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Perceived Risk of Avian Influenza in Poultry Varies with Urbanization in Vietnam

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Abstract

Highly pathogenic avian influenza (HPAI) is an important public health concern because of its potential to cause widespread morbidity and mortality in humans and poultry and associated devastating economic losses. In this study we examined how perceptions of and response to the risk of HPAI in poultry vary across communes/wards in the north of Vietnam at different levels of urbanization (rural, transitional, urban). We conducted a quantitative household survey with 1073 respondents. Results suggested that the perceived risk of HPAI in poultry was highest in transitional and rural settings. Respondents in these settings were more likely than respondents in urban settings to agree that the process of change (in urbanization, agricultural practices, or natural habitat) increased the likelihood of an outbreak of HPAI in poultry. Compared with others, respondents in transitional areas reported that they do less planning and perceive vaccines to be more effective, while respondents in rural areas reported less perceived ability to separate infected poultry from others. We also found that the inability to respond is not necessarily because of an inability to perceive change but because, rapid and extensive change poses different challenges for poultry management as communes move from rural to transitional to urban settings. Our results suggest that public and animal health campaigns could be tailored in a way that recognizes the needs of poultry raisers in different settings.

Introduction

Highly pathogenic avian influenza (HPAI) subtype H5N1 is an important public health concern because of its potential to infect humans and cause severe economic impacts. Vietnam first experienced three major epidemic waves of HPAI between December 2003 and February 2006 (1), with repeated outbreaks causing poultry and economic losses on a large scale. Gilbert et al. (2) demonstrated that a large proportion of the spatial variation in HPAI disease risk can be explained by a few key factors such as human population density, rice cropping intensity, and poultry density. The same study also highlighted that considerable variation remains unexplained and that additional dimensions of human behavior should be considered.

Studies examining the perceived risk of HPAI in poultry are lacking, but studies in Thailand (3), Laos (4), and Cambodia (5) suggest that few people are aware of HPAI symptoms in poultry and that many think it is unlikely to occur in their flocks. Few people report they would notify authorities of poultry deaths, despite believing that it is important to report the deaths. Non-reporting is believed most likely to occur when there is a lack of knowledge about or inaccessibility of the reporting procedure, fear of culling, and fear of being unable to sell remaining poultry. The above studies sampled from areas reflecting different levels of urbanization. However, differences among urban, semi-urban, and rural sub-samples were not examined, even though recent research suggests that the level of urbanization may be related to avian influenza outbreaks (6, 7). Thus, we do not know (a) whether perceived risk varies with levels of urbanization and (b) how people conceptualize urbanization and its impacts on animal husbandry and disease outbreaks.

To fill the gap in knowledge about whether and how HPAI outbreaks are related to levels of urbanization, we conducted a household survey with poultry raisers in the north of Vietnam. Our objective was to understand poultry raisers' perceptions of the risk of HPAI in poultry and how it

may or may not be related to the setting in which they live.

Vietnam provides an excellent site for this research because rapid urbanization in Vietnam has substantially changed farmers' interactions with natural systems. For example, increasing motorization of transport has heightened the potential for disease to spread further and more easily from one farm or commune to another via feces on moped or truck tires. Understanding perceptions of urbanization and its relationship with HPAI outbreaks in poultry is important because urbanization and the resulting infrastructure create a filter which distances people from the environment and affects their ability to perceive changes in natural resources (8). Failing to perceive change potentially threatens a community's ability to respond appropriately.

In this study, we examined risk perceptions and responses across people with different types of involvement in agricultural activities in communes at different levels of urbanization. Specifically, we explored the behaviors, cultural values, traditions, and risk perceptions of individuals in rural, transitional, and urban communes in provinces in the north of Vietnam. In contrast to the null hypothesis that there is no relationship between perceptions of risk of HPAI in poultry and setting, we tested two alternative hypotheses.

H₁: Highest risk perceptions of HPAI in poultry occur in transitional setting (i.e., perceived risk tracks real risk).

H₂: Highest risk perceptions of HPAI in poultry occur where the rapid urbanization is perceived to be occurring.

Methods

Design Overview

A questionnaire was administered to 1073 households July 22 – August 31, 2012. Thirty households in each of 12 urban, 12 transitional, and 12 rural places (communes or wards) were randomly selected from registries obtained with permission from commune/ward authorities. Settings were categorized as rural, transitional, or urban using methods developed by Saksena et al. (9). The sample was stratified by three agroecological zones: Red River Delta, lowlands (<15m elevation), and uplands (\geq 15m elevation) in Northern Vietnam.

Places (communes or wards) were selected using the following procedure. First, we excluded all places with less than 100 houses with chickens. Then we chose 12 urban wards (because these were the least prevalent), stratified by elevation (i.e., 4 wards in the Red River Delta, 4 wards at 0-15m; 4 wards at >15m). Next, we chose pairs of transitional and rural places randomly in the same district and elevation class as each of the urban wards. If we were unable to identify a transitional or rural place in the same district as the urban ward, we moved to a neighboring ward.

Once 36 places were identified, we then examined the number of villages /blocks in each place. If the place had only one village/block, then we chose all 30 households in that village/block. If there were two villages/blocks, we chose 15 households randomly in each of the chosen village/block. If there were three or more villages/blocks, then we chose 3 villages/blocks randomly and selected 10 households randomly in each village/block.

Participants

Inclusion criteria were (a) at least 21 years of age; (b) able to participate in a 60-90 minute survey interview; (c) household must have at least one adult chicken or duck. If there was more than one eligible person at the household, we selected the person who had most to do with the

poultry farming activities. We selected approximately equal numbers of men and women participants by alternating between selecting men vs. women from house to house. Participant characteristics are presented in Table 1.

Table 1. Characteristics of survey participants in rural, transitional, and urban settings

	Overall (N=1073)	Rural (N=359)	Transitional (N=359)	Urban (N=359)	p
Age, years, mean (sd), n	52.1 (11.5) N=1073	49.0 (11.1) N=359	53.4 (10.9) N=359	54.1 (11.8) N=355	.000
Gender, n (%)					.02
Male	529 (49.3)	188 (52.4)	187 (52.1)	154 (43.4)	
Female	544 (50.7)	171 (47.6)	172 (47.9)	201 (56.6)	
Ethnicity, n (%)					.001
Kinh	889 (82.9)	276 (76.9)	299 (83.3)	314 (88.5)	
Tay	137 (12.8)	61 (17.0)	45 (12.5)	31 (8.7)	
Chinese	1 (.09)	0 (0.0)	1 (0.28)	0 (0.0)	
Nung	43 (4.0)	22 (6.1)	11 (3.1)	10 (2.8)	
Other	3 (0.3)	0 (0.0)	3 (0.8)	0 (0.0)	

Household Questionnaire

The household questionnaire consisted of 105 items designed to collect information about: respondent, household, and farm characteristics; perceptions of urbanization and HPAI risk; and environmental values. The draft questionnaire was translated into Vietnamese and pilot tested with poultry raisers in rural, transitional, and urban settings near Hanoi. Based on findings from the pilot test, the questionnaire was revised to ensure the items were meaningful and the response scales appropriate. The final questionnaire was back-translated into English to verify that items

were worded as originally intended. The final English and Vietnamese versions of the questionnaire are provided in the appendix.

Procedure

Survey participants were read an informed consent briefing page that described the purpose, content, risks, and benefits of the study. If they consented to participate, they were then administered the questionnaire, with rest breaks as needed. About one hour was needed to complete the questionnaire. Participants were debriefed and thanked for their participation at the end of the interview and given payment for their time. Interviewers were provided with a set of standard guidelines.

Results

Perceptions of urbanization

We first examined responses to ensure that perceptions of urbanicity vary across setting (rural, transitional, urban). As expected, we found that each setting was perceived according to the category to which it had been assigned. Mean ratings of how rural or urban respondents' commune is (from 0=very rural to 10=very urban) differed significantly across setting, with the mean rating for respondents in the rural setting (mean=2.7) lower than the mean rating for respondents in the transitional setting (mean=3.8) or urban setting (mean=5.4) (Q34).

We next examined whether perceptions of urbanization vary across setting (rural, transitional, urban). As expected, we found that rapid urbanization and natural habitat alterations were perceived in urban areas, while rapid changes to agricultural practices were perceived in rural areas. Respondents in urban settings (47.9%) were significantly more likely than others (34.8% in rural and 34.5% in transitional settings) to report that their commune has become rapidly more urban over the past 10 years (Q35). Respondents in rural settings (59.9%) were

significantly more likely than others (47.1% in transitional and 47.3% in urban settings) to report that rapid changes have occurred to their agricultural practices in the past 10 years (Q37).

Respondents in urban settings (60.0%) were significantly more likely than others (53.8% in rural and 49.6% in transitional settings) to report that rapid changes have occurred to natural habitat in their commune over the past 10 years (Q39). Overall, there were no significant differences across settings in reported feelings about the perceived changes (Q36, Q38, and Q40).

Perceptions of the risk of HPAI in poultry

We examined responses to determine if perceptions of HPAI likelihood and impacts varied across setting (rural, transitional, urban). Overall, respondents rated the likelihood of an H5N1 outbreak as highest in rural areas (mean=5.7) and transitional areas (mean=5.3) compared with urban areas (mean=4.2) (Q62a-c). An outbreak of H5N1 in a rural commune was rated significantly more likely by respondents in urban settings (mean=6.3) than in transitional settings (mean=5.7) or rural settings (mean=5.3) (Q62a).

Analyses also showed that respondents see other communes as most at risk. An outbreak of H5N1 in an urban commune was rated significantly more likely by respondents in rural settings (mean=4.7) than in transitional settings (mean=4.4) or rural settings (mean=3.7) (Q62b). Compared with respondents in urban settings (mean 4.3) and transitional settings (5.4), respondents in rural settings (mean=6.3) perceived significantly more negative impacts of an H5N1 outbreak on their livelihood (0=no impact to 10=very negative impact) (Q60).

Perceptions of the relationship between urbanization and HPAI outbreaks in poultry

We examined responses to determine if there were differences across settings in people's perceptions of the relationship between the process of change and the likelihood of HPAI outbreaks in poultry. We found that respondents in rural areas perceived the strongest relationship between change and HPAI outbreaks. Compared with respondents in urban settings

(49.9%), respondents in rural settings (58.5%) and transitional settings (59.3%) are significantly more likely to report that the process of change (in urbanization, agricultural practices, or natural habitat) increases the likelihood of an outbreak of H5N1 (Q61). Respondents in rural settings (mean=5.1) are significantly more likely than respondents in transitional settings (mean=4.7) and urban settings (mean=4.3) to agree (on a scale from 0=do not agree at all to 10=strongly agree) that changes in urbanization, agricultural practices, and the natural habitat have increased disease outbreaks among poultry (Q44).

Prevention perceptions and activities

H5N1 prevention perceptions and activities varied across setting (rural, transitional, urban). Respondents in transitional areas reported that they do less planning and perceive vaccines to be more effective, while respondents in rural areas reported less perceived ability to separate infected poultry from others. Analyses showed that respondents in transitional settings (86.6%) were significantly less likely than others (89.4% in rural and 91.3% in urban settings) to report having made a plan about how to protect their poultry from H5N1 before an outbreak occurs (Q57c). Respondents in rural settings (77.2%) were significantly less likely than others (86.6% in transitional and 87.6% in urban settings) to report that if an H5N1 outbreak occurred in their commune, they could easily keep their poultry separate from poultry belonging to others (Q59). Respondents in transitional settings (mean=8.0) perceived the effectiveness of vaccinating poultry against H5N1 to be significantly higher compared with respondents in rural settings (mean=7.5) and urban settings (mean=7.9) on a scale from 0=not at all effective to 10=very effective (Q58a).

Perceived causes of disease in poultry

Respondents in rural settings tended more than others to highlight the role of increased volume of human waste and poultry density in causing disease in poultry. Respondents in rural

settings (mean=5.6) were significantly more likely than respondents in transitional settings (mean=5.1) and urban settings (mean=4.9) to agree (on a scale from 0=do not agree at all to 10=strongly agree) that disease in poultry in their commune is caused by increased volume of waste from livestock (Q49). Respondents in rural settings (mean=5.2) were significantly more likely than respondents in transitional settings (mean=4.7) and urban settings (mean=4.3) to agree (on a scale from 0=do not agree at all to 10=strongly agree) that disease in poultry in their commune is caused by increased poultry density (Q51).

Discussion

Backyard poultry raisers in this study confirmed that they perceived their settings as we had categorized them (rural, transitional, and urban). They also indicated that urban areas were perceived to be experiencing rapid urbanization and habitat alteration, whereas rural areas were experiencing rapid changes to agricultural practices. HPAI in poultry was perceived overall to be most risky in transitional areas (followed by rural areas). These findings provided support for our hypothesis that perceived risk is highest in transitional areas—exactly where outbreaks are expected to be most likely (7). We also found support for our second hypothesis that poultry raisers in transitional and rural areas would be more likely than those in urban areas to agree that the process of change increased the likelihood of HPAI and other diseases in poultry.

Importantly, when we examined responses within each setting we found that respondents tended to see other communes (not their own commune) as most at risk. Respondents in rural settings seemed most sensitive to a relationship between the processes of change and increases in the likelihood of an outbreak of HPAI or other diseases in poultry.

We also found that HPAI prevention perceptions and activities were reported to vary across setting. Perhaps most worrying is that respondents in transitional settings were less likely to

make a plan to protect their poultry from HPAI before an outbreak occurs, despite reporting that that they perceived the effectiveness of vaccinations to be higher than was reported in other settings. A particular challenge for respondents in rural settings was the difficulty in separating poultry. Compared with others, respondents in rural settings were also more likely to report that disease in poultry is caused by an increased volume of human waste and increased poultry density.

These findings are consistent with previous research on the perceived risk of HPAI in poultry in developing countries (3-5). The results are also consistent with previous reports that people engage ways of thinking that make them feel safer, but may also decrease their motivation to act to prevent or manage a risk appropriately (10).

What is new in the present findings is that we describe how urbanization is related to people's perceptions of and ability to respond appropriately to variations in their environment. In particular, the inability to respond is not necessarily because of an inability to perceive change (8). Rather, rapid and extensive change poses different challenges for poultry management as communes move from rural to transitional to urban settings.

Our results emphasize the need for more accurate information about the role of urbanization in HPAI outbreaks and safer animal husbandry practices before, during, and after an outbreak. Public and animal health campaigns could be tailored in a way that recognizes the needs of poultry raisers in different settings. Similarly, practitioners and policy makers interested in building capacity in the veterinary system should keep in mind the relationship between urbanization and farmers' perceptions of and responses to HPAI.

We conducted this study only in the north of Vietnam, so it is not possible to generalize the findings to all poultry raisers throughout the country. However, the consistency of results with previous research supports our conclusions about the important role that urbanization plays in

perceptions of and responses to the risk of HPAI in poultry. Furthermore, our robust approach to designing and administering a structured questionnaire to a random sample across settings that represent different levels of urbanization gives us confidence that we have collected reliable information about poultry raisers, their settings, and their perceptions of the relationship between urbanization processes and disease risk.

Future research could examine the extent to which the findings reported in this paper generalize to other parts of Vietnam or to other rapidly developing countries in Southeast Asia. The relationship between urbanization processes and responses to the risks of other zoonotic diseases could also be explored in more detail. Similar patterns of findings across different countries and infectious diseases would lend support to a reliable and valid framework for understanding how managing poultry disease is linked to perceived and actual transition in the social and natural landscape. We could then further examine how well risk perceptions correspond with actual outbreaks of disease in poultry and whether the strength of the relationship varies with setting. We also need to explore analytic methods for distinguishing components of urbanization that best predict perceived risk and actual outbreaks of HPAI in poultry. Addressing these and other questions will help policymakers be better informed about optimal risk prevention and management strategies in diverse settings.

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References

1. Pfeiffer DU, P. Q. Minh, V. Martin, M. Epprecht, M. J. Otte. An analysis of the spatial and temporal patterns of highly pathogenic avian influenza occurrence in Vietnam using national surveillance data. *Veterinary Journal* 2007;174(2):302-9.
2. Gilbert M, X. , Xiangming X, Pfeiffer DU, Epprecht M, Boles S, Czarnecki C, et al. Mapping H5N1 highly pathogenic avian influenza risk in Southeast Asia. *Proceedings of the National Academy of Sciences*. 2008;105:4769-74.
3. Takeuchi MT. Avian influenza risk communication, Thailand (letter). *Emerging Infectious Diseases*. 2006;12(7):1172-3.
4. Barennes H, Martinez-Aussel B, Vongphrachanh P, Strobel M. Avian influenza risk perceptions, Laos (letter). *Emerging Infectious Diseases* 2007;13(7):1126.
5. Ly S, Van Kerkhove MD, Davun Holl D, Froehlich Y, Vong S. Interactions between humans and poultry, rural Cambodia. *Emerging Infectious Diseases*. 2007;13(1):130-2.
6. Spencer JH. The Urban Health Transition Hypothesis: Empirical evidence of an avian influenza Kuznets curve in Viet Nam? *Journal of Urban Health* 2012.
7. Saksena S, Fox J, Epprecht M, Tran Chinh Cong, Castrence M, Nong Huu Duong, et al. Land-use changes, urbanization and agricultural intensification as drivers of HPAI H5N1 in Viet Nam. *Proceedings of the National Academy of Sciences*. in preparation.
8. Lilian A, Kliskey A, Williams P. The distancing effect of modernization on the perception of water resources in Arctic communities. *Polar Geography*. 2007;30(3-4):175-91.
9. Saksena S, Fox J, Spencer JH, Castrence M, Epprecht M, Sultana N, et al. Classifying and mapping the urban transition in Vietnam. *Applied Geography*. 2014;50:80-9.
10. Slovic P. *The perception of risk*. London: Earthscan; 2000.