
Reported changes in health-related behaviours in Chinese urban residents in response to an influenza pandemic

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SUMMARY

Strategies to lessen the impact of pandemic influenza include behavioural modifications of the general public regarding medical care, personal hygiene and protection, and social distancing. We conducted a telephone survey of Beijing residents to evaluate potential behavioural changes in the general public in the event of an influenza pandemic occurring. We used a two-stage Mitofsky–Waksberg telephone survey of Beijing residents aged ≥ 15 years. The sample was weighted to reflect the 2000 census. We asked the respondents about their current healthcare-seeking behaviours for influenza-like illness (ILI), protective measures (personal hygiene, social distancing), and compliance with health authorities. We then asked what they would do during a hypothetical pandemic. We interviewed 256 Beijing participants in our study (response rate 56%). The percent of participants consulting a doctor for ILI rose from the current 41% [95% confidence interval (CI) 35–47] to 74% (95% CI 68–79) during a pandemic. Fifty-five percent (95% CI 48–62) of the participants would seek care from a more specialized hospital during a pandemic than currently. More than 90% of the participants reported already practising hand-washing or covering their coughs or sneezes during a non-pandemic period; this percentage changed little under a pandemic scenario. Compared to the current social distancing practices, more people would avoid crowded places (77% vs. 92%, $P < 0.01$), use a mask outside the home (10% vs. 58%, $P < 0.01$), and take time off from work or school (17% vs. 38%, $P < 0.01$) during a pandemic. Moreover, 26% of the participants (95% CI 21–32) would stockpile food or water, and 55% (95% CI 49–61) would stockpile medicines. Some of the behavioural changes reported by Beijing participants might help to alleviate the damage caused by a potential pandemic. However, increased use of medical care at referral hospitals will further strain the healthcare system during a pandemic.

Key words: Cross-sectional studies, influenza, pandemic.

INTRODUCTION

Beijing is a large international city, with a population of 17.4 million in 2007, plus several million migrant

workers and their family members. The World Health Organization (WHO) estimated that if an influenza pandemic were to strike again, 2.3–5.3 million influenza cases would occur in Beijing, including 1.2–2.7 million outpatients and 330 000–760 000 hospitalizations [1]. Moreover, these influenza cases are predicted to occur within a matter of a few weeks, greatly straining the healthcare system. History has shown

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that during the severe acute respiratory syndrome (SARS) epidemic in 2003, failure to get accurate information to the public in a timely manner proved to be the cause of confusion and panic reactions in Beijing. How the public will respond to an influenza pandemic is one of the key factors in successfully alleviating the damage caused by the pandemic. To this end, we conducted a telephone survey of Beijing participants to obtain insight into their healthcare-seeking behaviour and use of preventive measures in the event of an influenza pandemic occurring.

METHODS

The survey sample was selected using the Mitofsky–Waksberg two-stage sampling methodology [2]. First, we randomly selected 52 telephone prefixes from the total of all 493 prefixes in Beijing. Within each prefix, we randomly dialled telephone numbers until we obtained five urban participants of Beijing willing to participate in our survey. We then asked the respondent to name all persons within the household, and randomly selected one person aged ≥ 15 years from the household as our survey respondent. We weighted the final dataset for sex and age to reflect the 2000 census data [3].

The interviews were carried out from 9 to 16 July 2007. Using a questionnaire (available in the online version of the paper) that we created after reviewing similar studies in the literature [4–8], we asked the respondents about their healthcare-seeking behaviours and whether they would take personal preventive measures in the event of influenza pandemic. Questions asked included whether the respondents would attempt self-medication or visit a hospital; what kind of hospitals they would visit; whether they would get vaccinated should a vaccine be available; and whether they would wash hands, avoid crowded places, use a mask outside of the home, take time off from work or school, and cover coughs and sneezes. Using the questionnaire, we asked respondents about their behaviours for the following three scenarios: (1) having influenza-like illness (ILI, i.e. fever >38 °C, with cough or sore throat) during the non-pandemic period; (2) not having ILI during a pandemic (i.e. a third of the population have ILI and there has been an official announcement that the pandemic has hit the city); and (3) having ILI during a pandemic.

We used EpiInfo version 3.3.2 (CDC, USA) and SPSS version 13.0 (SPSS Inc., USA) for statistical

analyses. Confidence intervals for proportions were calculated using the survey modules in EpiInfo [9].

RESULTS

Of the 1443 telephone numbers we dialled, 410 were invalid, 25 were fax numbers, and 47 were non-participant numbers. These numbers were deemed ineligible for our survey. Of the remaining 961 numbers, 423 did not answer (i.e. the telephone rang until being automatically cut off), 83 were busy even after three attempts and 455 had eligible respondents in the households. Of the latter, 256 (56% of eligible respondents, including 104 men and 152 women) agreed to participate in our survey. Table 1 shows the demographic distribution of the respondents.

When asked about their current practice if suffering from ILI, 69% (weighted percentage for all prevalence estimates in the study) of Beijing participants said they would self-medicate, and 41% of participants said they would visit a doctor (Table 2). However, upon being asked what they would do in the event of a pandemic occurring, the percent of participants who would self-medicate fell to 55%, whereas the percent of participants who would visit a doctor increased to 74%.

According to the Chinese Ministry of Health's 'Governing Rules for the Management and Classification of Hospitals' [10], hospitals in China are classified into three levels: Level 1 hospitals are 'community hospitals or health clinics that provide direct prevention, treatment, health promotion, and rehabilitation services to participants of a defined community'. Level 2 hospitals are 'area hospitals that provide comprehensive medical and other healthcare services to participants of multiple communities, which may, to a certain degree, also serve as teaching hospitals and research bases'. Level 3 hospitals are those that 'provide high-quality, speciality medical and other healthcare services to participants in a minimum of several areas, and also serve as high-level teaching hospitals and conduct sophisticated research'. Our study found that, with the exception of Level 1 hospitals, visits to all other levels of hospitals would increase; notably, participants were more than twice as likely to choose a Level 3 hospital during a pandemic compared to their current practice (Table 2). Of those that would not currently visit a hospital for ILI, the higher the participant's educational level, the more likely that s/he would visit a hospital for ILI during a pandemic ($P < 0.01$, χ^2 test for trend).

Table 1. Demographic distribution of study participants of healthcare-seeking and personal protective behaviours in response to an influenza pandemic, Beijing, China, 2007

	Men (n = 104)		Women (n = 152)		All (n = 256)	
	Unweighted (%)	Weighted (%)	Unweighted (%)	Weighted (%)	Unweighted (%)	Weighted (%)
Age (years)						
15–19	14	11	7.2	10	10	11
20–29	24	24	20	21	21	23
30–39	7.7	23	22	22	16	22
40–49	15	19	16	20	16	20
50–59	15	8.8	20	10	18	10
≥60	23	14	16	16	19	15
Education (years)						
0–8	5.8	4.0	3.9	3.7	4.7	3.9
9–11	25	22	25	26	25	24
12–14	24	21	26	26	25	23
≥15	44	50	43	43	43	47
Unknown	0.96	2.9	2.0	2.0	1.6	2.5
Occupation						
Student	19	16	12	15	15	16
Employed, part-time	29	18	32	29	30	23
Employed, full-time	49	61	53	52	51	57
Unknown	2.9	4.4	3.9	3.5	3.5	4.0

Table 2. Reported healthcare-seeking behaviours in study participants (n = 256), currently and during a pandemic, Beijing, 2007

Care-seeking behaviour	n	Having ILI in a non-pandemic context		Having ILI during a pandemic		Z value	P
		Proportion (%)	95% CI	Proportion (%)	95% CI		
Self-medication	256	69	63–74	55	49–61	3.2	<0.01
Visiting a doctor	256	41	35–47	74	68–79	7.5	<0.01
Visiting a clinic	256	1.1	0.2–3.4	2.1	0.6–4.5	0.84	>0.05
Visiting a Level 1 hospital	256	11	7.4–15	6.9	4.2–11	1.6	>0.05
Visiting a Level 2 hospital	256	5.2	2.7–8.5	6.9	4.2–11	0.83	>0.05
Visiting a Level 3 hospital	256	23	18–29	57	51–64	7.9	<0.01
Visiting others providers*	256	0.6	0.1–2.8	0.6	0.1–2.8	0.0	>0.05

ILI, Influenza-like illness; CI, confidence interval.

The proportions and 95% CIs are based on the weighted sample.

* Doctor, friends.

Similarly, the higher the participants' educational level, the more likely that s/he would either change from no visit to visit or choose a higher level hospital for their ILI between a non-pandemic and a pandemic period ($P < 0.01$, χ^2 test for trend). When analysing the reasons for not visiting a doctor for ILI during a pandemic, 54% (95% CI 41–66) of the participants not planning on visiting a doctor believed they were in good health and could cope with the situation, 19%

(95% CI 9.7–30) were afraid of being infected while visiting the doctor, and 10% (95% CI 4.3–20) feared that it would be too expensive. Of those reporting visiting a doctor for ILI currently but that would not do so during a pandemic, 86% (42–99.6) were afraid of being infected while visiting the doctor.

Of those who had not been vaccinated during the past 12 months, 41% (95% CI 34–48) reported they would want to be vaccinated against the new strain of

Table 3. Prevalence [% and 95% confidence interval (CI)] of various behaviours at different times in relation to an influenza pandemic in study participants (n=256), Beijing, 2007

	n	Currently % (95% CI)	Currently, with ILI % (95% CI)	During pandemic, without ILI % (95% CI)	During pandemic, with ILI % (95% CI)
Receiving influenza vaccination	256	22 (17–27)*	—	54 (48–60)	—
Washing hands	256	95 (92–98)	—	97 (94–99)	—
Avoiding crowded places	256	—	77 (72–82)	89 (84–92)	92 (88–95)
Using mask outside of the home	256	—	10 (7–15)	51 (45–57)	58 (52–64)
Absence from work or school	197†	—	17 (12–23)	18 (13–24)	38 (31–45)
Covering coughs and sneezes	256	—	90 (85–93)	—	93 (90–96)

ILI, Influenza-like illness.

The proportions and 95% CIs are based on the weighted sample.

* During the past 12 months.

† Excluding the retired, the homemakers, and the unemployed.

influenza virus during a pandemic; those with younger age ($P < 0.05$, χ^2 test for trend), higher educational level ($P < 0.01$, χ^2 test for trend), and higher household income ($P < 0.05$, χ^2 test for trend) were more likely to seek vaccination.

Currently, 95% (95% CI 92–98) of participants already reported hand-washing habitually, and 90% (95% CI 85–93) reported covering their coughs or sneezes while suffering from ILI; these percentages increased slightly when participants were asked what they would do during a pandemic. Compared to their current usual practices, more people would avoid crowded places (77% vs. 92%, $P < 0.01$), use a face mask outside the home (10% vs. 58%, $P < 0.01$), and take time off from work or school (17% vs. 38%, $P < 0.01$) during a pandemic. When suffering from ILI, 67% (95% CI 53–79) of those who would currently go to crowded places would avoid such places during a pandemic; similarly, 53% (95% CI 47–60) of those not using a face mask outside of the home now would wear one during a pandemic; and 27% (95% CI 21–35) of those who would continue to attend work or school currently would cease to do so during a pandemic.

Moreover, during a pandemic, 26% (95% CI 21–32) of participants would stockpile more food or water than usual, 55% (95% CI 49–61) would stockpile more medicines than usual (including any traditional and Western antiviral medicines and antibiotics); 12% (95% CI 8–16) would consider leaving the epidemic area for a safer place; and 90% (95% CI 86–93) trusted that the government would be able to control the pandemic if it occurred. When suffering from ILI, 81% (95% CI 76–86) of

participants would cooperate with health authorities regarding the investigation (Table 3).

DISCUSSION

We found that the Beijing participants in our study would respond to an influenza pandemic by getting vaccinated, washing hands, avoiding crowded places, using a mask outside of the home, taking time off from work or school, covering their coughs and sneezes, and stockpiling food and medicines. Some of these behavioural changes may be helpful for reducing the impact of an influenza pandemic. However, during a pandemic, many participants suffering from ILI would be more likely to choose a specialized hospital, especially a tertiary hospital, for medical care. This change in healthcare-seeking behaviour could place further burdens on the already strained healthcare resources.

Few studies have evaluated precautionary behaviours in response to a pandemic. In a study by Sadique and colleagues in five European and three Asian regions [4], 52% of the respondents considered absence from work, which is higher than the proportion (38%) found in our study. A study by Lau *et al.* [5] found that panic and interruption of daily routines may occur in the event of a human avian influenza outbreak. In our study, 26% of participants would stockpile more food or water and 55% would stockpile more medicines than usual. Moreover, in a hypothetical local outbreak of human-to-human H5N1 transmission, a lower percentage of participants in our study in Beijing (58%) would wear a face mask than that reported in a Hong Kong study

(92%). The percentage of participants that would seek medical consultation was also lower in our Beijing study (74%) than in the Hong Kong study (94%) [6].

According to WHO estimates [7], 15–35% of the population will develop ILI in a typical pandemic; in a city the size of urban Beijing, there will be 770 000–2 100 000 ILI cases, some of whom will need medical attention. Based on our study, 580 000–1 700 000 ILI cases will choose a tertiary hospital for treating their illness. This will further strain the healthcare system in Beijing already over-burdened by a sudden increase of influenza patients. According to the Beijing Pandemic Influenza Response and Preparedness Plan [8], the Beijing government plans to assign two hospitals as ‘special influenza hospitals’. Our findings indicate that the capacities of the two hospitals might be easily overwhelmed once the pandemic has started. Hence, the Beijing government might need to consider establishing additional hospitals and other healthcare facilities for treating pandemic influenza patients, such as those established during the SARS epidemic. The Beijing Plan also contains discussions on the need for triaging patients for treatment at different levels of hospitals when necessary, to ensure that the most severely affected patients are treated in tertiary hospitals. Our study findings may help to inform health authorities in Beijing and elsewhere to estimate the demand for medical care at various levels of hospitals, enabling a more detailed triaging plan to be devised.

Our study shows that a significant proportion of Beijing participants would not visit a doctor because of the fear of becoming infected. In Beijing, hospital waiting rooms are routinely crowded with sick patients, creating abundant opportunities for cross infection. One recently published study conducted in a paediatric hospital in Beijing showed that for every 100 discharges, there were seven episodes of nosocomial infections, 67% of which were respiratory tract infections [11]. This problem, if left unaddressed in pandemic response plans, would create significant challenges during a potential influenza pandemic.

We found that most Beijing participants in our study would modify their behaviour in response to a pandemic in ways that would be conducive to reducing the impact of the pandemic. However, some of the findings of our study should be taken into consideration in modifying pandemic response plans. For example, when suffering from ILI, a low proportion of participants would stop going to work, be it

during pandemic or non-pandemic periods. Taking prophylactic absence from work can help reduce the spread of the virus, and hence should be encouraged in principle. On the other hand, a very high proportion of workers taking leave of absence during a pandemic could be catastrophic economically, and could further hamper society’s ability to provide essentials to citizens which, in turn, could exacerbate the problem of stockpiling food, water, and other essentials. Additionally, stockpiling food, water and medicines created panic and social chaos during the 2003 SARS epidemic. Therefore, the pandemic preparedness plan for Beijing should include strategies to ensure adequate supply of food, water, and other essentials during a pandemic. Health education on stockpiling should take a balanced approach, i.e. participants should be encouraged to store a 2-week supply of food, water, and other essentials [12]; however, over-stockpiling should be discouraged. Moreover, 12% of the participants reported they would leave the epidemic area. This could cause the pandemic to spread even more quickly. Health education campaigns should also address this issue.

Our study has several limitations, some of which are related to our methodology of using a telephone survey. First, in Beijing in 2005, there were 7.2 million residential telephone numbers. With a population of about 15.4 million, on average there is a residential telephone number for every two residents. Therefore, a telephone survey is potentially representative. However, our study is likely to be subject to biases inherent to telephone surveys, including selection bias and information bias, despite our attempts to limit potential biases by using proper sampling techniques, training interviewers, and weighting the samples. Second, we were unable to reach 53% of the persons sampled because the telephone was either unanswered or busy, and it was impossible to know how many of those numbers were residential or commercial numbers. Of the persons who answered the telephone, only 56% agreed to participate in the study. As a result, our sample might have been biased. Although weighting the sample to the census population might have corrected some of the bias, residual bias is likely to remain. In fact, the large percentages of the participants reporting they would trust the government (90%) and would cooperate with health authorities (81%) during a pandemic may have been a result of this bias. Third, most respondents in our survey have never experienced a pandemic. Therefore, as discussed by Kristiansen and colleagues [13], the participants’

answers may not reflect the reality of the situation. However, our participants had first-hand experience of the 2003 SARS epidemic; therefore, they may have a more realistic understanding of a pandemic than respondents elsewhere. Fourth, the hypothetical scenario in our study was that one third of the population will have ILI. An attack rate of clinical illness as high as 35% is possible based on data from previous pandemics; however, those illnesses occurred over a span of perhaps 12–15 weeks and multiple waves of the pandemic. As such, our hypothetical scenario may have been unrealistically severe. Finally, in our questionnaire we did not include questions on reasons for not visiting a doctor for ILI in the absence of a pandemic, therefore we were unsure whether the reasons for not visiting a doctor found in our study are specific for a pandemic situation or not.

In conclusion, our study suggests that residents of Beijing will make precautionary behavioural changes in response to a pandemic. Some of these behaviours may be helpful in reducing the impact of the pandemic; others may actually impede the efforts of the health authorities to control and alleviate the impact of a pandemic. Health authorities in Beijing and elsewhere should take our findings into account when drafting pandemic preparedness plans.

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NOTE

Supplementary material accompanies this paper on the Journal's website (<http://journals.cambridge.org>).

DECLARATION OF INTEREST

None.

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