

2017

Antenatal influenza and pertussis vaccine uptake among Aboriginal mothers in Western Australia

Kennia Lotter

Annette K. Regan

Tyra Thomas

Paul V. Effler

Donna B. Mak

The University of Notre Dame Australia, donna.mak@nd.edu.au

Follow this and additional works at: https://researchonline.nd.edu.au/med_article



Part of the [Medicine and Health Sciences Commons](#)

This article was originally published as:

Lotter, K., Regan, A. K., Thomas, T., Effler, P. V., & Mak, D. B. (2017). Antenatal influenza and pertussis vaccine uptake among Aboriginal mothers in Western Australia. *ANZJOG: Australian and New Zealand Journal of Obstetrics and Gynaecology, Early View (Online First)*.

Original article available here:

<https://dx.doi.org/10.1111/ajo.12739>

This article is posted on ResearchOnline@ND at

https://researchonline.nd.edu.au/med_article/871. For more information, please contact researchonline@nd.edu.au.



This is the peer reviewed version of the following article:

Lotter, K., Regan, A.K., Thomas, T., Effler, P.V., and Mak, D.B. (2017). Antenatal influenza and pertussis vaccine uptake among Aboriginal mothers in Western Australia. *ANZJOG: Australian and New Zealand Journal of Obstetrics and Gynaecology, Early View Online First*. doi: 10.1111/ajo.12739

This article has been published in final form at: -

<https://dx.doi.org/10.1111/ajo.12739>

This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for self-archiving.

ANTENATAL INFLUENZA AND PERTUSSIS VACCINE UPTAKE AMONG ABORIGINAL MOTHERS IN WESTERN AUSTRALIA

Short title: Antenatal vaccination in Aboriginal mothers

Word count for abstract: 249

Word count for main text: 2664

Table and/or figure count: 4

Keywords: Indigenous population, pregnant women, antenatal vaccination, influenza vaccine, pertussis vaccine, primary prevention

Abstract

Background: Antenatal influenza and pertussis vaccination prevent serious disease in mothers and infants. Aboriginal individuals are at increased risk of infection yet little is known about vaccine coverage among Aboriginal mothers.

Aims: Estimate the uptake of influenza and pertussis vaccination among pregnant Aboriginal women in Western Australia and identify barriers and enablers to vaccination.

Materials and Methods: Four hundred Aboriginal women, aged ≥ 18 years, who gave birth to a live infant between April and October 2015 were randomly selected and invited to participate in telephone interviews. Of the 387 women who did not decline, 178 had a functioning phone number and 100 completed the survey. Analyses were weighted by maternal residence.

Results: During pregnancy the majority of Aboriginal mothers were recommended influenza 66% (unweighted, 65/96=68%) and pertussis 65% (unweighted, 62/94=66%) vaccines, with 62% (unweighted, 56/94=56%) and 63% (unweighted, 60/93=65%) receiving the vaccinations, respectively. Almost all vaccinated women (98%) reported wanting to protect their baby as the reason for immunisation. Rural mothers were more likely than metropolitan mothers to have been vaccinated against influenza (OR 4.1, 95% CI 1.7-10.2) and pertussis (OR 3.1, 95% CI 1.2-7.6). Recommendation by a healthcare provider was strongly associated with vaccine uptake (influenza: OR 15.6, 95% CI 4.9-49.5; pertussis: OR 13.3, 95% CI 4.6-38.0).

Conclusion: Vaccination uptake among Western Australian Aboriginal mothers is comparable with rates reported for non-Aboriginal populations worldwide. Provider recommendation is the single most important factor associated with vaccination uptake, underlining the importance of integrating vaccination into routine antenatal care.

Introduction

Antenatal influenza and pertussis vaccinations are vital public health interventions that prevent serious diseases in both pregnant mothers and infants under six months of age. Influenza infection during pregnancy has been associated with adverse maternal and neonatal outcomes, including preterm labour and delivery, pneumonia, and death.¹ Vaccination not only protects mothers against infection during their pregnancy, but also protects infants during the first months of life via maternal antibodies. Maternal vaccination has been shown to prevent 63% of laboratory-confirmed infections of influenza in infants less than six-months-old² and 91% of infections with *Bordetella pertussis* in infants younger than three months.³ Due to the potential health benefits of vaccination during pregnancy, influenza vaccine has been recommended and funded by the Australian government for all pregnant women, during any trimester, since 2009.^{4,5} Antenatal pertussis vaccination was introduced in Western Australia and most other Australian jurisdictions in April 2015 following the death of a four-week old baby due to pertussis. Midwives and nurses are authorized by the Department of Health to administer influenza vaccine to pregnant women in all WA public metropolitan and regional facilities that provide antenatal care.⁶

Aboriginal and Torres Strait Islander women (hereafter respectfully referred to as Aboriginal) are at increased risk of serious infections with influenza compared to non-Aboriginal women, and Aboriginal children are nearly three times as likely as non-Aboriginal children to be hospitalised with influenza or pertussis.⁷ Considering the increased burden of disease for Aboriginal mothers and their children, ensuring antenatal vaccinations are offered to Aboriginal mothers is a public health priority. Although several cross-sectional studies have measured vaccine uptake in the community, few studies have assessed vaccine uptake among Aboriginal mothers. Surveys from Sydney and Melbourne have shown that vaccine uptake has increased among pregnant women between 2010 and 2014.^{8,9} However both studies included small numbers of Aboriginal mothers, eight and nine respectively, and did not include

a subgroup analysis based on Aboriginality. A small pilot study of 58 Aboriginal mothers in Queensland who were pregnant in 2012 or 2013 found that just nine (17%) had received an influenza vaccination during their pregnancy.¹⁰ A study of influenza vaccination coverage rate in the Northern Territory pre and post the 2009 H1N1 pandemic found that coverage rates during the pre-pandemic period were negligible (2%), but showed a substantial increase in vaccine uptake to 41% during the pandemic period.¹¹ A more recent Northern Territory study reported influenza and pertussis vaccination coverage in pregnant Aboriginal mothers of 64% and 24%, respectively but did not examine predictors of antenatal vaccine uptake.¹²

In Western Australia, annual telephone surveys of mothers have been conducted by the Department of Health Western Australia (WA Health) since 2012 to monitor antenatal influenza vaccination uptake.¹³ The current study aimed to evaluate uptake of influenza and pertussis vaccines among Aboriginal pregnant women in Western Australia and to identify barriers and enablers to acceptance of vaccines during pregnancy.

Methods and Materials

The research protocol, including the survey instrument, was designed by WA Health's Communicable Disease Control Directorate (CDCD) in consultation with WA Health's Office of Aboriginal Health, the Aboriginal Health Council of WA and WA Health Consumer Council of Aboriginal Advisory Program.

A random sample of 400 (46.0% of eligible population) Aboriginal women, aged ≥ 18 years, who gave birth to a live baby between 05/04/2015 and 04/10/2015 (i.e. were pregnant during the 2015 influenza season) was selected from the Midwives Notification System (MNS), a legally mandated statewide data collection of attended births. With an estimated population size of 870, assuming a 40% vaccine

uptake¹⁴, a minimum of 112 participants were needed to measure vaccine coverage with a precision of +/- 8.5% at the standard 95% confidence interval.

Mobile phone numbers were obtained from the MNS and eligible women were sent a text message informing them about the study and giving them the opportunity to opt out of participation. Women who declined were not contacted again, the remaining mothers were telephoned in December 2015 by one of four female Aboriginal interviewers and invited to participate in a 15 to 20-minute computer-assisted telephone survey about antenatal influenza and pertussis vaccination during their most recent pregnancy. At least three attempts at different times of the day were made to reach each participant by telephone.

The survey instrument was adapted from the Pregnancy Risk Assessment Monitoring Systems survey, a validated telephone survey of pregnant women conducted by the United States Centers for Disease Control and Prevention.¹⁵ Additionally, co-author and lead interviewer TT developed a cultural guide for conducting telephone interviews to ensure cultural safety was maintained. The survey included questions regarding healthcare provider recommended of vaccination during their most recent pregnancy, whether the woman received a vaccine, and reasons why the woman was or was not vaccinated. Sociodemographic and medical factors were also collected. For women who self-reported being vaccinated, consent was obtained to contact their healthcare provider to verify the vaccination against their health records, for those who consented medical verification of the vaccination event was attempted.

We analysed data using STATA version 14.1 (StataCorp LP, Texas USA). Among respondents 48% of women were from metropolitan areas and 52% from rural areas, whereas 36% of Aboriginal women who gave birth during the same period were from metropolitan areas and 65% from rural areas.

Therefore analyses were weighted by the residence of the mother to adjust for over-representation of metropolitan women in the survey respondents. Results are reported as weighted percentages in the first instance with the unweighted raw numbers and percentages included in brackets. Data from women who answered 'unsure' or 'don't know' were excluded from analysis. Variables significant at $\alpha=0.05$ in univariate logistic regression analyses were included in a hierarchical multivariate logistic regression model in order to control for potential confounding factors. The final multivariate regression model estimated the odds of vaccination, adjusting for socioeconomic status, metropolitan versus rural residence and recommendation by a healthcare provider. Reasons for or against vaccination for either influenza or pertussis were compared using Pearson's chi square analysis.

Ethics approval was obtained from the WA Health Human Research Ethics Committee (#2015/43), WA Aboriginal Health Ethics Committee (657) and the University of Notre Dame Human Research Ethics Committee (016060F).

A plain language summary of key research findings was disseminated to all participants and Aboriginal organisations involved in designing the research protocol.

Results

Of the 400 women invited to participate in the survey, 13 (3%) declined participation, of the remaining 387 women 178 (45.9%) had a functioning phone number. Of these, 100 (56.2%) women participated in the survey (Figure 1). Reasons for not completing the survey among the 78 women with a working phone number included the telephone number was not theirs (i.e. it was functional but not correct) and no answer despite at least three call attempts and leaving messages for calls to be returned.

Participants' demographic characteristics are shown in Table 1. A total of 66% (95% CI 56-75%) (unweighted, 65/96=68%) of women reported having been recommended influenza vaccination during their pregnancy and 62% (95% CI 52-72%) (unweighted, 6/94=60%) stated they had received the vaccination. A total of 65% (95% CI 55-74%) (unweighted, 62/94=66%) of women reported having been recommended pertussis vaccination and 63% (95% CI 53-72%) (unweighted, 60/93=65%) stated they had received the vaccination. Among women who were recommended vaccination during pregnancy, 85% (unweighted, 49/65=75%) received an influenza vaccine and 86% (unweighted, 49/62=79%) received a pertussis vaccine. Among unvaccinated women, 61% (unweighted, 20/38=53%) stated they would have received an influenza vaccination and 88% (unweighted, 29/33=88%) would have received pertussis had it been recommended by a healthcare provider.

Among women who were vaccinated against influenza, 32% (unweighted, 21/55=38%) received their vaccine in a general practice (GP), 29% (unweighted, 16/55=29%) in a public hospital antenatal clinic, 25% (unweighted, 12/55=22%) in an Aboriginal Community Controlled Health Organisation (ACCHO), 9% (unweighted, 3/55=5%) in a community health vaccination clinic, 4% (unweighted, 2/55=4%) in a workplace vaccination clinic and 2% (unweighted, 1/55=2%) in a private hospital antenatal clinic. Similarly, 39% (unweighted, 26/60=43%) of women received their pertussis vaccination in a GP, 34% (unweighted, 19/60=32%) in a public hospital antenatal clinic, 18% (unweighted, 10/60=17%) in an ACCHO, 5% (unweighted, 2/60=3%) in a community vaccination clinic and 1% (unweighted, 1/60=2%) in a workplace vaccination clinic.

Rural women were more likely to have received their antenatal vaccinations at the health service where they received their antenatal care, with 44% (n=18/41) of vaccinated women receiving their antenatal care in a public antenatal clinic and 31% (n=11/36) and 36% (n=12/33) respectively receiving their influenza and pertussis vaccination as the same location. Similarly 44% (n=18/41) of rural women

received their antenatal care at an ACCHO with 31% (n=11/36) and 24% (n=8/33) receiving their antenatal influenza and pertussis vaccination there. In contrast 70% (n=19/27) of vaccinated women living in a metropolitan area received their antenatal care at a public antenatal clinic but only 26% (n=5/19) and 28% (n=7/19) respectively received their influenza or pertussis vaccination at this location, while only 15% (n=4/27) received their antenatal care at a GP but 63% (n=12/19) and 60% (n=15/25), respectively, received their influenza or pertussis vaccination there.

The reasons reported for getting vaccinated or remaining unvaccinated by mother for both influenza and pertussis were similar (Table 2). The main reasons reported by vaccinated women for receiving both influenza and pertussis vaccinations was wanting to protect their baby; 97% (unweighted, 54/56=96%) for influenza and 95% (unweighted, 56/60=93%) for pertussis. The reasons for remaining unvaccinated included not being recommended vaccination, influenza: 49% (unweighted, 17/38=45%) and pertussis 34% (unweighted, 11/33=33%), and safety concerns regarding both antenatal vaccines. Safety concerns were more commonly reported for influenza vaccine, with 30% (unweighted, 13/38=34%) of unvaccinated women reporting concern about influenza vaccine causing harm to the baby compared 26% (unweighted, 9/33=27%) in mothers not vaccinated for pertussis ($\chi^2(1)=8.90$, $p=0.003$). More women reported they were worried about the side effects of influenza vaccine, 36% (unweighted, 16/38=42%) compared to pertussis 11% (unweighted, 5/33=15%) vaccine ($\chi^2(1)=2.85$, $p=0.091$).

Univariate analyses demonstrated that recommendation by a healthcare provider and living in a rural area were both positively and significantly associated with antenatal influenza or pertussis vaccination uptake. Being in the middle and least socioeconomically disadvantaged tertile was negatively and significantly associated with influenza vaccine uptake (Table 3).

Hierarchical weighted multivariate analysis showed that advice by a healthcare providers was the single most important factor for both influenza (aOR: 12.1, 95%CI 5.1-66.7) and pertussis (aOR: 11.3, 95%CI 3.7-34.5) vaccination uptake after controlling for residence of the mother and socioeconomic status. Residing in a rural area was an additional independent predictor of antenatal influenza uptake (aOR: 3.3, 95%CI 1.3-18.4).

Discussion

To our knowledge, this is the first cross-sectional survey of vaccine uptake among Aboriginal mothers in Western Australia. In this survey, nearly two-thirds of Aboriginal women received an influenza or pertussis vaccine during her most recent pregnancy. While these vaccination rates are suboptimal, results are comparable with vaccination rates for non-Aboriginal women in WA¹⁴ and pertussis vaccination uptake was more than double that of Northern Territory Aboriginal women.^{12,16} In 2015, the proportion of all pregnant women in WA who received an influenza or pertussis vaccination were 61% and 70%, respectively (unpublished data from WA Health).

Our findings are consistent with Australian^{8,13,17,18} and international^{19,20} publications showing that recommendation by a healthcare provider remains the most important predictor of antenatal vaccination uptake. Although antenatal influenza vaccination has been a standard part of antenatal practice since 2009, more than one-third of women surveyed report that they had not received a recommendation of influenza or pertussis vaccination. Based on the responses from women who were not vaccinated, we estimate the coverage rates of 80% for antenatal influenza and 89% for pertussis vaccination could be achieved if all mothers had been recommended vaccination. This hypothesis is supported by a Northern Territory study reporting that the discrepancy between influenza and pertussis vaccination uptake (64%

vs 23%) among pregnant Aboriginal women was probably because annual influenza vaccination is offered routinely to all Aboriginal adults irrespective of pregnancy status.¹⁶

Women whose antenatal care provider does not offer on-site vaccination are required to make and attend at least one additional appointment to receive their vaccinations, incurring inconvenience and maybe additional costs. We found that women in the metropolitan area mostly received vaccines from general practitioners, even if a general practitioner did not provide most of their antenatal care. In contrast, women residing in rural or remote areas of the State mostly received their vaccination from their nominated antenatal care provider, and women more commonly reported receiving their vaccination from an ACCHO. The positive association observed between rural residence and antenatal vaccination uptake mirrors the situation with childhood vaccinations in WA Aboriginal people²¹, where vaccine coverage is greater in rural and remote areas in comparison to metropolitan areas. These results may reflect variation in health services in the State. Further research that directly addresses health provider behaviour is needed.

There are a number of limitations that may impact the generalisability of these findings, including a potential selection bias of study participants. Participation was restricted to women who have access to a mobile phone and mobile phone reception. These women may also have better access to healthcare services. We aimed to reduce this bias by adjusting for the disparity in the geographic location of mothers in the study sample compared to the eligible population by weighting our survey results. However, this is a broad adjustment and may not have fully accounted for differences in the health of participants and non-participants. As a result, it is possible that these findings do not generalise to the entire population of Aboriginal mothers. Because measurement of vaccination status relied on self-report, results may have been influenced by reporting bias.²² We were able to verify 86% of self-reported vaccinations against available medical records, indicating any bias in estimation is likely to be

small. Furthermore, as no verification was done for mothers who self-reported non-vaccination, vaccination uptake may have been underestimated in this sample.

Verification of self-reported vaccination status using the Australian Immunisation Register (AIR) or the WA Midwives Notification System (MNS) data sets was not possible because our study was conducted in 2015 and vaccination information for adults was not available through the AIR prior to September 2016 and not collected in the MNS before July 2016. Future studies could include verification of self-reported immunisation status against these data sources.

Whilst acknowledging the limitations of the study, these results are the first published which evaluate the barriers and enablers to antenatal vaccination uptake among Aboriginal women in Australia. Our study showed that there is no significant difference between Aboriginal women and non-Aboriginal women in terms of antenatal vaccination uptake and reasons for vaccination or non-vaccination. Similar to previous studies, recommendation by an antenatal care provider was the single most important factor associated with vaccination uptake.¹³ Healthcare providers need to incorporate the recommendation and delivery of influenza and pertussis vaccination into their routine antenatal care provision. General practitioners, midwives, Aboriginal health workers and obstetricians will benefit from up skilling on the current recommendations, administration, documentation and reporting of antenatal influenza and pertussis vaccination. Offering vaccination at the time of recommendation, as part of routine antenatal care could be an effective way to increase uptake. Given the high proportion of Aboriginal women who said they would have been immunised had a healthcare provider recommended vaccination, acceptance of antenatal vaccination is high among Aboriginal women.

Conclusions

Our results show that two in every three Aboriginal mothers receive an influenza or pertussis vaccine during pregnancy. While these results are encouraging, given the disproportionate burden of vaccine-preventable disease in Aboriginal population, improving the proportion of Aboriginal mothers who receive an influenza and pertussis vaccine during pregnancy is a priority. Further improvement could be achieved if providers consistently recommended and offered vaccine to pregnant women. This would likely have the added benefit of re-enforcing the importance of vaccination among women who are soon-to-be mothers. Comprehensive recording of antenatal influenza and pertussis vaccinations in the AIR and midwifery databases would facilitate ongoing monitoring of this important component of antenatal care.

References

- 1 Manske JM. Efficacy and effectiveness of maternal influenza vaccination during pregnancy: a review of the evidence. *Matern Child Health J* 2014; **18**: 1599-1609.
- 2 Zaman K, Roy E, Arifeen SE, et al. Effectiveness of maternal influenza immunization in mothers and infants. *N Engl J Med* 2008; **359**: 1555-1564.
- 3 Amirthalingam G, Andrews N, Campbell H, et al. Effectiveness of maternal pertussis vaccination in England: an observational study. *Lancet* 2014; **384**: 1521-1528.
- 4 National Health and Medical Research Council. *The Australian Immunisation Handbook 10th ed. Vol. 2016*. Canberra: Australian Department of Health and Ageing; 2013.
- 5 Hannoun A, Usta IM, Awwad J, et al. Effect of parity on maternal and neonatal outcomes in twin gestations. *Acta Obstet Gynecol Scand* 2012; **91**: 117-121.
- 6 Department of Health Western Australia. *OD 0363/12 Influenza vaccination for pregnant women*. Perth: Department of Health Western Australia; 2012.

- 7 Carville KS, Lehmann D, Hall G, et al. Infection is the major component of the disease burden in aboriginal and non-aboriginal Australian children: a population-based study. *Pediatr Infect Dis J* 2007; **26**: 210-216.
- 8 Maher L, Hope K, Torvaldsen S, et al. Influenza vaccination during pregnancy: coverage rates and influencing factors in two urban districts in Sydney. *Vaccine* 2013; **31**: 5557-5564.
- 9 McCarthy EA, Pollock WE, Tapper L, Sommerville M, McDonald S. Increasing uptake of influenza vaccine by pregnant women post H1N1 pandemic: a longitudinal study in Melbourne, Australia, 2010 to 2014. *BMC Pregnancy Childbirth* 2015; **15**: 53.
- 10 O'Grady K-AF, Dunbar M, Medlin LG, et al. Uptake of influenza vaccination in pregnancy amongst Australian Aboriginal and Torres Strait Islander women: a mixed-methods pilot study. *BMC Res Notes* 2015; **8**: 169.
- 11 Moberley SA LJ, Johnston, V, Andrews RM. Influenza vaccination coverage among pregnant Indigenous women in the Northern Territory of Australia. *Comm Dis Intell* 2016; **40**: E240-246
- 12 Overton K, Webby R, Markey P, Krause V. Influenza and pertussis vaccination coverage in pregnant women in the Northern Territory in 2015—new recommendations to be assessed. *NT Dis Control Bull.* 2016; **23**: 1-8.
- 13 Mak DB, Regan AK, Joyce S, Gibbs R, Effler PV. Antenatal care provider's advice is the key determinant of influenza vaccination uptake in pregnant women. *Aust N Z J Obstet Gynaecol* 2015; **55**: 131-7.
- 14 Regan AK, Mak DB, Hauck YL, Gibbs R, Tracey L, Effler PV. Trends in seasonal influenza vaccine uptake during pregnancy in Western Australia: implications for midwives. *Women Birth* 2016; **29**: 423-429.
- 15 Gilbert BC, Shulman HB, Fischer LA, Rogers MM. The Pregnancy Risk Assessment Monitoring System (PRAMS): methods and 1996 response rates from 11 states. *Matern Child Health J* 1999; **3**: 199-209.

- 16 Parkes H. Uptake of influenza vaccination by pregnant women in the Northern Territory. *NT Dis Control Bull* 2015; **22**: 11-5.
- 17 Wiley KE, Massey PD, Cooper SC, Wood NJ, Ho J, Quinn HE. Uptake of influenza vaccine by pregnant women: a cross-sectional survey. *Med J Aust* 2013; **198**: 373-375
- 18 Taksdal SE, Mak DB, Joyce S, Tomlin S, Carcione D, Armstrong PK. Predictors of uptake of influenza vaccination - a survey of pregnant women in Western Australia. *Ausr Fam Physician* 2013; **42**: 582-586
- 19 Wilson RJ, Paterson P, Jarrett C, Larson HJ. Understanding factors influencing vaccination acceptance during pregnancy globally: A literature review. *Vaccine* 2015; **33**: 6420-6429.
- 20 Blanchard-Rohner G, Siegrist C-A. Vaccination during pregnancy to protect infants against influenza: why and why not? *Vaccine* 2011; **29**: 7542-50.
- 21 Australian Institute for Health and Welfare. *My Healthy Communities. Vol. 2016*. Canberra: Australian Institute for Health and Welfare; 2016.
- 22 Jiménez-García R, Hernandez-Barrera V, Rodríguez-Rieiro C, et al. Comparison of self-report influenza vaccination coverage with data from a population based computerized vaccination registry and factors associated with discordance. *Vaccine* 2014; **32**: 4386-4392.

Table 1. Demographic characteristics of study participants (unweighted)

Characteristic	N=100
	Participants
Age (years):	
Range, mean	18-43, 26.3
<20	15
20-29	55
≥ 30	30
Location of residence:	
Metro	48
Rural	52
Highest level of education completed:	
Primary School	10
High School	64
TAFE	18
Undergraduate University Degree	6
Postgraduate University Degree	2
Socioeconomic Status:	
Tertile 3: least disadvantaged	35
Tertile 2	41
Tertile 1: most disadvantaged	24
Chronic Medical Condition:	
Yes	25
No	75

Location of Antenatal Care:

Public hospital antenatal clinic	54
Aboriginal Community Controlled Health Organisation (ACCHO)	24
General practice (GP)	19
Private specialist obstetrician	1
Unsure/ Don't know	2

Table 2. Reasons given by mothers for receiving an antenatal vaccination or remaining unvaccinated; multiple responses allowed

Reasons given for vaccination		
	Influenza n= 56 (n, weighted%)	Pertussis n= 60 (n, weighted %)
Wanting to protect their baby	54 (97)	56 (95)
Worried about getting the condition	37 (68)	28 (44)
Midwife recommended vaccination	21 (66)	31 (54)
GP recommended vaccination	37 (62)	29 (48)
Normally receive the influenza vaccination	26 (51)	Not asked
Family member or friend recommended vaccination	25 (50)	22 (40)
An Aboriginal health worker recommended vaccination	24 (48)	20 (39)
An Obstetrician had recommended it	12 (24)	11 (21)
I have a chronic medical condition	6 (11)	0 (0)
Reasons given for remaining unvaccinated		
	Influenza n= 38	Pertussis n= 33
Not recommended vaccination	17 (49)	11 (35)
Worried about the side effects of the vaccination	16 (36)	5 (12)
Concerns about the vaccination causing harm to the baby	13 (30)	9 (26)
Don't normally get the vaccination	7 (21)	Not asked
Baby was born too early	Not applicable	4 (22)
Advised against vaccination by a health care worker	5 (12)	2 (7)
Advised against vaccination by family or friends	4 (8)	2 (6)

Public Hospital	30/51 (66)	0.8	P > 0.05	0.2-2.5	32/51 (68)	0.8	P > 0.05	0.2-2.6
Private Obstetrician	1/1 (100)	1			0/1 (0)	1		
GP	9/18 (55)	0.5	P > 0.05	0.1-2.0	13/19 (74)	1.1	P > 0.05	0.2-4.3
ACCHO	15/22 (72)	1			14/20 (73)	1		
Socioeconomic Tertile*								
1- most disadvantaged	18/22 (86)	1			15/20 (85)	1		
2	22/38 (57)	0.2	P = 0.034	0.1-0.9	24/38 (62)	0.3	P > 0.05	0.1-1.0
3- least disadvantaged	16/34 (52)	0.2	P = 0.017	0.0-0.7	21/35 (66)	0.3	P > 0.05	0.1-1.2

* Statistically significant at $P \leq 0.05$

† Weighted analysis

