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Analyses of the Poultry Value Chain and Its Linkages and Interactions with HPAI Risk Factors in Nigeria

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Key Findings

- HPAI disease-transmission pathways are linked to the economic incentives that chain actors face.
- Disease transmission risk is strongly related to commercial practices and trade in poultry and poultry products.
- Consumer influences are insufficient to change governance and commercial practice.
- Chain actors face economic incentives to conceal information that is essential for effective HPAI control.
- Sustainable HPAI control will require improved private sector-driven coordination mechanisms that target deficient biosecurity practices in the value chain.

Impacts

of highly pathogenic avian influenza (HPAI) can cause reverberations throughout the poultry marketing chain. In Nigeria, peak HPAI outbreaks in February 2006 and February 2007 affected 3,057 farms and farmers; 1.3 million of the country's 140 million birds were destroyed, and the Nigerian government paid US\$5.4 million in compensation (FDL 2008). Still, policymakers may overlook some HPAI impacts, focusing upstream of the producer, whereas cumulative downstream (traders, slaughterhouses, retailers, casual employment, and support services) impacts often dwarf those at the farm level. More significantly, the failure to capture these diverse impacts may have important implications for disease evolution and control that may accentuate its impact.

The Nigerian poultry sector value chain was characterized and critical control points of disease entry and spread identified. Focus group discussions and key informant interviews generated information from key actors: breeder and hatchery operators, traditional and commercial producers, live bird and egg traders, processors, and transporters in the four major agroecological zones. The states most affected by HPAI were selected for each agroecological zone: Lagos and Ogun States (humid), Anambra State (subhumid), Plateau State (Northern Guinea Savanna), and Kano State (Sudan Savanna). These states also represent four of the six geopolitical zones in Nigeria, which may have implications for policymaking and advocacy.

Trained enumerators conducted field work in four teams composed of an agricultural economist (team leader), a rural sociologist, and the desk officer of the Avian Influenza Control Project for the selected states. The analysis tested the following hypotheses:

1. Disease transmission pathways are linked to economic incentives that poultry chain actors face.
2. Risk of disease transmission is strongly related to commercial practices.
3. Consumer sovereignty is insufficient to influence Nigerian governance and commercial practices.
4. Economic incentives encourage chain actors to conceal information that is essential for effective HPAI control.

Results

Stakeholder analysis

Breeders and hatcheries play critical roles in the commercial poultry industry because they supply day-old chicks (DOCs) to all commercial farms; they must be closely monitored as the first potential sources of HPAI disease should they fail to observe strict hygiene and biosecurity rules. The major DOC distributors are potentially dangerous actors because they link hatcheries to farms and could rapidly spread HPAI from hatcheries to other parts of the chain.

Both major (branded) feed millers and smaller toll milling companies are important actors. Handling about 40 percent of about 1.2 million tons per year of compound feed produced in Nigeria, major millers are unlikely to spread HPAI because of the high level of competition within their bracket and the associated need to maintain industry standards. In contrast, toll millers are likely to spread HPAI; they help nearby small commercial farmers grind, mix, and package feed, usually in previously used bags. Farmers can inadvertently spread HPAI on their own farms if the feed has been contaminated.

Four types of poultry producers are identified, roughly corresponding to the Food and Agriculture Organization of the United Nations (FAO) poultry classification for sectors 1–4. *Backyard indigenous growers* focus on indigenous breeds (duck, guinea fowl, pigeon, and local turkey) for their own consumption, gifts, and some sales. Their birds roam and scavenge freely, exposed to migratory wild birds that could carry the HPAI virus. Because these producers take few biosecurity measures, their birds are in constant danger of contracting HPAI. *Backyard commercial producers* derive most of their livelihoods from poultry-related activities but also generate income from other sources. Although they take more hygiene and biosecurity measures than the indigenous growers, their birds also are susceptible to HPAI infection and face an additional risk of contracting the virus through toll-milled feed. *Medium-to-large-scale commercial producers* are better organized in terms of on-farm hygiene and biosecurity but may have unfenced premises, allowing indiscriminate access to poultry pens. The experiences of some of their colleagues whose farms were decimated in the 2006–07 HPAI outbreaks forced them to pay closer attention to biosecurity. *Industrial farms* have the highest biosecurity levels; their risk of spreading HPAI is minimal because integration is vertical rather than horizontal. Because they do not readily provide information, industrial farms were excluded from this study.

Potentially important actors for HPAI spread are live bird collectors and distributors, especially those who gather mature broilers and spent layers from farms for distribution in retail markets. Informant interviews revealed that at the peak of the 2006–07 HPAI outbreaks, many collectors mixed poultry species in cages and deliberately sold sick birds to retailers, thereby encouraging the spread of the disease. Indeed, many of the most serious cases of HPAI infection and spread occurred between the producers' farms and live bird traders. The important role of transporters also must be considered. Like traders, transporters mix poultry species in cages. They transport humans and birds together and have few incentives to engage in proper biosecurity measures because they are paid for their services, even when birds die in transit. Given the crucial intermediary roles of traders and

transporters, an important area for public policy will be the development of mechanisms that better align the economic incentives of traders and transporters with improved poultry-trade biosecurity.

Given that large quantities of the HPAI virus are shed in the feces of infected poultry, the emerging market for poultry manure fertilizer may facilitate the rapid spread of HPAI from farm to farm. Moreover, because this trade takes place outside of existing channels, biosecurity incentives are low. Study results also reveal that much of the grain supplied to feed mills for large poultry farms in the south is shipped from the north, where more grain is produced. Importantly, some grain suppliers collect, bag, and transport poultry manure on their return trips (as far as 1,000 km to the north), then reuse the same bags for the next southward grain trip. The danger posed by the transport of poultry manure from an infected farm across the country clearly needs more careful assessment.

Governance and coordination

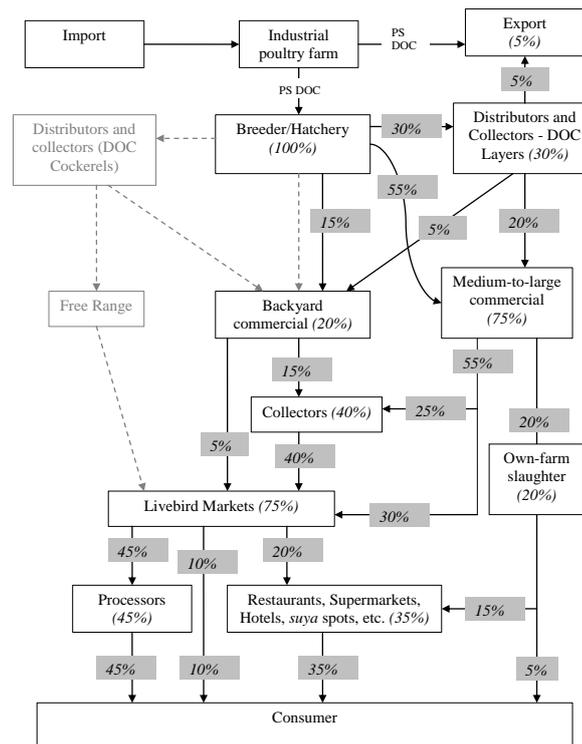
In the various poultry value chains, governance relationships typically involve arms-length or relationship-based interactions among actors. They tend to be codified through the actions of traders and collectors, which mediate the exchange between producers and retailers. Informant interviews revealed limited competition among live bird traders and collectors, with a small, powerful group of collectors and distributors cornering large portions of the business. Traders also play an important role in providing credit to retailers, locking them into a relationship and limiting retailers' bargaining power. In conjunction with the main trade association, traders also played an important role in encouraging consumers to continue eating chicken and eggs during the 2006–07 HPAI outbreaks.

Formalized standards in the poultry sector appear to be relatively ad hoc, with limited coordination among chain actors to provide consistency in the quality, food safety, or disease status of poultry and poultry products. End consumers have little input on the quality- and safety-based attributes of live birds and poultry meat, and their willingness to pay for higher quality probably is quite low.

The Nigerian government and industry trade associations play important roles in this sector, particularly among more commercialized parties, setting rules and closely monitoring the industry to ensure that rules are followed. The government controls the importation of grandparent and parent stock, sets rules for hatchery operators, bans the importation of various poultry products, insists on hygiene and biosecurity, and sanctions producers (especially the not-so-powerful ones) that are not in compliance. Associations engage in market-promotion and informational activities and were active in producer- and consumer-awareness campaigns during the 2006–07 HPAI outbreaks.

Product Flows

Four distinct poultry value chains are identified: eggs and spent layers, commercial broilers, indigenous poultry, and commercial and guinea fowl eggs. Industry operators estimate the commercial poultry population at about 24 million layers and 40 million broilers. Products flow through distinct channels for commercial egg and broiler production. The flow starts with DOCs. Distributors may deliver DOCs from hatcheries to producers' farms (Figure 1); large farms may collect large quantities of DOCs directly or have them delivered.

Figure 1. The spent layers' value chain in Nigeria

Up to 80 percent of DOCs are produced and used in the southwest of the country; the southeast and northwest regions source all DOCs from other regions. A few hatcheries in Plateau State (northeast) supply DOCs for that zone and send a substantial quantity to Kano State in the north central/northwest area. The proportion of poultry product flows between actors and their spatial distribution across the country are well illustrated in flow charts and maps in the main report.

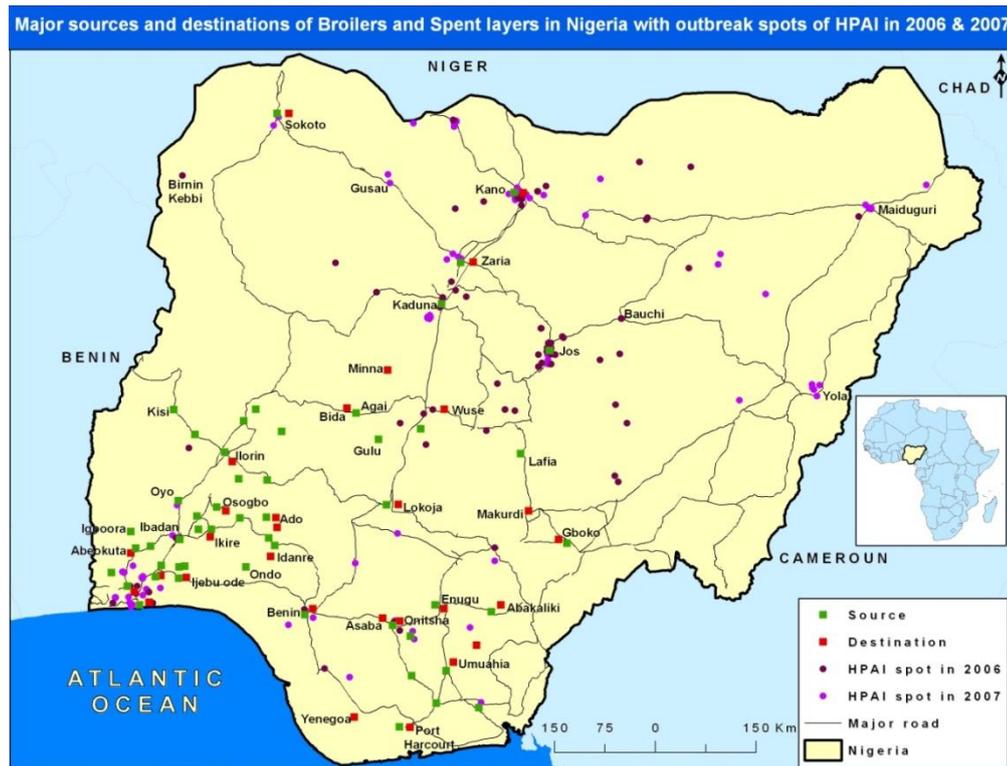
All zones produce spent layers as a residual output of commercial egg production. Most enter intra- and interstate trade from the southwest, moving to the southeast. Indigenous poultry grows nationwide, but the supply flows mainly from north to south. Commercial eggs flow from south to north and from southwest to southeast. In season, guinea fowl eggs flow from north to south.

The 2006–07 HPAI pattern of outbreaks closely follows the countrywide distribution routes for DOCs, feed, broilers, spent layers, and indigenous poultry, although a statistical correlation between these events is still required to confirm this hypothesis (Figure 2). This potential correlation suggests a strong association between HPAI spread and the poultry trade; future HPAI-prevention efforts must carefully note and control the movement of inputs and products. Biosecurity measures must be taken at the origins, the destinations, and along the paths of various poultry inputs and products.

Critical Control Points and Good Operating Practices

The focus group discussants noted several critical control points and good operating practices at such points in the poultry value chain:

- The emerging trade in poultry manure for crop fertilizer has the potential to spread HPAI.
- Live bird markets must be sanitized and inspected regularly to maintain hygienic conditions.

Figure 2. Major broiler and spent layer sources and destinations with locations of 2006–07 HPAI outbreaks

- Sick birds should be separated and quarantined.
- Plastic cages and crates should be used for live birds and eggs to facilitate disinfection.
- Only healthy birds should be purchased, and species should not be mixed in the same cage.
- Only scientifically accurate information should be passed to industry actors to avoid misunderstandings.
- Egg crates should not be exchanged between farmers and egg traders.
- Poultry pen access must be restricted.
- Processors should not operate close to live bird markets.
- Transporters should not mix bird species or carry humans and poultry in the same vehicles.
- Activities of free-range poultry producers should be controlled.
- Biosecurity should be increased on all poultry farms, and fencing should be required.
- The indiscriminate dumping of poultry manure should be prohibited.
- Properly supervise existing interstate control posts and establish new ones in strategic areas.

Although perceived by value chain actors as good operating practices to reduce HPAI risk, actual adoption of and compliance with such practices remains negligible due to inability or weak incentives for private actors to bear and internalize the associated costs.

Some hypotheses tested with a one-sample Kolmogorov–Smirnov method confirmed that traders mix all bird species at purchase and sales points; mix birds from all farms as they make purchases; act to minimize HPAI risk if it protects their businesses and, by extension, their livelihoods; comply with market closures to disinfect their stalls; and prefer to report HPAI outbreaks to public veterinarians rather than private veterinarians. In addition, trader associations control and influence trade practices, and markets are inspected by veterinarians or health workers only infrequently.

Conclusions

Several observations about the study hypotheses are discussed below.

- *Hypothesis 1:* To remain competitive, many poultry chain actors seek to minimize costs, including those related to biosecurity measures, and inadvertently increase risk. The services provided by these actors—distributors moving DOCs from hatcheries to producers, live bird traders visiting farms to gather mature broilers and spent layers for sale at live bird markets, collectors gathering live birds and guinea fowl eggs to sell at secondary and tertiary markets, and transporters moving poultry—can create disease transmission opportunities unless adequate biosecurity is practiced.
- *Hypothesis 2:* Direct and indirect commercial transactions between chain stakeholders are potential pathways for disease spread, and such transactions (for instance, packaging grain in HPAI-contaminated bags and using poultry manure for vegetable fertilizer) often are not targeted by regulations or public policies governing HPAI control.
- *Hypothesis 3:* Poultry products are available in so many forms that no single consumer group has been able to force producers or traders to modify processes to suit consumer demand in terms of animal and human health. Producers and traders pay little attention to consumer signals and more attention to quantity than to quality.
- *Hypothesis 4:* Many actors make economics-based decisions without regard for biosecurity. Poultry product transporters may knowingly transport sick birds and not wash or disinfect their vehicles, live bird traders and processors may not dispose of bird waste properly, and breeders and hatchery operators may sell birds or stock that they know to be infected.

From a policy perspective, it can be concluded that all key actors along the chain should be targeted to ensure effective HPAI control. Past outbreaks have increased HPAI awareness, and producers, traders, processors, feed millers, and transporters have adopted biosecurity measures to varying degrees. At the same time, the government has generally led and managed the response to the outbreak. However, in the absence of private mechanisms and/or improved and enforceable regulations that institutionalize good biosecurity practices, the long-term sustainability of these measures remains to be seen. Associations may have a useful role in coordinating improved compliance with more biosecure practices, particularly given the lack of any chain-level “champions” that could engage in such activities.

Reference

FDL (Federal Department of Livestock). 2008. An overview of the highly pathogenic avian influenza (HPAI) situation in Nigeria. Presentation by the Chief Veterinary Officer of the Federal Ministry of Agriculture at the International Forum on HPAI, ECOWAS Secretariat, Abuja, Nigeria, November 10–14.

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