Title: A study comparing the practice of Australian maternity care providers in relation to maternal immunisation

Sushena KRISHNASWAMY^{1,2}, Euan M Wallace^{1,3}, Jim BUTTERY^{4,5}, Michelle L GILES^{1,6}

¹ The Ritchie Centre, Department of Obstetrics and Gynaecology, Monash University, Melbourne, Australia ² Department of Infectious Diseases, Monash Health, Melbourne, Australia ³ Safer Care Victoria, Victorian Department of Health and Human Services, Melbourne, Australia ⁴ Infection and Immunity, Monash Children's Hospital, Melbourne, Australia ⁵ Monash Centre for Health Research and Implementation, Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Australia ⁶ Department of Infectious Diseases, The Alfred Hospital, Melbourne, Australia

Corresponding Author: Dr. Sushena Krishnaswamy, Monash Infectious Diseases, Monash Health, 246 Clayton Road, Clayton 3168, Australia. Tel: (03) 9594 4564. Email: sushena.krishnaswamy@monashhealth.org

Conflict of Interest Statement

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DR. SUSHENA KRISHNASWAMY (Orcid ID : 0000-0003-0727-8446)

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Abstract

Background: Women's decisions regarding vaccination during pregnancy are heavily influenced by maternity care provider (MCP) recommendation. Understanding why MCPs may not recommend vaccination is central to improving vaccination rates.

Aims: To examine the knowledge, attitudes and practice of Australian MCPs to maternal vaccination.

Methods: We surveyed obstetricians, midwives and general practitioners (GPs) between September and November 2016. Providers were asked about their knowledge and current practice, and about their perceived roles in discussing and administering maternal vaccinations.

Results: 870 surveys were completed. Each MCP group believed they had the primary responsibility for discussing vaccinations but all groups perceived GPs as primarily responsible for administering vaccines. More midwives had concerns about safety (21/129, 16%) than obstetricians (9/359, 3%) and GPs (7/326, 2%)($p < 0.001$). Overall, 83% of MCP recommended pertussis vaccination (dTpa) and 78% influenza vaccination (IIV) according to guidelines, with no differences between groups. Overall 77% provided dTpa onsite (GPs 99%, midwives 70%, obstetricians 60%, $p < 0.001$) and 71% provided IIV (GPs 99%, midwives 48%, obstetricians 54%, $p < 0.001$). Factors associated with recommending vaccination in accordance with guidelines and providing vaccination onsite were similar across groups; personal

history of vaccination, confidence in vaccine knowledge, and awareness of recommendations for and belief in the safety of maternal dTpa.

Conclusions: Among MCPs, the rates of recommending and providing maternal vaccination were higher than reported previously. Further improvements might be expected with increased awareness of guidelines, further education around vaccine safety, and by changing perceptions of the role of obstetricians and midwives in providing maternal vaccinations.

Introduction

Maternal vaccination has been recommended by the World Health Organisation to eliminate maternal and neonatal tetanus since the 1990s.¹ Likewise the benefit of vaccination to prevent severe influenza in pregnant women has been recognised since the 1960s but came to the forefront of public health efforts in association with the influenza pandemic in 2009. In addition to the direct benefits to the mother, maternal vaccination with an inactivated influenza vaccine (IIV) also prevents influenza and febrile respiratory illness in infants.²⁻⁴ Maternal vaccination with a diphtheria-tetanus-acellular pertussis vaccine (dTpa) reduces pertussis in infants by more than 90%,^{5,6} and has been recommended in several countries including the United Kingdom (UK), United States (US), Belgium, New Zealand, Argentina, and Australia.

Despite the recommendation for, and demonstrated effectiveness and safety of maternal dTpa and IIV, uptake varies considerably. For example, reported rates for pertussis vary from 14-64% in the US^{7,8}, 30-60% in the UK,⁹⁻¹¹ and 27-70% in Australia.¹²⁻¹³ Barriers to uptake can be categorised as consumer-, healthcare provider- or system- related. Examples of these barriers include lack of consumer and healthcare provider (HCP) awareness of recommendations, consumer and HCP concerns about vaccine safety and efficacy during pregnancy, lack of HCP recommendation, access to vaccines, failure to incorporate vaccination into routine pregnancy care, and, in some jurisdictions, cost.¹⁴⁻¹⁷ Of these, the most consistent reason women report for not being vaccinated is lack of HCP recommendation.^{15,18, 19}

In Australia despite national recommendations, and access to free vaccine and healthcare, the uptake of maternal vaccinations varies between jurisdictions.¹² Pregnancy care may be provided through private or public hospitals, by obstetricians, midwives, general practitioners (GPs) with an obstetric qualification or a combination of these (shared care). Other than a study by Maertens et al in Belgium,²⁰ studies have not looked at these different maternity care provider (MCP) groups within the same setting. The aims of this study were to: explore attitudes and practice; identify gaps related to division of responsibility; and ascertain the roles different MCPs believe they have in provision of maternal vaccination.

Methods

A questionnaire was developed by the researchers based on review of the published literature with input from members of each target group; GPs, midwives and obstetricians. It was piloted amongst a convenience sample of these target groups at two maternal immunisation forums. The final online questionnaire collected demographic information, and included questions on knowledge, perceived roles in discussing and administering vaccines, current practice and perceived barriers to provision of maternal vaccination.

An email describing the project and containing a link to the questionnaire was distributed to MCPs through their professional bodies between September and November 2016 as follows:

- Australian fellows, trainees and diplomates of The Royal Australian and New Zealand College of Obstetricians (RANZCOG)
- Members of the Australian College of Midwives
- Shared care providers through several primary healthcare networks

While all members of these groups could complete the survey, only those currently providing maternity care were included in the analysis. In addition, a convenience sample of midwives at a single institution (Monash Health) were invited to complete the survey to increase response rate by this provider group. Midwives were invited to participate from antenatal clinics, and during team meetings and education sessions. Hard copy surveys and the link to the electronic survey were provided and the midwife running each of the meetings or sessions subsequently returned any completed surveys to the researcher.

RANZCOG Fellows could claim 1 professional development point in Self-Education for completion of the survey.

Descriptive statistical analysis was performed using IBM SPSS Statistics Version 23.0. The significance of differences between subgroups were determined using Fisher's exact or Pearson chi-square tests. Statistical significance was defined as

$p < 0.05$. Binary logistic regression was used to determine factors associated with recommending according to guidelines and providing vaccines.

The study was approved by the Monash Health and Monash University Human Research and Ethics Committees.

Results

894 responses to the electronic mailout were received and an additional 80 midwives were recruited at Monash Health. Response rates were 25% (435/1741) for obstetricians, 10% (45/466) for obstetric trainees, 12% for GPs (346/2944), and 3% (135/5000) for midwives. Fifty surveys were excluded due to missing data and 54 as they were completed by HCP not currently providing pregnancy care. Accordingly, 870 surveys were included in the analysis (367 obstetricians, 45 obstetric trainees, 328 GPs, and 130 midwives).

Demographics

Responses were received from all jurisdictions in Australia although more Victorians were recruited because recruitment of GPs also occurred through Victorian primary healthcare networks and additional midwives at Monash Health. Participant demographics are presented in Table 1. Midwives were less likely to report ever receiving HIV themselves than obstetricians, obstetric trainees and GPs ($p = 0.001$) but there was no difference in personal dTpa status. (Table 1)

Of 359 obstetricians, 153 (43%) reported working predominantly in private rooms, of whom 65 (42%) also worked in a public hospital. Fifty percent (96/194) of the obstetricians who worked at least some of the time in private practice had a midwife or practice nurse in their rooms.

Knowledge and beliefs: vaccination during pregnancy

Midwives were more likely to be concerned about vaccine safety (21/129, 16%) than obstetricians (9/359, 3%), GPs (7/326, 2%) or obstetric trainees (0/43) ($p<0.001$). All MCP groups were most concerned that we do not fully understand the effects of dTpa given in every pregnancy; 30/129 (23%) midwives, 45/359 (13%) obstetricians, 33/326 (10%) GPs and 4/43 (9%) obstetric trainees ($p<0.001$).

Most MCPs agreed that influenza is a severe disease in pregnancy (794/848, 94%) and that IIV poses less risk to pregnant women than influenza infection (802/848, 95%). Only 290/848 (34%) were aware of the benefits of IIV in preventing respiratory illness in infants. Knowledge did not vary by MCP group.

Most respondents were aware of the national guidelines to recommend dTpa in the third trimester of every pregnancy (770/852, 90%). There were no differences by years of practice or work in private or public systems.

Overall 760/870 (87%) MCPs felt sufficiently knowledgeable to advise pregnant women about dTpa and 769/848 (91%) about IIV. GPs and obstetricians were more confident advising about dTpa (311/328, 95% and 324/367, 88%) and IIV (311/321, 97% and 337/356, 95%) than obstetric trainees (31/43, 72% and 33/42, 79%) or midwives (94/130, 72% and 88/129, 68%) ($p<0.001$).

Current practice: vaccination as part of routine pregnancy care

MCPs were asked if they routinely take a vaccination history as part of antenatal care. Overall 672/861 (78%) reported routinely taking a vaccination history. This varied by role. GPs were more likely to routinely include a vaccination history (290/325, 89%) than midwives (93/126, 74%), obstetricians (262/367, 71%), or obstetric trainees (27/43, 63%) ($p<0.001$). Obstetricians working primarily in private practice were more likely to routinely take a vaccination history (119/152, 78%) than those working primarily in public clinics (138/206, 67%) ($p=0.02$).

Responsibility for Discussing Vaccination

MCP were asked who they believe has the main responsibility for discussing vaccinations with pregnant women. Overall, 396/870 (46%) of respondents believed it was primarily the GP's role, 261/870 (30%) the obstetrician's role, and 101/870 (12%) the midwife's. The majority of each MCP group believed it to be primarily their role to discuss vaccinations; more than half of obstetricians (188/369, 51%), 225/328 (69%) GPs and 51/130 (39%) midwives. Only 9/130 (7%) midwives felt that discussing vaccinations with pregnant women was the primary responsibility of the obstetrician. A higher proportion of obstetricians working primarily in private practice 107/153 (70%) believed discussing vaccinations to be their primary responsibility compared to 75/206 (36%) in public practice ($p<0.001$). (Table 2)

Responsibility for Administering Vaccination

The majority of each MCP group believed it to be the GP's role to administer vaccinations (63% overall; 73% of GPs, 61% of obstetricians, 51% of obstetric trainees, and 50% of midwives). (Table 3).

Responsibility for administering vaccinations was less clearly delineated amongst obstetricians working in public clinics. Of those working primarily in private practice 117/153 (77%) believed vaccination to be the GP's role compared to 105/206 (51%) in public ($p<0.001$). Nearly a quarter (48/206, 23%) of obstetricians in public practice believed it to be the midwife's role.

Recommendation according to guidelines

Overall 711/862 (83%) MCP reported recommending dTpa in line with national guidelines, however 88/856 (10%) recommended dTpa in the third trimester only if women hadn't received a booster in the preceding five years (the recommendation prior to March 2015). There was no difference by MCP group.

For IIV, 632/815 (78%) MCP reported recommending IIV to pregnant women according to current recommendations (during the influenza season regardless of gestation) while 171/803 (21%) did not recommend IIV during the first trimester. Again there was no difference between MCP groups.

Factors associated with recommending dTpa and IIV according to current guidelines were personal history of vaccination, and confidence in their vaccine knowledge, irrespective of MCP group. In addition, for dTpa, awareness of guidelines and belief in the safety of dTpa during pregnancy were associated with recommending according to guidelines. (Table 3)

Provision of vaccination services during pregnancy

Overall 666/870 (77%) MCP indicated they provide dTpa and 602/848 (71%) IIV at their place of work. GPs were significantly more likely to provide dTpa and IIV than obstetricians or midwives. Obstetricians were more likely to provide vaccination if their primary practice was a public hospital clinic or if they had a nurse or midwife in their private rooms. MCPs who had personally received IIV and dTpa previously, and felt that they had enough information to confidently advise pregnant women on vaccination, were more likely to provide both dTpa and IIV. MCP who were aware of and recommended dTpa in accordance with national guidelines were also more likely to provide vaccination services. (Table 4)

Barriers to Provision of Vaccination Services

Overall 511/870 (59%) MCP reported they administer dTpa to pregnant women and did not perceive any barriers to provision of the service. Amongst the remaining 359 respondents, the following barriers were identified; lack of clarity around vaccination roles when multiple providers are involved (119/359, 33%), lack of capacity to store vaccines on site (101/359, 28%), lack of time (55/359, 15%), inability to manage severe adverse reactions onsite (41/359, 11%), and not having a practice nurse or midwife in their rooms (36/359, 10%). Thirty-one (9%) wanted more information to facilitate their decision-making, and 17/359 (5%) were worried about liability issues.

Discussion

In this nationwide survey of Australian MCPs we found that all practitioner groups had reasonable knowledge of the national recommendations and of the benefits of maternal vaccination. Most reported that discussing vaccination with pregnant women was part of their professional role. However, one in four practitioners did not recommend dTpa and one in five did not recommend IIV in accordance with national guidelines. Similar to previous studies we found that being vaccinated themselves, feeling adequately informed, belief in the safety of vaccines, and being aware of recommendations were associated with increased likelihood of recommending according to guidelines.^{14,15,21}

The majority of MCPs agreed that dTpa is of benefit to mother and infant. The safety of administering dTpa in every pregnancy was the primary safety concern particularly amongst midwives. This contrasts with earlier studies where MCP expressed more widespread concerns about the safety of vaccinations during pregnancy.^{14,22,23} Midwives are often the first HCP a woman consults during pregnancy. Addressing the safety concerns of midwives and increasing their confidence in vaccination may further increase the number of midwives recommending vaccination to pregnant women.

MCPs recognised the maternal benefits of IIV but the benefit in preventing influenza and other febrile respiratory illnesses in infants did not appear to be well appreciated. Women have consistently reported protecting their baby as their primary motivation for maternal vaccination.^{24,25} In contrast to dTpa, IIV has mostly been promoted for maternal benefit. The benefit of maternal IIV for infants is therefore an important message for MCPs to communicate if uptake is to be improved. In 2017, health departments targeted this message to both MCPs and pregnant women.²⁶

This study helps to provide some clarity around roles and may also reflect changing MCP attitudes. Compared to earlier studies, all groups perceived discussing vaccination as part of their role.^{17,27} However, administering vaccinations was viewed as the primary responsibility of GPs. An understanding of these expectations is important for development of health policy. As primary providers of population level vaccination, GPs have a well-established capacity to store and administer vaccines. However, in Australia and the US, midwives and obstetricians are often the primary

or only HCP women consult during their pregnancy. It has been suggested that embedding vaccination into routine pregnancy care and providing vaccination at the time of HCP recommendation increases uptake.^{17,19,28} When not provided onsite, the additional step of women making an appointment and attending an additional provider is a barrier to vaccination. In our previous work, uptake of dTpa increased from 39% to 91% after implementation of standing orders for midwife administration within pregnancy care clinics.²⁸ Many of the MCP we surveyed have adopted onsite vaccination, with 61% of obstetricians and 70% of midwives reporting dTpa to be available to pregnant women at their place of work. IIV was less commonly provided and this disparity warrants further research as it was beyond the scope of the current study. This study highlights that for onsite vaccination to be more widely implemented, MCP need to perceive administration as their responsibility and barriers to storing vaccines on site need to be overcome.

Strengths and Limitations

This is the first nationwide survey that directly compares different MCPs' knowledge of national guidelines, attitude and clinical practice in regards to administering vaccination to pregnant women in Australia. The strengths of our study include the large sample size and all three MCP groups completing the same survey allowing for direct comparison. However there are limitations that need to be acknowledged. Response rates from MCP groups other than obstetricians were limited. In particular the oversampling of midwives from our institution limits the generalisability of findings for this particular group as the results may be a reflection of the practice of our institution rather than that practiced nationally. In addition, respondents reported high rates of personal vaccination. This may reflect that they are more supportive of vaccination and may not represent the views of MCP who do not themselves get vaccinated. While not affecting the internal validity of our findings, the study may overestimate the proportion of providers who routinely recommend and provide maternal vaccination. Finally, MCP may have overestimated how frequently they recommend vaccination as previous studies surveying women and HCP simultaneously have found that more HCP report recommending vaccinations than women recall receiving them.^{14,29}

Conclusion

Rates of recommending and providing maternal vaccination were higher than reported previously. To increase MCP recommendation further, addressing knowledge gaps about timing, frequency and safety of maternal vaccines and keeping providers updated on guidelines will be important. Further work is required to change obstetrician and midwife perception of administration of maternal vaccines as their role in conjunction with providing the infrastructure to support vaccination within pregnancy care settings.

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Table 1: Demographics

	Total (n=870)	Obstetricians/ trainees (n=412)	Midwives (n=130)	General Practitioners (n=328)	p
Age					<0.001
Less than 35 years	182 (21)	91 (21)	46 (36)	45 (14)	
35-55 years	431 (50)	209 (51)	59 (46)	163 (50)	
More than 55 years	250 (29)	110 (27)	24 (19)	116 (36)	
Country of birth					<0.001
Australia	602 (69)	256 (62)	108 (83)	238 (73)	
Other	268 (31)	156 (38)	22 (17)	90 (27)	
Country of training					<0.001
Australia	776 (89)	347 (84)	118 (91)	311 (95)	
Other	94 (11)	65 (16)	12 (9)	17 (5)	
State/ Territory of practice					<0.001
Australian Capital Territory	15 (2)	6 (1.5)	1 (1)	8 (2)	
New South Wales	179 (21)	109 (27)	12 (9)	58 (18)	
Northern Territory	11 (1)	3 (1)	1 (1)	7 (2)	
Queensland	173 (20)	90 (22)	16 (12)	67 (20)	
South Australia	69 (8)	34 (8)	3 (2)	32 (10)	
Tasmania	18 (2)	11 (3)	2 (1.5)	5 (1.5)	
Victoria	329 (38)	116 (28)	94 (72)	119 (36)	
Western Australia	76 (9)	43 (10)	1 (1)	32 (10)	
Years providing pregnancy care					<0.001
0-5 years	155 (18)	63 (15)	48 (38)	44 (14))	
5-10 years	154 (18)	93 (23)	16 (13)	45 (14))	
10-15 years	106 (12)	58 (14)	14 (11)	34 (10))	
More than 15 years	448 (52)	195 (48)	49 (39)	204 (62)	
Personal Vaccination status					
Influenza vaccine ever	831 (96)	396 (96)	116 (89)	319 (97)	0.001
Pertussis vaccine in last 10 years	766 (88)	358 (87)	118 (91)	290 (88)	NS

Table 2: Each MCP[†] group's attitudes on roles in discussing and administering vaccination

MCP group's opinion	Who they believe has the primary responsibility to DISCUSS n(%)				Who they believe has the primary responsibility to ADMINISTER n(%)			
	Obstetrician	Midwife	GP	Other [#]	Obstetrician	Midwife	GP	Other [#]
Obstetricians (n=369)	188 (51)	29 (8)	120 (32.5)	32 (9)	44 (12)	61 (17)	225 (61)	39 (10)
Midwives (n=130)	9 (7)	51 (39)	37 (29)	33 (25)	2 (2)	25 (19)	65 (50)	38 (29)
General Practitioners (n=328)	49 (15)	15 (5)	225 (69)	39 (11)	25 (8)	23 (7)	239 (73)	41 (12)
Obstetric Trainees (n=43)	15 (35)	6 (14)	14 (33)	8 (18)	2 (5)	13 (30)	22 (51)	6 (14)

[†] MCP: Maternity Care Provider

[#] Other included a variety of responses including providers reporting a combination of the three main provider groups, and comments such as “whoever is the primary provider” and “whoever sees her at the booking visit”

Table 3: Univariable analysis of factors associated with recommending dTpa[†] and IIV[†] according to guidelines

	dTpa		IIV	
	OR (95% CI)	p	OR (95% CI)	p
MCP[†] role				
GP [†]	ref		ref	
Obstetrician	0.8 (0.6-1.2)	0.3	0.9 (0.6-1.3)	0.7
Midwife	0.7 (0.4-1.1)	0.7	1.1 (0.6-1.9)	0.7
Country Of Training				
Australia	ref	<0.001	ref	0.07
Other	0.4 (0.3-0.6)		0.6 (0.4-1.0)	
Years providing pregnancy care				
0-5 years	ref		ref	
5-10 years	0.8 (0.4-1.5)	0.8	0.6 (0.3-1.1)	0.1
10-15 years	1.1 (0.5-2.2)	0.9	0.4 (0.2-0.8)	0.01
More than 15 years	0.6 (0.3-0.9)	0.02	0.3 (0.2-0.5)	<0.001
Type of practice				
Public	ref	0.5	ref	0.6
Private	1.2 (0.7-1.9)		1.1 (0.7-1.8)	
Ever had influenza vaccine yourself				
No	ref	0.002	ref	0.01
Yes	2.8 (1.4-5.4)		2.7 (1.2-5.7)	
Had pertussis vaccine in last 10 years				

No	ref	<0.001	ref	<0.001
Yes	2.3 (1.5-3.7)		2.3 (1.5-3.6)	
Routinely take a vaccination history				
No	ref	0.01	ref	0.13
Yes	1.7 (1.2-2.5)		1.3 (-0.9-2.0)	
Do you feel confident you have enough information to advise pregnant women on dTpa/ IIV				
No	ref	<0.001	ref	<0.001
Yes	6.8 (4.5-10.4)		3.5 (2.0-6.1)	
Not enough is known about safety of dTpa in pregnancy				
Agree	ref	<0.001	n/a	n/a
Disagree/ Neutral	5.6 (2.9-10.9)			
Not enough is known about safety of dTpa in every pregnancy				
Agree	ref	<0.001	n/a	n/a
Disagree/ Neutral	4.0 (2.6-4.1)			
Awareness of change to dTpa guidelines in 2015				
No	ref	<0.001	n/a	n/a
Yes	22 (12.9-37.6)			
Recommend IIV according to guidelines				
No	ref	<0.001	n/a	n/a
Yes	3.1 (2.1-4.5)			
Recommend dTpa according to guidelines				
No	n/a	n/a	ref	<0.001

Yes

3.1 (2.1-4.6)

†Abbreviations: dTpa- Diphtheria-tetanus-acellular pertussis vaccine; IIV- Inactivated influenza vaccine; MCP- Maternity Care Provider; GP- General Practitioner

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Table 4: Univariable analysis of factors associated with providing vaccination services onsite

	Pertussis vaccine		Influenza vaccine	
	OR (95% CI)	p	OR (95% CI)	p
MCP[†] role				
GP [†]	ref		ref	
Obstetrician	0.02 (0.01-0.06)	<0.001	0.2 (0.006- 0.04)	<0.001
Midwife	0.04 (0.01-0.4)	<0.001	0.01 (0.004- 0.03)	<0.001
Years providing pregnancy care				
0-5 years	ref		ref	
5-10 years	1.2 (0.7-2.0)	0.6	1.9 (1.1-3.2)	0.02
10-15 years	0.6 (0.3-1.0)	0.07	0.7 (0.4-1.2)	0.2
More than 15 years	0.6 (0.4-0.97)	0.04	1.1 (0.7-1.6)	0.7
Type of practice				
Public	ref	<0.001	ref	<0.001
Private	0.2 (0.1-0.2)		0.4 (0.2-0.5)	
In private practice, do you have a practice nurse/ midwife in your rooms?				
No	ref	<0.001	ref	<0.001
Yes	4.8 (3.1-7.3)		4.7 (3.0-7.2)	
Ever had influenza vaccine yourself				
No	ref	0.04	ref	0.04
Yes	2.0 (1.05-3.8)		1.9 (1.03-3.7)	
Had pertussis vaccine in last 10 years				

No	ref	<0.001	ref	0.01
Yes	2.4(1.6-3.5)		1.7 (1.1-2.5)	
Do you feel confident you have enough information to advise pregnant women on dTpa[†]/ IIV[†]				
No	ref	<0.001	ref	<0.001
Yes	2.3 (1.6-3.4)		2.7 (1.7-4.2)	
Not enough is known about safety of dTpa in pregnancy				
Agree	ref	0.05	n/a	n/a
Disagree/ Neutral	1.9 (1.0-3.7)			
Awareness of change to dTpa guidelines in 2015				
No	ref	<0.001	n/a	n/a
Yes	2.8 (1.8-4.2)			
Recommend dTpa according to guidelines				
No	ref	0.002	n/a	n/a
Yes	1.8 (1.3-2.6)			
Recommend IIV according to guidelines				
No	n/a	n/a	ref	0.2
Yes			1.3 (0.9-1.8)	

[†] Abbreviations: MCP- Maternity care provider; GP- General Practitioner; dTpa- Diphtheria-tetanus-acellular pertussis vaccine; IIV- Inactivated influenza vaccine

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Author/s:

Krishnaswamy, S;Wallace, EM;Buttery, J;Giles, ML

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