

## Preplanned Studies

## Attitudes Regarding Influenza Vaccination Among Public Health Workers during COVID-19 Pandemic — China, September 2022

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### Summary

#### What is already known about this topic?

Public health workers (PHWs) were listed as a priority group recommended for influenza vaccination during the coronavirus disease 2019 (COVID-19) pandemic. Understanding the drivers of influenza vaccine hesitancy among PHWs can promote influenza vaccination in the COVID-19 pandemic.

#### What is added by this report?

The study found that 10.7% of PHWs were hesitant to get an influenza vaccination. Drivers associated with vaccine hesitancy were assessed based on “3Cs model.” The absence of a government or workplace requirement and concerns about vaccine safety were the biggest obstacles for PHWs to recommend influenza vaccination.

#### What are the implications for public health practice?

Interventions are needed to improve PHWs' influenza vaccine coverage to prevent the co-circulation of influenza and COVID-19.

Globally, influenza causes 3–5 million hospitalizations and 290,000–650,000 respiratory deaths each year (1). From February through August 2022, influenza activity was at its highest level compared to similar periods since the start of the coronavirus disease 2019 (COVID-19) pandemic globally (2). As the priority group recommended for influenza vaccination during the COVID-19 pandemic, healthcare workers (HCWs), including public health workers (PHWs), have a greater chance of contracting influenza viruses; this poses a greater risk of transmission (3). PHWs refer to those who are engaged in public health services and vaccination work in the Center for Disease Control and Prevention (CDC) system, community health service centers, or township health centers. Previous surveys have shown that willingness and influence factors of front-line staff involved in the work of influenza control are of higher

concern (4–5). The research mainly focused on assessing PHWs' attitudes toward influenza vaccination in 2022–2023. Univariate analysis and multivariable logistic regression analysis were used to evaluate factors associated with vaccine hesitancy. A total of 3,127 PHWs were surveyed. 10.7% were hesitant about influenza vaccination in the coming season. Multivariate logistic regression analysis found that PHWs who did not receive an influenza vaccine between September 2021 and April 2022 [odds ratio (OR)=5.08, 95% confidence interval (CI): 3.54–7.29] and PHWs who believed vaccination had no importance for health (OR=21.32, 95% CI: 10.15–44.80) were more likely to hesitate to get vaccinated. The results suggest that effective measures should be taken to strengthen the willingness of PHWs to vaccinate against influenza. This reduces the burden of the COVID-19 responding and medical facilities.

From September 16 to 26, 2022, a link to the questionnaire for the survey was posted on *Listening to the Experts*, a learning and communication platform that authenticates real identity information of registered users and was used by professionals in the field of vaccination in China (6). PHWs could voluntarily participate in the survey and forward it to their colleagues, but each participant could only answer once. As of September 30, 2022, the *Listening to the Experts* platform has over 650,000 PHW users, covering 31 provincial-level administrative divisions (PLADs) in China. Data on respondents' sociodemographic characteristics, workplace interventions, knowledge of influenza vaccination, influenza vaccination history and attitudes towards recommending influenza vaccination were collected. The per capita gross domestic product (GDP) of each PLAD was obtained from the National Bureau of Statistics of China (7). Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite availability of vaccination services. According to the “3Cs model” of vaccine hesitancy (8), the impact of confidence, complacency, and convenience on

hesitancy to receive influenza vaccination was analyzed and concerns of PHWs in recommending influenza vaccination were presented. The study protocol and questionnaire were approved by the Chinese Academy of Medical Sciences and Peking Union Medical College (No. CAMS&PUMC-IEC-2022-019, on March 14, 2022).

Univariate analysis included frequency and ratio calculations and Pearson's chi-squared test for differences. Multivariate logistic regression was used to evaluate factors associated with intention to accept vaccination. ORs and 95% CIs were calculated. Alpha level was set at 0.05. Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, version 26.0, SPSS Inc, Chicago, IL, USA.).

A total of 3,145 PHWs from 28 PLADs participated in the survey, with 18 incomplete questionnaires excluded. Among the 3,127 respondents in China, 823 (26.3%) work at CDC systems, and 2,304 (73.7%) were from community or township health service centers. Nearly half had an intermediate professional title or above and 10.7% (336) had influenza vaccine hesitancy. In the 2021–2022 influenza season, 52.5% respondents (1,643/3,127) were vaccinated against influenza, including 64.9% (1,067/1,643) vaccinated at a community or township health service center,

21.4% (352/1,643) vaccinated at a hospital, 12% (197/1,643) vaccinated at a CDC vaccination clinic, and 1.6% (27/1,643) vaccinated elsewhere.

Of the 336 respondents with vaccine hesitancy, 22.3% (75/336) worked at CDC systems and 77.7% (261/336) worked at community or township health service centers. The analysis results based on the “3Cs model” illustrated that 43.45% of the respondents believed complacency, 24.88% believed confidence, and 20.79% believed convenience had an impact on vaccine hesitancy. In terms of complacency, 43.3% (146/336) believed that influenza infection would not cause serious illness and it did not matter if they were not vaccinated (Table 1).

Of the 94.2% (2,945/3,127) of respondents who were willing to recommend influenza vaccines to others, no requirements at the government or workplace level for recommendation, fear of misinterpreting recommendation as having commercial interests, and potential adverse reactions were their primary concerns. Of the remaining respondents who were unwilling to recommend influenza vaccines, no requirements at the government or workplace level for recommendation and potential adverse reactions of influenza vaccines were their primary concerns (Table 2).

According to the results of univariate analysis,

TABLE 1. Reasons for influenza vaccine hesitancy among PHWs (Based on 3Cs model) in China, September 2022.

Variable	Very unacceptable (%)	Unacceptable (%)	Acceptable (%)	Highly acceptable (%)
<b>Convenience</b>				
High prices	37.8	21.1	27.4	13.7
Don't know when to vaccinate	66.1	12.8	14.0	7.1
No appropriate to take influenza vaccination	56.8	24.4	12.2	6.5
Vaccination place is inconvenient	69.3	12.8	9.5	8.3
Spend long time waiting for taking influenza vaccination	62.5	20.5	11.3	5.7
Don't know where to vaccinate	73.2	11.6	8.9	6.3
Influenza vaccination services are hard to make appointment	67.9	17.6	9.8	4.8
<b>Confidence</b>				
Being worried about adverse reactions	50.3	21.4	21.7	6.5
No influenza vaccination notification at workplace	56.0	16.4	14.3	13.4
Influenza vaccine is not effective	49.4	25.0	20.2	5.4
Having contraindications	56.0	19.6	16.1	8.3
Pregnant or lactating	67.0	14.6	10.1	8.3
<b>Complacency</b>				
Influenza will not cause severe illness	31.3	25.3	32.1	11.3

Abbreviation: PHWs=public health workers.

TABLE 2. Reasons for influenza vaccine recommendation among PHWs in China, September 2022.

Variable	Total (n, %)	Willing to recommend (n, %)
Worried about the misunderstanding of commercial interests by recipients	1,440 (46.1)	1,387 (47.1)
Worried about the adverse reactions of recipients	1,313 (42.0)	1,252 (42.5)
No recommendation on requirement by national authorities or at workplace	1,312 (42.0)	1,233 (41.9)
Pregnancy or have contraindications	1,123 (35.9)	1,068 (36.3)
Influenza won't cause severe illness and vaccination is unnecessary	1,065 (34.1)	1,004 (34.1)
Worried about the medical tangle caused by recommendation	927 (29.6)	886 (30.1)
Influenza vaccine is not effective	861 (27.5)	819 (27.8)
Due to self-unvaccinated and lack of influenza vaccine confidence	596 (19.1)	551 (18.7)
Influenza vaccination is inconvenient	354 (11.3)	336 (11.4)

Abbreviation: PHWs=public health workers.

vaccine hesitancy was high among PHWs who did not receive an influenza vaccine in the 2021–2022 season (19.7%), who reported the payment method was inconvenient (15.7%), who were not concerned about the risk of influenza in the 2022–2023 season (14.7%), and who believed influenza vaccination was not important to health (65.6%) (Table 3).

Multivariable logistic regression analysis was used to assess factors associated with influenza vaccine hesitancy among PHWs. Those who had no influenza infection history ( $OR=1.98$ , 95%  $CI$ : 1.21–3.24), who did not receive an influenza vaccine between September 2021 and April 2022 ( $OR=5.08$ , 95%  $CI$ : 3.54–7.29), who could not receive on-site vaccination at workplace ( $OR=1.50$ , 95%  $CI$ : 1.03–2.20), who were not concerned about the risk of influenza this year ( $OR=5.26$ , 95%  $CI$ : 1.09–25.41), who believed the health influence of influenza vaccine is not important at all ( $OR=21.32$ , 95%  $CI$ : 10.15–44.80), a little important ( $OR=4.21$ , 95%  $CI$ : 2.81–6.30) and moderately important ( $OR=2.50$ , 95%  $CI$ : 1.71–3.64) were more likely to have hesitation toward influenza vaccination (Table 3).

## DISCUSSION

The study found that 10.7% of PHWs were hesitant to get vaccinated against influenza during the COVID-19 pandemic. 52.5% of PHWs were vaccinated in the 2021–2022 season, which was higher than the 35.4% among respiratory care practitioners in the same season and 11.6% among HCWs in the 2018–2019 season (4–5). Although the influenza vaccination coverage in this survey is fairly optimistic, the small proportion of influenza vaccination hesitancy among PHWs still needs attention. The most cost-effective way to prevent

influenza and its complications is annual vaccination, especially during the COVID-19 pandemic. As a high-risk population, PHWs vaccination against influenza not only reduces the harm from associated diseases and the use of medical resources, but also promotes health information communication and public confidence in influenza vaccination. The study elucidated primary concerns or no mandatory government or workplace recommendations for vaccination and vaccine safety among PHWs. In the interest of self-protection, potential adverse reactions to vaccines affect PHW willingness to recommend vaccines (9).

The study also suggested that complacency remains the biggest driver to influenza vaccine hesitancy and has the greatest impact on the willingness of PHWs to get vaccinated. Among the 336 hesitant PHWs, those without influenza infection and vaccination history were more prone to vaccine hesitancy, and those who did not worry about getting influenza in the current season or did not believe getting an influenza vaccination was important were at higher risk. Since the COVID-19 outbreak, public health interventions such as mask-wearing and social distancing have reduced influenza activity significantly. However, the measures also led to a decline in existing immunity and increased susceptibility to influenza. An increasing trend of influenza activity was observed in the northern hemisphere, highlighting the need for close monitorization and preparation for the co-circulation of influenza viruses and severe acute respiratory syndrome coronavirus 2 (10). PHWs need to be fully aware of the severity of influenza and the necessity for influenza vaccination as well as extensively understand the burden of influenza disease and prevention and control strategies during the COVID-19 pandemic. This helps reduce hesitancy toward influenza vaccines.

TABLE 3. Univariate analysis and multivariable logistic regression analysis of influenza vaccine hesitancy among public health workers in China, September 2022 (ref: willing to vaccination).

Variable	Total (n, %)	Vaccination willingness (n, %)	Vaccine hesitancy (n, %)	Univariate analysis		Logistic regression analysis	
				$\chi^2$	P for chi-square test	OR (95% CI)	P-value
PLAD by GDP per capita*							
Low GDP area	680 (21.7)	588 (86.5)	92 (13.5)	8.81	0.012	Ref	
Middle GDP area	1,413 (45.2)	1,262 (89.3)	151 (10.7)			0.85 (0.61–1.19)	0.346
High GDP area	1,034 (33.1)	941 (91.0)	93 (9.0)			0.61 (0.43–0.88)	0.008
Type of workplace							
Community health service centers/Township health centers	2,304 (73.7)	2,043 (88.7)	261 (11.3)	3.10	0.078	Ref	
Center for Disease Control and Prevention	823 (26.3)	748 (90.9)	75 (9.1)			0.86 (0.60–1.22)	0.392
Professional title							
None	347 (11.1)	296 (85.3)	51 (14.7)	8.88	0.031	Ref	
Junior	1,206 (38.6)	1,070 (88.7)	136 (11.3)			1.21 (0.78–1.86)	0.397
Middle	1,212 (38.8)	1,095 (90.3)	117 (9.7)			1.19 (0.76–1.87)	0.446
Senior	362 (11.6)	330 (91.2)	32 (8.8)			1.25 (0.70–2.23)	0.458
Chronic diseases history (Except for simple hypertension)							
Yes	153 (4.9)	133 (86.9)	20 (13.1)	3.37	0.185	Ref	
No	2,922 (93.4)	2,615 (89.5)	307 (10.5)			0.51 (0.28–0.94)	0.030
Unclear	52 (1.7)	43 (82.7)	9 (17.3)			0.72 (0.26–2.03)	0.538
Influenza infection history since September 2021							
Yes	424 (13.6)	400 (94.3)	24 (5.7)	13.26	0.001	Ref	
No	2,176 (69.6)	1,926 (88.5)	250 (11.5)			1.98 (1.21–3.24)	0.006
Unclear	527 (16.9)	465 (88.2)	62 (11.8)			1.98 (1.14–3.42)	0.015
Received influenza vaccine between September 2021 and April 2022							
Yes	1,643 (52.5)	1,600 (97.4)	43 (2.6)	238.48	<0.001	Ref	<0.001
No	1,484 (47.5)	1,191 (80.3)	293 (19.7)			5.08 (3.54–7.29)	
On-site vaccination at workplace							
Yes	2,650 (84.7)	2,400 (90.6)	250 (9.4)	31.60	<0.001	Ref	
No	403 (12.9)	332 (82.4)	71 (17.6)			1.50 (1.03–2.20)	0.037
Unclear	74 (2.4)	59 (79.7)	15 (20.3)			1.47 (0.71–3.07)	0.303
Ways of influenza vaccine payment							
Self-paid	2,333 (74.6)	2,047 (87.7)	286 (12.3)	43.49	<0.001	Ref	
Free	329 (10.5)	313 (95.1)	16 (4.9)			0.60 (0.31–1.17)	0.132
Employer paid	225 (7.2)	214 (95.1)	11 (4.9)			0.89 (0.43–1.87)	0.763
Medical insurance	208 (6.7)	188 (90.4)	20 (9.6)			0.63 (0.36–1.11)	0.111
Unclear	32 (1.0)	29 (90.6)	3 (9.4)			0.39 (0.10–1.58)	0.185
Convenience of payment method							
Very convenient	973 (31.1)	910 (93.5)	63 (6.5)	43.49	<0.001	Ref	
Moderately convenient	1,295 (41.4)	1,157 (89.3)	138 (10.7)			0.95 (0.66–1.39)	0.807
A little convenient	558 (17.8)	463 (83.0)	95 (17.0)			1.32 (0.86–2.01)	0.202
Not at all convenient	301 (9.6)	261 (86.7)	40 (13.3)			1.10 (0.65–1.86)	0.717

TABLE 3. (Continued)

Variable	Total (n, %)	Vaccination willingness (n, %)	Vaccine hesitancy (n, %)	Univariate analysis		Logistic regression analysis	
				$\chi^2$	P for chi-square test	OR (95% CI)	P-value
Perceived risk of influenza this season							
Very concerned	132 (4.2)	130 (98.5)	2 (1.5)	41.06	<0.001	Ref	
Moderately concerned	243 (7.8)	230 (94.7)	13 (5.3)			2.53 (0.48–13.47)	0.276
A little concerned	1,590 (50.8)	1,440 (90.6)	150 (9.4)			3.11 (0.64–15.04)	0.158
Not at all concerned	1,162 (37.2)	991 (85.3)	171 (14.7)			5.26 (1.09–25.41)	0.039
Health influence of the influenza vaccine							
Very important	1,531 (49.0)	1,482 (96.8)	49 (3.2)	396.93	<0.001	Ref	
Moderately important	1,055 (33.7)	932 (88.3)	123 (11.7)			2.50 (1.71–3.64)	<0.001
A little important	480 (15.4)	356 (74.2)	124 (25.8)			4.21 (2.81–6.30)	<0.001
Not at all important	61 (2.0)	21 (34.4)	40 (65.6)			21.32 (10.15–44.80)	<0.001
Whether the trivalent or quadrivalent influenza vaccine affects willingness							
No	1,137 (36.4)	975 (85.8)	162 (14.2)	22.86	<0.001	Ref	
Yes	1,990 (63.6)	1,816 (91.3)	174 (8.7)			0.97 (0.72–1.31)	0.836
Whether the inactivated or live-attenuated vaccine influences willingness							
No	1,325 (42.4)	1,139 (86.0)	186 (14.0)	25.99	<0.001	Ref	
Yes	1,802 (57.6)	1,652 (91.7)	150 (8.3)			0.66 (0.49–0.89)	0.006
Workplace vaccination policy (free for all staff)							
Yes	810 (25.9)	766 (94.6)	44 (5.4)	34.16	<0.001	Ref	
No	2,038 (65.2)	1,788 (87.7)	250 (12.3)			0.88 (0.55–1.41)	0.602
Unclear	279 (8.9)	237 (84.9)	42 (15.1)			0.70 (0.39–1.28)	0.248
Expectation from colleagues toward influenza vaccination this season							
No	65 (2.1)	44 (67.7)	21 (32.3)	213.15	<0.001	Ref	
Yes	1,715 (54.8)	1,653 (96.4)	62 (3.6)			0.18 (0.09–0.37)	<0.001
Unclear	1,347 (43.1)	1,094 (81.2)	253 (18.8)			0.58 (0.28–1.19)	0.135
Attitudes toward influenza vaccine this season at your workplace							
Required	343 (11.0)	328 (95.6)	15 (4.4)	94.5	<0.001	Ref	
Encouraged	1,038 (33.2)	978 (94.2)	60 (5.8)			1.15 (0.59–2.25)	0.678
Neutrality	1,442 (46.1)	1,249 (86.6)	193 (13.4)			1.42 (0.73–2.74)	0.301
Unclear	304 (9.7)	236 (77.6)	68 (22.4)			1.57 (0.76–3.23)	0.219
How extensive do you consider your knowledge of the influenza vaccine							
Very confident	1,361 (43.5)	1,280 (94.0)	81 (6.0)	88.5	<0.001	Ref	
Moderately confident	1,181 (37.8)	1,044 (88.4)	137 (11.6)			1.22 (0.87–1.72)	0.252
A little confident	447 (14.3)	354 (79.2)	93 (20.8)			1.45 (0.98–2.16)	0.065
Not at all confident	138 (4.4)	113 (81.9)	25 (18.1)			1.66 (0.91–3.03)	0.101

Abbreviations: OR=odds ratio; CI=confidence interval.

\* In terms of GDP per capita, provincial-level administrative divisions (PLADs) are divided into three levels: low, middle and high.

Low for Anhui, Qinghai, Jiangxi, Shanxi, Heilongjiang, Guangxi, Guizhou, Yunnan, Gansu;

Middle for Chongqing, Shaanxi, Liaoning, Jilin, Hunan, Hainan, Henan, Sichuan, Hebei;

High for Beijing, Shanghai, Tianjin, Jiangsu, Zhejiang, Fujian, Guangdong, Shandong, Inner Mongolia, Hubei.

Similar to other studies (4), the convenience of vaccination services is also an important factor for

PHWs considering vaccination. Over the past year, many vaccination facilities have been used for

COVID-19 vaccination, affecting the accessibility of influenza vaccines. The influenza vaccination payment did not affect the will of PHWs from this study. Generally, the first concern of PHWs with the medical background was the safety and effectiveness of vaccines. Influenza vaccine payment did not directly impact their vaccination decisions and intentions.

This study has some limitations. First, in the interest of quick, simple and feasible survey results, the online questionnaire was a quantitative survey without individual interviews. The results of the study were influenced by the cooperative attitude of the participants. Second, individual indicators vary considerably, and further expansion of the sample size is recommended. Third, specific differences could not be analyzed as the matrix questionnaire was used for PHWs' intention to recommend influenza vaccine.

In conclusion, in the context of the potential co-circulation of influenza and COVID-19 in Winter 2022–2023, targeted interventions are needed among HCWs to improve influenza vaccination attitudes and behaviors, reduce the social hazards of influenza and protect the health of the population at large.

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