**Use of social networking sites and women's decision to receive vaccinations during pregnancy: A cross-sectional study in the UK**

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**Abstract**

In the UK, it is recommended that pregnant women receive the influenza and pertussis vaccination. However, uptake of these vaccinations in certain UK regions remains low. Previous studies show that pregnant women use the internet to access health information, yet it has not been previously explored whether the use of social networking sites (SNS) influences decisions about maternal vaccination uptake.

The aim of this study was to determine, if the use of SNS to gain information on pregnancy vaccinations, is associated with women’s uptake of the influenza and pertussis vaccines during pregnancy.

This is a cross-sectional study with data collected using an online questionnaire posted on Mumsnet (an online parenting site), from 3rd - 24th August 2017. Women were included if they lived in the UK, were over 32 weeks pregnant, or had given birth in the last year. Participants were questioned about their pregnancy vaccination uptake, general SNS use and, their SNS use in relation to gathering information on vaccinations during pregnancy. The data was analysed using chi-square test, and univariable and multivariable logistic regression.

Out of a sample of 308 participants, 305 (99.3%) of women reported using SNS and 64/308 (20.8%) of women reported using SNS to gather information on vaccinations during pregnancy.

Women who reported using SNS to gather information on pregnancy vaccinations were 58% (adjusted odds ratio 0.42; 95% CI 0.21-0.87) less likely to receive the pertussis vaccination during pregnancy. However, the association was not statistically significant for the influenza vaccination (adjusted odds ratio 0.64; 95% CI 0.37-1.11).

The study showed many women use SNS to gather information on pregnancy vaccinations, and this is negatively associated with their likelihood of receiving the pertussis vaccine. Future studies are needed to analyse the accuracy and quality of the vaccination information, which women find on SNS.

**Key words** – United Kingdom; social networking sites; pregnancy; vaccinations; pertussis; influenza.

**Introduction**

Vaccinations during pregnancy can protect both mother and baby from disease1-4. In the UK, pregnant women are classed as a vulnerable group, and it is recommended that all pregnant women receive the influenza and pertussis vaccine5.

The influenza vaccine has been recommended for pregnant women since 2009, to be given at any stage of their pregnancy during the period from September to February5-7. Studies have shown that women are more susceptible to influenza during pregnancy, and are more likely to develop severe disease, or die, compared to the non-pregnant population4, 8. Influenza in pregnancy is also linked to adverse pregnancy outcomes, such as miscarriage, preterm birth and stillbirth8.

Pertussis poses a great risk to the health of babies, and can result in them developing pneumonia, or suffering seizures, brain damage, and can result in death9. The pertussis vaccine has been offered to pregnant women in the UK since 2012, after a national outbreak of the disease10.

Deaths due to pertussis in babies less than 3 months of age had increased in 2016, with four babies succumbing to the disease10, 11. It is recommended that women receive the vaccination from 16 and 32 weeks gestation12. However, it can be given up until a woman goes into labour10, 12. Babies cannot be vaccinated until they are 8 weeks of age; however, immunity is passed on from mother to baby10-12. If a mother receives the pertussis vaccine, at least a week before giving birth, research shows that their babies have a 91% reduced risk of contracting whooping cough in the first 8 weeks of their lives, compared to the babies who are born to unvaccinated women13,14.

In England, the average pertussis vaccine uptake in pregnant women, from January to March 2017 was 73.8%15. However, in London, only 63.2% of pregnant women had their pertussis vaccination during March, whereas in Yorkshire and Humber 79.7% of pregnant women received the vaccine15. Uptake of the influenza vaccine in England is even lower, with only 44.9% of pregnant women receiving the vaccination during September 2016 and January 201716

Social networking sites (SNS) are a popular form of social connection and peer support. Usage of such sites continue to increase, with on average in the United Kingdom a person spending 114 minutes a day on social media in 201717. A report by Ofcom18 published in 2017, showed that within a weekly period 24% of women used the internet to search for health related topics18,and 51% used the internet to access social media18.

The terms social media and social networking sites are often used interchangeably; however, they are actually very different. *Social media* is the use of different technologies19; these technologies are used to upload communications, such as blogs or videos19. Social networking sites are services that let people create a profile that is within a restricted system20. They enable users to view the profiles of others and connect with people who share similar interests20.

Bodeker et alconducted a cross-sectional study in Germany and found that 47.6% of women thought the internet, a useful and important source of information on vaccination during pregnancy21. Campbell et al22 also foundthat 13.2% of women had heard about the pertussis vaccination programme in the UK, via the internet, with 15.3% of women preferring to use the internet, to obtain information on vaccines22. Internet use has increased dramatically over the last two years, and so these figures may be much higher. This study was also conducted when the pertussis vaccination had only been available in the UK for 3 months22, and so women may not have used the internet to gather information on it because it was not available to them.

Previous studies have shown that high numbers of women use the internet to find health information in pregnancy23-26, and social networking sites are used to search for pregnancy related health information, such as exercise and nutrition24. A cross-sectional study by Lagan et al, found that 13% of women reported that the internet was the only source they used, when wanting to gain information about pregnancy26 and another prospective study by O'Higgins et al25 in Ireland, found that 70% of women reported using discussion forums, and 67% used social networks to gain information on pregnancy health.

Women reported using internet sites because they appreciated the ease and quickness of the available results23. A cross-sectional study in Sweden by Bjelke et al also found that 46.5% of women reported that the lack of time available to them, to ask health professional questions, was a reason why they accessed the internet and social networking sites to gain information24. In addition, 48.6% of women reported in a cross-sectional study by Lagan et al in Northern Ireland26,that they used these sites because they were dissatisfied with the information that they received from their health care providers.

Lagan et al also reported that almost 94% of women supplemented the information they had received from their health provider, with information they also found on internet sites26, and that 83% of women stated they used the internet to influence their decision making in pregnancy26. However, this study was conducted in 2006, and, with the frequency of internet usage greatly increased since then, and changes in medical care, these results are unlikely to represent views of women today.

A cross-sectional study conducted in Italy by Bert et al, stated that 15% of multiparous women and 9% of primiparous women took part in online discussions about pregnancy23. However, this study only surveyed women that had healthy pregnancies, and so, the same results may not be repeated for those that experience complications in pregnancy. Half the women also included in this study used internet sites because they wanted to further their knowledge23, but a cross-sectional study by Bodeker et al, determined that those women, who used the internet, as well as radio and TV to source information, had on average, lower vaccination knowledge and were less likely to receive a vaccination21.

The current literature shows that there are many factors that contribute to a woman’s decision to receive vaccinations during pregnancy. These factors include ethnicity, age, marital status, education, number of pregnancies, the perceived effectiveness and safety of the vaccines, whether or not a woman has an underlying medical condition or a high risk pregnancy or, if she has received a recommendation to have a vaccine 22, 27-34. To our knowledge, there is no evidence investigating the association between a woman’s use of SNS, with their decision to be vaccinated.

This study aims to investigate if, and how women use social networking sites to gather information on pregnancy vaccinations, and whether this is associated with vaccination uptake during pregnancy.

**Methods**

This is a cross-sectional study using an online questionnaire. Women, who live in the UK, were over 32 weeks pregnant, or had given birth within the last year, were eligible to take part in this study. This criteria was set because the UK vaccination schedule recommends that pregnant women receive their seasonal influenza vaccine during any trimester of their pregnancy from September to February5, and that they should receive their pertussis vaccine by 32 weeks gestation12. The year after the birth of a child has been set as an upper cut-off point, to try to reduce recall bias, as it is hoped that women are likely to still remember if they received their vaccinations, and if they have used SNS to gain information about vaccination, at this point in time.

An online questionnaire was used to collect data from participants. The questionnaire was developed by the researchers and published using iSurvey, which is a survey tool used to generate and distribute online questionnaires. By using iSurvey, all information is stored on the University server, which uses secure encryption and ensures that any data cannot be accessed by third parties. The questionnaire did not collect any identifiable information, to ensure that all participants’ identities were anonymous. The questionnaire included 23 questions that gathered socio-demographic information, and questioned participants about their pregnancy vaccination uptake, general SNS use and their SNS use in relation to gathering information on vaccinations during pregnancy. The online questionnaire aimed to answer the following six research questions:

* What is the proportion of women, who used SNS to gain information on vaccinations in pregnancy?
* What is the frequency women used SNS to gather information on vaccinations in pregnancy?
* What is the proportion of women, who are aware of why they should be vaccinated in pregnancy?
* What are the different sources women use to gather information on pregnancy vaccinations?
* What is the proportion of women, who think that the online information they gather and the interactions they have, influence their decisions to be vaccinated?
* What the proportion of women, who received influenza and pertussis vaccinations during their pregnancy?

The questionnaire was posted on Mumsnet, a parenting website that is run by parents, and has over 10 million visitors a month35. The website provides advice and support for people, who are trying to conceive, those who are expecting a baby and for parents35.

Mumsnet was chosen to post the questionnaire, because it reaches a large audience of women in the UK. Permission was gained from Mumsnet to post the questionnaire on their website however, it could only be posted in one place and the researcher was not allowed to share it elsewhere on the site. To access the questionnaire, users of Mumsnet clicked on the not-for-profit (NFP) surveys tab. Participants accessed the study thread, which led to a post containing a link to the questionnaire and information about the study.

To complete the questionnaire participants opened the link and were taken to an in-depth information sheet. Participants gave their consent by ticking a box and were then taken to the two screening questions to ensure that they met the selection criteria. They then proceeded on to the questionnaire. Participants were able to share the questionnaire via social networking sites and email with other people. The questionnaire was posted for a period of three weeks on Mumsnet, from August 3rd- 24th 2017.

Study power:

At a 5% statistical significance level, and with a study power of 80%, it was determined that to detect a 16% difference in the uptake of vaccinations between the two groups (those who used SNS to gain information on vaccination and those who did not) 304 participants were required to complete the questionnaire.

Statistical analysis:

The collected data was downloaded from iSurvey in a standard comma separated values form and before analysis, the raw data was checked. Missing data was examined, outliers were identified and variables were defined. Descriptive, univariable and multivariable analysis was undertaken to analyse the data and attempt to answer the key research questions mentioned above. Descriptive analysis and univariable comparisons were then undertaken, using the chi-square test to analyse differences between categorical variables. Univariable and multivariable logistic regression were then undertaken in Stata version 14 (2016; College Station, Tex., USA) adjusting for age, marital status, ethnicity, highest qualification and if the women were currently pregnant.

Ethical approval was gained from the University Ethics Committee (reference number 29207).

**Results**

Overall, 503 participants attempted the survey, 193 abandoned the survey without saving and 310 participants completed and saved the questionnaire. We excluded the 193 questionnaires that had been abandoned, because the majority had no data at all. One participant was excluded because they did not answer the screening questions and another was excluded because they answered in the negative to the first screening question. In total, 308 participants were included in the data analysis, with a completion rate of 61.2% based on those participants, who accessed the survey and those who completed it.

The main socio-demographic characteristics of those who responded to the survey are reported in Table 1. The largest proportion of participants were white (96.1%), aged 25-34 years (67.9%), lived in England (91.9%) and were married or in a relationship (96.4%).Qualifications were grouped into levels and are explained using the National Qualifications Framework used for England, Wales and Northern Ireland36. Up to level 4 includes any qualification that is classed as a level 4 or below, such as GCSEs; the academic qualifications undertaken by students in secondary education and Level 2, 3 or 4 NVQ; a vocational qualification that recognises the skills and knowledge a person needs to undertake a job. Level 5-6 includes level 5 diplomas, level 5 or 6 NVQ or a degree with, or without honours. Level 7- 8 includes master’s degree, postgraduate diploma or doctorate. In the population sample, women are very well educated with 79/308 (25.6%) of women having a qualification level 7 or 8. Of 306 participants, half were currently pregnant or had one child and half were currently pregnant with one or more children or had given birth to two or more children. Two women did not answer this question. Only 30/307 (9.8%) of women were currently pregnant at the time of completing the survey and 305/307 (99.3%) of participants reported using SNS.

Table 2 shows 290 (94.2%) participants used SNS on a daily basis, and out of 264 participants, who answered the question regarding hours of use, 51 (19.3%) of women used them for more than 3 hours a day. 64/308 (20.8%) of women reported that they used SNS to gather information on vaccinations during their pregnancy, 241/308 (78.2%) reported that they did not use SNS to gather information on vaccination and 3/308 (1.0%) were unsure if they had used this method.

Of those who reported they used SNS to gather information about vaccination, over half 33/59 (55.9%) reported that they had used social networking sites 1-2 times during their pregnancy to undertake such a task. 17/59 (28.8%) reported they used SNS 3-4 times and 9/59 (15.3%) used social networking sites 5 or more times to access information on vaccinations, during pregnancy. Figure 1 shows that Facebook and Whatsapp are the most popular types of SNS used. Other types of SNS participants used, included Baby Center, Mumsnet and Viber.

Table 3 shows 36/308 (11.7%) did believe that the information they had gathered on SNS did influence their decision in some way, to receive vaccinations. The data also showed that 295/306 (96.4%) of the participants were aware of why they should receive vaccinations during pregnancy.

The sources that participants used to gather information on pregnancy vaccinations are described in Figure 2. The majority of participants (89%) gained vaccination information from their midwife and the National Health Service Choices website; however, as Figure 2 shows, women also used parenting websites, such as Baby Center and Mumsnet to gather information. Other sources included the internet in general, and search engines such as Google (2.6%), Facebook groups (1.3%), books or medical journals (1%) and their own knowledge or research (1.6%). 272/307 (88.6%) of participants reporting receiving the pertussis vaccination and 210/306 (68.6%) of women had reported receiving the influenza vaccine during the index pregnancy.

Table 4 shows that non-vaccinated women were more likely to be multiparous and use SNS 5 or more times, during their pregnancy to gather information on pregnancy vaccinations. The results showed that of the women who gained information from their midwives, 91.5% received the pertussis vaccination and 71.4% of women did not receive the vaccination after gaining information from a midwife. This was statistically significant. A higher percent (65.8%) of women received the pertussis vaccination if they had received a vaccination in a previous pregnancy. When participants were asked if they believed the information they had gathered on SNS had influenced them to not receive vaccinations, a higher percent (37.1%) of women, who answered yes to this question did not receive the pertussis vaccine. This again was statistically significant.

Table 5 shows the characteristics of participants by their influenza vaccination status, just as the pertussis vaccine multiparous women were less likely to receive the influenza vaccine. However, unlike the pertussis vaccine of the women who were currently pregnant, a higher percent (17.7%) did not receive the influenza vaccine. The frequency of how many times a week women used SNS was also noteworthy, with 5.2% of those who used SNS 3-4 days a week not receiving the influenza vaccine. When compared to the pertussis vaccine, a higher percent of women (81.3%) who gained information from their midwives did not receive the influenza vaccine, and of the women who believed that the vaccination information they had gathered influenced them to reject vaccinations in pregnancy, 14.6% did not receive the influenza vaccine. However, this was a small sample.

Women, who reported using SNS to gain information on pregnancy vaccinations were 61% less likely to receive the pertussis vaccine compared to those who did not. The odds ratio remained statistically significant (OR 0.42, 95% CI 0.21-0.87) after adjusting for confounders that included age, marital status, ethnicity, highest qualification and if the woman was currently pregnant. However there was no association with the uptake of influenza vaccine during pregnancy.

Women, who reported using SNS 3-4 times during pregnancy to gather information on pregnancy vaccinations were 36% less likely to receive the pertussis vaccination when compared to those who used SNS 1-2 times during their pregnancy. Those, who reported using SNS 5 or more times during their pregnancy were 90% less likely to receive the pertussis vaccine, compared to those who used it 1-2 times. However, after adjusting for confounders, use of SNS 3-4 times/week was no longer significantly associated with pertussis vaccine uptake, and there was no evidence of association between the frequency of SNS use and influenza vaccination uptake. Not all information gathered on SNS is negatively associated with vaccination uptake, with women, who used both Whatsapp and LinkedIn statistically more likely to receive the pertussis and the influenza vaccine if they had used these types of SNS.

**Discussion**

The study results revealed that women, who used SNS to gather information on pregnancy vaccinations were less likely to receive the pertussis vaccination; however, the study did not find the same association with the uptake of influenza vaccine during pregnancy. This may be related to the different timings of the two vaccines during pregnancy. There may be more perceived risk and anxiety about receiving a vaccine later in pregnancy, as the pertussis vaccine is not recommended in the first trimester of pregnancy. In addition, the type and accuracy of information widely available to women through SNS may be different for the two vaccines.

Within the population sample, the uptake of the pertussis and influenza vaccine were higher (88.6% and 68.6% respectively) when compared to the vaccination uptake data reported by Public Health England15-16, who reported that the average pertussis vaccine coverage in England for January to March 2017 was 73.8%15 and the influenza uptake for the 2016/ 2017 influenza season was 44.9%16. These findings may have been higher because of the characteristics of the population sample in this study. Participants of this study included a greater proportion of highly educated white women, who were in a stable relationship and so the results may not be generalisable to those from different socio-demographic backgrounds.

99.3% of participants at the time of the survey reported using SNS. This high percent may have occurred due to the method of recruitment of participants. When the types of SNS used by participants are examined, it can be seen that within the study population, a higher percent of women used Instagram compared with women in the Ofcom report (61.4% vs. 34%)18. The same applies for Pinterest (47.4% vs. 17%), You Tube (45.8% vs. 26%) and LinkedIn (20.5% vs. 14%)18. This could be because SNS are now being used more than ever, or because the sample population involved high SNS users.

During analysis of the data, it was found that the question that asked women to report how many hours a day they used SNS for, was the one with the most missing data, with 44 women not answering this question. It may be because women access SNS from many different devices throughout the day18, for short periods and so they found it hard to summarise how many hours in total they spent on SNS, or it may have been because women do not want to share this information from fear of being judged, even though the questionnaire was anonymous. What is evident is that many women are spending long periods of time accessing SNS a day, with 19.3% of the population sample spending more than 3 hours a day on social networking sites.

Those women, who used Whatsapp and LinkedIn were more likely to receive both vaccines. LinkedIn is often used by professionals, who are more likely to be well educated. Whatsapp is used for private messaging so may be more likely to include messages from trusted friends and family members. Some women use SNS for peer support. Other studies have shown this is potentially positive when women are sharing accurate information with each other37. The other types of SNS used were not significant, this may be because some of the types of SNS had small sample sizes and type 2 error may have occurred.

The study data shows that non-vaccinated women were more likely to be multiparous. Henninger et al, who conducted a prospective cohort study, similarly found that women, who had received the influenza vaccine, were more likely to have lower gravidity27. This may be because if a woman has not been vaccinated in previous pregnancies and she and her baby have not experienced a disease, then she may perceive the risk to herself and her baby as low, and deem vaccination unnecessary. This theory is supported by recently published studies that found that women did not obtain the pertussis and influenza vaccine in pregnancy because they perceived risk to themselves as low, thereby deeming vaccination as unnecessary 21, 30-31, 34.

Women, who have previously received a vaccination during pregnancy, were also significantly more likely to receive the influenza and the pertussis vaccine during their current or last pregnancy. This perhaps, could be because those who have previously had a vaccination in pregnancy have had a positive experience of receiving the vaccine, trust it, and are aware of the benefits and so are more likely to receive it again compared to those who have never received a vaccination in pregnancy. It was found that 66/305 (68.8%) of women, who had received the pertussis, vaccine did not receive the influenza vaccine. This high rate of women not receiving the influenza vaccine is concerning. If women are not willing to receive other types of vaccines themselves, they may be less likely to allow their child to receive routine childhood vaccinations.

Just as previous studies have shown, this study also confirms the fundamental role that midwives play in communicating the importance of pregnancy vaccinations to women22, 32. Using midwives as a source to gather information on vaccinations in pregnancy was statistically significant, with 194/307 (92.4%) of women, who gained this information from midwives, receiving the influenza vaccine during their pregnancy, and the same applied for pertussis with 249/307(91.5%) receiving the vaccine, if they gained information from a midwife. This was still significant, even after confounding factors were adjusted for. The findings did however suggest there is still a high percent of women, who are gaining information on pregnancy vaccinations from their midwives and are not receiving vaccinations. The reason why this is occurring needs to be explored.

**Strengths and Limitations**

To our knowledge, this is the first study to investigate the association of a woman’s use of SNS to gather information on pregnancy vaccinations, and the influence on vaccination uptake. The survey was web-based and posted on a popular site, so we were able to reach our target population, who use SNS38. An online survey was also more convenient for participants as they could complete the survey at a time of day that suited them38. Confounding factors were also adjusted for, and this adds strength to the findings, as does achieving more participants than the required sample size.

In this study, there was a lower percentage of minority ethnic groups when compared to the population average for England and Wales39. Census ethnicity statistics report that of women aged 20-44 years of age 9% identified themselves as white non-British and 73% as white British, 10% classed themselves as Asian/ Asian British, 2% as mixed/ multiple ethnic groups and 4% classified themselves as Black/ African/ Caribbean/ Black British39-40. In England and Wales in 2016, it is estimated 49.9% of women aged over the age of 16 were married41. In this study 96.4% of participants reported that they were in a stable relationship or married, thus single and divorced women were under-represented. The authors did not collect the occupation of participants, and it is noted that participants from certain working backgrounds may have a better knowledge of vaccinations than others. This is something that needs to be explored in future studies.

The sample size in the influenza category of the study was smaller than the sample size in the pertussis category, and this may have been why the same association was not found with the uptake of the influenza vaccine and the use of SNS to gather information on pregnancy vaccinations, as it was with the pertussis vaccine. Another limitation of this study is that the researchers cannot verify that the participants who completed the survey were pregnant, or had given birth within the last year, and vaccination status was self-reported. Some women would have had to think back nearly a year and this introduces recall bias into the study. How the participants were recruited, is a limitation in itself. The questionnaire was only published on one website on the internet, this form of recruitment excluded women, who may not access that website and it also excludes non-internet users. This recruitment strategy has resulted in selection bias. The length of time that the questionnaire was posted for would have also introduced bias; because of time restrictions, it was only available online for completion for 3 weeks in August. This would have excluded many from completing it.

The study design of a cross-sectional survey can only show association and not causation; however, in other studies focusing on factors and attitudes that affect vaccination uptake, a cross-sectional design was frequently used21-24, 30, 32-34. This design was appropriate for the time frame that the researchers had. A non-standardised questionnaire was used for this study and it was not piloted prior to the start of the study because of time constraints, this affects the reliability of the questionnaire. Another limitation of this study is that the survey did not define for the participants, what was meant by SNS at the outset, as that was left to their interpretation. Participants may have different ideas of what SNS is, and this could have affected their responses.

**Implications for research and practice**

Further research should be conducted to determine why women choose to use SNS to gather information on pregnancy vaccinations, and if they opt to choose SNS over other sources of information. Furthermore, there should also be further studies into the types of women, who are using SNS. Are they women, who want to gain the opinions or hear about experiences of others in the same situation, and are they women who are looking for a second opinion or are they women, who do not attend their medical appointments. Prospective or historical cohort studies are also required to analyse the accuracy and quality of the vaccination information that women find on SNS, and how women can be guided to sites that are more accurate. Trials using SNS to promote vaccination uptake should also be undertaken and evaluated. In order to achieve a more representative sample, recruiting women for studies assessing SNS use for health can be through non-SNS channels in the first instance, such as antenatal or postnatal clinics, or children’s centres.

As mentioned above, a high percent of women, who gain information from their midwives, still do not receive pregnancy vaccinations. This makes one wonder about how effective current methods are. A quality improvement project should be undertaken by local authorities to assess the methods and timings that vaccinations are communicated to women by their midwives. It may then be possible to determine how to improve communications between midwives and pregnant women, to improve vaccination uptake. Due to time restraints in antenatal visits, more online resources are being used, therefore health professionals should be more visual in online settings and should support and guide women in their online searches, and encourage them to use factual sites such as NHS choices.

Every health professional has the opportunity to make every contact count42 and discuss vaccination with their patients. Admin staff at surgeries should also be encouraged to follow this mantra. Receptionists come in contact with every patient, who visits the surgery when they check in. They should ask pregnant women if they need to make an appointment to receive their vaccinations, or perhaps give written information to women or remind them to ask their health care provider to discuss vaccinations with them.

Social networking sites should be used to advertise government campaigns regarding pregnancy vaccinations. Social marketing techniques can be used to promote the NHS choices website on Facebook, parenting websites and online groups43. These sites are an ideal place for information to be presented, as this is where women often discuss and share information with others. It is recommended that a digital media strategy for maternity services in the UK be developed to harness the virality of social networking sites, and enable factual information to be spread expansively.

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**Declarations of interest**

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Figure 1. Types of SNS used by participants.

Figure 2. Sources used to gather information on vaccination during pregnancy.

Table 1. General characteristics of participants

|  |  |
| --- | --- |
| Characteristic | Number (%) |
| Age (years) (n=308)  19-24 yrs.  25-34 yrs.  35-39 yrs.  ≥40 yrs. | 26 (8.4)  209 (67.9)  60 (19.5)  13 (4.2) |
| Marital Status (n=306)  Partner/ Married  Single/ Separated/ Divorced  Prefer not to say | 295 (96.4)  10 (3.3)  1 (0.3) |
| Ethnicity (n=308)  White  Mixed/ Multiple ethnic group  Asian/ Asian British  Other ethnic group | 296 (96.1)  4 (1.3)  6 (1.9)  2 (0.6) |
| Country of Residence (n=307)  England  Northern Ireland  Scotland  Wales | 282 (91.9)  3 (1.0)  16 (5.2)  6 (2.0) |
| Highest Qualification\* (n=308)  Up to a level 4 qualification  Level 5 or 6 qualification  Level 7 or 8 qualification  No qualification/ prefer not to say | 102 (33.1)  124 (40.3)  79 (25.6)  3 (1.0) |

\* The National Qualifications Framework (NQF) qualification levels for England,

Wales and Northern Ireland.

Table 2. Frequency of social networking sites use by participants

|  |  |
| --- | --- |
| Frequency of use by hours a day and days a week | n (%) |
| Days a week (n=308)  1-2 days a week  3-4 days a week  5-6 days a week  Everyday  Do not use SNS | 5 (1.6)  5 (1.6)  7 (2.3)  290 (94.2)  1 (0.3) |
| Hours a day (n=264)  Up to one hour a day  1-2 hours a day  2-3 hours a day  3-4 hours a day  4+ hours a day | 46 (17.4)  95 (36.0)  72 (27.3)  32 (12.1)  19 (7.2) |

Table 3. Did women believe the information they gathered on SNS influenced their

vaccination decision making in pregnancy.

|  |  |  |
| --- | --- | --- |
| Influence of SNS on women (n=308) | n (%) |  |
| Did women believe the information they gathered on SNS influenced them to receive vaccinations  Yes  No  Don’t Know  Not Applicable | 36 (11.7)  192 (62.3)  9 (2.9)  71 (23.1) |  |
| Did women believe the information gathered on SNS  influenced them not to receive vaccinations  Yes  No  Don’t Know  Not Applicable | 14 (4.5)  175 (56.8)  3 (1.0)  116 (37.7) |  |

Table 4. Characteristics of participants by pertussis vaccination status

|  |  |  |  |
| --- | --- | --- | --- |
|  | Vaccinated (n=272) | Not Vaccinated (n=35) | *P*-value\* |
| Age in Years (n=307)  19-24 yrs.  25-34 yrs.  35-39 yrs.  ≥ 40 yrs. | 22 (8.1%) (5%-12%)  185 (68.0%) (62%-74%)  54 (19.9%) (15%-25%)  11 (4.0%) (2%-7%) | 4 (11.4%) (3%-27%)  23 (65.7%) (48%-0.81)  6 (17.1%) (7%-34%)  2 (5.7%) (1%-19%) | 0.8 |
| Marital Status (n=305)  Partner/ Married  Single/ Separated/ Divorced  Prefer not to say | 260 (96.3%) (93%-98%)  9 (3.3%) (2%-6%)  1 (0.4%) (0%-2%) | 34 (97.1%) (85%-99%)  1 (2.9%) (0%-15%)  0 (0.0%) (0%-10%) | 1.0 |
| Ethnicity (n=307)  White  Mixed/ Multiple ethnic group  Asian/ Asian British  Other ethnic group | 262 (96.3) (93%-98%)  3 (1.1%) (0%-3%)  6 (2.2%) (1%-5%)  1 (0.4%) (0%-2%) | 33 (94.3%) (81%-99%)  1 (2.9%) (0%-15%)  0 (0.0%) (0%-10%)  1 (2.9%) (0%-15%) | 0.2 |
| Highest Qualification (n=307)  Up to Level 4 qualification  Level 5 or 6 qualification  Level 7 or 8 qualification  No qualification/ Prefer not to say | 87 (32.0%) (26%-38%)  107 (39.3%) (33%-45%)  75 (27.6%) (22%-33%)  3 (1.1%) (0%-3%) | 15 (42.9%) (26%-61%)  16 (45.7%) (29%-63%)  4 (11.4%) (3%-27%)  0 (0.0%) (0%-10%) | 0.2 |
| Parity (n=306)  Currently pregnant or have one child  Currently pregnant with one or more children or  have two or more children | 147 (54.2%) (48%-60%)  124 (48.8%) (40%-52%) | 6 (17.1%) (7%-33%)  29 (82.9%) (66%-93%) | **<0.001** |
| Country of Residence (n=307)  England  Northern Ireland  Scotland  Wales | 249 (91.5%) (88%-95%)  3 (1.1%) (0%-3%)  15 (5.5%) (3%-9%)  5 (1.8%) (1%-4%) | 33 (94.3%) (81%-99%)  0 (0.0%) (0%-10%)  1 (2.9%) (0%-15%)  1 (2.9%) (0%-15%) | 0.8 |
| Currently Pregnant (n=306) | 27(10.0%) (7%-14%) | 3 (8.6%) (2%-23%) | 1.0 |
| Use SNS (n=307) | 270 (99.3%) (97%-100%) | 35 (100%) (90%-100%) | 1.0 |
| Use Facebook (n=307) | 268 (95.8%) (96%-100%) | 34 (97.1%) (85%-100%) | 0.5 |
| Use Twitter (n=307) | 77 (28.3%) (23%-34%) | 11 (31.4%) (17%-49%) | 0.7 |
| Use Instagram (n=307) | 171 (62.9%) (57%-69%) | 17 (48.6%) (31%-66%) | 0.1 |
| Use You Tube (n=307) | 129 (47.4%) (41%-54%) | 12 (34.3%) (19%-52%) | 0.1 |
| Use Tumbler (n=307) | 4 (1.5%) (0%-4%) | 1 (2.9%) (0%-15%) | 0.5 |
| Use Google+ (n=307) | 27 (9.9%) (7%-14%) | 2 (5.7%) (1%-19%) | 0.6 |
| Use LinkedIn (n=307) | 61 (22.4%) (18%-28%) | 2 (5.7%) (1%-19%) | **0.02** |
| Use Pinterest (n=307) | 129 (47.4%) (41%-54%) | 16 (45.7%) (29%-63%) | 0.9 |
| Use Reddit (n=307) | 4 (1.5%) (0%-4%) | 2 (5.7%) (1%-19%) | 0.1 |
| Use Snapchat (n=307) | 81 (29.8%) (24%-36%) | 12 (34.3%) (19%-52%) | 0.6 |
| Use Whatsapp (n=307) | 230 (84.6%) (80%-89%) | 24 (68.6%) (51%-83%) | **0.02** |
| Frequency SNS used each week (n=307)  I do not use SNS  1-2 days a week  3-4 days a week  5-6 days a week  Everyday | 1 (0.4%) (0%-2%)  5 (1.8%) (1%-4%)  2 (0.7%) (0%-3%)  7 (2.6%) (1%-5%)  257 (94.5%) (91%-97%) | 0 (0.0%) (0%-10%)  0 (0.0%) (0%-10%)  3 (8.6%) (2%-23%)  0 (0.0%) (0%-10%)  32 (91.4%) (77%-98%) | 0.06 |
| Hours a day SNS used (n=264)  Up to an hour a day  1-2 hours a day  2-3 hours a day  3-4 hours a day  4+ hours a day | 36 (15.3%) (11%-20%)  89 (37.7%) (32%-44%)  64 (27.1%) (22%-33%)  29 (12.3%) (8%-17%)  18 (7.6%) (5%-12%) | 10 (35.7%) (19%-56%)  6 (21.4%) (8%-41%)  8 (28.6%) (13%-49%)  3 (10.7%) (2%-28%)  1 (3.6%) (0%-18%) | 0.1 |
| Aware of why receive vaccines (n=306) | 263 (97.0%) (94%-99%) | 32 (91.4%) (77%-98%) | 0.2 |
| Used GP (n=307) | 106 (39.0%) (33%-45%) | 7 (20.0%) (8%-37%) | **0.03** |
| Used Midwife (n=307) | 249 (91.5%) (88%-95%) | 25 (71.4%) (54%-85%) | **<0.001** |
| Used NHS Choices website (n=307) | 130 (47.8%) (42%-54%) | 16 (45.7%) (29%-63%) | 0.8 |
| Used Baby Center (n=307) | 46 (16.9%) (13%-22%) | 0 (0.0%) (0%-10%) | **0.01** |
| Used Mumsnet (n=307) | 28 (10.3%) (7%-15%) | 1 (2.9%) (0%-15%) | 0.2 |
| Used Netmums (n=307) | 17 (6.3%) (4%-10%) | 0 (0.0%) (0%-10%) | 0.2 |
| Used Family (n=307) | 36 (13.2%) (9%-18%) | 4 (11.4%) (3%-27%) | 1.0 |
| Used Friends (n=307)    Used Other Healthcare professionals (n=307) | 52 (19.1%) (15%-24%)  25 (9.2%) (6%-13%) | 7 (20.0%) (8%-37%)  5 (14.3%) (5%-30%) | 0.9  0.4 |
| Received vaccines in previous pregnancy (n=307) | 179 (65.8%) (60%-71%) | 9 (25.7%) (12%-43%) | **<0.001** |
| SNS used to gain info on vaccinations (n=307)    Frequency SNS used to gather information on vaccines in pregnancy (n=59)  1-2 times during pregnancy  3-4 times during pregnancy  5 or more times during pregnancy | 49 (18.0%) (14%-23%)  29 (61.7%) (46%-75%)  14 (29.8%) (17%-45%)  4 (8.5%) (2%-20%) | 15 (42.9%) (26%-62%)  4 (33.3%) (10%-65%)  3 (25.0%) (5%-57%)  5 (41.7%) (15%-72%) | 0.05  **0.03** |
| The woman believed the information they gathered on social networking sites influenced their decision toreceive vaccinations during pregnancy (n=307)  The woman believed the information they gathered on social networking sites influenced their decision not toreceive vaccinations during pregnancy (n=307) | 32 (11.8%) (8%-16%)  1 (0.4%) (0%-2%) | 4 (11.4%) (3%-27%)  13 (37.1%) (21%-55%) | 0.6  **<0.001** |
| Flu vaccine received during current/ last pregnancy (n=306) | 204 (75.6%) (70%-81%) | 5 (14.3%) (5%-30%) | **<0.001** |

\*Chi-square test reported unless at least one of the table cells had an expected count <5 then Fisher’s exact test was reported, *P-*values reported are for trend.

Table 5. Characteristics of participants by influenza vaccination status

|  |  |  |  |
| --- | --- | --- | --- |
|  | Vaccinated (n=210) | Not vaccinated (n=96) | P-value\* |
| Age in Years (n=307)  19-24 yrs.  25-34 yrs.  35-39 yrs.  40 yrs. or over | 16 (7.6%) (4%-12%)  140 (66.7%) (60%-73%)  44 (21.0%) (16%-27%)  10 (4.8%) (2%-9%) | 10 (10.4%) (5%-18%)  68 (70.8%) (61%-80%)  15 (15.6%) (9%-24%)  3 (3.1%) (1%-9%) | 0.6 |
| Marital Status (n=305)  Partner/ Married  Single/ Separated/ Divorced  Prefer not to say | 200 (96.2%) (93%-98%)  7 (3.4%) (1%-7%)  1 (0.5%) (0%-3%) | 93 (96.9%) (91%-99%)  3 (3.1%) (1%-9%)  0 (0.0%) (0%-4%) | 1.0 |
| Ethnicity (n=307)  White  Mixed/ Multiple ethnic group  Asian/ Asian British  Other ethnic group | 204 (97.1%) (94%-99%)  2 (1.0%) (0%-3%)  3 (1.4%) (0%-4%)  1 (0.5%) (0%-3%) | 90 (93.8%) (87%-98%)  2 (2.1%) (0%-7%)  3 (3.1%) (1%-9%)  1 (1.0%) (0%-6%) | 0.4 |
| Highest Qualification (n=307)  Up to Level 4 qualification  Level 5 or 6 qualification  Level 7 or 8 qualification  No qualification/ Prefer not to say | 69 (32.9%) (27%-40%)  80 (38.1%) (31%-45%)  58 (27.6%) (22%-34%)  3 (1.4%) (0%-4%) | 33 (34.4%) (25%-45%)  43 (44.8%) (35%-55%)  20 (20.8%) (13%-30%)  0 (0.0%) (0%-4%) | 0.4 |
| Parity (n=306)  Currently pregnant or have one child  Currently pregnant with one or more children or  have two or more children | 114 (54.8%) (48%-63%)  94 (45.2%) (38%-52%) | 39 (40.6%) (31%-51%)  57 (59.4%) (49%-69%) | **0.02** |
| Country of Residence (n=307)  England  Northern Ireland  Scotland  Wales | 192 (91.9%) (87%-95%)  3 (1.4%) (0%-4%)  10 (4.8%) (2%-9%)  4 (1.9%) (1%-5%) | 88 (91.7%) (84%-96%)  0 (0.0%) (0%-4%)  6 (6.3%) (2%-13%)  2 (2.1%) (0%-7%) | 0.8 |
| Currently Pregnant (n=306) | 13 (6.2%) (3%-10%) | 17 (17.7%) (11%-27%) | **0.002** |
| Use SNS (n=307) | 207 (99.0%) (97%-100%) | 96 (100%) (96%-100%) | 1.0 |
| Used Facebook (n=307) | 207 (98.6%) (96%-100%) | 94 (97.9%) (93%-100%) | 0.7 |
| Used Twitter (n=307) | 66 (31.4%) (25%-38%) | 21 (21.9%) (14%-31%) | 0.09 |
| Used Instagram (n=307) | 130 (61.9%) (55%-69%) | 57 (59.4%) (49%-69%) | 0.7 |
| Used You Tube (n=307) | 100 (47.6%) (41%-55%) | 41 (42.7%) (33%-53%) | 0.4 |
| Used Tumbler (n=307) | 4 (1.9%) (1%-5%) | 1 (1.0%) (0%-6%) | 1.0 |
| Used Google+ (n=307) | 24 (11.4%) (7%-17%) | 5 (5.2%) (2%-12%) | 0.09 |
| Used LinkedIn (n=307) | 50 (23.8%) (18%-30%) | 13 (13.5%) (7%-22%) | **0.04** |
| Used Pinterest (n=307) | 107 (51.0%) (44%-58%) | 39 (40.6%) (31%-51%) | 0.09 |
| Used Reddit (n=307) | 3 (1.4%) (0%-4%) | 3 (3.1%) (1%-9%) | 0.4 |
| Used Snapchat (n=307) | 65 (31.0%) (25%-38%) | 27 (28.1%) (19%-38%) | 0.6 |
| Used Whatsapp (n=307) | 183 (87.1%) (82%-91%) | 70 (72.9%) (63%-81%) | **0.002** |
| Frequency SNS used each week (n=307)  I do not use SNS  1-2 days a week  3-4 days a week  5-6 days a week  Everyday | 1 (0.5%) (0%-3%)  5 (2.4%) (1%-5%)  0 (0.0%) (0%-2%)  5 (2.4%) (1%-5%)  199 (94.8%) (91%-97%) | 0 (0.0%) (0%-4%)  0 (0.0%) (0%-4%)  5 (5.2%) (2%-12%)  2 (2.1%) (0%-7%)  89 (92.7%) (86-97%) | **0.006** |
| Hours a day SNS used (n=264)  Up to an hour a day  1-2 hours a day  2-3 hours a day  3-4 hours a day  4+ hours a day | 27 (14.8%) (10%-21%)  70 (38.3%) (31%-46%)  47 (25.7%) (20%-33%)  24 (13.1%) (9%-19%)  15 (8.2%) (5%-13%) | 19 (24.1%) (15%-35%)  23 (29.1%) (19%-40%)  25 (31.6%) (22%-43%)  8 (10.1%) (4%-19%)  4 (5.1%) (1%-12%) | 0.2 |
| Aware of why receive vaccines (n=306) | 202 (96.7%) (93%-99%) | 91 (95.8%) (90%-99%) | 0.7 |
| Used GP (n=307) | 84 (40.0%) (33%-47%) | 29 (30.2%) (21%-40%) | 0.1 |
| Used Midwife (n=307) | 194 (92.4%) (88%-96%) | 78 (81.3%) (72%-88%) | **0.004** |
| Used NHS Choices website (n=307) | 103 (49.0%) (42%-56%) | 43 (44.8%) (35%-55%) | 0.5 |
| Used Baby Center (n=307) | 35 (16.7%) (12%-22%) | 11 (11.5%) (6%-20%) | 0.2 |
| Used Mumsnet (n=307) | 22 (10.5%) (7%-15%) | 7 (7.3%) (3%-14%) | 0.4 |
| Used Netmums (n=307) | 12 (5.7%) (3%-10%) | 5 (5.2%) (2%-12%) | 0.9 |
| Used Family (n=307) | 31 (14.8%) (10%-20%) | 9 (9.4%) (4%-17%) | 0.2 |
| Used Friends (n=307) | 42 (20.0%) (15%-26%) | 17 (17.7%) (11%-27%) | 0.6 |
| Used Other Healthcare professionals (n=306) | 20 (9.5%) (6%-14%) | 10 (10.4%) (5%-18%) | 0.8 |
| Received vaccines in previous pregnancy (n=307) | 143 (68.1%) (61%-74%) | 44 (45.8%) (36%-56%) | **<0.001** |
| SNS used to gain info on vaccinations (n=307) | 38 (18.1%) (13%-24%) | 26 (27.1%) (19%-37%) | 0.1 |
| Frequency SNS used to gather information on vaccines in pregnancy (n=59)  1-2 times during pregnancy  3-4 times during pregnancy  5 or more times during pregnancy | 22 (59.9%) (42%-75%)  10 (27.0%) (14%-44%)  5 (13.5%) (5%-29%) | 11 (50.0%) (28%-72%)  7 (31.8%) (14%-55%)  4 (18.2%) (5%-40%) | 0.8 |
| The woman believed the information they gathered on social networking sites influenced their decision to receive vaccinations during pregnancy (n=307) | 24 (11.4%) (7%-17%) | 12 (12.5%) (7%-21%) | 0.7 |
| The woman believed the information they gathered on social networking sites influenced their decision not to receive vaccinations during pregnancy (n=307) | 0 (0.0%) (0%-2%) | 14 (14.6%) (8%-23%) | **<0.001** |
| Whooping cough vaccine received during current/ last pregnancy (n=305) | 204 (97.6%) (95%-99%) | 66 (68.8%) (58%-78%) | **<0.001** |

\*Chi-square test reported unless at least one of the table cells had an expected count <5 then Fisher’s exact test was reported, *P*-values reported are for trend.

Table 6. Binary logistic regression for SNS use and vaccination uptake.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Pertussis |  | Influenza |  |
|  | Univariable OR  95% CI *P*-value | Multivariable OR\*  95% CI *P-*value | Univariable OR  95% CI *P-*value | Multivariable OR\*  95% CI *P-*value |
| SNS used to gain information on vaccination during pregnancy | 0.39 (0.20-0.76) **0.006** | 0.42 (0.21-0.87) **0.02** | 0.64 (0.38-1.08) 0.1 | 0.64 (0.37-1.11) 0.1 |
| Midwife used as a source of information | 4.33 (1.85-10.12) **0.001** | 5.47 (2.10-14.28) **0.001** | 2.80 (1.36-5.77) **0.005** | 3.10 (1.78-8.98) **0.001** |
| NHS choices used as a source of information | 1.09 (0.54-2.20) 0.8 | 0.95 (0.45-2.00) 0.9 | 1.19 (0.73-1.93) 0.5 | 1.19 (0.71-1.98) 0.5 |
| Did information women gathered on SNS influence them to receive vaccinations in pregnancy | 0.94 (0.30-2.92) 0.9 | 1.20 (0.35-4.08) 0.8 | 0.95 (0.44-2.02) 0.9 | 1.09 (0.49-2.44) 0.8 |
| Frequency of SNS use to gather information on pregnancy vaccinations  1-2 times during pregnancy  3-4 times during pregnancy  5 or more times during pregnancy | Ref  0.64 (0.13-3.28)  0.11 (0.02-0.59)  **0.02**\*\* | Ref  1.19 (0.11-12.72)  0.08 (0.01-1.22)  0.1\*\* | Ref  0.74 (0.21-2.39)  0.63 (0.14-2.80)  0.5\*\* | Ref  0.65 (0.16-2.61)  1.19 (0.18-7.79)  0.9\*\* |

Abbreviation: CI – Confidence interval

\*Adjusted for age, marital status, ethnicity, highest qualification, parity and if currently pregnant

\*\**P*-value for trend