Consumer Awareness of the Avian Influenza Threat in Taiwan

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Abstract. This paper discusses an important issue concerning the avian influenza threat in Taiwan. Survey data were collected in Taipei during late March and early April. Utilizing the factor analysis, cluster analysis and regression analysis, we find that consumers in Taiwan are well informed about the health risks linked to avian influenza with Television being the most common source of information about avian influenza. However, socio-demographic characteristics such as gender, education and occupation were found to be insignificant factors influencing consumer awareness of avian influenza in Taiwan.

JEL classification: M30

Key words: consumer awareness, risk perceptions, avian influenza, Taiwan

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Introduction

Public awareness of a possible human influenza pandemic caused by virulent avian influenza (AI) viruses has increased. Recently, millions of domestic fowl have been slaughtered worldwide due to the infectious H5N1 avian influenza virus, and more than 250 human cases of avian influenza have been reported to the World Health Organization (WHO) with more than 150 deaths since 2003. Currently, Asian countries such as Vietnam, Indonesia, Thailand, and China are vulnerable in situations of an avian influenza pandemic (WHO, 2007). Japan, Korea, and other Southeastern Asian countries have found a few cases of avian influenza in recent years, which has alerted countries in the region free of avian influenza to reinforce their quarantine systems and educate consumers to the threat.

Taiwan is one of few Asian countries currently free of avian influenza. Are consumers in Taiwan aware of and prepared for the possible threat of avian influenza? Since Taiwan has strong economic ties with those Asian countries having confirmed the H5N1 avian influenza outbreaks or human cases, it is of greatest importance for consumers in Taiwan to be cautious and prepared. Well-established public understandings of the disease have become a global priority in influenza pandemic preparedness and response plans (Gupta et al., 2006). In the literature, limited attention has been paid to the investigation of consumer awareness of the possible threat of pandemic avian influenza in Taiwan. Hence, this study attempts to identify consumer awareness of the avian influenza in Taiwan. Objectives of this study are:

1. To understand how consumers search for relevant avian influenza information;
2. To examine consumers' knowledge of avian influenza and to assess their levels of risk perceptions;

3. To reveal consumer preparedness for avian influenza.

A survey was administered to gather information about consumers' awareness of a possible threat of avian influenza, their information search behavior, their risk perceptions of and attitudes toward the disease, and their demographics. Stratified sampling following age and gender distributions in the latest census was applied in conducting the survey in Taipei, the most populous city in Taiwan. Multivariate analyses, cluster analysis and decision models were utilized in analyzing the data.

The reminder of this paper is organized as follows. We review related literature in Section 2 and provide a brief discussion on the methodologies we apply in our analysis in Section 3. Data collection and descriptive statistics of the important variables are presented in Section 4, and in Section 5, we provide an empirical study of consumer behavior towards avian influenza in Taiwan by investigating consumers' information search, their awareness and risk perception of AI, and their preparedness for AI. In the last section, we will draw our conclusions. Empirical findings are invaluable to the government to help them educate the public about a possible threat of avian influenza and enhance preparedness for the disease.

Literature Review

Even though H5N1 was reported in China in 1996 and 18 human cases were first reported in Hong Kong in 1997, researchers did not pay much attention to this fatal H5N1 infection until 2004. Ferguson et al. (2004) estimated the probability of avian-to-human and human-to-human transmission. Their results suggested that current surveillance data would not be good enough for detecting the stochastic beginnings of a pandemic, and thus detailed case investigation would be essential to provide the reliable data required.

However, public health agencies would like to know more about the opinions of consumers. In recent years, several studies have examined consumers' knowledge, information search, awareness, risk perception and preparedness for the H5N1 avian influenza (for example, Fielding et al. 2005; Olsen et al. 2005; Gupta et al. 2006; Southwell et al. 2006; Abbate et al. 2006; Leggat et al. 2007). The largest-scaled survey was done in the European Union (EU) (Eurobarometer, 2006). The Directorate General for Health and Consumer Protection administered a consumer AI knowledge survey among 24,693 respondents in 25 countries in the EU between March 27 and May 1, 2006. This Eurobarometer (2006) study has three fundamental objectives: (1) to understand the level of knowledge of EU citizens concerning the health risks linked to AI, (2) to determine policies implemented to fight the spread of the virus and (3) to discover the planned changes in consumer behavior as a result of the virus outbreak.

The results of this Eurobarometer (2006) study showed that AI knowledge was influenced by whether or not the country was affected by AI outbreaks, namely, consumers in France, Germany, Denmark and Belgium, which experienced AI outbreaks, were best informed about the health risks of AI and had a high proportion of correct answers, whereas consumers in Spain, Ireland, Portugal and Italy, which had not experienced AI outbreaks, had a low proportion of correct answers. In addition, a majority of EU consumers were adequately informed about policies, including legislation, institutional structures and general measures adopted by the EU to fight the spread of the H5N1 virus. However, on average, only 20% of the EU consumers declared eating less poultry compared with six months earlier, and the reasons for reducing their consumption were mostly due to precaution.

In the literature mentioned earlier, one of the most important issues for consumers is how to prevent an infection of avian influenza. For example, "wash hands" and "avoid birds" are the two most important nominated preventative measures observed by hostellers (Leggat et al. 2007). In Italy, Abbate et al. (2006) showed that the use of a face mask, gloves, outer garments, boots or boot covers, and eye protection as well as washing hands with soap and water are the best preventive measures to use. Olsen et al. (2006) conducted a survey in rural Thailand and comparison results from a recalling data showed that the percentage of rural residents who thought touching sick or dead poultry with bare hands was safe had decreased dramatically. In addition, the percentage of people preparing raw poultry and other foods using different cutting boards increased considerably. Unfortunately, similar studies have not been done in Taiwan and thus this research would be one of few attempts to understand consumers' knowledge, attitude and preparedness of the avian influenza threat in Taiwan.

Data

Collection of the data

Data were colleted in Taipei from March 31 to April 1, 2007. A stratified sampling scheme was used in the data collection procedure. On the basis of the population in Taipei (as shown in Table 1), we randomly gave our questionnaire to 225 consumers at the Dr. Sun Yat-sen Memorial Hall, the CKS Memorial Hall, and by the Da-an park in order to represent the true population in Taipei. In addition, only consumers who are the primary food shoppers in a family and who have heard of avian influenza and the Certified Agricultural Standards (CAS) were included in this survey.[1] Questionnaires with partially missing information were dropped out of our analysis; in

[1] The "Certified Agricultural Standards" is the other issue in this research but is not included in this paper.

total, there are 188 observations available for our analysis. In addition, it is worth noting that nearly one fifth of the observations were from males, due to the criterion of "to be the primary food shoppers in a family." However, Table 1 also shows that the age group in our survey reflected the age group in the census very well.

[Insert Table 1 about here.]

Descriptive Statistics of the Sample

Table 2 presents descriptive statistics of the demographics in this survey. Over 90% of the observations were married and over 60% of the observations gained a bachelor's degree as their highest education level. Business persons and housewives had the most people in the category of occupation, accounting for nearly 70% of the survey in total. Most families have a monthly income ranging from 40-100 thousands NTD, with an average of 87 thousands NTD per month. In addition, household size is close to four persons in a family. The analyses from this survey are provided in later sections.

[Insert Table 2 about here.]

Empirical Analysis

The structure of the analysis is shown in Figure 1. On the basis of this structure, we will successively discuss the knowledge, information search patterns, risk perceptions, preparedness for AI and their relationships in this section.

[Insert Figure 1 about here.]

Knowledge of AI

In the first part of our questionnaire, consumers were asked to examine their objective knowledge and their probabilities of certainty in seven statements, which were adapted from Eurobarometer (2006). The percentage of correct answers and their probability of certainty for each statement are presented in Table 3. For comparison

purposes, the percentage of correct answers of the EU results from Eurobarometer (2006) is reproduced.

[Insert Table 3 about here.]

Overall, most consumers in Taiwan are well informed about the health risks linked to the H5N1 avian influenza. The proportion of correct answers ranges from 43.62% to 94.68%. Similar to the results in EU, consumers in Taiwan answered correctly that all the poultry on a farm must be destroyed immediately if a chicken is contaminated by AI on that farm (Statement 6 in Table 3). In addition, almost 90% of the interviewers answered correctly that humans can catch AI by touching contaminated birds (Statement 3 in Table 3). However, less than half of the consumers in Taiwan correctly know that "the AI virus contained in an egg or present on its shell can be eliminated by prolonged cooking" (Statement 5 in Table 3) and that "it is not dangerous to eat the meat of a chicken vaccinated against AI" (Statement 7 in Table 3) with only 48.94% and 43.62%, respectively. The probabilities of certainty when answering these questions are also presented in Table 3, ranging from 51.15% to 67.26%. Not surprisingly, the more the consumers answered the questions correctly, the higher probability they ensured the questions were answered correctly.

Comparing the results of the percentage of correct answers for each question in Taiwan with those in the EU, we find that consumers in both areas are quite similar. First, Statement 6 was correctly answered at the highest percentage in both Taiwan and the EU, whereas Statement 7 was at the lowest percentage. Moreover, consumers in Taiwan knew less than those in the EU about Statements 4 (i.e., the vaccination against seasonal influenza is not effective against avian influenza), 5 and 7. Taiwanese government may need to educate its people in order to improve their knowledge about AI.

Information Search

Gupta et al. (2006) and Southwell et al. (2006) showed that television was the most preferred means of receiving information during a pandemic. In our study, AI information search channels are also rated and presented in Table 4. Similarly to the previous studies, television is rated the most preferred source with 92% of the surveyed consumers. Newspapers are rated second at 71.3%. As for the rest of the sources, such as internet, radio, word of mouth and flyer, they are all rated less than 40%. This finding is in accordance with both Gupta et al. (2006) and Southwell et al. (2006).

[Insert Table 4 about here.]

What kind of information would consumers know more about? Table 5 shows the results. 77.7% of the interviewers would like to know more about how AI is transmitted. In addition, over 60% of the consumers would like to know more about (1) the current status in areas with AI outbreaks, (2) quarantine policies for AI in Taiwan, (3) handling procedures if an AI outbreak occurs, (4) how to be personally well-prepared about AI, and (5) information concerning meat safety issues.

[Insert Table 5 about here.]

Risk Perception

According to Peter and Tarpey (1975), consumers' physical risk perception scores are calculated and used together with the knowledge scores to partition 188 observations into subgroups. Using cluster analysis, we classify consumers into four subgroups on the basis of their knowledge level. There are 18, 53, 81, and 36 observations in low, medium-low, medium-high, and high subgroups, respectively. Table 6 presents the average points of both knowledge and risk perception for each subgroup. In the low knowledge subgroup, the average knowledge points are 1.724

and the risk perception points are about 75, whereas the average knowledge points are 4.262 and the risk perception points are about 112 in the high knowledge subgroup. This indicates that consumers having low knowledge about AI do not think or care seriously about a potential outbreak of AI; on the contrary, consumers with high knowledge about AI care the physical risk from an AI outbreak. This finding may be important to public health agents to find consumers who have low knowledge of AI in order to prevent any possibility of avian-to human or human-to-human transmissions.

[Insert Table 6 about here.]

Table 6 also shows the percentage of buying live chicken in traditional markets in the past three months and the percentage of supporting government policy of banning slaughter live chicken in traditional markets. Not surprisingly, most consumers support the ban. The percentage of supporting this policy increases from 55.56% (in low knowledge subgroup) to 72.22% (in high knowledge subgroup), indicating that the higher the knowledge levels consumers possess, the more the consumers are willing to support this policy.

A multiple regression is used to analyze the determinants of the AI knowledge. The ordinary least square technique is used in this study. Table 7 presents the regression results. Our findings indicate that male consumers on average understand the avian influenza better than females. Blue-collars consumers lower by 0.98 points about the AI knowledge on average, *ceteris paribus*. In addition, increase on age by one year would reduce the knowledge by 0.023 points on average, indicating that older consumers would not have a better understanding of the possible threat of avian influenza. All education dummy variables are not statistically significant. Therefore, our results provide evidence which is not consistent to findings in the literature (for example, Eurobarometer 2006).

[Insert Table 7 about here.]

Preparedness for AI

As to the preparedness for AI, 12 strategies were asked in our questionnaire in order to evaluate what consumers would do to prevent the infection of the AI. Using factor analysis, we can group these 12 strategies into two factors. One factor contains seven strategies and is named "self-protection;" the other factor is named "self-avoidance." "Self-avoidance" factor includes strategies such as to avoid going to crowded public areas, to avoid going to slaughter houses and live bird markets, to avoid traveling to areas with an AI outbreak, to avoid touching live birds and their droppings with bare hands and to wear a mask in public areas when an AI outbreak occurs. On the other hand, the "self-protection" factor consists of other seven actions, such as to keep air circulated indoors, to exercise regularly, to wash hands often, to have a well-balanced diet, to avoid eating poultry and eggs not thoroughly cooked, and not to purchase wild or smuggled live birds.

[Insert Table 8 about here.]

How do consumers change their eating patterns if an AI outbreak occurs in 2007? Table 8 shows the planned changes of poultry, eggs, and meats by knowledge subgroup. Intriguingly, most consumers will not buy poultry meats, including chicken, duck and goose if an AI outbreak occurs, no matter which knowledge subgroup they are in. However, most consumers will reduce their egg consumption, especially in the subgroups of medium-low and high knowledge levels. This finding indicates that the reason that consumers reduce eating poultry or don't eat poultry is not about perceiving a real danger but about precaution. They prefer to adopt a cautious attitude towards the AI risk, which is accordance with Eurobarometer (2006). Meanwhile, consumers indicate to increase their meat consumption or stat at least the

same level, especially pork and aquatic products. This may be due to pork and fishes are the most common sources of animal protein. Since poultry is not safe to eat due to precaution, consumers would like to consume more pork and aquatic products instead. Obviously, this will hurt the poultry industries in a short-run.

[Insert Table 9 about here.]

Conclusions

This paper investigates consumers' knowledge and risk perceptions of the H5N1 avian influenza and their impacts on changes in poultry consumption in Taiwan. Survey data were collected in Taipei during late March and early April, 2007. Utilizing factor analysis, cluster analysis and regression analysis, we find that consumers in Taiwan are well informed about the health risks linked to avian influenza; however, some information should pass to the public more efficiently in order to educate consumers to better understand avian influenza. In addition, television is the most common source of receiving relevant avian influenza information, and thus television would be an important medium in risk communication strategies. Most of consumers would change their poultry consumption behavior under the threat of avian influenza outbreaks. Moreover, socio-demographic characteristics such as gender, age and occupation were found to be significant factors influencing consumer awareness of avian influenza threat in Taiwan.

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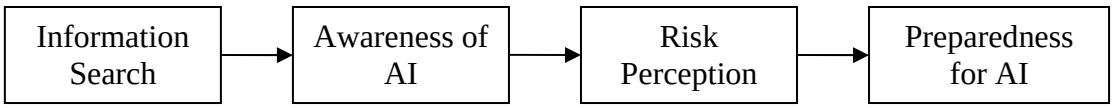

Figure 1. Structure of the Research

Table 1. Distributions of the Census and our Survey with respect to Age and Gender
Unit: %

	Census		Survey	
Gender \ Age group	20-39	40-59	20-39	40-59
Male	23.15	24.31	10.11	10.64
Female	25.31	27.23	39.36	39.89
Total	48.45	51.55	49.47	50.53

Note: number of observations = 188.

Table 2. Socio-demographic characteristics of the participants in Taipei, 2007.

Characteristic	Number	(%)
Gender		
Male	39	(20.74)
Female	149	(79.26)
Marital status		
Married	177	(94.15)
Single	11	(5.85)
Highest educational level		
Primary school	2	(1.06)
Junior high school	7	(3.72)
Senior high school	38	(20.21)
University	118	(62.77)
Post graduate	23	(12.23)
Occupation		
White collar	28	(14.89)
Blue collar	7	(3.72)
Business	74	(39.36)
Housewife	55	(29.26)
Student	1	(0.53)
Others	23	(12.23)
Monthly family income		
below 20,000	1	(0.53)
20,001 – 40,000	14	(7.45)
40,001 – 60,000	36	(19.15)
60,001 – 80,000	47	(25.00)
80,001 – 100,000	39	(20.74)
100,001 – 120,000	20	(10.64)
120,001 – 140,000	10	(5.32)
140,001 – 160,000	6	(3.19)
160,001 – 180,000	1	(0.53)
180,001 – 200,000	4	(2.13)
200,001 and above	10	(5.32)

Table 2. (Continuous)

Characteristic	Number	(%)
Household size		
1	3	(1.60)
2	9	(4.79)
3	45	(23.94)
4	96	(51.06)
5	20	(10.64)
6 and above	15	(7.98)
Age group		
20 – 29	4	(2.13)
30 – 39	89	(47.34)
40 – 49	68	(36.17)
50 – 59	27	(14.36)

Note: # of observations = 188.

Table 3. Comparison of objective knowledge of AI between Taiwan and EU
Unit: %

Correct statement	Taiwan		EU
	Correctly answered	Probabilities of certainty	Correctly answered
S1: The avian influenza virus cannot be easily transmitted between humans	67.02 (47.14)	59.62 (21.21)	60
S2: Even when it is contaminated poultry is not a health risk if it is thoroughly cooked	70.74 (45.61)	59.27 (21.92)	63
S3: Humans can catch avian influenza by touching contaminated birds	89.89 (30.22)	65.64 (20.32)	74
S4: The vaccination against seasonal influenza is not effective against avian influenza	68.09 (46.74)	57.34 (22.42)	76
S5: The avian influenza virus contained in an egg or present on its shell can be eliminated by prolonged cooking	48.94 (50.12)	54.87 (23.12)	61
S6: If a chicken is contaminated by avian influenza on a farm, all the poultry on that farm must be destroyed immediately	94.68 (22.50)	67.26 (21.59)	84
S7: It is not dangerous to eat the meat of a chicken vaccinated against avian influenza	43.62 (49.72)	51.15 (23.62)	47

Note: standard deviation in parentheses.

Table 4. AI information search sources

Source	Percentage	Standard deviation
Television	0.920	0.272
Newspaper	0.713	0.454
Internet	0.372	0.485
Ratio	0.335	0.473
Word of mouth	0.106	0.309
Flyer	0.101	0.302
Medical specialists	0.090	0.288
Others	0.005	0.073

Table 5. Information to know more about AI

Item	Percentage	Standard deviation
How AI is transmitted	0.777	0.418
The current status in areas with AI outbreaks	0.665	0.473
Quarantine policies for AI	0.665	0.473
Handling procedures if an AI outbreak occurs	0.649	0.479
How to be personally well-prepared about AI	0.638	0.482
Information concerning meat safety issues	0.617	0.487
Syndromes of the AI-infected poultry	0.511	0.501
Probability of human getting infected with AI	0.505	0.501
Information of travel guidance and warnings related to AI	0.399	0.491
Other information about AI	0.005	0.073

Table 6. Knowledge, risk perception and live-chicken issues by knowledge group

	Knowledge level			
	Low	Medium-Low	Medium-High	High
knowledge points	1.724 (0.475)	2.175 (0.533)	3.266 (0.728)	4.262 (0.705)
risk perception points	75.222 (9.717)	110.585 (10.413)	84.852 (9.311)	112.111 (12.553)
% of buying live chicken in traditional markets	100.000 (0.000)	54.717 (50.253)	60.494 (49.191)	69.444 (46.718)
% of supporting policy to ban slaughtering live chicken in traditional markets	55.556 (51.131)	62.264 (48.936)	62.963 (48.591)	72.222 (45.426)
Number of observation	18	53	81	36

Table 7. Parameter estimates of the OLS of the objective AI knowledge

Variable	Parameter Estimate	Standard Error	
Intercept	4.376	0.696	***
male	0.602	0.214	***
married	0.090	0.335	
edu_S	–0.476	0.396	
edu_C	–0.537	0.387	
edu_G	–0.482	0.464	
occ_1	0.299	0.255	
occ_3	–0.983	0.455	**
occ_4	–0.169	0.201	
occ_o	–0.049	0.270	
income	–0.010	0.019	
age	–0.023	0.011	**

Note: p-value: *<10%;**<5%;***<1%.

Table 8. Factor analysis of the preparedness for AI

	Factor 1 Self-protection	Factor 2 Self-avoidance
Avoid eating poultry not thoroughly cooked	**0.8638**	0.1644
Avoid eating eggs not thoroughly cooked	**0.7870**	0.2827
Have a well-balanced diet	**0.7845**	0.2443
Wash hands often	**0.7757**	0.2732
Exercise regularly	**0.7734**	0.2663
Keep air circulated indoors	**0.6726**	0.3644
Not purchase wild or smuggled live birds	**0.6717**	0.3740
Avoid going to crowded public areas	0.0858	**0.7999**
Avoid going to slaughter houses and live bird markets	0.3570	**0.6939**
Avoid traveling to areas with AI outbreaks	0.3449	**0.6796**
Wear masks in public areas	0.2247	**0.6473**
Avoid touching live birds and their droppings with bare hands	0.5006	**0.6056**
Cumulative variance explained	0.5338	0.6328

Table 9. Planned changes of poultry, egg and meat consumption by knowledge subgroup if an AI outbreak occurs in 2007

	Knowledge level			
	Low	Medium-Low	Medium-High	High
Chicken				
Reduce	38.89	18.87	35.80	16.67
Don't buy	61.11	69.81	53.09	69.44
Stay put	–	11.32	11.11	13.89
Duck				
Reduce	27.78	35.85	39.51	30.56
Don't buy	72.22	56.60	51.85	63.89
Stay put	–	7.55	8.64	5.56
Goose				
Reduce	27.78	37.74	39.51	30.56
Don't buy	72.22	54.72	53.09	66.67
Stay put	–	7.55	6.17	2.78
Increase	–	–	1.23	–
Egg				
Reduce	27.78	41.51	35.80	44.44
Don't buy	55.56	30.19	37.04	36.11
Stay put	16.67	28.30	27.16	19.44
Pork				
Reduce	16.67	30.19	30.86	25.00
Don't buy	22.22	7.55	9.88	16.67
Stay put	50.00	41.51	48.15	41.67
Increase	11.11	20.75	11.11	16.67
Beef				
Reduce	22.22	39.62	30.86	27.78
Don't buy	27.78	13.21	17.28	16.67
Stay put	33.33	30.19	37.04	41.67
Increase	16.67	16.98	14.81	13.89
Mutton				
Reduce	27.78	50.94	43.21	41.67
Don't buy	33.33	18.87	24.69	25.00
Stay put	27.78	24.53	30.86	30.56
Increase	11.11	5.66	1.23	2.78
Aquatic products				
Reduce	16.67	16.98	22.22	27.78
Don't buy	16.67	3.77	2.47	5.56
Stay put	38.89	49.06	48.15	47.22
Increase	27.78	30.19	27.16	19.44