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## Knowledge, Attitudes and Beliefs Related to Seasonal Influenza Vaccine among Pregnant Women in Thailand

Darunee Ditsungnoen<sup>1</sup>, Adena Greenbaum<sup>2</sup>, Prabda Praphasiri<sup>1</sup>, Fatimah S. Dawood<sup>2</sup>, Mark G. Thompson<sup>2</sup>, Pornsak Yoocharoen<sup>3</sup>, Kim A. Lindblade<sup>1,2</sup>, Sonja J. Olsen<sup>2</sup>, and Charung Muangchana<sup>4</sup>

<sup>1</sup>Influenza Program, Thailand Ministry of Public Health – U.S. Centers for Disease Control and Prevention Collaboration, Nonthaburi, Thailand <sup>2</sup>Influenza Division, Centers for Disease Control and Prevention, Atlanta, Georgia, United States <sup>3</sup>Department of Disease Control, Ministry of Public Health, Nonthaburi, Thailand <sup>4</sup>National Vaccine Institute, Ministry of Public Health, Nonthaburi, Thailand

### Abstract

**Background**—In 2009, Thailand recommended pregnant women be prioritized for influenza vaccination. Vaccine uptake among Thai pregnant women is lower than other high-risk groups.

**Methods**—During December 2012–April 2013, we conducted a cross-sectional survey of a convenience sample of Thai pregnant women aged 15 years attending antenatal clinics at public hospitals in 8 of 77 provinces. A self-administered questionnaire covered knowledge, attitudes, and beliefs related to influenza vaccination using the Health Belief Model. We examined factors associated with willingness to be vaccinated using log-binomial regression models.

**Results**—The survey was completed by 1,031 (96%) of 1,072 pregnant women approached. A total of 627 (61%) women had heard about influenza vaccine and were included in the analysis, of whom 262 (42%) were willing to be vaccinated, 155 (25%) had received a healthcare provider recommendation for influenza vaccination and 25 (4%) had received the influenza vaccine during the current pregnancy. In unadjusted models, high levels of perceptions of susceptibility (prevalence ratio [PR] 1.5, 95% CI 1.2–2.0), high levels of belief in the benefits of vaccination (PR 2.3, 95% CI 1.7–3.1), moderate (PR 1.7, 95% CI 1.2–2.3) and high (PR 3.4, 95% CI 2.6–4.5) levels of encouragement by others to be vaccinated (i.e., cues to action) were positively associated with willingness to be vaccinated. Moderate (PR 0.5, 95% CI 0.4–0.7) and high levels of (PR 0.5, 95% CI 0.4–0.8) perceived barriers were negatively associated with willingness to be vaccinated.

**Corresponding author:** Charung Muangchana, MD, PhD, National Vaccine Institute (NVI), DDC 4th Building, 2nd Floor, Ministry of Public Health, Tivanon, Rd., Nonthaburi 11000 Thailand, charungm@hotmail.com.

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In the final adjusted model, only moderate (PR 1.5, 95% CI 1.1–2.0) and high levels of cues to action (PR 2.7, 95% CI 2.0–3.6) were statistically associated with willingness to be vaccinated.

**Conclusion**—Cues to action were associated with willingness to be vaccinated and can be used to inform communication strategies during the vaccine campaign to increase influenza vaccination among Thai pregnant women.

### Keywords

Seasonal influenza vaccine; pregnant women; Thailand

## Introduction

Influenza is an important cause of morbidity and mortality worldwide, and pregnant women are at increased risk of severe complications compared with the non-pregnant population [1, 2]. During the 2009 influenza A(H1N1) pandemic, hospitalized and intubated patients with influenza were significantly more likely to be pregnant women compared to community controls [3]. The mortality rate among pregnant women from influenza and pneumonia during the 2009 pandemic was 2- to 3- fold higher than among non-pregnant women [4–6], and women who died were more likely to be pregnant than those who did not [6].

Influenza vaccination is the most effective strategy for preventing illness associated with influenza infection and reducing influenza-related complications [7, 8]. Vaccination during pregnancy provides benefits to both mother and newborn [9, 10]. A randomized controlled trial and a prospective cohort study both found that maternal influenza vaccination was effective at preventing laboratory-confirmed influenza in infants up to six months of age, who are not yet eligible for influenza vaccination [10, 11]. Maternal vaccination is also associated with a reduced risk of influenza-associated hospitalizations in infants less than six months old [12, 13].

In 2009, the Thai Advisory Committee on Immunization Practices recommended seasonal influenza vaccine for pregnant women in the second and third trimester of pregnancy as a high priority group, after which the vaccine was made available free of charge through the Universal Coverage Scheme (a national health insurance available to all Thais) [14, 15]. The amount of vaccine available is far less than needed for all recommended high risk groups, and between 2010 and 2012, coverage of seasonal influenza vaccine in pregnant women was less than 1% and far lower than other high risk groups [14]. The reasons for the low uptake of influenza vaccine among pregnant women in Thailand are not known, and the knowledge, attitudes and health beliefs of pregnant women in Thailand about seasonal influenza vaccination have not been investigated extensively. Understanding how these factors affect influenza vaccination would improve communication campaigns directed at pregnant women's awareness of the benefits of influenza vaccination and concerns regarding vaccine safety. In this evaluation, we identified factors among pregnant women that were associated with willingness to receive the seasonal influenza vaccine.

## Methods

During December 2012-April 2013, we conducted a cross-sectional survey among a convenience sample of pregnant Thai women who attended antenatal clinics (ANCs) at public hospitals. In Thailand, the largest influenza virus activity peaks between June and October [16] and therefore the influenza vaccine campaign runs between May and September each year [14]. We purposively selected seven provinces plus the Bangkok Metropolitan Area to draw from the four regions of Thailand (central, northern, southern and northeastern). We selected the provincial hospital and three district hospitals from each province, and the only government maternity hospital plus three health centers from the Bangkok Metropolitan area. We allocated a target number of women for enrolment to each hospital and health center in advance with an overall enrolment goal of 1,072 women. The ANC clinics are usually open one to two days per week, and surveys were only administered on days during which ANC clinics were open. Study staff approached pregnant women who visited ANC clinics and obtained verbal consent from all pregnant women before administering the survey. Surveys were conducted on multiple days in order to reach the sample size for each hospital. Women were eligible for participation if they were of Thai nationality, aged 15 years, could read and write Thai and provided verbal consent. As the survey was evaluating a national public health program, it was considered program evaluation and exempted from ethical review by the Thai Ministry of Public Health (Nonthaburi, Thailand) and the U.S. Centers for Disease Control and Prevention (Atlanta, GA).

The questionnaire requested demographic information, history of previous influenza vaccination and knowledge of influenza virus infection and vaccination. Questions related to attitudes towards influenza vaccination were based on the Health Belief Model (HBM) which includes five constructs that influence health behaviors, namely perceptions of susceptibility, severity, barriers, benefits, and cues to action [17]. The HBM posits that people are likely to exhibit disease prevention behaviors (such as vaccination) if they perceive that they are susceptible to the disease, the disease is severe, the behavior is beneficial, and barriers are minimal [18]. In addition, cues to action, such as recommendations of health care providers or health messages, can affect behaviors. We adapted and modified questions from previous published literature [18, 19] and translated them into the Thai language. Two statements in the questionnaire focused on perceived susceptibility to getting influenza for both mother and infant; two on perceived severity of influenza infection for mother and infant; three on perceived barriers of influenza vaccine; three on perceived benefits of the vaccine; and five on cues to action (i.e., encouragement by others to be vaccinated).

Participants who had never heard of the influenza vaccine were excluded from analysis of factors affecting vaccination since our study was designed to assess pre-existing attitudes towards influenza vaccination. Among the women who had heard of the influenza vaccine, those who reported having received an influenza vaccine or reported that they wanted to get the influenza vaccine during their current pregnancy were considered willing to be vaccinated. We grouped response answer for HBM individual items into two groups: 1) agree, or 2) disagree or don't know/not sure. Participants' level of concern about their

personal susceptibility to influenza during this pregnancy and their unborn child's susceptibility were categorized as 1) moderate or very concerned, or 2) little or not concerned or don't know. We compared the proportion of women who agreed with the statements or were moderately or very concerned between women willing and unwilling to be vaccinated using a Chi-square test.

Individual HBM items were re-coded to three levels (Supplemental Table 1) such that higher values corresponded to a greater degree of agreement or importance as: 1 = unlikely, low or disagree; 2 = uncertain or moderate, and 3 = likely, high or agree [20]. The individual HBM items were combined based on conceptual similarity into HBM constructs and then summed to create scores for each component of the HBM framework. In order to facilitate interpretation, participants were divided into tertiles by their summed score to create three (low/moderate/high) categories for each HBM construct, with the exception of perceived severity which was scored dichotomously (low/high) given the high kurtosis (peakedness) of the distribution [20].

The associations between demographic characteristics and HBM constructs with willingness to be vaccinated were analyzed using a log-binomial model with a generalized estimating equations approach. Standard errors were adjusted for data clustered by hospital using a robust sandwich estimator with an exchangeable correlation structure; prevalence ratios (PR) and 95% confidence intervals (CI) were calculated. All HBM constructs plus any patient characteristic variables statistically associated with willingness to be vaccinated ( $P < 0.05$ ) were included in the multivariable modeling process, although variables highly correlated with the outcome (such as previous history of vaccination) were excluded. Model selection proceeded by backward step selection to identify the set of parameters that minimized the quasi-likelihood information criterion [21]. All statistical analyses were performed with SPSS (IBM SPSS Statistic 20).

## Results

### Demographic characteristics of pregnant women and willingness to be vaccinated

Of 1,072 pregnant women approached from 32 facilities, 1,031 (96%) completed the questionnaire. Of these 1,031 women, 627 (61%) had heard about the influenza vaccine and were considered the analytical sample (Figure 1). Women who had heard about the influenza vaccine were more likely to be educated (PR 1.7, 95% CI 1.4–2.0), aged 25–34 years (PR 1.495% CI 1.3–1.6), aged 35–45 years (PR 1.4 95% CI 1.2–1.6), have universal health insurance (PR 1.8, 95% CI 1.2–2.7), have received influenza vaccine during a previous pregnancy (PR 1.3, 95% CI 1.2–2.7), and have received influenza vaccine during the current pregnancy (PR 1.3, 95% CI 1.2–1.5) than women who had not heard of the vaccine (Supplemental table 2).

Among women familiar with influenza vaccine, the median age was 27 years (inter-quartile range [IQR] 22–31 years) and median gestational age at time of interview was 28 weeks (IQR 17–35 weeks). The average household income in our survey was 15,767 Thai Baht per month (493 U.S. dollars) and almost half of participants were earning less than 10,000 Baht (313 U.S. dollars) per month. Most of the participants were married (97%), 50% worked

outside the home, and 98% had health insurance through the Universal Coverage Scheme. Sixty-three (10%) pregnant women had received influenza vaccine during a previous pregnancy and 25 (4%) had received it during their current pregnancy.

Two hundred and sixty-two (42%) women reported being willing to receive the seasonal influenza vaccine (Figure 1). Most demographic characteristics were similar between women willing and not willing to receive the influenza vaccination (Table 1), but women who had received an influenza vaccine during a previous pregnancy were twice as likely to be willing to receive an influenza vaccine during the current pregnancy (PR 2.1, 95% CI 1.8–2.5).

### Health beliefs of pregnant women and willingness to be vaccinated

Perceived susceptibility to influenza, severity of influenza, benefits of influenza vaccine and cues to action were higher among women who were willing to be vaccinated than those who were not (Table 2). Among women willing to be vaccinated, 42% perceived themselves as susceptible to influenza compared with 28% of women unwilling to be vaccinated ( $P<0.001$ ). A greater proportion of pregnant women who were willing to be vaccinated than those not willing believed the influenza vaccine would protect their unborn child (78% vs. 52%,  $P<0.001$ ) or themselves (83% vs 53%,  $P<0.001$ ). Women willing to be vaccinated were much more likely than women unwilling to be vaccinated to respond to cues to action to be vaccinated from the MOPH (74% vs. 34%,  $P<0.001$ ), relatives (59% vs. 20%,  $P<0.001$ ), husband (60% vs. 20%,  $P<0.001$ ), nurse (77% vs. 49%,  $P<0.001$ ) and physicians (87% vs. 65%,  $P<0.001$ ).

In univariate models, high levels of perceived susceptibility of influenza illness, high levels of perceived benefits of vaccination, and moderate and high levels of cues to action were positively associated with willingness to receive the influenza vaccine, while perceived barriers of vaccination were negatively associated with willingness to be vaccinated in pregnant women (Table 3). In the final model, moderate (PR 1.5 95% CI 1.1–2.0) and high (PR 2.7 95% CI 2.0–3.6) level of cues to action were statistically associated with willingness to be vaccinated (Table 3).

## Discussion

We surveyed pregnant women receiving antenatal care at public clinics in Thailand as part of a national influenza vaccine program evaluation. Our evaluation suggests that two out of three pregnant women had heard about the influenza vaccine but <5% of women who had heard about the vaccine received it during their current pregnancy. Although vaccine uptake was low, 42% of women who were familiar with the influenza vaccine said they would be willing to be vaccinated. Cues to action such as recommendations for vaccination from healthcare providers, relatives and husbands were independently associated with willingness to be vaccinated among Thai pregnant women after adjusting for other variables. Although in univariate models, perceived susceptibility to influenza and perceived benefits to influenza vaccination were associated with greater willingness to be vaccinated in pregnant women, and perceived barriers were associated with lower willingness to be vaccinated, these associations were no longer statistically significant after adjusting cues to action.

Although the Thai Advisory Committee on Immunization Practices expanded influenza vaccine recommendations to include pregnant women as a high priority group in 2009, seasonal influenza vaccine coverage among Thai pregnant women was reported to be only 0.9–1.1% during 2010–2012, and much lower than other high risk groups [14]. Vaccination coverage among Thai pregnant women may be low for several reasons. First, access may be insufficient, since national influenza vaccine supplies are limited and are determined by estimates of the number of persons with chronic diseases without accounting for pregnant women as a separate risk group. Each year, the Thai government purchases 3.5 million doses of vaccine, whereas the population of Thailand is 66 million with approximately 10 million persons with chronic disease and 700,000 pregnant women.[14]. Thus, the government may wish to consider the number of pregnant women each year when purchasing influenza vaccine to increase influenza vaccine coverage. Second, we found that healthcare provider recommendations were an important cue to action for influenza vaccine acceptance among Thai pregnant women, but only 25% of pregnant women had received a healthcare provider recommendation for influenza vaccination. Improving access to influenza vaccines by increasing the supply of government-funded vaccine available each year and increasing healthcare provider awareness of the importance of recommending influenza vaccination to pregnant women might increase vaccination coverage rates among Thai pregnant women.

HBM theory provides a valuable framework for evaluating factors associated with vaccination behavior. Using the HBM model, we found that cues to action were the most important factors associated with willingness to receive influenza vaccine. Prior studies have identified healthcare providers' recommendations as an important cue to action for pregnant women to receive influenza vaccine [22, 23]. A study by Geraldine and colleagues (2011) demonstrated that the factors associated with higher rate of vaccination during the influenza A(H1N1) 2009 pandemic were vaccination occurring toward the end of pregnancy, and confidence in advice offered by health professionals [23]. In our study population, a recommendation for vaccination from a family member or husband was also an important cue to action suggesting that vaccination campaigns could also target family members as well as pregnant women themselves in order to increase vaccination coverage.

Surprisingly, after accounting for cues to action, potential barriers to influenza vaccination, including safety concerns and lack of confidence in the effectiveness of the vaccine, were not important predictors of willingness to be vaccinated in our survey. This finding is in contrast with several previous studies of pregnant women conducted in Western countries [24–26]. In the Georgia Pregnancy Risk Assessment and Monitoring System, unvaccinated respondents cited a variety of reasons for not receiving the influenza vaccine including worries that the vaccine might harm their babies (27%) or themselves (26%) [27]. Similarly, in a cross-sectional survey of pregnant women at an academic, tertiary care hospital in Pennsylvania, 61% of the women reported concern about vaccine safety during pregnancy and 8% reported the belief that the influenza vaccine caused influenza [28]. As perceived barriers were associated with lower willingness to be vaccinated in univariate models, it is likely that confidence in recommendations of healthcare providers and family members overrides any personal concerns about safety or effectiveness.

Our evaluation had several limitations. First, the survey was not a probability sample, and therefore it is unclear how representative the sample is of the pregnant Thai population. Our finding of a much higher rate of vaccination in this sample than in national estimates suggests that our sample was more interested and knowledgeable of the influenza vaccine than the general population. Second, our evaluation was conducted only in public hospitals, and therefore, our survey population may not be representative of Thai pregnant women who receive antenatal care at private hospitals or sub-district hospitals and women who do not receive antenatal care. A survey of Health Behaviors during pregnancy and breastfeeding in Thailand in 2013 found that 71% pregnant women received antenatal care at public hospital, 4% at private hospital, 17% at private clinic, and 8% at sub-district health promotion hospital [29]. A report from the National Statistics Office found that the proportion of Thai pregnant women who received antenatal care at least four times during their pregnancy was 93% [30]. Finally, our evaluation was not conducted during the influenza vaccine campaign period (May to September), so the answers from this survey may not reflect beliefs one would encounter during periods when the vaccine is being promoted.

## Conclusions

In this survey 39% of pregnant women had never heard of the influenza vaccine and only one in 25 received the vaccine during the current pregnancy. Cues to action such as a healthcare provider, relative or husband recommendation to get the vaccination were important to a pregnant women's willingness to receive the influenza vaccine. These findings suggest that improve communication strategies directed toward pregnant women, their families and their providers are needed during vaccine campaigns in Thailand.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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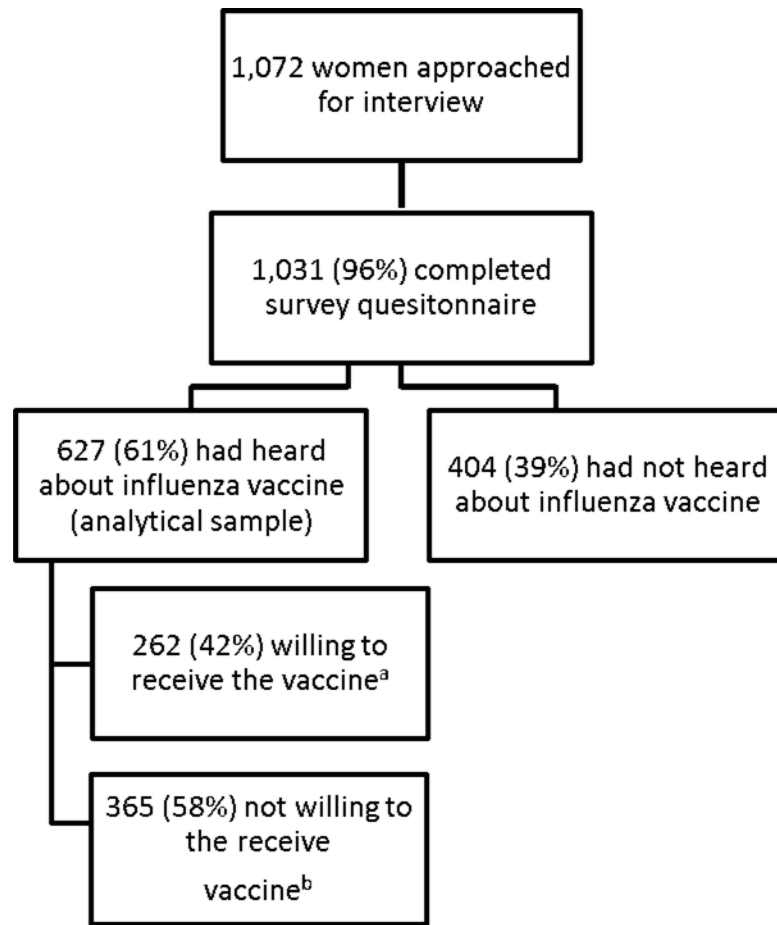
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**Figure 1. Flow chat of pregnant women survey**

<sup>a</sup>Willing to receive the vaccine: pregnant women who responded “yes” to one of the following questions: “Did you receive influenza vaccine during this pregnancy?” or “Do you want to get influenza vaccine or not?”

<sup>b</sup>Not willing to receive the vaccine: pregnant women who responded “no” “not sure” and “not now, need more information” to “Do you want to get influenza vaccine or not?”

**Table 1**

Descriptive characteristics of pregnant women by willingness to be vaccinated, Thailand, 2013

<b>Factors</b>	<b>Willing to be vaccinated N (%) (n=262)</b>	<b>Not willing to be vaccinated N (%) (n=365)</b>	<b>Prevalence Ratio</b>	<b>95 % confidence interval</b>
Age (years)				
15–24	116 (44)	133 (36)	1.0	–
25–34	112 (43)	185 (51)	0.8	0.7–1.0
35–45	34 (13)	47 (13)	0.9	0.7–1.2
Gestational age (weeks)				
First trimester (1–13 weeks)	47 (18)	59 (16)	1.0	–
Second trimester (14–27 weeks)	88 (34)	118 (32)	1.0	0.7–1.3
Third trimester (>27 weeks)	127 (48)	188 (52)	0.9	0.7–1.2
Married	253 (97)	356 (98)	0.8	0.8–1.3
Highest level of education				
None or primary	32 (12)	48 (8)	1.0	–
Secondary school	174 (66)	222 (61)	1.1	0.8–1.5
Diploma or higher	56 (21)	95 (26)	0.9	0.7–1.3
Household income <10,000 Baht per month	149 (57)	174 (48)	1.2	1.0–1.5
Work outside of home	120 (45)	193 (53)	1.1	0.9–1.4
Health insurance that covered influenza vaccination	257 (98)	356 (98)	1.2	0.6–2.4
Received influenza vaccine during previous pregnancy	50 (19)	13 (4)	2.1	1.8–2.5
Received influenza vaccine during current Pregnancy	25 (9.5)	–	–	–

Table 2

Comparison of the proportion of pregnant women who agreed with various health beliefs by willingness to receive the influenza vaccination, Thailand, 2013 (N=627)

Health Belief Model Construct	Item	Wording	Willing to be vaccinated		PRC	p-value <sup>d</sup>
			(n=262) % agreed <sup>a</sup>	(n=365) % agreed <sup>a</sup>		
<b>Perceived susceptibility<sup>b</sup></b>	Susceptible to influenza	I am moderately or very concerned about getting influenza	41.6	27.9	1.4	<0.001
		I am moderately or very concerned about my unborn baby getting influenza	27.1	18.4	1.3	0.009
<b>Perceived severity<sup>b</sup></b>	Influenza more severe in pregnancy	If a pregnant woman gets influenza, she is more likely to have severe illness compared to the general public	70.6	57.3	1.4	0.001
	Harm baby	If a pregnant woman gets influenza, the illness could harm her unborn baby	76.3	69.3	1.2	0.053
<b>Perceived barriers<sup>b</sup></b>	Vaccine causes illness	Influenza vaccine can cause a person to get sick with influenza	9.9	10.4	1.0	0.842
	Vaccine not safe	Influenza vaccine is not safe during pregnancy	4.6	4.4	1.0	0.906
	Vaccine not effective	Influenza vaccine is not an effective way to prevent a pregnant woman from getting sick with influenza	2.3	2.5	1.0	0.887
<b>Perceived benefits<sup>b</sup></b>	Protects unborn/new born baby	Giving influenza vaccine to a pregnant woman will benefit her fetus and new born baby	78.2	52.1	2.1	<0.001
	Protects child	Influenza vaccine could protect the baby during the first months of life	77.9	52.6	2.1	<0.001
	Protects women	Getting influenza vaccine during pregnancy is a benefit for the pregnant woman	82.8	53.2	2.5	<0.001
<b>Cues to action<sup>b</sup></b>	MOPH	If MOPH recommended influenza vaccine for pregnant women I would get vaccinated	74.0	34.2	2.8	<0.001
	Relatives	If relative recommended influenza vaccine for pregnant women I would get vaccinated	58.8	19.5	2.5	<0.001
	Husband	If husband recommended influenza vaccine for pregnant women I would get vaccinated	60.3	20.3	2.6	<0.001
	Healthcare provider	If nurse recommended influenza vaccine for pregnant women I would get vaccinated	77.1	48.8	2.2	<0.001
		If physician recommended influenza vaccine for pregnant women I would get vaccinated	86.6	64.7	2.3	<0.001

<sup>a</sup>The % agreed was calculated from frequency of participant who answered "agree" or "Moderate and very much concerned (likely)" after we recoded scale (see Supplemental Table 1)

<sup>b</sup>Original scale was recoded and collapsed to three levels (see Supplemental Table 1)

$p$ -value based on Chi-Square test

$PR = \frac{p}{1-p}$  Prevalence ratio

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**Table 3**  
Prevalence ratios for association between Health Belief Model constructs and willingness to receive the influenza vaccination among pregnant women in Thailand, 2013 (N=627)

Health Belief Model construct	Willing to be vaccinated (n=262) N (%)	Not willing to be vaccinated (n=365) N (%)	Unadjusted PR <sup>a</sup>	95 % CI <sup>b</sup>	Adjusted <sup>c</sup> PR <sup>a</sup>	95% CI <sup>b</sup>
Perceived susceptibility						
Low (Reference)	67 (25)	121 (33)	1.0	–	–	–
Moderate	109 (42)	170 (47)	1.1	0.9–1.4		
High	86 (33)	74 (20)	1.5	1.2–2.0		
Perceived severity						
Low (Reference)	105 (40)	180 (49)	1.0	–	–	–
High	157 (60)	185 (51)	1.2	1.0–1.6		
Perceived barriers						
Low (Reference)	166 (64)	137 (37)	1.0	–	1.0	–
Moderate	64 (24)	153 (42)	0.5	0.4–0.7	0.8	0.6–1.0
High	32 (12)	75 (21)	0.5	0.4–0.8	0.9	0.7–1.2
Perceived benefits						
Low (Reference)	57 (22)	174 (48)	1.0	–	1.0	–
Moderate	35 (13)	61 (17)	1.5	1.0–2.1	1.2	0.9–1.6
High	170 (65)	130 (35)	2.3	1.7–3.1	1.4	1.0–1.9
Cues to action						
Low (Reference)	37 (14)	141 (38)	1.0	–	1.0	–
Moderate	89 (34)	170 (47)	1.7	1.2–2.3	1.5	1.1–2.0
High	136 (52)	54 (15)	3.4	2.6–4.5	2.7	2.0–3.6

<sup>a</sup>PR, prevalence ratio derived from a log-binomial model.

<sup>b</sup>CI, confidence interval.

<sup>c</sup>Adjusted for other variables in the model.