

# Cockfighting:

## Playing chicken & gambling with potentially pandemic Avian Influenza & virulent Newcastle Disease

*An investigation into the adverse animal health & public health infectious disease impacts of the cruel, reckless, dangerous & illegal U.S. cockfighting industry*



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The [Red Jungle Fowl](#) is the Southeast Asian ancestor of all domestic chickens including cockfighting breeds. Note the white ear lobe which is a marker of pure-bred (non-hybrid) wild fowl.

Compared to the domestic egg or meat chicken or game fowl, the red junglefowl has a:

- Smaller adult body mass of ~1 kg in females and ~1.5 kg in males
- Brighter metallic feather coloration
- More horizontal body stance
- More developed pectoral (chest) muscles that permit flight

[Game fowl are taller, heavier, maintain a more vertical posture, have a wider chest, larger gluteal \(thigh\) muscles, smaller brains, and bigger bones compared to the Red Jungle Fowl.](#) Feather coloring in some game cock breeds is quite similar to its wild prototype.

## ***SUMMARY - Cock Fighting: playing chicken and gambling with potentially pandemic Avian Influenza and virulent Newcastle Disease***

### ***i - Overview***

This research summary is a scientific assessment of two major infectious disease threats that the cruel organized illegal cockfighting industry poses to animal and human health and well-being in the United States. There are many infectious disease risks to birds and people from illegal cockfighting (eg *Salmonella* and *Campylobacter* zoonotic bacteria; avian viruses such as Marek's disease and infectious bronchitis coronavirus), but we focus here on [the two most important transboundary epidemic-to-pandemic poultry diseases](#) caused by two similar, small, and extremely infectious RNA viruses: ***virulent Newcastle Disease (vND)*** and ***Highly Pathogenic Avian Influenza (HPAI, "bird flu") H5N1***.

Only vND and HPAI have the epidemic potential to spread widely and quickly and kill commercial poultry and even wild birds by the millions. They are arguably the two most important infectious diseases of domestic animals. Although caused by different viruses, these two diseases have similar clinical presentations and require laboratory tests to differentiate.

*Both vND and HPAI outbreaks are strongly linked epidemiologically to cockfighting activities either at fighting derbies or at game fowl farms where the birds are raised and trained.* While all vND and HPAI outbreaks or epidemics are *not* a direct result of cockfighting, the poor biosecurity and other high disease-risk practices of the cockfighting industry (eg bird smuggling, bird mixing at fights, hiding birds from surveillance or depopulation, underutilizing veterinary services) will always, at a minimum, prolong and worsen vND and HPIA outbreaks. The potential disease threat and economic damage from perhaps 25 million (M) cockfighting game fowl in the US asymmetrically puts all 9 billion broilers, 389 M layers, 217 M turkeys, and millions of backyard poultry and wild birds in our nation at some risk.

Veterinarians are legally required to report unusual animal disease events, especially those with high morbidity and mortality, to their State Veterinarian and the USDA Animal and Plant Health Inspection Service (APHIS). Since cockfighting is underground and unlawful, veterinary vigilance is undermined, so exotic diseases like vND and HPAI are more likely to invade and spread undetected. Further, cockfighters are reluctant to report suspected serious diseases like HPAI and vND for fear of loss of their valuable birds. Because of the high value of game cocks as breeders or fighters (up to two thousand dollars per bird), cockfighters are also disinclined to sacrifice their birds for disease control even when compensated, as valuable breeding lines and potential derby or gambling winnings are lost.

For example, in 2002, vND was first diagnosed in a pet parrot in southern California by a private avian practitioner. In hindsight, it was determined that the vND virus had been introduced from smuggled fighting cocks from Mexico weeks earlier. The virus was freely circulating among cockfighting farms (and killing game fowl) for several weeks, had already infiltrated commercial poultry operations unbeknownst to veterinary authorities, and even spilled over to pet birds by the time it was first detected.

***Stamping out:*** Millions of gamecocks die in the cock pit in involuntary blood sport combat every year. But bird misery is far-reaching when cockfighting introduces, spreads, perpetuates, or prolongs a vND or HPAI outbreak. This is because the only known way to control vND or HPAI is to rapidly "*stamp out*" the virus ie to "depopulate" any birds infected, exposed, or potentially exposed to the virus, whether pet birds, backyard flocks, or industrial poultry. Stamping out typically employs (1) asphyxiation with CO<sub>2</sub> gas; (2) suffocation with firefighting foam; or (3) ventilation shutdown (VSD) for large commercial

barns. In VSD, barns are closed, air inlets are sealed, fans are turned off, and heaters, steam, and/or CO2 gas are turned on. The poultry suffer a prolonged death and die from hyperthermia.

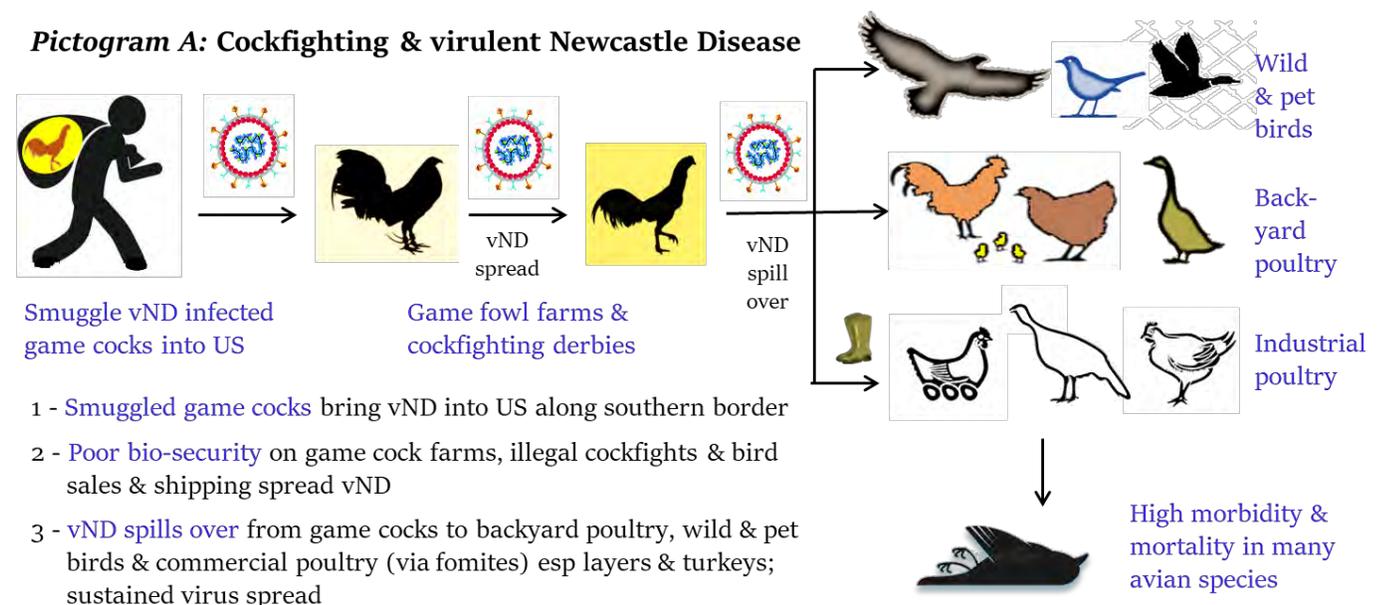
**Costs:** Both vND and HPAI have major economic impacts on poultry production so the consequences of vND and HPAI introduction or dispersal from cockfighting activity can be enormous. Consumer poultry product prices (eggs, meat) must increase with the culling of millions of poultry as the birds and their products (meat, eggs) cannot be sold or eaten. Three large vND epidemics in southern California over the past 50 years, mainly driven by cockfighting, resulted in 16.2 million domestic bird deaths or culls, mostly commercial poultry, at a total cost exceeding \$1 billion. The 2015 and current 2022 US HPAI outbreaks have caused the deaths of more than 100 million poultry (and counting) at a cost of several billion dollars.

**Spillover:** Both vND or HPAI viruses can infect and kill virtually every avian species, not just poultry, on a mass scale, from pet birds to [wild birds](#), with potentially grave ecological consequences for endangered bird species. HPAI (but not vND) also spills over to multiple mammalian species including ferrets, foxes, tigers, dogs, horses, and dolphins.

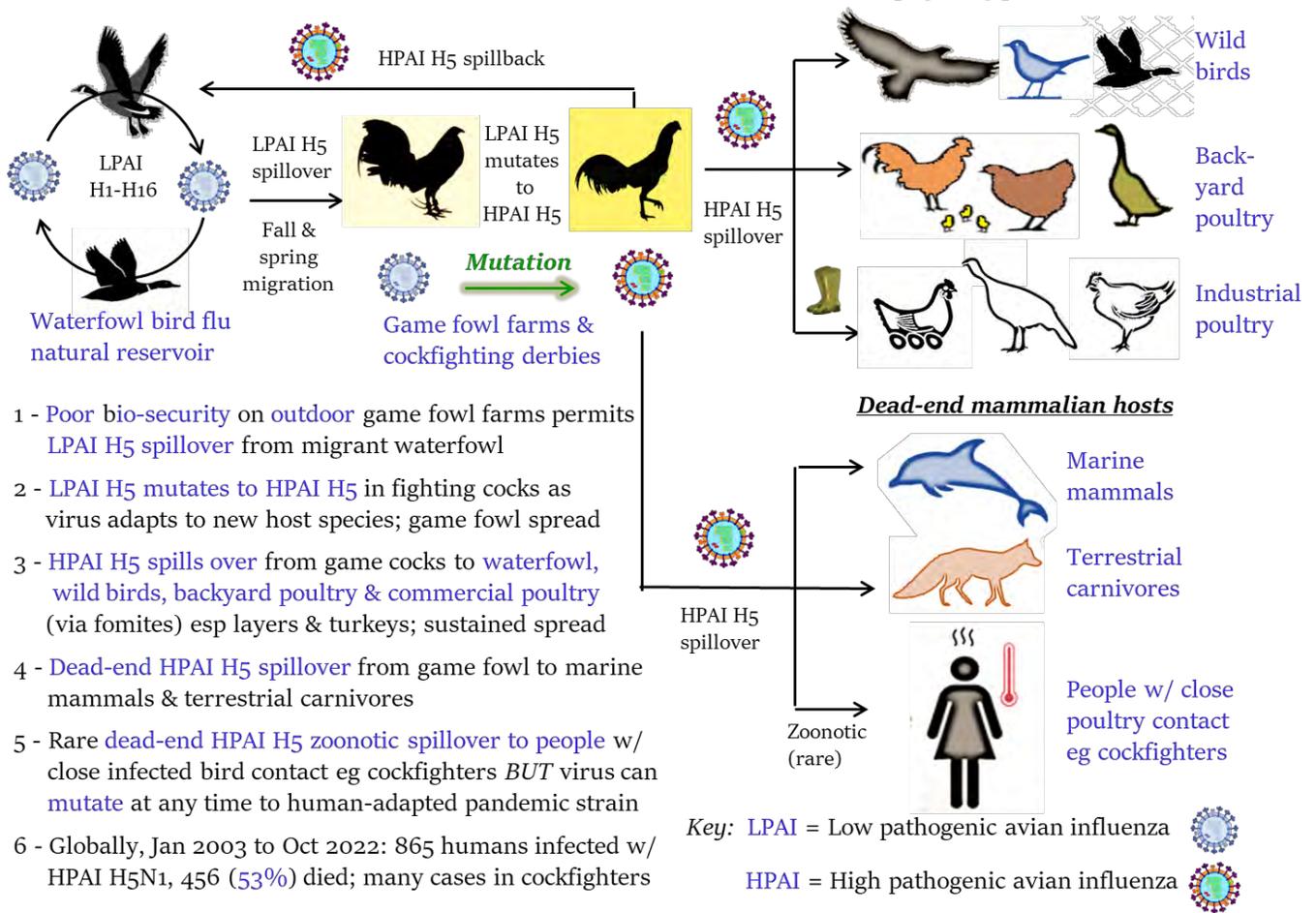
**Zoonotic risks:** Relatively infrequently so far, people are infected with HPAI when they have close contact with infected birds. For example, many cockfighters in Southeast Asia were infected with HPAI H5N1 in 2003-2006 ([Appendix 1](#)). According to the World Health Organization, [865 people in 21 countries \(including the US\) were infected with HPAI H5N1 since 2003](#), with 456 deaths for a 53% case fatality rate. The latest case was reported in April 2022 in a poultry worker from Colorado. There is no evidence of human-to-human HPAI spread thus far. However, *HPAI is a mutation-prone virus*, so a new variant human-adapted strain could emerge at any time resulting in wide-scale human-to-human transmission and possibly triggering a human bird flu pandemic that could infect millions of Americans.

## ii - Key findings

Cockfighting activities are unequivocally linked to HPAI and vND outbreaks. History tells us that cockfighting merits special consideration in animal and zoonotic disease control programs (Morris and Jackson 2005). [Pictogram A](#) summarizes the roles of cockfighting in vND outbreaks. [Pictograms B-1 and B-2](#) illustrate the roles of cockfighting in HPAI “bird flu” outbreaks. [Table 0](#) summarized these roles.

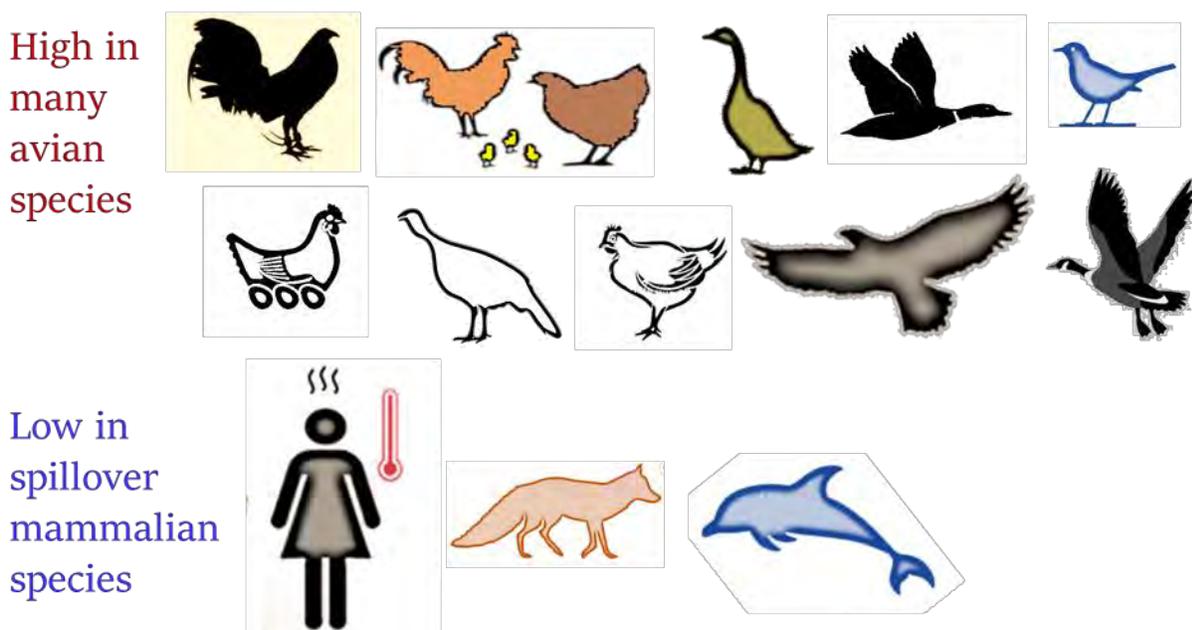


**Pictogram B-1: Cockfighting & “bird flu” HPAI H5N1**



- 1 - Poor bio-security on outdoor game fowl farms permits LPAI H5 spillover from migrant waterfowl
- 2 - LPAI H5 mutates to HPAI H5 in fighting cocks as virus adapts to new host species; game fowl spread
- 3 - HPAI H5 spills over from game cocks to waterfowl, wild birds, backyard poultry & commercial poultry (via fomites) esp layers & turkeys; sustained spread
- 4 - Dead-end HPAI H5 spillover from game fowl to marine mammals & terrestrial carnivores
- 5 - Rare dead-end HPAI H5 zoonotic spillover to people w/ close infected bird contact eg cockfighters BUT virus can mutate at any time to human-adapted pandemic strain
- 6 - Globally, Jan 2003 to Oct 2022: 865 humans infected w/ HPAI H5N1, 456 (53%) died; many cases in cockfighters

**Pictogram B-2: HPAI H5 morbidity & mortality**



**Table 0** - Comparison of Highly Pathogenic Avian Influenza (HPAI) & Virulent Newcastle Disease (vND) vis-à-vis Cockfighting (**yellow highlight red font**= important role of cockfighting)

<i>Characteristic</i>	<i>HPAI H5</i>	<i>vND</i>
<i>Very contagious small RNA virus</i>	Yes	Yes
<i>Hosts</i>	All birds + mammals (rare)	All birds
<i>Bird morbidity &amp; mortality?</i>	Very high (>90%)	Very high (>90%)
<i>Exotic to U.S.? OIE List A disease?</i>	Yes & yes	Yes & yes
<i>Virus introduced into US by cockfighters?</i>	No - introduced by migrating waterfowl	<b>Yes - fighting cocks smuggled from Mexico</b>
<i>Virus spread &amp; maintained by cock-fighting activities?</i>	<b>Yes - via fights, bird trading, selling, shipping &amp; poor farm &amp; fight bio-security</b>	<b>Yes - via fights, bird trading, selling, shipping &amp; poor farm &amp; fight bio-security</b>
<i>Bird-to-human spread as serious zoonotic disease?</i>	<b>Yes ~50% mortality in ~900 human cases world-wide over past 20 years</b>	No
<i>Cockfighting promotes bird-to-human infections?</i>	<b>Yes - via intimate bird-human contact</b>	Not applicable
<i>Virus with high mutation rate?</i>	<b>Yes - mutates to higher virulence when spreads from waterfowl to game cocks</b>	No
<i>Cockfighting promotes zoonotic virus mutation?</i>	<b>Yes - via intimate bird-human contact eg at fights</b>	Not applicable
<i>Cockfighting impedes disease control efforts?</i>	<b>Yes - cockfighters hide birds from surveillance &amp; avoid depopulation; may not self-report disease in their birds</b>	<b>Yes - cockfighters hide birds from surveillance &amp; avoid depopulation; may not self-report disease in their birds</b>
<i>Pandemic risk to people?</i>	<b>Yes ... when virus mutates</b>	No
<i>USDA response to outbreak or epidemic</i>	“Stamping out” = kill all infected & exposed birds	“Stamping out” = kill all infected & exposed birds
<i>Most recent US epidemic (no. poultry died or killed; no. depopulated flocks)</i>	<b>Southern California, 2018-2020 (1.2M; 485 flocks); outbreak started, spread &amp; maintained by cockfighting activities</b>	46 states, Dec 21-present (53M as of Dec 22 in 628 flocks; millions more birds will die in coming months; <b>cockfighting role not known</b> )
<i>Economic disaster if virus infects commercial poultry?</i>	Yes	Yes

### ***iii - Recommendations***

An irksome problem is that while cockfighting activity is illegal in the US and its territories and it is unlawful to possess birds for fighting, *it is not illegal to raise, own or sell cockfighting breeds*. This dilemma impedes law enforcement and judiciary action and allows cockfighters to “hide in plain sight” by falsely claiming they raise their birds for “show or exhibition”. It also allows them to use the US postal service [to ship their birds nationwide or internationally](#) by the thousands and to use legitimate government-subsidized poultry health programs like the National Poultry Improvement Plan to screen their flocks for disease. This quandary makes controlling, prosecuting, and punishing illegal cockfighting a challenge.

Not all persons who raise game bird breeds are cockfighters, but it is easy to identify those who do (**Figure A & Figure B**). As a major international supplier of game fowl fighting cocks and breeding stock to Southeast Asia and Latin America, the US contributes greatly to the global risk from HPAI and vND.

The following recommendations will limit the animal welfare and avian and zoonotic disease risks from cockfighting:

- 1 - *Vigorously enforce, prosecute, and punish persons who violate existing state and federal anti-cockfighting laws and statutes at all levels of law enforcement and the judiciary.*
- 2 - *Strengthen federal anti-cockfighting legislation.* For example, bipartisan legislation introduced in November 2022 ([Irby 2022](#)) into the US House of Representatives proposes to amend Section 26 of the Animal Welfare Act by:
  - Banning simulcasting and gambling on animal fights in the United States, no matter where the fights and broadcasts originate;
  - Halting shipment of mature roosters through the US mail; (the US mail is widely used for domestic and international transport of thousands of game fowl from US gamecock farms);
  - Creating a citizen suit provision to allow a private right of action against illegal animal fighters and ease the resource burden on federal agencies; and
  - Enhancing forfeiture provisions to include real property used in the commission of an animal fighting crime.
- 3 - *Improve local anti-cockfighting ordinances.* For example, in September 2018, the Los Angeles County Board of Supervisors in California [approved an ordinance to limit the keeping of roosters](#) in unincorporated areas of the county. This action was taken to curtail ongoing problems with illegal cockfighting and associated criminal activities, improve the quality of life for residents, and reduce complaints of noise and odor associated with keeping large numbers of roosters. No more than 25 roosters may be kept or maintained on any property which is sufficient to accommodate poultry enthusiasts who raise chickens in rural areas as a hobby. Importantly, keeping hens is not regulated. *Note:* The third large US vND outbreak began in Los Angeles County in May 2018 from cockfighting activity, just four months before ordinance passage.
- 4 - *Compel USDA APHIS to capture the epidemiologic risk of cockfighting in disease outbreaks.* The USDA APHIS (and the World Organization for Animal Health) should create a unique and separate category for premises with cockfighting birds, rather than pooling them with all “backyard poultry” in HPAI and vND disease control efforts as they currently do. This would better quantify avian disease and zoonotic infection risks created by cockfighting in spawning and propagating outbreaks, improve trace-back and trace-forward disease control actions, enhance post-outbreak risk factor analyses, and

improve disease risk management. History tells us that cockfighting merits special consideration in animal and zoonotic disease control as a major risk factor (Morris and Jackson 2005).

- 5 - *Create the best possible civic and legal conditions for law enforcement, humane organizations, the judiciary, and society at large to take punitive and preventive actions against illegal cockfighting.*
- 6 - *Educate and inform the public on the cruelty, dangers, and high costs of illegal cockfighting, including zoonotic disease risks and inflated food prices, to make this abusive industry less socially and culturally acceptable to Americans.*
- 7 - *Close or shrink the loophole that allows cockfighters “[to hide in plain sight](#)” by making it difficult or illegal to raise large numbers of cockfighting roosters eg the 2018 [Los Angeles rooster ordinance](#).*

#### ***iv - Methodology***

We carefully reviewed more than 100 peer-reviewed scientific publications on virulent Newcastle Disease and Highly Pathogenic Avian Influenza, focusing on cockfighting impacts on these two diseases. We also reviewed the “grey literature” consisting of numerous USDA, CDC, FAO, OIE, and USGS government or NGO reports and websites on vND and HPAI outbreaks. Finally, we identified media reports from across the globe on cockfighting liability in avian and zoonotic disease occurrence.

#### ***v - Primary authors***

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***vi - Acknowledgments:*** Critical contributions, edits, and suggestions made to this report by Wayne Pacelle are recognized and gratefully appreciated by the authors.

## **REPORT - Cock Fighting: Playing chicken and gambling with potentially pandemic Avian Influenza and Virulent Newcastle Disease**

### ***I - Cockfighting 101***

Cockfighting features staged one-on-one combat, often to the death, between two fighting roosters fitted with steel knives or gaffs on their legs. The type of fight is defined by the style of the weapons used - eg a long-knife fight, short-knife fight, or a gaff. The roosters battle in a pit with seating around the fighting stage. The handlers agitate the birds in the run-up to the fight by placing them beak to beak, enraging them, before they are then released into the enclosed cock pit. The roosters fight until the referee calls the fight, typically when one combatant is unable to continue due to injury or exhaustion or refuses to fight.

The weeks-long training period before the fight is called “the keep” and the birds are typically injected with vitamins, stimulants, and even blood-clotting drugs. Fighting cock breeds are characterized by their vigor and their ability to keep fighting even after enduring serious pain and injury.

Cockfights may be held in the backyard of a private house, on smooth open ground, or even in large purpose-built arenas. Cockfighters pay an entry fee for the fight and may enter several birds into the competition. It may be a three-cock derby, a five-cock derby, or some other entry requirement. The cockfighter whose birds win the greatest number of fights gets the largest share of the pot, with the rest of the money reserved for the house. Spectators make “side bets,” putting their money on one of the combatants in a fight. Worldwide, cockfighting is a multi-billion-dollar industry, with millions of birds conscripted into the multi-national enterprise. Cockfighting is considered a traditional sport, a gambling venue, a hobby, and a business by some. [Cockfights are illegal in most countries \(including the US and all its territories\)](#) based on opposition to gambling, animal cruelty, and concerns about the general climate of crime and lawlessness in its fabric.

Game fowl heritage can be traced to the Red Jungle Fowl of Southeast Asia, the ancestor of all domesticated chickens. They probably resemble their wild ancestor more than any other domestic chicken breed. Gamecocks with bloodlines from winning birds may go for as much as \$2,000 or \$2,500 a bird.

The housing of game fowl for fighting contrasts dramatically with the housing of laying hens or broiler birds used in agriculture. Fighting roosters are typically tethered to barrels or A-frame huts in large yards, with the structure allowing modest shelter from sun or precipitation. Flocks range from a few birds in a small backyard to thousands in large elaborate urban or rural commercial enterprises. Old horse barns are sometimes converted to raise game cocks. The total U.S. national game fowl flock consists of perhaps 24 million birds of which California’s game fowl industry represents 33-40%, according to some sources. Game fowl numbers in California range from 3-8 million birds held by 50,000-60,000 owners (Allen 2013). Owners belong to many racial and ethnic groups, including Mexicans, other Central and South Americans, Caucasians, Filipinos, Vietnamese, Thai, Cuban, Hmong, Chinese, and others. The [United Gamefowl Breeders Association](#), a national front group for cockfighters, claims 15,000 game fowl breeders and 150,000 game fowl owners.

Game fowl are readily distinguishable from roosters of commercial broiler (meat), commercial layer (egg), backyard heritage, or fancy chicken breeds by their physical appearance as well as their dispositions (**Figure A**). Compared to non-game fowl, cockfighting roosters have a strong backbone and musculature, close-fitting plumage, hard feathers, a deep chest, and widely spaced legs with strong claws. The shaft of

game fowl feathers is tough, and the feathers themselves are narrow and short. The barbs make a tight web. They have little feather fluff, the downy part of the feather near the skin.

Game fowl breeding season begins in January and lasts for about 3 months. Breeding game fowl are often kept as “trios,” a group of one rooster and two hens maintained in a separate housing. The chicks are raised for about a year before they become breeding stock. Fighting cocks are often culled breeders that are sold through local dealers or directly at local swap meets. The fighting season, commonly referred to as “playing,” runs for about eight months from Thanksgiving in November until the following August in the United States (Allen 2013). Poultry molt (shed) their feathers each year for eight to twelve weeks from July to November, a period when they do not like to be handled and are not often moved. Cockfighting usually ceases during this time.

Fighting birds are often transported long distances for matches and there is frequent trading of birds among breeders and trainers. Game fowl are commonly taken into and out of the United States, both legally and illegally, for breeding and/or cock fighting events. Please see *Figures A through Figure G*

## ***II - Social costs of cockfighting***

Cockfighting is linked to many [social pathologies](#) including [money laundering](#), [illegal drug sales, and use, gambling and addiction](#), [violence](#), tax evasion, prostitution, [illegal firearms](#) (since large sums of money are at play), and [gang activity](#) (*Box 0*). A cockfighting derby (where hundreds of people may attend and bet on dozens of fights involving hundreds of birds) can entail the exchange of thousands of dollars in gambling wagers. Unlike legalized casino gambling, the government cannot monitor and collect income taxes from gambling on illegal cockfighting. Thus, cockfighting is both a major animal welfare concern and a doorway to other illicit criminal and black-market activities.

While cockfighting is illegal in the US and its territories and it is illegal to possess birds for fighting, *it is not illegal to raise and sell cockfighting breeds*, which are readily identifiable by their striking physical appearance, heavy musculature, colorful feathering, and aggressive behavior (*Figure A*). The description of the birds as “breeding stock” is a charade, meant to evade prosecution for possession of fighting animals. In short, cockfighters “*hide in plain sight*.” The market for show birds is tiny compared with the millions of birds raised for cockfighting by known enthusiasts for the blood sport. These birds will never attend a poultry show or state or county fair exhibition.

Game fowl farms that breed, raise, and sell birds for domestic or international cockfighting markets are also easily identifiable by the game fowl breeds present, the predominance of roosters, persistent crowing, bird housing, and training and management regimens (*Table 1; Figure B*). Mature fighting cocks for breeding in the US are usually co-caged with two females (a “trio” breeding unit). Non-breeding roosters are individually tethered to small wooden A-frame teepees or plastic barrel shelters. Mature fighting cocks also often have their combs and wattles amputated (“dubbed”), as these fleshy appendages are a disadvantage in a cockfight as a source of blood loss or a point to be grabbed by the opponent (*Figure A, lower panel*). Thus, game fowl farms are readily distinguishable from backyard poultry farms that raise birds for show and exhibition, pleasure, meat or eggs by breeds, management, design, paraphernalia, and sex ratios on the farms.



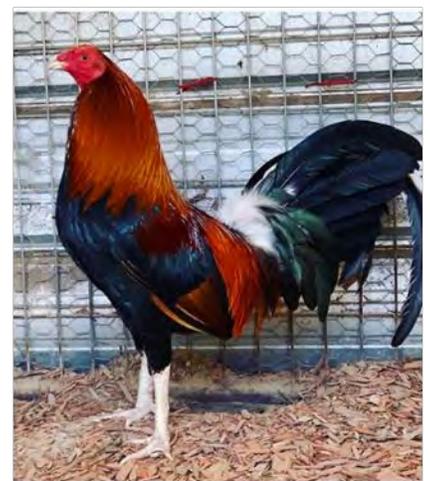
Cornish-cross commercial broiler    White leghorn commercial layers in battery cage



Kelso



Hatch



RoundHead



Claret rooster, un-dubbed ie natural comb & wattles intact



Claret rooster - dubbed ie comb & wattles amputated in preparation for cock fight

**Figure A** - Fighting game cock breed (eg Kelso, Hatch, Roundhead, Claret) appearance & aggressive behavior is completely different from commercial or back-yard chickens raised for meat or eggs



**Figure B** - Fighting game cock farms (“game fowl farms”) are readily identifiable and designed completely different from backyard farms raising birds for eggs or meat. The roosters must be caged separately or tethered, or else the birds will likely fight to the death due to their highly aggressive natures.





*Figure C* - Assortment of knives and gaffes used in cockfighting



*Figure D* - An organized cockfight takes advantage of the natural instincts of roosters to briefly fight over access to mates or feed. However, an organized cockfight escalates the encounter from simply deciding non-lethal dominance of one rooster over another, to an exaggerated lethal armed prize fight through:

- selective breeding, nutrition, training, surgical mutilation eg dubbing of combs and wattles
- use of steroids, amphetamines and other performance enhancing drugs and
- weaponry ie metal gaffs or knives attached to their spurs

On occasion, cockfighting roosters have killed their trainers or spectators.



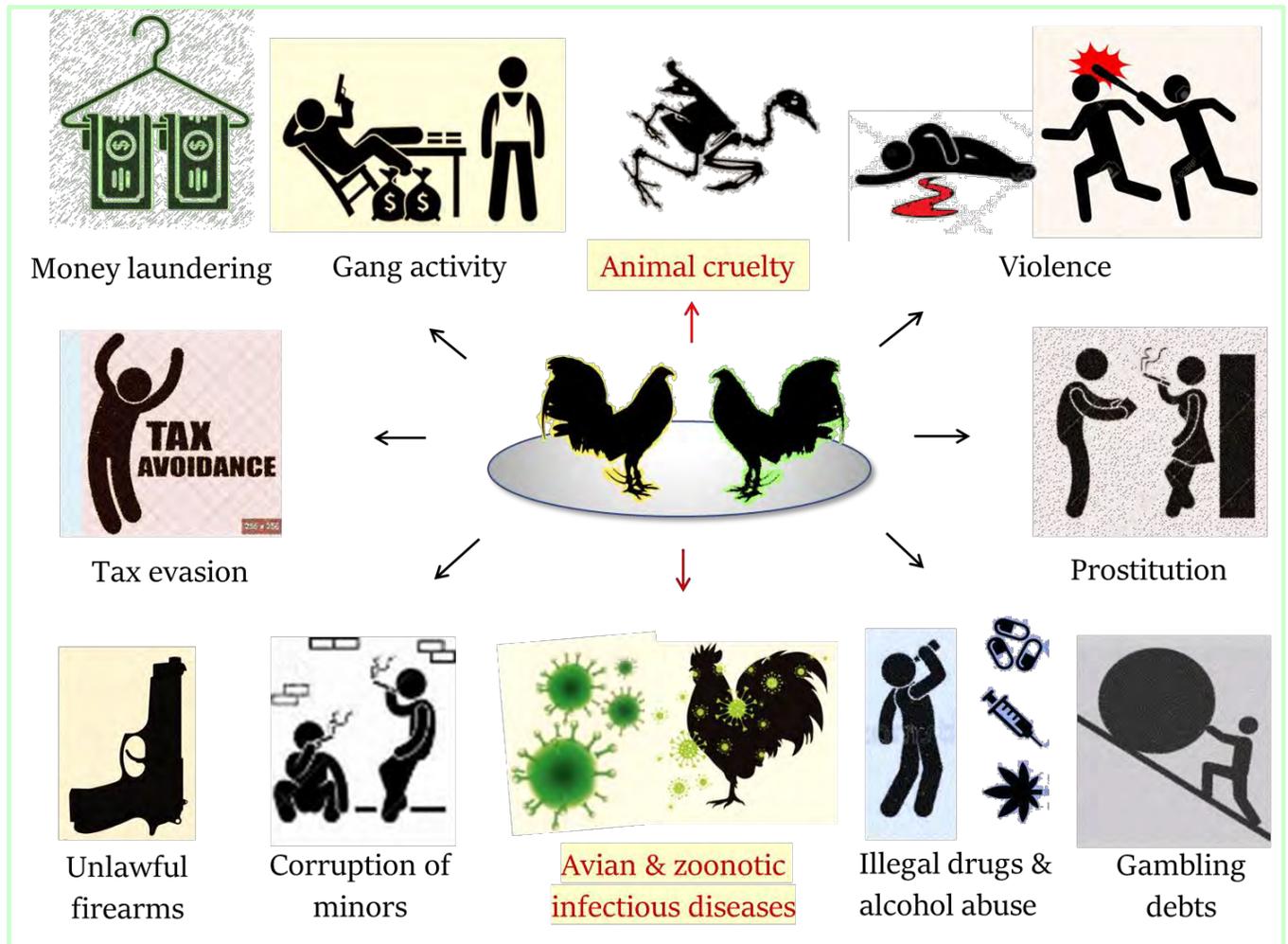
**Figure E** - It is not uncommon for a cockfighter to suck fluids out of a dying bird's airways mid-bout to extend the fight, greatly increasing their risk of a human avian influenza infection. In Thailand in 2004, a human avian influenza case occurred in a young man "...who had very close contact to fighting cocks by helping to clear up the mucus secretion from the throat of the cock during the fighting game by using his mouth"



**Figure F** - Rooster blood, mucus, urine, feces and other secretions or excretions at cockfights may contain billions of infectious virulent Newcastle disease or highly pathogenic avian influenza viruses



**Figure G** - Cockfighting arena in Puerto Rico, 2019. Large crowds provide great potential for human exposure to sick bird viruses including zoonotic avian influenza.



**Box 0 - Cockfighting is both a serious crime and a disease threat.** Human cruelty to animals is the root of cockfighting but several other harmful bio-socio-pathological sequelae follow from this blood sport. We focus here on the serious avian and zoonotic infectious disease risks arising from cockfighting.

### III - Cockfighting and infectious disease risks

Most infectious diseases of domestic or confined animals are introduced and spread by human movement of infected animals, infectious-agent-contaminated animal products or excretions (eg meat, eggs, and feces), or inanimate fomites (eg contaminated vehicles, clothing, or feed). Game fowl are a high-risk group as disease vectors and infection reservoirs because: (1) they move (and are traded) more widely than other birds; (2) are deliberately mixed under stressful fighting conditions; (3) are usually housed outdoors under low biosecurity (contrasting with commercial poultry); and (4) employ husbandry practices conducive to disease spread between birds and between birds and owners for zoonotic diseases (Morris & Jackson 2005).

Cockfighting is particularly dangerous to bird health where: (1) game fowl are raised or fought near large commercial poultry populations or aviaries or (2) poultry farm workers also participate in cockfighting activities as in southern California. Concerns about disease spread are particularly high during the cockfighting season from Thanksgiving Day until the following August (Allen 2013). Game fowl may be transported and moved frequently over long distances putting these birds at increased risk of contracting

or spreading an exotic disease. Thus, cockfighting requires special consideration in avian/zoonotic disease control programs as a major risk factor (Morris & Jackson 2005). *Unfortunately, such special consideration is lacking in USDA APHIS (the federal agency charged with animal disease control) and in most state and territorial agriculture departments;* <https://www.pacificislandtimes.com/post/aw-underground-cockfighters-protected-by-agriculture-officer>

Cockfights are gathering places for highly stressed, immune-suppressed birds from many different enterprises that engage in close combat, with open wounds and body fluids, secretions, or excretion (eg blood, saliva, mucus, feces, urine). The exchanges of respiration and bodily fluids are an inevitable result of fights (*Figure H*). Breeders sell birds to many customers. Hundreds of people may attend cockfights. These represent near-ideal conditions, from a pathogen's ecological viewpoint, to find a new animal or human host (for zoonotic diseases) to infect, reproduce, and disseminate. Cockfighting enthusiasts, including both those who rear and train the birds directly and those who attend matches and/or wager on their outcomes, can all function as mechanical disease vectors and dispersal agents. In addition, cockfights may be attended by poultry barn workers who may inadvertently infect commercial flocks from infectious excreta on shoes, clothing, or vehicles.

*There are two serious and similar poultry diseases, both caused by extremely infectious small RNA viruses, that are clearly and unequivocally linked to cockfighting activities: **virulent Newcastle Disease (vND**, formerly called Exotic Newcastle Disease) and **Highly Pathogenic Avian Influenza (HPAI) H5 and H7**. Both vND and HPAI are internationally reportable to the World Organization of Animal Health (WOAH) and on their [List A](#):*

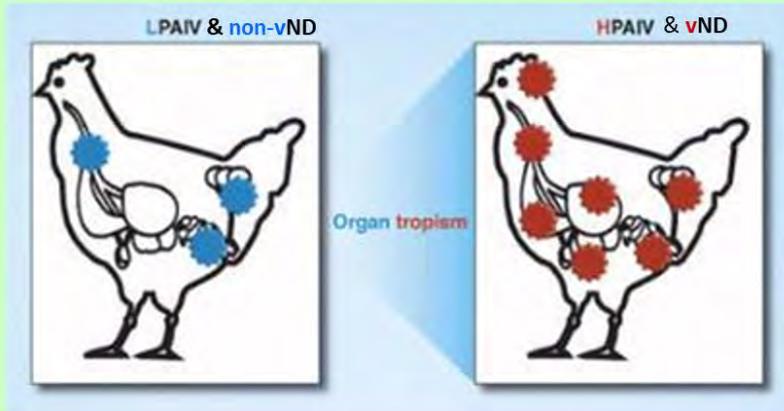
“Transmissible diseases that have the potential for very serious and rapid spread, irrespective of national borders, that are of serious socio-economic or public health consequence and that are of major importance in the international trade of animals and animal products.”

Both HPAI and vND are considered “foreign animal diseases” exotic to the U.S. Both diseases have the potential to result in mass-kill orders for poultry houses that shows signs of infection. Since both diseases are continually present worldwide, vigilant surveillance and biosecurity are needed to prevent a devastating outbreak among poultry flocks.

HPAI and vND kill millions of domestic poultry, pet birds, and wild birds globally every year, as these viruses infect and kill most bird species and genera with abandon. *It is now generally presumed that all bird species are susceptible to the replication, shedding, and transmission of vND* (Ayala et al 2020). HPAI has a similar broad avian host range biased towards migratory waterfowl and poultry and has recently also spilled over to humans and other mammals as *dead-end hosts*. *Note: A dead-end host is one that generally does not transmit the virus to a new host. In contrast, a permissive (or propagating) host can transmit the virus to a new host, thus maintaining the chain of transmission.*

Both viruses cause severe highly contagious, acute often fatal febrile systemic disease of the respiratory, digestive, reproductive, and nervous systems of birds. Both diseases are endemic in most of Asia, Latin America, and Africa that sporadically foray into Western Europe and North America. The two diseases are clinically indistinguishable. The common colloquial name for avian influenza is “Fowl Plague,” while that of vND is “Pseudo-Fowl Plague.” Please see *Figures I* and *Figure J*.

### Box 1 - Avian influenza & Newcastle disease viruses vary in virulence



*Abbreviations:* LPAIV = low pathogenicity avian influenza virus  
HPAIV = high pathogenicity avian influenza virus  
vND = virulent Newcastle Disease

*Definition:* Tropism = ability of virus to infect a host tissue

**Left frame:** For LPAIV & non-virulent ND, virus replication is limited to the gastro-intestinal (GI) tract and respiratory tract mucosa, causing limited mild infections.

**Right frame:** For HPAIV & vND, the viruses replicate rapidly in virtually all body tissues leading to rapid onset of fatal systemic disease. Nervous, GI, respiratory and reproductive system signs are severe for both HPAIV and vND.

**Mechanism:** Furin is a ubiquitous proteolytic enzyme (ie breaks down proteins) of humans and animals. Many viral proteins need furin cleavage to become active. A mutation producing a furin cleavage site in the HPAIV Hemagglutinin H5 protein drives enhanced virulence. Likewise, furin cleavage of the vND Hemagglutinin-Neuraminidase (HN) protein drives severe clinical disease. SARS-CoV-2 has a furin cleavage site in its spike protein which contributes greatly to COVID-19 pathogenicity.

Historically vND and HPAIV viruses have not become endemic (permanently established) in poultry populations of countries with developed veterinary infrastructure such as the U.S. or Europe. Neither vND nor HPAIV is normally present in U.S. domestic poultry or pet birds. When vND or HPAIV cases or outbreaks do occur, there is typically a rapid (and very expensive) emergency Federal and, State disease control response whose goal is disease eradication. The USDA's Animal and Health Inspection Service (APHIS) is charged with directing the response to vND and HPAIV outbreaks in the US. The standard response to a vND or HPAIV introduction in domestic poultry or pet birds is quarantine, stoppage of all bird movements, and "stamping out" (ie mass slaughter and euthanasia) of all infected, diseased, and potentially exposed birds and flocks. This is because both vND and HPAIV can and do cause tremendous damage to commercial and backyard poultry (eg flock morbidity and mortality can approach 100%), *leading to egg or meat shortages, higher food prices, trade embargoes, or in the case of some strains of HPAIV, serious human zoonotic disease risk. The vND and HPAIV viruses are probably the two most economically significant domestic animal diseases worldwide.*

During a vND or HPAIV outbreak, many disease response activities - such as epidemiology, surveillance, biosecurity, quarantine and movement control, and depopulation - must occur in a deliberate and coordinated fashion (**Box 2**). Rapid depopulation of infected poultry is critical to halt virus transmission and is prioritized for vND and HPAIV (USDA 2017). Thus, USDA APHIS' primary response strategy to a vND or HPAIV outbreak is rapid stamping out. Implementation of effective biosecurity measures is also critical to control and contain the virus.

Poultry vaccines against HPAIV H5 exist but they were not used in US bird flu outbreaks in 2014-2015, 2016, 2017 nor the current 2022 epidemic. There are three US-licensed H5N1 poultry vaccines (Ceva, Zoetis, and Merck) but none are USDA-approved for domestic use even though they could severely limit the death toll of mass culling. This is because they would interfere with the global poultry trade.

Existing HPAI H5N1 vaccines:

- Are considered less likely to successfully eradicate the bird flu virus than culling
- Create the dilemma of differentiating (natural) infection from vaccination (the so-called “DIVA” problem). Typically, poultry product exports are not permitted from nations or regions where vaccination is utilized. (The US exports 18% of its poultry products). Bird flu vaccines are used primarily in countries where bird flu is endemic and which have little international poultry trade.
- May promote virus mutation from evolutionary selection pressure so their use be counter-productive in the long run
- Require a minimum of two to four weeks to provide immuno-protection which could be too lengthy to be effective against a fast-spreading virus such as HPAI H5
- Will offer less protection against future strains due to the rapidly evolving nature of the HPIA virus.

An emergency HPAI vaccination strategy could be considered by APHIS if an HPAI epidemic outpaces stamping-out resources or if other factors direct the response away from a stamping-out alone strategy. *The ongoing 2021-22 US HPAI US epidemic may be the first to outpace the stamping-out approach as described in Section V.* Mexico, Britain, and some European countries started vaccinating poultry against HPAI H5N1 in Fall 2022 as their stamping-out strategy has failed to stop the epidemic viral spread.

Vaccines against non-virulent Newcastle Disease are used routinely in the poultry production sector but are not used in virulent Newcastle Disease outbreaks.

### **Box 2 - On farm HPAI & vND outbreak control: 4Ds + R**

- 1 - **Diagnose** HPAI or vND
- 2 - **Depopulate** infected & nearby exposed flocks
  - Market-value based bird owner compensation by USDA
  - “Euthanasia”
    - CO2 asphyxiation for layers
    - Firefighter foam suffocation for birds on ground eg broilers & pullets
    - Ventilation shutdown (w/ or w/o heat or CO2): cut off airflow & heat barns to 104 °F until heatstroke death
- 3 - **Dispose** of dead birds
  - Compost (most common)
  - Landfill (expensive)
  - Incinerate (expensive)
  - Bury on site (rare due to environmental concerns)
- 4 - **Decontaminate** premise
- 5 - **Repopulate** after several weeks if test negative for virus





**Figure H** - Cockfighting as blood sport. There is no way to hide or avoid the cruel bloody nature of organized cockfighting, which almost always results in the death of one or both birds, even the “winner”. Blood is highly infectious for vND and HPAI if from an infected bird.



**Figure I** - Chickens sick with virulent Newcastle disease virus; See also this ten-minute video <https://www.youtube.com/watch?v=htCZPsgBMjU>



**Figure J** - Chickens, turkeys and wild birds sick, dying or dead from highly pathogenic avian influenza H5N1 virus. At least 200 bald eagles died from HPAI H5N1 in 2022.

See also this eight-minute video of poultry infected with HPAI H5N1

<https://www.youtube.com/watch?v=Cr9kA0xi4gk>

or this three-minute video

<https://www.youtube.com/watch?v=F7f5fir0QZO>

### ***The cockfighting industry launches disease outbreaks & impedes disease control efforts***

Cockfighting activity is frequently linked to the introduction of vND into the US along the southern border (**Table 2**). Migrating waterfowl can easily infect low bio-security game fowl housed outdoors along flyways. Cockfighting will always, at a minimum, prolong and worsen vND and HPAI outbreaks. Cockfighting activity generates disease risks before and during outbreaks (See also **Box 6** and **Box 7**).

#### ***Pre-outbreak risks***

- ***Poor biosecurity on game fowl farms and at cockfighting derbies.*** Game fowl farms are highly variable. Flocks range from a few backyard birds to thousands of birds in large elaborate commercial enterprises. Larger flocks that introduce new birds and have more human traffic are at higher risk of experiencing a disease outbreak.

Game fowl are usually housed outdoors (**Figure B**) allowing interaction with wild birds that could infect them with LPAI or HPAI bird flu viruses. Large game fowl farms often hire caretakers to look after the birds along with the owners. Game fowl owners may also rent small portions of a larger facility to other cockfighters to house their game fowl. There is a robust trade of game fowl through swap meets and shows eg in the Los Angeles basin and via the US postal service. Cockfighting derbies (tournaments) may be attended by dozens of cockfighters, hundreds of game cocks, and hundreds of attendees who may all become accidental disease vectors.

- ***Bird smuggling from Mexico and Latin America where nND is endemic.*** Game fowl are commonly brought into and out of the U.S., both legally and illegally, for breeding or cock fighting derbies. Poultry smuggling is easy and profitable. Birds trafficked across borders are hidden by many means to avoid detection. Roosters transported to cockfights must be individually caged to prevent fighting so various types of individual cages or multi-bird cages are utilized. These cages fit into the trunk of a car or the back of a truck and are easily disguised or concealed (Allen 2013).

In 2002, vND was first diagnosed in a pet parrot in southern California by a private avian practitioner. In hindsight, it was determined that the vND virus had been introduced from smuggled fighting cocks from Mexico weeks earlier. The virus was freely circulating among cockfighting farms (and killing game fowl) for several weeks, had already infiltrated commercial poultry operations unbeknownst to veterinary authorities, and even spilled over to pet birds by the time it was officially diagnosed.

- ***Domestic and international shipping:*** Every year [US game fowl farms ship thousands of cockfighting adult roosters often through the postal service](#) to domestic and international markets. This greatly facilitates disease spread if any of the birds are infected with vND or HPAI (or another infectious disease) particularly since shipping stress likely induces increased pathogen shedding.
- ***Cockfighter or game fowl owner employment on commercial poultry farms:*** For bio-security reasons, poultry or bird ownership is strongly discouraged and usually forbidden for workers employed by the commercial poultry industry. However, this stipulation is difficult to enforce. In any case, it is virtually impossible to preclude commercial poultry industry workers from having some degree of outside involvement in game fowl activities as a breeder, cockfighter, or cockfight attendee. This connection to the game fowl industry is a major risk for disease introduction and/or spread from game fowl to commercial poultry (Allen 2013). The low infectious dose and generally high environmental survival of vND and HPAI make it easy for poultry workers to unknowingly carry these viruses onto large high bio-security indoor commercial farms eg on contaminated clothing or vehicles. Commercial turkey and laying hen operations are especially vulnerable. See **Figure O-2** and **Figure P-2**.

- ***Under-utilization of veterinary services.*** Since cockfighting is clandestine and unlawful, veterinary vigilance is undermined, so exotic diseases like vND and HPAI are more likely to invade and spread undetected. Game fowl breeders rarely utilize private veterinary practitioners for avian health care. Instead, they rely on their judgment and experience, product advertisements in trade journals, the internet, and advice from feed store operators, other breeders, and anyone whom they think may have needed answers about their avian health issues (Allen 2013).

Game fowl owners may take sick or dead birds to a state veterinary diagnostic laboratory. In some states such as California, this diagnostic service is free to avian “hobbyists,” ie those with flocks of fewer than one thousand birds. In the 2002-2003 California vND outbreak, the virus was first detected in game fowl after the owner reported the loss of around 200 game birds within five days and brought dead birds to a state veterinary laboratory. The index case in the 2018-2020 vND outbreak in California was in dead game cocks submitted by a small game fowl owner (Carvalho et al 2018).

### ***Risks during outbreaks***

- ***Hazards to animal health officials.*** Because cockfighting is an illegal activity masquerading as an accepted use of poultry, it is difficult and sometimes dangerous to investigate poultry disease outbreaks linked to cockfighting, even for high-consequence pathogens like vND and HPAI. Co-author Keen spent five weeks detecting and euthanizing vND-infected or exposed backyard urban poultry in south central Los Angeles and surrounds during the 2002-2003 vND epidemic in southern California, mostly on presumably illegal backyard game fowl operations. Some owners strongly resisted depopulation.
- ***Quarantine violations.*** Game fowl have significant financial importance to their owners. Income generated by game fowl was estimated at \$50 million annually in California in 2001 (Allen 2013) and is likely even higher in 2022. Sales of game fowl exported to other countries were estimated at \$125 million annually (Allen 2013). In addition to sales of game fowl as fighters or breeders, winnings from cockfighting events and “derbies” can be substantial. These are strong financial incentives for cockfighters and breeders to ignore poultry disease control efforts. Thus, cockfighters will illegally continue to attend fighting derbies and transport, ship, trade, sell and mix game fowl during animal health quarantines and bird movement restrictions.

During the exotic Newcastle disease quarantine in California in 2002-2003, it was common for game fowl to be moved around illegally despite bird movement restrictions imposed by state and federal quarantines. The purpose of this illegal movement was to avoid having the flock, or at least selected birds within the flock, depopulated due to infected or exposed birds being traced or connected epidemiologically to that flock (Allen 2013).

A favorite (and ingenious) way for cockfighters in California in 2002-2003 to move birds was to place them in rental pickups from the same company that supplied vehicles to the Federal-State Taskforce. The task force leased many pickups and other box trucks and identified those vehicles by finger-painting an identifying number on the inside of the windshield. To avoid detection, many game fowl owners leased the same types of pickups or trucks from the same rental company and painted similar-looking numbers on the inside of the windshield.

Using these “look-alike” vehicles, birds were moved in, out, or within the quarantined area without arousing any suspicion and with little chance of being detected. This scheme was not discovered until after the outbreak was over and the task force disbanded. Many movements like this took place over a long-time interval while quarantines were in place (Allen 2013).

- ***Hiding valued game fowl.*** Because of the great value of game cocks as breeders or fighters (up to two thousand dollars per bird), cockfighters are reluctant to self-report birds suspected to be infected with serious diseases like HPAI and vND for fear of loss of their prized birds. Cockfighters are also disinclined to sacrifice their birds for disease control even when compensated, as valuable breeding lines or potential gambling winnings will be lost.
- ***Draining indemnity funds meant for legitimate poultry producers.*** To encourage compliance with disease suppression (ie depopulation) efforts, government-sponsored market-based compensation (indemnity payments) are provided to bird owners for destroyed animals and lost animal products (eg feed, eggs, or meat) in the U.S. and many other countries. This produces a moral dilemma as cockfighting roosters have a “market value” that greatly exceeds that of commercial layers or broilers, *providing a subsidy of sorts to an illegal industry.*

For example, in the 2002-2003 vND outbreak in southern California in which four million birds were destroyed, USDA paid an average of \$2.89 per laying hen in indemnity compensation, *while the government paid an average of \$79.31 for game fowl and as high as \$500 for roosters.* Many, perhaps most, of these birds were part of the illegal cockfighting industry. A Freedom of Information Act request revealed that an indemnity payment of \$1800 was paid for one California gamebird, presumably a fighting rooster (Shrider 2003).

- ***Unsanitary cockpit practices.*** Cockfighters use a variety of unhygienic high-risk methods to revive injured or exhausted birds during fights. These methods include blowing into the beak, cleaning the trachea, and licking the wounds of fighting roosters. These actions are high-risk for HPAI H5N1 bird-to-human transmission risk and the development of human-adapted bird flu viruses.
- ***Wordsmithing.*** Animal health officials in the US and elsewhere usually do not explicitly identify suspected cockfighting operations (or the presence of game fowl) in outbreak reports, vaguely and euphemistically categorizing them as “backyard poultry operations” or “exhibition farms”. This makes the epidemiologic linkage of game farms to disease outbreaks difficult. (Please see [Figure Q](#)). For example, Carvallo et al (2018) and USDA (2021) use the politically correct terms “*backyard exhibition chickens*” and “*exhibition chickens*”, respectively, as euphemisms to describe cockfighting birds infected with vND. The “*backyard exhibition bird*” euphemism for cockfighting farms is also adopted by animal health officials to try to gain and keep the trust of sources within the cockfighting industry whose cooperation is sought for vND and HPAI disease suppression efforts.

The potential disease threat and subsequent economic damage from perhaps 25 million (M) cockfighting game fowl in the US asymmetrically puts our 9 billion broilers, 389 M layers, 217 M turkeys, and millions of backyard poultry and wild birds in our nation at some risk. The poultry populations at risk from vND and HPAI H5N1 viral incursions are detailed in [Table 1A](#) and [Table 1B](#).

This is not to say that cockfighting is the sole driver of vND and HPAI outbreaks and epidemics in all cases. However, this organized criminal enterprise certainly introduces and spreads these two important avian diseases leading to untold loss and suffering to people and animals.

There is, however, high quality if imperfect epidemiologic, molecular, and anecdotal evidence for an important role of the cockfighting industry in:

- (1) ***vND outbreaks & epidemics in the US over the past 50 years*** and
- (2) ***zoonotic HPAI H5 bird flu epidemic in Southeast Asia from 2003-2006.***

**Box 3 - Confusing USDA and [World Organization for Animal Health \(WOAH\) definitions of “Poultry” and “Non-Poultry”](#)**

According to the [OIE Terrestrial Animal Health Code](#) (TAHC, 2021):

- (1) **POULTRY**, *commercial or backyard*, are domesticated birds reared or kept in captivity for:
  - Production of meat or eggs for consumption
  - Production of any commercial animal products eg feathers
  - Restocking of game or for breeding for this purpose until released from captivity eg pheasants
  - **Fighting cocks used for any purpose**
- (2) **NON-POULTRY** are *backyard* domesticated birds reared or kept in captivity (including chickens, ducks, turkeys, guinea fowl, geese, etc) that are *excluded* from the WOAH definition of poultry if:
  - Birds are kept in a *single household* and their products are used within the same household *exclusively* provided they have no direct or indirect contact with poultry or poultry facilities.
  - Birds are kept in captivity for other reasons, including for shows, racing, exhibitions, zoological collections and competitions, and for breeding or selling for these purposes, as well as pet birds provided that they have no direct or indirect contact with poultry or poultry facilities.
- (3) **WAHO and USDA's intent** in defining “POULTRY” & “NON-POULTRY” in this manner is to *specify classes of birds at risk to enter international or export markets*.
  - Outbreaks of vND and HPAI in POULTRY (commercial or backyard) must be [reported to the WOAH](#) and *may result in trade bans on poultry or poultry products exports*.
  - Reporting of HPAI or vND outbreaks in NON-POULTRY (eg wild birds, pet birds, hobby birds, backyard birds as defined by the TAHC (2021)) *does not have trade implications*.
  - Therefore, categorizing a bird flock as “POULTRY” or “NON-POULTRY” in a disease outbreak setting can have enormous international trade and financial implications.
- (4) **Summary** (See also [Figure N](#) for Venn diagram of this concept)
  - Backyard chickens, turkeys, ducks, etc can be defined as “POULTRY” or “NON-POULTRY”
  - “NON-POULTRY” backyard flocks, including chickens, turkeys, and ducks, have little chance of spreading disease across borders
  - “POULTRY” flocks, whether backyard or commercial, could introduce disease via global trade
  - **Fighting cocks are always defined as “POULTRY” an overt acknowledgment and admission that cockfighting is an international (transboundary) disease risk.**
  - [Figure O-1](#) and [Figure P-1](#) show USDA backyard flocks and birds classified as “Poultry” and “Non-Poultry” for the ongoing US HPAI H5N1 epidemic.

#### **Box 4 - Commercial Poultry versus Backyard Flocks** (See also [Table 1A](#))

The WAHO and USDA classify vND and HPAI virus-infected flocks as “*Commercial*” or “*Backyard*” (or non-commercial). However, their definitions appear to lack precision and uniformity. [Major differences between backyard flocks and large commercial flocks](#) of broilers and layers include:

##### **(1) Degree of confinement & level of bio-security**

- Large industrial flocks spend almost 100% of their time in a climate-controlled enclosed barn, have no little to no contact with wild birds, are protected from rodents and predators, and have restricted human traffic. Such flocks are only occasionally subject to diseases and other threats.
- In contrast, backyard flocks are given daytime outdoor access and typically have poor bio-security. There is routine exposure to wild birds, rodents, predators (eg foxes, birds of prey, stray dogs), severe weather events and outside human traffic.

##### **(2) Extent of government regulation**

- The commercial poultry industry is tightly regulated by federal and state laws and regulations.
- Backyard poultry are largely exempt from regulation which is typically limited to local ordinances. Some municipalities have no regulations. Local ordinances may require permits or licenses and define limits on property size, space per bird (eg birds per acre), bird sex (eg hens only), or nuisance clauses for noise (eg rooster crowing), odor, and cleanliness. Local poultry ordinances are often not enforced.

##### **(3) Premise size**

- Commercial poultry operations have large numbers of birds (to take advantage of economies of scale), are kept in crowded indoor spaces (to minimize overhead costs), raise birds with defined hybrid genetics, and are often vertically integrated. Egg-laying farms often have more than one million birds; broilers are reared in indoor barns with eight to fourteen thousand birds housed per barn. Operations typically have 1000 or more birds.
- Backyard flocks vary in size and bird species but typically have fewer than 1000 birds of variable genetic backgrounds from purebred heritage to hybrids. However, the “backyard flock” legal definition varies by state eg up to 25,000 birds is defined as “backyard” in some states. *Game fowl farms vary from a few breeding trios and fighting cocks to large operations raising and thousands of breeding birds and fighting cocks.*

##### **(4) Products**

- The commercial poultry sector is a billion-dollar business raising billions of birds world-wide. [About 70% of all birds on earth are farmed poultry.](#) The industry is split into *meat* (broiler chickens, turkeys, ducks, and geese) and *egg-laying* (table-egg and breeder) bird types.
- Traditional backyard poultry species include chicken, turkey, duck, and goose as well as pheasants, quail, chukar partridges, pigeons, guinea fowl, and ratites. Birds are kept for pleasure, exhibition, breeding, and/or small-scale sale of birds, meat, or eggs. Niche markets (eg live bird markets, free-range eggs, local production) are often targeted. *Cockfighting farms typically buy, sell and trade breeding stock and fighting roosters.*

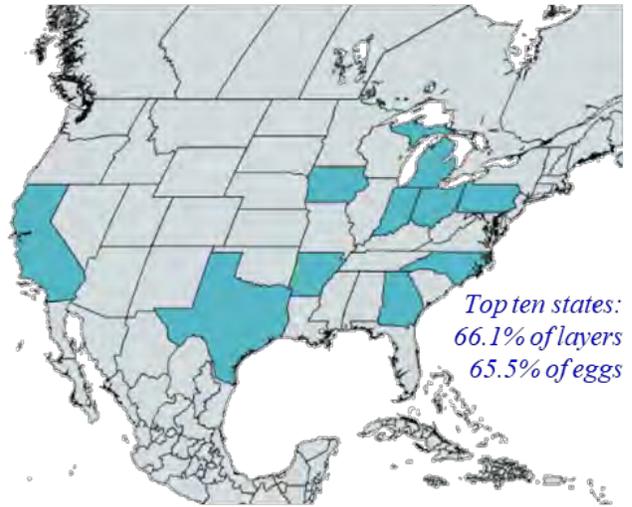
**Table 1A:** Comparison of U.S. chicken industries. Cockfighting breeds, management, paraphenalia, sex ratios and housing differ completely from other type of poultry so cockfighting operations are easy to identify. Commerical farms commonly defined as having greater than 1000 birds on a premise.

<b>Bird type</b>	<b>Raised for eggs or meat</b>			<b>Not raised for eggs or meat</b>	
	<b>Layer chicken</b>	<b>Broiler chicken</b>	<b>Backyard poultry</b>	<b>Cockfighting</b>	<b>Show or hobby</b>
<b>Purpose</b>	Lay many eggs; avg 296 eggs per hen per year	Grow fast muscle (meat) esp breast; minimize feed cost; prod efficiency	Eggs or meat for family or local use	Cockfighting; game fowl raised for fighting & breeding; a few exhibited at poultry shows	Hobby flocks & pets; usu ornamental; a few keep game fowl as hobby not fighting
<b>Business type</b>	Commercial; top 20 firms: 75% of eggs	Commercial; ~30 companies	Small local or non-commercial flocks	Unknown & unknowable; ~150,000 gamefowl farms	Hobby
<b>No. birds in US per year</b>	328 million	9 billion	Unknown millions; recent popularity	Unknown, perhaps 25 million in US; CA: 3 to 8M	Unknown millions
<b>Body weight</b>	400 g (0.8 lb)	2.5 kg (6.5 lb) market wt at 47d	Variable	2 to 2.4 kg (4 to 7 lbs)	Variable
<b>Lifespan</b>	1-3 years; start egg laying at 20 weeks	42-60 days	Layers: 6-8 years	Fighting cocks: two years; rarely survive more than two fights	Six to eight years
<b>Top states</b>	IA, OH, IN, PA, TX	GA, AL, AK, NC, MS	Ten million US households; all states	Southern & western states esp NC, SC, TX, OK, CA, HI, LA; less in north	All 50 states
<b>Housing</b>	Indoor: Layers caged entire life; multi-tiered barns; 60 sq inches per bird	Indoor: Large deep litter barns; 40x300 to 40x500 barns w/ 8K to 13.5 K birds; 1.5 sq ft per bird	Outdoor: Usu free range in day, coop housed at night for predator defense	Outdoor: Roosters caged alone or w/ two females (breeders); tether roosters 9 feet apart; plastic barrels or wood A-frame housing	Outdoor; Usu free-range in day, night cooped to guard from predators
<b>Management</b>	Large barns; >1M birds per farm; 29% cage-free; 71% battery caged	Reach market weight at 35 to 42 days of age; small no. raised outdoors	Usually kept on small farmsteads or even in some large cities (hens only)	Game fowl farms raise 10 to 1,500 roosters per year; cocks caged or tethered; sell breeders or fighters in US & abroad	Usually kept on small farmsteads or even in some large cities (hens only)
<b>Bio-security</b>	High	High	Low	Low to medium	Low to medium
<b>Sex ratios on farm</b>	All hens	Approx equal male & female	Mostly hens; few roosters	Mostly roosters; few hens	Mostly hens; few roosters
<b>Major breeds</b>	Hybrid White Leghorns (white eggs); hybrid New Hampshire Red & Barred Plymouth Rocks (brown eggs)	Hybrid Cornish and Plymouth Rock eg Cobb700	Often heritage dual purpose (meat & eggs) purebreeds eg Leghorn, Rhode Island Red, Plymouth Rock, Wyandotte etc	Many: Kelso, Hatch, Claret, Roundhead & crosses; bred for specific fighting attributes & fight styles	Many eg Silkie, Polish, Araucana, Yokohama
<b>Annual output</b>	96.9 billion eggs (2020)	56.5 billion pounds, live wt; 42.5 billion lb product (2018)	Unknown	Billions of \$ in economic activity via bets, derby fees & game fowl sales	Unknown

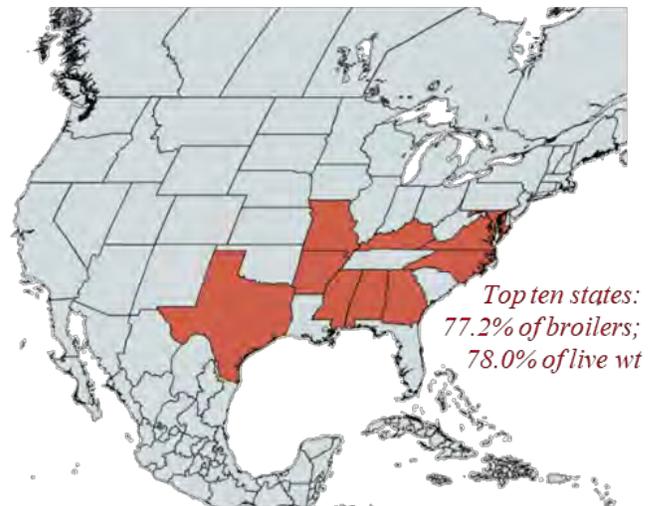
Sources: <https://www.nationalchickencouncil.org/about-the-industry/statistics/broiler-chicken-industry-key-facts/>  
<https://extension.psu.edu/modern-egg-industry>; <https://extension.psu.edu/modern-meat-chicken-industry>;  
<https://unitedegg.com/facts-stats/>; <https://gamefowl-news.livejournal.com/>  
<https://centerforahumaneconomy.org/2021/10/19/the-sun-finally-sets-on-legal-cockfighting-in-the-united-states>

**Table 1B** - US commercial poultry populations-at-risk for virulent Newcastle Disease & Highly Pathogenic Avian Influenza viruses. Top ten producing states for layers (eggs), broilers (meat) and turkeys; USDA data for 2021

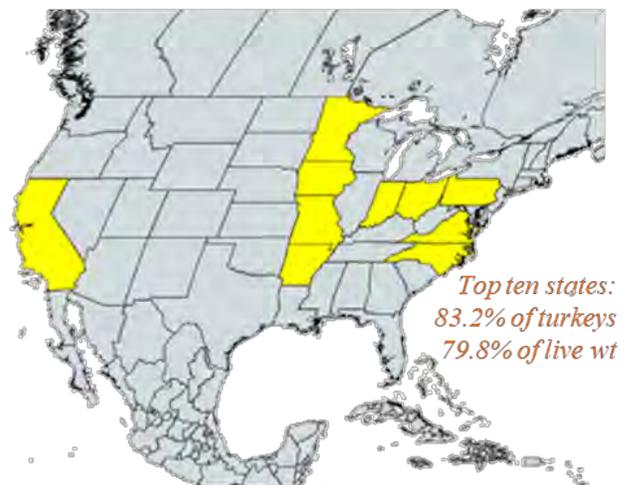
Layers	Layers (millions)	Eggs (billions)	Eggs/layer
1. Iowa	48.9	14.98	306.3
2. Ohio	35.1	10.46	298.0
3. Indiana	35.4	10.61	299.7
4. Pennsylvania	30.4	8.11	266.8
5. Texas	23.0	6.42	279.1
6. Georgia	19.8	5.06	255.6
7. Arkansas	19.9	4.25	213.6
8. North Carolina	15.7	4.09	260.5
9. Michigan	15.1	4.54	300.7
10. California	14.0	4.02	288.6
All US	389.0	110.7	284.6



Broilers	Birds (millions)	Live wt (billions of lb)	Avg lb/bird
1. Georgia	1300	7.92	6.1
2. Alabama	1170	6.56	5.6
3. Arkansas	1050	7.46	7.1
4. North Carolina	971	8.06	8.3
5. Mississippi	707	4.45	6.3
6. Texas	707	4.73	6.7
7. Missouri	301	1.57	5.2
8. Kentucky	297	1.93	6.5
9. Virginia	285	1.8	6.3
10. Maryland	260	1.72	6.6
All US	9130	59.25	6.5



Turkeys	Birds (millions)	Live wt (millions of lb)	Avg lb/bird
1. Minnesota	40.5	1040	25.7
2. North Carolina	30.0	1170	39.0
3. Arkansas	27.0	540	20.0
4. Indiana	20.5	836	40.8
5. Missouri	17.0	553	32.5
6. Virginia	14.5	421	29.0
7. Iowa	11.7	512	43.8
8. Pennsylvania	6.9	198	28.7
9. California	6.0	191	31.8
10. Ohio	6.0	268	44.7
All US	216.5	7175	33.1



#### IV - Cockfighting and Virulent Newcastle Disease (vND) in the United States

Fifteen known introductions of vND into the US since the first outbreak in 1950 have led to three devastating epidemics in 1971, 2002, and 2018. Disease introductions occurred from legally imported pet birds (often parrots), imported infected poultry, or illegally smuggled game fowl for cockfighting. Ten of the 15 US vND outbreaks originated from illegally smuggled game fowl for cockfighting ([Table 2](#)).

**Table 2** - Outbreaks of virulent Newcastle Disease introduced by illegally smuggled game fowl for cockfighting

<i>Date</i>	<i>Place of outbreak</i>	<i>Outcome</i>
Sep-71	Dade County FL & Sonoma County CA	Spread to two flocks - birds destroyed
Oct-71	Miami FL	Limited spread - affected flocks destroyed.
Dec-71	Puerto Rico	Puerto Rico placed under quarantine
Apr-72	Parker AZ	No spread - all affected flocks destroyed
May-72	Dade & Broward Counties FL	No spread - disease eradicated
Jan-73	Los Ebanos TX	Limited spread - birds destroyed & disease eradicated
Feb-74	El Paso TX	Limited spread - birds destroyed & disease eradicated
May-98	Central Valley CA	No spread - game bird flock destroyed & disease eradicated
Oct-02	Los Angeles County, Southern California	<b>Epidemic spread</b> to 22 commercial flocks & 910 backyard & game fowl flocks
May-18	Southern California	<b>Epidemic spread</b> to six commercial flocks & 478 backyard & game fowl flocks

*Sources* : USDA APHIS 1978; Crespo et al 1999; Nolen 2002; Carvallo et al 2018

The three major vND epidemics the US has experienced (ie that spread to commercial poultry farms) all occurred in southern California in 1971-1974, 2002-2003, and 2018-2020. Southern California is uniquely at risk for epidemic poultry diseases such as vND (and HPAI) because it has (1) thousands of low biosecurity urban and semi-rural backyard poultry farms; (2) a *massive illegal cockfighting industry*; (3) a large commercial egg-laying, broiler, and turkeys industries; (4) large non-poultry aviaries; (5) millions of feral exotic tropical birds (eg escaped pet parrots); (6) a large pet bird population; and (7) huge wild native bird populations all in proximity in the Los Angeles basin. In addition, (8) vND is endemic just across the border in Mexico where cockfighting is legal in many Mexican states. Cockfighting has been illegal in California since 1905, but it is the only state in the western mainland United States that treats cockfighting as a misdemeanor. Many people speculate that cockfighters gather there because of weaker, differential penalties than in Arizona, Nevada, Oregon, and other western states.

Two of the three US vND epidemics (in 2002-2003 and 2018-2020) were very likely started by illegally imported cockfighting birds based on the genetic molecular signatures of the index vND strains ([Table 2](#)). Bird and human movements associated with cockfighting also contributed greatly to the spread of vND in all three vND epidemics after disease introduction.

As shown in [Table 3](#), the economic consequences of the three vND epidemics were severe, exceeding \$659 million in 2022 inflation-adjusted direct eradication costs. An even greater economic penalty likely transpired in indirect costs eg lost employment, foregone domestic and international trade from

embargoes, business, and personal bankruptcies, etc. *Thus, the total direct and indirect costs of just these three vND epidemics in southern California very likely exceeded \$1 billion inflation-adjusted dollars.*

Newcastle disease is *easily underestimated* and often has been because it is not a food safety concern or a zoonotic disease. But virulent Newcastle disease (like HPAI) also causes enormous bird suffering, some from the disease itself, and perhaps even more because the only known way to stop an outbreak is to rapidly kill all the birds who are or may become infected and transmit the virus (**Box 2**). This may be done using firefighting foam or carbon dioxide to suffocate birds, live mechanical maceration of birds, burying birds alive, burning barns down with birds still inside, or raising the barn temperature until it is incompatible with avian life. This last method, called Ventilation Shutdown (VSD/VSD+), is used for both confined poultry and swine, typically as a last resort (AVMA 2019; Bolotnikova 2022). The pig or chicken barn is closed, all air inlets and ventilation sealed, and fans turned off. Heaters, steam, and/or gas are turned on. Body heat from the animals, combined with any added heat, raises the temperature in the house until the pigs or chickens die from hyperthermia (overheating) or suffocation from built-up gases. This process typically takes hours for all animals to die.

For pet birds such as long-lived parrots, many of whom are also deliberately killed in vND outbreaks, the loss experienced by people is no different from the one felt for a deceased canine or feline companion.

### ***Epidemiologic risk factor analysis of vND epidemics in Southern California***

Epidemiological descriptions of infected backyard premises in the 1971-1974 outbreak identified contact with infected commercial layer farms as the primary source of infection, followed by active trading of birds among backyard flocks and purchases of infected exotic birds from dealers.

An epidemiological study of backyard premises during the 2002-2003 southern California vND outbreak identified the *presence of game fowl*, the presence of feral chickens, flock sizes larger than 40 birds, and multiple owners of a flock as significant risk factors for vND infection.

A case-control analysis of the 2018-2020 vND outbreak in southern California demonstrated that backyard poultry premises with (1) a greater number of birds, (2) *possessing game fowl*, and (3) *having >50% of the adult bird as roosters* all correlated strongly with being vND infected (**Table 3, Table 4**). *Game fowl on premises and high numbers of adult roosters are obvious markers of an active cockfighting operation.* Odds ratios (ORs) are measures of risk magnitude and risk direction. For example, an OR of 4.8 for having game fowl on the premise means that a premise with game fowl is 4.8 times more likely to be vND infected than a similar premise that does not have game fowl. Thus, there is strong statistical evidence linking cockfighting to the 2002-2003 and 2018-2020 southern California vND epidemics.

If one reviews the 2018 USDA listing of California premises affected by vND, the majority are identified as having “backyard exhibition chickens”. A backyard exhibition chicken is a type of bird that is not kept for its eggs or meat, but for its money-making potential in cockfights. Backyard exhibition chickens is just a politically correct way of saying “cockfighting birds.” (Smith 2019).

**Table 3** - Three major US virulent Newcastle Disease epidemics in Southern California over past 50 years

No.	Outbreak	Outbreak source	Bird type affected	No. infected or exposed flocks	No. birds died or destroyed	Direct costs of eradication	Indirect outbreak costs	Comments	
<b>I</b>	<b>Southern California</b> <b>Nov 1971 to July 1974</b> <b>(33 months)</b>	Legally imported wild caught parrots from South America	Commerical layers (85%); broilers; turkey breeders	155 infected; 31 exposed	11,808,242	\$56M in 1974; including \$28M indemnity costs for birds, eggs & supplies; \$10.5M labor costs; <b>\$337M in 2022 dollars</b>	CA lost status as nations no. 1 egg producer; some egg producers relocated outside of CA (esp to Midwest) to lessen vND risk	Exotic bird imports banned for several years nationwide	
			Pigeons	9 infected; 19 exposed	1,779				USDA paid max of \$2000 indemnity \$2 per layer hen; no dollar limit on breeding stock, cockatoo
			Exotics (mostly parrots)	28 infected; 61 exposed	18,125				caged pet birds, or backyard flocks; <b>mean gamecock indemnity \$25, equivalent to \$137 in 2022 dollars</b>
			Game birds (quail & pheasants)	7 infected; 6 exposed	27,070				
			Backyard & <b>game fowl</b>	201 infected; 824 exposed	34,382				
		<b>All flocks &amp; birds</b>	<b>400 infected; 941 exposed</b>	<b>11,889,598</b>					
<b>II</b>	<b>Southern California</b> <b>Oct 2002 to Sept 2003</b> <b>(11 months)</b>	<b>Illegally smuggled cock-fighting roosters from Mexico</b>	Commerical layers, broilers, turkeys, breeders	22 infected		\$162M in 2003; includes \$23M in indemnity costs; <b>\$250 M in 2022 dollars</b>	\$246M in 2003: \$167M US trade loss; \$27M loss of eggs not laid; \$17M feed sales lost; \$35M poultry labor wages lost; <b>\$379M in 2022</b>	Highest risk factors for infected commercial flocks were farm employees* & <b>proximity to infected backyard game fowl</b>	
			Backyard & <b>game fowl</b>	910 infected; 1566 exposed	145,000				USDA paid \$2.89 per laying hen in compensation
			<b>All flocks &amp; birds</b>	<b>932 infected; 1566 exposed = 2498 premises depopulated</b>	<b>3,160,000</b>				<b>USDA paid mean of \$79.31 for game fowl, as high as \$500 for game roosters (Clifton 2018)</b>
<b>III</b>	<b>Southern California</b> <b>May 2018 to June 2020</b> <b>(25 months)</b>	<b>Illegally smuggled cock-fighting game fowl</b>	Commerical layers	6 infected	1,100,000	At least \$72 million (Wisckol 2019)	Risk factors: larger flock size (OR 5.4 to 9.0), <b>own game fowl (OR 4.8); more than 50% roosters in flock (OR 2.4)</b>		
			Backyard & <b>game fowl</b>	478 infected	120,000				
		<b>All flocks &amp; birds</b>	<b>485 infected</b>	<b>1,220,000</b>					

Sources : USDA APHIS 1978; USDA APHIS 2003; USDA APHIS 2021

\* Poultry workers who partake in cockfighting are the most frequent suspected outbreak vectors for commercial farms. *Thus most vND outbreaks both originate on illegal cockfighting farms & then spread from them to other game fowl farms & to commercial poultry.*

**Table 4** - Case-control risk factors for being a virulent Newcastle infected non-commercial premise (102 case and 538 control premises) from multi-variate logistic regression in southern California, 2018-2020 vND outbreak

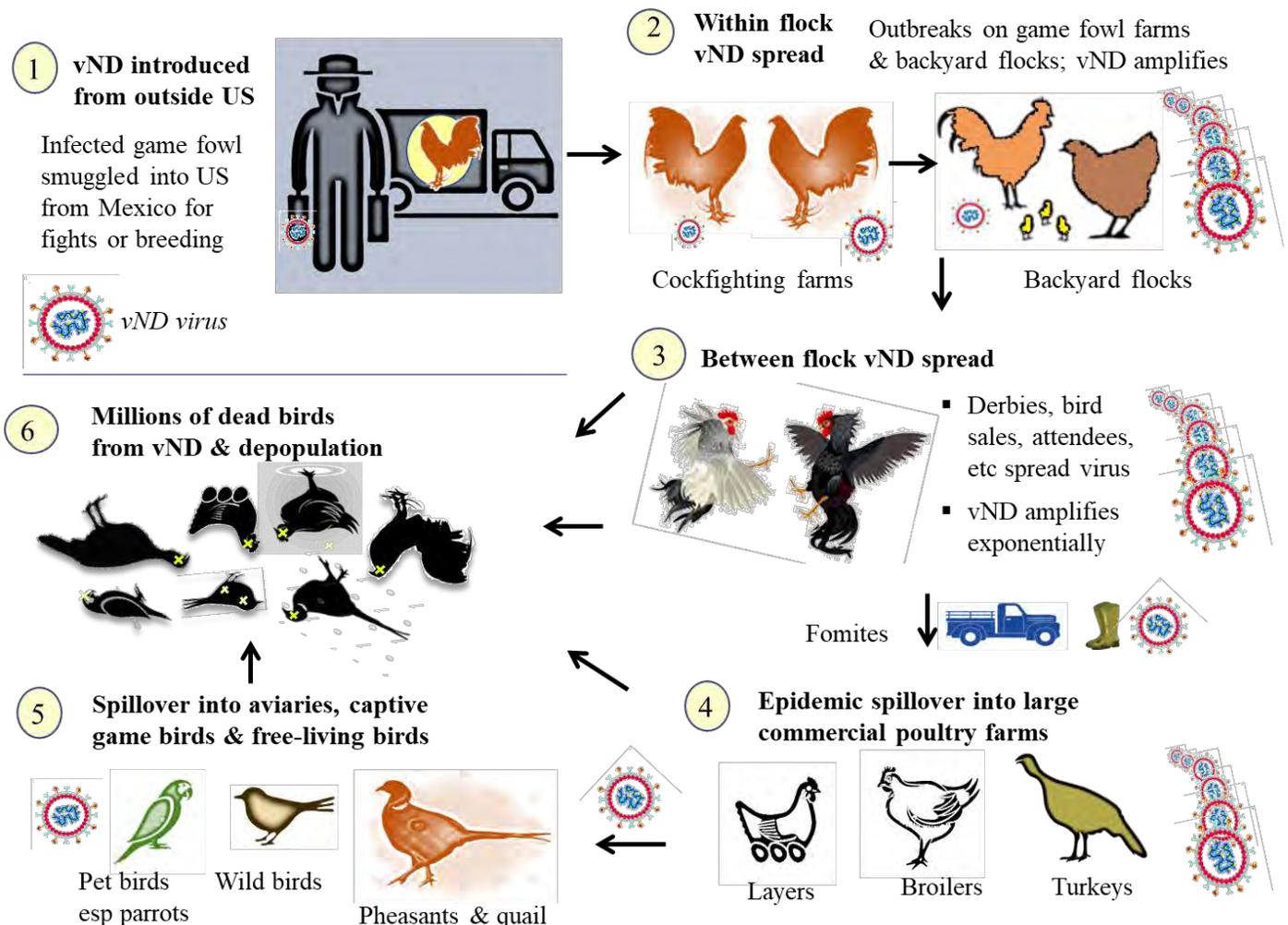
Risk factor	Level	Odds ratio	Probability
Number of birds	1-19	Ref	NA
	20-99	5.4	0.04
	100+	9.0	0.001
Game fowl on premises	Yes vs No	4.8	0.001
Adult birds >50% roosters	Yes vs No	2.4	<0.001

Source: USDA APHIS 2021, p 26

Odds ratios (ORs) measure risk magnitude and direction. An OR >1 implies an increased risk of outcome; an OR <1 is protective from the outcome. For example, an OR of 4.8 for having game fowl on the premise means that a farm with game fowl is 4.8 times more likely to be vND infected than an otherwise similar farm

The role of the cockfighting industry in vND outbreaks and epidemics is summarized below in **Figure K**.

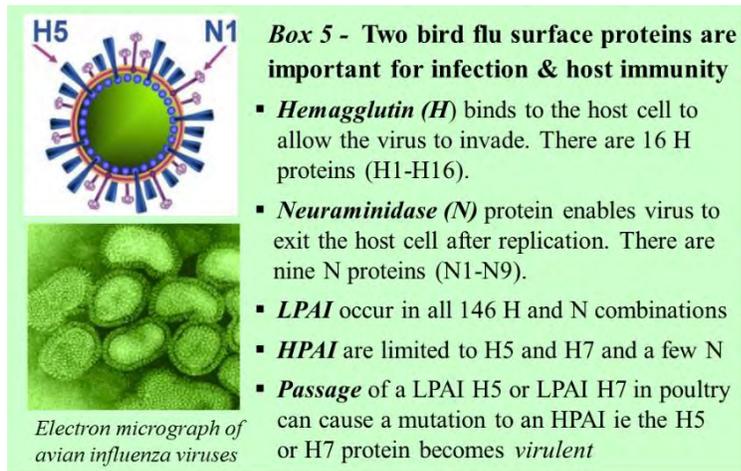
**Figure K - Cockfighting introduces, spreads & prolongs virulent Newcastle Disease outbreaks & epidemics**



## V - Cockfighting and Highly Pathogenic Avian Influenza (HPAI) H5N1

### Bird flu: the global pandemic & US epidemic you haven't heard of

Avian influenza or “bird flu” is a family of highly contagious viruses that infect both domestic and wild birds. Avian influenza viruses have also been isolated, although much less frequently, from mammalian species, including humans, marine mammals, and terrestrial carnivores. This complex disease is caused by viruses divided into multiple subtypes whose genetic characteristics evolve and change rapidly. The virus occurs worldwide but different subtypes are more prevalent in certain regions than others.



Bird flu viruses are classified using a combination of two groups of viral surface proteins: *hemagglutinin* or “H” proteins, of which there are 16 (H1-H16), and *neuraminidase* or “N” proteins, of which there are nine (N1-N9). Numerous “H” and “N” combinations are possible. Each virus has one H and one N protein in any combination. Each combination defines a different subtype. The H protein allows the virus to bind to and invade host cells. The virus escapes the host cell using the N protein after replicating.

The many strains and subtypes of avian influenza virus are also generally grouped into two categories according to the severity of the disease they cause in poultry and the genetic sequence of their H5 or H7 gene: *highly pathogenic AI (HPAI)* and *low pathogenic AI (LPAI)*.

- HPAI viruses cause high mortality in poultry and occasionally in some wild birds and possess a “virulent” H5 or H7 gene that allows the viral infection to become systemic. Only viruses of the H5 and H7 subtypes are HPAI, but not all H5 and H7 viruses are virulent.
- LPAI strains cause mild to moderate disease in poultry and usually little to no clinical illness in wild birds. Migratory waterfowl are the natural hosts and reservoirs of avian influenza viruses. Aquatic Anseriformes (eg ducks, teals, geese, swans) and Charadriiformes (eg shorebirds, gulls, terns, skuas, auks), are the natural hosts of LPAI with few ill effects. Bird flu outbreaks in commercial or backyard poultry or game fowl farms often associate temporally with fall and spring waterfowl migrations and geographically with migration flyways (Pacific, Central, Mississippi, Atlantic).

Wild waterfowl silently carry different bird flu virus strains in their respiratory or intestinal tracts. Depending on the virus strain and wild bird species, the infection can be harmless or fatal. When birds have few or no symptoms, they can spread viruses between neighboring countries or over long distances along their fall or spring migratory flyways. LPAI representing nearly all 146 combinations of haemagglutinin (H1-H16) and neuraminidase (N-N9) have been isolated from wild waterfowl.

Influenza A viruses like HPAI have a high level of “plasticity”, meaning that they continuously evolve by exchanging their genes or acquiring mutations. All of these events may enable bird flu viruses to infect new species (“species jump”), circumvent the animal or human host’s immune defenses, or become more virulent. Avian influenza viruses have high mutation rates typical of RNA viruses (faulty transcription) resulting in high rates of antigenic drift (random change in RNA sequence). In addition, due to their segmented genome (eight RNA gene segments), genetic reassortment can occur in hosts that are infected

by more than one avian influenza strain, facilitating adaptation to novel hosts and resulting in high rates of genetic shift eg change in H and N proteins. *Importantly, the passage of an LPAI H5 or H7 in domestic poultry (eg a game fowl) can cause an H5 or H7 mutation to become an HPAI strain.* In addition, LPAI strains are sometimes zoonotic ie can infect people.

A widespread HPAI outbreak can have a substantial economic impact. The 1983-1984 HPAI outbreak in the northeastern US killed 17 million birds at a cost of \$65 million. The retail price of eggs jumped nearly 30 percent. A 2004 outbreak of H7N3 in Canada resulted in C\$360 million in gross economic losses. The 2014-2015 HPAI outbreak resulted in the loss of 50.5 million commercial birds (depopulated or succumbed to the virus) mostly infected with H5N2. The first case was detected in December 2014 and the last was confirmed on June 16, 2015. The death/depopulation losses represented 7.5% of the average US turkey inventory, 10% of the average layer inventory, and 6.3% of the average US pullet (young layer) inventory. Broilers were mainly unaffected during this outbreak (USDA 2017).

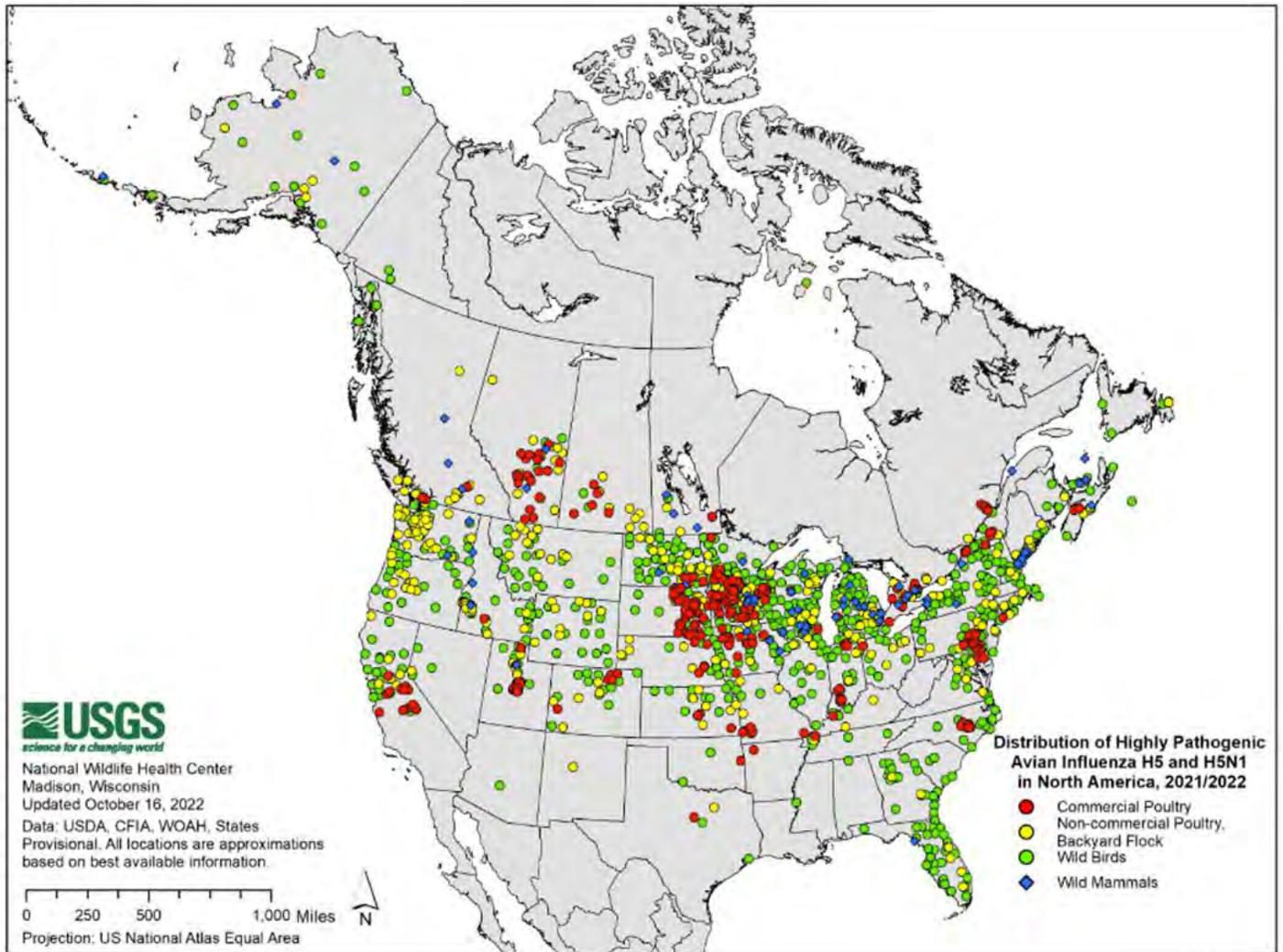
*The worst-ever US HPAI outbreak, caused by a new Eurasian H5N1 strain, is ongoing.* First detected in Indiana in February 2022, the virus has spread to commercial chickens (mostly layers) and turkeys, and backyard flocks in 47 states. The same strain is causing widespread poultry destruction in Canada and Europe. Commercial poultry and backyard flocks in the upper Midwest (overlapping with the Mississippi flyway) and wild birds nationwide are most impacted to date. (See [Figures L, M, N, O, P, Q, R & S](#)). As of December 9, 2022, 53.02 million poultry originating from confirmed HPAI-infected flocks in 287 commercial flocks and 388 backyard flocks died or were euthanized from this strain ([Figures O and P](#)). Data is not yet available linking this outbreak to U.S. cockfighting farms, but it is likely the start of the cockfighting season on Thanksgiving in November 2022 will prolong or exacerbate this epidemic.

### ***Cockfighting as HPAI farm and zoonotic risk factor in Thailand***

No epidemiologic data directly links cockfighting to HPAI outbreaks in the U.S. because (1) cockfighting is an illicit, underground, largely untraceable activity, and (2) USDA does not specifically indicate game fowl farms in HPAI outbreak data. (See [Figure Q](#)). However, in Thailand, cockfighting is legal and there is quality epidemiologic farm-level data from the 2004-2005 Asian HPAI H5N1 epidemic linking cockfighting with HPAI risk ([Table 5](#)). Having fighting cocks on a farm in Thailand made the farm *6-fold more likely* to be at an HPAI-infected premise. There are also credible reports linking human infections and deaths from avian influenza to cockfighting activity in Thailand. See [Appendix 1](#).

**Table 5** - Case-control risk and protective factors for being a Highly Pathogenic Avian Influenza H5N1 infected premise in high risk northern Thailand 2004-2005 (172 case and 456 random control premises) from multivariable conditional logistic regression (*Source* : Tiensin 2011)

<b>Risk factor</b>	<b>Level</b>	<b>Adjusted odds ratio</b>	<b>Probability</b>	<b>Comment</b>
<b>Fighting cocks on farms</b>	Yes vs No	<b>5.81</b>	0.001	Increased HPAI risk
Shared feed with other flocks	Yes vs No	3.92	<0.001	Increased HPAI risk
Vehicles could enter premises	Yes vs No	13.07	<0.001	Increased HPAI risk
Within 5 km of previous outbreak	Yes vs No	18.61	<0.001	Increased HPAI risk
Farmer visited suspect or infected flock	Yes vs No	4.95	<0.001	Increased HPAI risk
Used tap water for birds	Yes vs No	0.08	<0.001	Protective by 12.5X (1/0.08)
Buried dead birds on premises (sell or discard)	Yes vs No	0.08	0.003	Protective by 12.5X (1/0.08)



**Figure L** - Highly Pathogenic Avian Influenza H5N1 in commercial poultry (n=267 flocks), backyard flocks (n=361 flocks), wild birds (n=3700) & wild mammals (eg foxes, seals, dolphins, raccoons, n=78) in North America, 2021/2022 as of Oct 16, 2022.

- All birds in 675 infected flocks died or destroyed = 53.02 million birds as of Dec 9, 2022
- Midwest commercial layers & turkeys hit hardest just as in 2015 HPAI H5 outbreak
- HPAI H5N1 detected in: (1) *Wild birds in 48 states* (except NM & HI); (2) *Wild mammals in 16 states*; (3) *Commercial poultry in 26 states*; (4) *Backyard poultry in 48 states* (except LA and HI)
- Note that bird flu distribution in wild birds, mammals and poultry is mostly in the northern half of the US. This is likely due to better bird flu survival at colder temperatures.

<https://www.usgs.gov/media/images/distribution-highly-pathogenic-avian-influenza-h5-and-h5n1-north-america-20212022>



# HPAI 2022 Confirmed Detections

as of December 9, 2022

Last reported detection Wednesday, December 7, 2022

Data updated weekdays by 12pm Eastern

[Download Data](#)

## 675 Confirmed Flocks

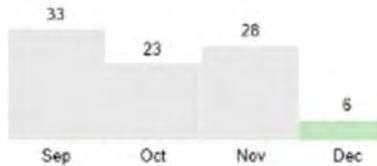
Birds tested and confirmed having HPAI

## 47 Affected States

States with at least one confirmed infected flock

### Commercial Flocks

# 287



### Backyard Flocks

# 388



### Birds Affected\*

# 53.02M



\*Number of birds on confirmed infected premises.

Bars reflect most recent 4 months (numbers may not add up to total).

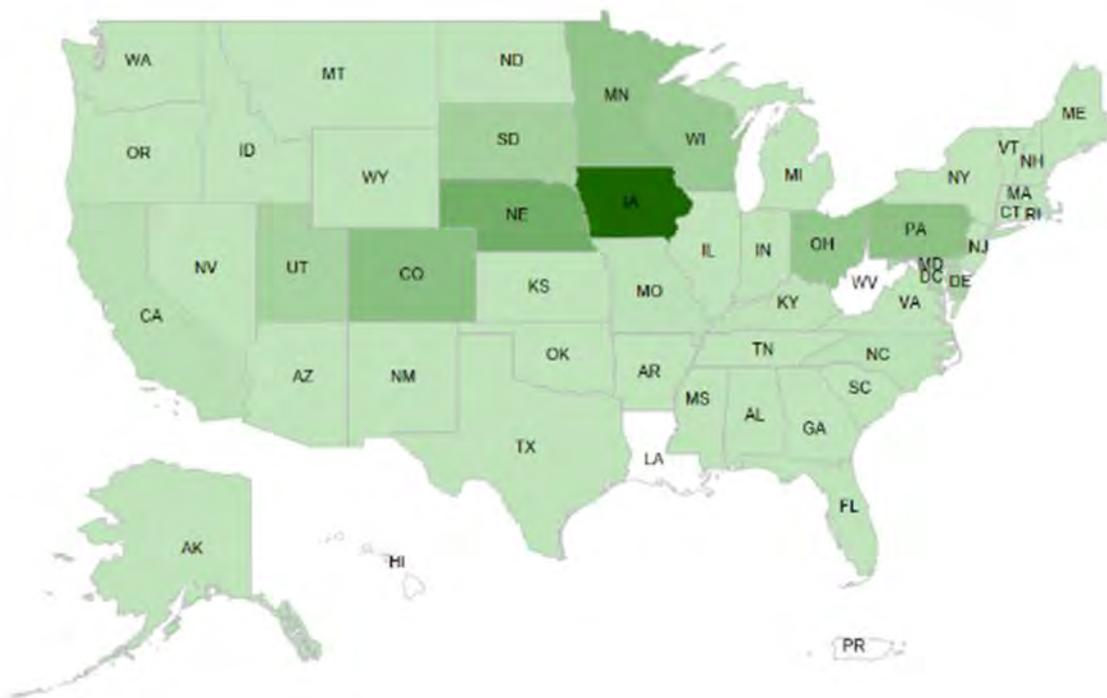
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Birds Affected

## Birds Affected by State

Legend

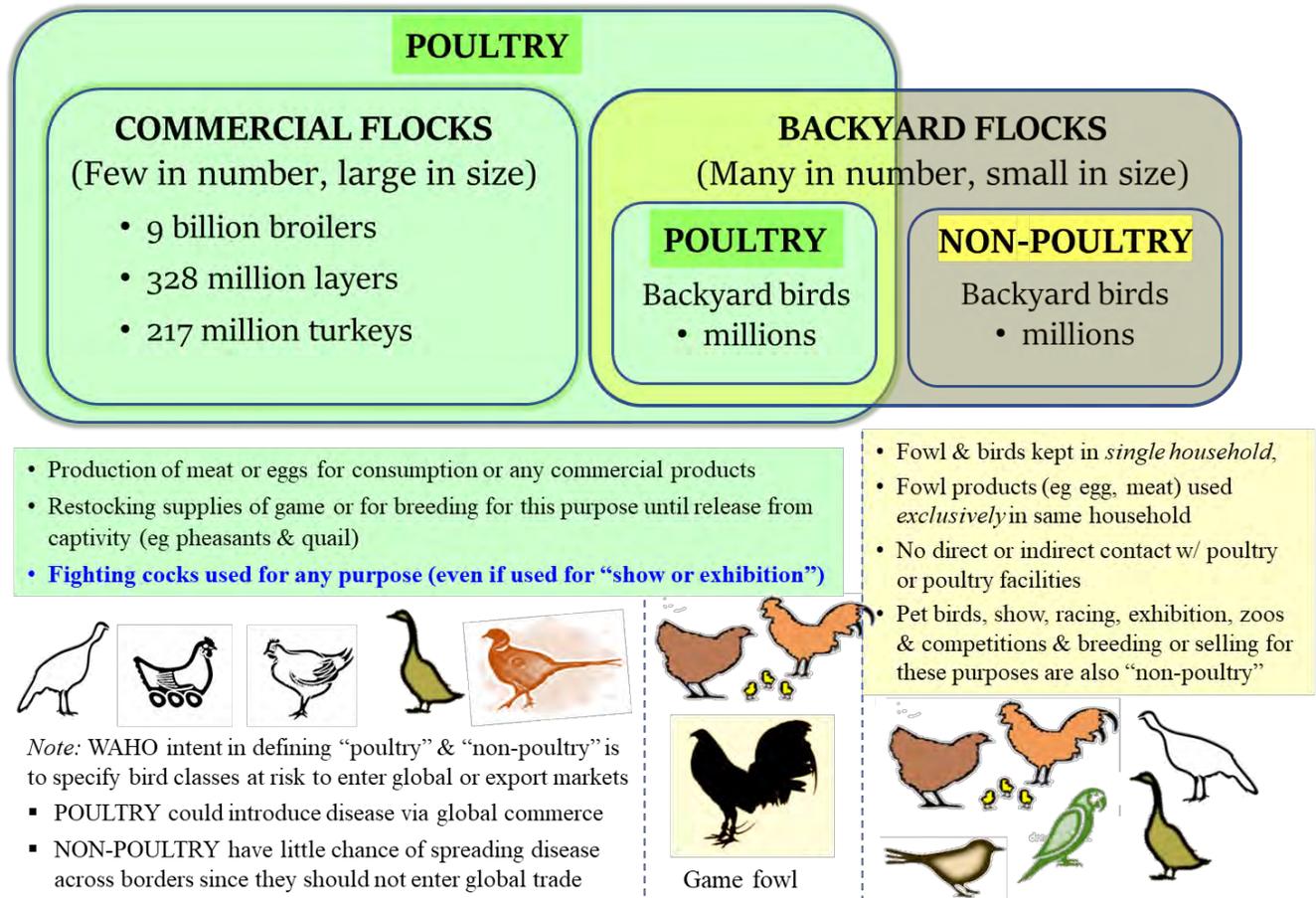
0 15,692,774



**Figure M** - Screen grab of USDA APHIS HPAI H5N1 website for avian influenza in commercial and non-commercial poultry as of Dec 9, 2022. Unfortunately, the website does not indicate backyard farms with game fowl. Note that poultry in just three states (LA, WV and HI) have not had an HPAI H5N1 outbreak.

<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/hpai-2022/2022-hpai-commercial-backyard->

**Figure N** - Venn diagram of confusing WAHO & USDA definitions of “Poultry” & “Non-Poultry”. Both groups are considered types of domesticated birds reared or kept in captivity



The *epidemic curves* for HPAI H5N1 *infected flocks* in the US in 2022 are shown below in **Figure O-1** for *backyard flocks* and in **Figure O-2** for *commercial farms*. Both backyard flocks and commercial farms show strong spring and fall seasonality.

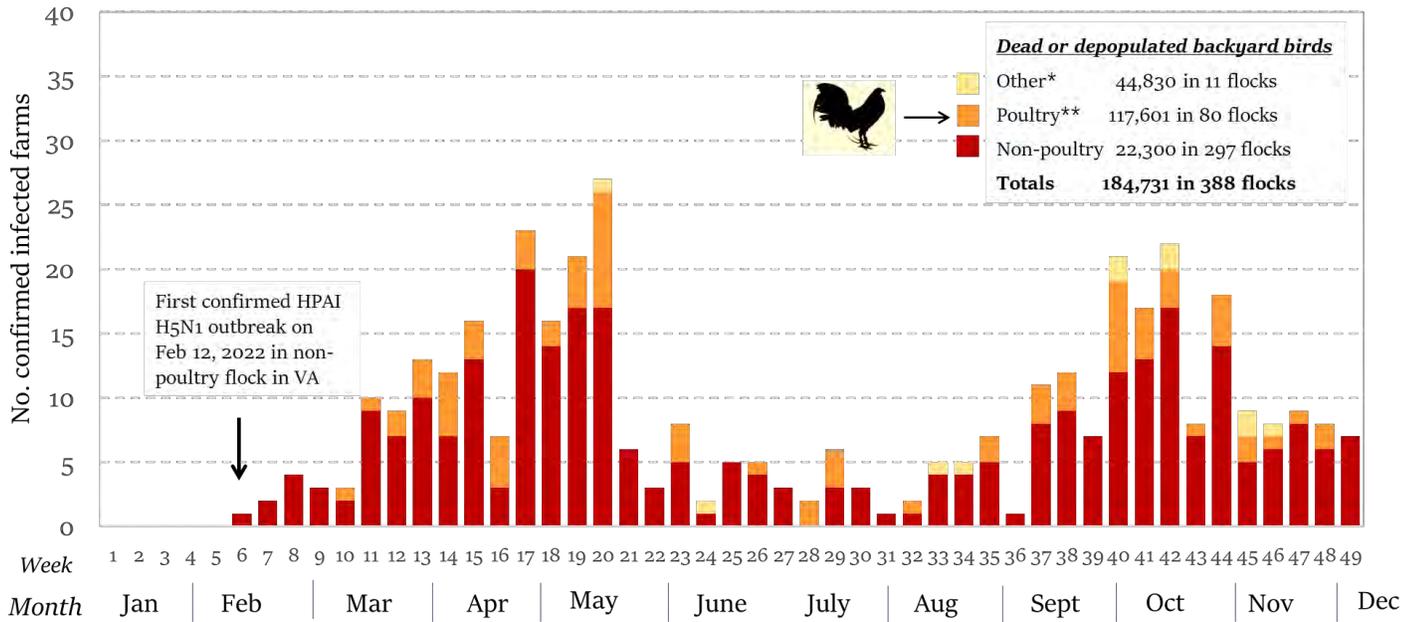
The US cockfighting season starts on Thanksgiving and continues through the following Summer, therefore overlapping temporally with both the Fall and Spring waterfowl migrations. *Any cockfighting flocks would be included in the “backyard poultry” category of Figure O-1).*

The US 2022 *epidemic curves* for HPAI H5N1 *depopulated birds* over time are shown below in **Figure P-1** for *backyard flocks* and in **Figure P-2** for *commercial farms*. Both backyard flocks and commercial farms show strong spring and fall seasonality.

Please note that the Y-axis scale for backyard flocks is **thousands of birds**, while the Y-axis scale for commercial birds is **millions of birds** *ie the huge majority of bird deaths are in commercial poultry flocks. Only 0.3% of the total 53,018,741 bird deaths are in backyard flocks. Also, note that most bird deaths (77%) were in commercial layer flocks. Any game fowl would be included in the “backyard poultry” category (Figure P-1).*

**Figure O-1: Backyard flocks confirmed infected with HPAI H5N1 from Feb 8, 2022 to Dec 9, 2022.**

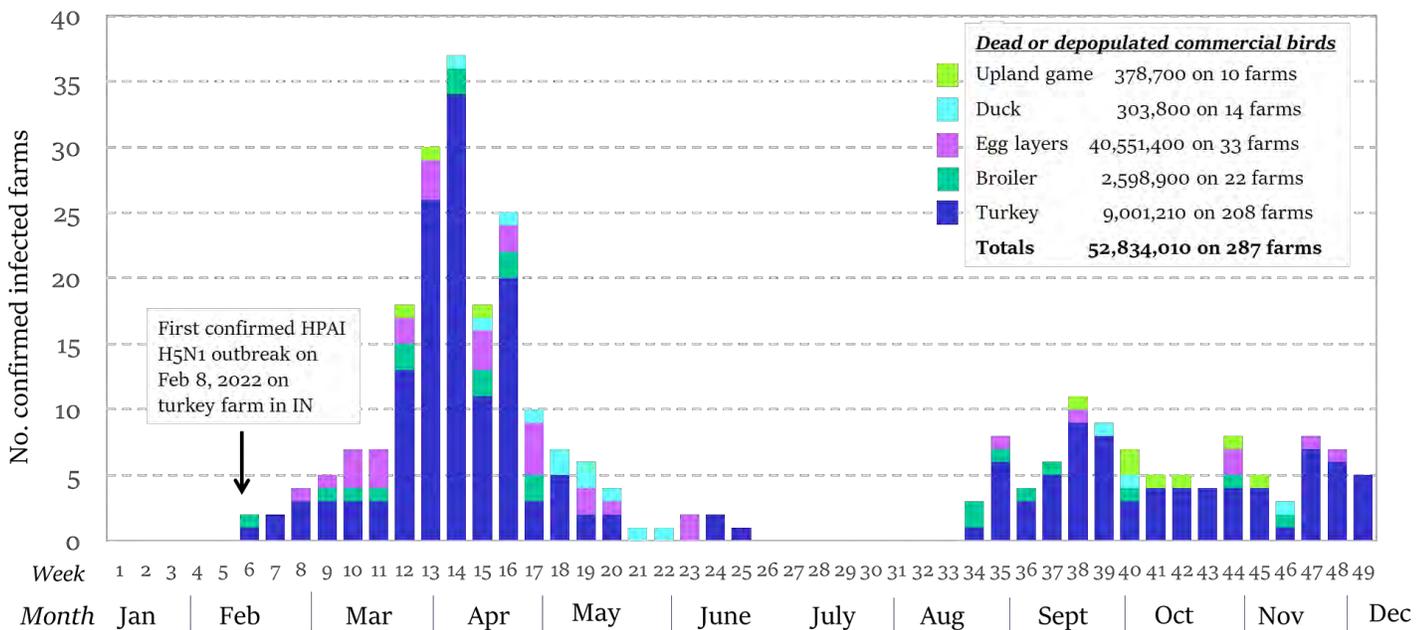
Note: (1) Spring and Fall bird flu peaks overlap with waterfowl migration; (2) summer nadir



\* Rescue farms, petting zoos, live slaughter, sentinel flock, hunting preserve; \*\* Game fowl are defined as backyard poultry by USDA APHIS

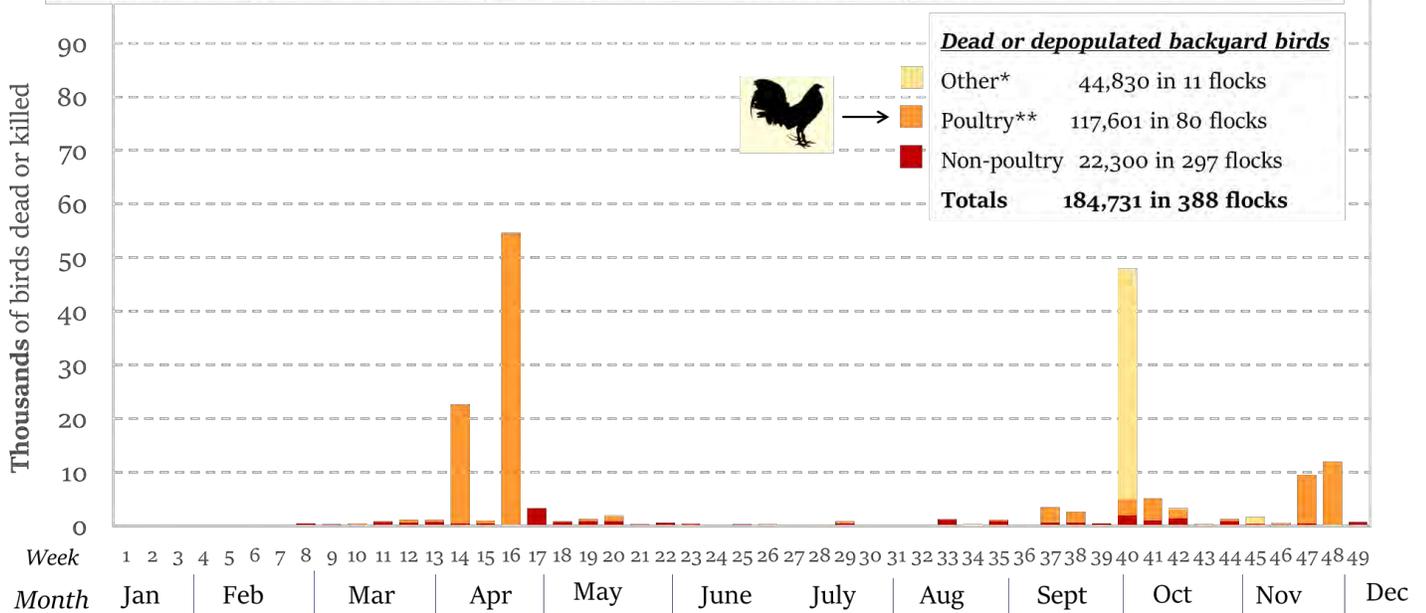
**Figure O-2: Commercial farms confirmed infected with HPAI H5N1 from Feb 6, 2022 to Dec 9, 2022.**

Note: (1) Spring and Fall bird flu peaks overlap with waterfowl migration and (2) summer nadir



**Figure P-1: Backyard birds dead or killed from HPAI H5N1, from Feb 6, 2022 to Dec 9, 2022.**

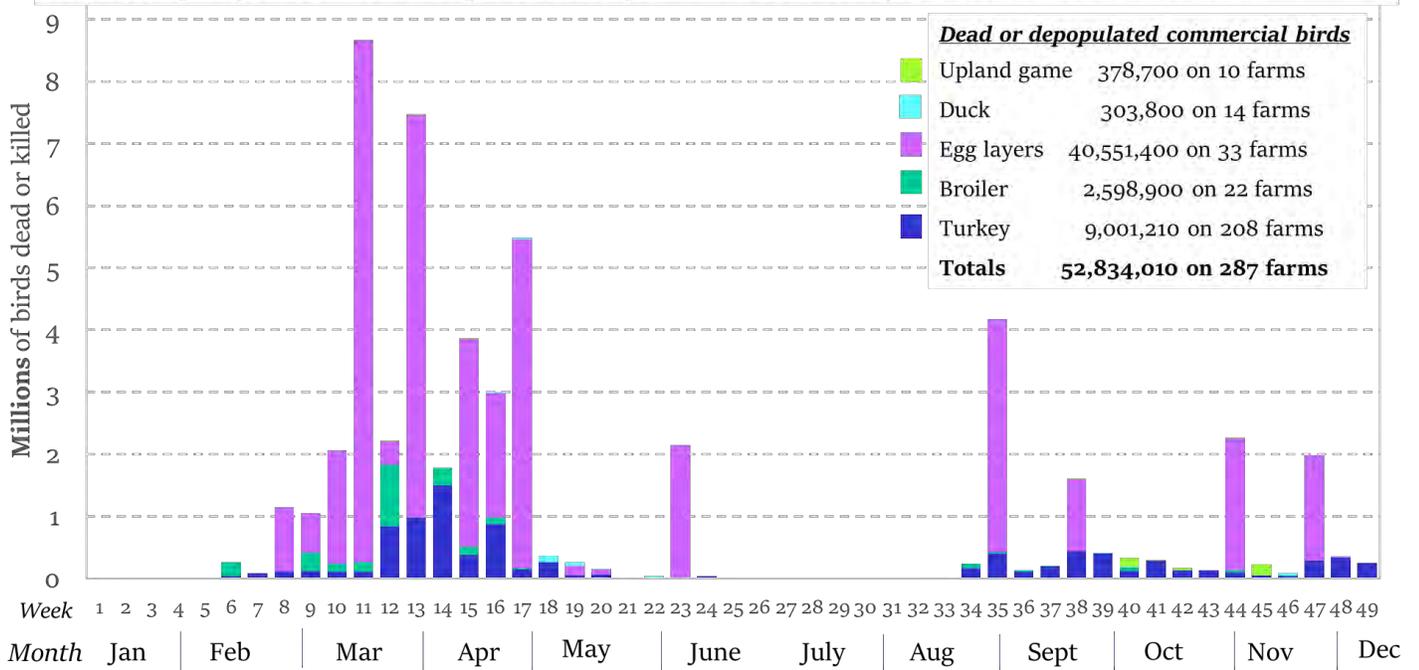
Note: (1) Spring and Fall bird flu peaks overlap with waterfowl migration and (2) summer nadir



\* Rescue farms, petting zoos, live slaughter, sentinel flock, hunting preserve; \*\* Game fowl are defined as backyard poultry by USDA APHIS

**Figure P-2: Commercial poultry dead or killed from HPAI H5N1 from Feb 6, 2022 to Dec 9, 2022.**

Note: (1) Spring and Fall bird flu peaks overlap with waterfowl migration and (2) summer nadir



List of Detections by Day						<a href="#">Click For International Exports</a>
Sort table by	Limit by month and year		Search by typing any word or phrase into the box below and pressing enter			
Confirmation Date	(All)					
Confirm..	State	County Name	Production	Control Area Released	Birds Affected	
17-Nov-22	Florida	Broward	Backyard Producer (non-poultry)	Active	20	
16-Nov-22	California	Fresno	Commercial Duck Breeder	Active	53,000	
	Florida	Hillsborough	Backyard Producer (non-poultry)	Active	100	
		Seminole	Backyard Producer	Active	80	
15-Nov-22	Florida	Duval	Backyard Producer (non-poultry)	Active	30	
	Minnesota	Otter Tail	Commercial Turkey Meat Bird	Active	28,200	
	Tennessee	Bledsoe	Commercial Broiler Breeder	Active	20,900	
14-Nov-22	Mississippi	Lowndes	Backyard Producer (non-poultry)	Active	0	
12-Nov-22	New York	Queens	Live Bird Sales / Slaughter	Active	170	
10-Nov-22	Michigan	Lapeer	Other	Active	990	
	North Dakota	Mountrail	Backyard Producer (non-poultry)	Active	40	
		Ward	Backyard Producer	Active	20	

For more information, see [https://www.aphis.usda.gov/animal\\_health/emergency\\_management/downloads/hpai/hpai\\_zones.pdf](https://www.aphis.usda.gov/animal_health/emergency_management/downloads/hpai/hpai_zones.pdf)

**Figure Q** - Screen grab of USDA APHIS HPAI website for avian influenza in commercial and non-commercial poultry as of Nov 18, 2022.

Unfortunately, the website does not indicate backyard farms with game fowl so it is not possible to link cockfighting farms with HPAI incidence, although this could be easily accomplished if the data was captured by APHIS.

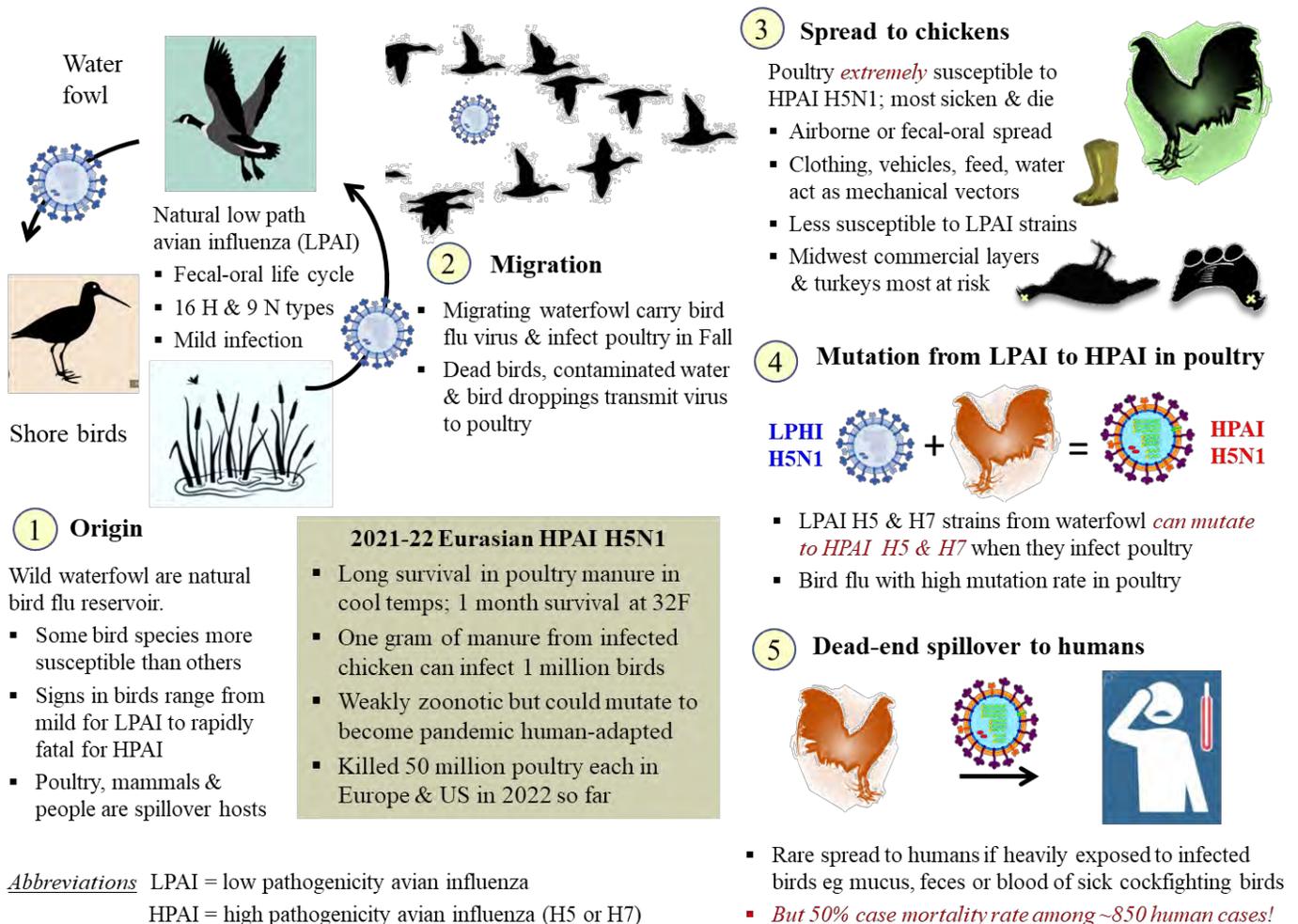
Game fowl are defined as “poultry” by USDA and the World Organization of Animal Health.

<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/hpai-2022/2022-hpai-commercial-backyard-flocks>



The role of the cockfighting industry in HPAI outbreaks is summarized below in **Figure T**.

**Figure T - Cockfighting amplifies Highly Pathogenic Avian Influenza outbreak risk to birds & people**



Abbreviations LPAI = low pathogenicity avian influenza  
HPAI = high pathogenicity avian influenza (H5 or H7)

## VI - Conclusions

- Cockfighting *introduces, spreads, and prolongs* virulent Newcastle Disease outbreaks in poultry (**Box 6**).
- Cockfighting *amplifies* Highly Pathogenic Avian Influenza H5N1 outbreak risk to poultry and wild birds and the zoonotic (pandemic) bird flu risk to people (**Box 7**).

1 - Organized cockfighting is a major global driver of both the introduction and rapid or continuous spread of virulent Newcastle Disease and Highly Pathogenic Avian Influenza, the two most important animal diseases on our planet. Cockfighting can serve as the match that ignites the outbreak kindling or the hot coals that keep an outbreak going. Indeed, all infectious disease outbreaks start with a small, often imperceptible exchange, with risk factors often able to be forecast by experts.

2 - Virulent Newcastle disease has entered the US by illegally smuggled cockfighting roosters many times (**Table 2**). Frequent game fowl and people movements facilitate HPAI and vND spread to poultry, wild birds, and people (for bird flu).

## Box 6 - Cockfighting introduces, spreads and prolongs virulent Newcastle Disease (vND) outbreaks in poultry



### *Pre-outbreak*

- Low biosecurity on game farms & at derbies
- Smuggle infected birds into US for cockfights

### *During outbreaks*

- Break quarantine to attend cockfights; sell, transport, trade & mix birds
- Hide valuable birds from surveillance or depopulation prolonging outbreaks; loath to self-report suspected vND cases
- Bring vND onto commercial farms via poultry workers who cockfight
- Drain indemnity funds meant for legitimate poultry

## Box 7 - Cockfighting increases HPAI H5N1 bird flu risk to birds & people

### *Pre-outbreak*

- Fall waterfowl migration overlaps with Thanksgiving start of US cockfighting season maximizing chance of waterfowl-to-game fowl bird flu spread
- Low biosecurity on game cock farms allows wild bird & waterfowl contact to spread LPAI or HPAI
- HPAI arise by mutation when waterfowl LPAI of H5 or H7 subtype are introduced into poultry or game fowl flocks

### *During outbreaks*

- Violate quarantines to attend derbies; smuggle, transport, ship, trade, sell & mix game fowl
- Hide valued game fowl from testing & depopulation pro-longing outbreaks; averse to self-report suspect HPAI cases
- Carry HPIA onto large indoor commercial farms as poultry workers (clothing, vehicles) esp turkey & laying hen barns
- Drain indemnity funds meant for legit poultry producers
- Use high-risk unsanitary practices to revive birds in fights
  - High H5N1 bird-to-human transmission risk & development of human-adapted bird flu viruses
  - eg blow in beak, clean trachea & lick wounds of injured fighting cocks



- 3 - HPAI and vND indiscriminately kill millions of domestic and wild birds of multiple species every year across the globe, leading to exorbitant animal pain and suffering, egg and poultry meat shortages, inflated food prices, trade embargoes, job losses, agri-food bankruptcies, food insecurity in some locales, and ecological impoverishment and disruption from massive wild bird die-offs.
- 4 - Virulent Newcastle Disease and HPAI outbreaks are costly to animals, people, and ecosystems.
- The three major vND epidemics in southern California since 1971 exceeded \$1 billion in inflation-adjusted cumulative direct and indirect public and societal costs and caused the deaths of more than 16 million birds ([Table 3](#)).
  - During the 2014-2015 US HPAI H5 outbreak (December 2014 to June 2015), 50.4 million commercial layers and turkeys died or were euthanized in 21 states, resulting in economic losses of \$3.3 billion, the most expensive animal disease outbreak in US history up to that time. Egg layers in the upper Midwest were the most impacted, causing soaring egg prices. Approximately 7.4 million turkeys (3% of the national flock) and 43 million egg-layers and pullet chickens (10% of the national layer flock) died from the disease or were depopulated. There were 211 outbreaks on commercial operations and 21 outbreaks on backyard premises. Broilers (chickens raised for meat) account for ~95% of poultry and are much less likely to contract the virus because they are killed at just about 45 days old.
  - The ongoing US December 2021-present HPAI H5N1 epidemic ([Figures L through S](#)) has killed even more poultry (53.02 million birds and counting as of December 9, 2022; 287 commercial flocks, 388 backyard flocks) as well as countless wildfowl in 48 states. The US epidemic has lasted 12 months so far, is nowhere near an endpoint, *and the expected highest-risk spring migration months are ahead in February and March 2023*. This epidemic will become, without doubt, *the new most expensive animal disease outbreak in US veterinary history and will require a major re-evaluation of HPAI disease control strategy, tactics, and operations by USDA APHIS*.
  - The [ongoing 2021-2022 HPAI H5N1 epidemic in Europe](#) is the largest ever, with 47.7 million birds culled as of December 2022 from 2,467 outbreaks in poultry, 187 outbreaks in captive birds, and 3,573 HPAI virus detections in wild birds with an unprecedented geographical extent reaching across 37 European countries as of Sept 30, 2022.
- 5 - The US (and European) HPAI H5N1 epidemic may be the first veterinary “wicked problem” (Waltner-Toews 2017). In planning and policy, a [wicked problem](#) is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. It refers to a problem that cannot be fixed, where there is no single solution to the problem; and “wicked” denotes resistance to resolution, rather than evil. “Wicked” aspects of the current HPAI H5N1 epidemic include:
- The current global HPAI epidemic/pandemic is the worst on record. The rampant epidemic has led to the deaths of more than 100 million poultry globally, mainly from culling, in the US and Europe in 2021-2022. This has enormous animal welfare and environmental ramifications, as there are no humane methods of mass euthanasia of commercial poultry nor eco-sound methods for the disposal of millions of virus-laden carcasses. In addition, endangered wild birds are at increased extinction risk from the HPAI H5N1 virus.

- (1) Failure of previously successful methods of HPAI disease control (ie rapid detection/diagnosis combined with ruthless rapid depopulation) and (2) breaches in normally effective commercial poultry biosecurity defenses in both Europe and North America to contain the virus. The HPAI H5N1 virus may become endemic in North America and Europe (Pohlmann et al 2022). Failure of traditional veterinary approaches to control HPAI H5N1 previously occurred in Southeast Asia and China in 2003-2007 where this virus subtype is now endemic (Pfeiffer et al 2013). Classical “stamping out” control approaches are neither effective nor sustainable for HPAI H5N1.
  - Dead-end spread of this avian virus to multiple species of North American mammals for the first time ([Figure S](#)) and the first US human infection ([in a Colorado poultry worker](#)).
  - Continued significant viral spread throughout the summer of 2022 in both Europe and North America rather than the typical summer seasonal transmission break observed in previous HPAI outbreaks ie for the first time the virus endured hot summer temperatures when bird flu viruses should deteriorate.
  - Many more wild birds died of HPAI in 2022 vs the previous large US HPAI epidemic in 2015. The number of reported wild bird events (3700 in the US as of Oct 15, 2022) is a vast underestimate of the total number of wild birds that have been infected and died from HPAI during this epidemic, limiting the assessment of the impact of the disease on wild bird populations.
  - Necessary introduction of new untested biosecurity measures. The long duration of the avian influenza risk period challenges the sustainability of the reinforced biosecurity measures implemented along the poultry chain in high-risk areas or production sectors with negative welfare and economic impacts. For example, many European countries have banned free-range poultry, enforcing indoor confinement, to reduce transmission risk from wild birds (EFSA 2022). The United Kingdom issued a mandatory indoor housing requirement for all birds in the nation regardless of flock size to mitigate HPAI spread.
  - [“The bird flu situation is not sustainable,” Piet Adema, Dutch minister of Agriculture, said on Friday \(Oct 17, 2022\). “Not for the animals, not for the \(poultry\) sector, and not for society.”](#) The same is true in the US where turkey prices have soared to all-time highs and egg prices have broken record highs three times with a potential to achieve the fourth record before year's end.
- 6 - With each new avian, mammalian, or human host exposure to, or infection with, the bird flu virus, *the odds of the emergence of a zoonotic human-adapted, potentially pandemic influenza strain increase*. For example, forty-four distinct HPAI H5N1 genetic variants (genotypes) were identified globally between 1996 and 2006, with changes in dominant genotypes reflecting major mutation events and the establishment of distinct lineages in poultry in different geographical regions (Pfeiffer et al 2013).
- So far, HPAI strains do not readily spill over from birds to people and only rarely transmit from human to human. But this could change as HPAI strains are highly adaptive and mutable, especially as they infect and adapt to new avian and mammalian hosts. An HPAI pandemic launched or sustained by cockfighting activities anywhere in the world could lead to a zoonotic avian flu pandemic with greater severity than the COVID-19 pandemic.

7 - Cockfighting activities are inordinately influential in promoting zoonotic spillover and host adaptation to humans of HPAI.

- *There is no doubt that illegal cockfighting is contributing to the ecological success and zoonotic spillover risk of the HPAI virus via intimate human-bird exposure during cockfighting activities (eg [Figure E](#)) and frequent gamecock shipping, trading, and transport to derbies.* The risk of HPAI infection for the general human population in the US and Europe is currently assessed as low, and for occupationally exposed people low to medium with high uncertainty due to the high diversity of circulating avian influenza viruses in bird populations.
- The 2003 Asian HPAI H5N1 strain has a human case-fatality rate of 53% (455 deaths among 863 human infections) in 18 countries as of April 2022 [according to the WHO](#). Cockfighting was the source of several fatal human infections from this virus in Southeast Asia. See [Appendix 1](#).
- Humans are currently only aberrant HPAI hosts which do not transmit the infection to any degree but are at risk of reaching spillover host status due to viral evolution, which could result in a global influenza pandemic.

8 - Cockfighting persists even though it is unlawful in the entire United States and all its territories. Passing a law to ban an activity is the easy part; stopping the actual practice is quite another, especially when dealing with a “sport” that is culturally entrenched, garners tax-free income, and [where law enforcement is lax](#) (Smith 2019). *Its dangers largely go unrecognized by our political leaders.*

Frustration has long smoldered among humane law enforcement and animal disease control personnel over the failure of law enforcement agencies, agricultural departments, the judiciary at multiple levels, and legislators to address cockfighting as both a serious crime and a disease threat with many downstream negative repercussions. It is past time to put a stop to gambling with our food supply, our health, our economy, and our wildlife from organized criminal cockfighting.

## ***VII - Recommendations to minimize zoonotic and animal disease risks from illegal cockfighting***

- 1 - *Vigorously enforce, prosecute, and punish those persons who violate existing state and federal anti-cockfighting laws and statutes by law enforcement and the judiciary.*
- 2 - *Strengthen federal anti-cockfighting legislation.* Existing laws against cockfighting must be reinforced. For example, bipartisan legislation was recently (November 2022) introduced ([Irby 2022](#)) in the U.S. House of Representatives proposing to amend Section 26 of the Animal Welfare Act by:
  - Banning simulcasting and gambling on animal fights in the United States, no matter where the fights and broadcasts originate;
  - Halting shipment of mature roosters (through the U.S. mail; (the US mail is widely used for domestic and international transport of thousands of game fowl from US gamecock farms);
  - Creating a citizen suit provision to allow a private right of action against illegal animal fighters and ease the resource burden on federal agencies; and
  - Enhancing forfeiture provisions to include real property used in the commission of an animal fighting crime

- 3 - *Improve local anti-cockfighting ordinances.* For example, in September 2018, the Los Angeles County Board of Supervisors [approved an ordinance to limit the keeping of roosters](#) in the unincorporated areas of the county. All neighboring countries in the Southland now have similar ordinances, including Orange, Riverside, San Bernardino, San Diego, and Ventura. This important action was taken to curtail ongoing problems with illegal cockfighting and associated criminal activities, improve the quality of life for residents, and reduce complaints of noise and odor associated with keeping large numbers of roosters. No more than 25 roosters may be kept or maintained on any property, which is considered sufficient to accommodate poultry enthusiasts who raise chickens in rural areas for hobby purposes. Importantly, the keeping of hens is not regulated by this ordinance. *Note:* The third large outbreak of virulent Newcastle Disease began in Los Angeles County in May 2018 from cockfighting activity, just four months before the passage of this ordinance.
- 4 - *Compel the USDA APHIS to capture the eco-epidemiologic role and risk of cockfighting in disease outbreaks at high granularity.* The USDA APHIS (and the World Organization for Animal Health) should create a unique and separate category for premises with cockfighting birds, rather than pooling them with all “backyard poultry” in HPAI and vND disease control efforts as is currently done. This would recognize the enhanced avian disease and zoonotic infection risks posed by cockfighting activities in originating and promulgating contagious infections, improve trace-back and trace-forward disease control actions, enhance post-outbreak epidemiologic quantitative risk analyses, and improve disease risk management. History tells us that cockfighting activities merit special consideration in animal and zoonotic disease control programs (Morris and Jackson 2005).
- 5 - *Create the best possible civic and legal conditions for law enforcement, humane organizations, the judiciary, and society at large to take punitive and preventive actions against illegal cockfighting.*
- 6 - *Educate and inform the public on the cruelty, many dangers, and high costs of illegal cockfighting, including zoonotic disease risks and inflated food prices, to make this abusive industry less socially acceptable to Americans.*
- 7 - *Close the loophole that allows cockfighters “to hide in plain sight” by making it difficult or illegal to raise large numbers of cockfighting roosters.* For example, strictly limit the number of roosters (but not hens) of any breed on specific areas of land. An example is the 2018 [Los Angeles rooster ordinance](#).

## ***VIII - Appendix 1: Media and scientific reports linking cockfighting to HPAI H5N1 in Southeast Asia 2003-2006; zoonotic fighting cock-to-human HPAI spillover***

Anonymous. "Thailand battles avian flu in hidden fighting cocks". *Houston Chronicle*. Feb 16, 2004. <https://www.chron.com/news/nation-world/article/Thailand-battles-avian-flu-in-hidden-fighting-1633369.php>

Deputy Agriculture Minister Newin Chidchop told reporters the H5N1 virus had been found in fighting cocks in areas of eight provinces where mass slaughters were carried out and in ducks in one not struck by the first wave of infections. *The infected fighting cocks - valuable birds some owners were accused of hiding -- were found in former "red zones" where the government had ordered the slaughter of poultry within a three-mile radius of an outbreak, he said*

Anonymous. "Thai man who bred fighting cocks dies of bird flu". *Pravda*. Sept 26, 2006. [https://english.pravda.ru/news/world/84673-bird\\_flu/](https://english.pravda.ru/news/world/84673-bird_flu/)

*A 59-year-old Thai man who bred and raised fighting cocks in northeastern Thailand contracted the H5N1 bird flu virus and has died, bringing the country's human death toll from the disease to 17, health officials said Tuesday. "He didn't give his full history to the doctor that he raised chickens, that they were sick, and that they had died," Thawat told The Associated Press. "He was scared that the agriculture officials would kill his birds." The H5N1 strain of bird flu has killed at least 146 people worldwide since it started ravaging poultry stocks in Asia three years ago, according to the World Health Organization, not including the most recent death in Thailand.*

Anonymous. "Cockfighters Spread Asian Killer Bird Flu." *Animal People*. March 1, 2004. <https://newspaper.animalpeopleforum.org/2003/03/01/cockfighters-spread-asian-killer-bird-flu/>

BANGKOK, BEIJING - Cockfighters, cock breeders, and public officials kowtowing to them tried to pass the blame for spreading the deadly H5N1 avian flu virus throughout Southeast Asia to pigeons, sparrows, and even open-billed storks. Bad vaccines took some of the rap, too. An attempt was even made, as the death toll increased on factory farms, to attribute the epidemic to free-range poultry producers. But as the H5N1 "red zones" expanded in at least eight nations, *the evidence pointed ever more directly at commerce in gamecocks - and at the efforts of cockfighters and cock breeders to protect their birds from the culls and disease outbreaks that had already killed more than 100 million chickens who were raised to lay eggs and be eaten, as well as 22 people, most of them children.* The pattern of the H5N1 outbreak paralleled the spread of exotic Newcastle disease through southern California and into Arizona between November 2002 and May 2003. Approximately 3.7 million laying hens were killed to contain the Newcastle epidemic, but USDA investigators believe it began among backyard fighting bird flocks, advancing as gamecocks were transported between fights. It apparently invaded commercial layer flocks through contaminated clothing worn by workers who participated in cockfighting.

Hamilton, Jon. "Flu Fears Threaten Thai Cockfighting Tradition". *National Public radio*. Feb 23, 2005. [Flu Fears Threaten Thai Cockfighting Tradition: NPR](#)

Strictures put into place by the Thai government to stop the spread of bird flu have imperiled the future of cockfighting, a pastime that many Thais consider an integral part of rural life. Thai officials say they're trying to protect people. *So far, only a few humans have been infected -- including at least one owner of a fighting cock. But each new infection increases the chance that bird flu will jump from chickens to*



[Lubroth/publication/7673952\\_Origin\\_and\\_evolution\\_of\\_highly\\_pathogenic\\_H5N1\\_avian\\_influenza\\_in\\_Asia/links/0f31752d9010d3b64e000000/Origin-and-evolution-of-highly-pathogenic-H5N1-avian-influenza-in-Asia.pdf](http://Lubroth/publication/7673952_Origin_and_evolution_of_highly_pathogenic_H5N1_avian_influenza_in_Asia/links/0f31752d9010d3b64e000000/Origin-and-evolution-of-highly-pathogenic-H5N1-avian-influenza-in-Asia.pdf)

Both the legal and illegal trade in poultry and poultry products could have contributed to the spread of H5N1 viruses. There are long land borders between many of the infected countries in the region and it is acknowledged that there are unofficial movements of poultry and poultry products across them. *The movement of live poultry, including fighting cocks, across borders and within countries has apparently been an important route for the spread of the viruses. Investigations of outbreaks of disease suggested that smuggling of fighting cocks was the most likely route of entry of the virus into Malaysia.*

Sipress, Alan. "Bird Flu Adds New Danger to Bloody Game" April 14, 2005. *Washington Post*.  
<https://www.washingtonpost.com/archive/politics/2005/04/14/bird-flu-adds-new-danger-to-bloody-game/7f49062b-41fc-404d-ab92-8cdee193b302/>.

*Cockfighting, popular in many parts of Southeast Asia, is suspected of spreading the highly lethal bird flu virus from poultry to humans through contact with blood, feces, and droplets of fluid.* It is one of several cultural practices, including the eating of raw duck blood and the raising of chickens in backyards, that is threatening to help spark a global pandemic that the World Health Organization warns could kill tens of millions of people.

For centuries, these practices posed no human threat. But a dramatic increase in poultry farming in the region in the past 15 years has allowed avian influenza to become entrenched in the bird population. Now, these cultural routines represent a potential springboard for a human epidemic.

"There will be opportunities for the virus to take advantage of these practices," said Klaus Stohr, director of WHO's global influenza program. "They didn't cause trouble before, but now they do." Often, the home-raised birds are fighting cocks. In Thailand alone, estimates put their number in the millions. *According to WHO and local news reports, infected fighting cocks may have caused at least eight confirmed human cases of avian influenza in Thailand and Vietnam since the beginning of 2004.* It is one of several cultural practices, including the eating of raw duck blood and the raising of chickens in backyards, that is threatening to help spark a global pandemic that the WHO warns could kill tens of millions of people.

*In September, the virus killed an 18-year-old Thai man who raised fighting cocks outside Bangkok. Thai health officials said he had the habit of sucking mucus and blood from the beaks of his injured roosters and sometimes even slept with his birds.* Earlier last year, a 13-year-old boy who frequented cockfights in Vietnam's Ho Chi Minh City and often held the birds before the bouts also succumbed to the disease. ... Fighting cocks represent a lavish investment. A proven winner can sell for as much as \$2,500, Phapart said. *That is why some owners hid their roosters when Thai officials ordered the mass culling of poultry to contain the bird flu epidemic.* Others have smuggled cocks across provincial lines, potentially spreading the disease. Officials in Malaysia blamed the outbreak in the north of their country in September on fighting cocks illegally transported from Thailand.

Young, Yavarace (Vongsivavilas), 2006. Cockfighting: the culture that has to change to avoid a deadly influenza pandemic. *Journal of Health Sciences*, 15(3): May-June 2006.  
<https://doczz.net/doc/1937983/cockfighting--the-culture-that-has--to-change-to-avoid-a-...>

Waterfowl have been well recognized as a natural reservoir for all 16 subtypes of AI (avian influenza) including H5 and H7 subtypes. It was once believed that waterfowl were resistant to infection by HPAI

viruses. When HPAI, subtype H5N1 swept across Asia in 2004, people pointed finger at migratory birds as likely culprits in its spread. Yet many avian experts were skeptical about it. *Ornithologists and animal epidemiologists argued that the epidemics did not fit any known flyways of migratory birds.* H5N1 outbreaks occurred in some areas along the East Asian/Australian flyway but skipped Taiwan, Malaysia (except its border with Thailand), and western Australia. At that time the sampling often of thousands of waterfowl failed to demonstrate any healthy wild bird carrying' HPAI, subtype H5N1.

*Moreover, many experts believed infected wild birds could not fly long distances. Subsequent investigations kept turning up evidence suggesting that poultry trade and human movements of infected poultry were to blame.*

The 2003-2004 epidemic of HPAI, subtype H5N1 has become established in eight Southeast Asian countries. The outbreaks were followed by human cases of direct transmission of H5N1 viruses from chickens and a case of probable human-to-human transmission. The virus affected various poultry species, wild birds, and several mammals including tigers, leopards, cats, mice, ferrets, pigs, and dogs. The 2004 outbreak claimed the lives of more than 30 million birds and 12 human beings among 17 confirmed cases in Thailand. Although human death cases were low, the mortality rate was as high as 70.59 percent in Thailand. Moreover, the outbreaks could not be controlled despite several control measures. It is partly due to a lack of qualified personnel, facilities, and/or system for early detection of the infection.

Various outbreaks in a wide geographic area have raised a global concern that this disease has the potential to become a pandemic in the near future if not properly managed. However, the most immediate threat is the economic loss resulting from large numbers of poultry infected or culled. Poultry are a major food supply of protein for humans. As the human population increases, poultry production has changed. It has become commercialized and industrialized in many countries, notably in the western and other developing countries.

*Some traditional practices in Asia can facilitate the transmission of HPAI viruses. For example, local poultry production with minimal or no biosecurity is common in the region. Village and backyard chickens, free-grazing ducks, and fighting cocks are often raised along with other animals. The birds freely roam the village around people and other animals.*

*The 2004 H5N1 outbreak in Thailand prompted the Thai government to announce a temporary suspension of cockfighting as a control measure. There is no doubt that some human activities related to cockfighting can spread the virus. For example, fighting cocks are often raised in unsanitized conditions along with backyard chickens or other domestic waterfowl. They are commonly carried long distances for trade as well as for fighting contests.*

*The contest is usually held in a small cockpit or open ground surrounded by many excited spectators, including adults and children. The overcrowded cockpit allows close contact between humans and live birds. In addition, mouth-to-mouth suction to remove an excess secretion from the bird's throat is a common practice among the handlers and it is a perfect mechanism for viral transfer from fighting cock to human. After performing mouth-to-mouth suction, they spit the secretion right onto the ground.*

## ***IX - Appendix 2: Global HPAI H5Nx situation (where x denotes different N antigens)***

***The bird flu virus:*** High pathogenicity avian influenza (HPAI) is caused by influenza A viruses with virulent H5 or H7 hemagglutinin surface proteins. Since its identification in southern China in a domestic goose in 1996, there have been multiple waves of intercontinental transmission of the *H5Nx Gs/GD lineage virus*. The spread of this virus and its mutated descendants across Asia and into Europe and Africa and North America over the past two decades is unprecedented. [The virus recently spread to South America for the first time](#). The original 1996 HPAI H5 virus has [evolved into several clades](#), forming many genotypes and sub-genotypes that threaten poultry production and wildlife worldwide, including several endangered bird species. The HPAI H5N1 strain is fast-mutating and infects multiple bird species. It is both epizootic (an epidemic in non-humans) and panzootic (a disease affecting many animal species over a wide area). The H5Nx virus has proven remarkably adaptable, successfully infecting poultry in nations and regions with completely different agricultural, ecological, social, and economic backgrounds. Avian influenza viruses have a comparatively high evolutionary capacity to adapt to new hosts and changing environments.

***Viral spread:*** Migratory waterfowl have caused repeated viral incursions of HPAI H5Nx since 2005, but live poultry markets, backyard poultry flocks, and [cockfighting operations](#) maintain the virus and foster mutations after wild waterfowl introduction in parts of Asia and Africa where the virus is now permanently established and endemic. While wild birds in some instances might introduce the infection into the domestic poultry population as [“wild bird airplanes dropping \(virus\) bombs”](#) this source has much lower importance for the spread and maintenance of HPAI H5N1 infections compared with human activities associated with domestic poultry such as cockfighting (Pfeifer et al 2013). Furthermore, HPAI H5Nx virus emergence has often *not* been associated with waterfowl migration, pointing to human activity [such as cockfighting](#) as the likely source of H5Nx bird flu introduction. The maintenance of viruses in poultry in many endemic regions is the result of local poultry trade and cockfighting activities rather than the re-introduction of viruses via wild birds.

***Bird deaths:*** HPAI H5Nx has caused the death and mass slaughter of more than 316 million poultry worldwide between 2005 and 2021, with peaks in 2016, 2020, and 2021. The ongoing bird deaths in North America and Europe in 2022-23 may prove even worse. During the years 2006, 2016, 2017, and 2021, more than 50 countries and territories were affected by HPAI H5Nx strains. According to the World Organization for Animal Health (WOAH), there were 18,620 outbreaks of HPAI of various HN subtypes in poultry in 76 countries between 2005 and 2019 (WOAH 2022).

***Zoonotic risk:*** *There is a justified fear that the HPAI H5Nx virus family may mutate into a strain capable of sustained human-to-human transmission.* However, *the greatest impact to date has been on the highly diverse poultry food systems in affected countries, leading to poultry meat and egg shortages and higher food prices, and a decimated backyard and commercial poultry industry.* Up to now, humans have only occasionally been infected with subtypes H5N1 (around 850 cases reported, of which half died), H7N9 (around 1,500 cases reported, of which about 600 died), and H5N6 (around 80 cases reported, of which about 30 died). Most H5N1 human cases occurred in Southeast Asia and most developed following contacts between villagers and rural chickens or fighting cocks where basic hygienic standards are rarely respected (See [Appendix 1](#)).

Figure U shows a CDC infographic on the emergence and evolution of HPAI H5N1 from 1996 to 2022. Figures V, W, and X show the vast global extent of the current HPAI H5Nx pandemic.

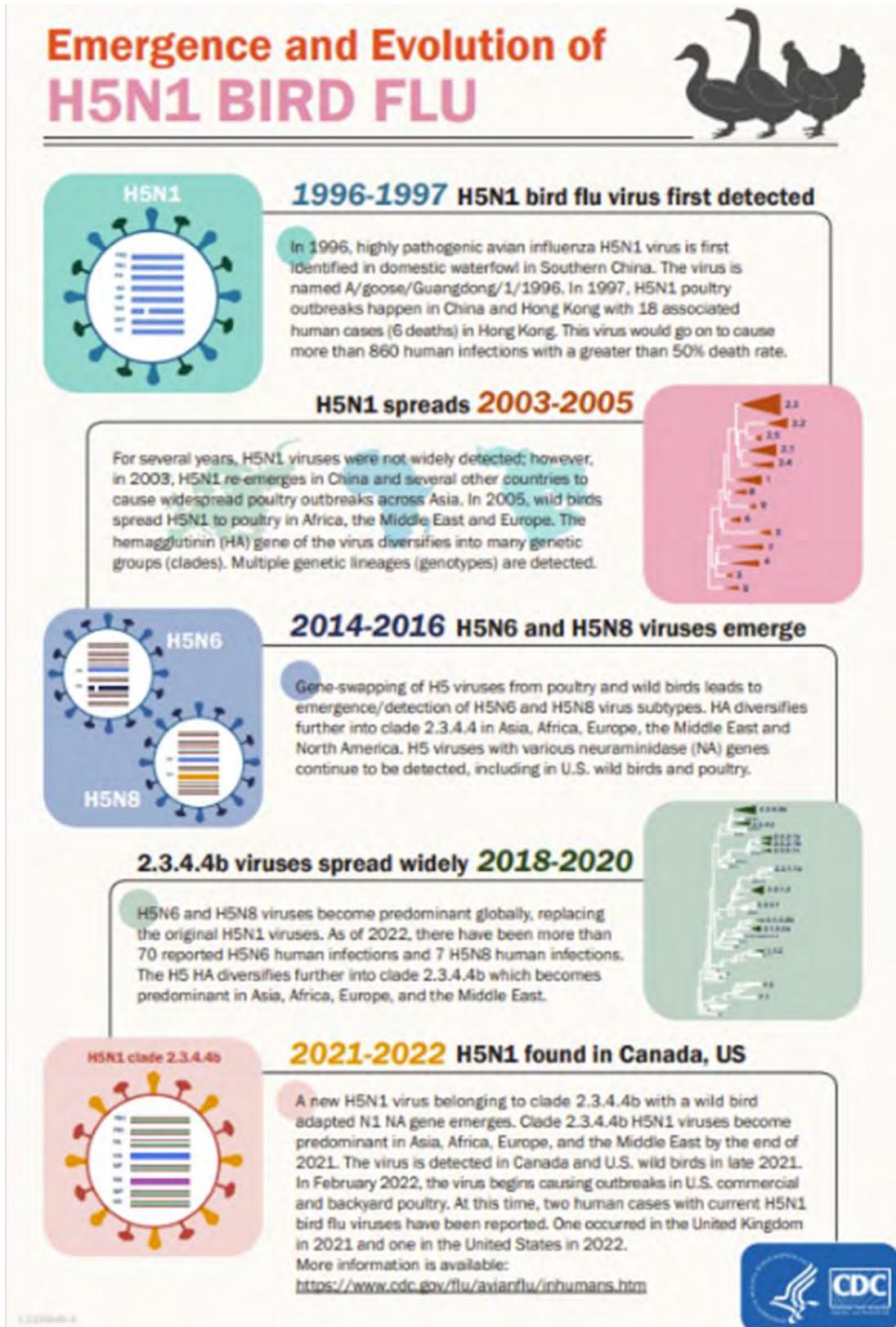


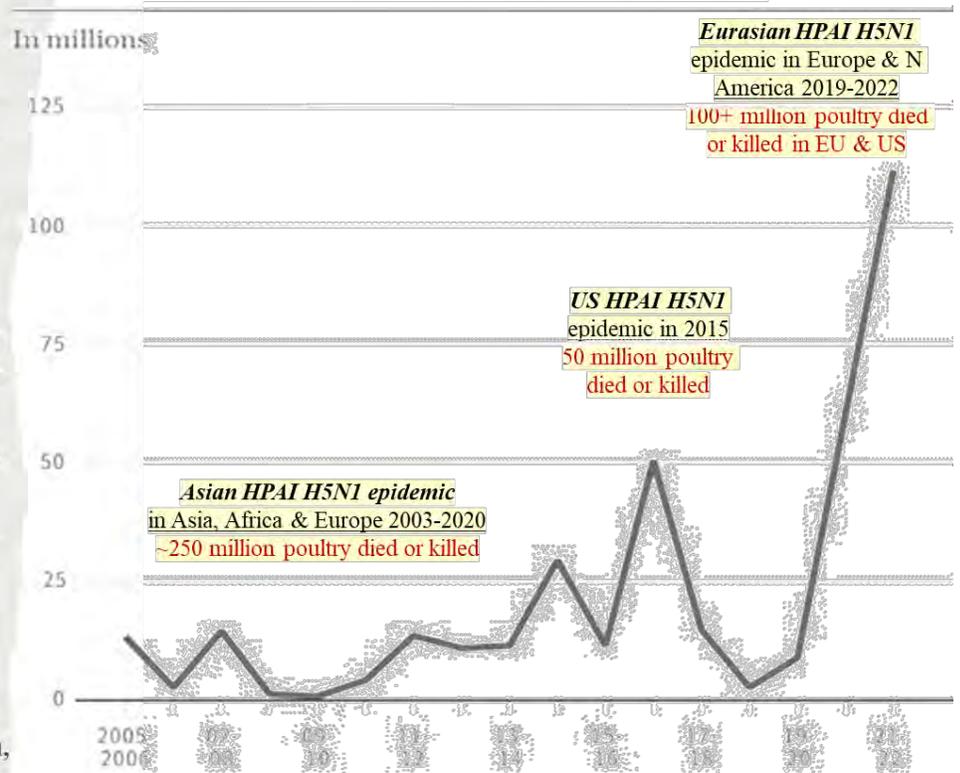
Figure U - Emergence and evolution of H5N1 bird flu (infographic).  
<https://www.cdc.gov/flu/pdf/avianflu/bird-flu-origin-graphic.pdf>

## The Telegraph

Oct 31, 2022

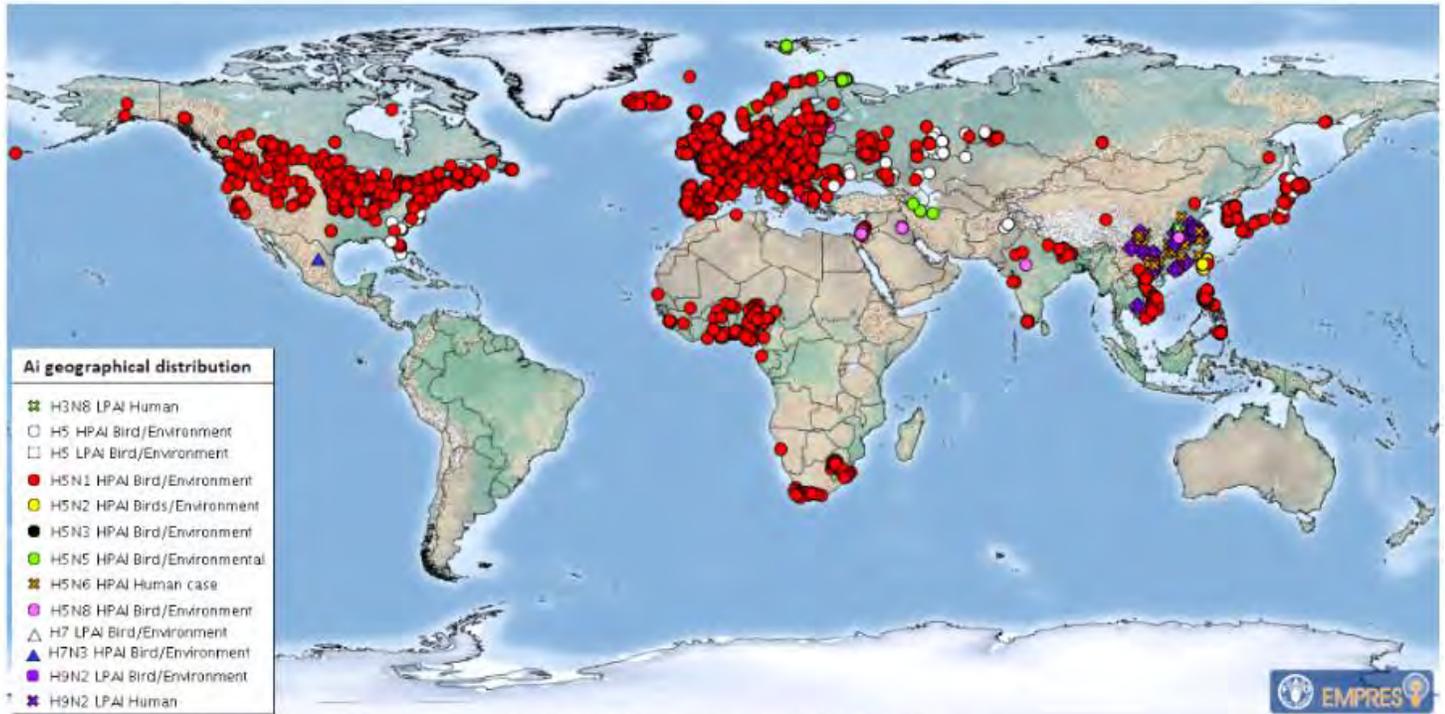
- HPAI H5N1 global panzootic (ie animal pandemic) (2003-present) is most damaging domestic animal epidemic in world history
- Ongoing US 2021-present HPAI H5N1 epidemic is most costly animal disease event in US history
- Between 2005 and 2020, 246 million birds culled
- About 2,500 human cases of various bird flu subtypes recorded but most are HPAI H5N1
- No evidence yet of sustained human-to-human transmission,

## Avian flu: our food chain is in crisis



**Figure V - Global poultry deaths from culling & sickness due to HPAI, 2005-2022**

<https://www.telegraph.co.uk/global-health/science-and-disease/what-bird-flu-pandemic-killedmillions-means-us/>



Note: Symbols may overlap for events in similar geographic locations.

\*includes H5Nx, H7Nx highly pathogenic avian influenza (HPAI) viruses and H3N8, H5Nx, H6N1, H7Nx, H9N2, H10N3, H10N7, H10N8 low pathogenicity avian influenza (LPAI).

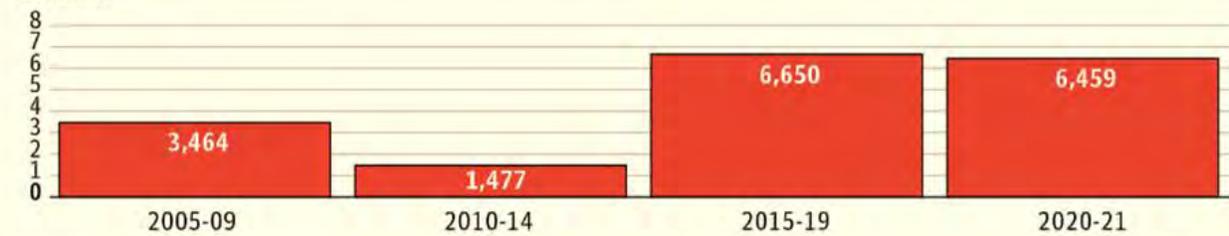
**Figure W** - Global distribution of outbreaks of Avian Influenza virus with zoonotic potential from October 2021 through September 30, 2022. (Screen grab from FAO website).

<https://www.fao.org/animal-health/situation-updates/global-aiv-with-zoonotic-potential>

## Bird flu cases surged dramatically in 2020-2021

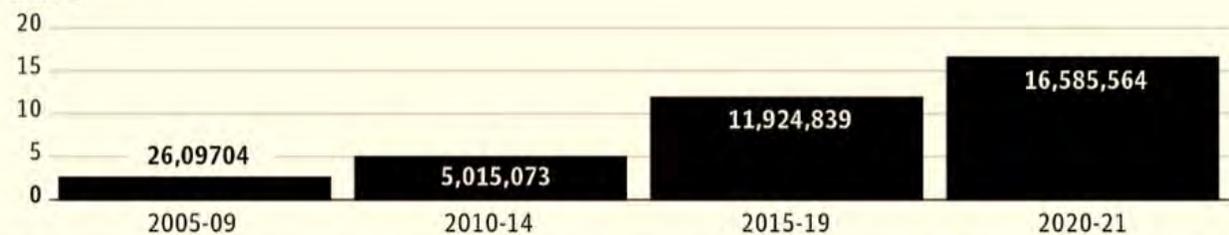
### Overall outbreaks

Thousands



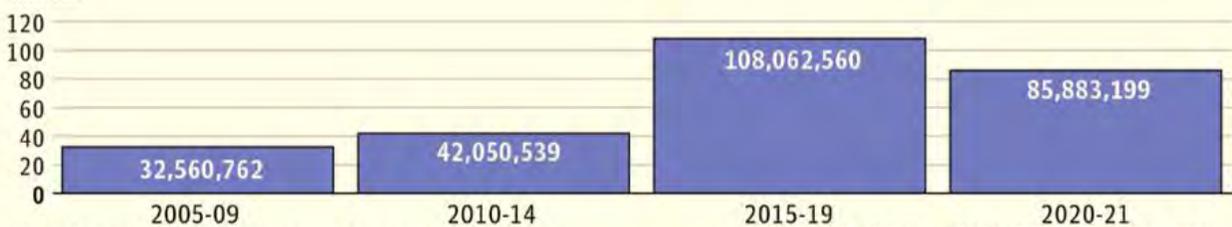
### Individual cases

Millions



### Deaths

Millions

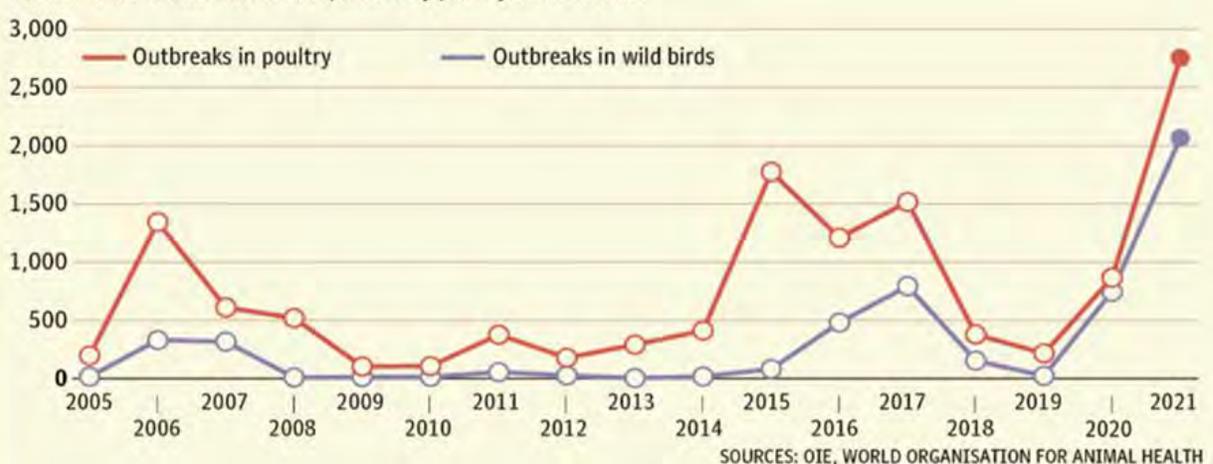


Note: All data is for a 5-year period except for 2020-21

SOURCES: OIE, WORLD ORGANISATION FOR ANIMAL HEALTH

## 2021 was a record-breaking year for bird flu

Number of outbreaks recorded separated by poultry and wild birds



SOURCES: OIE, WORLD ORGANISATION FOR ANIMAL HEALTH

**Figure X** - Global highly pathogenic avian influenza poultry outbreaks, cases and deaths, 2005-2021. Note that poultry and wild bird epidemic curves mirror each other. The global situation continues to worsen in 2022. *Source: The Telegraph, Feb 15, 2022.*

<https://www.telegraph.co.uk/global-health/science-and-disease/exclusive-bird-flu-surge-threat-human-health-experts-warn/>

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