Logistics Aspects of Avian Influenza Pandemic in Hong Kong

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Abstract

This paper investigates the logistics of handling possible avian influenza outbreaks. The research investigates various aspects of avian influenza relevant to the Hong Kong circumstances, such as literature review and the financial impacts of avian influenza pandemic. Then the paper will focus on various ways to minimize the risks of pandemic, such as the use of vaccination, non-pharmaceutical intervention (NPI) and poultry-slaughtering centre plan. This paper concentrates on discussing various logistics responses that can help the medical personnels to do their jobs more effectively in a possible avian influenza outbreak. This research concludes that vaccination and the non-pharmaceutical intervention (NPI) are important measures in countering the avian flu pandemic in the early stage of its widespread.

This paper also supports any measures that can trace the infected poultry as a way to prevent an avian influenza outbreak in the very first place. In this aspect, the research investigates about the Singapore experience in operating poultry-slaughtering centres. In view of the current trends, this paper concludes that the establishment of a central poultry-slaughtering centre becomes a less favorable policy options.

Keywords: Avian flu pandemic, H5N1, Hong Kong, non-pharmaceutical intervention (NPI), logistics

1. Introduction

This paper investigates the logistics of handling possible avian influenza outbreaks. The primary goal of logistics during an outbreak is to transfer the needed medical supplies, devices and equipment to the medical personnels for doing their missions. Since the goal is related to the lives and health of their patients, medical logistics is unique in that its main focus is to optimize effectiveness, and efficiency be only seen as a constraint to be managed. The concept of logistics in this paper has two major components:

1. Moving the medical personnels in connection with the counter avian influenza outbreak mission.
2. Supplying the force. This component includes the processes used to enable the deployed force to continuously maintain its readiness to accomplish its missions. This component relates to sustainment of medical personnels and support equipment. The medical forces in the field perform the best when they are healthy, well fed, properly clothed, and equipped to function in the targeted environmental conditions.

Logistics is traditionally an underappreciated activitiy (Pagonis, 1992). When the German Chief of Staff asked Marshall Rommel how he planned to supply and feed the two additional panzer corps that he demanded from Berlin, Rommel replied coolly: “That is quite immaterial to me. That is your pigeon.”(Irving, 1977) In modern days, however, logistics becomes the key factor in determining the success of any important mission. Contrast Rommel‟s attitude, General H. Norman Schwarzkopf attributed the success of the Gulf War to its logistical operation. Without the logistical capacity to move unprecedented numbers of people and quantities of material to the battlefield in Middle East, US could not have won the Gulf War.[1] He saw it was only the superior logistical capacity that made the celebrated “end run” possible.[2]

[1] Just for eating and transportation, the US needed to move and serve more than 122 million meals to the war zone. This can be compared to feeding all the residents of Wyoming and Vermont three meals a day for forty

This paper will discuss the principles of logistics in relation to the circumstances of avian influenza outbreaks. There are three types of influenza virus: A, B and C. Type C causes mild symptoms, but types A and B can cause severe illness. Avian influenza (bird flu) is caused by a type A virus that is spread from bird to bird through respiratory secretions and contact with contaminated droppings (Gstraunthaler, 2008). The H5N1 strain of bird flu is prevalent in domestic and wild birds in Asia and Europe.

Influenza is a highly contagious viral illness, and the virus can also be spread through contact with a contaminated person or surface. Avian influenza A viruses do not usually infect humans, but more than 300 people, of whom two-thirds have died, have caught the H5N1 strain as a result of close and direct contact with infected birds (Bishop, 2007). Avian influenza virus could cause an epidemic in the country of origin and spreading globally in lights of modern transportation features, such as air travel and container trade.

This paper will investigate various aspects of avian influenza relevant to Hong Kong, such as literature review and the financial impacts of avian influenza pandemic. Then the paper will focus on various ways to minimize the risks of pandemic, such as the use of vaccination, non-pharmaceutical interventions (NPIs) and poultry-slaughtering centre plan.

2. H5N1 in Hong Kong

Hong Kong was one of the first places attacked by H5N1 infection. Outbreaks of highly pathogenic H5N1 avian influenza occurred in Hong Kong in 2001, twice in 2002 and 2003.[3] The transmission of avian H5N1 influenza viruses to 18 humans in Hong Kong in 1997 with six deaths established that avian influenza viruses can transmit to and cause lethal infection in humans.[4]

Shortridge et al. said that each of the H5N1 viruses from Hong Kong poultry markets that were tested were lethal in chickens, possessed polybasic amino acids at the carboxy-terminus of HA1, and by definition were highly pathogenic in poultry.[5] The authors noted that the poultry markets were of critical importance in the transmission of influenza viruses to other avian species and to mammals, including humans.

With the 1997 H5N1 experience, measures against avian influenza adopted in 2001 showed great improvements. In 2001, the flu struck three different markets in early May, when the death of 800 chickens occurred within three days, the government promptly implemented the decision on May 16 to slaughter 6,000 chickens from all poultry stalls in these three markets, even the source of the flu has not yet been established. The gene tests indicated the H5N1 strain was different from the one which killed six people in 1997, and even this strain was unlikely to affect humans, the government decided to close the poultry stalls in the three markets for two weeks and have them thoroughly sterilized.

For the chicken retailing market, the 2001 event showed that wholesale prices of chickens immediately dropped 20 percent within the week after the news came public. The sales were reduced about 40 percent over the few days after the event. The consumption of frozen chicken increased as consumers substituted it for the fresh product.

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days. During the war, almost 500 new traffic signs were erected along the Saudi Arabian road network, helping US soldiers find their destinations in a relatively featureless landscape (Langenus, 1991).

[2] Excerpt from General Schwarzkopf‟s February 27, 1991, Central Command Briefing, reprinted in *Military Review* (September 1991), p.97.

[3] Ellis TM, Bousfield RB, Bissett LA, Dyrting KC, Luk GS, Tsim ST, Sturm-Ramirez K, Webster RG, Guan Y, Malik Peiris JS. Investigation of outbreaks of highly pathogenic H5N1 avian influenza in waterfowl and wild birds in Hong Kong in late 2002. *Avian Pathol*, 2004 Oct; 33(5): 492 – 505.

[4] Sims LD, Ellis TM, Liu KK, Dyrting K, Wong H, Peiris M, Guan Y, Shortridge KF. Avian influenza in Hong Kong 1997 – 2002. Avian Dis. 2003; 47 (3 Suppl): 832 – 8.

[5] Shortridge KF, Zhou NN, Guan Y, Gao P, Ito T, Kawaoka Y, Kodihalli S, Krauss S, Markwell D, Murti Kg, Norwood M, Senne D, Sims L, Takada A, Webster RG. Characterization of avian H5N1 influenza viruses from poultry in Hong Kong. *Virology*. 1998 Dec 20; 252(2): 331 – 42.

With the subsequent H5N1 events, the Hong Kong government tried to find a better way to minimize the chance of an influenza pandemic. This is a sensible direction as the cost of an influenza pandemic should not be measured in economic terms alone; it could present strong pressures on the logistics capacity of social essential resources. For example, in February 2007, when bird flu was found in poultry at a turkey farm in Suffolk, the community imposed policies such as closure of schools together with businesses and travel constraints, these measures put a hard test on the logistic ability of a community to deliver essential services to its people; such as food, health, and social care services.

Researches in Hong Kong H5N1 events showed that the principle mode of transmission of avian influenza from poultry to human is through direct contacts; and the avian influenza viruses, just like other veterinary viruses, cannot be eradicated. In other words, the risks that the avian influenza viruses may affect the poultry population cannot be completely eliminated. Therefore, there are two policy options available:

(1) To reduce the possible contacts between the public and live poultry at the retail end of the poultry industry. This policy option assumes that avian influenza infected poultry are already present in the retail market, the key focus is to separate the infected poultry from the customers.

(2) To minimize the possibility of the placing avian influenza infected poultry in the retail market by adopting preventive measures to prevent infected poultry flowing from local farms to the retail markets.

Future outbreaks of avian influenza are foreseeable. Stopping the infected poultry for reaching the retail market should be the key focus. The means to achieve such goal include the implementation of an effective isolation policy to contain and localize the infected poultry, so as to keep the avian influenza viruses away from the general public.

3. Literature Review

For understanding the general concept of risk management, one may find the *Harvard Business Review* article '*Preparing for evil*' by Mitroff and Alpaslan (2003) a helpful reference. The two authors observed that crisis-prepared players would not manage disasters through cost-benefit analyses. Smart players would focus their efforts on preventing crises rather than containing them after the fact. Efforts on preventing crises include but not limited to the design of strategic tools to improve preparedness towards disruption events.

In 2004, Dr. Jonathan Rushton, an animal health economist, published his research findings on evaluating the impact of avian influenza outbreaks in the poultry sectors in Cambodia, Indonesia, Lao PDR, Thailand, Vietnam. The study (Rushton et al. 2004) concluded that the potential danger of a human influenza pandemic should be the greatest concern with regard to avian influenza control and eradication. In order to develop plans of control, it needs to understand the winners and losers in an outbreak situation. And based on such understanding, the government could implement effective actions to motivate all actors to become actively involved in a control campaign. Rushton's research findings indicated that the epidemiological role of the different sectors identified appears to be poorly understood at present. He suggested two approaches may be helpful in bringing insights for gathering data in formulating the plans of control: (1) the researchers can carry out a value chain analysis to identify the key control points and important actors in the movement of eggs, day old chicks, live birds and products; (2) the policy makers can identify the risk factors and prioritize scarce resources through an analysis of the socio-economic circumstances of those who have died and their relationship with poultry systems.

Dr. Richard Coker from London School of Hygiene and Tropical Medicine assessed the planning documents issued by Pacific countries for outbreaks of influenza in people related. The study (Coker and Mounier-Jack 2003) found that the regional approaches were polarized. Thailand, China, and Vietnam had set out a strategic vision to strengthen future capacity in detecting and responding to disease in the future. By contrast, Hong Kong, Australia, and New Zealand took a strategic approach aimed mainly at harnessing available resources for stockpiling antiviral agents and vaccines. He observed that affluent countries have the capacity to stockpile antiviral drugs and, in the event of a pandemic, could rely on their capacity to procure vaccine rapidly through agreements. By contrast, lower-income countries in the Asia–Pacific region would find it difficult to access sufficient quantities of these globally scarce resources. Dr. Coker opined that the plans of Hong Kong, Australia, and New Zealand compared favorably with the best European plans. He noted that the weaknesses

of preparedness plans in the Asia–Pacific region were much the same as those described for Europe. Most plans did not adequately address the operational responsibility at the local level, especially relate to the logistical aspects of vaccination and antiviral stockpiling, distribution, and delivery. In conclusion, Dr. Coker gave the warning that a pandemic might not wait until capacity is developed. It would also need to extend to allocation of scarce resources in a globally equitable fashion. The next pandemic will test notions of global solidarity.

4. Financial Impacts of Avian Influenza Pandemic

The outbreak of a contagious pandemic, even with a relatively small health impact, could exert strong adverse economic implications, as proved by 2003 SARS outbreak. According to an estimate by the Asian Development Bank, the economic impact of SARS was around US$18 billion in East Asia, which comes to around 0.6 percent of the total GDP in the region (ADB, 2003).

In addition to the direct impact of avian flu on agricultural output, the indirect effects could severely disrupt domestic economies. Trade and transport restrictions arise, incomes from tourism will fall, consumer spending will drop, and business confidence and investment deteriorate. The balance of payment pressures would arise, especially in tourism-dependent economies.

All global economic players should be mindful because disruptions in one jurisdiction could have spill-over effect in other jurisdictions. When the H5N1 virus first reported in East Asia, particularly in Vietnam, Thailand, Indonesia and China; just within 6 to 9 months, the virus has gone global, spreading to over 40 more countries (Brahambhatt, 2006). The cumulative number of confirmed human cases of death on account of H5N1 stood at 132 in 10 countries as reported in WHO Fact Sheet as of July 2006. Financial costs of a human pandemic are impossible to predict. The World Bank estimates that a severe avian flu pandemic among humans could cost the global economy about 3.1 percent of world gross domestic product, around US$ 1.25 trillion on a world GDP of US$ 40 trillion (World Bank, 2006).

Possible financial Impacts of an avian influenza pandemic may include a significant but temporary reduction in net capital flows to emerging markets, which may cause a breakdown in the trading infrastructure. The likely challenges to the central banks may be: (1) financing the borrowing needs of the governments from the affected regions, (2) inflation, (3) liquidity management, (5) payment and settlement systems, etc.

Avian flu pandemic would definitely affect the insurance sector. A flood of claims would likely to strain the capacity of the global insurance and reinsurance sectors. Underwriters are exposed multiple risks relate to the avian influenza pandemic, such as claims connect with business interruption, health, disability, medical malpractice, workers' compensation, and life insurance. Estimates of the impact of a global flu pandemic on the insurance industry vary widely. Standard and Poor's recently suggested a mild pandemic might produce $15-20 billion in worldwide losses, while losses from a more severe event might total up to $200 billion (Standard and Poor's, 2005).

5. Vaccines

Vaccination relates to the supplying component of logistics in countering the avian flu pandemic. There are two philosophies in treating this logistics component. First, to build up an inventory of vaccines "just-in-case." Second, to substitute the inventory by information. The attractive advantage of the second philosophy is to motivate the commercial sector to do the supplying logistics, so that the government will save tax monies on hiring people, building facilities to protect the inventory of vaccines.

Regardless of who should take up the costs of keeping the vaccines inventory, histories in countries with endemic infection show that vaccination can bring down the level of infection before its elimination.

When carried out in combination with other disease control measures, including enhanced biosecurity, culling of infected flocks with compensation, poultry movement control and management of markets, vaccination has a powerful impact in reducing disease incidence and virus load in the environment as has been demonstrated

in Hong Kong, PR China and Vietnam.

Vaccination is also extremely valuable in high-risk places in which disease has recurred. For example, Hong Kong's poultry farms have remained infection-free for over four years following vaccination (which was introduced after repeated outbreaks), despite the presence of infection in wild birds in Hong Kong and in poultry in neighbouring provinces in mainland China (FOA 2008).

Vaccination must be supported by appropriate post-vaccination monitoring to ensure that adequate flock protection is being achieved, to determine whether virus circulation is occurring in inadequately vaccinated flocks and especially whether antigenic variants have emerged.

A vaccination programme should be planned as part of an integrated control strategy, subject to periodic review, which anticipates ultimate cessation of vaccination once the factors leading to virus persistence have been identified and addressed, and vaccination has reduced the number of cases to a level that will allow classical measures to succeed.

The cost and logistic challenges of widespread vaccination, especially in backyard poultry, are major constraints to effective use of vaccines and to sustain the programmes over a prolonged period. The cost of vaccination campaigns must be chaired with the commercial poultry sector and be subsidized in village backyard sector as a public good activity (prevention of regional and international crisis and of human pandemic emergence).

Unregulated and uncontrolled use of vaccines from unknown sources and of dubious quality and efficacy, or without associated disease control measures, may confound efforts to introduce a systematic approach to disease control.

Improperly vaccinated poultry flocks may perpetuate virus circulation through partially protected birds and remain a source of infection for other birds and humans. Active targeted monitoring programmes need to be in place in countries practising vaccination to ensure that any circulating H5N1 viruses are fully characterized and compared with existing vaccine strains for protective capacity.

Well-developed vaccination strategies, with advance arrangements for rapid access to vaccines, may offer a significant advantage in controlling and eradicating the disease in a newly-infected country.

Vaccination can reduce the level of H5N1 infection, which reduces the need to cull poultry. It brings favorable economic benefits by reducing the compensation. To sustain government-sponsored large scale vaccination campaigns, cost sharing with the commercial producer would be a sensible way, so that vaccination can target to areas where high-risks exist.

It is also necessary to set up post-vaccination review points for assessing the need for ongoing vaccination programs.

6. Non-pharmaceutical Intervention (NPI)

Non-pharmaceutical intervention (NPI) includes using the measures, such as closure of schools and bans on public gatherings to limit the spread. Statistics showed that cities that implemented the NPI sooner would suffer a much smaller overall death toll caused by the pandemic. NPI relates to the supplying component of logistics in countering the avian flu pandemic. The reason: during the beginning stage of a widespread breakout, the available supplies of effective vaccines were very limited.

For example, the 1918 influenza pandemic resulted in an unprecedented mortality rate, with an estimated 675,000 deaths in the United States, and more than 50 million deaths worldwide (Barry, 2004). The 1918 pandemic showed the value of adopting NPI in the early stage of the breakout.

Two cities in particular, Philadelphia and St. Louis, could illustrate the dramatic differences. Philadelphia caught news of the pandemic but downplayed its significance and allowed large public gatherings to continue taking place, most notably a city-wide parade on September 28, 1918. Bans on public gatherings, school closures and other NPI's did not begin until October 3. By then, the disease had already spread and begun to overwhelm local medical and public health services (Grinberg 2007).

In St. Louis, on the other hand, the first cases of disease among civilians were reported on October 5, and the city moved quickly to promote the "social distancing" policy within two days (Grinberg 2007). St. Louis mayor Henry Kiel followed the measures proposed by Dr. Max C. Starkloff, made an order to close schools, churches, theaters and other places where crowds could spread the flu. When flu deaths in St. Louis rose above 600, Dr. Starkloff suggested to close taverns, tobacco shops, department stores and many other businesses. In facing angry businessmen, Henry Kiel held his ground by pointing out that "It is a case of get the dollars and lose the lives or save the lives and lose the dollars." Said Dr. Starkloff, "The people are out of doors, getting lungs full of fresh air, which is better for them than if they were at work..."

The difference in response times between the two cities was approximately 14 days, but costs of the delay are evident when comparing the mortality rates and final death tolls across the two cities.

Philadelphia experienced a peak weekly death rate of 257 per 100,000 people and an overall death count of 719 per 100,000. St. Louis showed much lower totals, with a weekly mortality peak of just 31 per 100,000 and a final mortality count of 347 per 100,000 (Grinberg 2007). In short, Dr. Starkloff's strategy of "social distancing" saved lives. St. Louis' death toll of 1,703 equaled 2.8 for each 1,000 residents, lowest among major American cities (Barry, 2004).

The study finds that the time between the report of an outbreak and the implementation of NPIs is perhaps the most crucial element in lowering the spread of a deadly virus outbreak. Government needs to have a solid procedural plan to maintain school closings, to ban on public outings, and to make employees staying homes. These simple measures are among the many NPIs that can help to reduce exposure to the public spread of the virus.

7. Poultry-slaughtering centre plan

Some disasters are foreseeable, although it may be difficult to predict the exact timing of their occurrences. Therefore, the government should not solely focus on the preparedness of a possible outbreak of an avian flu pandemic, but also on minimizing the economic hardship of the affected social sectors. The establishment of a poultry-slaughtering centre may serve both purposes. First, a poultry-slaughtering centre facilitates the tracing of the infected inputs of poultry, which serves as a preventive measure. Second, a central run poultry-slaughtering centre may gradually shifted the working persons and resources from the poultry retail outlets, this lower the relief costs when the outbreak of an avian flu pandemic actually happens.

A slaughterhouse is a facility where farm animals are killed and processed into meat products. Since 2006 the Hong Kong government has devoted about three years to investigate whether to set up a central a poultry slaughtering plant to replace all sales of live poultry at retail outlets. The establishment of a licensing regime for poultry slaughtering plant is regarded as a precautionary measure against avian influenza.

Singapore Experience

The investigation starts with the learning from the Singapore experience. Starting from 1991, the Singapore Government banned the poultry slaughtering in wet markets.[6] It required all poultry to be processed at AVA

[6] In Singapore, the Wholesome Meat and Fish Act (the Act) provides that no person shall slaughter any animal in any premises which is intended for human consumption, unless those premises have
been licensed by AVA as a slaughter-house and the person concerned has been granted by AVA a permit allowing him to slaughter the animal on those premises. Licensee who breaches any condition of licensing

(Agri-Food and Veterinary Authority)[7] approved poultry slaughtering plant. There are about 14 poultry slaughtering plants in Singapore, all are privately-run. Ten of them slaughter live chickens while four slaughter live ducks. The farms which supply the live chickens to the Singapore poultry slaughtering plants required to be AVA accredited. There are about 99 AVA-accredited farms, and they are located mainly in the Johor State in Malaysia. These comprise about 98% of the source of live chickens in Singapore. The high concentration of poultry inputs from one area simplifies the tagging process as the Singapore regulation requires all freshly slaughtered poultry carcasses be individually tagged.[8] The Singapore poultry slaughtering plants adopt the following measures:

1. The slaughter houses are designed as one-directional flow, so as to prevent cross contamination between live poultry and dressed carcasses. The partition materials could meet specific conditions to prevent bacterial growth and transmission.
2. The slaughter-houses have adequate sanitary facilities and are required to implement the Hazard Analysis and Critical Control Point (HACCP) or similar food safety system. A proper programme must be in place to recall products that are not processed in accordance with the law.
3. Slaughter-houses workers must receive adequate and appropriate training and are given protective clothing. Only authorized personnel are allowed into areas where the poultry is slaughtered, processed or handled.
4. The number of poultry to be slaughtered is subject to the approval of AVA. Live poultry are not allowed to be taken out of the slaughter-house or sold without the prior permission of AVA. Live poultry must be slaughtered within 24 hours of arrival at the slaughter-house.
5. The chilling process of the dressed poultry must be completed within 90 minutes after evisceration. Ice used for processing and chilling of the dressed poultry must be manufactured from uncontaminated potable water.
6. The dressed poultry must be stored in freezers at specified temperature. The temperature records of freezers should make available for inspection by AVA up to a period of three months.
7. All dressed poultry must be transported by vehicles with refrigerating facilities. The poultry slaughter house must furnish a daily report to AVA, stating the number and type of poultry for slaughter. The licensee must also provide all customs clearance permits for AVA inspectors.
8. No portion of the slaughter-house is allowed to be used as living quarters, and all activities taking place in the slaughter-house must be approved by AVA.

In terms of logistics, AVA only allows live poultry to be imported from Malaysia to Singapore through the route which passes through fewer residential areas. All live poultry undergo ante-mortem inspection by AVA officers at the Tuas Checkpoint to identify problem birds. About 65 to 75 trucks pass through the Tuas Checkpoint daily. They operate from 5:00 am to 1:00 pm from Monday to Thursday, and from 5:00 am to 3:00 pm on Friday and Saturday.

The Decision

The Hong Kong government made the final decision of holding up the central poultry slaughtering plant development because the latest assessment shows that the risk of avian influenza in Hong Kong is very low. Dr York Chow, Secretary for Food & Health, opined that the risk of human infection by avian flu has been reduced to a minimal level. The decision matched with the findings by the University of Hong Kong about the rate of H9N2 viruses after the implementation of the following two measures:

(1) Ban on the keeping of live poultry overnight in retail markets.
(2) Introduction of the buyout scheme for the live poultry trade in 2008. Following the licence-buyout scheme, the number of poultry retail outlets fell from more than 800 to the existing 133, while that of poultry farms dropped from 192 to 30. The rearing capacity fell from 3.9 million to 1.3 million.

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shall be guilty of an offence under the Act and is liable on conviction to a maximum fine of Singapore $10,000 (about HK$50,000) and/or 12-month imprisonment.

[7] AVA stands for Agri-Food and Veterinary Authority. AVA is the national authority on food safety for both primary and processed food.

[8] The information includes the source of poultry input, name of the slaughter-house, and the date of slaughter.

(3) On-going surveillance conducted in retail outlets by the University of Hong Kong found that the isolation rate of H9N2 viruses in 21 months has significantly dropped from 5.11% before banning the keeping of live poultry overnight in retail markets in July 2008 to 0.09% after the commencement of the ban (see table 1.).

Table 1. Surveillance of H9N2 in retail markets conducted by the University of Hong Kong

	Before the ban on overnight keeping of live poultry in retail markets	After the ban on overnight keeping of live poultry in retail markets
No. of samples collected	4 186	3 300
No. of positive H9N2	214	3
Isolation rate	5.11%	0.09%

Source: LC Paper No. CB(2)1698/09-10(03)

Besides, a change in preference also justifies the holding up of the central poultry slaughtering establishment. Hong Kong consumers have showed a preference towards frozen and chilled chickens, with their market shares at 64% and 30%, while that of live chickens at 6% of the total chicken supply. Such trend will reduce the need to develop a poultry-slaughtering centre.

8. Conclusion

This paper focuses on discussing the logistics responses on supplying the medical personnels in a possible avian influenza outbreak, so that they can do their jobs more effectively. The paper starts with the lessons learned from the histories of H5N1 incidents in Hong Kong and the economic implications of an outbreak. This paper concludes that vaccination and the non-pharmaceutical intervention (NPI) are important measures in countering the avian flu pandemic in the early stage of its widespread. This paper also support any measures that can trace the infected poultry as a preventive way to an avian influenza outbreak, the authors investigate about the Singapore experience in operating poultry-slaughtering centres and briefly discuss about the value of establishing such centres in Hong Kong. This paper concludes that three factors render the establishment of such centre a less favorable policy options, the three factors are: (1) the government policy on banning live poultry keeping overnight in retail markets; (2) the buyout scheme for the live poultry trade, and (3) a preference towards frozen and chilled chickens.

Acknowledgements

This research was supported by The Hong Kong Polytechnic University under grant number G-U638 project.

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