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Factors affecting parental intention to vaccinate kindergarten children against influenza: A cross-sectional survey in China

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ABSTRACT

Background: The impact of influenza in children under 5 can be severe and fatal. However, the influenza vaccination uptake in China remains suboptimal. The objectives of this study were to investigate parents' perceptions on influenza vaccination and to assess vaccination promotional factors.
Methods: A cross-sectional survey among 1506 parents with children in kindergarten was conducted in two areas with different policies: self-paid vaccination and free vaccination. The questionnaire was based on the structure of the Health Belief Model (HBM). Multiple logistic regression was used to analyze the determinants of parental vaccination intention. Odds ratios (OR) and respective 95% confidence intervals (95% CI) are reported.
Results: Within the free policy group versus the non-free group, vaccination intention rates were 76.3% versus 83.4%, and vaccination rates were 34.2% versus 3.1%. Results from multivariate analysis showed that parents with high scores for perceived susceptibility (OR = 1.44; 95% CI: 1.09–1.91), perceived benefits (OR = 1.80; 95% CI: 1.30–2.50) and cues to action (OR = 3.32; 95% CI: 2.47–4.46) were more likely to get their children vaccinated, while those perceived more barriers (OR = 0.50; 95% CI: 0.37–0.68) had lower vaccination intention. More knowledge (OR = 1.74; 95% CI: 1.18–2.56) and preferable attitudes (higher perceived necessity: OR = 1.84; 95% CI: 1.53–2.22; less safety worry: OR = 1.35; 95% CI: 1.10–1.66) were associated with significantly higher vaccination intention. Adjusted for parents' gender, age, education, income and children's age, the same significant factors were found. Parental intention was found to be influenced by different vaccination policies. Under a free policy, past influenza vaccination uptake (OR = 4.52; 95% CI: 1.07–19.02) greatly promoted parents' willingness to vaccinate their children.
Conclusion: Parents had high intention to get their kindergarten children vaccinated with the influenza vaccine in spite of the low uptake rate. Our results indicate that offering free influenza vaccines and parental education over the next years may increase the influenza vaccination rate.

1. Introduction

Influenza-related morbidity, mortality and hospitalization rates among young children exceed those of other age groups [1,2]. According to a systematic review of studies from 1982 to 2012, influenza results in approximately 870,000 hospitalizations annually in children <5 years, and the influenza-associated hospitalization rates in developing countries are more than three times higher than those in industrialized countries [3]. In 2015, the number of child deaths from influenza reached about 10,200 all over the world [4]. The influenza vaccine is effective and widely recognized as the first line of defense against infection and related complications of influenza [5–7]. Current evidence shows that universal vaccination against influenza in children is not only beneficial to children themselves, but also brings significant health benefits and cost savings for the entire community [8].

The World Health Organization (WHO) recommends that children aged 6–59 months be considered a priority group for yearly vaccination against influenza. More than two-fifths of the world listed the influenza vaccine in their National Immunization Program as a means of improving vaccination rates in 2010, but influenza vaccination rates still remain suboptimal among children [9]. In mainland China, however, the influenza vaccine remains excluded from the National Immunization Program. According to estimations of the total annual supply of influenza vaccine, the

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vaccination rate in mainland China is merely 2% [10]. Another county-level data reveals that in 2016 only 12.87% of children in local kindergartens were administered the influenza vaccine [11]. Overall, the influenza vaccination rate in mainland China is far from satisfactory.

It is crucial to understand the factors affecting parental intention to vaccinate their children as parents are main decision makers in households. Previous research shows that parents' willingness to vaccinate is a strong predictor of child influenza vaccination [12]. Assessing these factors may also help us to implement interventions or polices which improve vaccination uptake.

Previous studies have introduced a few theories to explain people's willingness to receive vaccinations. The most convincing theoretical framework is the Health Belief Model (HBM), originally designed as a way of focusing efforts to improve public health by understanding why people failed to adopt a preventative health measure [13,14]. The HBM is composed of five core components that can influence health-related practice: perception of susceptibility, perception of severity, perception of benefits, perception of barriers, and cues to action [15,16]. The HBM has been extensively applied to studies exploring decision-making factors related to vaccine acceptance or refusal among target populations, for instance, students[17], medical services workers[18], young adult women[19], and the elderly[20]. Relatively, only a handful of studies applied it to understand parents making decision on influenza vaccination for their young children. For example, a cross-sectional survey conducted in Hong Kong investigated parental perceptions of influenza vaccination among parents of children aged 6 to 23 months, found that perceived benefits of influenza vaccine and perceived severity of influenza among parents were related to a higher likelihood of vaccine acceptance, while perceived side effects were barriers of vaccination intention[21]. Additionally, attitudes, beliefs, knowledge and vaccination experiences are also proved as predictors of vaccination against influenza [22,23]. Past vaccination experiences might help parents perceive more benefits and eliminate their safety worries, thus they tended to hold a more optimistic attitude towards further vaccination. A study in Guangzhou found children's past influenza vaccination positively associated with parental intention to vaccinate their children in the following year [24]. Moreover, many other sociodemographic factors, including parents' gender, age, education and income may also affect uptake.

However, existing studies adapting the HBM have a focus on an individual's perception but no enough investigation to external constraints, vaccine reimbursement policy for instance. Without vaccination subsidy, the out-of-pocket policy may contribute to relatively low vaccination uptake as people's demand for vaccines are proved sensitive to the price [25,26]. Prior research findings still need to be checked in China, where vaccination policy varies among areas. For example, the two sides of the Taiwan Straits, Taiwan and mainland China, share similar culture but have substantive policy differences. In 2004, a government-funded influenza vaccination was introduced in Taiwan and was available for all children aged 6–23 months, extended to all children over 6 months afterwards [27], whereas the vaccine was not nationally funded in mainland China. So far seasonal influenza vaccination remains exclude from the national immunization program in mainland China, and can only be purchased out-of-pocket with the exception of a few large cities where local governments provide subsidized influenza vaccine.

Thus, based on a modified HBM, the primary objective of this study is to investigate parents' perceptions on influenza vaccination; and to explore potential factors promoting parents to vaccinate their children. As a secondary aim, by comparing the two areas, we investigate whether the free policy could increase this intent and then enhance influenza vaccination rates.

2. Methods

2.1. Study setting and subjects

In this cross-sectional survey, data were collected using a questionnaire. Parents with young children in kindergarten (aged 3 to 6 years) were selected using stratified random sampling in two paired areas with different influenza vaccination policies in September 2015. One area is Xiamen in southeastern mainland China where there is a no-free policy, and the other in Hualian in eastern Taiwan where there is a free policy.

2.2. Sample size and enrollment

The initial sample size was calculated by the following formula (estimation for population probability, based on an α error of 0.05 and maximum permissible error δ equaling 0.10) [28]:$n = \left\{ \frac{Z_{\alpha/2}}{arcsin\left[\delta/\sqrt{P(1-P)}\right]} \right\}^2$. According to the Xiamen Municipal Bureau of Statistics, more than 136,100 children were enrolled in the 691 kindergartens in Xiamen in 2015. The rate of influenza vaccination among children (P) was set at 26% according to the latest national survey [29]. We estimated a minimum sample size of 1060 respondents and enlarged that to 1350. The enlargement of sample size was mainly based on three considerations: (1) the non-response rate (10% at least) and missing values of variables; (2) required sample size of logistic analysis is 10 times more than the number of predictors [30,31]; (3) both vaccination intention and uptake history were surveyed, thus the lower uptake rate was used to ensure a larger minimum sample size. The sample was stratified according to the distribution of study participants in each urban/suburban/rural area. Five schools were randomly selected from each district, and 30 children aged between 3 and 6 years were selected from each kindergarten level (junior, middle, and senior class). A total of 1211 questionnaires were considered valid (effective rate = 89.0%).

According to data from the Bureau of Public Health, there were 7617 children in Hualian in July 2015. Based on the data from the Taiwan Centers for Disease Control (CDC) database for 2014, the uptake rate of influenza vaccination among kindergarten children was estimated to be 59%. Based on this rate, we estimated that a minimum sample size of 266 respondents was required and enlarged the sample size to 390 in consideration of the response rate. The survey was conducted among parents of kindergarten children living in the 13 towns and townships of Hualian. A total of 295 questionnaires were considered valid (effective rate = 75.6%).

To assure the reliability of the self-reported data obtained from the self-administered questionnaires, data on children's demographic characteristics and vaccination status and history were validated by government records.

2.3. Measures

This study used an anonymous, population-based, semi-structured questionnaire which included the following four parts: (1) intention to vaccinate their children in the next year; (2) questions evaluating parents' knowledge and attitudes on influenza vaccination, and also vaccination history. Eight questions concerning influenza vaccines and vaccination were used to asses parents' knowledge. By counting the number of correct responses, we constructed a binary variable using 60% accuracy; (3) items measuring HBM variables, including susceptibility, seriousness, benefits, barriers and cues to action. A 5-point Likert scale (strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree)

was used to assess all these items; (4) items concerning sociodemographic characteristics, including age, gender, education and family monthly income.

The first draft of the questionnaire was developed based on previous studies [32,33]. To ensure content validity, the questionnaire was then improved based on reviews by five public health scholars or practicing experts. Confirmatory factor analysis was used to evaluate the construct validity of the instrument based on the 24-item scales for influenza vaccination derived from the HBM. The results revealed an acceptable model fit after including four correlation coefficients of error (GFI = 0.90, CFI = 0.97, $\chi 2/df = 3.83$). The reliability of each scale construct was evaluated according to Cronbach's α coefficients, which were 0.65, 0.82, 0.83, 0.81, and 0.70 for perceived susceptibility, perceived severity, cues to action, perceived benefits, and perceived barriers, respectively.

2.4. Data analysis

The database was created using Epidata (Version 3.1), and double entry and validation were used to ensure data quality. For descriptive analyses, we used Chi-square tests and t tests to identify significant differences between these two areas. The differences of HBM scores between those who intend to vaccinate children and those who have no intention were also determined by t tests.

Following this, we employed several multiple logistic regressions to identify the possible factors affecting parental intention. Model 1 only entered in five measures of HBM, including perceived susceptibility, severity, benefits, barriers, and cues to action. In Model 2, parents' knowledge, belief (safety worry, perceived necessity) and practice (vaccine history) were added to see the differences caused by. Finally, socio-demographic characteristics such as parents' age, gender, education, income, and children's' age were controlled for in Model 3. Furthermore, separate regressions were applied on two subsamples [34,35] to clarify whether the associations observed in Model 3 were affected by a free vaccination policy. The results were reported in Model 4 and Model 5. For all regressions above, OR and respective 95% CI were estimated. All analyses were performed using Stata version 14.0 (Stata Corp. 2015, Stata statistical software, College Station, TX, USA). The alpha level was set at 0.05.

2.5. Ethics statement

This study was approved by the ethical review committee of the School of Public Health, Xiamen University. Every participant provided informed consent at the first page of the questionnaire. The survey was conducted on a voluntary basis with agreement from the participants for the use of the collected data for scientific purposes.

3. Results

3.1. Demographics

Table 1 summarizes the basic demographic information for the sample. Of the 1506 respondents, most of them (73.8%) were mothers, and more than 60% were aged between 30 and 39 years in both Xiamen (74.2%) and Hualian (65.4%). More than half of the respondents (53.0%) possess a university/college degree or above. The respondents' economic status was also presented.

3.2. Parental perceptions and practice

Table 2 presents parents' intent and knowledge, attitude and vaccination history with regard to vaccinating kindergarten children against influenza by area. In Xiamen, 83.4% of the parents reported intent to vaccinate their children, whereas in Hualian, 76.3% of the parents reported this intent; the difference in intentions between the two regions was significant ($p < 0.001$). Moreover, only 3.1% (n = 37) of children in Xiamen had received the influenza vaccination during the previous year. The proportion of children who had received the influenza vaccination during the previous year was much higher in Hualian (34.2%) than in Xiamen ($p < 0.001$) (Fig. 1). We also found that 19.0% of the parents in Xiamen and 16.6% of those in Hualian believed that the influenza vaccination was unnecessary. In addition, 92.0% and 83.8% of the parents in Xiamen and Hualian respectively, expressed concerns about the safety of the influenza vaccine. Unexpectedly, in regard

Table 1
Socio-demographic characteristics of child, parents and household in the two areas.

Variables	Total (n, %)	Xiamen (n, %)	Hualian (n, %)	*P* value
Respondent				
Father	394 (26.2)	310 (25.6)	84 (28.5)	0.314
Mother	1112 (73.8)	901 (74.4)	211 (71.5)	
Parent's age (years)				
<30	262 (17.4)	223 (18.4)	39 (13.2)	0.000
30–39	1091 (72.5)	898 (74.2)	193 (65.4)	
≥40	152 (10.1)	89 (7.4)	63 (21.4)	
Parent's education				
Senior high school or below	707 (47.0)	440 (36.4)	267 (90.5)	0.000
University/college or above	798 (53.0)	770 (63.6)	28 (9.5)	
Monthly family income (RMB)				
<4000	167 (11.4)	146 (12.4)	21 (7.1)	0.009
4000–7999	345 (23.5)	268 (22.8)	77 (26.1)	
8000–11,999	428 (29.1)	346 (29.4)	82 (27.8)	
12,000–15,999	267 (18.2)	220 (18.7)	47 (15.9)	
≥16,000	264 (17.9)	196 (16.7)	68 (23.1)	
Child's age (years)				
3	363 (24.1)	293 (24.2)	70 (23.7)	0.959
4	505 (33.5)	409 (33.8)	96 (32.5)	
5	433 (28.8)	346 (28.6)	87 (29.5)	
6	205 (13.6)	163 (13.5)	42 (14.2)	

Table 2
Parents' intent and knowledge, attitude and vaccination history with regard to vaccinating kindergarten children against influenza by area.

	Variables	Total (N, %)	Xiamen (n, %)	Hualian (n, %)	*P* value
Intent	Vaccine intent				
	No	250 (16.6)	180 (14.9)	70 (23.7)	0.000
	Yes	1256 (83.4)	1031 (85.1)	225 (76.3)	
Knowledge	Total knowledge scores				
	<5	938 (62.3)	643 (53.1)	295 (100.0)	0.000
	5–8	568 (37.7)	568 (46.9)	0 (0.0)	
Worry degree	Don't worry about the safety of influenza vaccine				
	Very worried	251 (16.7)	223 (18.4)	28 (9.5)	0.000
	Worried	575 (38.2)	462 (38.2)	113 (38.3)	
	Somewhat worried	534 (35.5)	428 (35.4)	106 (35.9)	
	Not worried	119 (7.9)	85 (7.0)	34 (11.5)	
	Not very worried	26 (1.7)	12 (1.0)	14 (4.7)	
Perceived necessity	Influenza vaccination is necessary				
	Very unnecessary	76 (5.1)	63 (5.2)	13 (4.4)	0.020
	Unnecessary	202 (13.5)	167 (13.8)	36 (12.2)	
	Somewhat necessary	414 (27.6)	351 (29.0)	64 (21.7)	
	Necessary	635 (42.2)	499 (41.3)	136 (46.1)	
	Very necessary	175 (11.6)	129 (10.7)	46 (15.6)	
Vaccination history	Child's history of influenza vaccination				
	No	1368 (90.8)	1174 (96.9)	194 (65.8)	0.000
	Yes	138 (9.2)	37 (3.1)	101 (34.2)	

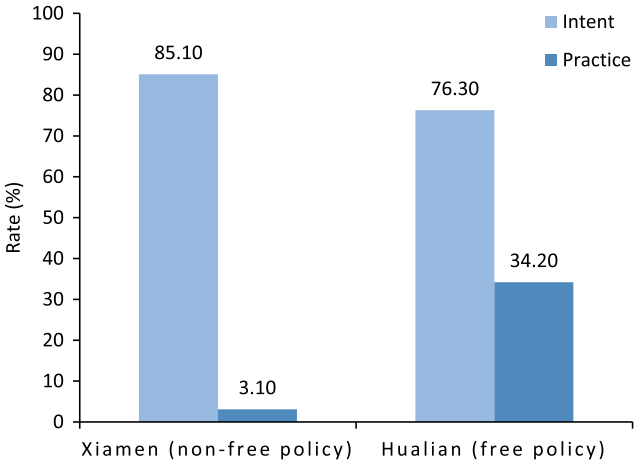

Fig. 1. Influenza vaccination intention and actual uptake rates between different policy modes.

to influenza vaccine related knowledge, the proportion of parents who reported to know more about the influenza vaccine were significantly higher in Xiamen compared with those in Hualian.

Table 3 shows the mean values of HBM categories. As expected, parents who perceived more susceptibility, severity, benefits, cues to action, and fewer barriers were more likely to vaccinate their children.

3.3. Factors affecting parental vaccination intention

Table 4 presents the multiple logistic regression results on the potential factors affecting parents' vaccination intention for the full sample. Consistent with bivariate analysis, the results in Model 1 showed that four constructs of HBM were significantly associated with parental intention. In Model 2, it was observed that there were also significant associations between parental intention and their knowledge and attitudes towards influenza vaccines.

According to model 3, in which demographic and economic variables were adjusted, results of Model 1 and Model 2 appeared to be robust. The parents who had higher scores for perceived susceptibility (OR = 1.44; 95% CI: 1.09–1.91), perceived benefits (OR = 1.80; 95% CI: 1.30–2.50) and cues to action (OR = 3.32; 95% CI: 2.47–4.46) were more likely to get their kindergarten children vaccinated, while those with high scores for perceived barriers (OR = 0.50; 95% CI: 0.37–0.68) had lower vaccination intention. In comparison, perceived severity (OR = 0.97; 95% CI: 0.74–1.27) was not significantly related to dependent variable, indicating that the severity of influenza was not a pivotal concern of parents when considering whether to vaccinate their children.

As expected, knowledge (OR = 1.74; 95% CI: 1.18–2.56) and attitudes (more perceived necessity: OR = 1.84; 95% CI: 1.53–2.22; less safety worry: OR = 1.35; 95% CI: 1.10–1.66) to influenza vaccine exerted an obvious impact on vaccination intention. Parents were more willing to get children vaccinated and held a more positive attitude towards vaccination when they knew more about the influenza vaccination. Meanwhile, no significant association between vaccination history and parental vaccination intention was observed among the full sample.

Additionally, there was a significant negative association between family income (over 16,000 yuan per month: OR = 0.46; 95% CI: 0.23–0.93) and vaccination intention. Moreover, respondents with a higher education level (university/college or above: OR = 1.54; 95% CI: 1.03–2.28) showed greater vaccination acceptance.

Table 3
Total values of HBM measures by intention to get free influenza vaccine.

Scale	Intend to get free influenza vaccine		Do not intend to get free vaccine		*t* test (*P* value)
	N	Mean (SD)	N	Mean (SD)	
Susceptibility	1256	3.06 (0.66)	250	2.70 (0.68)	0.000
Severity	1256	3.63 (0.71)	250	3.35 (0.75)	0.000
Benefits	1256	3.70 (0.60)	250	2.76 (0.72)	0.000
Barriers	1256	2.60 (0.64)	250	2.92 (0.63)	0.000
Cues to action	1256	3.03 (0.72)	250	2.24 (0.70)	0.000

Table 4
Logistic regression to identify factors affecting parental vaccination intention.

Variables	Vaccination intention		
	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
HBM			
Susceptibility	1.60* (1.24–2.06)	1.45* (1.11–1.91)	1.44* (1.09–1.91)
Severity	0.88 (0.69–1.12)	0.95 (0.73–1.23)	0.97 (0.74–1.27)
Benefits	2.29* (1.71–3.06)	1.68* (1.23–2.30)	1.80* (1.30–2.50)
Barriers	0.38* (0.29–0.49)	0.53* (0.40–0.70)	0.50* (0.37–0.68)
Cues to action	3.88* (2.95–5.11)	3.30* (2.47–4.40)	3.32* (2.47–4.46)
Knowledge, attitudes and behavior			
More knowledge		1.92* (1.32–2.78)	1.74* (1.18–2.56)
Less safety worry		1.30* (1.06–1.58)	1.35* (1.10–1.66)
More perceived necessity		1.91* (1.60–2.29)	1.84* (1.53–2.22)
Vaccinated during last year		2.66 (0.92–7.66)	2.66 (0.91–7.76)
Socio-demographic characteristics			
Mother			1.25 (0.82–1.91)
Parents age (years)			
< 30			Ref
30–39			0.83 (0.50–1.38)
≥40			0.61 (0.30–1.25)
Education			
Senior high school or below			Ref
University/college or above			1.54* (1.03–2.28)
Monthly family income (RMB)			
<4000			Ref
4000–7999			0.69 (0.35–1.35)
8000–11,999			0.58 (0.30–1.12)
12,000–15,999			0.56 (0.28–1.13)
≥16,000			0.46* (0.23–0.93)
Children age (years)			
3			Ref
4			0.90 (0.55–1.44)
5			0.81 (0.50–1.31)
6			0.67 (0.37–1.19)
Constant	0.07* (0.02–0.23)	0.00 (0.00–0.02)	0.01* (0.00–0.02)
Observations	1506	1503	1468

*p < 0.05, **p < 0.01, ***p < 0.001.

3.4. Comparison between two policy modes

To investigate whether the effects of the above independent variables on vaccination intention are different under different policy modes, separate multiple logistic regressions were run for two subgroups: with or without a free vaccination policy.

As shown in Table 5, the overall results were consistent with previous findings. However, we can still find certain differences from the estimated OR. The variable concerning parents' knowledge on influenza vaccination was omitted. Parents living in areas offering free influenza vaccination tended to perceive more susceptibility and necessity of influenza, less barriers, more benefits and cues to action regarding vaccination. Apart from the positive association between parents' education level and vaccination intention was no longer significant when respondents were divided into the two policy groups. The effects of parents' gender and monthly family income were also found to be no longer significant under a non-free vaccination policy. Moreover, in Hualian offering free influenza vaccination, mothers (OR: 4.37, 95% CI: 1.37–13.96) and parents aged 30–39 (OR: 4.19, 95% CI: 1.00–17.43) are more willing to vaccinate their children compared with other groups.

Specially, vaccination history during last year (OR = 4.52; 95% CI: 1.07–19.02) was positively associated with parental vaccination intention under a free vaccination policy compared with a non-free policy where there was no positive association. Among all these factors in Model 5, vaccination history showed the greatest impact on parental vaccination intention.

4. Discussion

It is widely recognized that influenza vaccination can effectively prevent infection and associated morbidity and mortality [36,37]. As primary caregivers, parents' preference or hesitancy have a direct association with children vaccination uptake [38,39]. This study investigated the role of HBM, knowledge, attitudes, and sociodemographic factors pertaining to parents' intention to vaccinate their children for influenza in a sample of two policy modes. Also, this is one of the first studies to identify the impact of a free vaccination policy on vaccine acceptance.

The results revealed an overwhelming parental preference for the administration of influenza vaccine to their kindergarten children. Despite the high intention to vaccinate, this study found a much lower vaccination rate among kindergarten children, especially under a non-free policy. Although it's generally acknowledged that the influenza vaccine is effective and the WHO recommends that children aged between 6 and 59 months be prioritized for annual vaccination against influenza, the vaccination rate in our two surveyed areas remains suboptimal. The vaccination rate under a non-free policy (3.1%) is much lower than the free policy (34.2%). In total, the vaccination rates found in this study are lower than the vaccination rates recorded in a similar survey conducted by the US CDC on children. This US survey suggested that 49.2% of children aged between 4 months and 4 years and 39.0% of children aged between 5 years and 12 years were vaccinated by November 2017 [40]. This significant gap in vaccination rates between the two studies may be due to economic barriers,

Table 5
Comparison of determinants of vaccination intention between different policies.

Variables	Vaccination intention	
	Model 4 Non-free policy OR (95% CI)	Model 5 Free policy OR (95% CI)
HBM		
Susceptibility	1.35 (0.98–1.87)	2.41* (1.09–5.35)
Severity	1.00 (0.73–1.35)	0.73 (0.31–1.74)
Benefits	1.96* (1.31–2.92)	2.73* (1.22–6.12)
Barriers	0.51* (0.35–0.73)	0.31* (0.14–0.68)
Cues to action	3.14* (2.16–4.57)	4.52* (2.17–9.43)
Knowledge, attitudes and behavior		
More knowledge	1.21 (0.80–1.84)	
Less safety worry	1.45* (1.13–1.86)	1.62 (0.92–2.85)
More perceived necessity	1.74* (1.39–2.16)	3.83* (2.06–7.16)
Vaccinated during last year		4.52* (1.07–19.02)
Socio-demographic characteristics		
Mother	0.99 (0.60–1.62)	4.37* (1.37–13.96)
Parents age (years)		
<30	Ref	Ref
30–39	0.88 (0.49–1.59)	4.19* (1.00–17.43)
≥40	0.70 (0.29–1.67)	2.99 (0.56–16.09)
Education		
Senior high school or below	Ref	Ref
University/college or above	0.73 (0.45–1.21)	2.24 (0.48–10.45)
Monthly family income		
<4000	Ref	Ref
4000–7999	0.87 (0.41–1.80)	0.74 (0.06–8.46)
8000–11,999	1.00 (0.48–2.07)	0.15 (0.01–1.76)
12,000–15,999	0.91 (0.42–1.95)	0.17 (0.01–2.45)
≥16,000	1.08 (0.49–2.40)	0.07* (0.00–0.94)
Children age (years)		
3	Ref	Ref
4	0.78 (0.45–1.35)	1.50 (0.41–5.51)
5	0.88 (0.50–1.55)	0.41 (0.10–1.62)
6	0.59 (0.30–1.15)	1.02 (0.19–5.35)
Constant	0.02* (0.00–0.16)	0.00* (0.00–0.00)
Observations	1136	295

*p < 0.05, **p < 0.01, ***p < 0.001.

reimbursement policy or cognition differences. Promotion of influenza vaccination targeting this age group in China is urgently needed.

In accordance with existing research, four categories of the Health Belief Model were found to be consistently related to vaccination intention [17,41]. In both areas with or without a free vaccination policy, parents who intended to vaccinate their children felt at higher risk of contracting the flu and they also perceived there to be more benefits from vaccination. Conversely, those who refused the influenza vaccine reported more barriers and fewer cues to action than average. Besides, it has been suggested in most studies that perceived susceptibility is useful in predicting health behavior. This study did not find perceived susceptibility as a significant predictor.

Yang et al. found that existing knowledge was not related to higher vaccination intention, indicating that knowledge does not help to engage in health or behavioral change [41]. In our study, however, parents' knowledge on vaccines strongly explained vaccination intention in a combined model. When separated into two subgroups, the association disappeared, which indicates that the impact of knowledge might be moderated by the free policy.

We also found parents' vaccination intention was strongly related to their attitudes. Specifically, more favorable attitudes towards the vaccine could contribute to vaccination acceptance. It is observed that a large proportion of the participants reported their worries about vaccine safety and people under a non-free policy were more anxious, which could also explain why some of them refused to vaccinate children. Results from logistic regression analysis validated this assumption. This reveals the importance of broadening health education towards targeting population, especially young parents, to eliminate their worries about vaccines safety. However, this work faces unprecedented difficulty in mainland China, considering for the large-scale vaccine scandals causing worst confidence crisis one after another [42].

Previous studies have found a positive association between vaccination history and further vaccination intention. Regular users of the influenza vaccine tended to perceive more seriousness of seasonal flu and to hold more positive attitudes about vaccine safety and its value [43]. People who had a previous history of seasonal vaccination were more likely to accept pandemic vaccine [44]. In this study, vaccination history was not found to be significant in a combined model but had a greatest positive effect on vaccination intention when the model only included a sample from an area with a free vaccination policy. A possible explanation could be the long-standing gap of vaccination rate between the two policy groups. Besides, this important factor might be related to different vaccination policies, as a free policy could ease parents' economic burden and create more intense external cues to promote parents' engagement. According to a globally comparative study by Abraham, the presence of reimbursement policy correlated strongly with higher seasonal influenza vaccine supply [45]. Though the reasoning is only speculative, more crucial conclusion may be that policy did exert certain differences. This indicates that a free policy may be a feasible way to encourage vaccination practice as well as to raise the local vaccination rate. Up to now, only a few large cities in mainland China have provided reimbursed influenza vaccination to particular groups of citizens [46]. For example, Beijing started to eliminating influenza vaccination fees for people over 60 years old every winter since 2007, obviously raised the willingness to receive the vaccine among the elderly with lowest income [47].

Moreover, our results suggested that families with highest monthly income had lowest vaccination intention, which coincides with a previous finding that vaccination rates among children tend to be higher in families with lower economic and social status [48]. It was also found that parents' education level could impact vaccination intention positively, possibly because of deeper knowledge and more awareness on vaccines obtained from higher education.

Despite the heterogeneous nature of people's intention, the government can still employ our findings as promising tools to increase influenza vaccine uptake. Providing free influenza vaccines or some other cues to action such as timely information would be useful strategies to enhance influenza vaccination coverage and increase the intent to vaccinate. Meanwhile, great importance should be attached to the provision of information, as a recent study indicates that a crucial factor affecting influenza vaccine uptake among elderly in China is awareness of the free policy [49]. Furthermore, education on influenza vaccines should be broadened among young parents and other caregivers to improve their knowledge on vaccination.

The limitations of this study include potential selection bias. As reported, a majority of the parents we surveyed were female, probably because those who picked up or dropped children are usually mothers other than fathers. This gives rise to selection bias as mothers are found to have a stronger desire to improve child health [50]. Also, respondents of this cross-sectional survey were only selected from two cities, observing a small snapshot of the whole population. This may limit the generalization of the results to other areas.

5. Conclusion

This is one of the first studies to identify the impact of vaccination policies on vaccination intention. Our results showed

that parents had high intention to get their kindergarten children vaccinated against influenza in spite of the low uptake rate. Factors positively affecting vaccination intention included three constructs of HBM, parents' knowledge, attitudes and especially past influenza vaccination uptake. A free vaccination policy was found strongly correlated with higher vaccination intention. Our study findings urge the need to offer free influenza vaccines to children and more education to parents in order to increase the vaccine uptake rate.

Conflicts of interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

All authors attest they meet the ICMJE criteria for authorship.

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Author contributions

Conceptualization, Yanbing Zeng and Ya Fang; Formal analysis, Yanbing Zeng and Zhipeng Yuan; Funding acquisition, Yanbing Zeng and Ya Fang; Project administration, Jiahui Yin and Cheng-I Chu; Writing – original draft, Yanbing Zeng, Zhipeng Yuan and Jiahui Yin; Writing – review & editing, Yaofeng Han and Ya Fang.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2019.01.071.

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