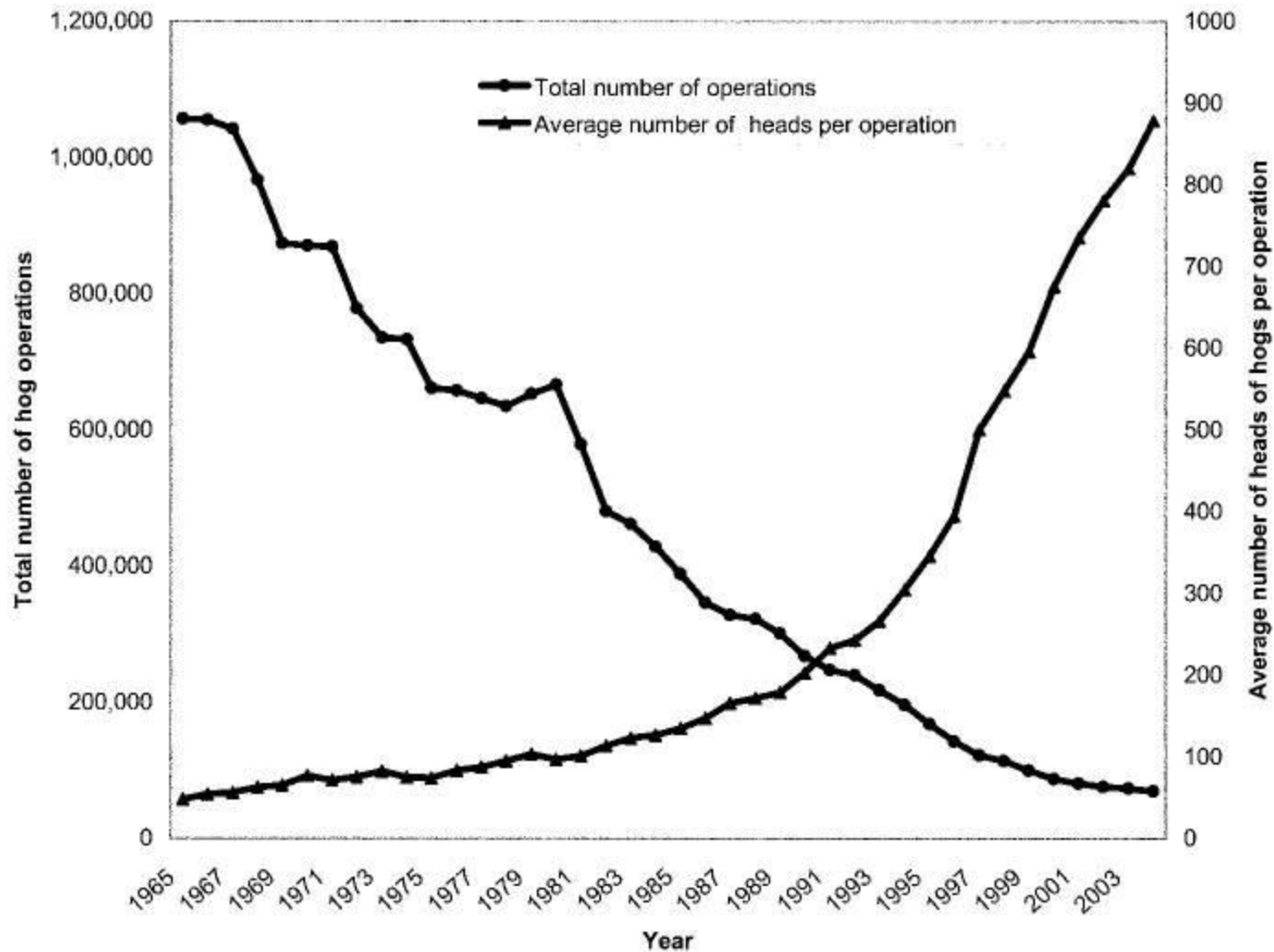
# Asian chicken production



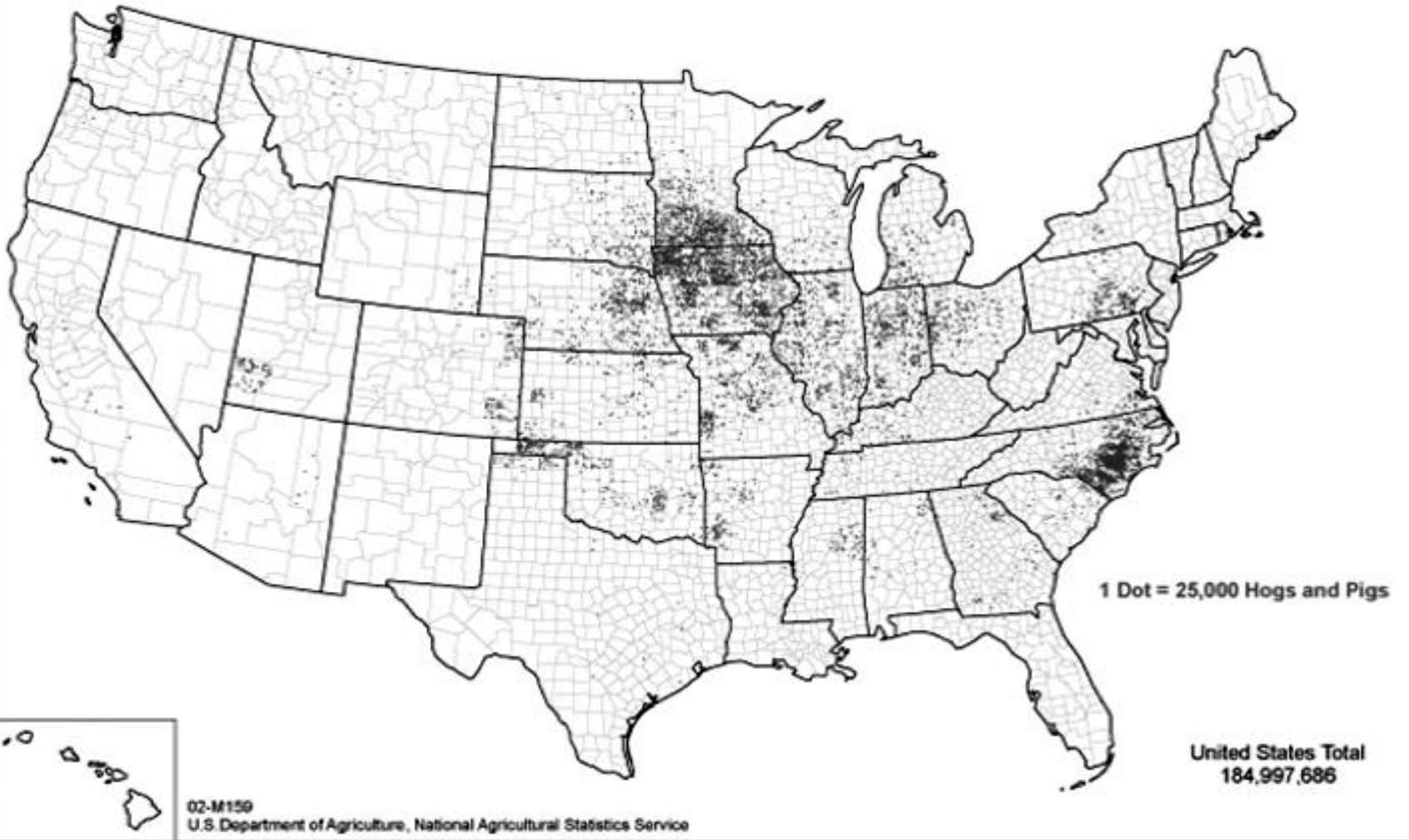
# Estimated industrially produced poultry



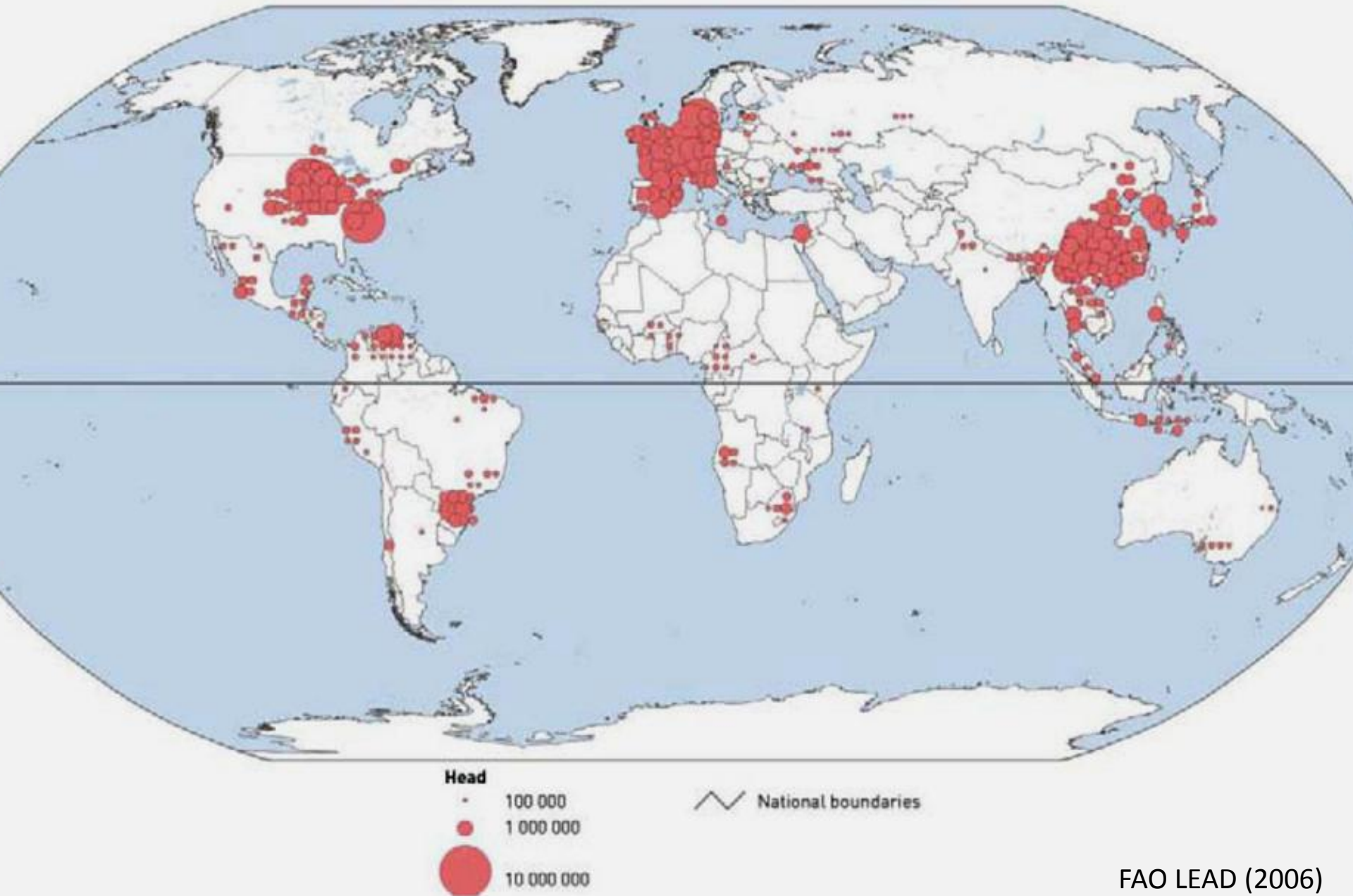
# U.S. hog consolidation



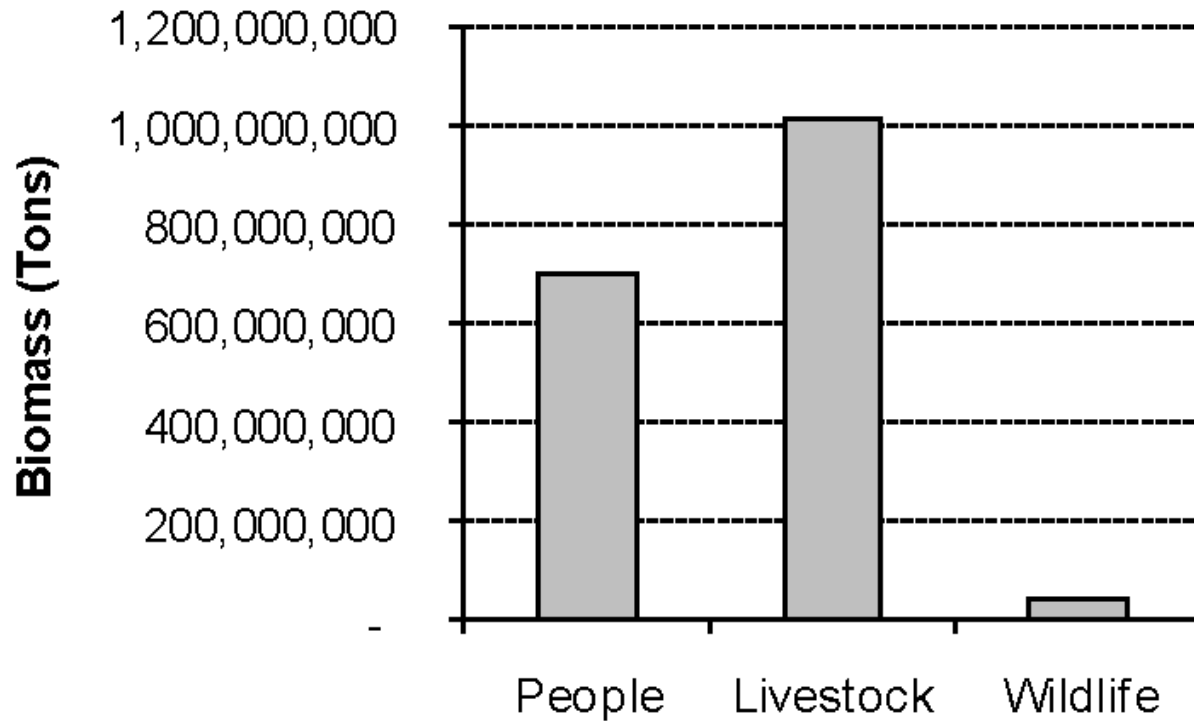
# Number of Hogs and Pigs Sold: 2002



# Estimated industrially produced pig



# Global biomass

















# Geographic extent of transport



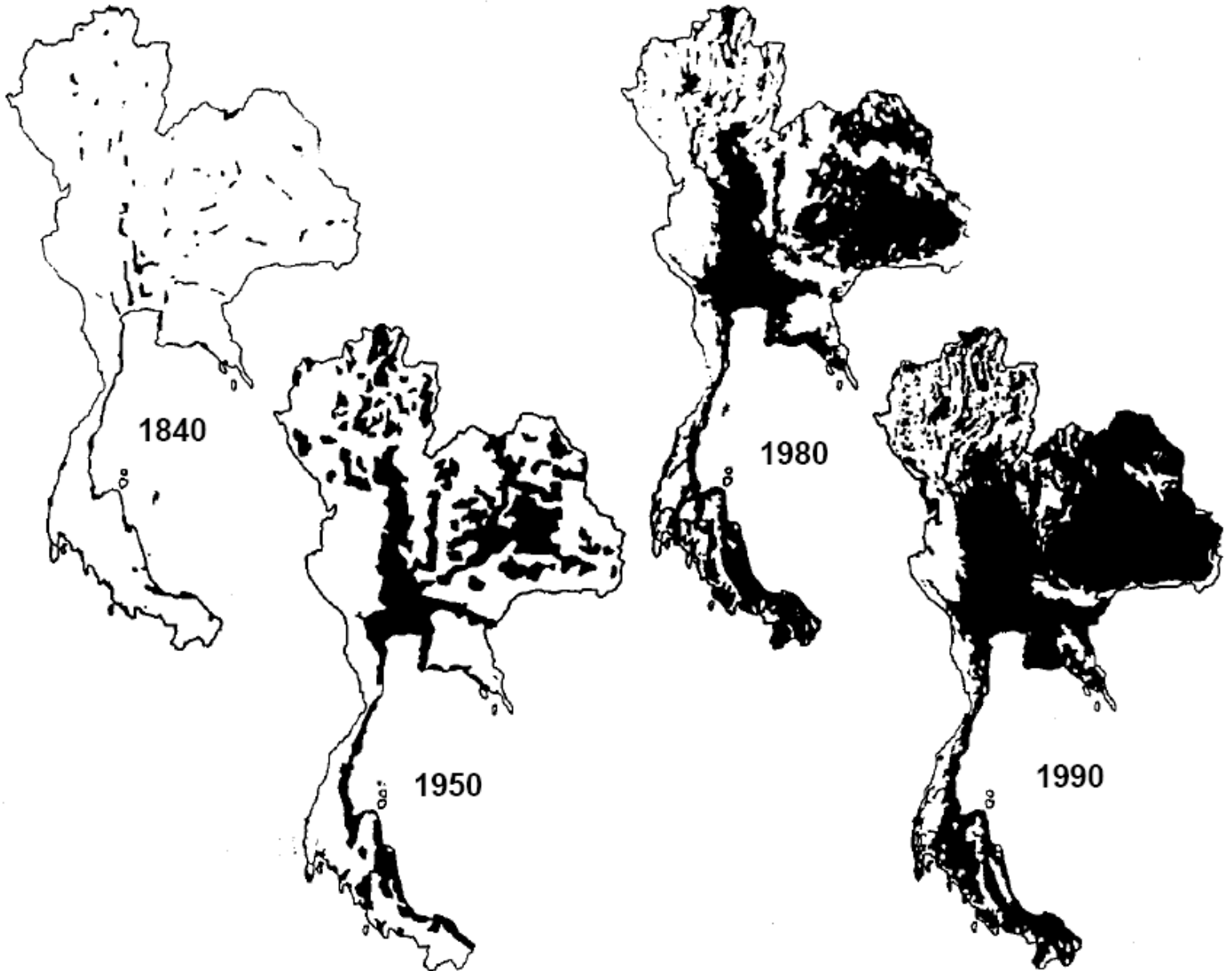
Baltussen *et al.* (2009)



# Pigs do fly



# Expansion of agricultural cropland, Thailand



Source: Phongpaichit and Baker, 1995

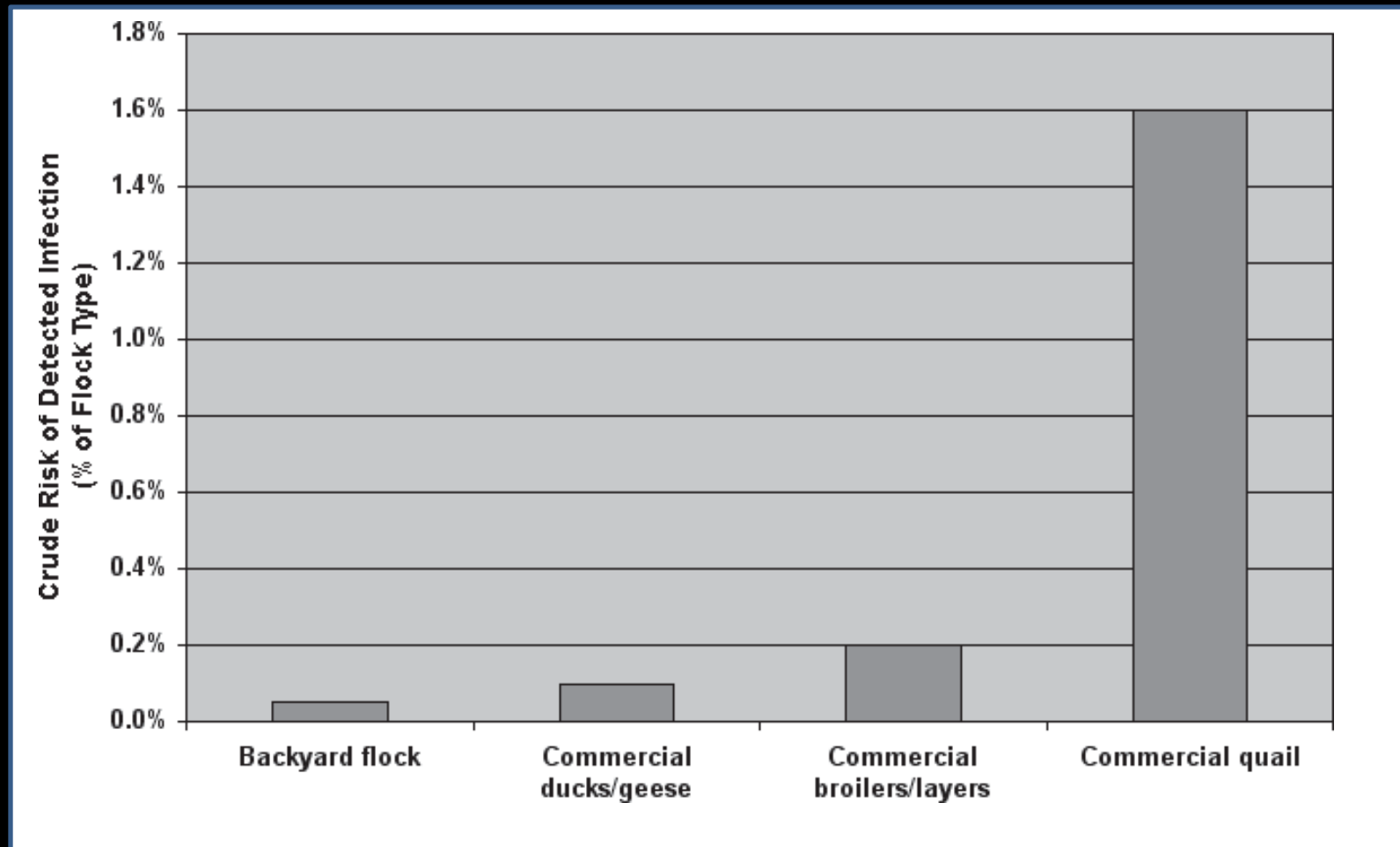








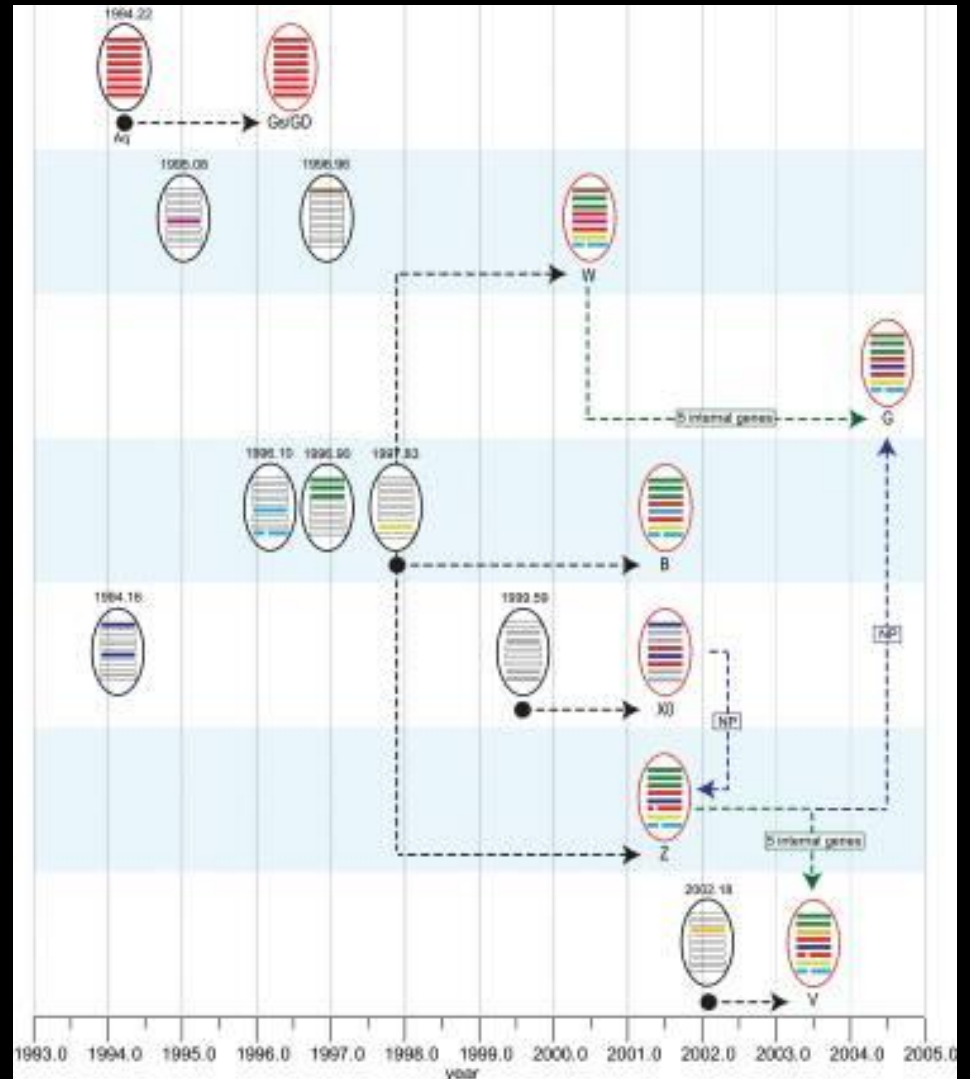
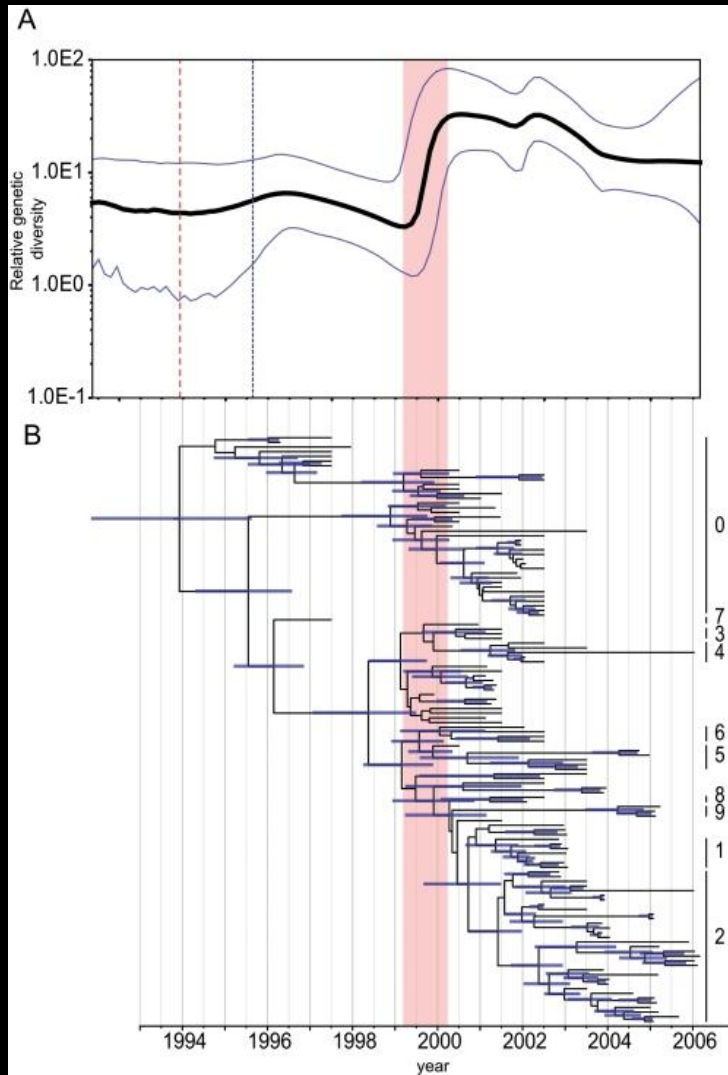
# Epidemiology by agricultural sector

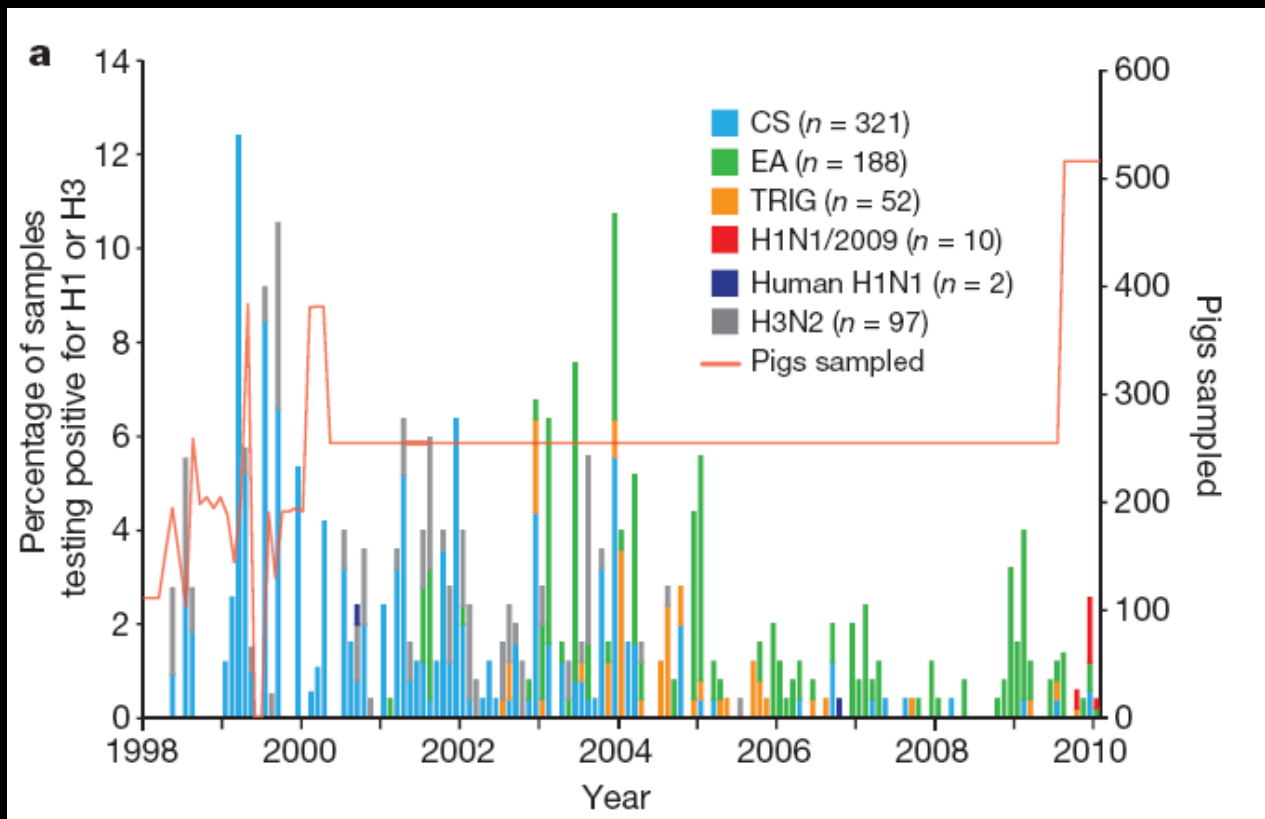


# Seroepidemiology

Group	Subjects Tested	Anti-H5-Positive	Anti-H9-Positive	Odds Ratio (95% CI)	P Value <sup>†</sup>
	no.	no. (%)	no. (%)		
Poultry retailers in food market	252	2 (0.8)	39 (15.5)	14.00 (4.92–39.81)	<0.001
Poultry wholesalers in poultry wholesale market	244	2 (0.8)	16 (6.6)	5.49 (1.81–16.69)	0.003
Workers in large-scale poultry-breeding enterprise <sup>‡</sup>	125	0	7 (5.6)	4.74 (1.34–16.56)	0.01
Farmers in small-scale rural poultry farm <sup>§</sup>	869	0	24 (2.8)	2.48 (0.84–7.29)	0.06
Workers in pig-breeding enterprise	182	0	5 (2.7)	2.42 (0.63–9.23)	0.38
Retailers of goods other than poultry in food market	218	0	4 (1.8)	1.42 (0.35–5.75)	0.63

# Phylogenetic evidence



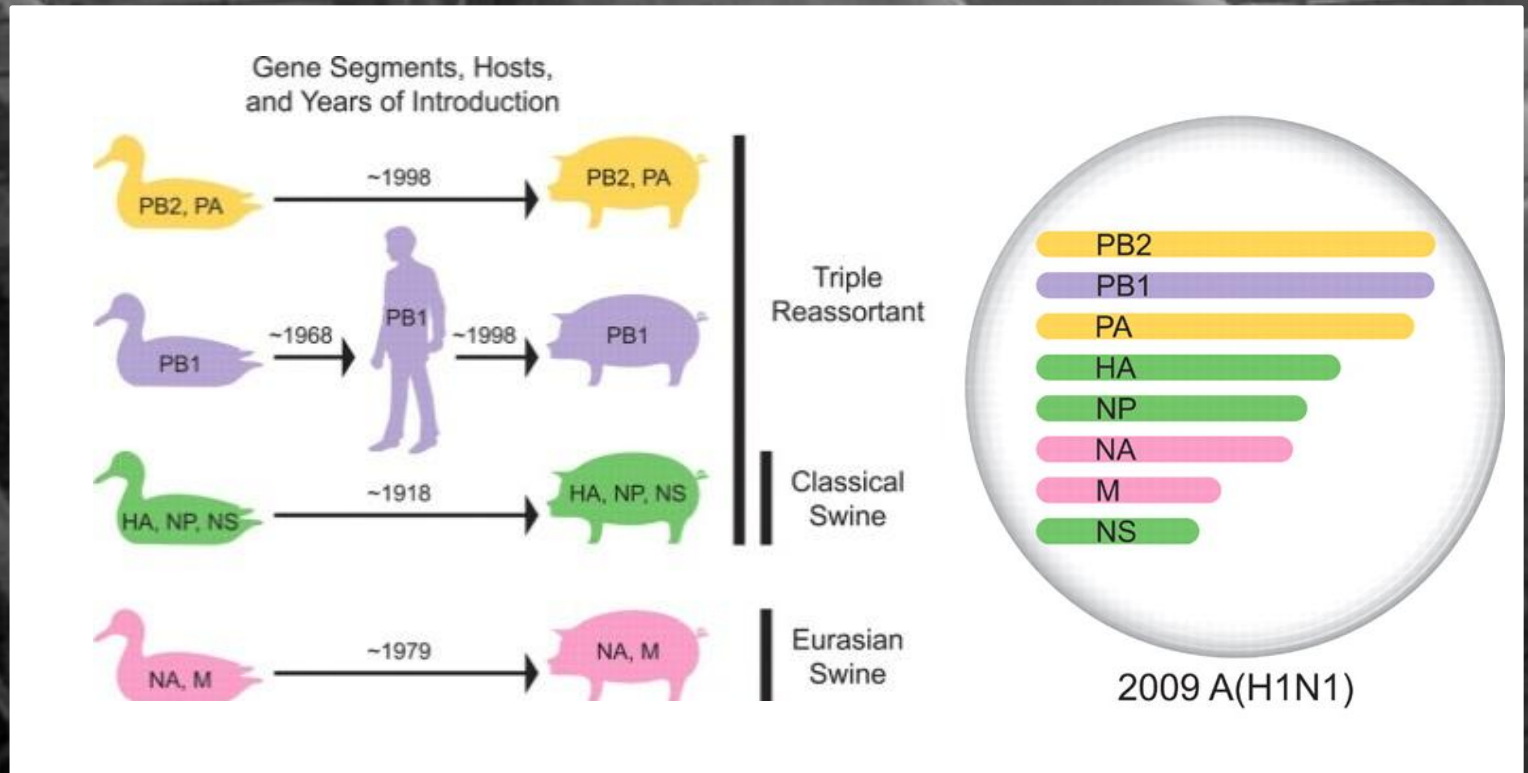


Vijaykrishna et al. 2011

	SC-to-SE	SC-to-MW	SE-to-MW	SE-to-SC	MW-to-SC	MW-to-SE
Mean (95% HPD)	0.14 (0, 1)	<b>9.4</b> (7, 12)	<b>13.1</b> (10, 16)	0 (0, 0)	0.39 (0, 2)	3.3 (2, 6)
Swine-flows	232,596	14,528,536	17,584,512	50,080	275,932	1,086,101
Swine-flows/intro	1,661,400	1,545,589	1,342,329	n/a	707,518	329,121

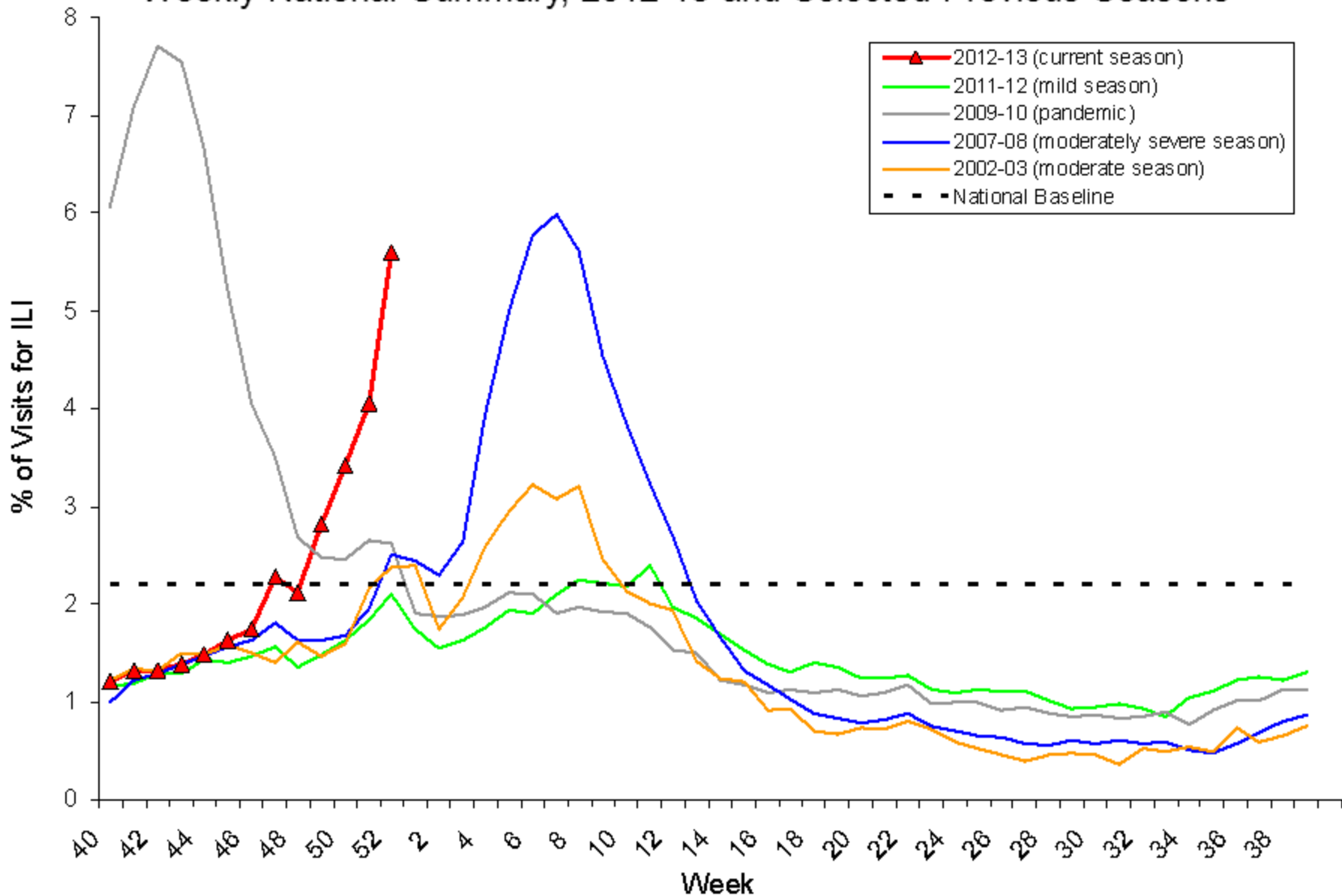
# The genomic tell-tale

## Multi-continental reassortment





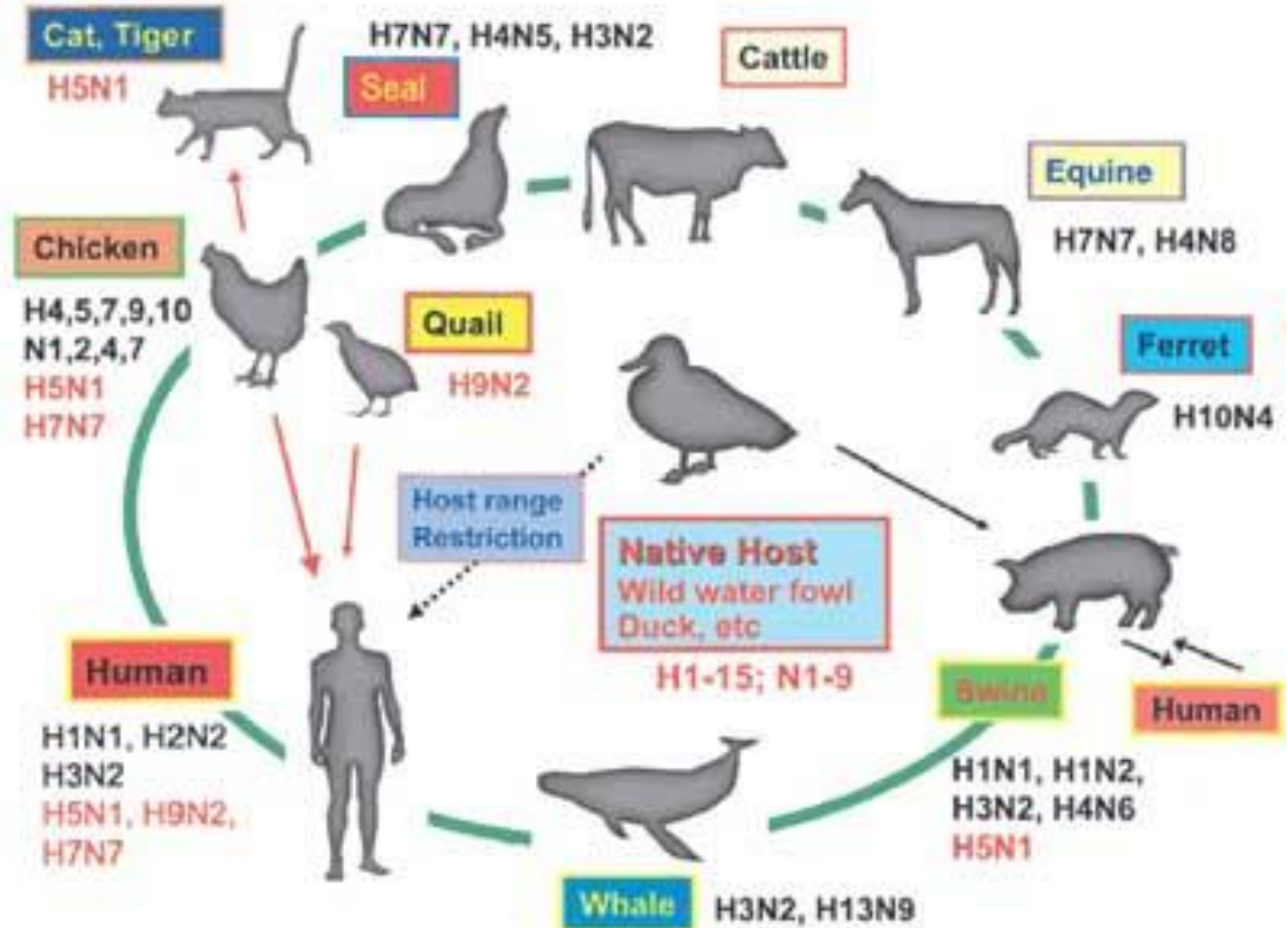
Percentage of Visits for Influenza-like Illness (ILI) Reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Weekly National Summary, 2012-13 and Selected Previous Seasons







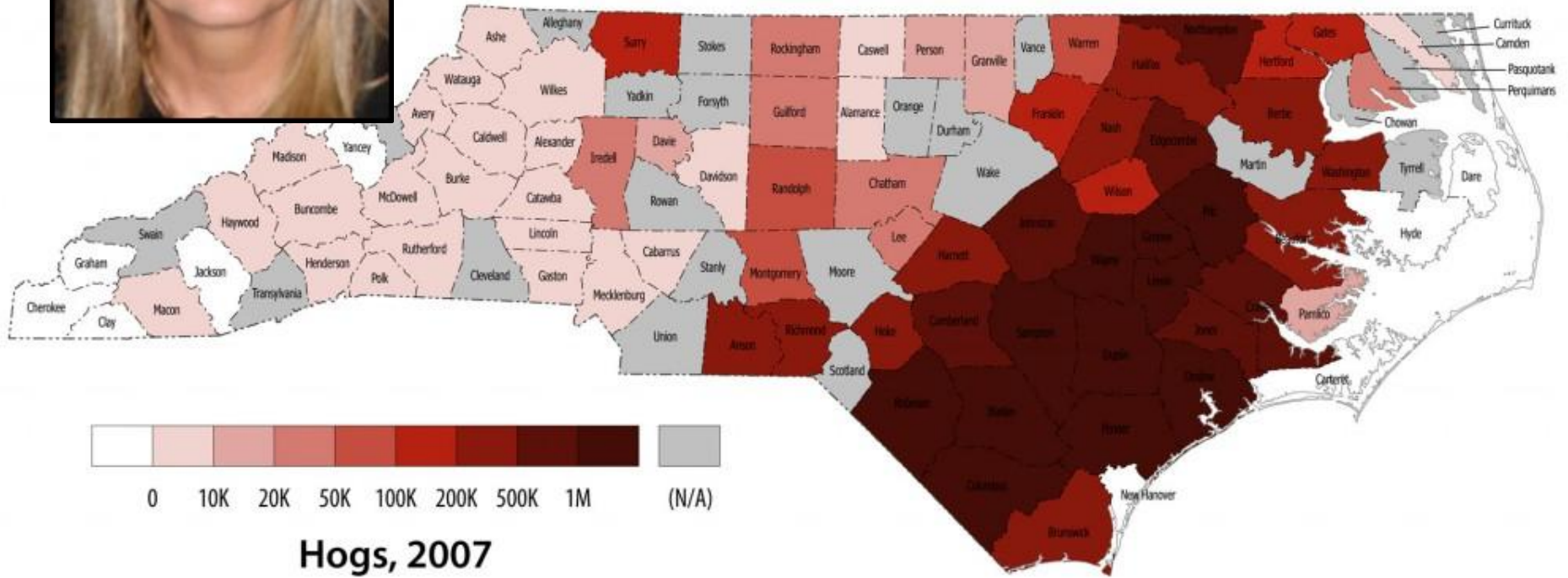
# Gene pool diplomacy







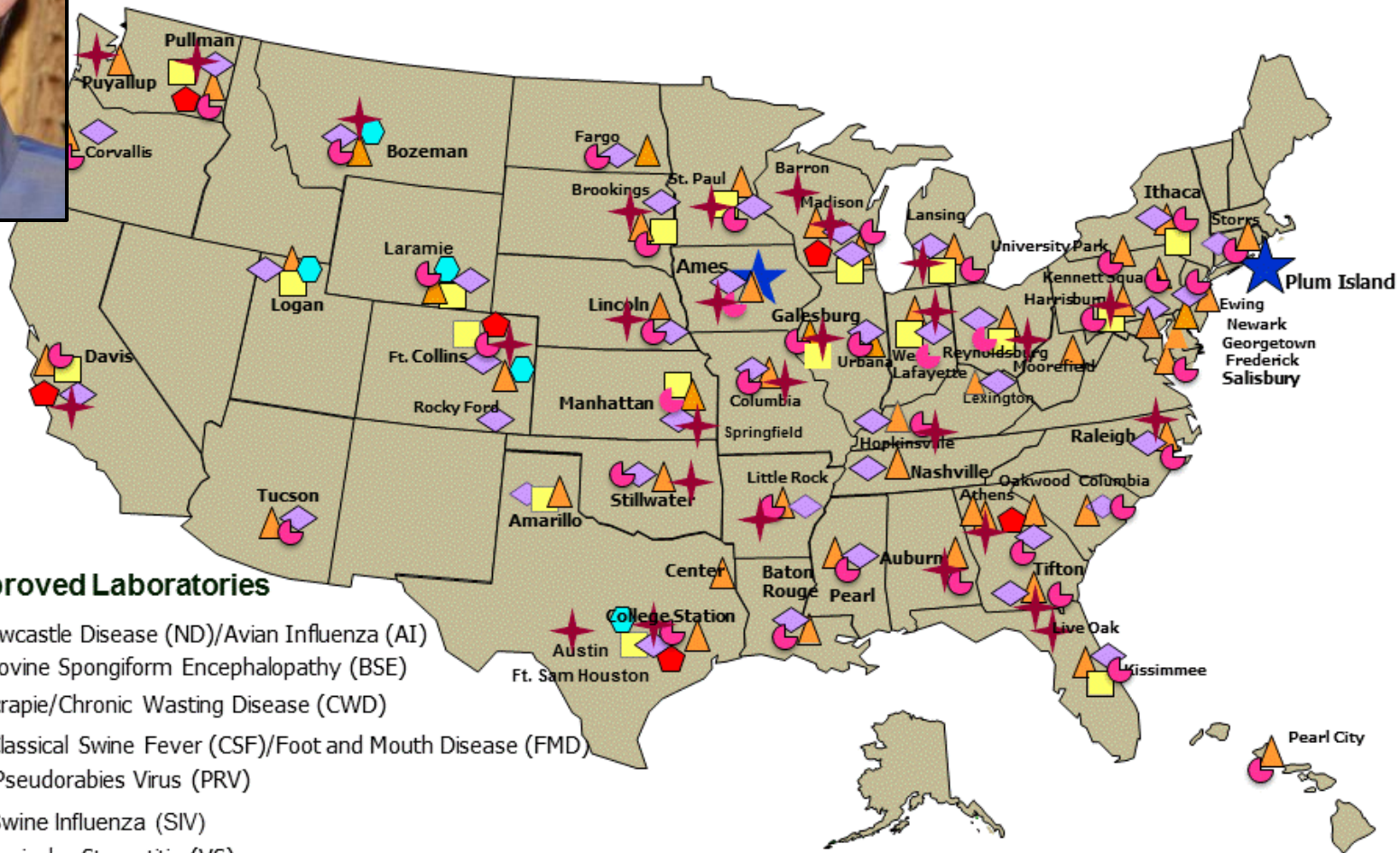








## National Animal Health Laboratory Network (NAHLN)



### Approved Laboratories

- Newcastle Disease (ND)/Avian Influenza (AI)
- \*Bovine Spongiform Encephalopathy (BSE)
- Scrapie/Chronic Wasting Disease (CWD)
- \*Classical Swine Fever (CSF)/Foot and Mouth Disease (FMD)
- \*Pseudorabies Virus (PRV)
- Swine Influenza (SIV)
- Vesicular Stomatitis (VS)
- National Veterinary Services Laboratories

\*For specified agents, not all laboratories are currently participating in surveillance testing.



