To investigate human exposure to live poultry and changes in risk perception and behavior after the April 2013 influenza A(H7N9) outbreak in China, we surveyed 2,504 urban residents in 5 cities and 1,227 rural residents in 4 provinces and found that perceived risk for influenza A(H7N9) was low. The highest rate of exposure to live poultry was reported in Guangzhou, where 47% of those surveyed reported visiting a live poultry market >1 times in the previous year. Most (77%) urban respondents reported that they visited live markets less often after influenza A(H7N9) cases were first identified in China in March 2013, but only 30% supported permanent closure of the markets to control the epidemic. In rural areas, 48% of respondents reported that they raised backyard poultry. Exposure to live commercial and private poultry is common in urban and rural China and remains a potential risk factor for human infection with novel influenza viruses.

Previously published studies have reported that most human infections appear to have occurred as a result of exposure to live poultry, particularly through visits to live poultry markets (LPMs) in urban areas (3,5–8). No published reports have detailed population exposure to live poultry and LPMs in influenza A(H7N9) virus–affected areas in China, and few data on live poultry exposure have been previously reported in areas in which the virus has not been detected (4,9,10). In addition, little information has been reported on how the population of China responded to the outbreak and the control measures that were implemented. To clarify responses to the influenza A(H7N9) outbreak in China, we investigated patterns in human exposure to live poultry in LPMs and at home, examined risk perception and behavioral responses in the population, and compared these parameters between urban and rural areas in China that were affected or unaffected by the virus.

Methods

Study Design

We collected information on human exposure to poultry, risk perception and psychological responses to the outbreak, preventive behaviors, and attitudes toward control measures, including closure of LPMs. We used 2 approaches to collect these data. In urban areas, we conducted telephone surveys because access to mobile telephones is high, making the approach feasible. In rural areas, where telephone accessibility is lower, we conducted door-to-door surveys.

We selected 5 large cities for our study to represent diverse levels of socioeconomic development and geographic location: Chengdu, Guangzhou, Shanghai, Shenyang, and Wuhan (Figure 1). Before our study, no laboratory-
confirmed human cases of influenza A(H7N9) had been reported in these cities except Shanghai; 1 environmental sample had tested positive for the virus in Guangzhou (11).

In each city, we aimed to interview >500 adult residents (>18 years of age) who had been living there for >1 year. The telephone surveys were conducted by using a computer-assisted interviewing system, which enabled random generation of mobile telephone numbers and systematic data collection across each city. On each call, after the study was explained and verbal consent obtained, the respondent would be recruited into the study and asked to complete the survey. If a respondent were busy, a call would be made later, when the respondent was available to finish the questionnaire. Unanswered numbers were given 4 follow-up calls, made at different hours and on different days of the week, before being classified as invalid. The online Technical Appendix shows the survey used in English and Chinese (http://wwwnc.cdc.gov/EID/article/20/8/13-1821-Techapp1.pdf).

Although we had planned to use the same telephone survey approach in rural areas, a pilot study revealed it was not feasible because the survey would occur during the busy farming season, when residents would not be readily available by telephone. Instead, in rural areas we conducted door-to-door surveys. In mainland China, some cities/counties that are administrated as rural regions actually include semiurban areas, such as towns in a county, and rural areas, such as villages in a town/county. The living conditions and lifestyle of residents in semiurban areas are similar to those of urban residents, whereas residents in rural areas live in a different environment, with low population density and a more self-sustainable life, mainly dependent on farming. We used convenience sampling to choose 4 counties from rural rather than semiurban areas. Rural sites were selected on the basis of the level of economic development (measured by gross domestic product per capita) and the overall incidence of infectious diseases in 2012. Given the tiers of administration levels in mainland China, including province, city, county, town, and village, we selected a city from each of the 4 provinces with mid-level gross domestic product per capita compared with other cities in the province and with an incidence of notifiable infectious diseases above the provincial average. Within each province, we then selected a rural county from each of the 4 cities areas. As a result, we chose Dawa County (Panjin city, Liaoning Province), Zijin County (Heyuan city, Guangdong Province), Nanzhang County (Xiangfan city, Hubei Province), and Pengxi County (Suining city, Sichuan Province) for the study (Figure 1). At time of the survey, none of these counties had laboratory-confirmed human infections with avian influenza A(H7N9) virus.
After the initial selections, all towns within a county were stratified into high, middle, and low levels of socioeconomic status on the basis of census data (12–15), and 1 town was selected at random within each strata. Then, 2 villages were selected at random within each town, a convenience sample of 50 households was recruited in each village, and 1 adult in each household (≥18 years of age and resident in the village for ≥1 year) was interviewed. To improve cooperation, each rural interviewee received a small gift worth ≈10 Chinese renminbi (6.1 renminbi = $1 US), such as a towel or a bottle of shampoo, after the survey was completed. All selected participants in the rural areas consented to be interviewed during the survey. The time taken to complete the survey was 16 minutes on average for each participant.

The urban surveys were conducted in May and June 2013 and the rural surveys in July and August 2013. Ethical approval was obtained from the Institutional Review Board of the Chinese Center for Disease Control and Prevention before the survey was conducted.

Survey Instrument

All surveys in urban and rural areas were conducted by using the same questionnaire, which was based on an instrument used during the outbreaks of severe acute respiratory syndrome (SARS) in 2003 (16,17) and influenza A(H1N1)pdm09 in 2009 (18). The survey instrument was pretested for face and content validity, length, and comprehensibility. Most answers were ranked on ordinal Likert scales. We used the State Trait Anxiety Inventory to measure the general level of anxiety in the population (16–18).

We investigated exposure to live poultry in backyards and in LPMs, which are defined as markets where the public can buy live chickens, ducks, pigeons, and other birds. Because LPMs are rare in rural areas and rural residents seldom visit LPMs, we did not ask rural respondents about exposures to live poultry in LPMs, only about backyard poultry exposure. In urban areas, we asked respondents about frequency of visits to LPMs and behaviors in LPMs (i.e., frequency of purchases, practice of picking up birds before purchasing, location where purchased live poultry were slaughtered). We asked all respondents about perception of risk for influenza A(H7N9) infection and perceived severity of such an infection, preventive practices in general and specifically in response to influenza A(H7N9), and attitudes toward influenza A(H7N9) and closure of LPMs.

Statistical Analysis

Statistical analyses were conducted in R version 2.13.0 (R Foundation for Statistical Computing, Vienna, Austria). We performed descriptive analyses of responses in each location and compared responses between urban areas with and without laboratory-confirmed cases of influenza A(H7N9) by using χ² tests. For the subset of respondents who reported purchasing live poultry in LPMs during the previous year, we used a multivariate logistic regression model to estimate the associations of age, sex, educational level, and geographic location with attitudes toward closure of LPMs and changes in habits of buying live poultry after public health authorities announced the first human influenza A(H7N9) case on March 31, 2013 (19).

The sample size of 500 respondents in each city and 300 respondents in each rural county was chosen to ensure precision of answers to within ±4% and ±6%, respectively, and to ensure reasonable statistical power to identify differences in responses of 5%–10% or more between locations.
Results

In the 5 urban areas, 81,266 unique telephone numbers were dialed, and the overall response rate was 8% (number of participants [2,504] divided by number of calls with eligible respondents [29,919]) (Figure 2, panel A). The selection of 1,227 participants in 4 rural sites is illustrated in Figure 2, panel B. The surveys were conducted from May 23 through August 24. During this period, the influenza A(H7N9) epidemic had passed its peak, and few cases occurred. Guangdong Province notified its first human influenza A(H7N9) case on August 9, after the completion of the survey in Guangzhou on June 26.

Respondents in urban areas tended to have white-collar jobs or were unemployed, were younger, had more education and higher income, and were less likely to be married than those in rural areas (Table 1). However, because the surveys were conducted in different forms in urban versus rural areas and the general characteristics of participants were different, including the risk for becoming infected with influenza A(H7N9) virus and the types of potential exposure to avian influenza viruses, we did not make any further direct quantitative comparisons between urban and rural respondents. For comparisons among urban areas, respondents were generally similar, but reported incomes were higher for Shanghai and Guangzhou than for the other 3 cities (data not shown).

We assessed exposures to live poultry and visits to LPMs in the 5 cities. In total, 33% of respondents reported visiting LPMs during the preceding year, the highest proportion in Guangzhou; notable differences were found between cities (Table 2). By imputing midpoints of reported purchasing rates, we estimated that the mean number of live poultry purchased per year varied between cities: 6.8 for Shenyang, 19 for Shanghai, 20 for Wuhan, 28 for Chengdu, and 47 for Guangzhou. Age-specific patterns in exposure to live poultry were generally similar for men and women within each city, with some exceptions. In Guangzhou, women 35–54 years of age purchased poultry in LPMs much more frequently than did men of the same age, but the reverse was true for those ≥65 years of age (Figure 3). We found no evidence of a substantial difference in poultry exposures by sex in Shanghai (Figure 3).

We further analyzed exposures in LPMs among urban residents on the basis of responses from the 829 (33%) of respondents who were 18–64 years of age.

Table 1. Sociodemographic characteristics of participants recruited for urban and rural surveys of influenza A(H7N9) awareness, China, 2013*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Urban, n = 2,504</th>
<th>Rural, n = 1,227</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>1,288 (51.4)</td>
<td>626 (51.0)</td>
</tr>
<tr>
<td>Age group, y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–44</td>
<td>1,938 (77.5)</td>
<td>685 (55.8)</td>
</tr>
<tr>
<td>45–64</td>
<td>415 (16.6)</td>
<td>405 (33.0)</td>
</tr>
<tr>
<td>≥65</td>
<td>147 (5.9)</td>
<td>137 (11.2)</td>
</tr>
<tr>
<td>Educational attainment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>38 (1.5)</td>
<td>86 (7.0)</td>
</tr>
<tr>
<td>Primary school</td>
<td>191 (7.6)</td>
<td>259 (21.1)</td>
</tr>
<tr>
<td>Middle school</td>
<td>391 (15.6)</td>
<td>464 (37.9)</td>
</tr>
<tr>
<td>High school</td>
<td>593 (23.7)</td>
<td>268 (21.9)</td>
</tr>
<tr>
<td>College and above</td>
<td>1,291 (51.6)</td>
<td>148 (12.1)</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service workers and shop sales workers</td>
<td>601 (24.0)</td>
<td>164 (13.4)</td>
</tr>
<tr>
<td>Professionals</td>
<td>504 (20.1)</td>
<td>66 (5.4)</td>
</tr>
<tr>
<td>Retired</td>
<td>293 (11.7)</td>
<td>61 (5.0)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>678 (27.1)</td>
<td>195 (15.9)</td>
</tr>
<tr>
<td>Full-time students</td>
<td>232 (9.3)</td>
<td>111 (9.0)</td>
</tr>
<tr>
<td>Homemakers</td>
<td>96 (3.8)</td>
<td>86 (7.0)</td>
</tr>
<tr>
<td>Agricultural and fishery workers</td>
<td>100 (4.0)</td>
<td>544 (44.3)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>941 (38.1)</td>
<td>269 (22.0)</td>
</tr>
<tr>
<td>Married</td>
<td>1,458 (59.0)</td>
<td>923 (75.4)</td>
</tr>
<tr>
<td>Divorced/separated</td>
<td>35 (1.4)</td>
<td>12 (1.0)</td>
</tr>
<tr>
<td>Widowed</td>
<td>36 (1.5)</td>
<td>20 (1.6)</td>
</tr>
<tr>
<td>Average household income, in renminbi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No income</td>
<td>65 (3.0)</td>
<td>83 (6.8)</td>
</tr>
<tr>
<td>&lt;3,000</td>
<td>368 (17.0)</td>
<td>748 (61.2)</td>
</tr>
<tr>
<td>3,001–6,000</td>
<td>627 (28.9)</td>
<td>264 (21.6)</td>
</tr>
<tr>
<td>6,001–10,000</td>
<td>408 (18.8)</td>
<td>80 (6.5)</td>
</tr>
<tr>
<td>10,001–50,000</td>
<td>396 (18.2)</td>
<td>28 (2.3)</td>
</tr>
<tr>
<td>Not sure</td>
<td>307 (14.1)</td>
<td>20 (1.6)</td>
</tr>
<tr>
<td>Recent history of travel away from home</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>479 (19.1)</td>
<td>117 (9.6)</td>
</tr>
</tbody>
</table>

*6.1 Chinese renminbi = $1 US.
Table 2. Exposure to live poultry and attitudes toward closure of LPMs among participants recruited in urban areas for surveys related to influenza A(H7N9) awareness, by area, China, 2013*

<table>
<thead>
<tr>
<th>Exposure</th>
<th>No. (%) persons</th>
<th>Chengdu, n = 500</th>
<th>Guangzhou, n = 500</th>
<th>Shanghai, n = 500</th>
<th>Shenyang, n = 504</th>
<th>Wuhan, n = 500</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of LPM visits in the previous year ≥1</td>
<td></td>
<td>183 (36.6)</td>
<td>237 (47.4)</td>
<td>161 (32.2)</td>
<td>97 (19.2)</td>
<td>151 (30.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No. live poultry bought in the previous year†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1-2/yr</td>
<td>33 (18.0)</td>
<td>32 (13.5)</td>
<td>25 (15.5)</td>
<td>35 (36.1)</td>
<td>25 (16.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5/yr</td>
<td>31 (16.9)</td>
<td>27 (11.4)</td>
<td>30 (18.6)</td>
<td>23 (23.7)</td>
<td>28 (18.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-11/yr</td>
<td>27 (14.6)</td>
<td>25 (10.5)</td>
<td>24 (13.4)</td>
<td>4 (4.1)</td>
<td>23 (15.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3/mo</td>
<td>33 (18.0)</td>
<td>56 (23.6)</td>
<td>32 (19.9)</td>
<td>10 (10.3)</td>
<td>29 (19.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2/wk</td>
<td>19 (10.4)</td>
<td>49 (20.7)</td>
<td>20 (12.4)</td>
<td>2 (2.1)</td>
<td>19 (12.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5/wk</td>
<td>2 (1.1)</td>
<td>8 (3.4)</td>
<td>7 (12.1)</td>
<td>2 (2.1)</td>
<td>3 (1.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almost every day</td>
<td>2 (1.1)</td>
<td>4 (1.7)</td>
<td>2 (1.2)</td>
<td>0</td>
<td>2 (1.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almost none</td>
<td>36 (19.7)</td>
<td>36 (15.2)</td>
<td>27 (16.8)</td>
<td>23 (23.7)</td>
<td>23 (15.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pick up live poultry before buying‡</td>
<td></td>
<td>120 (81.6)</td>
<td>136 (67.7)</td>
<td>94 (69.6)</td>
<td>38 (51.4)</td>
<td>97 (75.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>123 (83.7)</td>
<td>175 (87.1)</td>
<td>119 (88.1)</td>
<td>66 (89.2)</td>
<td>113 (88.3)</td>
<td></td>
<td>0.601</td>
</tr>
<tr>
<td>In LPM</td>
<td>22 (15.0)</td>
<td>23 (11.4)</td>
<td>15 (11.1)</td>
<td>6 (8.1)</td>
<td>13 (10.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In household</td>
<td>21 (14.3)</td>
<td>3 (1.5)</td>
<td>1 (0.7)</td>
<td>2 (2.7)</td>
<td>2 (1.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other places</td>
<td>2 (1.1)</td>
<td>8 (3.4)</td>
<td>7 (12.1)</td>
<td>2 (2.1)</td>
<td>3 (1.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not buying or buying less since March 2013¶</td>
<td></td>
<td>101 (68.7)</td>
<td>139 (69.2)</td>
<td>123 (91.1)</td>
<td>59 (79.7)</td>
<td>104 (81.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>37 (25.2)</td>
<td>54 (26.9)</td>
<td>53 (39.3)</td>
<td>25 (33.8)</td>
<td>35 (27.3)</td>
<td></td>
<td>0.06</td>
</tr>
<tr>
<td>Views toward closure of LPMs#</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>104 (81.3)</td>
<td>139 (81.6)</td>
<td>119 (88.1)</td>
<td>66 (89.2)</td>
<td>113 (88.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More inconvenient**</td>
<td>123 (83.7)</td>
<td>175 (87.1)</td>
<td>119 (88.1)</td>
<td>66 (89.2)</td>
<td>113 (88.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>23 (25.6)</td>
<td>42 (33.3)</td>
<td>28 (28.8)</td>
<td>10 (10.8)</td>
<td>10 (25.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>16 (17.8)</td>
<td>20 (15.9)</td>
<td>16 (14.4)</td>
<td>6 (6.2)</td>
<td>7 (17.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>39 (43.3)</td>
<td>25 (18.8)</td>
<td>42 (37.8)</td>
<td>22 (55.9)</td>
<td>17 (42.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance of nearest LPM from home, km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&lt;0.50</td>
<td>12 (13.3)</td>
<td>39 (31.0)</td>
<td>21 (18.9)</td>
<td>5 (13.5)</td>
<td>6 (15.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.51–1.00</td>
<td>23 (25.6)</td>
<td>42 (33.3)</td>
<td>23 (28.8)</td>
<td>4 (10.8)</td>
<td>10 (25.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.01–2.00</td>
<td>16 (17.8)</td>
<td>20 (15.9)</td>
<td>16 (14.4)</td>
<td>6 (16.2)</td>
<td>7 (17.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;2.00</td>
<td>39 (43.3)</td>
<td>25 (18.8)</td>
<td>42 (37.8)</td>
<td>22 (55.9)</td>
<td>17 (42.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backyard poultry exposure</td>
<td>73 (14.6)</td>
<td>76 (15.2)</td>
<td>34 (6.8)</td>
<td>37 (7.3)</td>
<td>54 (10.8)</td>
<td></td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*LPM, live poultry market; NA, not applicable.
†Respondents who bought live poultry ≥1/year were further asked about the number of live poultry bought in the previous year, picking up poultry or not before buying, locations where poultry was slaughtered, and changes in poultry purchase behavior since influenza A(H7N9) outbreak.
‡Respondents who answered always/usually to the question “Did you pick up poultry for examination before deciding to buy it?” were categorized as “Yes.”
§Respondents who stated that they always/usually have live poultry slaughtered in LPMs were categorized as “In LPM,” whereas those who answered always/usually in household were categorized as “In household.”
¶Respondents who answered not buying since then/still buying but less than before to the question “Has your habit of buying live poultry changed since H7N9 was identified in China in March 2013?” were categorized as “Yes.”
#Respondents who answered strongly agree/agree to the question “Would you agree to permanent closure of live poultry markets in order to control avian influenza epidemics?” were categorized as “Agree.”
**Respondents who reported that market closure caused great/some inconvenience were categorized as “More inconvenient.” This question was only asked of respondents in Shanghai because Shanghai was the only area where LPMs were closed at the time of the survey.

2,504 participants who visited LPMs ≥1 time in the preceding year. Overall, 69% of these respondents reported that they always visited the nearest LPM; median distance from home to the nearest LPM was 1 km. Most respondents reported that they “usually” or “always” picked up poultry for examination before deciding to buy, with the highest proportion in Chengdu and lowest in Shenyang; 87% of respondents always arranged for slaughter of purchased poultry in the LPM, with no notable differences between cities.

During the study period, the general anxiety level among urban respondents (measured by the State Trait Anxiety Inventory) was low to moderate, but levels varied substantially between cities; the lowest mean scores were seen in Wuhan and Shenyang (Table 3). Perceived risk for influenza A(H7N9) in the following month (absolute susceptibility) and relative to others (relative susceptibility) were generally low in all cities, but highest in Shanghai. Respondents in Shanghai and Guangzhou were more likely to respond that they would be more worried than usual if they experienced an influenza-like illness (ILI). Twelve percent of respondents reported that they had worried about becoming ill with influenza A(H7N9) during the previous week; levels varied among cities, with a greater frequency of worry in Shanghai and Guangzhou (Table 3). Respondents in Shenyang reported the highest perceived severity of influenza A(H7N9) compared with seasonal influenza and avian influenza A(H5N1); respondents in Guangzhou reported the highest perceived severity of influenza A(H7N9) compared with that of SARS (Table 3).

In rural areas, as in urban areas, the mean State Trait Anxiety Inventory was low to moderate (Table 4). A total of 48% of respondents reported that they raised ≥1 type of
Human Exposure to Live Poultry and Responses to Influenza

Overall, 47% reported raising chickens, 15% raised ducks, and 8% raised geese; these proportions varied between counties (Table 4). In rural areas, levels of perceived absolute and relative susceptibility and concern about ILI or confirmed influenza A(H7N9) infection were generally low; some differences were seen between the 4 rural areas. Respondents in Nanzhang and Zijin were more likely to respond that they would be more worried than usual if they had an ILI; 24% of respondents in Zijin reported that they had worried about becoming ill with influenza A(H7N9) in the previous week, and the average level of worry in Zijin was higher than that for other counties (Table 4). Most respondents in each area perceived influenza A(H7N9) to be more severe than seasonal influenza but less severe than influenza A(H5N1) and SARS.

Among respondents in urban areas who visited LPMs ≥1 time in the preceding year, 77% reported that they had stopped buying or bought lower amounts of live poultry since March 2013; this proportion was highest (91%) for Shanghai (Table 2). We examined factors affecting the likelihood of supporting the closure of LPMs and found greater support among persons 55–64 years of age (odds ratio [OR] 3.28, 95% CI 1.71–6.29) and ≥65 years of age (OR 2.36, 95% CI 1.04–5.32). We also found greater support for closure of LPMs in Shanghai (OR 1.77, 95% CI 1.05–2.99) than in Chengdu but no significant differences by sex or educational attainment (Table 5). However, 32% of respondents in Shanghai reported that the closure of LPMs had caused them inconvenience.

### Discussion

We have reported empirical information on human exposures to live poultry, perception of risk for influenza A(H7N9), and behavioral responses to the 2013 influenza A(H7N9) outbreak in China. We found that exposure to LPMs in urban areas is common: 20%–50% of urban residents report ≥1 visit to an LPM in the preceding year (Table 2). Most respondents who purchased poultry in LPMs reported close contact with live poultry before slaughter. It is likely that the number of laboratory-confirmed cases of influenza A(H7N9) virus infection is lower than the actual number of human infections to date (8), and our results show that a broad cross-section of urban residents could be exposed to influenza A(H7N9) virus if it were prevalent among poultry in LPMs. In the spring 2013 outbreak, some evidence pointed to high prevalence of influenza A(H7N9)
The absolute risk for human infection was low in only a small proportion of samples collected from across the country (of 4,488 samples tested, 0.9% were positive for the virus) (11). The absolute risk for human infection after close contact with poultry infected with the influenza A(H7N9) virus remains unclear. We found that men in the 55–64-year age group had more exposures to live poultry than women in that age group, but no difference by sex among the small number of respondents ≥65 years of age in Shanghai (Figure 3). We had previously hypothesized that exposure to poultry in LPMs might be higher for older men than for older women (3). Our findings suggest that the higher risk for laboratory-confirmed influenza A(H7N9) virus infection among men during the spring 2013 outbreak in the Yangtze River Delta might not be explained by sex differences in exposure but rather by increased susceptibility to serious disease after infection among men (e.g., because of greater prevalence of co-existing conditions) or by increased access to health care and laboratory testing for men. However, our sample size was relatively small, particularly for respondents ≥65 years of age. As in a previous report of live poultry exposures in the southern China cities of Guangzhou in 2006 and Shenzhen in 2007 (9), we did not identify major differences in exposures among middle-aged adults compared with exposures among the elderly. However, most laboratory-confirmed influenza A(H7N9) cases have been in persons ≥60 years of age (3), consistent with our hypothesis that exposures in middle-aged adults may have led to milder disease that was less likely to result in laboratory testing (3,9).

A minority of respondents reported willingness to accept LPM closures in the event of future outbreaks of influenza A(H7N9). During the winter 2013–14 influenza season, in some areas where human cases of influenza A(H7N9) had been reported, local governments implemented short-term LPM closures; other administrations, including that of Shanghai, closed LPMs for longer periods. However, such interventions can have serious economic consequences. Given the lack of public support for LPM closure and the related economic concerns, whether
Most confirmed human cases have occurred in urban areas, rural residents, which indicates that avian influenza viruses in LPMs in Hong Kong and have been proposed in some areas of China. However, these approaches would not be effective for controlling spread of avian flu over the next month. Worry induced by ILI symptoms were categorized as “Low.”

**Respondents who answered much higher/a little higher regarding the severity of influenza A(H7N9) compared with seasonal influenza, avian influenza A(H5N1), and SARS.**

### Table 4. Risk perception related to influenza A(H7N9) and backyard poultry exposure among participants recruited for surveys in rural areas, by area, China, 2013*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Dawu, n = 310</th>
<th>Zijin, n = 308</th>
<th>Nanzhang, n = 308</th>
<th>Pengxi, n = 301</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean STAI scores (95% CI)</strong></td>
<td>1.52 (1.47–1.57)</td>
<td>1.85 (1.80–1.90)</td>
<td>1.66 (1.62–1.70)</td>
<td>1.54 (1.48–1.61)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td><strong>Self-perceived susceptibility to influenza A(H7N9)‡</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Higher</td>
<td>2 (0.6)</td>
<td>1 (0.3)</td>
<td>1 (0.3)</td>
<td>9 (3.0)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Even</td>
<td>29 (9.4)</td>
<td>41 (13.3)</td>
<td>21 (6.8)</td>
<td>31 (10.3)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Lower</td>
<td>279 (90.0)</td>
<td>266 (86.4)</td>
<td>286 (92.9)</td>
<td>261 (86.7)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td><strong>Perceived susceptibility to influenza A(H7N9) compared with others§</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Higher</td>
<td>0</td>
<td>1 (0.3)</td>
<td>2 (0.6)</td>
<td>8 (2.7)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Even</td>
<td>10 (3.2)</td>
<td>25 (8.1)</td>
<td>3 (1.0)</td>
<td>36 (12.0)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Lower</td>
<td>300 (96.8)</td>
<td>282 (91.6)</td>
<td>303 (98.4)</td>
<td>257 (85.4)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td><strong>Infection with influenza A(H7N9) in next week#</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Worry</td>
<td>32 (10.3)</td>
<td>75 (24.4)</td>
<td>71 (23.1)</td>
<td>51 (16.9)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Think about it but no worry</td>
<td>51 (16.5)</td>
<td>42 (13.7)</td>
<td>20 (6.5)</td>
<td>33 (11.0)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Never think about it</td>
<td>227 (73.2)</td>
<td>190 (61.9)</td>
<td>217 (70.5)</td>
<td>197 (62.1)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td><strong>Severity of influenza A(H7N9) compared with</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Seasonal influenza</td>
<td>201 (64.8)</td>
<td>181 (58.8)</td>
<td>224 (72.7)</td>
<td>182 (60.5)</td>
<td>0.001</td>
</tr>
<tr>
<td>Avian influenza A(H5N1)</td>
<td>105 (33.9)</td>
<td>112 (36.4)</td>
<td>67 (21.8)</td>
<td>92 (30.6)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>SARS</td>
<td>51 (16.5)</td>
<td>83 (26.5)</td>
<td>30 (9.7)</td>
<td>44 (14.6)</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Distance, km††</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>482</td>
<td>2448</td>
<td>351</td>
<td>665</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Raising backyard poultry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of backyard poultry raised</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
<td>120 (38.7)</td>
<td>134 (43.5)</td>
<td>162 (52.6)</td>
<td>161 (53.5)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Ducks</td>
<td>49 (15.8)</td>
<td>45 (14.6)</td>
<td>20 (6.5)</td>
<td>65 (21.6)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Geese</td>
<td>34 (11.0)</td>
<td>17 (5.5)</td>
<td>2 (0.6)</td>
<td>43 (14.3)</td>
<td>&lt;0.001††</td>
</tr>
<tr>
<td>Median no. live poultry raised</td>
<td>6</td>
<td>20</td>
<td>13</td>
<td>12</td>
<td>&lt;0.001††</td>
</tr>
</tbody>
</table>

*Values are no. (%); †p value <0.05; ‡Respondents who answered certain/very likely/likely to the question “How likely do you think it is that you will contract H7N9 avian flu over the next 1 month?” were categorized as “High”; those who answered never/very unlikely/unlikely were categorized as “Low.”
§Respondents who answered extremely concerned/concerned much more/more to the question “What do you think is your chance of getting infected with H7N9 avian flu over the next 1 month compared to other people outside your family of a similar age?” were categorized as “High”; those who answered not at all/much less/less were categorized as “Low.”
¶Respondents who answered extremely concerned/concerned much more normal/concerned more normal to the question “If you were to develop ILI symptoms tomorrow, would you be…?” were categorized as “More”; those who answered not at all concerned/much less normal/less normal compared to the question “If you were to worry about H7N9 over the past year” were categorized as “Less.”
#Respondents who answered extremely concerned/concerned normal more normal compared to the question “If you were to develop ILI symptoms tomorrow, would you be…?” were categorized as “More”; those who answered not at all concerned/much less normal/less normal compared to the question “If you were to worry about H7N9 over the past 1 month?” were categorized as “Low.”
††Distance between the survey location and the nearest area in which influenza A(H7N9) case(s) were reported.

To make additional closures should be considered carefully. Regular rest days (i.e., days on which live poultry are not sold and stalls must be disinfected and left empty of live birds) and bans on overnight retention of live poultry in markets have been successful in controlling the transmission of avian influenza viruses in LPMs in Hong Kong (20,21) and have been proposed in some areas of China (8).

Although almost all cases of influenza A(H7N9) cases have been identified in areas within or surrounding large cities, about half of the laboratory-confirmed avian influenza A(H5N1) cases in China were identified in rural residents, which indicates that avian influenza viruses can reach backyard poultry flocks and pose a risk to human health (3). Influenza A(H7N9) virus does not appear to have spread to backyard flocks at this time, however. Most confirmed human cases have occurred in urban areas among persons who have reported recent exposure to live poultry in LPMs, although a smaller number of cases occurred in persons who have reported recent exposure to backyard poultry (3). However, if the circulation of influenza A(H7N9) virus in backyard poultry were to increase, the number of potential exposures could be substantial because almost half of rural residents report raising backyard poultry (22,23). Unfortunately, this approach would not be effective for controlling spread of influenza A(H7N9) virus because infected chickens do not show signs of illness.

Perception of risk for influenza A(H7N9) infection by respondents to our surveys was generally low, as might be expected given the small number of laboratory-confirmed cases in China. However, low perception of risk could pose...
difficulties for policy measures such as closure of LPMs. Indeed, we found generally low levels of public support for long-term closure of LPMs (Table 2), particularly in cities that had not been affected by influenza A(H7N9). Respondents in Guangzhou and Shanghai reported higher likelihood than residents of other cities that they would be worried if they showed signs and symptoms of IILI. This finding is unsurprising for Shanghai, but there had been no confirmed influenza A(H7N9) cases in Guangzhou at the time of our survey.

Our study has several limitations. First, the cross-sectional study design did not enable us to identify changes over time in risk perception or preventive behaviors. Having access to data on live poultry exposures before the identification of influenza A(H7N9) virus infections would have been helpful because the epidemic may have led to changes in exposure patterns by the time our survey was conducted. Second, because the survey was conducted by telephone in urban areas and face-to-face in rural areas, our results may have been affected by selection bias. We did attempt multiple calls to unanswered telephone numbers in an attempt to mitigate this bias, but the overall response rate for the telephone survey was low. Also, because the respondents self-reported their behaviors, the results might be affected by response biases (e.g., if respondents had incomplete recollection of past visits to LPMs). In particular, results could have been affected by social desirability bias if respondents felt uncomfortable reporting true patterns of poultry exposure or attitudes toward government interventions and preferred to report what they perceived to be ideal or most acceptable.

Third, our analyses did not explore in depth the social or psychological factors underlying behavioral responses to influenza A(H7N9), such as the effect of perceived risk or severity. This area might be productive for further investigation. Fourth, similar to other cross-sectional knowledge–attitude–behavior studies, our survey could only provide descriptive data on live poultry exposure, risk perception, and behavioral changes. Inferences on the associations between different psychosocial factors will require further study. Furthermore, we did not investigate seasonal variation in poultry-purchasing behaviors, which could also be studied in longitudinal surveys.

In conclusion, exposures to live poultry are common in many areas of China. If influenza A(H7N9) virus were to become more prevalent among poultry, the number of human exposures could be substantial in the absence of control measures. Our findings highlight possible problems in the structure of the live poultry trade in China and the potential for improved protection of human and animal health (8, 24).

**Acknowledgments**

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L.W., B.J.C., P.W., G.M.L., and H.Y. designed the study; L.W., J.Y., F.L., and L.Z. collected data; and L.W., B.J.C., P.W., and J.Y. analyzed data. L.W. and B.J.C. wrote the first draft of this article, and all authors contributed to review and revision of the report.

Dr Wang is a director of the Branch of General Affairs on Infectious Disease, Division of Infectious Disease, Key Laboratory of Surveillance and Early-warning on Infectious Disease, Chinese Center for Disease Control and Prevention. Her research interests include notifiable infectious diseases surveillance and related policy research.
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Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 20, No. 8, August 2014 1305
Human exposure to Live Poultry and Psychological and Behavioral Responses to Influenza A(H7N9), China

Technical Appendix

The following pages contain English and Chinese language versions of the questionnaire used for the telephone survey conducted in 5 cities in China to determine human exposure to poultry, risk perception, and psychological responses to influenza A(H7N9) outbreaks, preventive behaviors, and attitudes toward control measures, including closure of live poultry measures. At least 500 adult residents (age ≥18y) who had been living in the city for at least 1 year were interviewed. The telephone surveys were conducted using a Computer-Assisted Telephone Interviewing system, which enabled random generation of mobile telephone numbers and systematic data collection across each city. After explaining the study and obtaining verbal consent from respondents, they were recruited as study subjects and asked to complete the survey. If the respondents were busy at the time, a telephone call would be made later when the respondents were available to finish the questionnaire. Unanswered numbers were given 4 more follow-up calls, made at different hours and days of the week, before being classified as invalid.
Greetings: Hello, This is a national Tele-survey, conducted by Chinese Center for Disease Control and Prevention. We are collecting H7N9 Avian Flu-related information, which will be very important for the H7N9 control in China. It will take you around 10 minutes. Thank you for your cooperation, which will be highly appreciated.

SG1. Where do you live? *(Don’t ask could be recorded automatically.)
① Beijing  ② Shanghai
③ Shenyang  ④ Wuhan
④ Guangzhou  ⑤ Chengdu
⑥ De’er County, Panjin City  ⑦ Nanjiang County, Xiangyang City
⑧ Penglai City, Shantou City  ⑨ Zijn County, Heiyuan City

SG2. How many years do you live here: ______ (excluded, if reside less than 1 year)

SG3. Gender *(Don’t ask if obvious, must record)
① Female  ② Male

SG4. What is your age?
 a) *(required) ______ years old
 b) ① 18-24  ② 25-34
③ 35-44  ④ 45-54
⑤ 55-64  ⑥ 65 or above
⑦ Refused

SG5. What is your occupation? *(required)
① Retired  ② No job, unemployed, seeking job
③ Full-time student  ④ Home maker
⑤ Professionals  ⑥ Service workers and shop sales workers
⑦ Health care worker  ⑧ Skilled agricultural and fishery workers;
 and occupations not classified
⑨ Businessman selling live poultry or meat
⑩ Others

Part 1 Self-Rated Health

PH1. How do you perceive your health in the past 1 week?
① Excellent  ② Very good
③ Good  ④ Fair
⑤ Poor

中国城市和农村人感染 H7N9 禽流感调查问卷

2013年5月24日  第1.14稿

开头语：您好，这里是中国疾控中心正在实施的全国性电话调查，以下问题将占用您约10分钟的时间，您的个人意见对于我国H7N9疫情的防控非常重要，谢谢您的配合！

(备注) 开头语：喂，先生/女士您好，我姓***，我是北京益派市场咨询有限公司的访问员，我们受国家疾控中心的委托进行一项全国性的调查，想了解公众对于H7N9禽流感的认知，我只会占用您几分钟时间，请您放心。您的电话号码是由我们通过电脑随机抽中的，您提供的资料将绝对保密，并将会用作综合分析。为保证数据的准确性，我们的访问将会被录音，但只用作内部参考，并会在短期内销毁。

(访问员注意) 如遇访员对本次访问有任何疑问或查询，您可以拨打热线电话：***，或010-58900548，与有关专家联系。

访问员现在我们可以开始访问吗？可以，即开始；不可以，则结束。

SG1. 请问您是居住在XX吗？*(不必提问，CATI自动记录)
① 北京  ② 上海
③ 沈阳  ④ 武汉
⑤ 广州  ⑥ 成都
⑥ 辽宁省鞍山市大洼县  ⑦ 湖北省襄阳市南漳县
⑧ 四川省遂宁市蓬溪县  ⑨ 广东佛山市南海区

SG2. 请问您在本地居住____年（少于1年则不填）

SG2a. 您目前的居住状态：
① 与家人同住  ② 不与家人同住

SG3. 性别 *(如果已经很明显，不需再问，但请记录下来)
① 男性  ② 女性

请生成调查时间及访问员姓名，并纳入数据库

Page 2 of 10
SM1. Have you had any of the following signs or symptoms in the past 2 weeks?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Fever ≥37.8°C (100°F) for 1 day or more</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Cough</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

SM2. If you had fever in the last 2 weeks (SM1a=yes), when did the fever start?

( dd-mm-yy )

AX1. A number of statements which people have used to describe themselves are given below; please tell how you feel to the statements right now:

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Sometimes</th>
<th>Moderately So</th>
<th>Very Much So</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I feel rested</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. I feel content</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. I feel comfortable</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. I am relaxed</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. I feel pleasant</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. I feel anxious</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. I feel nervous</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>h. I am jerytry</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>i. I feel “high strung”</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>j. I feel over-exciied and “rattled”</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

BF4b. Please rate the current level of your worry towards H7N9 avian flu, 1 being very mild to 10 being very severe (1 = Very Mild, 10 = Very Severe): _______

Part 2 Exposure to live poultry markets (Only for the urban cities; go to EM7 directly for Beijing respondents)

EM1. How often did you go to live poultry markets in last year?

(Live poultry markets mean the markets where public could buy the live chicken, ducks and pigeons, etc)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1-2/year</td>
</tr>
<tr>
<td>2.</td>
<td>3-5/year</td>
</tr>
<tr>
<td>3.</td>
<td>6-11/year</td>
</tr>
<tr>
<td>4.</td>
<td>1-3/month</td>
</tr>
<tr>
<td>5.</td>
<td>1-2/week</td>
</tr>
<tr>
<td>6.</td>
<td>3-5/week</td>
</tr>
<tr>
<td>7.</td>
<td>Almost every day</td>
</tr>
</tbody>
</table>

SG4. 您的年龄？

a) *(必填)* ________ 岁

b) ① 18-24 ② 25-34 ③ 35-44 ④ 45-54 ⑤ 55-64 ⑥ 66 以上

SG5. 您的职业 *（必填）*

① 退休 ② 没有工作、失业、找工作中 ③ 全日制学生 ④ 家庭主妇 ⑤ 专业人士 ⑥ 服务行业或商店工作人员 ⑦ 医务人员 ⑧ 农业及渔牧业技工（不含禽类饲养） ⑨ 活禽饲养、贩卖人员或肉类销售人员 ⑩ 其他

第二部分 健康自我评估

PH1. 请问过去1周您感觉自己身体状况如何?

① 非常好 ② 很好 ③ 好 ④ 一般 ⑤ 差

SM1. 过去2周，您是否出现以下症状?

<table>
<thead>
<tr>
<th></th>
<th>没有</th>
<th>不记得了</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 持续 1 天或以上，摄氏 37.8°C 以上的高烧</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. 咳嗽</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

SM2. 过去2周，如果您曾发烧(问题 SM1a 回答：有)，那么，您是从哪天开始发烧的?

① ____月 ____日 ② 不记得了

AX1. 下面是10个反映自我感觉的方面，请您分别回答最能表达您当前感觉的答案：

<table>
<thead>
<tr>
<th></th>
<th>完全没有</th>
<th>有些</th>
<th>中等程度</th>
<th>非常明显</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 我感到安宁</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. 我感到满意</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. 我感到舒适</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. 我是放松的</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. 我感到愉快</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. 我感到高兴</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. 我感到紧张不安</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>h. 我现在精神过度</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>i. 我感到十分敏感和容</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

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容易激动

j. 我感到过于激动和慌张

B14b. 如果可以用1-10分来表达您对H7N9禽流感的担心程度，1表示很少担心，10表示非常担心，您目前担心程度是________分。

第二部分：活禽市场暴露情况（城市和农村调查内容不同）

（以下内容针对沈阳、北京、武汉、成都、上海和广州城市居民，其中北京居民直接跳至B17题）

EM1. 在过去一年中，您多久去一次活禽市场？

（活禽市场：主要是指公众去购买活禽活鸡等的市场）

① 每年1-2次
② 每年3-5次
③ 每年6-11次
④ 每月1-3次
⑤ 每周1-2次
⑥ 每周3-5次
⑦ 几乎每天
⑧ 不去（如果选择⑧，直接跳至第三部分）

EM1a. 您最近一次去活禽市场的时间是：_____月____日（或者___天以前）

EM1b. 您最近一次去的活禽市场距离您家有多远？________公里

EM1c. 您总是去距离最近的活禽市场吗？

① 是 ② 不一定，您常去的活禽市场距离您家多远？________公里

EM2. 一年里平均在活禽市场购买多少活禽？

① 每年1-2只
② 每年3-5只
③ 每年6-11只
④ 每月1-3只
⑤ 每周1-2只
⑥ 每周3-5只
⑦ 基本每天1只
⑧ 没买过（如果选择⑧，直接跳至第三部分）

EM3. 在决定购买活禽前，您会自己挑选接触活禽吗？

① 总是 ② 有时 ③ 从不

EM4. 您在购买活禽后，会在哪里进行宰杀？

① 一直在活禽市场
② 通常在活禽市场

EM5. 你了解H7N9禽流感吗？

① 了解
② 不了解

EM6. 您对活禽市场的关闭有何看法？

① 强烈支持
② 支持
③ 不支持
④ Strongly disagree
⑤ Don’t know

EM7. Has the closure of LPMs caused you any inconvenience in your life? (Only ask the respondents from Beijing/Shanghai that has closed the markets)
① Great inconvenience ② Some inconvenience
③ Inconvenience a bit ④ No inconvenience
⑤ No inconvenience at all

Raising the backyard poultry at home (Only for the 4 rural cites)

EM8. Do you raise backyard poultry in the past year?
① Yes
② No (go to Part 3)

EM8.1. What type of backyard poultry do you raise at home? (Multiple choice questions)
① Chicken
② Ducks
③ Geese
④ Others

EM8.2. How many backyard poultry do you have? (Including chicken, ducks, geese and others in total)

Part 3 Health Services Utilization

HS1. Have you used any of the following health services in the past 2 weeks?
Yes No
·
a. Hospital (including 24-hour clinics/A&E services) □ _______ times □

b. Self-treatment (Drug/acupuncture) □ _______ times □

Part 4 Contacts with Flu Cases

The following questions refer to the past 2 weeks:

CT1. Has anyone in your household had any flu symptoms in the past 2 weeks (e.g. fever, runny nose, cough, sore throat)?
① Yes, me (may include others) please specify the ages of the members (oldest first): _______ _______ _______
② Yes, others but not me (please specify the ages of the members (oldest first): _______ _______ _______
③ No (go to Part 5 perception on H7N9 avian flu)

CT2. If yes, as a result of this did you personally take any preventive measures?
Yes No Don't know

a. Wash hands more frequently
① ② ③
第四部分、流感接触史（针对过去2周情况回答）

CT1. 过去2周中，您家中有没有人出现过流感症状（例如：发烧、咳嗽、流涕、喉咙痛）?（仅问与家人同住者）
① 有，是我（可包括其他家庭成员）（跳至CT2）。
② 有，是其他家庭成员（跳至CT2）
③ 没有（直接跳至第5部分，对H7N9禽流感的认知）

CT1a. 过去2周中，您有没有出现过流感症状（例如：发烧、咳嗽、流涕、喉咙痛）? （仅问不与家人同住者）
① 有（跳至CT2，仅问CT2）
② 没有（直接跳至第5部分，对H7N9禽流感的认知）

CT2. 您采取了以下哪些防护措施？

<table>
<thead>
<tr>
<th>Exp. fluctuation of H7N9 virus over the past month compared to other people outside your family of a similar age?</th>
<th>Yes</th>
<th>No</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
<tr>
<td>Less</td>
<td>④</td>
<td>⑤</td>
<td>⑥</td>
</tr>
<tr>
<td>More</td>
<td>⑦</td>
<td>⑧</td>
<td>⑨</td>
</tr>
<tr>
<td>Certain</td>
<td>⑩</td>
<td>⑪</td>
<td>⑫</td>
</tr>
</tbody>
</table>

CT3. 出现流感症状的家人是否采取了以下哪些防护措施？

<table>
<thead>
<tr>
<th>Exp. fluctuation of H7N9 virus over the past month compared to other people outside your family of a similar age?</th>
<th>Yes</th>
<th>No</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>①</td>
<td>②</td>
<td>③</td>
</tr>
<tr>
<td>Less</td>
<td>④</td>
<td>⑤</td>
<td>⑥</td>
</tr>
<tr>
<td>More</td>
<td>⑦</td>
<td>⑧</td>
<td>⑨</td>
</tr>
<tr>
<td>Certain</td>
<td>⑩</td>
<td>⑪</td>
<td>⑫</td>
</tr>
</tbody>
</table>

CT4. 自出现流感症状当天算起，您或您的家人是在多长时间后去就诊的？（按照年龄顺序排列）

| 患病家庭成员
（年龄由大到小排列） | 1 | 2 | 3 | 4 | 5 | 其他成员 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>没去就诊</td>
<td>①</td>
<td>②</td>
<td>③</td>
<td>④</td>
<td>⑤</td>
<td>⑥</td>
</tr>
<tr>
<td>发病到就诊间隔（天）</td>
<td>⑦</td>
<td>⑧</td>
<td>⑨</td>
<td>⑩</td>
<td>⑪</td>
<td>⑫</td>
</tr>
<tr>
<td>不记得了</td>
<td>⑬</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

第五部分对H7N9禽流感认知

BF1. 您认为在接下来的1个月中，自己患上H7N9禽流感的可能性多大?
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

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(e.g. from one building to another one)

l. Body contact with patients
m. Touching objects that have been contaminated by the virus
n. Close contact with chickens in a wet market

BF4. If you were to develop flu-like symptoms tomorrow, would you be
① Not at all worried
② Much less worried than normal
③ Worried less than normal
④ About same
⑤ Worried more than normal
⑥ Worried much more than normal
⑦ Extremely worried

BF4a. In the past one week, have you ever worried about catching H7N9 avian flu?
① No, never thought about it
② Think about it but doesn’t worry me
③ Worries me a bit
④ Worries me a lot
⑤ Worry about it all the time

BF5a. How does H7N9 avian flu compare with seasonal flu in terms of seriousness?
① Much higher
② A little higher
③ Same
④ A little lower
⑤ Much lower

BF5b. How does H7N9 avian flu compare with H5N1 avian flu in terms of seriousness?
① Much higher
② A little higher
③ Same
④ A little lower
⑤ Much lower

BF5c. How does H7N9 avian flu compare with SARS in terms of seriousness?
① Much higher
② A little higher
③ Same
④ A little lower
⑤ Much lower

BF6. If you were to develop flu-like symptoms tomorrow, where would you seek medical consultation? (can choose 1 item or more)
① Public clinics/A&E department consulting Western medical doctors
② Public clinics/A&E department consulting Traditional Chinese medicine
③ Self-treatment
④ Telephone to a medical professional, such as 12120 hot-line
⑤ Internet
⑥ Others (please specify):

BF2a. With family friends, do you think the risk of contracting H7N9 is higher or lower than usual?
① Definitely higher
② Slightly higher
③ About same
④ Slightly lower
⑤ Definitely lower

BF3. You believe H7N9 is transmitted through the following pathways. Please select all that apply:
① Airborne
② Direct contact (e.g. handshaking)
③ Contact with infected objects
④ Contact with infected animals

BF4. If you have a fever, cough, diarrhea, sore throat, would you:
① Completely not care
② Care somewhat
③ Care greatly

BF4a. In the past week, did you worry about catching H7N9 avian flu?
① No, never thought about it
② Think about it but doesn’t worry me
③ Worries me a bit
④ Worries me a lot
⑤ Worry about it all the time

BF5a. How does H7N9 avian flu compare with H5N1 avian flu in terms of seriousness?
① Much higher
② A little higher
③ Same
④ A little lower
⑤ Much lower

BF5b. How does H7N9 avian flu compare with SARS in terms of seriousness?
① Much higher
② A little higher
③ Same
④ A little lower
⑤ Much lower

BF5c. How does H7N9 avian flu compare with SARS in terms of seriousness?
① Much higher
② A little higher
③ Same
④ A little lower
⑤ Much lower

BF6. If you were to develop flu-like symptoms tomorrow, where would you seek medical consultation? (can choose 1 item or more)
① Public clinics/A&E department consulting Western medical doctors
② Public clinics/A&E department consulting Traditional Chinese medicine
③ Self-treatment
④ Telephone to a medical professional, such as 12120 hot-line
⑤ Internet
⑥ Others (please specify):
BF7a. How would you evaluate the current performance of the provincial/city government in controlling H7N9 avian flu?
Effectiveness of prevention measures: _____ (0=extremely poor, 5=moderate, 10=excellent)

Part 6 Preventive Measures

PM1. Did you receive the flu vaccine in the past 3 years?
① Yes ② No ③ Don’t know

The following questions refer to the past 3 days:

PM2. Did you cover your mouth when you sneeze or cough?
① Always ② Usually ③ Sometimes ④ Never ⑤ Don’t know

PM5. Did you wash your hands after sneezing, coughing or touching nose?
① Always ② Usually ③ Sometimes ④ Never ⑤ Don’t know

PM5a. Did you wash your hands after returning home?
① Always ② Usually ③ Sometimes ④ Never ⑤ Don’t know

PM4. Did you use liquid soap when washing your hands?
① Always ② Usually ③ Sometimes ④ Never ⑤ Don’t know

PM6. Did you wear face mask?
① Always ② Usually ③ Sometimes ④ Never (go to PM6) ⑤ Don’t know (go to PM6)

PM5d. The reason(s) of your wearing mask: *can choose 1 item or more

BF5c. 与非典（SARS）相比，您认为H7N9禽流感严重程度是？
① 严重很多 ② 较严重 ③ 差不多 ④ 较轻微 ⑤ 轻微很多 ⑥ 不知道

BF6. 如果这几天您突然出现了流感症状（例如，发烧、咳嗽、流涕、咽痛），您可能会（可多选）？
① 医院就诊 ② 到私人诊所就医 ③ 自我医疗，如服中药、理疗等 ④ 打专业热线电话咨询，例如，12320热线 ⑤ 上网查询有关信息 ⑥ 其他（请注明）：__________

BF7. 对国家目前预防H7N9禽流感的成效，用0-10分进行评价，您会给出____分（0代表极差，5代表中等，10代表非常棒）

BF7a. 对本地目前预防H7N9禽流感的成效，用0-10分进行评价，您会给出____分（0代表极差，5代表中等，10代表非常棒）

下面还有几个问题，我们的访谈就结束了。

第六部分 预防措施

PM1. 过去3年中您曾接种过流感疫苗吗？
① 有 ② 没有 ③ 不记得

请注意，以下是针对过去3天的：

PM2. 过去3天内，当您打喷嚏或咳嗽的时候是否有遮脸的动作？
① 总是 ② 通常 ③ 有时 ④ 从不 ⑤ 不记得（无打喷嚏或咳嗽）

PM3. 过去3天内，当您用手背、咳嗽和打喷嚏后是否洗手？
① 总是 ② 通常 ③ 有时 ④ 从不 ⑤ 不记得（无用手背、咳嗽或打喷嚏）

PM3a. 过去3天内，您外出回家后是否马上洗手？
PM6. Did you serve utensils when dining with others?
① Always ② Usually ③ Sometimes ④ Never ⑤ Don’t know

PM7. In the past 7 days did you: (please answer directly with “yes” or “no”). Note: If answered “yes”, interviewer should immediately inquire whether it is because of H7N9 flu.

- a. avoid eating out?
- b. avoid using public transport?
- c. avoid going to crowded places?
- d. keep good indoor ventilation?
- e. reschedule travel plan?
- f. clean or disinfect house more often?

PM8. If free H7N9 flu vaccine is available in the coming month, would you consider receiving it?
① Yes ② No ③ Not sure ④ Don’t know

Part7 Demographics

SG6. What is your marital status?
① Single ② Married ③ Divorced/separated ④ Widowed ⑤ refuse to answer

SG7. How many people live in your household, including yourself and domestic helper(s)?

SG8. What is your education level?
① primary school and illiteracy ② Middle school ③ High school ④ College and above

SG9. Do you or your family members have the hobbies to raise chicken, duck or homing pigeon in your home?
① Yes ② No

---

PM4. Over 3 days, you wash hands with soap or hand sanitizer?
① Always ② Usually ③ Sometimes ④ Never ⑤ Don’t remember

PM5. Over 3 days, you wear masks?
① Always ② Usually ③ Sometimes ④ Never ⑤ Don’t remember

PM5d. Wear masks for other reasons?
① Protect yourself ② Protect others ③ Feel safe ④ Other reasons, so I also wear

PM6. Over 7 days, you have any of the following situations? If you answer “yes”, interviewers should immediately inquire whether it is because of H7N9 flu.

- a. Avoid going out?
- b. Avoid using public transport?
- c. Avoid going to crowded places?
- d. Keep good indoor ventilation?
- e. Adjust travel plans?
- f. Clean or disinfect house more often?

PM7. If you are asked to receive the free H7N9 flu vaccine in the coming month, would you consider it?
① Yes ② No ③ Not sure ④ Don’t know

Part7 Demographics

SG6. What is your marital status?
① Single ② Married ③ Divorced/separated ④ Widowed ⑤ Refuse to answer

SG7. How many people live in your household, including yourself and domestic helper(s)?

SG8. What is your education level?
① primary school and illiteracy ② Middle school ③ High school ④ College and above

SG9. Do you or your family members have the hobbies to raise chicken, duck or homing pigeon in your home?
① Yes ② No

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SGI 0. Did you travel to other province (or prefecture) in the past month?
   a) ① Yes  ② No
   b) If "Yes", please specify the destination of your last travel: __________________________
   c) When did you travel back: ___(month) ___(day) (or ___days before)

SGI 1. Did you travel abroad in the past month?
   a) ① Yes  ② No
   b) If "Yes", please specify the country of your last travel: __________________________
   c) When did you travel back: ___(month) ___(day) (or ___days before)

SGI 2. What is your household total income from employment?
   ① Less than 2,000  ② 2,001—4,000
   ③ 4,001—6,000  ④ 6,001—8,000
   ⑤ 8,001—10,000  ⑥ 10,001—15,000
   ⑦ 15,001—20,000  ⑧ 20,001—25,000
   ⑨ 25,001—30,000  ⑩ 30,001—40,000
   ⑪ 40,000 or more  ⑫ No income

SGI 3. Name (Chinese): ______________________*(If refuse, please record the salutation)

SGI 4. Would it be possible to contact you again in a few weeks for a follow-up survey?
   ① Yes  ② No  ③ It depends

第七部分人口资料

SG6. 您的婚姻状态？
   ① 单身  ② 已婚
   ③ 离异/分居  ④ 丧偶
   ⑤ 拒绝回答

SG7. 家里/住处有多少人共同居住，包括保姆等： ___人

SG8. 您的教育程度？
   ① 从未接受过学校教育  ② 小学
   ③ 初中  ④ 高中
   ⑤ 大学及以上

SG9. 您或您的家人是否有在家饲养鸡、鸭或鸽子？（仅问6个城市的居民）
   ① 是  ② 否

SG10. 上个月您是否离开本地去过别的城市/省份？（根据访问的不同城市分别设置题面）
   a) ① 是  ② 否
        b) 如果选“是”，最近一次的目的地：____________________（国内问到地市，国外问到国家）
        c) 您何时返回： ___月 ___日 （或者 ___天以前）

SG12. 您的家庭月均收入是多少人民币？（不与家人同住者，仅问个人的月均收入）
   ① 不足1,000  ② 1,001—2,000
   ③ 2,001—3,000  ④ 3,001—4,000
   ⑤ 4,001—6,000  ⑥ 6,001—8,000
   ⑦ 8,001—10,000  ⑧ 10,001—15,000
   ⑨ 15,001—20,000  ⑩ 20,001—30,000
   ⑪ 30,001以上  ⑫ 无收入
   ⑬ 不清楚  ⑭ 拒答

SG14. 可以在未来几个星期内再次随访您吗？
   ① 可以  ② 不可以  ③ 看情况，在我方便时

SG13. 请问您贵姓（中文）： ____________先生/女士