Prevalence of preventive behaviors and associated factors during early phase of the H1N1 influenza epidemic

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Background: The community plays an important role in controlling influenza A/H1N1. There is a dearth of data investigating adoption of preventive behaviors in the initial phase of the A/H1N1 pandemic.

Methods: Three round of random, population-based, anonymous telephone survey were conducted in Hong Kong during the pre-community outbreak phase (May 7 to June 6, 2009) of the influenza A/H1N1 pandemic in Hong Kong (n = 999).

Results: Respectively, 46.65%, 88.75%, and 21.5% washed hands more than 10 times/day, wore face masks when having influenza-like illness (ILI), and wore face masks regularly in public areas. Perceptions related to bodily damages, efficacy of frequent handwashing, nonavailability of effective vaccines, high chance of having a large scale local outbreak, and mental distress because of influenza A/H1N1 were associated with frequent handwashing (odds ratio [OR], 1.46 to 2.15). Perceived vaccine availability was associated with face mask use when having ILI (OR, 1.60). Perceived fatality, efficacy of wearing face masks, and mental distress because of influenza A/H1N1 were associated with face mask use in public areas (OR, 1.53 to 2.52).

Conclusion: Preventive behaviors were prevalently adopted by the public and were associated with cognitive and affective factors. Prevention efforts should take public perceptions into account, and emerging infectious diseases provide good chances for promoting hygiene.

Key Words: Influenza A/H1N1; swine flu; perceptions; preventive measures; Hong Kong, China.

The World Health Organization declared the influenza A/H1N1 (human swine flu) outbreak a pandemic on June 11, 2009.[1] As of July 3, 2009, 382 deaths have been reported globally.[2] In Hong Kong, the first confirmed case, a traveler from Mexico, was reported on May 1, 2009, and the government quarantined all hotel staff and residents at the hotel where he was staying.

The flu alert level in Hong Kong was raised to the highest "emergency" level.[3] As of July 3, 2009, Hong Kong has detected 785 confirmed cases, and no death was reported. The first local nonimported community case was reported on June 10, 2009.[4] The government then changed from the containment strategy to the mitigation strategy. It suspended all primary schools and kindergartens from June 11, 2009, until the next school year. Globally, as of February 28, 2010, there were at least 213 countries that have reported cases of H1N1 with at least 16,455 deaths.[5] In Hong Kong, as of March 3, 2010, there were at least 34,174 cases that have been reported, with 73 death cases and 256 severe cases.[6]

The Hong Kong government has been informing citizens that the A/H1N1 is transmitted in the same way as seasonal influenza. During the severe acute respiratory syndrome (SARS) epidemic, which killed 299 people in Hong Kong, the population showed high levels of compliance with advice and adopted preventive behaviors such as wearing face masks and frequent hand washing as recommended by the Hong Kong government. Such practices were found effective in the control of the SARS epidemic in Hong Kong[7] and continued to be practiced by a large proportion of the public even after the SARS epidemic subsided in Hong Kong.[8]

Two reports investigated community responsiveness toward influenza A/H1N1 in Hong Kong[9] and in

the United Kingdom[10] around the same time period (May 7-9 and May 8-12, 2009). With higher adoption rates of preventive measures, the public in Hong Kong seemed to have a relatively higher level of vigilance than that in the United Kingdom. For instance, the prevalence of avoiding crowded places and washing hands more frequently were, respectively, 54.9% and 73.6% in Hong Kong, as compared with 4.9% and 28.1% in the United Kingdom.[10] The UK study documented that the perceived efficacy of preventive measures and the perceived risk of contracting the disease were associated with adoption of recommended preventive behaviors.[10]

This study investigated the prevalence of self-reported preventive behaviors in response to the influenza A/H1N1 epidemic in Hong Kong, including wearing face masks regularly in public areas, wearing face masks in case of influenza-like illness (ILI) symptoms, and frequent handwashing. Factors associated with these behaviors, including sociodemographic factors, cognitive factors (eg, perceived efficacy, perceived chance of having a large scale local outbreak), and affective factors (mental health distress) were investigated. It is hypothesized that such cognitive and affective factors are associated with adoption of preventive behaviors.

MATERIALS AND METHODS

Sampling and data collection

The target population comprised all Hong Kong adults ($\geq$18 years old). The survey consists of 3 rounds of anonymous telephone interviews and were conducted by well-trained interviewers, using the same structured questionnaire, from May 7 to May 9 (round 1: days 7-9, n = 550), from May 14 to May 17 (round 2: days 14-17, n = 201), and from June 4 to June 6 (round 3: days 34-36, n = 248), 2009. There were, respectively, 1, 2, and 30 imported cases (and no community nonimported cases) detected at the beginning date of these 3 surveys. The first local community-infected case with an unknown source of infection was reported on June 10, 2009. The surveys with 3 rounds of data collection (May 7 to June 6, 2009) therefore covered almost the entire ''pre-community-outbreak phase'' (May 1 to June 10, 2009) of the local epidemic.

Random telephone numbers were selected from up-to-date telephone directories, and over 95% of the households in Hong Kong have a fix-line telephone installed.[11] The same structured questionnaire, which took about 20 minutes to complete, was used in these surveys. The interviews were conducted from 6:30 PM to 10 PM to avoid over-sampling of the unemployed population. For unanswered calls, at least 3 other calls were made before the telephone number was considered invalid. For the households with more than one eligible member, the one whose birthday was closest to the date of the interview was invited to join the study. The interviewers brief participants about the details of the study. Verbal consent was obtained before the interview commenced. The study was approved by the Chinese University of Hong Kong. A total of 1621 eligible respondents was identified, and 999 completed the interview. The response rate was hence 62%.

Measures

Respondents' demographic characteristics were recorded. They were asked whether they were currently adopting the following preventive behaviors: wearing face masks regularly in public areas, wearing face masks in case of ILI symptoms (definitely, mostly, unlikely, and definitely not), and the frequency of handwashing per day. Moreover, perceived efficacies of wearing a face mask in public areas and washing hands frequently for influenza A/H1N1 prevention were assessed (not efficacious at all, not quite efficacious, quite efficacious, very efficacious).

Respondents were asked about perceptions related to influenza A/H1N1 (including perceived fatality and irreversible severe bodily damages, perceived availability of vaccine, and perceived chance of having a large scale local influenza A/H1N1 outbreak in the coming year and their current level of mental distress because of influenza A/H1N1 epidemic, on a scale ranging from 1 (not at all) to 10 (extremely severe distress). The questionnaire was modified from those that were used in some avian flu and SARS studies and was used in a descriptive baseline influenza A/H1N1 study.[9]

Statistical analysis

The χ^2 test was used to test statistical significance of between-group differences. Univariate odds ratios (OR) and, respectively, 95% confidence intervals (CI) were used to assess the magnitudes of the associations between the studied independent variables (ie, sociodemographic, cognitive, and affective factors) and the studied preventive behaviors (dependent variables). Those variables that were significant in the univariate analysis were used as candidates for multivariate stepwise logistic regression modeling. $P < .05$ is considered statistically significant. SPSS version 16.0 (SPSS, Inc, Chicago, IL) was used for data analysis.

RESULTS

Demographic characteristics

Of all respondents, 56.6% were females, 47.2% were of ages 30 to 49 years, 35.1% had college or above

Table 1. Background characteristics of the respondents: May and June 2009, Hong Kong

Characteristics	Number (%)
Sex	
Male	434 (43.4)
Female	565 (56.6)
Age, yr	
<30	250 (25.0)
30-39	201 (20.1)
40-49	271 (27.1)
50-60	277 (27.7)
Education level	
Form 3 or below*	184 (18.5)
Form 4, matriculation*	463 (46.4)
College or above	350 (35.1)
Marital status	
Single	333 (33.5)
Married/cohabited	647 (65.0)
Divorced/widowed	15 (1.5)
Full-time employed	
No	438 (44.0)
Yes	558 (56.0)
Currently being a health care practitioner	
No	975 (98.1)
Yes	19 (1.9)

*In Hong Kong, form 3 and form 4 mean having 9 and 10 years, respectively, of formal education.

Table 2. Perceptions related to influenza A/H1N1 of respondents: May and June 2009, Hong Kong

Perceptions of influenza A/H1N1	Number (%)
Perceived consequences of A/H1N1	
Very high fatality	206 (20.6)
Severe irreversible bodily damage	189 (18.9)
Perceived availability of vaccine	
There is no vaccine that could prevent human swine flu effectively	629 (63.0)
Perceived efficacy of public health measures	
Wearing face masks in public areas	
Not effective at all	9 (0.9)
Not very effective	61 (6.1)
Quite effective	689 (69.0)
Very effective	240 (24.0)
Washing hands frequently	
Not effective at all	2 (0.2)
Not very effective	20 (2.0)
Quite effective	671 (67.2)
Very effective	305 (30.6)
Perceived chance of having a large-scale local A/H1N1 outbreak in the coming year	
Unlikely/most unlikely/certainly not/unsure	727 (72.9)
Certainly/most likely/likely	270 (27.1)
Mental health distress	
Mental health distress because of influenza A/H1N1 score ≥7 (ranged from 1 = very mild to 10 = extremely severe)	100 (10.1)
Preventive behaviors in response to influenza A/H1N1	
Wearing face masks regularly in public areas	215 (21.5)
Wearing face masks when going out in case of ILI symptoms	885 (88.7)
Frequency of washing hands per day	
1-5	89 (8.9)
6-10	444 (44.5)
11-15	277 (27.8)
16-20	109 (10.9)
>20	79 (7.9)

education, one third (33.5%) were never married, and 56.0% were employed full-time. The age and gender compositions were broadly comparable with those of the recent Hong Kong census (see footnote of Table 1).

Prevalence of preventive behaviors

A vast majority (88.7%) of the respondents would definitely/mostly wear face masks when going out in case of ILI symptoms. About half of them (46.6%) reported currently washing hands more than 10 times a day. Of all respondents, 21.5% would definitely/mostly wear face masks regularly in public areas (Table 2).

Perceptions related to influenza A/H1N1

Respectively, 20.6% and 18.9% of all respondents perceived that influenza A/H1N1 had very high fatality rate and could cause irreversible bodily damage. Of all respondents, 63.0% knew that no effective vaccines were presently available to prevent influenza A/H1N1. Respectively, 24.0% and 30.6% believed that wearing face masks in public areas and washing hands frequently is very efficacious in preventing A/H1N1. Over one quarter (27.1%) of the respondents perceived that there was a chance of having a large scale influenza A/H1N1 outbreak in Hong Kong in the next year. The overall average rating score assessing the current level of mental distress because of influenza A/H1N1 outbreak was 4.0 (standard deviation = 2.5, range: 1-10), with one tenth (10.1%) giving a score exceeding 7.0 (Table 2).

Factors associated with preventive behaviors

Wearing face masks regularly in public areas. The results of the univariate analyses showed that those who were female (OR, 1.94; $P < .0001$), currently married (OR, 1.67; $P = .003$), not employed full-time (OR, 1.64; $P = .002$), or of older age (OR, 1.77 and $P = .021$ for those 30-39 years of age; OR, 1.86 and $P = .007$ for 40-49 years of age; OR, 2.16 and $P = .001$ for 50-60 years of age as compared with below age of 30 years of age) were more likely than others to be currently wearing face masks regularly in public areas. Other significant factors included the following: perceptions of very high fatality of influenza A/H1N1 (OR, 1.64; $P = .006$), perceived very high efficacy of wearing face

masks for influenza A/H1N1 prevention (OR, 1.90; $P <$ .0001), perceived high chance of having a large scale influenza A/H1N1 outbreak in Hong Kong in the coming year (OR, 1.54; $P =$ .009), and a higher level of mental distress because of influenza A/H1N1 outbreak (OR, 2.77; $P <$ .0001 for distress scores ≥ 7 vs < 7). In the multivariate analysis, all except 2 of the aforementioned variables (''marital status'' and ''perceived chance of having a large scale A/H1N1 outbreak in Hong Kong in the next year'') remained statistically significant (Table 3). The variable indicating survey time was not significant in the multivariate analysis.

Wearing face masks in public areas in case of ILI symptoms. Respondents who were female (OR, 2.44; $P <$ .0001), who attained a higher education level (OR, 1.97; $P =$ .007 for form 4 to matriculation and OR, 1.85; $P =$ .19 for college or above education as compared with form 3 or below) (In Hong Kong, form 3 and form 4 mean having 9 and 10 years of formal education), and those who believed that there is no vaccine currently available to prevent influenza A/H1N1 (OR, 1.65; $P =$ .013) were more likely than others to wear face masks in public areas in case of ILI symptoms. In the multivariate analysis, all the variables aforementioned remained significant (Table 3). The variable indicating survey time was not significant in the univariate and multivariate analysis.

Washing hands more than 10 times per day. Similarly, those who were female (OR, 2.22; $P <$ .0001), currently married (OR, 1.67; $P <$ .0001), and of older age (OR, 1.67 and $P =$ .008 for 30-39 years of age; OR, 1.66 and $P =$ .004 for 40-49 years of age; OR, 1.55 and $P =$ .014 for 50-60 years of age as compared with below age of 30 years) were more likely than others to be washing hands for >10 times per day. Other factors were significantly associated with frequent handwashing (>10 times per day), including perceived irreversible bodily damages caused by influenza A/H1N1 (OR, 1.60; $P =$ .004), perceived very high efficacy of frequent handwashing for prevention of influenza A/H1N1 (OR, 1.60; $P =$ .003), perceived nonavailability of effective vaccines for prevention against influenza A/H1N1 (OR, 1.48; $P =$ .003), perceived high chance of having a large scale local influenza A/H1N1 outbreak in the next year (OR, 1.54; $P =$ .003), and a higher level of mental distress because of influenza A/H1N1 (OR, 2.44; $P <$ .0001). Except the variables of age and ''the perception about high chance of having a large scale local influenza A/H1N1 outbreak in the next year,'' all of the aforementioned variables remained statistically significant in the multivariate analysis (Table 3). The variable indicating whether data were collected in round 1, 2, or 3 of this survey study was not significant in the univariate and multivariate analysis.

DISCUSSION

In the early phase of the local H1N1 epidemic, the Hong Kong government adopted containment strategies and implemented a series of stringent measures, including closure of the Metropark Hotel, quarantine of vulnerable cases, and thermoscreening at the custom checkpoints. It was only after community spread was confirmed on June 12, 2009, that the Hong Kong government changed to a mitigation strategy. As in all outbreaks of infectious disease, the control of the influenza A/H1N1 pandemic cannot rely only on governmental measures. Personal preventive behaviors are equally important, and individuals need to take responsibility for helping control emerging infectious diseases. This is especially important when the disease has spread widely in the community. Other countries such as the United States and United Kingdom relied less on initial containment strategies and more on individual preventive behaviors.

In Hong Kong, there was a high level of protective behavior in the community in the initial containment phase. This study has shown that around half of the respondents had washed their hands more than 10 times a day. Previous local studies conducted during and after the SARS period, as well as one study that was related to avian flu, which was conducted in 2007, also recorded very high frequencies of handwashing.[12] Moreover, the vast majority of our respondents (close to 90%) wore face masks in case of ILI symptoms. A comparable prevalence (92.4%) was obtained from a local study, which was conducted in 2007, investigating responses to an anticipated human-to-human H5N1 epidemic in Hong Kong.[13] The frequency of mask use in case of ILI symptoms therefore had in fact been increasing since the SARS and post-SARS period.[14]

Frequent handwashing and use of face masks in case of ILI symptoms have been promoted by the Hong Kong government in the last few years as part of the preparedness against avian flu. There were posters and public health announcements on TV and other media, frequent broadcasts in all train stations, as well as leaflets handed out at the customs, educating people about the importance of washing hands frequently and properly. Similar messages were given during the SARS period, as well as for prevention of avian flu and seasonal flu. Such efforts have escalated since the influenza A/H1N1 outbreak occurred and are paying off: frequent handwashing seems to have become a habit of many Hong Kong people, and use of face masks in case of ILI symptoms seems to have become a norm in the Hong Kong community, worn to protect others from contracting influenza. It is known that subjective norms are important determinants of health behaviors. SARS and the series of public health threats resulting from avian flu and influenza

Table 3. Factors associated with preventive measures to avoid contracting H1N1 human swine flu: May and June 2009, Hong Kong

	n	Wearing mask regularly in public areas			Wearing face masks when going out in case of ILI symptoms			Washing hands >10 times a day		
		Row %	OR_U	OR_m (95% CI)	Row %	OR_U	OR_m (95% CI)	Row %	OR_U	OR_m (95% CI)
Wave of survey										
Wave 1	550	23.8	1.00	NS	89.6	1.00	NSU	47.4	1.00	NSU
Wave 2	201	21.4	0.87		88.6	0.90		46.3	0.96	
Wave 3	248	16.5	0.63*		86.7	0.75		45.2	0.92	
Background characteristics										
Sex										
Male	434	15.4	1.00	1	83.6	1.00	1	35.6	1.00	1
Female	565	26.2	1.94‡	1.72 (1.21-2.44)†	92.6	2.44‡	2.56 (1.70-3.86)‡	55.0	2.22‡	2.10 (1.61-2.74)‡
Age, yr										
<30	250	14.0	1.00	1	87.2	1.00	NSU	37.8	1.00	NS
30-39	201	22.4	1.77*	1.97 (1.16-3.33)*	88.0	1.08		50.2	1.67†	
40-49	271	23.2	1.86†	2.26 (1.39-3.67)†	90.8	1.44		50.2	1.66†	
50-60	277	26.0	2.16†	2.27 (1.42-3.62)†	88.4	1.12		48.4	1.55*	
Education level										
Form 3 or below§	184	23.4	1.00	NSU	82.5	1.00	1	44.0	1.00	NSU
Form 4, matriculation§	463	22.0	0.93		90.3	1.97†	2.04 (1.24-3.37)†	50.8	1.31	
College or above	350	20.0	0.82		89.7	1.85*	1.96 (1.16-3.33)*	42.4	0.94	
Marital status										
Single	333	16.2	1.00	NS	87.3	1.00	NSU	38.3	1.00	1
Married/cohabited	647	24.4	1.67†		89.5	1.23		50.9	1.67‡	1.56 (1.18-2.06)†
Divorced/widowed	15	13.3	0.79		80.0	0.58		46.7	1.41	1.30 (0.44-3.85)
Employed full-time										
No	438	26.0	1.00	1	89.7	1.00	NSU	48.7	1.00	NSU
Yes	558	17.7	0.61†	0.68 (0.48-0.96)*	87.8	0.82		45.2	0.87	
Perceptions of influenza A/H1N1										
Perceived consequences										
Very high fatality										
Disagree/unsure	792	19.7	1.00	1	89.0	1.00	NSU	45.5	1.00	NSU
Agree	206	28.6	1.64†	1.53 (1.05-2.21)*	87.4	0.86		50.5	1.22	
Severe irreversible bodily damages										
Disagree/unsure	810	20.7	1.00	NSU	89.1	1.00	NSU	44.4	1.00	1
Agree	189	24.9	1.26		86.8	0.80		56.1	1.60†	1.50 (1.07-2.09)*
Perceived availability of vaccine										
There is no vaccine that could prevent influenza A/H1N1 effectively										
Disagree/unsure	370	20.8	1.00	NSU	85.4	1.00	1	40.5	1.00	1
Agree	629	21.9	1.07		90.6	1.65*	1.60 (1.07-2.39)*	50.2	1.48†	1.46 (1.11-1.92)†
Perceived efficacy of self-protective measures										
Wearing face masks in public area										
Quite effective/not very effective/not effective at all/don't know	759	18.7	1.00	1	87.9	1.00	NSU	NE		
Very effective	240	30.4	1.90‡	1.83 (1.29-2.59)†	91.3	1.44				
Washing hands frequently										

	N	%	OR_U	OR_m	%	OR_U	OR_m	%	OR_U	OR_m
Quite effective/not very effective/not effective at all/don't know	694	43.0	1.00	—	NE			NE		
Very effective	305	54.8	1.60†	1.58 (1.19-2.10)†				NS		
Perceived chance of pandemic of influenza A/H1N1 in Hong Kong in the coming year										
Unlikely/most unlikely/certainly not/unsure	727	19.4	1.00	NS	88.4	1.00	NSU	43.7	1.00	NSU
Certainly/most likely/likely	270	27.0	1.54†		89.3	1.09		54.4	1.54†	
Degree of mental distress because of influenza A/H1N1 (ranged from 1 = very mild to 10 = extremely severe)										
Rating <7	893	19.4	1.00	—	88.1	1.00	NSU	44.3	1.00	—
Rating ≥7	100	40.0	2.77‡	2.52 (1.59-3.99)‡	94.0	2.11		66.0	2.44‡	2.15 (1.36-3.39)†

NOTE. The independent variable "current health care practitioner" was not significantly associated with all the 3 independent variables in the univariate analysis and was not tabulated.

NE, not entered into logistic regression; NS, statistically nonsignificant in multivariate analysis; NSU, statistically nonsignificant in univariate analysis; OR_m, odds ratio obtained from stepwise multivariate logistics regression analysis using univariately significant variables as candidate variables; OR_U, univariate odds ratio obtained from logistic regression models.

*P < .05.
†P < .01.
‡P < .001.
§In Hong Kong, form 3 and form 4 mean having 9 and 10 years of formal education.

A/H1N1 have had a sustained impact on personal hygiene and protective behaviors. Emerging infectious diseases therefore provide a window of opportunity for health education to improve personal hygiene.

Despite the international debate on efficacy of wearing face masks in infection control, recent research findings have supported the efficacy among influenza patients in protecting others from contracting the virus.[7] Handwashing has also been shown to be efficacious in influenza protection.[7] Research shows that the perception of efficacy of preventive measures is associated with adopting measures for prevention against SARS, avian flu, and influenza A/H1N1.[12,13] Our respondents also demonstrated very high levels of perception that the efficacy of handwashing for influenza A/H1N1 prevention was associated with frequent handwashing. However, only 30.6% believed that frequent handwashing is very efficacious for prevention of influenza A/H1N1, although many believed that it is quite efficacious. The frequency of handwashing among the Hong Kong public can be increased further by informing citizens about the evidence base of the relationship between handwashing and prevention of emerging respiratory infectious diseases.

Unlike handwashing and mask use in case of ILI, evidence of the efficacy of using face masks to protect oneself from contracting respiratory infectious diseases has been mixed,[15] although a local study has shown that the use of face masks during the SARS period contributed to the control of the disease.[7] The guidance given by the Hong Kong government during the study period was to wear a mask if one develops ILI symptoms but not for going out into public places as was the advice given during SARS. As compared with the first month of the SARS period,[14] a much lower percentage of the Hong Kong general public has been wearing face masks regularly in public areas (69.7% vs 21.5%, respectively). This is understandable because SARS is more fatal than influenza A/H1N1. Our data showed that those who perceived that H1N1 had a high fatality were more likely to use face masks in public areas. Governments in different countries seem to be at variance on the advice they give on mask use in public areas, and further research is needed.

The results of the multivariate analysis showed that the prevalence of the 3 aforementioned types of preventive behaviors did not vary significantly across the 3 surveys, which were carried out in the pre-community outbreak phase of the influenza A/H1N1 pandemic in Hong Kong (day 7 to day 36). During the study period, no severe cases and no deaths were reported. The hypotheses that the adoption of the 3 types of preventive behaviors was associated with cognitive factors such as perceived efficacy of the preventive measure, perceived chance of having a large scale

outbreak, and perceived nonavailability of vaccine were largely supported by the results of this study. Similar factors were identified in the recently published UK study.[10] Moreover, similar factors were associated with adoption of different types of preventive behaviors protecting people from contracting SARS[12] or human avian flu.[13] The similarities are not unexpected because the aforementioned perception factors were derived from general health behavioral theories (such as the health belief model), which can be applied to understanding different types of preventive behaviors. It is hence important to keep track of changes in perceptions toward new emerging respiratory infectious diseases because modification of these perceptions may result in promotion of preventive behaviors.

Consistent with the finding of the UK study,[10] our study showed that people with a higher level of mental distress because of A/H1N1 were more likely to adopt some of the 3 preventive measures. A Web-based study conducted in Norway reported the impact of fear and anxiety on people's decision making in the context of imminent influenza pandemic.[16] The result revealed that a certain level of fear and concern might lead to desirable preventive behaviors. One challenge for health policy makers and workers is to allay public anxiety without adversely impacting on positively protective behaviors particularly among single, male, and younger people who were less likely than others to use preventive measures to prevent influenza A/H1N1. In this regard, informing people about the mild nature of the virus in general but to remind people about its pandemic nature and risk for mutation may be helpful.

The study has several limitations. First, although almost all the households in Hong Kong have telephones, some households may still have been left out. Second, the response rate of the study was modest, and self-selection bias may exist. However, the age and gender distributions of our respondents were comparable with the 2005 census distributions, which give some support to the generalizability of the study results. Third, reporting bias may also be significant because responses on handwashing and face mask use were self-reported and could not be validated. However, the questions were not sensitive ones, so it is unlikely that social desirability would strongly bias the results. Fourth, this study used a cross-sectional design, so only associations rather than causal effects could be observed.

In summary, prevalence of mask use in case of ILI and frequency of handwashing are high, whereas approximately one fifth of the general public was wearing face masks in public areas. Cognitive and affective factors are significantly associated with such preventive behaviors. Ongoing surveillance of preventive behaviors and related perceptions are in place in Hong Kong, and such real-time data can help policy makers to adjust their measures. International comparisons would also be very informative.

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