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# Knowledge of Avian Influenza (H5N1) among Poultry Workers, Hong Kong, China

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In 2009, a cross-sectional survey of 360 poultry workers in Hong Kong, China, showed that workers had inadequate levels of avian influenza (H5N1) risk knowledge, preventive behavior, and outbreak preparedness. The main barriers to preventive practices were low perceived benefits and interference with work. Poultry workers require occupation-specific health promotion.

In 1997, a zoonosis in humans caused by a highly lethal strain of avian influenza virus (H5N1) was reported in Hong Kong. Live-poultry markets were the source of this outbreak (1). As one of the world's most densely populated regions (16,000 persons/mile<sup>2</sup> [ $>6,300$  persons/km<sup>2</sup>]) (2), Hong Kong is a city at high risk for a large-scale outbreak of avian influenza caused by live poultry in large-volume wholesale markets and within neighborhood wet markets (open food stall markets).

Because members of the average household in Hong Kong shop in wet markets on a habitual basis, these markets are located in the most densely populated areas (Figure) and are commonly multistory complexes or in basement levels of shopping centers. Because poultry workers are a potential bridge population (3,4), the government has instigated voluntary avian influenza training since 2001 that reviews regulations for workplace disinfection, waste disposal, poultry storage, and personal hygiene measures (5,6).

Despite occupational risk for exposure to avian influenza (7,8), there have been few studies of poultry workers (8–12). Most studies were conducted in rural settings in developing countries (9–12), but findings cannot be readily extrapolated to cities such as Hong Kong because of differences in food-handling practices and

occupational settings. Knowledge, perceptions, and work practices of live-poultry workers in Hong Kong have not been examined. Therefore, a survey of these workers is timely and warranted, given confirmed persistence of avian influenza in Asia. (13)

## The Study

An anonymous, cross-sectional survey was conducted during June–November 2009. Interviewers approached 132 licensed live-poultry retail businesses in wet markets and 23 wholesale establishments. The final sample was 360 poultry workers (194 retailers and 166 wholesalers; response rate 68.1%).

Respondents were asked about their demographics, past month's work and preventive behavior, and avian influenza-related knowledge on the basis of a World Health Organization factsheet (14). We asked perception questions based on the Health Belief Model and the likelihood of adopting certain behavior patterns in the event of a local bird-to-bird or bird-to-human outbreak of avian influenza.

Summative scores were computed for avian influenza-related knowledge, current preventive behavior patterns, outbreak preparedness, and various perception domains. Higher scores reflected more beneficial levels of each domain. Unconditional multilevel regression indicated no evidence of clustering effect by poultry market. Standard multivariable linear regression was conducted by using SAS version 9.1.3 (SAS Institute, Cary, NC, USA) with knowledge, practice, and preparedness scores as outcomes and potential predictors showing  $p < 0.25$  in unadjusted analyses as input variables. Distribution of standardized residuals and their association with predicted values were examined to assess model assumptions.

Most (208, 60.1%) respondents were men 35–54 years of age, of whom 192 (55.3%) had worked a mean of 16.1 years in the poultry industry. Respondents showed low mean summative scores for knowledge of avian influenza (online Appendix Table 1, [wwwnc.cdc.gov/EID/article/17/12/11-0321-TA1.htm](http://wwwnc.cdc.gov/EID/article/17/12/11-0321-TA1.htm)). Nearly two thirds (232, 64.1%) of poultry workers reported that avian influenza virus (H5N1) infects wild birds, but fewer workers reported that this virus could infect live poultry (212, 60.1%), domesticated birds (159, 44.8%), or humans (178, 50.0%).

A total of 242 (69.1%) workers reported that consuming undercooked poultry could transmit the virus, and 210 (59.7%) knew that infection could result from touching bird feces. For other transmission routes, awareness was lower, ranging from 14.0% (48) for eating undercooked eggs to 29.1% (102) for slaughtering poultry.

Ninety-six (27.4%) workers were unsure whether avian influenza virus (H5N1) infection had occurred in humans in Hong Kong, 198 (58%) incorrectly believed that nearly everyone survives this infection, and 110 (32.8%)

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incorrectly believed that a human vaccine for avian influenza was available. Most (208, 89.9%) respondents were familiar with influenza-like symptoms of avian influenza virus (H5N1) infection such as fever, but fewer workers were aware of respiratory and gastrointestinal symptoms of virus infection.

The Internet and other sources (e.g., health talks) of information about avian influenza were strong independent predictors of greater knowledge. However, training did not result in higher knowledge levels.

Poultry workers reported low-to-moderate levels of compliance with hand hygiene and other preventive measures (ranging from 7.3% [36] using eye protection to 65.2% [245] using handwashing with soap after slaughtering poultry). Working in the poultry industry  $\geq 10$  years, lower perceived barriers to preventive behavior, and retail poultry work were independent predictors of higher preventive behavior scores.

With regard to avian influenza-related perceptions, lack of training (277, 83.4%) and the view that compliance with all infection regulations is difficult during peak hours (218, 64.9%) were the most frequently cited barriers to adoption of preventive behavior. A total of 154 (46.4%) workers believed that face masks reduced business, and 153 (46.1%) believed that vaccination was expensive.

Low anxiety about illness was reported by 242 (76.6%) respondents. In the event of a local outbreak, workers expressed various levels of acceptance for precautionary actions, ranging from 15.8% (56) for reducing work hours to 82.4% (290) for seeking medical care for influenza-like symptoms. Ninety-six (27.4%) respondents anticipated taking oseltamivir. Greater perceived benefit of preventive behavior was the strongest independent predictor of higher preparedness scores (online Appendix Table 2, [wwwnc.cdc.gov/EID/article/17/12/11-0321-TA2.htm](http://wwwnc.cdc.gov/EID/article/17/12/11-0321-TA2.htm)).

## Conclusions

Similar to other regions (8–11), poultry workers in Hong Kong showed low risk perceptions for avian influenza, inadequate knowledge, and a wide range of compliance with preventive measures. Because training (6) was not associated with overall preventive behavior or preparedness, there may be an unmet need for occupation-specific health information.

Higher levels of knowledge demonstrated by workers who accessed health information sources (e.g., Internet) that provide detailed information suggest that comprehensive, occupation-relevant information should be more widely accessible. However, occupational practices of animal workers might not be amenable to change solely on the basis of improvements in knowledge. Only 129 (42.1%) respondents reported that poultry workers could realistically adhere to all government guidelines (6). Interference with work, high cost, and reduction of business were repeatedly cited as impediments to the adoption of preventive behavior. Even in the event of local outbreaks of avian influenza, most workers were not amenable to actions having adverse economic effects such as reducing work hours. Animal workers are thereby unlikely to widely adopt preventive behavior if these measures conflict with their economic interests.

Despite the ongoing government regulations regarding avian influenza in Hong Kong (6), a complete ban on live poultry is unrealistic because of the culturally entrenched demand for fresh poultry. Increasing knowledge and risk perceptions while simultaneously reducing occupational barriers to preventive behavior thereby continues to be the cornerstone of effective zoonotic infection control among animal workers.

Implications of these findings extend to other poultry-borne pathogens, such as *Campylobacter* spp. and

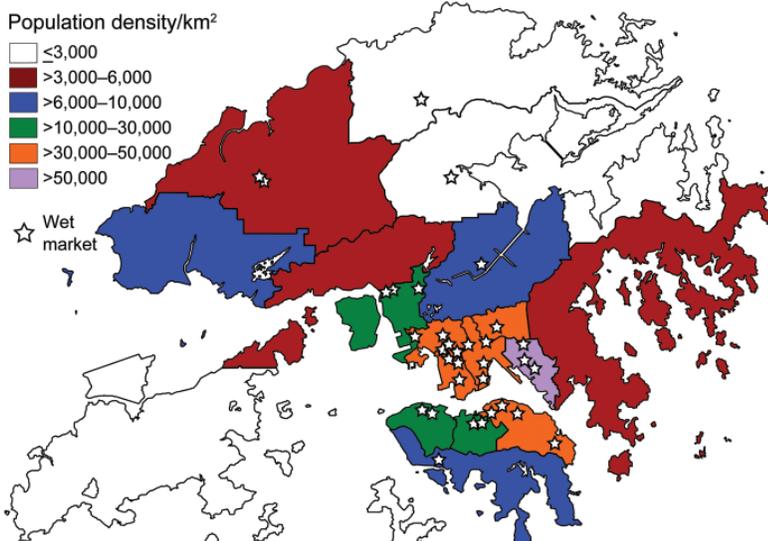


Figure. Location of live poultry wet markets (open food stall markets) in relation to population density, Hong Kong, China, June–November, 2009.

*Salmonella* spp., which share common preventive measures. Close adherence to workplace measures will likely reduce outbreak risk for other poultry-borne diseases. Therefore, a framework for greater integration of risk management strategies and worker education of these poultry-borne infections tailored to the local context is worthwhile and cost-effective.

In the spirit of the One Health Commission, which calls for an integrated, interdisciplinary approach to human–veterinary–environmental health challenges (15), the fight against global pandemics, such as those of avian influenza virus (H5N1), necessitates greater dialogue and collaborative leadership between governments and livestock industries. Development of realistic occupational safety measures is an ongoing challenge for national governments.

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