Avian Flu – Update

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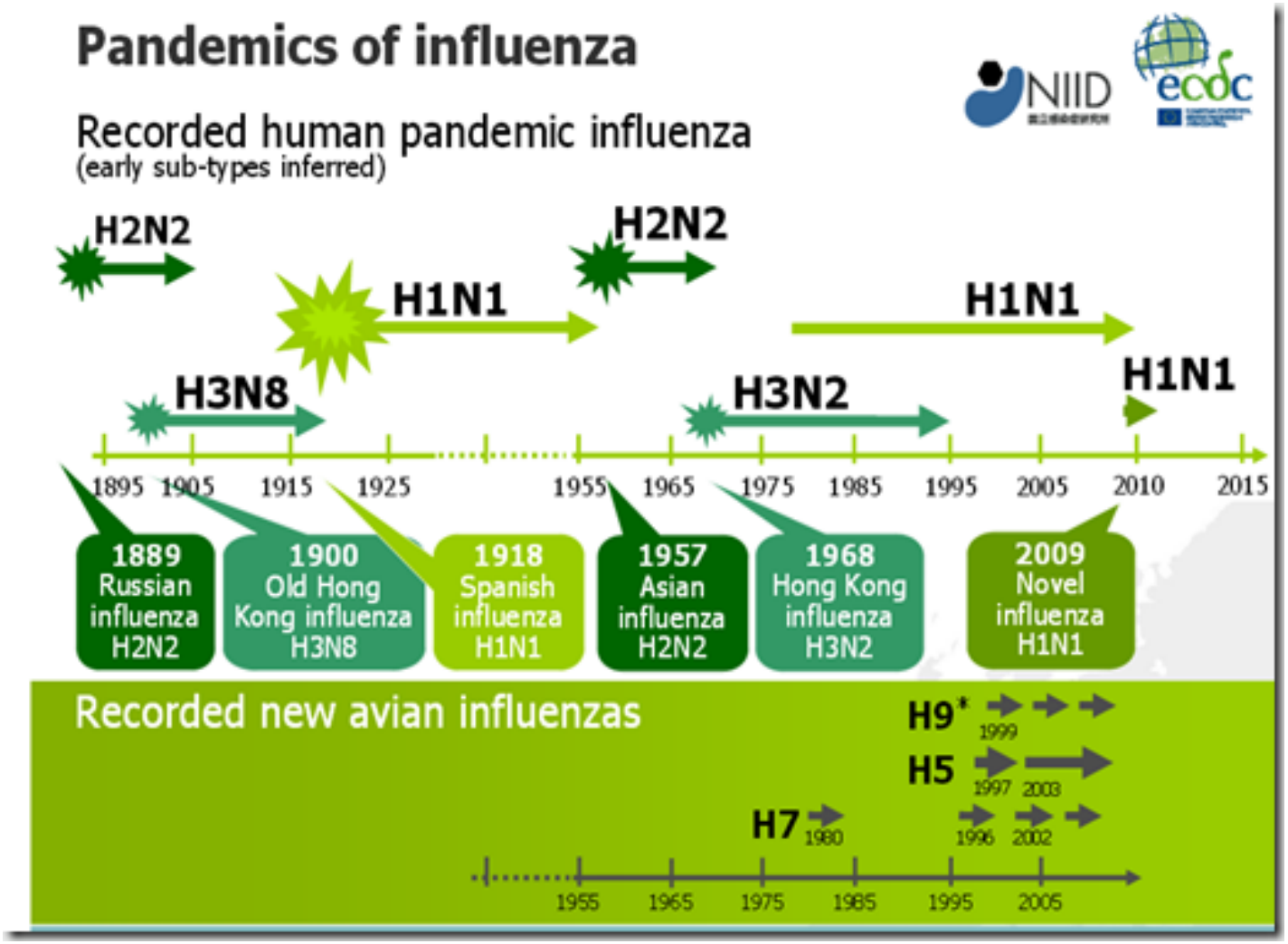
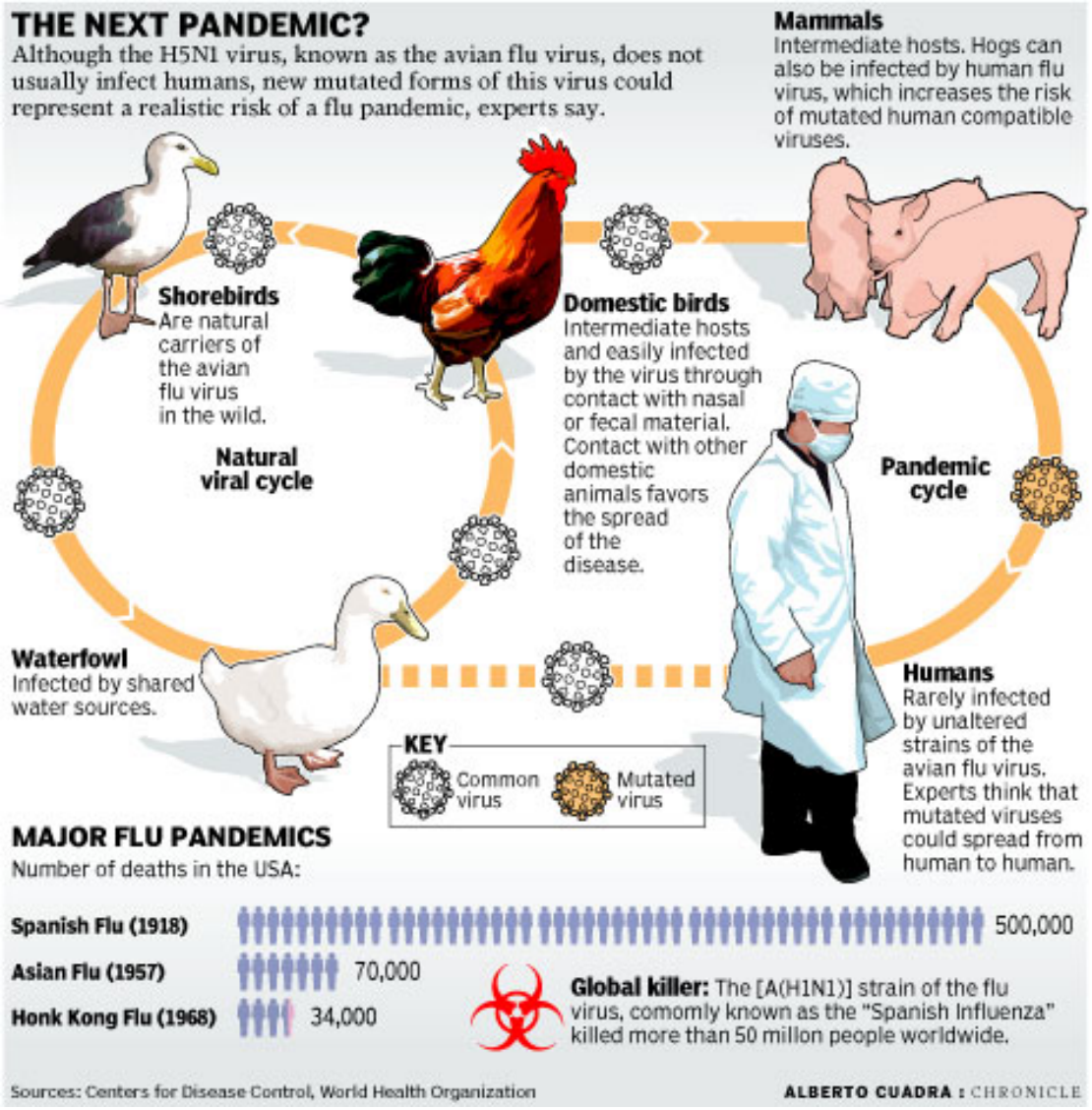
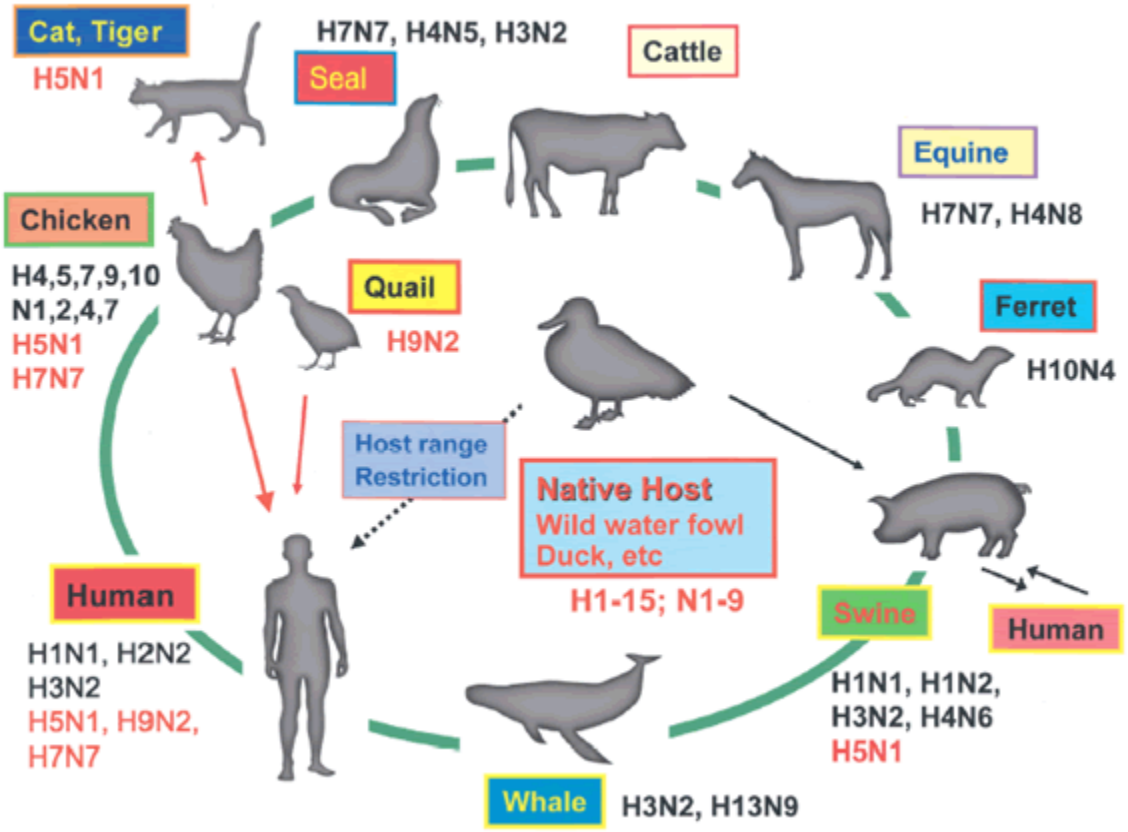

Pandemics of influenza
NIID
ecdc
Recorded human pandemic influenza
(early sub-types inferred)
H2N2
H2N2
H1N1
H1N1
H3N8
H3N2
H1N1
1895 1905 1915 1925 1955 1965 1975 1985 1995 2005 2010 2015
1889 Russian influenza H2N2
1900 Old Hong Kong influenza H3N8
1918 Spanish influenza H1N1
1957 Asian influenza H2N2
1968 Hong Kong influenza H3N2
2009 Novel influenza H1N1
Recorded new avian influenzas
H9* 1999
H5 1997 2003
H7 1980
1996 2002
1955 1965 1975 1985 1995 2005


THE NEXT PANDEMIC?
Although the H5N1 virus, known as the avian flu virus, does not usually infect humans, new mutated forms of this virus could represent a realistic risk of a flu pandemic, experts say.
Mammals
Intermediate hosts. Hogs can also be infected by human flu virus, which increases the risk of mutated human compatible viruses.
Shorebirds
Are natural carriers of the avian flu virus in the wild.
Natural viral cycle
Domestic birds
Intermediate hosts and easily infected by the virus through contact with nasal or fecal material. Contact with other domestic animals favors the spread of the disease.
Pandemic cycle
Waterfowl
Infected by shared water sources.
KEY
Common virus
Mutated virus
Humans
Rarely infected by unaltered strains of the avian flu virus. Experts think that mutated viruses could spread from human to human.
MAJOR FLU PANDEMICS
Number of deaths in the USA:
Spanish Flu (1918)
500,000
Asian Flu (1957)
70,000
Honk Kong Flu (1968)
34,000
Global killer: The [A(H1N1)] strain of the flu virus, comomly known as the "Spanish Influenza" killed more than 50 millon people worldwide.
Sources: Centers for Disease Control, World Health Organization
ALBERTO CUADRA : CHRONICLE

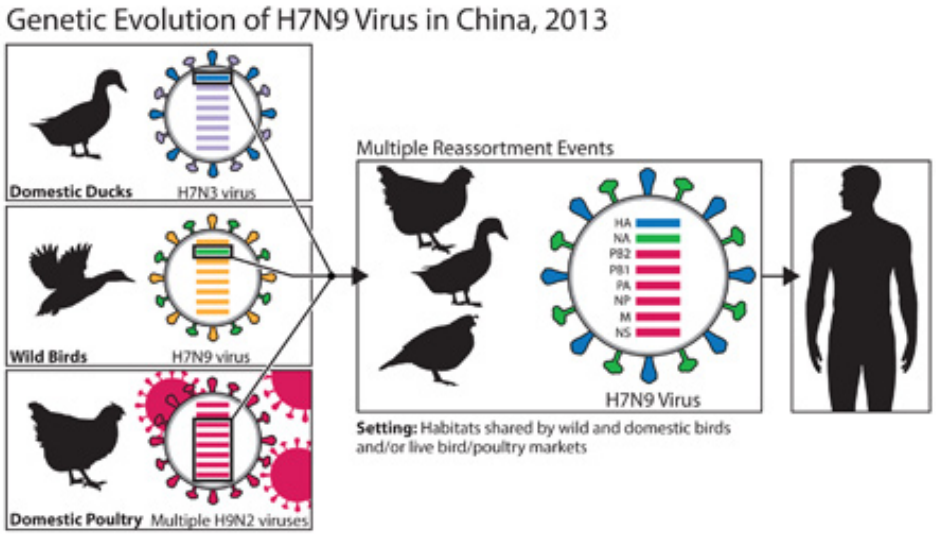
Flu virsus – multiple species



HPAI H5N2

- “Largest loss of livestock due to a Foreign Animal Disease in the History of the United States”
- Not the first introduction of Bird Flu in the U.S.

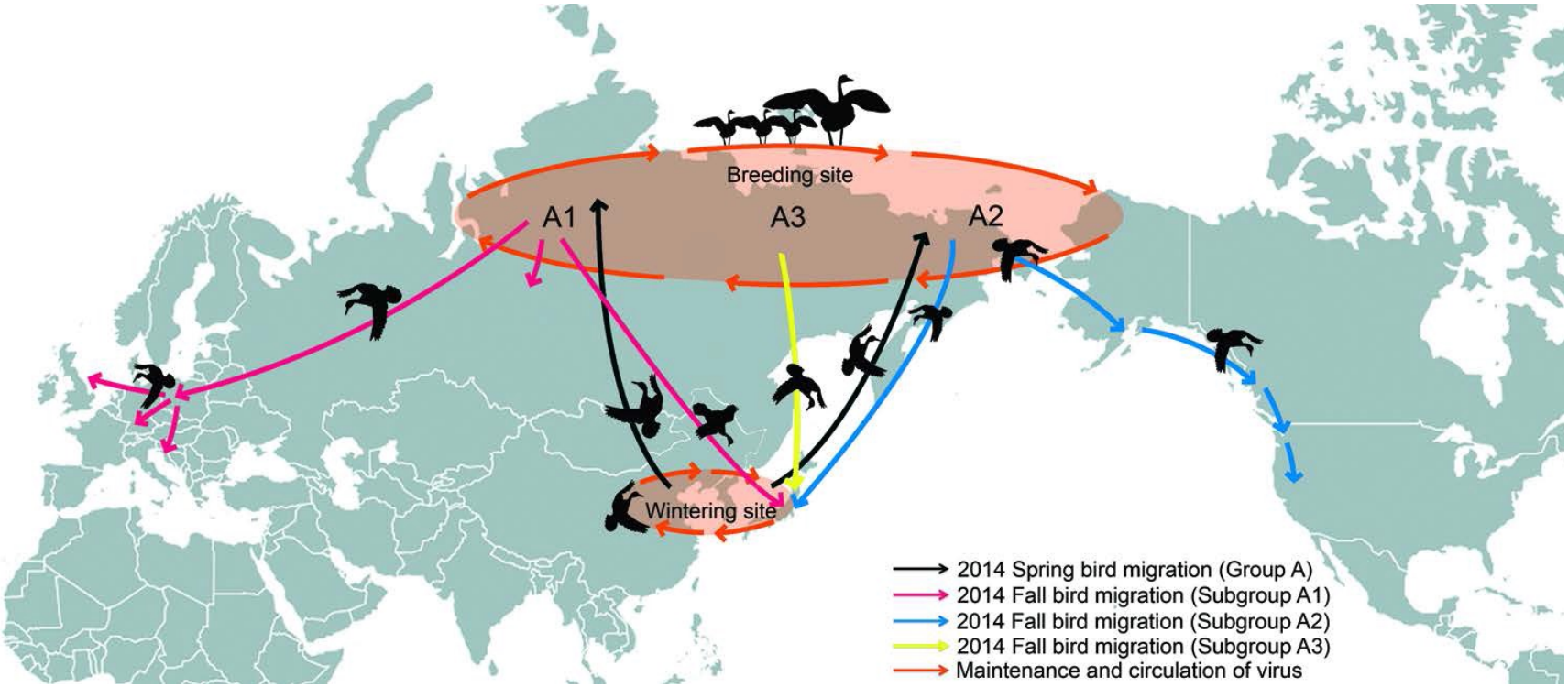
How do AI viruses mutate?



The eight genes of the H7N9 virus are closely related to avian influenza viruses found in domestic ducks, wild birds and domestic poultry in Asia. The virus likely emerged from "reassortment," a process in which two or more influenza viruses co-infect a single host and exchange genes. This can result in the creation of a new influenza virus. Experts think multiple reassortment events led to the creation of the H7N9 virus. These events may have occurred in habitats shared by wild and domestic birds and/or in live bird/poultry markets, where different species of birds are bought and sold for food. As the above diagram shows, the H7N9 virus likely obtained its HA (hemagglutinin) gene from domestic ducks, its NA (neuraminidase) gene from wild birds, and its six remaining genes from multiple related H9N2 influenza viruses in domestic poultry.

CDC
Centers for Disease Control and Prevention
National Center for Immunization and Respiratory Diseases

Movement of H5 clade 2.3.4.4



How is AI moving in the U.S.?

- **Eurasian H5 clade 2.3.4.4 is now present in North American flyways**
- **•H5N8 appears well adapted to certain waterfowl species; no definitive means to predict how long it will remain in our flyways**
- **•Asian and European studies have detected the H5 2.3.4.4 viruses in wild birds across Eurasian flyways and winter resting grounds**

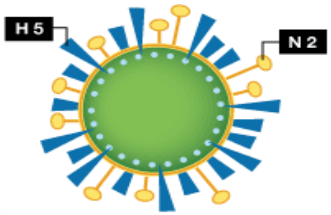
3 Major U.S. Poultry Sectors

- Broiler – largest – production of broiler meat for consumption, (not eggs), geographically predominant in the U.S. Southeastern states
- Turkeys – Minnesota is the largest state
- Commercial Egg Production, largest egg producing state is Iowa (prior to 2015 break)
- Egg production chickens are genetically quite different from meat production chickens

High Pathogenicity Avian Influenza (HPAI)

- Over 40 million laying hens, constituting 11% of the U.S. layer flock
  - 30% decreased supply of egg products
    - (hardest hit sector in U.S. Midwest region)
    - Resulting in Changes in Restaurant Recipes and Use
- Over 7.5 million turkeys (< 5% total market lost)

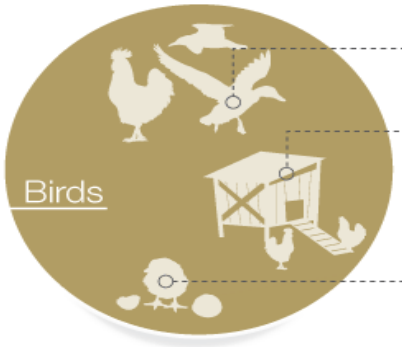
Avian influenza H5N2 – 2015



What is it?

A viral infection that affects the following:

Birds | Wild | Commercial Poultry Small Flocks



A. **Waterfowl** (wild and domesticated) are the primary natural reservoir of influenza viruses.

B. **Infected birds** shed the virus in fecal and oculo-nasal discharges.

C. **In the hatchery** eggshell surfaces can be contaminated with the influenza virus, and thus are a means of transmission.

D. **People and equipment** can easily spread the disease.

E. **Improper disposal** of carcasses, manure or byproducts can spread the disease.

F. **Live-bird markets** are a reservoir of infection.

G. **Water and organic material** from lakes and ponds utilized by infected ducks.

H. **Insects and rodents** may mechanically carry the virus from infected to susceptible poultry.

I. **There are theories** that the virus can be spread airborne for short distances.

Source: Avian Influenza in Poultry
J. P. Jacob, G.D. Butcher, F. B. Mather, and R.D. Miles; University of Florida Extension. Document is PS38, one of a series of the Animal Sciences Department, UF/IFAS Extension. Original publication date April 1998. Reviewed April 2014. http://edis.ifas.ufl.edu.

Descrip2on of the problem

Number of birds affected (until June 17th, 2015)

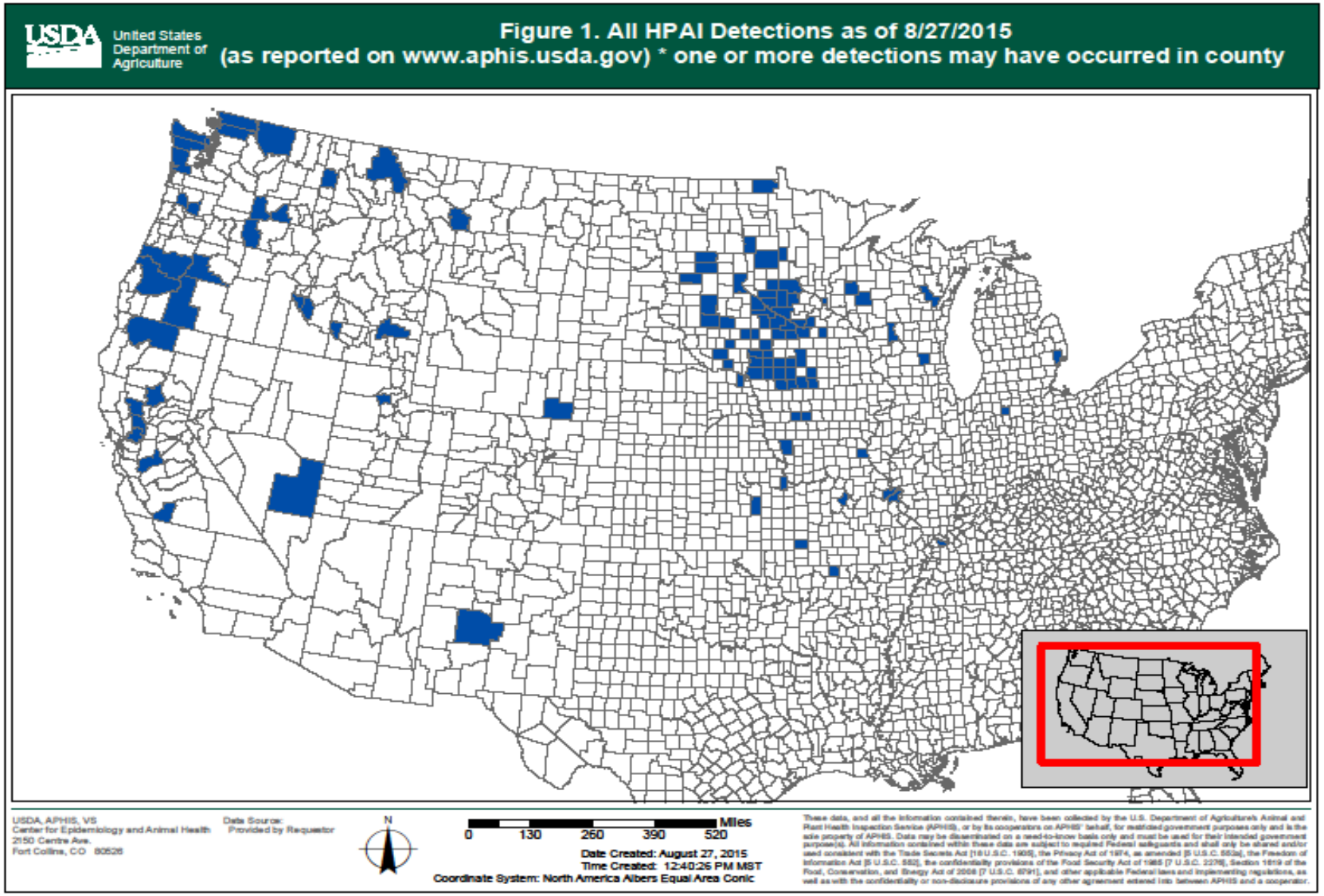
Specie	Sites		Birds affected	
Egg Layers	32	14%	34,358,140	71%
Pullets	14	6%	5,873,700	12%
Turkeys	153	69%	7,759,520	16%
Mixed & Backyard	24	11%	99,933	0%
Total	223		48,091,293	

Layer sites affected represented only 14% of the outbreak, but they represented 71% of the affected birds because of the large size of the premises affected.

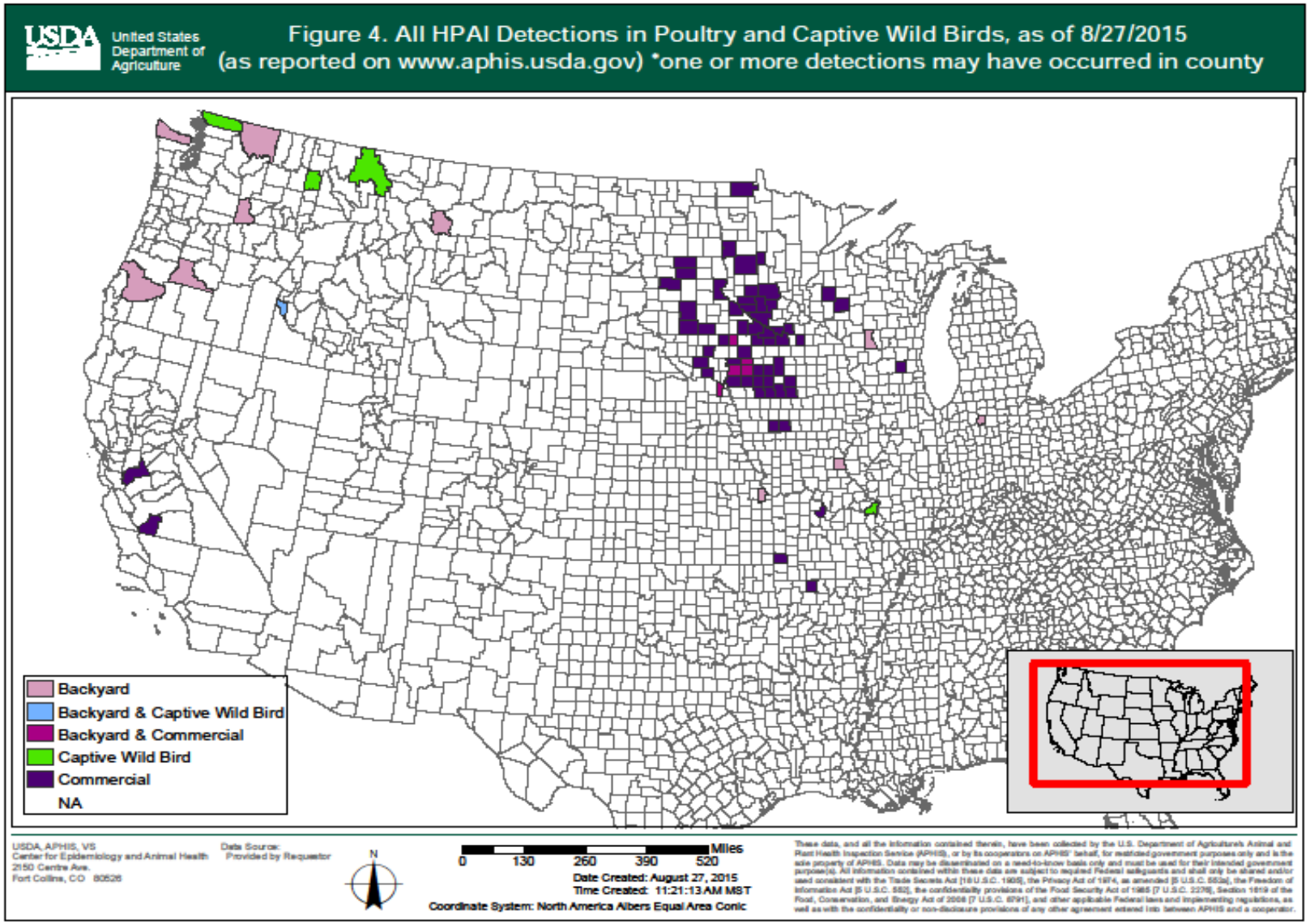
Source: USDA APHIS

Link to USDA/APHIS Website

- https://www.aphis.usda.gov/wps/portal/aphis/ourfocus/animalhealth/sa_animal_disease_information/sa_avian_health/ct_avian_influenza_disease



Note only 1 outbreak early 2016 – turkey farm in Indiana, but contained


United States Department of Agriculture
Figure 4. All HPAI Detections in Poultry and Captive Wild Birds, as of 8/27/2015
(as reported on www.aphis.usda.gov) *one or more detections may have occurred in county
Backyard
Backyard & Captive Wild Bird
Backyard & Commercial
Captive Wild Bird
Commercial
NA
USDA, APHIS, VS
Center for Epidemiology and Animal Health
2150 Centre Ave.
Fort Collins, CO 80526
Data Source:
Provided by Requestor
N
0 130 260 390 520
Miles
Date Created: August 27, 2015
Time Created: 11:21:13 AM MST
Coordinate System: North America Albers Equal Area Conic
These data, and all the information contained therein, have been collected by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), or by its cooperators on APHIS' behalf, for restricted government purposes only and is the sole property of APHIS. Data may be disseminated on a need-to-know basis only and must be used for their intended government purpose(s). All information contained within these data are subject to required Federal safeguards and shall only be shared and/or used consistent with the Trade Secrets Act [18 U.S.C. 1905], the Privacy Act of 1974, as amended [5 U.S.C. 552a], the Freedom of Information Act [5 U.S.C. 552], the confidentiality provisions of the Food Security Act of 1985 [7 U.S.C. 2276], Section 1619 of the Food, Conservation, and Energy Act of 2008 [7 U.S.C. 8791], and other applicable Federal laws and implementing regulations, as well as with the confidentiality or non-disclosure provisions of any other agreement entered into between APHIS and a cooperator.

Different Serotypes of HPAI

- H5N8, found in Pacific flyway 2015, waterfowl very well adapted to this serotype
- H5N1 and H5N2, found in Mississippi and Missouri River Flyways
- H5N2 primary serotype in Midwest Breaks, very high mortality in poultry flocks (>90%)
- Virus mutates rapidly

Point Source vs. Lateral Spread

- Minnesota Turkeys – Point Source contaminations by wild waterfowl sources
- Iowa Layers – much lateral spread by human and vehicle vectors

Avian Influenza is Easy to Kill but highly Contagious

- High temperatures kill this virus - > 95 for 48 hours
- Simple strong disinfectants kill the virus – Chlorox solution
- Exposure to UV light
- So why did so many birds get this virus during Spring 2015?

Risk to Humans

- USDA indicates that the Risk to Human Health remains low with this particular strain of HPAI, it is different from the Asian strains
  - Does not get into eggs, and eggs are held until lab results are reported and then destroyed
  - All hens/turkeys are destroyed, no slaughter allowed of positive AI birds

Movement of Poultry Products

- In order to move product in and out of control zones, within and outside of the state in which the plant is located, permits are needed. Companies work directly with their state and APHIS.

- Example – Smart Chicken had several farms in Control Zones but none of their flocks broke with AI

Highest Risk Factors for Poultry Farmers

- Located in a Infected Zone
- High density of Corn Fields
- Open water/lakes frequented by waterfowl

Biosecurity vs. Biocontainment

- Biosecurity is protecting your farm, keeping all possible vectors of HPAI OUT!

- Biocontainment occurs once you have HPAI in your facility, keeping it in and from spreading to your neighbors

Vaccination

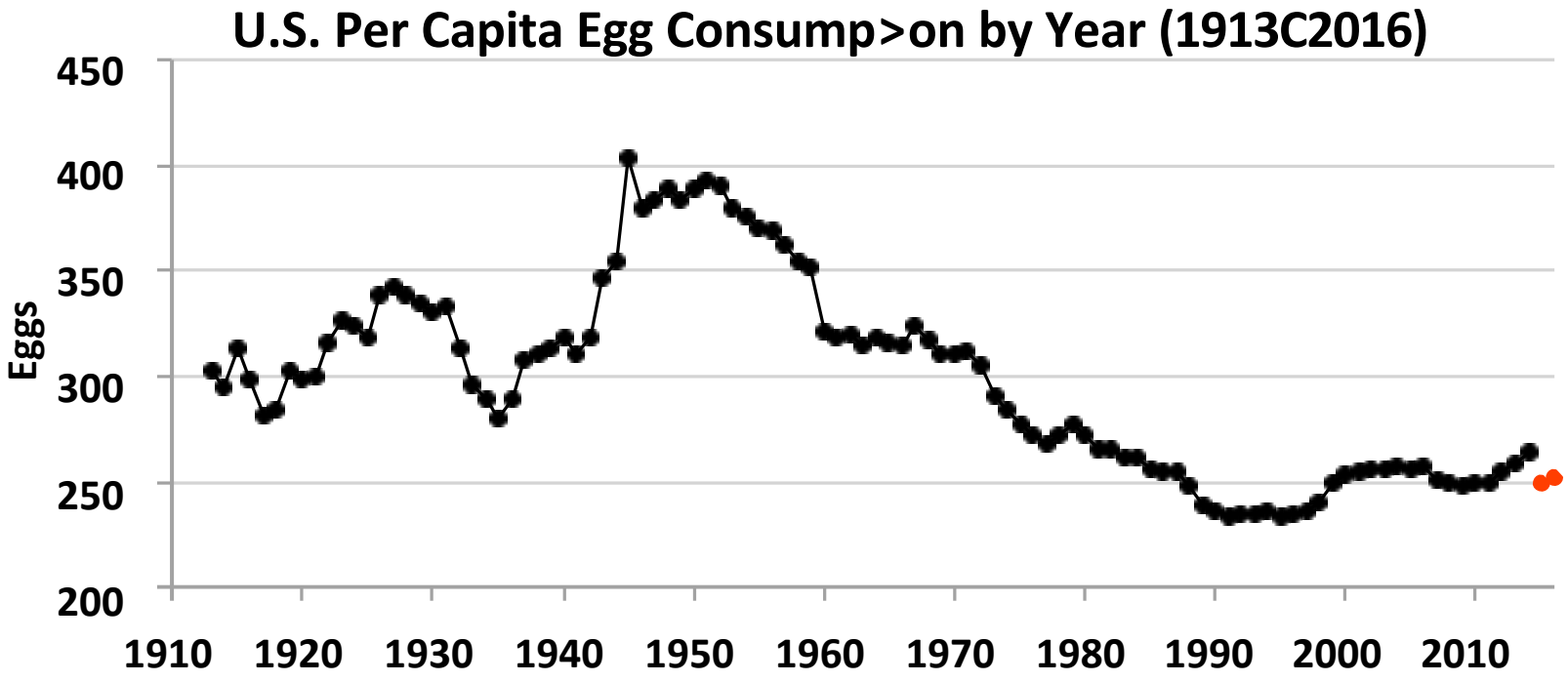
- Vaccine has been developed and tested for various serotypes including H5N2
- Has not been released by USDA due to several factors
  - Efficacy for a highly mutating Virus
  - Not a cure-all
  - Politics

Losers and Winners in the Egg Market

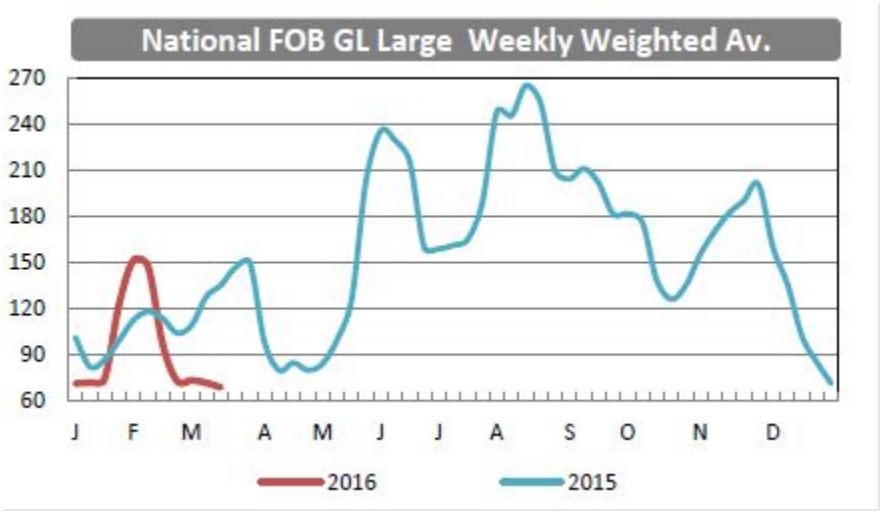
- Egg Processors with huge losses – Rembrandt (Iowa), Michael Foods (Nebraska), Sioux County Eggs, (Iowa), Sparboe (IA and MN)
  - 30% loss in liquid egg production caused a change in import law and imports of liquid eggs from Europe to U.S.
- Winner – Cal-Maine is the largest egg producer in US and had no flocks affects by AI, net income rose from $27.7 million to $143 million in 2015

Export Markets

- Politics Complicate the Situation
- Many bans on U.S. Poultry including broiler meat while breaks are primarily eggs and turkey
- Some countries accept compartmentalization/ regionalization for bans
- Any + tests for AI antibodies, including those from vaccine will trigger export bans



Source: USDA ERS


National FOB GL Large Weekly Weighted Av.
270
240
210
180
150
120
90
60
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M
A
M
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S
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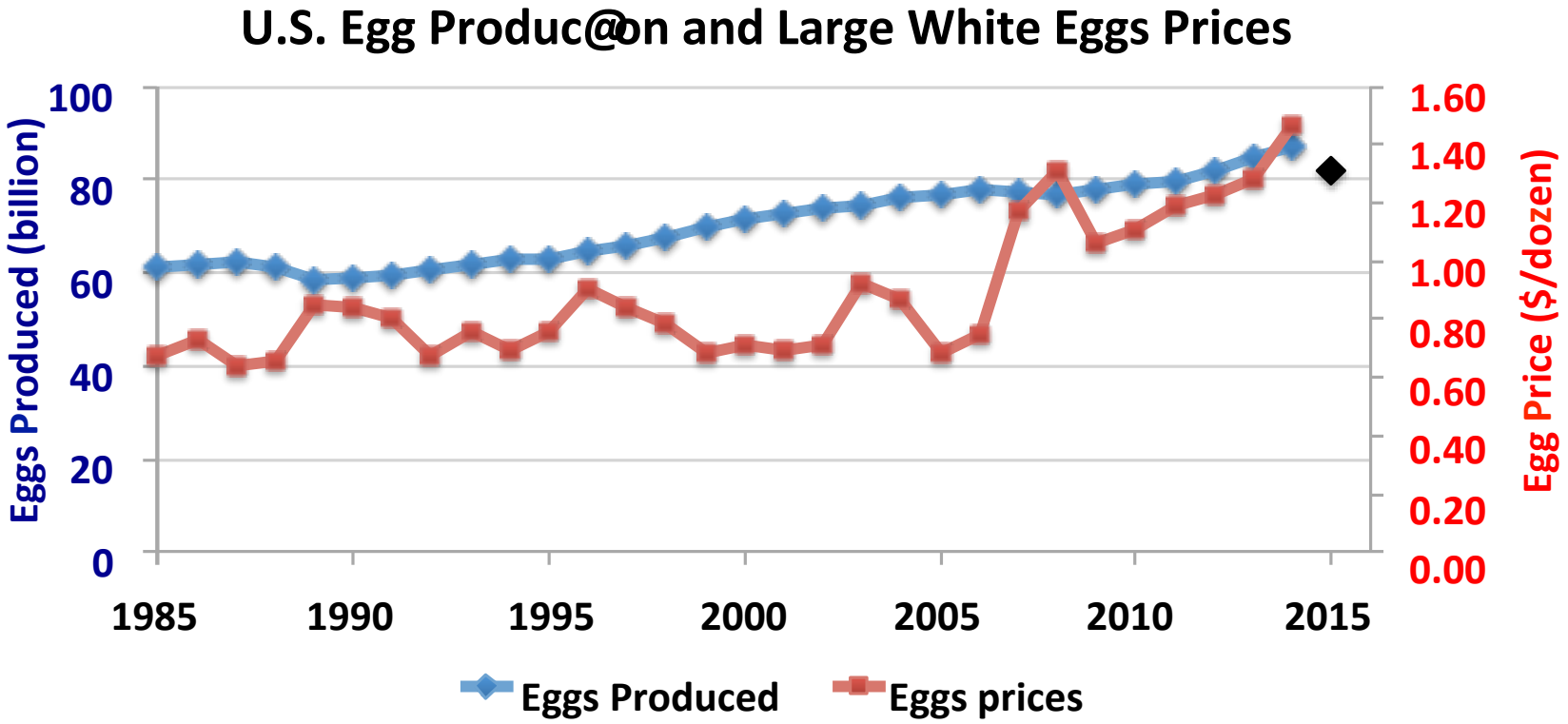
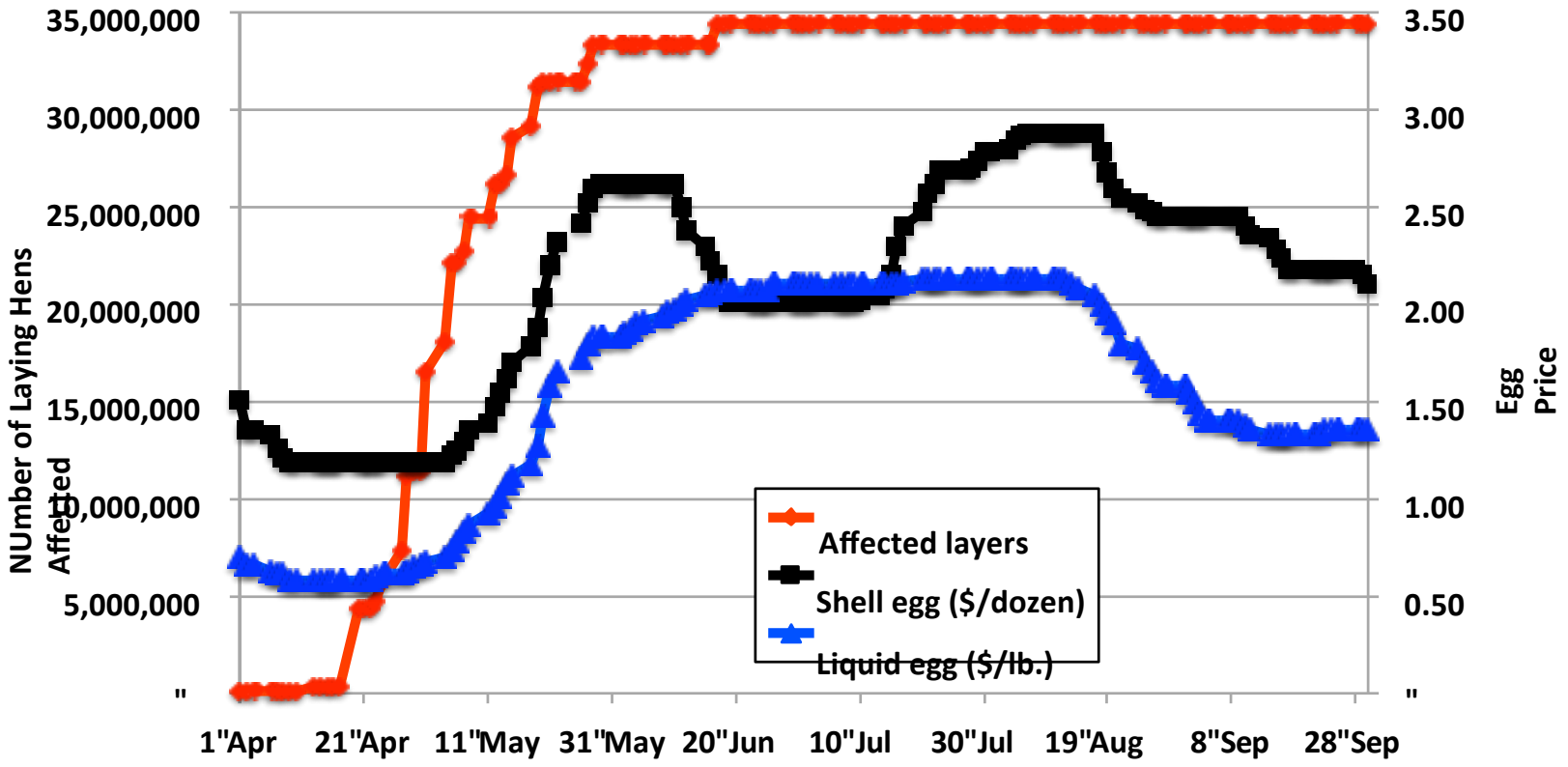
2016
2015



Projected year 2015 produc<on 6% lower than in 2014 (similar to years 2011–2012).

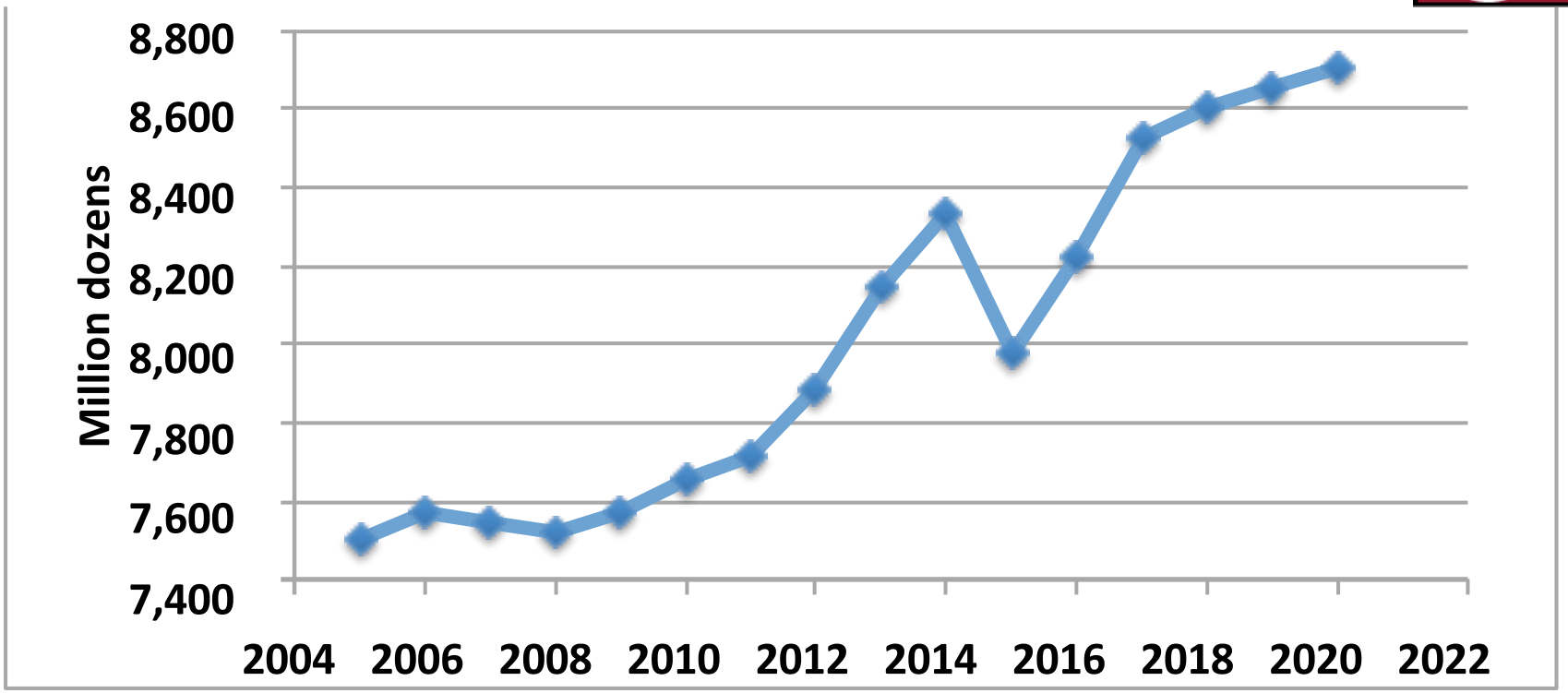
Sources: USDA NASS Chickens and Eggs and Urner Barry Midwest Prices

Impact on the shell and liquid egg prices



Prices Source is Urner Barry: Midwest LG White Eggs Delivered to the Store Door and Liquid Whole Unpasteurized Standard

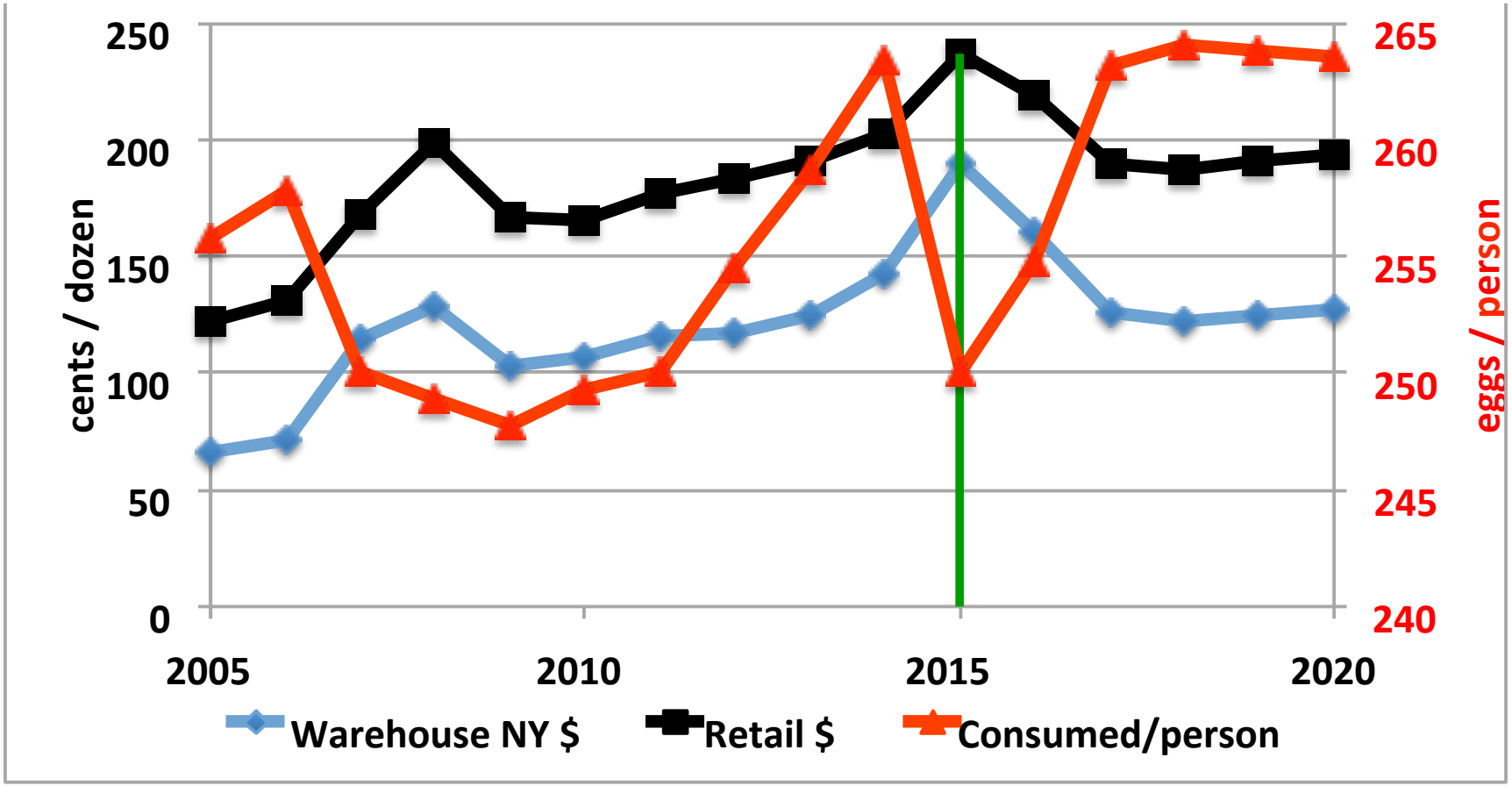
Production of all eggs (including hatching)



AI outbreak effect on supply is expected to con<nue well into the year 2016

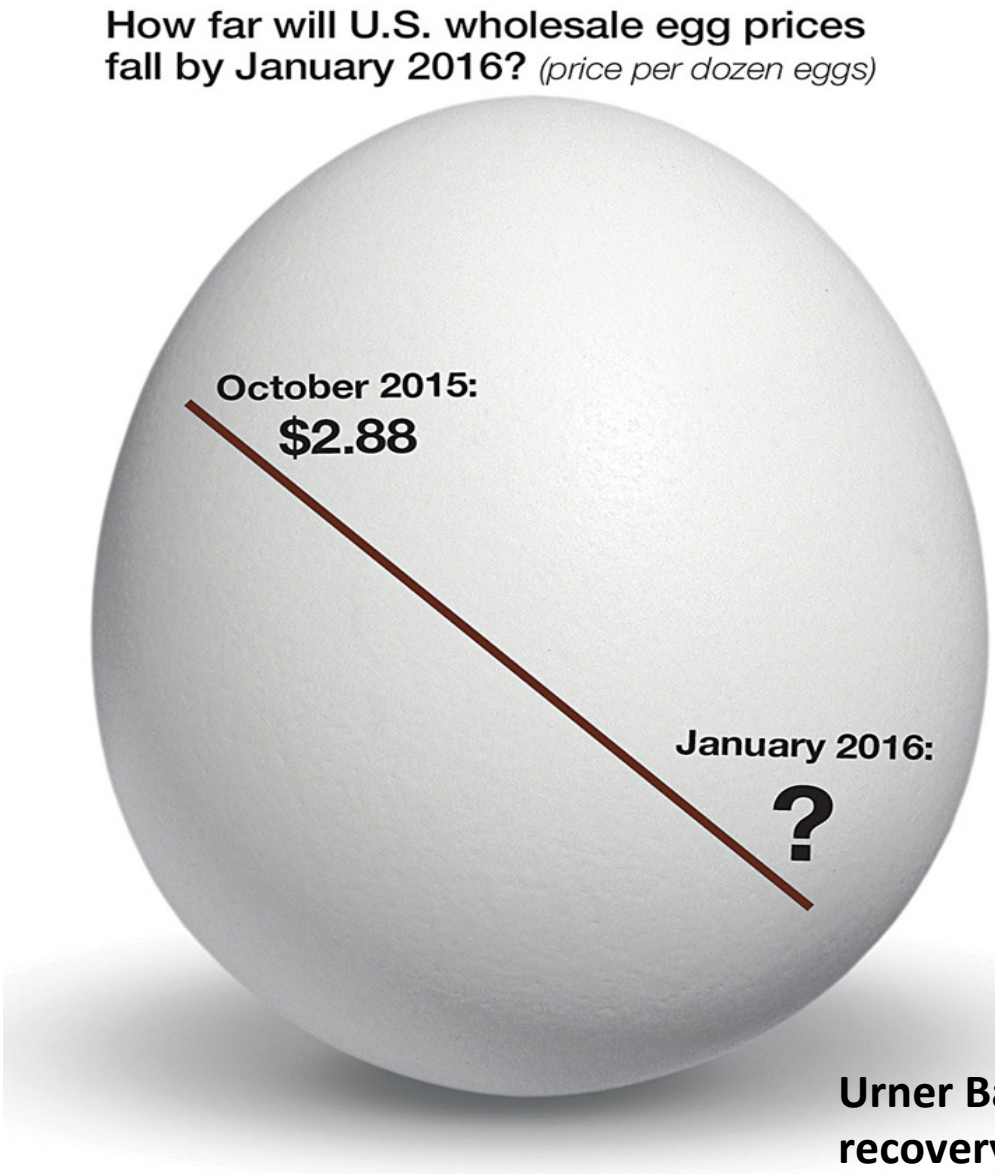
Source: Agricultural Markets and Policy, August 2015

Egg Prices and Consump2on



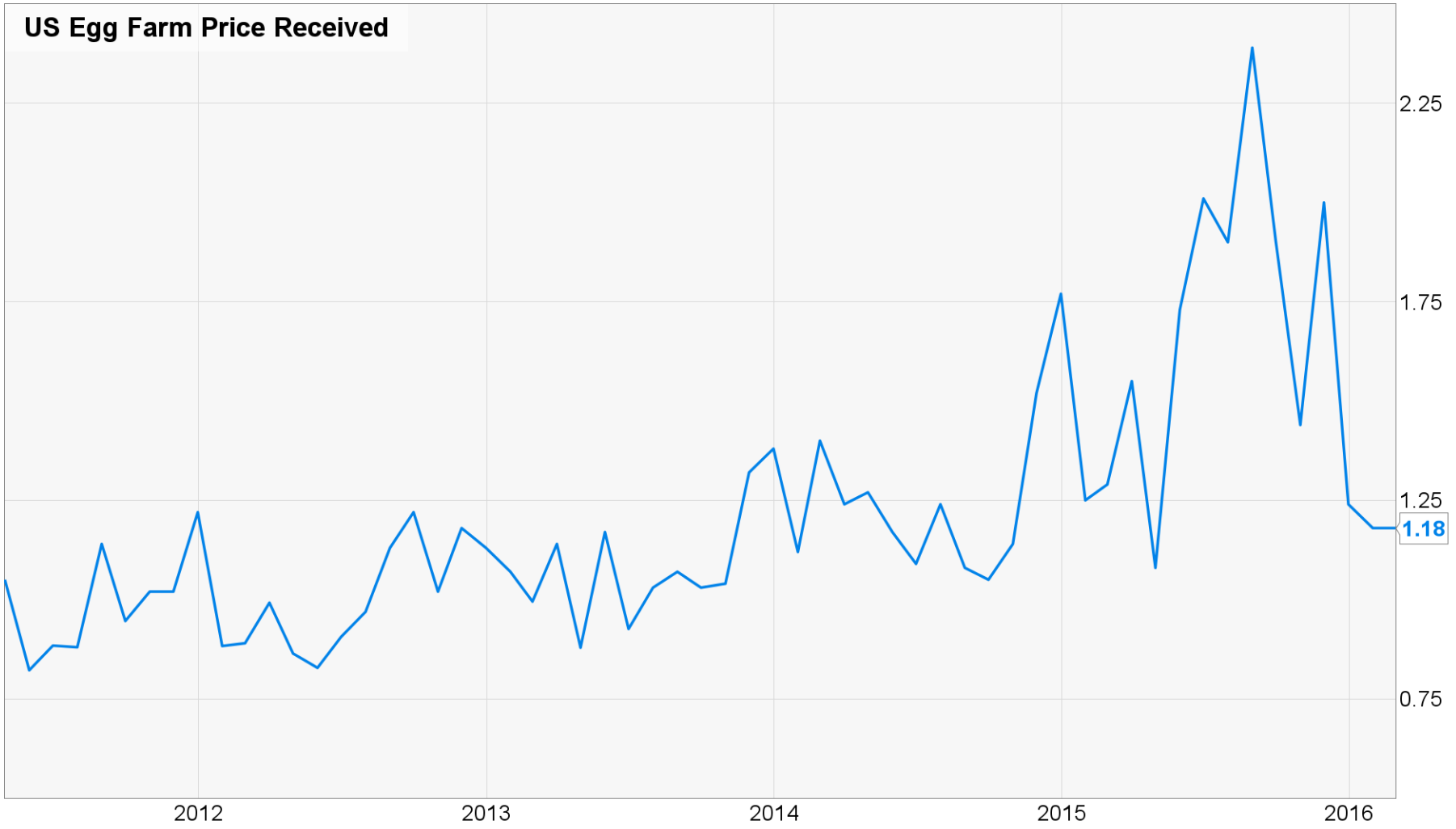
Warehouse price is: NY grade A large egg

Source: Agricultural Markets and Policy, August 2015



Note – good recovery of prices by March 2016

Urner Barry market reporter says projected recovery in hen numbers combined with lost exports may increase US egg supply enough to bring down egg prices.



Source: USDA

Apr 11 2016, 3:56PM EDT. Powered by YCHARTS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Preliminary numbers –1st year (value of eggs not produced)

- Associated economic loss is very large, some early es<mates are that almost 7.5 billion eggs (5.5 billion in IA) are not going to be produced, which value represent almost 750 million dollars at 1st processing (priced as liquid whole unpasteurized for breaking industry and delivered to the store door for shell egg industry).
- **This es2mate will really depend on the speed of the repopula2on (the faster the speed the lower the value of eggs not produced)**

Cost to the USDA

According to Dr. John Clifford, chief veterinary officer for APHIS:

- the H5N2 outbreak had killed more animals and cost more than any prior animal disease event in U.S. history
- this outbreak will cost the USDA probably somewhere in the neighborhood of $550 million
- USDA have paid, or are in the process of paying, $190 million in indemnity

Summary

- Tremendous losses to the egg and turkey industries and egg supply
- Likely to happen again
- Not harmful to human health at this time
- Biosecurity is paramount to limit spread of the disease in the poultry industry
- Poultry products are safe