

# Uptake of influenza vaccine by pregnant women: a cross-sectional survey

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**P**regnant women with influenza have an increased risk of complications, including hospitalisation, intensive care unit admission, preterm delivery and, in severe cases, death.<sup>1–3</sup>

A growing body of evidence supports the safety and effectiveness of inactivated influenza vaccine during pregnancy. A recent review concluded that influenza vaccine is safe to administer during any trimester.<sup>4</sup> Two recent randomised controlled trials found that babies born to vaccinated mothers had a reduced risk of contracting influenza in the first 6 months of life.<sup>5,6</sup> The 9th edition of the *Australian immunisation handbook* recommends influenza vaccine for all pregnant women who will be in their second or third trimester during influenza season, although it can be given in any trimester.<sup>7</sup> The vaccine is free for all pregnant women.

Uptake of influenza vaccine by pregnant women in Australia is low, with estimates ranging from about 7% to 40%.<sup>8–11</sup> However, these estimates are often from relatively small samples at single sites dependent on local vaccination policies and procedures.

Our aims were to determine the uptake of seasonal influenza vaccine among a larger sample of pregnant women residing in New South Wales, and to identify barriers and facilitators to vaccine uptake in pregnancy.

## Methods

### Survey development

We used a self-administered questionnaire delivered to pregnant women attending public hospitals in NSW. The survey was based on the Health Belief Model and Precaution Adoption Process Model of health behaviour.<sup>12</sup> Questions covered self-reported receipt of influenza vaccine during the current pregnancy, demographic characteristics, general attitudes toward vaccination, perception of disease risk and vaccine risk and benefit during pregnancy, and information sources. Face and content validity and internal

## Abstract

**Objectives:** To determine influenza vaccination coverage among pregnant women in New South Wales, and factors associated with vaccine uptake during pregnancy.

**Design, setting and participants:** Quantitative self-administered survey of pregnant women, using a non-random, stratified sample from antenatal clinics at three demographically diverse hospitals in NSW during the influenza season of 2011.

**Main outcome measures:** Self-reported influenza vaccine uptake while pregnant; and attitudes, barriers and facilitators to vaccine acceptance during pregnancy.

**Results:** Of 939 women approached, 815 participated (87%). Influenza vaccine uptake in pregnant women was 27%. Women who had received a recommendation to have the vaccine were 20.0 times (95% CI, 10.9–36.9) more likely to have been vaccinated. Forty-two per cent recalled receiving a recommendation to be vaccinated. Other factors associated with vaccination were study site, perceived infection severity, overall feelings toward vaccination during pregnancy, vaccine accessibility, and willingness to take up the vaccine if recommended. Concern about the baby's safety was negatively associated with vaccination (odds ratio, 0.5; 95% CI, 0.2–0.9), but 68% (95% CI, 63%–71%) of women who expressed concern agreed they would have the vaccine if their health care professional recommended it.

**Conclusion:** Recommendation from a health care provider is strongly associated with influenza vaccine uptake among pregnant women and can overcome their concerns about safety, but less than half the women surveyed reported receiving such a recommendation. Educational material targeting pregnant women and professional education and support for antenatal health care providers are needed to increase awareness and recommendation.

consistency were examined through a pilot study. The final questionnaire was translated into Arabic and Chinese.

### Sample size and recruitment

A non-random stratified sampling plan was used to ensure a representative sample of pregnant women in NSW. Pilot data showed 15% vaccine uptake, and a target sample of 783 was calculated to provide a 95% confidence interval within 15% of the point estimate. Data on women who had given birth in NSW between 2004 and 2008 were obtained (J Bentley, Principal Epidemiologist, Health Services, Centre for Epidemiology and Evidence, NSW Ministry of Health, personal communication, 2010) and stratified by age, parity and region of residence. Using these population data, target sample proportions were calculated for each stratum.

Women were recruited from antenatal clinic waiting rooms of three tertiary hospitals and one Aboriginal community-controlled health service (ACCHS). The sites were: a hospital in metropolitan Sydney (Site A), with about 5300 births per year; a hospital in

Sydney's outer suburbs (Site B), with 4200 births per year; and a rural referral hospital (Site C), with 800 births per year. The ACCHS was associated with Site C. During the study, Sites A and B did not provide influenza vaccination for pregnant women; however, it had been offered at Site B in March–June 2011, before study commencement. During recruitment, Site C ran an 8-week influenza vaccination clinic onsite. Recruitment took place between 27 July and 9 November 2011. Recruitment days were rotated to ensure all days of clinic operation were sampled. All women attending on these days were approached.

Ethics approval was gained from the human research ethics committee of each participating institution, and the NSW Aboriginal Health and Medical Research Council.

### Data analysis

We used  $\chi^2$  tests for differences in proportions and backward logistic regression analysis. Data were analysed using SPSS version 17.0 (IBM), and QuickCalcs (GraphPad Software).

**Weighted percentage responses and adjusted odds ratios (AORs) for influenza vaccine uptake by pregnant women, by associated study factors**

Factor	Women who had vaccine*	Women who did not have vaccine*	AOR (95% CI)	P
Study site				0.04
Site B <sup>†</sup>	37 (17%)	186 (83%)	1.0	
Site A	71 (21%)	264 (79%)	1.4 (0.3–2.8)	
Site C	103 (46%)	119 (54%)	2.4 (1.2–4.8)	
Perceived severity of the consequences of influenza infection during pregnancy				0.01
Mild <sup>†</sup>	43 (21%)	166 (79%)	1.0	
Neither mild nor severe	36 (19%)	155 (81%)	0.9 (0.4–2.0)	
Severe	131 (36%)	228 (64%)	2.2 (1.2–4.1)	
Overall feelings toward influenza vaccination during pregnancy				< 0.01
Oppose <sup>†</sup>	14 (6%)	231 (94%)	1.0	
Neither oppose nor support	20 (9%)	197 (91%)	2.1 (0.8–5.3)	
Support	179 (57%)	133 (43%)	7.6 (3.2–17.9)	
Concerned about baby's safety if having influenza vaccine during pregnancy				0.04
Disagree <sup>†</sup>	113 (60%)	75 (40%)	1.0	
Neither disagree nor agree	43 (39%)	66 (61%)	0.8 (0.4–1.7)	
Agree	57 (12%)	426 (88%)	0.5 (0.2–0.9)	
Would have influenza vaccine while pregnant if GP recommended it				< 0.01
Disagree <sup>†</sup>	4 (3%)	143 (97%)	1.0	
Neither disagree nor agree	8 (8%)	93 (92%)	1.9 (0.4–8.2)	
Agree	200 (38%)	333 (62%)	7.9 (2.4–26.3)	
It is difficult to get to the doctor to have influenza vaccine while pregnant				0.01
Agree <sup>†</sup>	25 (27%)	68 (73%)	1.0	
Disagree	165 (36%)	297 (64%)	1.0 (0.4–2.1)	
Neither disagree nor agree	22 (10%)	199 (90%)	0.3 (0.1–0.9)	
Received recommendation to have influenza vaccine during this pregnancy				< 0.01
No <sup>†</sup>	19 (4%)	432 (96%)	1.0	
Yes	193 (59%)	136 (41%)	20.0 (10.9–36.9)	

GP = general practitioner. \* Weighted values. Percentages are of total respondents in each row. † Referent category. ◆

## Results

### Participant characteristics

The overall response rate was 87% (815/939). Site-specific rates were: Site A, 88% (349/398); Site B, 79% (234/298); and Site C, 95% (232/243). The overall sample proportions for age and parity differed from the NSW population data, so the data were weighted for these variables. The weighted sample was comparable to women who gave birth in NSW between 2004 and 2008 for age, parity and region of residence. At the time of the survey, the participants had a mean gestation of 29 weeks (median, 30; range, 5–41), and 99% were > 12 weeks' gestation.

Most women received their antenatal care exclusively through public hospital antenatal clinics (466/815, 57%). A quarter (201/815) received shared antenatal care through their general practitioner and the local public hospital, and small numbers received care through a birth centre, private obstetrician or the ACCHS.

Five per cent of women (37/815) identified as Aboriginal. Most (580/815, 71%) spoke English at home, but 46 other languages were spoken, most commonly Arabic, Cantonese or Mandarin, and Hindi. Nearly half the women (347/815, 43%) had completed a university degree or higher.

Of the 815 women, 255 (31%) reported an underlying condition that put them at higher risk of complications from influenza.

### Vaccine uptake and associated factors

Overall, 215 of 786 women (27%, 95% CI, 24%–31%) had received influenza vaccination during their current pregnancy (Site A, 75/340 [22%]; Site B, 39/225 [17%]; Site C, 101/221 [46%]).

Of the 815 women, 324 (40%; 95% CI, 36%–43%) correctly believed influenza vaccination was recommended during pregnancy, while 207 (25%; 95% CI, 23%–29%) incorrectly thought it was not, and 276 (34%; 95% CI, 31%–37%) were unsure.

Multivariate analysis showed that women who had received a recommendation to have influenza vaccination while pregnant were 20.0 times (95% CI, 10.9–36.9;  $P < 0.01$ ) more likely to have been vaccinated than women who had not received a recommendation. Other factors associated with vaccine uptake are presented in the Box.

Factors found not to be significantly associated with vaccine uptake included previous influenza infection, perceived likelihood of infection, knowledge of recommendations, belief that the vaccine would protect from influenza, concern that the vaccine would cause influenza, age, parity, antenatal care type, level of education, ethnicity, geographical area (rural v urban), and the presence of maternal comorbidities such as asthma, diabetes, obesity and hypertension.

Concern about the safety of the vaccine for the baby was negatively associated with vaccination (Box). However, of the 502 women who

expressed concern, 339 (68%; 95% CI, 63%–71%) agreed they would have the vaccine if their doctor or midwife recommended it.

Of the 310 women who reported from whom they had received a recommendation to have influenza vaccination, 160 (52%; 95% CI, 46%–57%) received it from their doctor and 35 (11%; 95% CI, 8%–15%) from a midwife. Other sources of recommendation included antenatal clinic staff such as receptionists (30; 10%; 95% CI, 7%–14%) and family members (22; 7%; 95% CI, 5%–11%).

Women reporting an underlying condition that put them at higher risk of complications from influenza were no more likely to have received the vaccine than women not reporting this ( $\chi^2=2.02$ ;  $P=0.16$ ) and were no more likely to have received a recommendation to do so ( $\chi^2=0.02$ ;  $P=0.88$ ).

## Discussion

Our results show the importance of health care provider recommendation in pregnant women's willingness to receive influenza vaccination. Vaccine uptake among women in this sample was relatively low (27%), with significant variation between study sites.

This study has some limitations. First, few women in our sample received antenatal care through private obstetric providers. In NSW, about 26% of women seek antenatal care from a private obstetrician or midwife.<sup>13</sup> Our sample can therefore be considered representative of the public obstetric care population only.

Second, our data on uptake relied only on self-report. Self-report has been identified as an acceptable proxy to medical record audit for determining vaccine uptake in older adults.<sup>14,15</sup> We anticipate pregnant women's recall to be equal or better, given that they were unlikely to have received another vaccine while pregnant in 2011.

Third, the data are cross-sectional and although we were able to identify associations between vaccine uptake and certain study factors, we cannot confirm these associations as causal. However, the findings concur with other studies that found health care provider recommendation, safety per-

ceptions and access to vaccines are major factors in vaccine uptake.<sup>16–18</sup>

Our findings suggest that women's concerns about the safety of the vaccine for their unborn child can be overcome by health care provider recommendation. Although women who were concerned about their baby's safety were less likely to be vaccinated, 68% of them agreed that they would have the vaccine if their doctor or midwife recommended it.

Given that a minority of women surveyed, including those at risk due to underlying conditions, had received a vaccination recommendation, it is important to consider what would increase recommendations from health care providers. While some studies have found that physicians are aware of current recommendations,<sup>19</sup> others report confusion among health care providers about contraindications and vaccine safety.<sup>20–22</sup> These findings highlight the need for professional education and support for antenatal care providers.

Vaccine availability at the antenatal clinic was an apparent contributor to uptake. Site C, which had an onsite vaccination nurse at the time of the study and staff members who discussed the recommendations with women in the waiting room, had a 46% uptake. Sites A and B, which had significantly lower uptake, had no such programs during the study period. This suggests that easily accessible vaccine is likely to be important, but other contributing factors cannot be ruled out.

Uptake by women who felt it was easy to access the doctor for vaccination was not significantly different to uptake by women who felt access was difficult. One explanation may be that women attending Site C (29% of the study sample), who live in a rural setting where access to a primary care doctor is comparatively difficult, had an alternative method of accessing vaccination through the clinic.

Our results suggest that provision of information about influenza vaccination for pregnant women will only partially overcome the low uptake in this group. Motivation and education of antenatal care providers is also important. Information for pregnant women and providers, coupled with easily accessible vaccine, have the potential

to substantially increase maternal influenza vaccination coverage.

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