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# Wet Markets and Avian Influenza: Public Policy Decisions in Hong Kong

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## Abstract

After the emergence of H5N1 avian influenza in 1997 Hong Kong implemented a sophisticated system to regulate live poultry markets. While this system is well implemented and thorough, it also has limitations. The rise of H7N9 avian influenza (which is typically acquired through contact with poultry, including in live markets) makes this an appropriate time to revisit the ethical and practical issues related to this trade. Based on data from field observations of live markets in Hong Kong, and interviews with experts in the field, this paper recommends that the government of Hong Kong create a committee to examine the pros and cons of ending live poultry markets in this Special Administrative Region.

**Keywords** H7N9, avian influenza, China, public policy, wet markets

Perhaps the greatest global health threat today would be an outbreak of a respiratory virus like avian influenza (AI), which could be similar to the 1918 pandemic that killed between 50 and 100 million people. Over the last decade the areas in which highly pathogenic avian influenza (HPAI) circulates have increased significantly, while the number of clades of the virus has risen. In particular, epidemiologists are concerned by H7N9, which is circulating in eastern China, the historical heartland of avian influenza. Since February 2013, there have been 1,625 human cases of H7N9 infection in China, according to the U.S. Agriculture and Consumer Protection Department (25 April 2018). In the fall of 2018 a new strain of highly pathogenic H5N7 avian influenza was circulating in eastern China, particularly in Guandong (Yang, 2017).

Since the emergence of H5N1 avian influenza in 1997, and Severe Acute Respiratory Syndrome (SARS) in 2003, the Chinese government has invested in the infrastructure for pandemic preparedness, such as viral surveillance in animals and humans, border controls, quarantine rooms in hospitals, respirators, public health communication, and fever scans in public places. At the same time, one possible source of risk remains in that live poultry markets continue to exist, including in Hong Kong. Despite a sophisticated system of quarantine and surveillance, this live poultry trade remains controversial amongst infectious disease experts within this Special Administrative Region (SAR). This paper will examine this trade and the current debates regarding it, based on field observations of markets in Hong Kong, Macao and Shenzhen, China, as well as a small number of interviews with influenza researchers and health policy officials in Hong Kong. The issue of whether live animal markets (wet markets) should be closed is not a new one, but merits reconsideration given the recent emergence of H7N9 (Webster, 2004, pp. 234-236).

### **What are Live Markets and their Risks?**

Live (or wet) markets are street markets that sell living animals to consumers in China, and elsewhere in Asia. These markets may sell a wide array of mammals, birds, fish, reptiles, amphibians and invertebrates. The main issue with these markets is that they may carry poultry infected with avian influenza, which can spread to workers and consumers (Webster, 2004, p. 234). For this reason, in 1997 authorities closed live markets in Hong Kong after the appearance of highly pathogenic H5N1 caused six deaths. All poultry in the region were destroyed. Live markets have also been associated with other viruses, such as the emergence of SARS in 2003 (Guan, Zheng, He, Liu, Zhuang, Cheung, et al., 2003). This virus was believed to have emerged from palm civets (*Paguna larvata*, a nocturnal mammal), which were an intermediary host in turn infected by exposure to horseshoe bats (Wicker, Canfield & Higgins, 2017). More recently, the majority of infections with H7N9 have been amongst poultry workers on farms or in live markets.

### **Why is it difficult to ban live markets?**

Why have these markets persisted despite their well-known risks? My third interview in Hong Kong was with a person who had studied how wet markets were regulated, who enumerated why he/she believed that these markets could not be closed. First, there was a general lack of confidence in food safety in China, particularly after a scandal involving contaminated baby milk; people preferred to buy their food fresh, which they perceived to be safer (Peiris, Cowling, Wu, Feng, Guan, Yu, et al., 2016, p. 255). Second, if the trade was

banned it would move underground, which would circumvent current controls to limit the virus's spread. In 2013 when the first wave of H7N9 arrived the Chinese government closed the markets, but the black market replaced them. The virus was not controlled by that step, and there were massive economic losses. Third, this expert felt that consumers had changed their behavior since 1997. For example, purchasers no longer blew on the birds' cloacas to ascertain freshness, and the de-feathering machines—which created dangerous aerosols—were kept away from customers. Fourth, wet markets were an integral aspect of Chinese culture. Fifth, and most importantly, there had been a major effort in Hong Kong to reduce risks (Peiris, Cowling, Wu, Feng, Guan, Yu, et al., 2016, pp. 252-258; Interviewee Number 3, August 2017). Interviewee Number 3 recognized that the wet markets gave highly pathogenic avian influenza (HPAI) opportunities to transfer to humans. Nonetheless, he/she believed that the current system to monitor and control the live poultry trade in Hong Kong was effective.

### **The Regulation of Wet Markets**

As Interviewee Number 3 described, poultry is now raised outside Hong Kong in southern China, on farms that are monitored for biosecurity. These farms are banned from selling poultry anywhere else in China. There are strict border controls, and samples from all poultry shipments are tested at the border for HPAI (Webster, 2004, p. 235). The birds are then quarantined for two days, before they are transferred to markets. Rest days have been introduced into wet markets, during which all poultry are removed, and the environment can be cleaned (Webster, 2004, p. 235). Interviewee Number 3 stressed that one critical issue is the direction of poultry movement. Poultry are bred on regulated farms, moved to the wholesale market, and then to retail markets. In Hong Kong birds were no longer permitted to move back in this system; as Interviewee Number 3 stated: "It's a one-way road." This is true both in terms of transit from the farms to the wholesale market, and from the retail market afterwards. If this rule did not exist, then viruses could move back to the farms or wholesale markets, thereby infecting new populations. In Hong Kong, any birds not sold by the end of the day in the retail markets are slaughtered and sold as chilled meat. These steps reduced the diversity of influenza subtypes circulating in Hong Kong after their implementation (Webster, 2004, p. 235).

In Interviewee Number 3's opinion, Hong Kong's system could be a model for all of China. One problem, however, was that these measures cost over \$100 million a year for Hong Kong alone, which might be excessive for the entire nation, and that there might be governance issues on the mainland. They took pride in the integrity of Hong Kong's system, saying that "Hong Kong has got a grip." They contrasted Hong Kong's surveillance and systems to that of the United States, which lacked a good swine influenza monitoring system, in their opinion, because agricultural corporations opposed it. They also discussed the avian influenza surveillance system in China, which they believed suffered from major flaws that led to undercounts of infected poultry: "Someone knows it's not the right way to do it. But they're doing it anyway because they prefer lower numbers" (Interviewee Number 3, August 2017). Hong Kong appeared to be a model system.

Interviewee Number 2 did not share this optimistic perspective. When I brought up the issue of live market sales in Hong Kong he/she became so upset that they shouted. They believed that the entire system was based on a fallacy that the testing was meaningful. The reality was that tests only identified what researchers already knew was in existence. This was the lesson with

the emergence of SARS in 2003. There was also nepotism and corruption in the existing system within China, which made not only monitoring but also vaccines problematic.

Interviewee Number 2 believed that there was a division between the point of view of applied researchers, who shared a deeper understanding of the field, and the public health authorities. The latter were convinced that the dangers of the live poultry trade were manageable, and they did not want to know about the system's flaws. From Interviewee Number 2's perspective, it was critical that the entire live poultry trade be shut down. Still, they knew that their colleagues in the public health policy side would be upset if they heard these views. To evaluate these competing arguments, this paper will first examine the functioning of wet markets in Hong Kong.

### **Field Observations of Hong Kong's Street Markets**

In August 2017 I visited 10 street markets in Hong Kong that sold food, as well as one street market each in both Macau and Shenzhen. Hong Kong markets vary greatly in size and stability. Because of gentrification, even long-established markets disappear, while new markets quickly materialize. For this project, I only considered markets with more than four stalls, and which sold a variety of whole foods. The 10 food markets visited represent a small subset of a larger group of street markets that I visited in Hong Kong.

I found poultry for sale at the first market that I visited at the Bowrington Road Market in Causeway Bay. At this location, as at many others, there were two parts of the market. Typically, there were stalls on the street with live fish and seafood, while next door there would be an indoor market, which was where poultry was sold. Live pigs were not present in any markets, although pork was the dominant meat. There generally was a visible presence of police and market inspectors in the street, including "Hawker Control Officials."

In all cases, fish, crustaceans and shellfish were the most common live animals for sale. Most often fish and seafood were kept in Styrofoam tanks in which a clear plastic hose provided oxygen. Still, one could find a diversity of animals, such as turtles and toads (the latter are squeezed to obtain medicinal secretions). There were often educational posters posted, which warned of the dangers of rodents and avian influenza. The level of hygiene varied widely with some markets being well-lit and clean, while others had meat scraps on walking surfaces and poor air circulation in the interior rooms. In all cases, sellers emphasized freshness. For example, at one market I saw a tub of just removed fish heads, which were so newly cut that they were still trying to breathe.

Interviewee Number 1 was a public health expert who had stated that they believed that live markets were in decline because younger people preferred to purchase their food at supermarkets. They suggested that the health dangers posed by live markets would vanish in time. I did not see evidence for this in my observation of the markets. The clientele often included younger people, including couples. This was particularly the case at the more well-lit and upscale markets, while the distressed markets usually had an older clientele.

In general, wet markets were not difficult to locate, and there were even street signs on the corner near one market labeled "wet market." Market signs typically used images of chickens on signs to indicate poultry vendors. The number of chickens for sale was limited, which suggested that demand was small. The birds were typically kept in metal cages, and there were never more than twenty birds in any individual stall, with most holding 10 or fewer. There were no special biosafety practices in place, beyond distancing consumers from de-feathering

machines. Animals of different species were kept in neighboring stalls. One wet market even had cats living there, which dined on meat scraps littering the walkways. The level of hygiene varied widely. In one live market I observed a butcher tossing scraps of meat (pork) onto the walkway, presumably for the cats. The floor was slick with blood and tissue. In another market there was a large area for eating cooked food sold by vendors, which sellers used to scale and prepare fish.

There were stations with hand sanitizers in the markets, but none that functioned. At one market there were signs warning that the area was being treated for rodents. At some markets posters warned people: “Don’t touch live poultry.” In no market did I observe customers handling live chickens. None of the markets carried live mammals, particularly pigs. Nonetheless, there seemed to be few visible measures to ensure that poultry meat did not contaminate the environment, or that customers and sellers had a good understanding of how to minimize the risks of handling chicken meat. Although Hong Kong has an impressive system to regulate poultry safety, the health standards within wet markets themselves was inconsistent, and safety information should have been standardized (Peiris, Cowling, Wu, Feng, Guan, Yu, et al., 2016, pp. 252-256).

### **Arguments for Either Maintaining or Closing Live Markets**

The broader question remains whether these markets should exist at all. Some experts believe that the wet markets are an integral part of Chinese culture, and that closing them will drive the live poultry trade underground, which happened with the sale of civet cats after they were banned for possibly carrying the SARS virus (Webster, 2004, p. 235). They also believe that an impressive surveillance system ensured the safety of this trade. According to Interviewee Number 1, the clientele for these markets was typically older, which suggested that in the long run these markets would disappear without intervention. The academic literature has also made this point: “In the longer term, wet markets will be phased out. The younger generation of customers in Asia buy their produce frozen or chilled” (Webster, 2004, p. 236).

Interviewee Number 2 suggested that most advocates for this perspective come from a public health policy background, whereas those with a more applied focus perceived the issue differently. In their opinion, the markets should be completely shut down, as has been the case in most other Asian nations, including Japan, Taiwan and Singapore (Peiris, Cowling, Wu, Feng, Guan, Yu, et al., 2016, pp. 252-255). The suggestion that these markets were part of Chinese culture was misleading, because these markets were no more important to China than in those countries. No system was perfect, and the dangers posed by these markets was excessive.

Careful studies of antibody prevalence to H7N9 have demonstrated that far more people are being infected with this virus than are being hospitalized with an illness (Ip, Liao, Wu, Gao, Cao, Feng, et al., 2013). Poultry workers, such as farmers, have a significant level of seroprevalence (Wang, Fang, Lu, Xu, Cowling, Tang, et al., 2014). As such, the transmission of the virus is an ongoing risk, which reported hospitalizations may undercount. As Peiris and colleagues have discussed, live poultry markets (LPMs) have previously been closed after outbreaks of avian influenza (Peiris, Cowling, Wu, Feng, Guan, Yu, et al., 2016, p. 254). Afterwards, the virus has repeatedly disappeared “although proof of causality remains elusive” (Peiris, Cowling, Wu, Feng, Guan, Yu, et al., 2016, p. 252-255).

It is important to note that some other nations in southeastern Asia also have live markets. Still, those in eastern China have a special significance in global health. The scale of the agriculture industry, density of populations, and association of ducks, poultry and swine, have

meant that this region has historically seen the emergence of more cases of new clades of influenza than other world regions. Although the answer to this question is perhaps unknowable, it is even possible that the 1918 pandemic began in eastern China (Humphries, 2014).

There are perhaps a 100 markets total in the entire SAR, according to Interviewee Number 3. This is a relatively limited market in a regional context, and poultry sales would continue even if the live trade were ceased. As Interviewee Number 2 indicated, however, the example of SARS has proved that these live markets can be a risk for the transmission of other emerging infectious diseases (EIDs). Even Peiris and colleagues recognize that the ideal outcome would be the elimination of these markets, although “there are major short-term hurdles in implementation, both in terms of cultural preference and perceptions of food security” (Peiris, Cowling, Wu, Feng, Guan, Yu, et al., 2016, p. 257).

### Conclusion

There are significant arguments for maintaining the existence of live markets, as Robert Webster has described in a concise and thoughtful article: they allow for sentinel surveillance of influenza, banning them would entail major economic costs, the trade might move underground, and closing the markets in Hong Kong might have little significance if the trade continues just across the border in mainland China. “Although it may seem a simple matter to close wet markets for the general good of society, it would be no simple matter” (Webster, 2004, p. 236). All these arguments have validity. In the end, however, the ultimate decision regarding whether to maintain the wet markets in Hong Kong must balance economic and social costs of this measure with the health risks that this trade poses. These discussions should also consider the risks posed to populations outside of Hong Kong itself, while keeping in mind that Hong Kong’s total trade is relatively small compared to that of China itself.

While many authors have hoped that the demand for live poultry would fade away in Hong Kong as a youthful generation turned to chilled poultry, a survey of these markets shows that a younger clientele continues to patronize live markets. It is true that there is an expensive and thorough surveillance and regulation system in place to minimize the trade’s risks. This system, however, is itself controversial as some experts believe, as Interviewee Number 2 stated, that its effectiveness is qualified. In 2016 and 2018 there were also major scandals in China involving vaccines, which raised questions about the Chinese regulatory system (BBC News, 2018; Economist, 2016; Hancock & Wang, 2018; Hernández, 2018; Murphy, 2018). The Chinese responded to this scandal about fake vaccines by removing social media coverage of the issue, which only exacerbated widespread popular anger (Jourdan and Gibbs, 2018; Rothschild, 2018). Memories of the 2008 melamine milk scandal heightened citizens’ outrage, as did the 2012 chromium scandal involving pharmaceutical products (Sieren, 2016).

There is greater public confidence amongst China’s citizens regarding the integrity of Hong Kong’s system (Sieren, 2018), but maintaining the security of the poultry trade requires an integrated approach. It is also the case that while most live poultry markets in Hong Kong are clean and have posted safety information, others create a space contaminated by tissue and fluids, and have no information posted regarding basic food safety with poultry.

Because the threat posed by avian influenza is pressing, the government of Hong Kong should convene a committee of stakeholders, in which the voices of diverse health experts are included, as well as economists and ethicists. The committee’s recommendations should be endorsed and implemented. If the decision is made to close the markets, the funds currently

devoted to the poultry surveillance and regulation system might be redirected to compensate the sellers of live poultry in the SAR. The program could be modeled after programs to compensate commercial fishing operators for their losses, as fish stocks are protected. Given that most of these live poultry sellers operate at a small scale, and the existing poultry surveillance system is quite expensive, these funds should be adequate to compensate retailers for much of their losses for a defined period.

If the decision is made to operate these live markets, then attention should be given not only to the current system of surveillance, but also to the live poultry markets themselves. More efforts should be made to ensure consistent safety practices in these spaces, as well as to provide standardized and useful information for consumers. The government should implement measures to encourage the sale of chilled poultry market over time. As I write these words, it is the one century anniversary of the 1918 influenza pandemic. Although the poultry trade in Hong Kong is well-regulated, there is always the possibility of a future outbreak or epidemic of avian influenza. Hong Kong must do all it possibly can to avoid this.<sup>1</sup>

### Notes

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### **Interviews**

Interview number 1, Hong Kong, August 2017.

Interview number 2, Hong Kong, August 2017.

Interview number 3, Hong Kong, August 2017.

Interview number 4, Hong Kong, August 2017.