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Determinants of satisfaction with information and additional information-seeking behaviour for the pertussis vaccination given during pregnancy

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ABSTRACT

Objectives: Information search and processing is critical to the vaccine decision-making process. However, the role of drivers of information satisfaction and search is not fully understood. Here, we investigated the predictive potential of psychosocial characteristics related to satisfaction with information and additional information-seeking about the pertussis vaccine currently recommended during pregnancy.
Design: Cross-sectional online questionnaire study.
Methods: A UK based sample of 314 women who had given birth during the previous six months was recruited to participate. The questionnaire included measures of the psycho-social predictors: *trust*, *coping strategies*, *attitude towards vaccine information-seeking behaviour* and *risk perception of vaccination during pregnancy*, and measures of two outcome variables: *satisfaction with information* received from a health care professional and whether participants engaged in *vaccine information-seeking behaviour*.
Results: Trust in health care professionals, a perceived behavioural control of own vaccine information-seeking behaviour, and an engaged problem-focused strategy for coping with stress were significant predictors of satisfaction with official information given by a health care professional. 40% of women sought out additional information about vaccination however, none of the psychosocial factors measured significantly predicted the behaviour.
Conclusions: We found that high trust in health care professionals, a perceived ability to seek out accurate information about vaccines and actively focusing on problems as a means of coping with stress, drives satisfaction in official vaccine information. We also developed measures of these variables that could be used in further research.

1. Introduction

When making a decision about vaccination, parents frequently prefer, trust and use health care professionals as a source of information [1–8]. Occasionally, due to unsatisfied information needs, additional sources of information are actively sought out [9,10]. This seeking can take place across numerous sources [3,7] and, for some individuals, can be an extensive process [11] that is highly influential in their final decision [12]. When vaccine information-seeking behaviour occurs, information from sources is assessed, trusted, and perceived as influential to varying degrees across different individual decision makers [3,13–16]. Although vaccine information-seeking behaviour is present in individuals who both accept and refuse vaccination [4,17,18], the behaviour poses a potential risk factor for exposure to information that is misleading and unduly critical of vaccination [19–21]. This information can be influential in the forming of knowledge, attitude towards, and final uptake of a vaccination [22–25].

1.1. The pertussis vaccination program

As a relatively recent addition to the UK immunisation schedule [26], the pertussis vaccine for pregnant women may be particularly vulnerable to misleading information [27].

Previous research involving pregnant and recently pregnant women demonstrates a strong willingness to vaccinate against pertussis during pregnancy [28], which the most recent reported uptake of the vaccine reflects [29]. However, a number of attitudi-

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nal and systems barriers prevent some individuals from taking the vaccine – information needs are one such cited barrier [28,30,31].

1.2. Vaccine information-seeking behaviour during pregnancy

Information-seeking behaviour for a wide range of health related reasons is common during pregnancy [32–38]. In relation to vaccine specific information-seeking behaviour in pregnancy, Bodeker et al. [39] found that 40.5% of women in their study actively sought out information about the influenza vaccine given during pregnancy. Women that sought advice from their health care professional were significantly more likely to vaccinate than those who sort information elsewhere. Thirty-five percent reported a need for further information, primarily for vaccine side-effects whether for themselves or their unborn child [39]. A similar result was reported in a survey related to the 2009/10 pandemic influenza vaccination [14] whereby the targeted at risk group, pregnant women, were found to use their health care professional as a source of information about the disease at a rate higher than that the general public.

1.3. Theoretical framework

Within the discipline of information science, Krikelas suggests that information needs occur when there is a perceived gap between currently held information and the level of information that an individual feels they need in order to confidently make an informed decision [9].

A health care professional will often offer patients additional information to help inform them during an upcoming health care decision. Satisfaction with such information forms a key role within Wilson's model of information behaviour [40]. If the given information does not significantly fill a person's unique information needs, information-seeking behaviour may occur. A successful information-seeking process is defined as leading to information being gathered and evaluated for use. Satisfaction or non-satisfaction with this new information gathered then serves to update the level of information need and amount of subsequent information-seeking behaviour [40].

Unmet information needs related to vaccination can often be stressful for a decision maker [10,27]. Therefore, the process of information-seeking is often mentioned in terms of a coping strategy whereby individuals who hold an "*engaged coping strategy*" will aim to reduce psychological stress caused by uncertainty through an active process of seeking information [41].

Our view of vaccine information-seeking behaviour is that of an active process performed by an individual. As such, we take the behaviour to be a reasoned action that a person consciously performs as a means of satisfying unmet information needs. In this way we draw upon the model of risk information-seeking by Griffin, Dunwoody and Neuwirth [42] in which factors such as risk perception, beliefs, about information-seeking, and self-efficacy related to information gathering are important predictors of information sufficiency (satisfaction) and subsequent information-seeking behaviour.

This study aims to investigate to what degree the factors mentioned first, predicts levels of satisfaction with official information about the pertussis vaccination and second, predict vaccine information-seeking behaviour during pregnancy. In addition, tools to measure the concept more effectively were developed for future research use (further details related to this can be found in the supplemental materials).

Hypothesis 1. We hypothesise that trust in health care professionals, trust in the health care system, psychosocial determinates of vaccine information-seeking behaviour, risk perception of vaccination during pregnancy, and an engaged coping strategy will significantly predict satisfaction with information.

Hypothesis 2. We hypothesise that trust in health care professionals, trust in the health care system, risk perception of vaccination during pregnancy, psychosocial determinates of vaccine information-seeking behaviour, engaged coping strategy, and satisfaction with information will significantly predict the occurrence of vaccine information-seeking behaviour.

2. Methods

2.1. Participants and design

To be eligible to participate in the study women had to meet three inclusion criteria, these were (i) to have given birth within the last six months of starting the survey, (ii) to have spent the majority of their pregnancy within England or Wales and (iii) class themselves as fluent in English. To recruit the participants, we contacted public baby and toddler groups (typically groups that organise events for 0–4 year olds) across England and Wales and asked the coordinators to forward an invitation email to group members for participation. Coordinators of 3,248 groups were contacted, 312 of which forwarded the invitation either in the form of a printed flyer or electronically through social media or e-mail. Further snowball sampling occurred through a request to pass on the participation link to interested parties once the survey had been completed. A total of 719 participants followed the link provided to start the survey between October 2016 and April 2017, when the survey was closed as we reached our goal of over 350 fully completed responses. Of the 719 participants, 149 were excluded automatically due to not fulfilling one of the three inclusion criteria, 211 dropped out before full completion of the survey and 45 were excluded because they reported on the survey that they were unaware of the pertussis vaccination program during pregnancy; thus, 314 women were included in the subsequent analyses (this process of exclusion and dropout is illustrated in Fig. 1).

The sample of participants who fully completed the survey (N = 314) had an age range of between 18 and 46 with the mean age of 32.2 years (*SD* = 4.6 years). For 42.8% the recent birth was their first pregnancy. The majority of participants were white British (87%) and the sample was geographically diverse across England with no one outward geographical code (first three of four digits of postcode) representing more than 2.7% of the sample.

The study involved a cross-sectional, self-reported questionnaire (see supplemental materials for full survey) designed to be taken online.

2.2. Procedure and measures

After providing informed consent, participants answered a range of questions related to socio-demographic factors such as age, location, ethnicity, and number of previous pregnancies that reached the third trimester. The questionnaire that followed contained a range of psychometric measures. The following subheadings outline the included scales and measures. These were presented to participants in the same fixed order as presented here. On completion, all participants received a full debriefing of the study and were provided with an open text box for any further comments they would like to make.

2.3. Trust in health care professionals and trust in the health care system

To measure trust in an individual's primary health care professional we adopted The Wake Forest Scale of Physician Trust [43] with the sole substation of *health care professional* for *physician*.

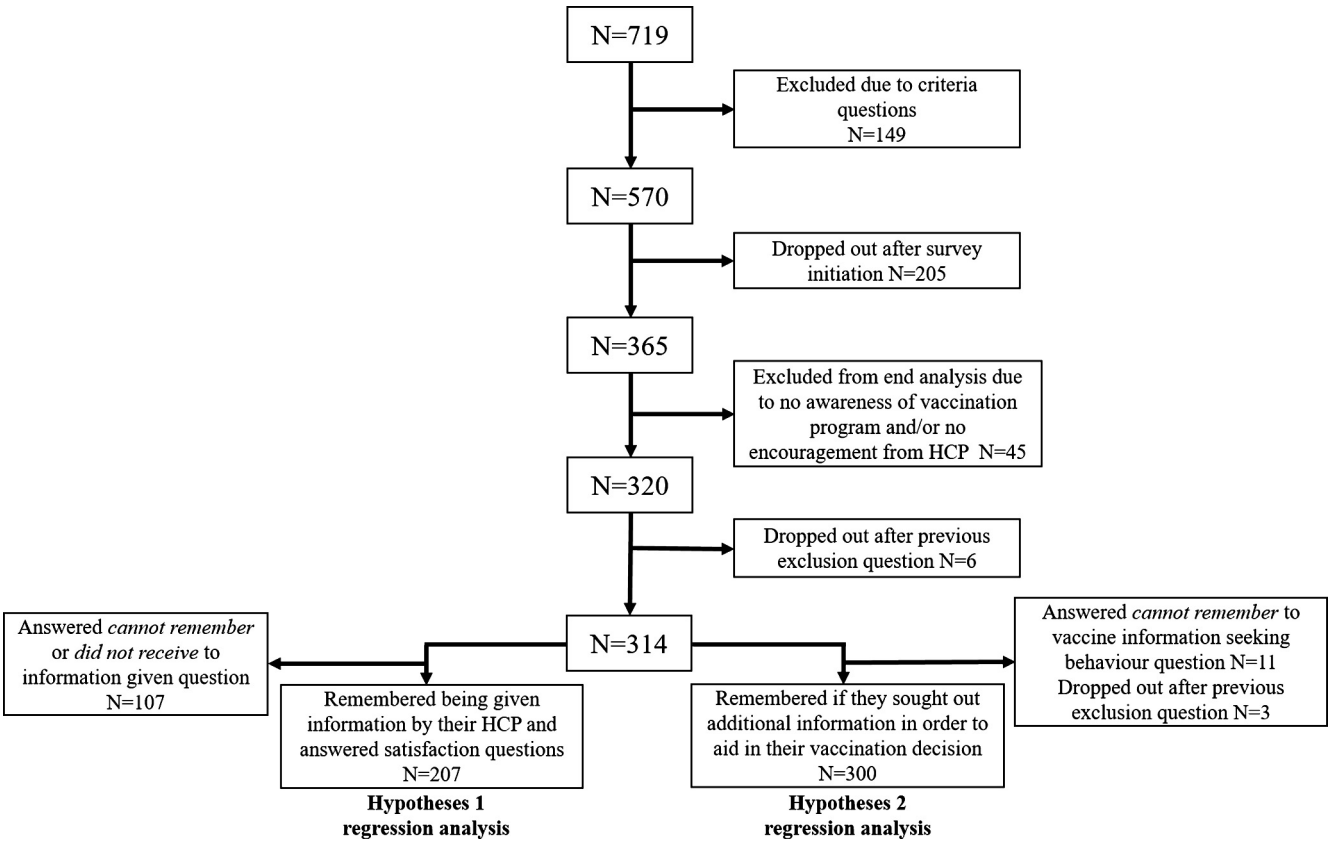

Fig. 1. The flowchart illustrates participate dropout, exclusion, and inclusion in the hypothesis testing analyses.

The scale consists of ten statements related to trust in primary health care professionals (e.g., *"Your health care professional did whatever it took to get you all the care you needed during your pregnancy"*) that are assessed on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The scale has good internal consistency (Cronbach's $\alpha = 0.94$) and the final score was expressed as an average of all items with the higher number indicating more trust.

To measure trust in the wider health care system we used The Health Care System Distrust Scale [44]. The scale consists of nine statements related to trust in the health care system (e.g., *"The health care system does its best to make patients' health better"*) that are assessed on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). This scale also has good internal consistency (Cronbach's $\alpha = 0.84$). The final score was expressed as a summation index and for ease of understanding reverse coded to indicate trust in the health care system (rather than distrust).

2.4. Coping strategies

The Short-Form Coping Strategies Inventory [45] involves a participant first recalling and describing a recent event (within the last month) that they found particularly stressful. The participant then responds to 32 items related to how they coped with the previously described stressor (e.g., *"I tackled the problem head on"*) that are assessed on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

The scale consists of first-order and second-order subscales. For the purpose of this study the first order scale of *disengaged* and two second order subscales of *emotion-focused engaged* and *problem-focused engaged* were used for testing the aforementioned hypotheses. The subscales had good internal consistency (*problem-focused engaged* Cronbach's $\alpha = 0.808$, *emotion-focused engaged* Cronbach's $\alpha = 0.89$, and *disengaged* Cronbach's $\alpha = 0.83$) and the final score for each was expressed as a summation index with the higher number indicating a greater propensity to adopt that coping strategy.

2.5. Psychosocial determinants of vaccine information-seeking behaviour

The Psychosocial Determinants of Vaccine Information-Seeking Behaviour Scale is an adapted version of a similar scale originally outlined in Harmsen et al. [46]. Its original Dutch context (information-seeking related to the Dutch National Immunisation Program) was adapted to that of general vaccination. The scale measures beliefs about information-seeking, perceived social norms to information-seeking and perceived self-efficacy when seeking information. The scale draws on the model of risk information-seeking behaviour by Griffin, Dunwoody and Neuwirth [42] and on a theory of planned behaviour approach to behavioural intention [47]. The scale has 16 statements (e.g., "*My friends think I should look for additional information when making a vaccination decision*") that participants rated on a seven-point Likert scale ranging from Totally Disagree (1) to Totally Agree (7). A four-factor model is proposed whereby the final score is expressed as an average of all items within the factor with the higher number indicating higher likelihood of behavioural intention. A full account of the scales development using principal components analysis can be found in the supplemental materials.

2.6. Risk perception of vaccination during pregnancy

The Risk Perception of Vaccination during Pregnancy Scale is a custom-made scale for use in this project tailored to measure risk perception. It has its bases in the severity and susceptibility elements of the Health Belief Model. This theoretical underpinning of a scale has been used in previous studies such as Henninger and colleagues [48], and Wallace and colleagues [49], this scale however captures attitude towards vaccination during pregnancy and the perceived susceptibility and severity for both pertussis as a disease and the pertussis vaccine offered during pregnancy. The scale consists of 10 statements (e.g., "*The whooping cough vaccine during pregnancy is likely to cause painful side effects*") that are assessed on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The scale had questionable internal consistency (Cronbach $\alpha = 0.61$). The final score was expressed as a subtraction of the vaccine related items from the disease related items with a lower value indicating a more negative perception of risk related to the pertussis vaccinations given during pregnancy.

2.7. Satisfaction with information

This short scale, constructed for use in this study, asks participants to rate information based on perceived amount, clarity, and accuracy. The scale consists of three statements related to satisfaction (e.g., "*How satisfied were you with the clarity of the information given to you by your health care professional(s)?*") that are assessed on a seven-point Likert scale between highly dissatisfied (1) to highly satisfied (7). The scale has good internal consistency (Cronbach's $\alpha = 0.91$) and the final score was expressed as an average of all items with higher number indicating higher satisfaction with information.

2.8. Vaccine information-seeking behaviour

For the purposes of this study the variable of *vaccine information-seeking behaviour* was quantified as a binary yes/no for the question ("*Did you seek out or research additional information about the whooping cough vaccine or whooping cough as a disease to help you make your decision? This could be from searching on the internet, talking to a friend or family member, reading pregnancy books, talking to other health professionals or anything else that would have aided you in your decision*"). An option of cannot remember was included whereby individuals who selected this option were excluded from analysis.

2.9. Statistical analyses

Statistical analyses were carried out using SPSS v.24 for Windows. All measures were treated as continuous variables apart from *vaccine information-seeking behaviour* which was treated as nominal.

2.9.1. Regression models

Two regressions analyses were conducted to assess the predictive ability of the listed variables on *satisfaction with information,* and *vaccine information-seeking behaviour*.

2.9.1.1. Regression model one. A multiple linear regression with the predictor variables of *coping strategy, trust in health care professional, trust in health care system, risk perception of vaccination during pregnancy,* and *psychosocial determinates of Vaccine information-seeking behaviour* was used to predict the variable *satisfaction with information.*

2.9.1.2. Regression model two. A logistic regression with the predictor variables of *coping strategy, trust in health care professional, trust in health care system, risk perception of vaccination during pregnancy, psychosocial determinates of vaccine information-seeking behaviour* and *satisfaction with information* was used to predict the variable *vaccine information-seeking behaviour.*

3. Results

3.1. Predicting information satisfaction

We observed several weak to moderate correlations between *trust in health care professional*, *trust in health care system*, *problem-focused engaged coping strategy*, *perceived behaviour control of vaccine information-seeking behaviour*, *risk perception of vaccination during pregnancy,* and *satisfaction with information* (see Table 1). While significant correlations were found between variables included in the regression model the IVF statistics demonstrated low multicollinearity, with none of the values exceeding an IVF of 2.0.

In a regression model the variables significantly predicted *satisfaction with information* $F(10, 185) = 9.436$, $p < .001$. This successfully accounted for 33.8% of the variance. We found three significant predictors of *satisfaction with information* (see Table 2): a *problem-focused engaged* coping strategy, *trust in health care professional,* and *perceived behavioural control of vaccine information-seeking behaviour*. These variables remained significant after a Bonferroni correction for multiple comparisons. A higher rating on all three variables predicted a higher likelihood that the respondent would report being satisfied with the information presented to them by their health care professional.

3.2. Predicting information-seeking behaviour

We observed several weak to moderate correlations between *trust in health care professional*, all four subscales of the Psychosocial Determinants of Vaccine Information-Seeking Behaviour Scale, and *satisfaction with information* (see Table 3). While significant correlations were found between variables included in the regression model the VIF statistics demonstrated low multicollinearity, whereby none of the values exceeded a VIF of 2.0.Table 4.

Model two was found to be significant, $\chi^2(11) = 47.690$, $p < .001$. This predicted 30.2% of the variance in *vaccine information-seeking behaviour*. Initially the variables of *satisfaction with information* and the attitude and beliefs component of the *psychosocial determinates to vaccine information-seeking behaviour* scale were found to be significant within the model, however after the Bonferroni correction for multiple comparisons this significance was lost. The Hosmer and Lemeshow test demonstrates the data violates parametric assumptions for the model, $\chi^2(8) = 16.564$, $p = .035$. Seventy-six percent of those who did not seek extra information were predicted by the model. Fifty-nine percent of those who did seek information were predicted. Overall 69.7% of individuals' vaccine information-seeking behaviour were correctly predicted by the model.

We conducted a post-hoc backwards stepwise logistic regression to further explore the predictors in the model. From this, it was evident that the removal of the risk perception variable had no effect on the variance explained by the model. Furthermore, removing the variables injunctive norms towards vaccine information-seeking behaviour, trust in health care professionals and trust in the health care system together reduce the variance explained by only 0.8%. Therefore the following model (see Table 5), with seven variables, would appear to be the most economical when predicting vaccine information-seeking behaviour.

Table 1
Zero order correlations among variables in model 1 (N = 207).

Variable	1	2	3	4	5	6	7	8	9	10	11
Trust in health care system	–										
Trust in health care professional	.507*	–									
Disengaged coping style	.048	.019	–								
Problem engaged coping style	.184	.043	−.191	–							
Emotion engaged coping style	.080	.100	.071	.318*	–						
Psychosocial determinants of VISB factor 1: Attitudes and beliefs	−.067	−.063	.075	.105	.024	–					
Psychosocial determinants of VISB factor 2: Descriptive norms	.093	.014	.145	.135	.047	.514*	–				
Psychosocial determinants of VISB factor 3: Injunctive norms	.039	.071	−.028	.024	−.048	.390*	.327*	–			
Psychosocial determinants of VISB factor 4: Perceived behavioural control	.235*	.118	.076	.165*	.122	.348*	.177	.081	–		
Risk Perception of vaccination during pregnancy	.286*	.192	−.053	−.060	.026	−.063	.010	.020	.161	–	
Satisfaction with information	.370*	.401*	.080	.208*	.081	.018	.107	.084	.279*	.252*	–

Vaccine information-seeking behaviour (VISB).
* p < .0045 (as corrected for multiple hypothesis testing).

Table 2
Psychosocial predictors of the satisfaction with vaccine information (multiple regression analysis).

Variable	*B*	*t*	*p*	*VIF*
Constant	0.601			
Trust in health care system	0.013	0.779	.437	1.581
Trust in health care professional	0.467	4.698	<.001	1.383
Disengaged coping style	0.011	1.647	.101	1.118
Problem engaged coping style	0.042	3.163	.002	1.283
Emotion engaged coping style	−0.010	−0.884	.378	1.161
Psychosocial determinants of VISB factor 1: Attitudes and beliefs	−0.091	−1.202	.231	1.700
Psychosocial determinants of VISB factor 2: Descriptive norms	0.034	0.607	.544	1.450
Psychosocial determinants of VISB factor 3: Injunctive norms	0.056	0.929	.354	1.250
Psychosocial determinants of VISB factor 4: Perceived behavioural control	0.240	2.923	.004	1.289
Risk Perception of vaccination during pregnancy	0.234	2.778	.006	1.138

Alpha was $p < .005$ as adjusted for multiple comparisons.
Unstandardized Beta coefficient *B*.
Variance inflation factor (VIF).
Vaccine information-seeking behaviour (VISB).

Table 3
Zero order correlations among variables in model 2 (N = 300).

Variable	1	2	3	4	5	6	7	8	9	10	11	12
Trust in health care system	–											
Trust in health care professional	.551*	–										
Disengaged coping style	.042	−.034	–									
Problem engaged coping style	.210	.071	−.218*	–								
Emotion engaged coping style	.051	.116	−.778	.298*	–							
Psychosocial determinants of VISB factor 1: Attitudes and beliefs	−.115	−.119	.107	.093	−.006	–						
Psychosocial determinants of VISB factor 2: Descriptive norms	.002	−.029	.109	.078	.063	.584*	–					
Psychosocial determinants of VISB factor 3: Injunctive norms	−.069	−.027	.026	.034	−.075	.436*	.381*	–				
Psychosocial determinants of VISB factor 4: Perceived behavioural control	.207*	.121	.054	.160	.069	.311*	.185	.102	–			
Risk Perception of vaccination during pregnancy	.300*	.230*	−.105	−.080	.050	−.141*	.041	−.065	.158	–		
Satisfaction with information	.373*	.397*	.064	.221*	.109	.017	.104	.090	.270*	.256*	–	
Vaccine information seeking behaviour†	−.080	−.148	.083	.028	−.065	.402*	.279*	.178	.129	−.053	−.145	–

Vaccine information-seeking behaviour (VISB).
* p < .0041 (as corrected for multiple hypothesis testing).
† Point-biserial correlations (r_{pb}).

This model was found to be significant, $\chi^2(7) = 46.582$, $p < .001$ and predicted 29.6% of the variance in *vaccine information-seeking behaviour*. The variables of *satisfaction with information* and the attitude and beliefs component of the *psychosocial determinates to vaccine information-seeking behaviour* scale were now found to be significant within the model. The Hosmer and Lemeshow test demonstrates the data did not violates parametric assumptions for the model, $\chi^2(8) = 8.994$, $p = .343$.

3.3. Further notable findings and exploratory analyses

Ninety-five percent of the sample had been vaccinated against pertussis during their recent pregnancy, with 95.8% receiving the vaccine between week 17 and week 36 of their pregnancy (see Table 6). Fifty-two percent of the sample reported becoming aware of the vaccination during their most recent pregnancy with midwives being found to be both the means that an individual first heard about the vaccination program (77.4%) and the health care professional to give the mother the most encouragement to vaccinate (91.4%).

Further exploratory analysis of the results given by the Psychosocial Determinate of Vaccine Information-Seeking Behaviour Scale demonstrated a significant difference across the subscales with the social (injunctive) norms to seeking information about vaccination constantly rated as lower than the other factors $F(3,1086) = 377.5$, $p < .001$.

For the individuals who reported seeking additional information to aid in their decision making process 88.1% indicated using

Table 4
Psychosocial predictors of vaccine information seeking behaviour (logistic regression analysis).

Variable	*B*	*Odds ratio*	*p*	*VIF*
Constant	−5.050			
Trust in health care system	0.033	1.033	.421	1.631
Trust in health care professional	−0.161	0.852	.520	1.595
Disengaged coping style	0.025	1.025	.120	1.137
Problem engaged coping style	0.051	1.052	.111	1.385
Emotion engaged coping style	−0.046	0.955	.070	1.172
Psychosocial determinants of VISB factor 1: Attitudes and beliefs	0.556	1.743	.007	1.746
Psychosocial determinants of VISB factor 2: Descriptive norms	0.244	1.276	.075	1.483
Psychosocial determinants of VISB factor 3: Injunctive norms	0.074	1.076	.587	1.252
Psychosocial determinants of VISB factor 4: Perceived behavioural control	0.240	1.272	.264	1.58
Risk Perception of vaccination during pregnancy	−0.058	0.944	.774	1.215
Satisfaction with information given	−0.493	0.611	.005	1.519

Alpha was $p < .0045$ as adjusted for multiple comparisons.
Unstandardized Beta coefficient *B*.
Variance inflation factor (VIF).
Vaccine information-seeking behaviour (VISB).

Table 5
Psychosocial predictors of vaccine information seeking behaviour (stepwise logistic regression analysis).

Variable	*B*	*Odds ratio*	*p*	*VIF*
Constant	−4.657			
Disengaged coping style	0.025	1.026	.105	1.102
Problem engaged coping style	0.057	1.058	.060	1.264
Emotion engaged coping style	-0.048	0.953	.057	1.144
Psychosocial determinants of VISB factor 1: Attitudes and beliefs	0.550	1.732	.005	1.502
Psychosocial determinants of VISB factor 2: Descriptive norms	0.263	1.301	.048	1.398
Psychosocial determinants of VISB factor 4: Perceived behavioural control	0.263	1.301	.206	1.286
Satisfaction with information given	-0.500	0.607	.002	1.181

Alpha was $p < .007$ as adjusted for multiple comparisons.
Variance inflation factor (VIF).
Unstandardized Beta coefficient *B*.
Vaccine information-seeking behaviour (VISB).

online sources (with 41.7% citing only web 1.0 and 0.07% citing only the use of web 2.0 and 39.4% using both), 42.5% talked to friends or family members and 7.1% sought out an additional health care professional (see Table 7). For those women who did search for additional information, time spent searching for information varied from 8 min to 11 h (mean = 2 h 31 min).

4. Discussion

Our findings indicate that seeking out further information in relation to the vaccines offered during pregnancy is a widely performed behaviour. We found that those women who trusted their health care professionals more, those who adopted a problem-focused engaged *strategy* when coping with stressful events and those who perceived higher behavioural control related to their own vaccine information-seeking behaviour, reported more satisfaction with the information received from their health care professional. This confirms our first hypothesis. Higher ratings in the three variables were found to relate to higher ratings of *satisfaction with information.*

When investigating hypothesis 2 the data used in logistic regression model did not meet parametric assumption and to predict vaccine information-seeking behaviour and no single individual measure within the module reached significance.

These findings, particularly those related to hypothesis 1, indicate that when official information is given to aid in the decision-making process it is often perceived in relation to a range of additional personality and social factors and not solely evaluated on its own intrinsic merit. The fact that *trust in health care professional* was found to be significant in the model, whereas *trust in the health care system* was not, gives evidence to Yaqub and colleagues [16] notion that social context predominantly shapes how information is interpreted and used. The importance of *perceived behavioural control of vaccine information-seeking behaviour* and *problem-focused engaged coping strategy* also adds to our understanding. Both of the constructs place factual information at the centre: (1) a problem-focused coping strategy is primarily related to cognitive and behavioural strategies to proactively change a stressful situation [45] and (2) behaviour control is the belief that a person is able to seek out and accurately assess information when needed [47]. Therefore, individuals who value factual information (over, for example, emotional or social information) are likely to be more satisfied with official written information being supplied by their health care professional.

It is noteworthy that the three coping strategy subscale did not play more of a sizable role in predicting vaccine information-seeking behaviour. From the theoretical framework outlined in the introduction we predicted that an engaged coping *strategy* would facilitate vaccine information-seeking behaviour whereas a disengaged coping *strategy* would inhibit it. Additional exploratory analysis of the Psychosocial Determinants of Vaccine Information-Seeking Behaviour Scale may indicate why this was the case. Although women in our study reported a desire to undertake searching (*Factor 1*) and feel that they had the necessary skills to do so (*Factor 4*) there were hints towards a possible social norm against the behaviour (*Factor 3*). Frequently, the items that asked whether the respondent thought that their health care professional

Table 6
General pertussis vaccine single item questions summary.

Questions	Number	%
Did you receive the whooping cough vaccine during your last pregnancy?		
Yes	297	94.9
No	16	5.1
When did you become aware that the whooping cough vaccine is recommended for pregnant women?		
Before last pregnancy	144	45.9
During last pregnancy	165	52.5
Cannot remember	5	1.6
Approximately how many weeks pregnant were you when you had the whooping cough vaccination?		
<17 Weeks	7	2.4
Between 17 and 26 Weeks	109	37
Between 27 and 36 Weeks	173	58.8
>36 Weeks	5	1.7
How did you first become aware about the whooping cough vaccination given during pregnancy?		
Leaflet with an appointment letter	16	5.1
During a meeting with a midwife	243	77.4
During a meeting with an obstetrician	4	1.3
During a meeting with a GP	6	1.9
During a meeting with a health visitor	2	0.6
During a meeting with a nurse	1	0.3
Public Health Campaign	3	1.0
Media (TV, Newspaper)	2	0.6
Friend or family member	16	5.1
Do not remember	4	1.3
Other	17	5.4
Out of the health care professionals you saw during your pregnancy which (if any) gave you the most encouragement to receive the whooping cough vaccine?		
Midwives	287	91.4
Obstetrician	2	0.6
GP	10	3.2
Health Visitor	2	0.6
Nurse	8	2.5
Pharmacist	1	0.3
Consultant	4	1.3

Table 7
Vaccine information seeking behaviour single item questions.

Questions	Number	%
Did you seek out or research additional information about the whooping cough vaccine or whooping cough as a disease to help you make your decision?		
No	177	56.9
Yes	123	39.5
Cannot remember	11	3.5
If yes, where did you go for this additional information?		
The internet (articles and news) e.g. NHS Choice, Net doctor	103	81.1
The internet (Forums and discussion with other women) e.g. Mumsnet, Netmums, Facebook, Twitter	59	46.5
Friends and family members	54	42.5
Parenting and pregnancy books and magazines	17	13.4
Another NHS health care professional	7	7.1
A complementary/alternative health care professional	5	3.9
A private health care professional	3	2.4
e-books	1	0.8
Religious leaders	0	0
Other	6	4.7

or friends and family felt that they should seek additional information about vaccinations were rated as *disagree* or *strongly disagree*. Due to the Coping Strategy Scale being related to a general stress-causing event rather than medically specific, nuance such as the existence of a specific social norm such as those related to information-seeking may have been lost.

From the evidence we present here it is possible to say that for official sources of information to be seen in a positive light a relationship between the mother and her health care professional must be based on a solid foundation of trust. Furthermore, different individuals will place different levels of importance on the information given during the vaccine decision making process with those that value, and feel particularly skilled with, factual information reacting more positively towards factual information based communications. These findings also perhaps bring in to question the level of real world applicability of purely information based interventions [50]. Without suitable attention also being paid to the social and personal context in which this information is presented it is possible that the contents of the communicated information may go largely ignored.

5. Limitations

The theoretical framework allowed us to study many of the relevant factors in vaccine information-seeking behaviour, however it is possible that some concepts relevant to information search behaviour (e.g., *need for cognition*) were neglected by the model. Furthermore, caution also must be applied when interpreting these results given the self-selecting nature of our sample. The sample was predominantly vaccinated against pertussis during their pregnancy (95% in our sample compared to a 70% average across England [29]), however the fact that information-seeking still occurred within a sizable minority is noteworthy, as it actively contradicts a possible social norm against such behaviour. Furthermore, due to the Psychosocial Determinate of Vaccine Information-Seeking Behaviour Scale being validated on the decision related to the pertussis vaccine during pregnancy caution should be applied when using the scale to investigate attitudes related to vaccine information-seeking in other contexts.

6. Conclusion

This research indicates the complicated dynamic that exists between factual information and the context in which it is presented. In the case of vaccination during pregnancy, it is evident that trust held by a mother for her health care professional is of utmost importance if the mother is to feel satisfied with the information about vaccination that is presented to her.

Ethical approval

Ethical approval was received from the London School of Hygiene & Tropical Medicine ethics committee on 13/10/2016.

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Conflict of interest

All authors have no conflicts of interest.

Authors' contributions

RC, PP and MS conceived the experimental design, analysed, and interpreted the data. RC collected the data and wrote the manuscript. PP and MS revised the manuscript. All authors approved the final draft of the manuscript and meet the ICMJE criteria for authorship.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2019.04.008.

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