Influenza vaccination during pregnancy: Coverage rates and influencing factors in two urban districts in Sydney

[Louise Maher](http://www.sciencedirect.com/science/article/pii/S0264410X13011936), , [Kirsty Hope](http://www.sciencedirect.com/science/article/pii/S0264410X13011936), , [Siranda Torvaldsen](http://www.sciencedirect.com/science/article/pii/S0264410X13011936), , [Glenda Lawrence](http://www.sciencedirect.com/science/article/pii/S0264410X13011936), , [Angela Dawson](http://www.sciencedirect.com/science/article/pii/S0264410X13011936), , [Kerrie Wiley](http://www.sciencedirect.com/science/article/pii/S0264410X13011936), , [Deborah Thomson](http://www.sciencedirect.com/science/article/pii/S0264410X13011936), , [Andrew Hayen](http://www.sciencedirect.com/science/article/pii/S0264410X13011936), , [Stephen Conaty](http://www.sciencedirect.com/science/article/pii/S0264410X13011936),

Highlights

•Influenza vaccination during pregnancy is considered to be safe and effective, however uptake of the vaccine remains low.

•In two urban districts in Sydney during the 2012 influenza season, influenza vaccine coverage in pregnant women was 25%.

•There is little association between demographic factors and influenza vaccine uptake during pregnancy, however factors related to antenatal care provision and access (antenatal care type, hospital of delivery, and parity) are associated with vaccine uptake.

•Provider recommendation is the most significant factor associated with vaccine uptake – women who receive a recommendation for the vaccine from an ante-natal care provider have 33 times the odds of receiving the vaccination.

Abstract

Background

Pregnant women have an increased risk of complications from influenza. Influenza vaccination during pregnancy is considered effective and safe; however estimates of vaccine coverage are low. This study aimed to determine influenza vaccination coverage and factors associated with vaccine uptake in pregnant women in two Sydney-based health districts.

Methods

A random sample of women who delivered a baby in a public hospital in Sydney and South-Western Sydney Local Health Districts between June and September 2012 were surveyed using a computer assisted telephone interviewing service.

Results

Of the 462 participants (participation rate 92%), 116 (25%) reported receiving the influenza vaccine during their pregnancy. In univariate analysis, vaccination coverage varied significantly depending on antenatal care type, hospital of birth, and parity (*p*<0.05), but not for age category, highest level of education, country of birth, language spoken at home, or Aboriginal status. Women who received antenatal care through a general practitioner (GP) had 2.3 (95% CI 1.4–3.6) times the odds (unadjusted) of receiving the influenza vaccination than those who received their antenatal care through a public hospital. The main reason cited for vaccination was GP recommendation (37%), while non-recommendation (33%) and lack of knowledge (26%) were cited as main reasons for not receiving the vaccination. 30% of women recalled receiving a provider recommendation for the vaccination and these women had 33.0 times the odds (unadjusted) of receiving the vaccination than women who had not received a recommendation. In a multivariate model a provider recommendation was the only variable that was significantly associated with vaccination (OR 41.9; 95% CI 20.7–84.9).

Conclusion

Rates of influenza vaccination during pregnancy are low. There is a significant relationship between healthcare provider recommendation for the vaccination and vaccine uptake. Increasing provider recommendation rates has the potential to increase coverage rates of influenza vaccination in pregnant women.

Keywords

Influenza;

Vaccine;

Pregnancy;

Provider recommendation

1. Introduction

Influenza infection during pregnancy is associated with increased risk of complications for both mother and baby, including respiratory and cardio-pulmonary illness requiring hospitalisation, pre-term delivery, foetal distress, and in severe cases, death [1], [2], [3], [4], [5], [6] and [7]. Influenza vaccination during pregnancy is considered safe for both the mother and the foetus for use in any trimester of pregnancy [8], [9], [10] and [11]. Influenza vaccination during pregnancy protects pregnant women and their infants from severe influenza infection, significantly reducing respiratory illnesses in both the mothers and their infants in the first six months of life [12], [13] and [14].

Routine seasonal influenza vaccination for all pregnant women is recommended in Australia by health authorities [15] and [16] and the Royal Australian and New Zealand College of Obstetrics and Gynaecology [17]. Despite the influenza vaccine being free of charge for all pregnant women in Australia, vaccine uptake during pregnancy is low, with coverage rates estimated to be between 10% and 40% [18], [19], [20], [21] and [22]. Multiple factors influence vaccine uptake during pregnancy, with women more likely to receive the influenza vaccine during pregnancy if they perceive themselves to be at higher risk of influenza complications during pregnancy, perceive the vaccination to be safe, have received an influenza vaccinate before, and receive a recommendation from a healthcare provider [21], [22], [23], [24], [25] and [26].

There is no surveillance of influenza vaccination during pregnancy in Australia hence most available data are derived from single-site surveys conducted in ante-natal care facilities or post-natal hospital wards [19], [20] and [21]. Strategies to improve awareness about influenza vaccination during pregnancy in both antenatal care providers and pregnant women, including a letter, brochures, poster, and a reminder stamp in records, were implemented across central and south-western Sydney in early 2012 [27]. However, little information is available on vaccination uptake and associated factors in this population. This study was designed to ascertain the coverage of influenza vaccination in pregnant women in central and south-western Sydney during the 2012 influenza season, and to identify factors that affect vaccine uptake for these women.

2. Methods

A cross-sectional survey of women who delivered a baby in public hospitals in South Western Sydney and Sydney Local Health Districts during the 2012 influenza season was conducted using computer assisted telephone interviewing. These Local Health Districts cover a population of 1.4 million people, and include higher proportions of people from culturally and linguistically diverse backgrounds and low socio-economic areas than the state average. In 2010 there were 21,252 births to residents of these districts, representing 22% of all births in the state of New South Wales, Australia, that year.

2.1. Study population

The study population was defined as women who gave birth in one of the seven public hospitals in South Western Sydney and Sydney Local Health Districts in the period June 1 to September 30, 2012. The following women were excluded: mothers of babies who were born before 35 weeks’ gestational age, who were discharged to another hospital facility after delivery, who were still born or who died while in hospital, or women under 18 years and women who left hospital against medical advice after delivery.

2.2. Sample size

Based on an estimated population of 6321, an estimated vaccination coverage rate of 25%, and an accepted precision of ±4%, it was estimated that a sample size of 420 would be required. To allow for 40% non-participation, 700 women were randomly selected, using random number allocation and ordering.

2.3. Survey content

The survey tool consisted of questions designed to determine awoman's knowledge, attitudes, perceptions, and experiences of influenza vaccination during their recent pregnancy, reasons for being vaccinated or not, and demographic characteristics. Knowledge, attitudes and perceptions questions using a 5-point Likert-type scale were used in this survey, with some of which had been field tested in a previous survey [22]. Pre-survey interviews were conducted with 20 women to check face validity, following which minor refinements were made.

2.4. Survey delivery

A Computer Assisted Telephone Interviewing (CATI) service was employed to contact randomly selected women following the distribution of an introductory letter and information sheet. Translated information sheets in the three most common languages were provided as appropriate. Women were telephoned by an experienced interviewer who invited them to participate in the study, and the survey was conducted with consenting women. A minimum of six call attempts were made to contact each respondent, and once contacted a minimum of three further call attempts were made to complete the interview. When required a telephone interpreter assisted interview in the relevant language was arranged. The survey was conducted in November to December 2012.

2.5. Data analysis

The Index of Relative Socio-economic Disadvantage (IRSD) for areas was used to determine socio-economic status of women based on their postcode of residence, and reported in quintiles, where for example the most disadvantaged 20% of areas in NSW are in the lowest quintile. [28] Data analysis was conducted using SAS Enterprise Guide Version 5.1. A chi-squared goodness of fit test was conducted to compare the study group and study population from which they were selected to assess representatives. The knowledge and attitudes 5-point response categories were collapsed into binary results, with a strongly agree or agree answer recorded as a positive response, and a neutral, disagree or strongly disagree answer recorded as a negative response. Chi-squared tests for differences in proportions were conducted for each demographic and knowledge category to determine if any group category was more likely to have received the influenza vaccine. Within each category factors predicting whether the influenza vaccination was received or not were identified by conducting univariate regression, and calculating odds ratios and their respective 95% confidence intervals compared to a nominated referent category. A multi-variate logistic regression analysis was undertaken, which included all demographic and ante-natal care experience variables, with the exception of country of birth due to correlation with language spoken at home. The multi-variate analysis did not include knowledge and attitudes variables. A *P*-value of <0.05 was considered statistically significant.

2.6. Ethics

This project was approved by the Sydney Local Health District Human Research Ethics Committee.

3. Results

3.1. Participation

In the period June 1 to September 30, 2012 a total of 6133 women delivered a baby within the seven public hospitals of interest; of these 5421 met the eligibility criteria and 700 women were randomly selected to be invited to participate. Of these, 500 (71%) were contactable, and 462 women (92%) agreed to participate and completed the survey resulting in an overall response rate of 66%.

3.2. Study participants

No difference between the study group and the study population in terms of country of birth and proportion of Aboriginal people was found. However, study participants were significantly more likely to be older, from less socio-economically disadvantaged areas, and to have given birth at Royal Prince Alfred Hospital (Table 1). 26% of participants reported speaking a language other than English at home, and 39 participants (8%) required a telephone interpreter service to complete the interview. The majority of participants (56%) accessed antenatal care through a public hospital, 17% accessed ante-natal shared care through their general practitioner (GP) and18% of participants reported an underlying chronic medical condition.

Table 1.

Characteristics of participants and study population.

| Characteristic | Participants *N* (%) | Study population N (%) | *P*-Value |
| --- | --- | --- | --- |
| Age (years) | | | |
| <25 | 51 (11%) | 871 (16%) | <0.01 |
| 25–34 | 296 (64%) | 3379 (62%) |  |
| ≥35 years | 114 (25%) | 1171 (22%) |  |
| Unknown | 1 (0%) | 0 |  |
|  | | | |
| Country of birth | | | |
| Australia | 229 (50%) | 2569 (47%) | 0.35 |
| Other | 233 (50%) | 2852 (53%) |  |
|  | | | |
| Aboriginal and/or Torres Strait Islander | | | |
| Yes | 8 (2%) | 90 (2%) | 0.90 |
| No | 454 (98%) | 5331 (98%) |  |
|  | | | |
| Hospital | | | |
| Royal Prince Alfred | 157 (34%) | 1574 (29%) | <0.05 |
| Liverpool | 55 (12%) | 912 (17%) |  |
| Fairfield | 55 (12%) | 641 (12%) |  |
| Canterbury | 48 (10%) | 533 (10%) |  |
| Campbelltown | 79 (17%) | 905 (17%) |  |
| Bowral | 18 (4%) | 151 (3%) |  |
| Bankstown | 49 (11%) | 705 (13%) |  |
| Other | 1 | 0 |  |
|  | | | |
| Socio-economic disadvantage quintile[a](http://www.sciencedirect.com/science/article/pii/S0264410X13011936#tblfn0005) | | | |
| 1 – most disadvantaged | 134 (29%) | 1857 (34%) | <0.01 |
| 2 | 78 (17%) | 1162 (21%) |  |
| 3 | 39 (8%) | 431 (8%) |  |
| 4 | 143 (31%) | 1362 (25%) |  |
| 5 – least disadvantaged | 64 (14%) | 605 (11%) |  |
| Missing | 4 (1%) | 4 (0%) |  |
| Total | 462 (100%) | 5421 (100%) |  |

aSocio-economic disadvantage determined using the index of relative socio-economic disadvantage (IRSD) based on the postcode of residence.

3.3. Uptake and demographic factors

Overall, 116 women reported receiving the influenza vaccination during their pregnancy, giving a vaccination coverage rate of 25% (95% CI 21.2–29.1%). Vaccination coverage varied significantly depending on antenatal care type, hospital of birth, and parity with women having their first baby, receiving antenatal care through general practitioner, or birthing in Royal Prince Alfred Hospital, having greater odds of receiving the vaccination (Table 2). (Royal Prince Alfred Hospital is a large teaching hospital which has the highest proportion of antenatal shared care provision and the largest number of births of the seven hospitals in this study). Women who received antenatal care through a GP or through GP shared care had 2.4 times the odds for receiving the influenza vaccination than women who accessed antenatal care through a public hospital (*p* < 0.001). There was no significant difference in the proportion of women who received the influenza vaccine during pregnancy in relation to age group, highest level of education, country of birth, language spoken at home, or Aboriginal status (note that the results for Aboriginal women are not published as there is a potential of individuals being identifiable due to small numbers). Women who reported having one or more of the chronic diseases of asthma, renal disease, diabetes, heart disease, hypertension, or being overweight had no greater odds for receiving the vaccine than those who did not report any of these conditions. The majority of women who had received the vaccine had obtained it through their GP (83%).

Table 2.

Characteristics of participants according to vaccination status.

|  | Total *N* (%) | Vaccinated *N* (%) | Not vaccinated *N* (%) | Univariate regression | | | Multivariate regression[\*](http://www.sciencedirect.com/science/article/pii/S0264410X13011936#tblfn0015) | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | Unadjusted or (95% CI) for vaccination | Stratum specific *P*-value | Overall *P*-value | Adjusted or (95% CI) for vaccination | Stratum specific *P*-value | Overall *P*-value |
| Age (years) |  |  |  |  |  | 0.89 |  |  | 0.34 |
| < 25 | 51 (11%) | 12 (24%) | 39 (76%) | 1.0 |  |  | 1.0 |  |  |
| 25–34 | 296 (64%) | 76 (26%) | 220 (74%) | 1.12 (0.56–2.26) | 0.75 |  | 0.96 (0.34–2.76) | 0.45 |  |
| ≥ 35 | 114 (25%) | 27 (24%) | 87 (76%) | 1.01 (0.46–2.20) | 0.98 |  | 0.54 (0.16–1.84) | 0.19 |  |
| Unknown | 1 (0%) | 1 (100%) | 0 |  |  |  |  |  |  |
|  | | | | | | | | | |
| Highest level of education |  |  |  |  |  | 0.12 |  |  | 0.18 |
| No higher school certificate | 71 (15%) | 18 (25%) | 53 (75%) | 1.0 |  |  | 1.0 |  |  |
| Higher school certificate | 81 (18%) | 16 (20%) | 65 (80%) | 0.73 (0.34–1.56) | 0.41 |  | 0.30 (0.10–1.00) | 0.09 |  |
| Certificate/diploma | 112 (24%) | 22 (20%) | 90 (80%) | 0.72 (0.35–1.46) | 0.36 |  | 0.65 (0.23–1.85) | 0.53 |  |
| University degree or higher | 198 (43%) | 60 (30%) | 138 (70%) | 1.28 (0.69–2.38) | 0.43 |  | 0.43 (0.15–1.21) | 0.40 |  |
|  | | | | | | | | | |
| Country of birth |  |  |  |  |  | 0.75 |  |  |  |
| Australia | 229 (50%) | 56 (24%) | 173 (76%) | 1.0 |  |  | N/A | N/A | N/A |
| Other | 233 (50%) | 60 (26%) | 173 (74%) | 1.07 (0.70–1.63) | 0.75 |  |  |  |  |
|  | | | | | | | | | |
| Language spoken at home |  |  |  |  |  | 0.74 |  |  | 0.29 |
| English | 340 (74%) | 84 (25%) | 256 (75%) | 1.0 |  |  | 1.0 |  |  |
| Other | 122 (26%) | 32 (26%) | 90 (74%) | 1.08 (0.68–1.74) | 0.74 |  | 1.55(0.69–3.47) | 0.29 |  |
|  | | | | | | | | | |
| Parity |  |  |  |  |  |  |  |  | 0.61 |
| Second baby or higher | 253 (55%) | 51 (20%) | 202 (80%) | 1.0 |  |  | 1.0 |  |  |
| First baby | 209 (45%) | 65 (31%) | 144 (69%) | 1.78 (1.17–2.73) | <0.01 |  | 1.18 (0.62–2.27) | 0.61 |  |
|  | | | | | | | | | |
| Socio-economic disadvantage quintile[a](http://www.sciencedirect.com/science/article/pii/S0264410X13011936#tblfn0010) |  |  |  |  |  | 0.03 |  |  | 0.13 |
| Fifth – least disadvantaged | 64 (14%) | 16 (25%) | 48 (75%) | 1.0 |  |  | 1.0 |  |  |
| Fourth | 143 (31%) | 41 (29%) | 102 (71%) | 1.21 (0.62–2.36) | 0.59 |  | 1.38 (0.55–3.47) | 0.52 |  |
| Third | 39 (8%) | 15 (38%) | 24 (62%) | 1.88 (0.80–4.42) | 0.15 |  | 3.63(1.02–12.94) | 0.07 |  |
| Second | 78 (17%) | 10 (13%) | 68 (87%) | 0.44 (0.18–1.06) | 0.07 |  | 0.92(0.27–3.17) | 0.15 |  |
| First – most disadvantaged | 134 (29%) | 32 (24%) | 102 (76%) | 0.94 (0.47–1.90) | 0.86 |  | 2.80 (0.85–9.23) | 0.16 |  |
| Missing | 4 (1%) | 2 (50%) | 2 (50%) |  |  |  |  |  |  |
|  | | | | | | | | | |
| Major chronic disease |  |  |  |  |  | 0.50 |  |  | 0.94 |
| None | 380 (82%) | 93 (24%) | 287 (76%) | 1.0 |  |  | 1.0 |  |  |
| One or more | 82 (18%) | 23 (28%) | 59 (72%) | 1.20 (0.70–2.06) | 0.50 |  | 1.03(0.47–2.28) | 0.94 |  |
|  | | | | | | | | | |
| Hospital of delivery |  |  |  |  |  | <0.05 |  |  | 0.75 |
| Royal Prince Alfred | 157 (34%) | 54 (34%) | 103 (66%) | 1.0 |  |  | 1.0 |  |  |
| Liverpool | 55 (12%) | 7 (13%) | 48 (87%) | 0.28 (0.12–0.66) | <0.01 |  | 0.84 (0.24–2.94) | 0.60 |  |
| Fairfield | 55 (12%) | 10 (18%) | 45 (82%) | 0.42 (0.20–0.91) | <0.05 |  | 0.37 (0.10–1.42) | 0.27 |  |
| Canterbury | 48 (10%) | 15 (31%) | 33 (69%) | 0.87 (0.43–1.74) | 0.69 |  | 0.56 (0.17–1.89) | 0.74 |  |
| Campbelltown | 79 (17%) | 16 (20%) | 63 (80%) | 0.48 (0.26–0.92) | <0.05 |  | 1.00 (0.36–2.77) | 0.29 |  |
| Bowral | 18 (4%) | 6 (33%) | 12 (67%) | 0.96 (0.34–2.68) | 0.93 |  | 0.74 (0.17–3.24) | 0.85 |  |
| Bankstown | 49 (11%) | 8 (16%) | 41 (84%) | 0.37 (0.16–0.85) | <0.05 |  | 0.39 (0.10–1.53) | 0.32 |  |
| Other | 1 (0%) | 0 | 1 (100%) |  |  |  |  |  |  |
|  | | | | | | | | | |
| Ante-natal care type |  |  |  |  |  | <0.01 |  |  | 0.43 |
| Ante-natal clinic (public hospital) | 293 (63%) | 60 (20%) | 233 (80%) | 1.0 |  |  | 1.0 |  |  |
| General practitioner or shared care | 125 (27%) | 46 (37%) | 79 (63%) | 2.26 (1.42– 3.59) | <0.001 |  | 1.51(0.76–2.98) | 0.23 |  |
| Private obstetrician | 44 (10%) |  | 34 (77%) | 1.14 (0.53–2.44) | 0.73 |  | 0.87(0.28–2.79) | 0.55 |  |
|  | | | | | | | | | |
| Provider recommendation received |  |  |  |  |  | <0.001 |  |  | <0.001 |
| No | 322 (70%) | 20 (6%) | 302 (94%) | 1.0 |  |  | 1.0 |  |  |
| Yes | 140 (30%) | 96 (69%) | 44 (31%) | 32.95 (18.51–58.62) | <.0001 |  | 41.89 (20.68–84.86) | <0.001 |  |
|  | | | | | | | | | |
| Saw information about influenza vaccination when pregnant |  |  |  |  |  | <.0001 |  |  | 0.11 |
| No | 302 (65%) | 54 (18%) | 248 (82%) | 1.0 |  |  | 1.0 |  |  |
| Yes | 160 (35%) | 62 (39%) | 98 (61%) | 2.91 (1.88–4.48) | <.0001 |  | 1.69 (0.88–3.23) | 0.11 |  |

a Socio-economic disadvantage determined using the index of relative socio-economic disadvantage (IRSD) based on the postcode of residence.

\*

The multivariate logistic regression analysis included all the variables in this table, with the exception of country of birth N/A: Not Applicable. This variable was not included in the multivariate analysis.

3.4. Provider recommendation

Of all the 462 women surveyed, 30% could recall receiving a recommendation for the vaccine from an antenatal health care provider during their pregnancy (Table 2). Some women received a recommendation from more than one provider (27% had received a recommendation from a general practitioner, 10% from a midwife, and 5% from an obstetrician). Women who received a recommendation for the vaccine from an antenatal care provider had 33 times greater odds of receiving the vaccination than women who had not received such a recommendation. Women who reported having one or more of the listed chronic diseases were no more likely to have received a provider recommendation for the vaccine than those who did not list chronic diseases.

From the multi-variate regression model, the only significant variable was provider recommendation, with an adjusted odds ratio of 41.89 (95% CI 20.68–84.86; *p* < 0.001). Of all women, 78% said they would have the influenza vaccine during pregnancy if their doctor advised it, and 72% said they would receive it during pregnancy if their midwife recommended it (Table 3). Of the 346 women who did not receive the influenza vaccine during their pregnancy, 68% said they would receive it during pregnancy if their GP or obstetrician recommended it and 67% if their midwife recommended it.

Table 3.

Maternal knowledge and attitudes towards influenza vaccination during pregnancy.

| Maternal Factors |  | Total | Vaccinated | Not vaccinated | Odds ratio (95% CI) | *P*-Value |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | *N* (%) | *N* (%) | *N* (%) |  |  |
| Perceives that the consequences of influenza are more serious in pregnant women than other people | No | 143 (31%) | 26 (18%) | 117 (82%) | 1.0 |  |
| Yes | 319 (69%) | 90 (28%) | 229 (72%) | 1.76 (1.08–2.89) | <0.05 |
|  | | | | | | |
| Believes that having an influenza vaccine would protect a pregnant woman from the effects of influenza | No | 181 (39%) | 23 (13%) | 158 (87%) | 1.0 |  |
| Yes | 281 (61%) | 93 (33%) | 188 (67%) | 3.39 (2.06–5.62) | <.0001 |
|  | | | | | | |
| Believes that a maternal influenza vaccination would protect the baby from influenza after birth | No | 329 (71%) | 77 (23%) | 252 (77%) | 1.0 |  |
| Yes | 133 (29%) | 39 (29%) | 94 (71%) | 1.36 (0.86–2.13) | 0.18 |
|  | | | | | | |
| Concerned about the safety of maternal influenza vaccination for the mother | No | 253 (55%) | 75 (30%) | 178 (70%) | 1.0 |  |
| Yes | 209 (45%) | 41 (20%) | 168 (80%) | 0.58 (0.38–0.90) | <0.05 |
|  | | | | | | |
| Concerned about the safety of maternal influenza vaccination for the baby | No | 208 (45%) | 70 (34%) | 138 (66%) | 1.0 |  |
| Yes | 254 (55%) | 46 (18%) | 208 (82%) | 0.43 (0.28 –0.67) | <0.001 |
|  | | | | | | |
| Would have an influenza vaccination while pregnant if the GP or obstetrician recommended it | No | 102 (22%) | 1 (1%) | 101 (99%) | 1.0 |  |
| Yes | 360 (78%) | 115 (32%) | 245 (68%) | 47.41 (6.53–344.06) | <0.001 |
|  | | | | | | |
| Would have an influenza vaccination while pregnant if the midwife recommended it | No | 131 (28%) | 8 (6%) | 123 (94%) | 1.0 |  |
| Yes | 331 (72%) | 108 (33%) | 223 (67%) | 7.45 (3.51–15.78) | <.0001 |
|  | | | | | | |
| Feels she had access to enough information to enable an informed decision about influenza vaccination during pregnancy | No | 255 (55%) | 28 (11%) | 227 (89%) | 1.0 |  |
| Yes | 207 (45%) | 88 (43%) | 119 (57%) | 6.00 (3.71–9.68) | <.0001 |

3.5. Reasons for vaccination

The main reasons women cited for receiving the vaccine were that their GP recommended it (43%), they wanted to prevent influenza (21%), or they normally receive the vaccine (13%) (table 4). Overall, 45% of women cited a recommendation from the GP as one of the reasons for receiving the vaccine, 34% women cited wanting to prevent influenza, and 26% cited wanting to protect the baby. Of the women who did not receive the vaccine, 204 (59%) stated their main reason for not receiving it was that it was not recommended to them or because they were not aware of it (Table 4). Only 10% of women reported safety concerns as the main reason for not receiving the vaccine. Overall, 44% of women cited the absence of a suggestion or recommendation as one of the reasons they did not receive it, 32% did not think or know about it, and 20% had safety concerns.

Table 4.

Reasons cited by women for receiving or not receiving the vaccination.

| Reasons cited for Receiving the influenza vaccination during pregnancy | Main reason cited | All reasons cited[a](http://www.sciencedirect.com/science/article/pii/S0264410X13011936#tblfn0020) |
| --- | --- | --- |
|  | *N* (%) | *N* (%) |
|  | | |
| GP Recommended It | 43 (37%) | 52 (45%) |
| I wanted to prevent influenza | 24 (21%) | 39 (34%) |
| I normally get the influenza vaccine | 15 (13%) | 20 (17%) |
| I wanted to protect the baby | 14 (12%) | 30 (26%) |
| Midwife recommended it | 4 (3%) | 6 (5%) |
| Information from family/friends/media | 2 (2%) | 3 (3%) |
| High risk work environment | 4 (3%) | 7 (6%) |
| I think pregnant people should get it | 2 (2%) | 5 (4%) |
| Other | 8 (7%) | 20 (17%) |
| Total | 116 (100%) | N/A |
|  | | |
| Reasons cited for NOT receiving the influenza vaccination during pregnancy | | |
| It was not suggested/recommended to me | 115 (33%) | 152 (44%) |
| I did not think/know about it | 89(26%) | 112 (32%) |
| I was concerned about safety/vaccine risk to the baby or myself | 35 (10%) | 69 (20%) |
| I did not need it | 21 (6%) | 40 (12%) |
| General practitioner or obstetrician advised against | 13 (4%) | 15(4%) |
| I didn’t have time | 12 (3%) | 14 (4%) |
| I was concerned the vaccination would give me the influenza | 9 (3%) | 12 (3%) |
| I do not normally get the influenza vaccine | 11 (3%) | 19 (5%) |
| I was not concerned about getting the influenza | 8 (2%) | 21 (6%) |
| I was unsure of the benefits or effectiveness of the vaccine | 4 (1%) | 13 (4%) |
| Other | 29 (8%) | 65 (19%) |
| Total | 346 (100%) | N/A |

a Women nominated all the reasons for receiving or not receiving the vaccination, which were collated. There may be multiple reasons cited and counted for each woman.

3.6. Knowledge and perceptions

There was a significant association between the knowledge and perceptions of women regarding influenza vaccination during pregnancy and the uptake of the influenza vaccine during the pregnancy (Table 3). The majority of women (69%) perceived that influenza had more serious consequences for pregnant women, and women who perceived that influenza was more serious during pregnancy or who believed that an influenza vaccine would protect a pregnant woman from the effects of influenza were significantly more likely to receive the vaccine than those who did not (Table 3). Only 29% of all women believed that maternal influenza vaccination during pregnancy would protect the baby from influenza once the baby was born. Of all women, 45% had concerns about the safety of influenza vaccination during pregnancy for the woman, and 55% had concerns about safety for the baby. Women who were concerned about safety for the mother or the baby had significantly lower uptake of the influenza vaccine. Of the women who did not receive the vaccine, 82% had concerns about safety for the baby, however of these 67% still stated that they would receive the vaccine during pregnancy if their general practitioner or obstetrician recommended it.

3.7. Access to information

Of all women, 160 (35%) could recall seeing information about influenza vaccination during pregnancy, through brochures, posters, information sheets, or the internet, and they reported seeing this information mostly at their general practitioners or at the public hospital ([Table 2](http://www.sciencedirect.com/science/article/pii/S0264410X13011936#tbl0010)) The odds of these women having received the vaccine while pregnant were three times higher (*p* < 0.0001) than women who did not recall seeing information.

Many women (45%) reported that they felt that they did not have access to enough information to enable them to make an informed decision about influenza vaccination during their pregnancy ([Table 3](http://www.sciencedirect.com/science/article/pii/S0264410X13011936#tbl0015)). Of the women who had not received the vaccine 89% felt they did not have access to enough information, and women who felt that they had enough information had six times greater odds of having received the influenza vaccine during their pregnancy than those who did not.

4. Discussion

Influenza vaccination coverage during pregnancy in Sydney and South-Western Sydney Local Health Districts is low, despite evidence confirming the efficacy and safety of the vaccine, and clear recommendations from health authorities that the vaccine should be received during pregnancy.

The limitations of this study are firstly that it only includes women who gave birth in a public hospital and therefore does not represent all women who live in this region because those who delivered in a private hospital were not included (in 2010, 17% of all deliveries for residents of this region occurred in a private hospital). Secondly, this telephone survey was conducted after the women gave birth, which would have affected contact with some women, and increased the potential for recall bias. Interviewing women after the pregnancy was completed enabled a measure of vaccine uptake rather than an intention to vaccinate. However, women who received the vaccine, and women who actively sought their provider's advice on the vaccine, may have been more likely to recall or report receiving a provider recommendation than other women [29]. Information on vaccine status and provider recommendation was reported by the mother only and not verified by medical records. Finally, the characteristics of our study group were different to the study population they were selected from in terms of the distribution of age, hospital of delivery, and socioeconomic status. While these differences were statistically significant, the size of the difference was not large for any of the factors. 34% of the sample were not contactable or did not agree to participate, and potential differences between participants and non-participants may have resulted in the study group characteristics observed. A major strength of this study is that it was conducted over a large area of Sydney with a diverse population in terms of socio-economic status and cultural diversity, which enabled us to determine if demographic factors influenced uptake of influenza vaccine during pregnancy.

Our findings suggest that demographic factors have little influence on influenza vaccine uptake during pregnancy, however factors related to antenatal care provision and access (antenatal care type, hospital of delivery, and parity) do influence uptake. The most significant factor influencing vaccine uptake is provider recommendation – in multivariate analysis this association was very strong and the only significant predictor of vaccination, and appeared to account for all antenatal care factors associated with vaccination in the univariate analysis. A higher proportion of women who received a recommendation from a health care provider for influenza vaccination during pregnancy reported receiving the vaccine while pregnant, and most women said they would accept it during pregnancy if their doctor recommended it. This concurs with previous findings which identify that provider recommendation increases vaccine uptake [22], [23], [24], [25], [26] and [27]. Providers are more likely to recommend vaccination if they are knowledgeable about influenza and vaccination during pregnancy, have positive attitudes towards influenza vaccination during pregnancy, have observed serious conditions due to influenza, or have personally received the influenza vaccine [21], [30], [31] and [32].

Our results demonstrate that some women still have significant safety concerns regarding use of influenza vaccine during pregnancy. Women with more confidence in the safety of the vaccine have greater uptake, but even those who were not confident in the safety report they would accept the vaccine if their health care provider recommended it. While providers may perceive that safety fears of the vaccine in pregnant women may preclude vaccine uptake, our results indicate that a provider recommendation can overcome these concerns.

Our findings show the significant influence of the GP, with women who receive GP-provided antenatal care being more likely to have received the vaccine. This may be partly due to the vaccine only being available through GPs in this region, and therefore the vaccine may be less available to women who are not accessing antenatal care through a GP. A recent survey in three antenatal clinics in NSW showed that the one antenatal clinic in which the vaccine was available onsite had significantly higher vaccine coverage than the other two clinics [22]. Increasing the availability of the vaccine through avenues other than GPs may improve coverage. Alternatively, increasing participation rates in antenatal shared care through a general practitioner may also improve coverage.

The coverage rate found in this study represents that achieved during the influenza season when awareness is heightened and likely to be higher than other times during the year. This survey was also conducted after the implementation of a number of strategies aimed at increasing coverage of influenza vaccine during pregnancy – in March 2012 all GPs in this region received a letter from local public health and obstetric divisions encouraging them to recommend influenza vaccine to women in their care who were pregnant or planning a pregnancy, and brochures and posters promoting influenza vaccination during pregnancy were also distributed. There are no coverage estimates available for the period before these actions were implemented, however low coverage afterwards suggests that further action is required to increase coverage of influenza vaccine among pregnant women. A number of studies conducted at single antenatal clinic sites have demonstrated that it is possible to increase provider knowledge about influenza vaccination during pregnancy, rates of provider recommendation or patient acceptance of the vaccine through strategies targeting providers, pregnant women, or both [20], [33] and [34]. Strategies targeting women include displaying posters in the clinics and providing them with information brochures, while strategies targeting providers include education programmes, reminder stamps in patients’ files, e-mail reminders to providers, and making the vaccine available in the clinic.In an obstetric hospital in Melbourne, the implementation of a combination of these strategies saw influenza vaccine coverage increase from 30 to 40%, and provider recommendation increase from 37% to 62% [20].

The strong influence of the provider's recommendation suggests that strategies to improve coverage should initially target providers. Previous studies indicate that antenatal care providers have varying levels of knowledge about influenza vaccination during pregnancy [21], [30], [31], [32] and [33], and that improved provider knowledge is associated with higher rates of influenza vaccination in patients [30] and [31]. Concurrently with this study, we conducted a qualitative study to investigate the attitudes of GPs in the same region towards influenza vaccination during pregnancy. That study identified that they are concerned about vaccine safety, and are generally unwilling to strongly recommend the vaccine in pregnancy [35]. This suggests that strategies should target both provider knowledge and their perception of risk in order to improve their willingness to recommend the vaccine to pregnant women.

There are currently no routine systems available to monitor influenza vaccine coverage among pregnant women, making it difficult to monitor trends and evaluate the impact of strategies aimed at increasing coverage. Surveys are valuable as they provide not only estimates of vaccine uptake but also information on the knowledge, attitudes, and experiences of women, however conducting such a survey is resource intensive. Alternative solutions to routine surveillance of influenza vaccination during pregnancy need to be considered and implemented. The two Local Health Districts where this study was conducted are currently trialling the inclusion of information about receipt of the influenza vaccine during pregnancy into their electronic medical record systems for the perinatal period. This will enable surveillance of coverage of influenza vaccination during pregnancy, and evaluation of strategies aimed to increase these rates.

5. Conclusion

Antenatal health care providers have a significant influence on the uptake of influenza vaccine during pregnancy in South Western Sydney. Women who receive an antenatal health care provider recommendation were significantly more likely to be vaccinated than those who did not receive such a recommendation. However, only one third of pregnant women are receiving any recommendation. Improving rates of provider recommendation for the vaccine is likely to have a significant impact on the uptake of the influenza vaccine by pregnant women.

Acknowledgement

*Conflict of interest statement*: The project was supported by an unrestricted grant from Sanofi Pasteur.

References

[1] H.B. Rothberg, S.D. Haessler, R.B. Brown Complications of viral influenza Am J Med, 121 (4) (2008), pp. 258–264

[2] K.M. Neuzil, G.W. Reed, E.F. Mitchel, L. Simonsen, M.R. Griffin Impact of influenza on acute cardiopulmonary hospitalizations in pregnant women Am J Epidemiol, 148 (11) (1998), pp. 1094–1102

[3] D.J. Jamieson, M.A. Honein, S.A. Rasmussen, J.L. Williams, D.L. Swerdlow, M.S. Biggerstaff, *et al.* H1N1 2009 influenza virus infection during pregnancy in the USA

Lancet, 374 (9688) (2009), pp. 451–458

[4] S. Cox, S.F. Posner, M. McPheeters, D.J. Jamieson, A.P. Kourtis, S. Meikle

Hospitalisation with respiratory illness among pregnant women during influenza season

Obstet Gynecol, 107 (2006), pp. 1315–1322

[5] The ANZIC Influenza Investigators, S.A. Webb, V. Pettila, I. Seppelt, R. Bellomo, M. Bailey, *et al.* Critical care services and 2009 H1N1 influenza in Australia and New Zealand

New Engl J Med, 361 (2009), pp. 1925–1934

[6] S. Hewagama, S.P. Walker, R.L. Stuart, C. Gordon, P.D. Johnson, N.D. Friedman, *et al.*

2009 H1N1 influenza a and pregnancy outcomes in Victoria, Australia Clin Infect Dis, 50 (5) (2010), pp. 686–689

[7] The ANZIC Influenza Investigators, S.A. Webb, V. Pettila, I. Seppelt, R. Bellomo, M. Bailey, *et al.* Critical illness due to 2009 A/H1N1 influenza in pregnant and postpartum women: population based cohort study BMJ, 340 (7749) (2010), p. 751

[8] P.D. Tamma, K.A. Ault, C. del Rio, M.C. Steinhoff, N.A. Halsey, S.B. Omer Safety in influenza vaccination during pregnancy Am J Obstet Gynecol, 201 (6) (2009), pp. 547–552

[9] P.L. Moro, K. Broder, Y. Zheteyeva, K. Walton, P. Rohan, A. Sutherland, *et al.*

Adverse events in pregnant women following administration of trivalent inactivated influenza vaccine and live attenuated influenza vaccine in the Vaccine Adverse Event Reporting System, 1990–2009 Am J Obstet Gynecol, 204 (2) (2011) 146 e1–e7

[10] P.L. Moro, K. Broder, Y. Zheteyeva, N. Revzina, N. Tepper, D. Kissin, *et al.* Adverse events following administration to pregnant women of influenza A (H1N1) 2009 monovalent vaccine reported to the Vaccine Adverse Event Reporting System Am J Obstet Gynecol, 205 (473) (2011), pp. e1–e9

[11] S. Haberg, L. Trogstad, N. Gubbes, A. Wilcox, H. Gjessing, S. Samuelsen, *et al.*

Risk of fetal death after pandemic influenza virus infection or vaccination New Engl J Med (2013) <http://dx.doi.org/10.1056/NEJMoa1207210>

[12] K. Zaman, E. Roy, E. Shams, S. Arifeen, R. Rahman, R. Raqib, *et al.* Effectiveness of maternal influenza immunization in mothers and infants New Engl J Med, 359 (2008), pp. 1555–1564

[13] I. Benowitz, D.B. Esposito, K.D. Gracey, E.D. Shapiro, M. Vázquez

Influenza vaccine given to pregnant women reduces hospitalization due to influenza in their infants Clin Infect Dis, 51 (12) (2010 Dec 15), pp. 61–1355

[14] A.A. Eick, T. Uyeki, A. Klimov, H. Hall, R. Reid, M. Santosham, *et al.* Maternal influenza vaccination and effect on influenza virus infection in young infants Arch Pediatr Adolesc Med, 165 (2) (2011), pp. 104–111

[15] National Health and Medical Research Council The Australianimmunisation Handbook

(10th Edition)NHMRC, Australia (2013)

[16] NSW Health. Influenza Information for Antenatal Care Providers, <<http://www0.health.nsw.gov.au/PublicHealth/Infectious/Influenza/hp_pregnancy_advice.asp>>; 2013 [acessed 08.01.13].

[17] Royal Australian and New Zealand College of Obstetrics and Gynaecology. Influenza Vaccination for Pregnant Women, <[www.ranzcog.edu.au/component/docman/doc\_download/978-c-obs-45-influenza-vaccination-for-pregnant-women.html](http://www.ranzcog.edu.au/component/docman/doc_download/978-c-obs-45-influenza-vaccination-for-pregnant-women.html)>; 2013 [accessed 01.03.13].

[18] D.B. Mak, A.M. Daly, P.K. Armstrong, P.V. Effler Pandemic (H1N1) 2009 influenza vaccination coverage in Western Australia Med J Australia, 193 (7) (2010), pp. 401–404

[19] S. White, R. Petersen, J. Quinlivan Pandemic (H1N1) 2009 influenza vaccine uptake in pregnant women entering the 2010 influenza season in Western Australia

Med J Aust, 193 (2010), pp. 405–407

[View Record in Scopus](http://www.scopus.com/inward/record.url?eid=2-s2.0-77958054234&partnerID=10&rel=R3.0.0&md5=b614f568c8284106066b0c817e5c7b44)

[20] E.A. McCarthy, W.E. Pollock, T. Nolan, S. Hay, S. McDonald

Improving influenza vaccination coverage in pregnancy in Melbourne 2010–2011

Aust N Z J Obstet Gynaecol (2012) [http://dx.doi.org/10.1111/j.1479-828X.2012. 8.x0142](http://dx.doi.org/10.1111/j.1479-828X.2012.%208.x0142)

[21] A.B. Lu, A.A. Halim, C. Dendle, D. Kotsanas, M.L. Giles, E.M. Wallace, *et al.*

Influenza vaccination uptake amongst pregnant women and maternal care providers is suboptimal Vaccine, 30 (2012), pp. 4055–4060

[22] K. Wiley, P.D. Massey, S.C. Cooper Robbins, N. Wood, J. Ho, H.E. Quinn, *et al.*

Uptake of influenza vaccine by pregnant women: a cross-sectional survey with implications for policy and practice Med J Aust, 198 (7) (2013), pp. 373–375

[23] G. Blanchard-Rohner, S. Meier, J. Ryser, D. Schaller, C. Combescure, M.H. Yudin, *et al.*

Acceptability of maternal immunization against influenza: the critical role of obstetricians

J Matern Fetal Neonatal Med, 25 (9) (2012), pp. 1800–1809

[24] Y. Dlugacz, A. Fleischer, M.T. Carney, N. Copperman, I. Ahmed, Z. Ross, *et al.*

2009 H1N1 vaccination by pregnant women during the 2009–10 H1N1 influenza pandemic

Am J Obstet Gynecol, 206 (339) (2012), pp. e1–e8

[25] J. Lau, Y. Caia, H. Tsuia, K. Choia Prevalence of influenza vaccination and associated factors among pregnant women in Hong Kong

Vaccine, 28 (2010), pp. 5389–5397

[[26]](http://www.sciencedirect.com/science/article/pii/S0264410X13011936#bib0135) H. Ding, T. Santibanez, D. Jamieson, C. Weinbaum, G. Euler, L. Grohskopf, *et al.*

Influenza vaccination coverage among pregnant women – National 2009 H1N1 Influenza Survey (NHFS) Am J Obstet Gynecol (2011 June), pp. S96–S106

[[27]](http://www.sciencedirect.com/science/article/pii/S0264410X13011936#bib0140) NSW Ministry of Health.Influenza Vaccination during Pregnancy. Protect you and your baby from influenza (flu). Brochure. Available at <<http://www0.health.nsw.gov.au/resources/publichealth/infectious/influenza/pdf/flu_vacc_eng_broch_may12.pdf>>; 2013 [accessed 28.02.3].

[28] Australian Bureau of Statistics. An Introduction to Socio-Economic Indexes for Areas (SEIFA), 2006. ABS Catalogue No. 2039.0, [www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/D729075E079F9FDECA2574170011B088/$File/20390\_2006.pdf](http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/D729075E079F9FDECA2574170011B088/$File/20390_2006.pdf); 2013 [accessed 28.02.2013].

[29] Centre for Disease Control and Prevention Influenza vaccination coverage among pregnant women—29 states and New York City, 2009–10 season Morbidity and Mortality Weekly Report, 61 (07) (2012), pp. 113–118

[30] C. Eppes, A. Wu, K. Cameron, P. Garcia, W. Grobman Does obstetrician knowledge regarding influenza increase HINI vaccine acceptance among their pregnant patients?

Vaccine, 30 (2012), pp. 5782–5784

[31] A. Tong, A. Biringer, M. Ofner-Agostini, R. Upshur, A. McGeer A cross-sectional study of maternity care provider's and women's knowledge: attitudes, and behaviours towards Influenza vaccination during pregnancy J Obstet Gynaecol Can, 30 (5) (2008), pp. 404–410

[32] D. Kissin, M. Power, E. Kahn, J. Williams, D. Jamieson, K. MacFarlane, *et al.*

Attitudes and practices of obstetrician–gynecologists regarding influenza vaccination in pregnancy Obstet Gynecol, 118 (5) (2011), pp. 1074–1080

[33] B. Panda, R. Stiller, A. Panda Influenza vaccination during pregnancy and factors for lacking compliance with current CDC guidelines J Matern Fetal Neonatal Med, 24 (3) (2011), pp. 402–406

[34] H. Yudin, M. Salripour, M. Sgro Impact of patient education on knowledge of influenza and vaccine recommendations among pregnant women J Obstet Gynaecol Can, 32 (3) (2009), pp. 232–237

[35] Maher L, Dawson A, Wiley K, Hope K, Torvaldsen S, Lawrence G, et al. Influenza vaccination during pregnancy: the attitudes and practices of general practitioners in central and south-western Sydney. Unpublished 2013.