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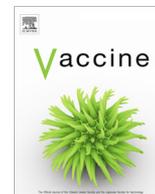
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## Understanding the role of peace of mind in childhood vaccination: A qualitative study with members of the general public

G. Lasseter<sup>a,\*</sup>, H. Al-Janabi<sup>b,1</sup>, C.L. Trotter<sup>c,1</sup>, F.E. Carroll<sup>d,1</sup>, H. Christensen<sup>e</sup>

<sup>a</sup> Population Health Sciences, Bristol Medical School, University of Bristol, United Kingdom

<sup>b</sup> Institute of Applied Health Research, University of Birmingham, Birmingham, United Kingdom

<sup>c</sup> Department of Veterinary Medicine, University of Cambridge, Cambridge, United Kingdom

<sup>d</sup> Royal College of Obstetricians and Gynaecologists, London, United Kingdom

<sup>e</sup> Population Health Sciences, Bristol Medical School, University of Bristol, United Kingdom

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### ABSTRACT

**Background:** Recent debates on the introduction of new childhood vaccines in the UK have suggested that 'peace of mind' (PoM) might influence decision making. The aim of this study is to ascertain the importance of 'PoM' in individuals' decision making.

**Methods:** Four focus groups were conducted in the UK. Participants were 22 females and 2 males, aged 18–74 years, with a selection of non-parents, parents, guardians and foster carers. Data were analysed using an inductive thematic framework approach and conceptualised using the Health Belief Model, which provided an overview of participants' perceptions and behaviours about childhood vaccinations. **Results:** Vaccine associated PoM was associated with individuals' perceptions of disease severity, with individuals feeling more reassurance after obtaining vaccinations against diseases that they considered to be severe compared to relatively mild diseases. Conversely, concerns about vaccination side-effects reduced participants PoM, but the duration of this effect varied between individuals. Other factors, such as social pressure and the emotional anxiety related to children's feelings, or physical reactions, to vaccinations also negatively impacted on participants' vaccine associated PoM.

**Conclusion:** Vaccine associated PoM was a consideration for some participants seeking vaccinations but was only a minor motivating factor for these individuals. These differences stemmed from whether participants received PoM from the uptake of a vaccination because they perceived some intrinsic benefit from it or, conversely, they considered vaccinations as a routine health intervention. Overall, vaccine related PoM varied between participants in magnitude and fluctuated over time, even in the same individuals.

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### 1. Introduction

Before health care interventions are introduced in the UK, there is often a requirement that the intervention should be cost-effective. For vaccines, this involves measuring the net cost of a vaccine programme, versus the health benefits gained. Current methods for assessing the health benefit from vaccinations have been challenged recently, as it is felt that some important benefits are not being fully considered or missed completely [1]. Increasing evidence is showing that vaccines can have broad and endur-

ing impacts on society that are not always considered in cost effectiveness analysis [2,3]. These non-health benefits can have various societal impacts, such as effecting educational achievement, future productivity and healthcare usage [4]. Furthermore, it has been suggested that some members of the public might value the 'Peace of Mind' (PoM) gained from knowing that they and their family are protected from a vaccine preventable disease, and that this PoM might be achieved not just from those who are vaccinated, but also others in the population [5].

In recent years the UK Government has been under pressure to address the cost-effectiveness approaches used by the Joint Committee on Vaccination and Immunisation (JCVI; the government's vaccine advisory committee) for assessing the benefits from childhood vaccinations. In April 2016 the largest health petition of its time (signed by 823,345 members of the public) was submitted

\* Corresponding author.

E-mail address: [gemma.lasseter@bristol.ac.uk](mailto:gemma.lasseter@bristol.ac.uk) (G. Lasseter).

<sup>1</sup> These authors contributed equally to this work.

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to Parliament calling for the Government to reconsider the provision of the meningitis B (MenB) vaccine for only children aged 3–5 month, and to extend the vaccination to all children up to age 11 [6]. This petition, and the consistently high uptake rates for the MenB vaccine [7], has been perceived as a demonstration of public anxiety about meningitis [8]. Furthermore, in 2016 the Cost Effectiveness Methodology for Immunisation Programmes and Procurement (CEMIPP), an independent group set up by the government to consider whether the method for appraising cost effectiveness of vaccination programmes should change, recommended that non-health benefits, such as the PoM that parents gain from getting their children vaccinated, warranted further investigation to ascertain if they should be included in future cost-effectiveness analyses [5,9].

For PoM benefits to be considered for inclusion in decisions regarding which vaccine programmes to fund or not, key questions need to be answered about the nature of vaccine associated PoM (for example, are there associations with the severity of the condition being prevented), and the duration of the experience. Previous research has proposed that parents make decisions about childhood vaccinations according to personal and social variables [10–14]. Furthermore, preliminary findings from our previous qualitative work [15] suggested that some UK members of the public obtain PoM from vaccination and that this factor needs more consideration. Thus, the aim of this study was to investigate the role of PoM in influencing vaccination decisions.

### 1.1. Background

The Health Belief Model (HBM) is a theoretical framework that can be used to conceptualise the attitudes and beliefs of individuals in an attempt to explain and predict health behaviours [16]. This psychological model has been used extensively to study vaccination beliefs and behaviours and in vaccination research to identify patient perceptions of disease and vaccination [10,11,17–21]. The HBM can be used to examine individuals' motivations for adopting a health-related behaviour and as such was used in this study to understand vaccination seeking behaviours and the role of PoM. The HBM includes six key domains which influence health behaviours: perceived severity, perceived susceptibility, modifying factors, perceived benefits, perceived barriers and cues to action. Some adaptations of the model also incorporate self-efficacy, but this was not relevant for this research.

## 2. Methods

### 2.1. Study design

A focus group method was chosen, as the group dynamic created via this approach provides rich data, especially when participants have little prior knowledge about a topic [22]. COREQ guidelines have been used in reporting the study conduct and findings [23].

### 2.2. Setting and participants

A qualitative convenience sampling [24] approach was used, whereby participant selection was based on accessibility. However, in order to increase diversity within the sample population, two different recruitment strategies were used:

1. Previous participant group: Participants from previous qualitative work about population preferences for prioritising vaccination programmes against childhood diseases were contacted via postal invite [15].

2. Parent groups (pre-school and nursery): These groups had previously participated in research based at the University of Bristol and had given their written consent indicating willingness to take part in future research.

Groups were located in North Somerset and South Gloucestershire. Any adult individuals ( $\geq 18$  years) affiliated with these groups were eligible to participate. Individuals were not excluded due to ethnicity, gender, sexual orientation, disability or socioeconomic status. Understanding how heterogeneity upon preference for vaccines was important, therefore the role of age, gender and parental status was investigated during analysis.

#### 2.2.1. Data collection

Focus groups were conducted by the corresponding author G.L. (female/PhD/senior researcher). G.L. had previously received qualitative training and was experienced in conducting group interviews with members of the public. All participants were sent information about the study goals prior to each focus group, but were not asked to complete any preparatory work prior to attending. Focus groups were held face-to-face, at a time and location convenient to the majority of participants. It was emphasised at the start of each group that participants could withdraw from the discussion or the study at any point. Participants from each group type (i.e. previous participant or parent group) were only eligible to participate in a group with their peers. Focus groups were facilitated by researchers from the University of Bristol (moderator and assistant), who used a semi-structured topic guide (S1 File) to encourage discussions on the potential social-environmental and personal factors influencing vaccination seeking behaviour, with particular focus on vaccine associated PoM.

Focus groups lasted one hour on average and were audio recorded, with field notes created by the assistant. Recordings were transcribed verbatim shortly afterwards; all data were subsequently pseudoanonymised. At the end of each focus group, participants were asked to complete a demographic questionnaire; explicit written consent was sought prior to this data collection. The focus group moderator (GM) explained to each participant that they were under no obligation to complete the questionnaire and that this had no impact on their eligibility to contribute. All participants were offered a £20 shopping voucher as reimbursement for their time.

#### 2.2.2. Interview topic guide

A semi-structured interview topic guide (S1 File) was used to facilitate discussions on the nature of vaccine associated PoM and if, how and when this factor influenced individuals during their vaccination decision making processes. The topic guide asked participants to think about vaccination decisions they had previously made for themselves and, if appropriate, the decisions they made for their children and whether vaccine associated PoM had played a role.

Throughout the focus group, the interviewer was mindful that some participants had little previous knowledge or experience of vaccinations; this was taken into consideration by providing relevant prompts to stimulate discussion. Furthermore, the interviewer was mindful that both pro and anti-vaccination beliefs were likely to be discussed, and whenever possible participants were encouraged to discuss varying views.

#### 2.2.3. Focus group analysis

Analysis used an inductive thematic framework approach [25]. Firstly, each transcript was read whilst listening to the focus group audio file to help capture verbal emphases. A general coding structure was then developed and applied to large sections of text, paragraphs and then sentences. All transcripts were reread and compared numerous times until no new codes were found [26].

Descriptive accounts were created using data created during the coding process, this approach was used to detect key attributes and identify the variety of participants' opinions [27]. Data was managed using NVivo software (QSR International) and analysed concurrently, so that any future focus group discussions were used to clarify and expand on emerging themes. The HBM was used as a framework for presenting, conceptualising and supporting the exploration of the qualitative results [28].

A selection of the study team coded the initial focus group transcript independently and then during subsequent meetings team members developed a thematic coding scheme for all additional transcripts [29]. Data analysis was led by G.L., with support from an experienced research team (H.A.-J., F.C. C.T. and H.C.) with a range of expertise; (H.A.-J.) health economist with qualitative experience, (F.C.) health psychology with qualitative experience, and (C.T. and H.C.) epidemiologists. The breadth of experience within the research team meant that different opinions were frequently discussed during data analysis.

Ethical approval for this study was obtained in July 2017 from the University of Bristol, Faculty of Health Sciences Research Ethics Committee, Bristol, England (Ref: 29821).

### 3. Results

Focus groups took place between August - September 2017. Thirty-five individuals showed interest in participating, however 11 were not available to attend the focus groups on the scheduled dates. In total, four focus groups were conducted; two parent groups with seven participants, one parent group with six participants and one previous participant group with four participants (N = 24).

Focus groups lasted between 48 and 59 min with a mean duration of 55 min. Tables 1–3 show the broad range of participants' characteristics.

Fig. 1 shows the major findings from the thematic qualitative analysis as a conceptual framework based on the HBM. This figure illustrates participants' key perceptions and behaviours relating to vaccine associated PoM, which in turn influenced the likelihood of accepting a vaccination.

It is worth noting, the topic guide was designed to encourage participants to discuss the PoM associated with vaccination decisions that they had previously made for themselves or children in their care, however many (92%) participants were parents,

**Table 1**  
Descriptive characteristics of focus group participants (n = 24).

Focus group (n)	Gender (n)	Age category					Parental status			
		18–24 years	25–34 years	35–44 years	45–54 years	55–64 years	65–74 years	Not a parent/guardian	Parent/guardian	Parent/guardian and foster carer
1 (7)	Female (6)	1	2	3				6		
	Male (1)			1				1		
2 (6)	Female (6)		2	1	2	1		6		
	Male (0)									
3 (4)	Female (3)				1	1	1	1	1	1
	Male (1)			1				1		
4 (7)	Female (7)	5	1	1				1	6	
	Male (0)									

**Table 2**  
Additional descriptive characteristics of focus group participants (n = 24).

Focus group (n)	Gender (n)	Ethnicity				Religion		Employment status			
		White British	White European	White and Black Caribbean	Other mixed background	Christian	None	In active paid work	Retired	Unemployed	Other
1 (7)	Female (6)	6				1	5	4			2
	Male (1)	1					1	1			
2 (6)	Female (6)		6			5	1	5			1
	Male (0)										
3 (4)	Female (3)	3				2	1	1	1		
	Male (1)	1				1		1			
4 (7)	Female (7)	5		1	1	4	3	2		4	1
	Male (0)										

**Table 3**  
Highest qualification of focus group participants (n = 24).

Focus group (n)	Gender (n)	Highest qualification						
		Doctorate or equivalent	Masters or equivalent	Bachelors or equivalent	HND/HNC or equivalent	A level or equivalent	GCSE or equivalent	None
1 (7)	Female (6)		1	1		1	3	
	Male (1)						1	
2 (6)	Female (6)		2		1	1		2
	Male (0)							
3 (4)	Female (3)			1		2		
	Male (1)	1						
4 (7)	Female (7)			1		3		3
	Male (0)							

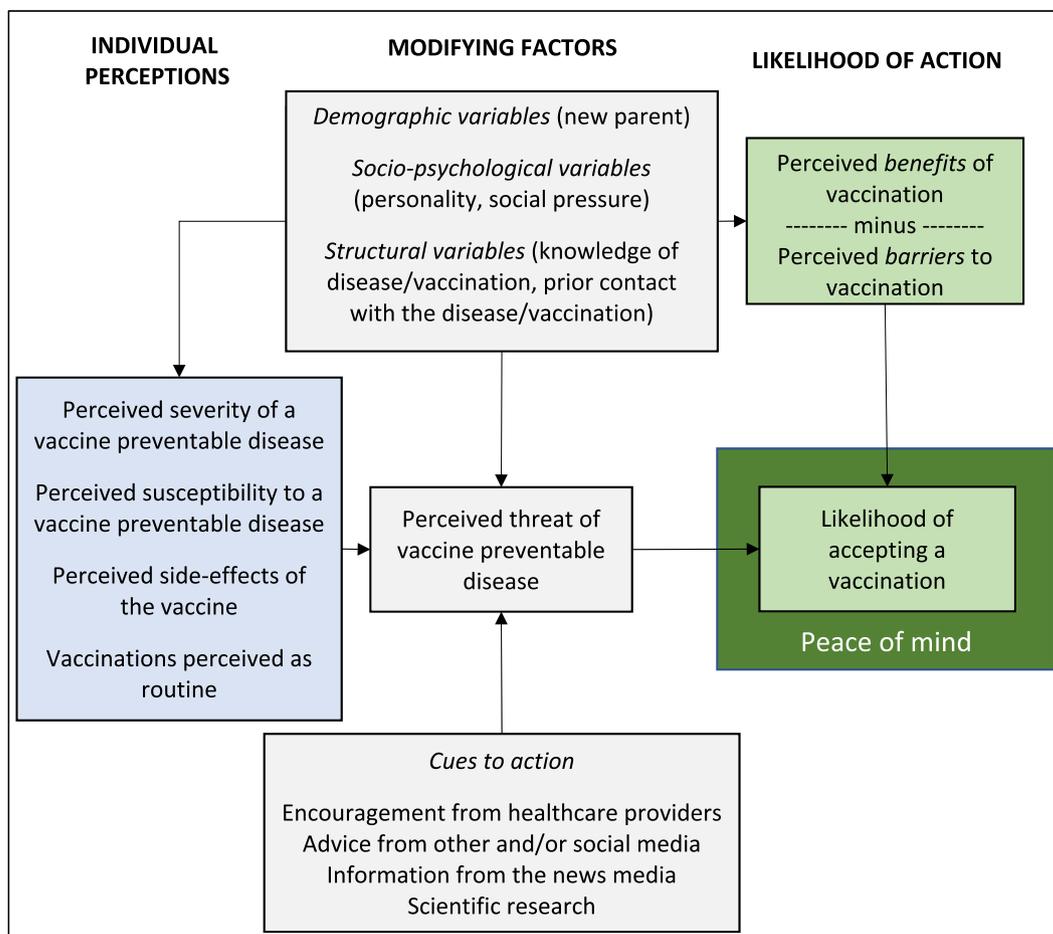


Fig. 1. Factors related to vaccine associated PoM and the likelihood of accepting a vaccination.

guardians or foster carers and therefore discussion often focused on childhood vaccination decisions.

### 3.1. Individual perception

#### 3.1.1. Perceived severity of a disease

This element of the HBM deals with an individual's assessment of how severely they would be impacted if they were affected by a health condition. Specifically, participants were asked to think about the severity of vaccine preventable diseases and how this impacted on their vaccination decisions. Participants from all focus groups agreed that they felt more PoM after obtaining vaccinations against diseases that they considered to be severe compared to relatively mild diseases.

[F6] "They're [children] probably not going to die of chicken pox, unless it gives them a knock-on effect of something else, are they? But there is a really strong chance that they're going to die of meningitis, and I think if you can vaccinate against that, then you would. [FG1]"

[F1] I think it's the seriousness of the illness and you'd get PoM to know you've protected them." [FG1]"

Nevertheless, some participants had little understanding about the severity of vaccine preventable diseases, so felt less emotive about the relevant vaccine.

#### 3.1.2. Perceived susceptibility to a vaccine preventable disease

When asked to think about the likelihood of accepting a vaccine against a preventable disease, two participants from one focus

group discussed this as motivation for seeking a vaccination. These participants talked about feeling more reassured after vaccinating their children, especially if they were known to have underlying susceptibilities to disease.

[F5] "I think if there's a particular family history or something, then it reassures you that if your children have that vaccination, they're going to be protected a little bit more than not having it. And so, from that perspective, I can see where PoM would come into it". [FG1]"

#### 3.1.3. Vaccine associated side-effects of the vaccine

Participants across all focus groups discussed having PoM once they had vaccinated their child, as they felt that the vaccine would provide protection against a specific disease. Nevertheless, this perceived protection was often tempered with concerns about vaccine associated side effects.

[F4] "Once you go through the 'light' symptoms, let's say, the common ones, it's fine. It's like when you look at the back of the drug and what can happen and then you start reading about serious symptoms that could cause death or breathing problems and things like that and you start really panicking. Sometimes, I prefer not to look. That is something that can really scare you and take away the PoM." [FG2]"

A small minority of participants were less concerned about potential short-term side effects and took a more objective view, believing that relatively trivial adverse reactions were preferable to potentially contracting a vaccine preventable disease.

[M1] “You know it’s unpleasant for them [children] to have an injection, it’s unpleasant for them to feel a bit off colour you know for a couple of hours or a day or so after. But that’s what part of the vaccination is you know and again it’s okay, a bit of a pain for them for a day. But which would you rather, you know, that or contracting meningitis or something else. So not a big deal for me.” [FG3]

### 3.1.4. Vaccination perceived as routine

Some participants across three focus groups stated that they regarded childhood vaccinations as a routine procedure and gave them very little forethought. For these individuals there was no indication that vaccinating their child was associated with feelings of reassurance or PoM, rather they simply attended vaccination clinics as directed by their healthcare providers.

[F4] “I mean everyone gets their child vaccinated. Well, not everyone but the majority of people get their child vaccinated, so you kind of just follow the crowd. It’s not PoM; it’s a routine.” [FG4]

## 3.2. Modifying factors

### 3.2.1. Demographic variables

Twenty-two (92%) of our participants were parents or guardians and some of these individuals talked about the worry of being a first-time parent and the lack of knowledge/experience about childhood vaccinations. These individuals spoke about their temporary worry, and thus reduced PoM, when taking their first child for their vaccinations, mainly because they were unsure about what to expect both before and after vaccination.

[F5] “The only one I was really worried about was the first injection that they get. I think it was just being a new mum and having to take your kid for an injection. That’s the only thing that I was really worried about. ...you just don’t know what to expect either, do you? You know they’re going to be in a bit of pain and that.

[GM] So do you think that the other vaccinations that came later were different?

[F5] No, I just knew what was coming, so I knew how to deal with her, kind of thing.” [FG4]

Other demographics factors, such as age and gender, were examined as possible determinants of participants opinions on vaccine associated PoM, but no link was found.

### 3.2.2. Sociopsychological variables

For this study, this element of the HBM focused on the combination of social and psychological factors that influenced individuals’ attitudes and actions around childhood vaccinations. Most notably, the perceived influence of healthcare providers was discussed across all focus groups, but for some this social pressure was mitigated by the psychological concerns that they had about their child’s wellbeing, and more specifically whether they believed that they would be in pain or distress during a vaccination. This short-term unease was a key worry for some participants and negatively impacted on their immediate PoM.

[F4] “So, when I was invited to go to have this vaccination for my daughter, I was still crying and I was still upset because you don’t want your child to be pricked in their little leg. That was almost stopping me from going and because I was crying, she was crying and I was thinking, ‘Oh god, she’s in pain because of that’ but then I was thinking, ‘I will trust the professionals. This is the first child. Let’s see. I will risk it.’” [FG2]

### 3.2.3. Structural variables

All focus groups discussed the impact of structural variables on their PoM and resulting vaccination decisions, such as their knowledge about, or more specifically lack of knowledge, about certain vaccine preventable disease.

[F3]: “I think we’ve got so little experience of diseases that the vaccines prevent against that you just have to guess, I guess, because there are just not people around that get these things.” [FG1]

Other participants talked about personal experience they had had with certain diseases and how their perception of the infection influenced their opinion about accepting a vaccination against such diseases. These participants reported feeling more PoM when vaccinating against diseases that they perceived as common or severe.

[F6?] “I would probably consider how many times you’ve heard of these diseases happening and how common they are because some of it, we had diseases when we were younger, like Chicken Pox or Rubella. There was something else, Mumps. We had these, for example, when we were smaller and there was no vaccination and it was okay and now they want to vaccinate the children and then we are thinking ‘Why?’ you know, ‘Why?’” [FG2]

Participants in one focus group discussed the reassurance they received from knowing that a vaccine had been used for many years, and although these participants did not have personal experience to reassure them about its safety, simply knowing that it had been used for an extended period of time gave them PoM.

[F3] “It’s PoM associated with the vaccine having been around for ages as well, isn’t it? You think it’s safe.” [FG1]

Conversely, participants were more cautious about vaccinations that they considered to be ‘newer’ or vaccinations that they had little personal experience with during their own life.

[F6] “You think, ‘Well, how much research has been done? Is this going to be another thing where...?’ Especially, if it’s for something you feel maybe they don’t really need, like the chicken pox virus and stuff like that, you think, ‘Actually, they might not need it, so I won’t do it’ but if you’ve already had it yourself and you were fine, then you’re more open to letting your children have stuff.” [FG1]

However, interestingly, this was not the case for the ‘MenB’ vaccine which although considered relatively ‘new’ by some participants, the perceived severity of this infection meant seeking this vaccination provided increased PoM.

## 3.3. Cue to action

### 3.3.1. Encouragement from healthcare providers

Participants across all focus groups talked about either receiving postal or verbal reminders offering vaccination. As discussed previously, a small minority of our participants regarded these cues to action with some trepidation, yet most noted that these reminders were a key motivation for attending vaccination clinics. This factor was not found to impact on participants’ overall PoM.

[F1] “I think that’s it though. Personally, I don’t really think about it [vaccination]. I get told to come at that time, so I do. I don’t really think about what it actually is or what it means.” [FG4]

### 3.3.2. Advice from others, social media and/or news media

Social media and advice from others was an issue for some participants. These individuals mentioned the amount of conflicting information was problematic, especially as they found it difficult to know what sources to believe.

[F7] "I think things on the NHS website and from places of authority and knowledge will make me feel reassured but like the girls have said, if you see things on Facebook and social media, it's so conflicting. What do you believe?" [FG4]

Participants also talked about the impact of the news media on their awareness of vaccine preventable diseases and that this was often their main source of information. The impact of the media varied between these participants, for a small minority it negatively impacted on their PoM and was thus a barrier to action.

[F6] "[Y]ou probably only see it [vaccine preventable disease] from television or media, if there are reports on countries that don't have the vaccinations that are so freely available to us and then you think, 'Oh, that's what could happen if they weren't vaccinated'" [FG1]

All focus group participants agreed that there was more information available now than ever before, and for some this impacted negatively on their PoM as it complicated their vaccination decisions.

[F4] "Maybe there is also more information now about it [childhood vaccinations]. Maybe people share it more, rather than before and a few years back because I don't remember reading about it before. Maybe I'm more into the subject. I don't know but it's definitely less PoM." [FG2]

### 3.3.3. Scientific research

A few participants talked about collecting information from a range of sources to make vaccination decisions and the reassurance they received by having access to research that were corroborated by healthcare professionals.

[F4] "For me the PoM will be good research based on facts, so I can make my own decision as a parent and I'm not pushed to do things... but I think that good research and professionals backing up the idea, that would be helpful and that would give me PoM. I will know that I'm doing the right thing." [FG2]

## 3.4. Likelihood of action

### 3.4.1. Perceived benefits of vaccination - balance of risks

For the purposes of this study, the likelihood of action related to whether an individual would choose to accept, or not, routine vaccinations offered by their healthcare provider. Some participants described these vaccination decisions as a delicate balance between the perceived benefits of the vaccination versus potential risks.

[M] "I think the sort of benefits of vaccination, and vaccination working successfully, far outweigh the risks of potential ill effects if you like. You know it is a balancing exercise, but I think I'd go with the group that would say 'You know what I would rather take the very small risk of something going awry than taking the risk of any of my children or anyone else contracting any of the [diseases]'. You know we're talking about quite serious infections. So yeah, I think it's reassurance for me and there hasn't been a great deal of worry that I've gone through, it's a pretty no brainer type decision I think." [FG3]

### 3.4.2. Perceived barrier - cost of vaccinations

Some individuals were worried about the need to pay for certain vaccinations due to age restrictions within the UK vaccination schedule. This perceived barrier was a concern for some of our participants with young children, as not everyone was financial able to privately fund vaccinations, such as the MenB vaccine.

[F4] "I have friends who have children and some of them are on low income and so they wouldn't go through this, thinking, 'This is too expensive' and so they just have the basic ones.

[F2] It's like a luxury.

[F4] Yeah, so it's more like a luxury. But I have friends who have money and so they will pay for extra ones. They think, 'It's a PoM. Let's do that.'" [FG2]

### 3.5. Relative importance that participants attributed to vaccination associated PoM

When talking to participants specifically about vaccine associated PoM, we asked them to think about the sense of wellbeing or reassurance that they might have felt, or not, when making their vaccination decisions. We also asked participants to talk about the emotions they felt when making these decisions. During these discussions some participants stated that they received no PoM or reassurance from having their children vaccinated.

[F4] "For the regular vaccinations that children get nowadays, it was a no brainer for me personally. So, there was no feelings of pride or joy that I allowed my child to overcome these nasty viruses and bugs. It was just plain sailing for me because that's what I was going to do." [FG1]

For others, vaccine associated PoM was important and stemmed from the reassurance that once either they or their children had received a vaccination, they would receive some protection from a specific disease. This PoM was described as both temporary and permanent, depending on the disease and vaccination.

[F1] "Well, just like with the flu jab. For me, once they'd had it and they were okay for the next couple of weeks, then I felt reassured that they won't get flu for the year." [FG1]

[F5] "I think it gives you PoM that whatever the vaccine is you've just had done, obviously you want it done for a reason, and so it just gives you PoM for that reason at that particular time. Like people are saying, it's one less thing to worry about; a little bit of worrying, but not as much as if they had have had it. It's just PoM really. You're calmer [laughter]." [FG1]

### 3.5.1. Difference in PoM between vaccinating yourself versus your child

Some participants talked about being parents and the pressure they felt to make vaccination decisions that were in their child's best interests, especially since their children were too young to decide for themselves.

[F2] "It's about the vaccination isn't it, it's about the protection that that vaccination will give you and what side effects they are. If you know what side effects they are, as you were saying, you can be vigilant. You know your child, you know what's normal for them and what's not. So, you are alert and aware and you can act as soon as possible. So, it's very emotive all the way through you know, all through their childhood isn't it you know... you want them to be in the best of health, so anything that you do is all in their best interest, you know, whether that's education or health you know, but you are making that decision, the needle's not going into you, it's going into somebody else." [FG3]

Furthermore, participants also talked about the anxiety they would feel if they were responsible for making the wrong vaccination decisions.

[F5] “No, if there was a repercussion for your child and the repercussion was because you decided, ‘Well actually, I’m not going to give the chicken pox vaccination’ and they get chicken pox, then you feel guilty. They’re your offspring. That’s, they’re part of you and all you want to do is protect them the best you can and to the best of your ability. When something goes wrong, every parent, no matter the slightest little thing, you feel guilty.” [FG1]

## 4. Discussion

### 4.1. Principal findings

The finding presented in this paper, using the Health Belief Model, indicates that there was a difference in individuals’ vaccination associated PoM depending on their perceptions, concerns, and motivations associated with vaccination seeking behaviours. Vaccination associated PoM was mainly found to originate from the perceived benefits of having a vaccination and reassurance derived from the belief that once vaccinated an individual would receive some level of protection against a certain disease. Nevertheless, this reassurance was sometimes diminished by sociopsychological concerns, such as social media stories about potential vaccination side effects and concerns about the short-term pain their children might suffer during vaccination. As an overall concept, vaccine associated PoM was important to some participants, but was not a consideration for other. These differences largely stemmed from whether individuals received wellbeing from their child having a vaccination because they perceived some intrinsic benefits or, conversely, they considered vaccinations as a routine health intervention. Overall, participants demonstrated that vaccine associated PoM fluctuated in both magnitude and duration, and occurred at different points on their vaccination timeline. These findings indicate that PoM should be considered in the current health economic framework used by decision makers, however, further work is required to further define and quantify PoM for use in such analyses.

#### 4.1.1. Relevance to other work

Although various studies have considered and presented factors influencing vaccination decisions, some even using the HBM framework, to the authors’ knowledge this is the first study to view decision making for childhood vaccinations through the lens of PoM [17,30–32]. A similar concept of parental ‘anticipated regrets’ related to vaccinations was previously suggested by Sadique et al. (2013), an idea that seems similar to the PoM attribute investigated in this study [33]. These anticipated regrets were explained as parents making a vaccination decision by balancing the perceived risks associated with vaccine associated side-effects in instances when a vaccination was taken, compared to potentially suffering from a vaccine preventable disease when a vaccination was not taken. This approach was similar to those discussed by participants in our previous study [15].

Similarly, Gallagher and Poverty (2006) explored the effect of anticipate regret on the intention of older adults to vaccinate against influenza and found that anticipated regrets significantly influenced respondents’ attentions to vaccinate [34]. Nevertheless, there remains the issue of how to define the somewhat intangible concept of PoM (or anticipated regrets) in such a way that it can be assessed and incorporated into cost-effectiveness assessments. A review by Herdman et al (2016) highlighted the need for more studies to elicit utility weights for paediatric vaccines against

infectious disease, arguing that there are aspects specific to vaccines that should be taken into consideration when making cost-effectiveness decisions [35]. Clearly future research on this topic is warranted.

#### 4.1.2. Strengths and limitations

The strengths of our study included using a qualitative method appropriate to the research question. Focus groups were used because they generate rich data about personal attitudes and beliefs, whilst the HBM was valuable for providing insight on the attitudes and beliefs of participants in order to explain their health behaviours [16,36]. A constant comparison approach allowed us to explore themes as they emerged from the data [37]. Reliability was aided by analysing the full transcripts using qualitative software and reaching a coding consensus with all co-authors. While our sample was relatively small, we achieved data saturation.

One of the limitations of this study the use of a convenience sampling approach; therefore, selection bias is a concern [24]. It is possible that those who participated had different views about vaccination associated PoM than those who did not participate. Nevertheless, those individuals who participated in the study were overall demographically heterogeneous, except in terms of gender and parental status. The overrepresentation of women in research about childhood vaccination is common, and reflects the fact that mothers are more commonly identified as the primary healthcare decision-maker for their children [38]. The authors would recommend conducting additional research with diverse groups in order to further explore this topic.

Some of the focus groups involved ‘natural’ groups, where the participants already knew each other or the researchers. An advantage of using natural groups is that participants feel more comfortable and are more likely to speak freely than if they were amongst strangers. Contrariwise, there may also be a disadvantage in that participants follow established social norms and are thus less likely to discuss opposing views [36,39]. From an observational perspective, the natural group sessions did not appear different from the other focus groups in terms of participant interactions or opinions expressed, but there may have been unobserved influences.

#### 4.1.3. Reflexivity

Throughout the study process, the authors were aware of our own positions and reflected on how these could influence the study design, conduct and analysis. Two authors work to inform the Joint Committee on Vaccination and Immunisation (independent expert advisory committee of the United Kingdom Department of Health) and as such could be considered advocates for childhood vaccination. Thus, it is possible that these biases may have influenced the manner in which the data was interpreted or the implications for future research and practice that have been drawn.

## 5. Conclusions

This study explored the perceptions of the general public on vaccine associated PoM. Using the HBM to present, conceptualise and explore our focus group data, several themes were identified as important. Our participants noted that making vaccination decisions was a difficult process and required striking a delicate balance between the perceived benefits versus potential risks of each vaccination. For some, the magnitude of PoM was dependent on their perceptions of disease severity and perceived susceptibility to disease. Furthermore, opinions of vaccine associated side-effects were also found to reduce PoM, but the duration of this effect varied between individuals. Sociopsychological modifying factors also impacted on participants’ PoM, including social pres-

sure and the emotional anxiety related to children's reactions to vaccinations. Overall, vaccine associated PoM was found to vary in duration, with participant reporting it as both a short-term and long-term consideration, with the time of occurrence, duration and magnitude influenced by an individual's attitudes and beliefs towards a vaccine and/or the related preventable disease. Whilst recognising that the focus group participants were not generalisable, these findings provide evidence that PoM is a key attribute of some individual's vaccination decision-making process, and has some value to the recipients, therefore there may be a case for creating a framework for quantifying such benefits in the cost-effectiveness evaluation of vaccines, which in turn could have significant policy implications.

### CRediT authorship contribution statement

**G. Lasseter:** Conceptualization, Funding acquisition, Methodology, Project administration, Investigation, Data curation, Formal analysis, Validation, Visualization, Writing - original draft, Writing - review & editing. **H. Al-Janabi:** Conceptualization, Methodology, Formal analysis, Writing - review & editing. **C.L. Trotter:** Conceptualization, Methodology, Formal analysis, Writing - review & editing. **F.E. Carroll:** Conceptualization, Methodology, Formal analysis, Writing - review & editing. **H. Christensen:** Conceptualization, Funding acquisition, Methodology, Investigation, Formal analysis, Writing - review & editing.

### Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: HC reports receiving honoraria from Sanofi Pasteur, and consultancy fees from IMS Health, AstraZeneca and GSK all paid to her employer. HA reports receiving personal fees to attend a workshop organised by GSK. CT reports receiving personal fees from GSK and Sanofi Pasteur. This does not alter our adherence to Vaccine policies on sharing data and materials.

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### Ethics approval

University of Bristol, Faculty of Health Sciences Research Ethics Committee in Bristol, England approved this study (application number 29821).

### Consent for publication

As part of the informed consent process participants provided written consent for publication of the presented data.

### Availability of data and material

Data for this study are kept at the Health Protection Research Unit in Evaluation of Interventions, Bristol Medical School, University of Bristol, UK. Anyone who wishes to have further information is welcome to contact the Co-Principal Investigator and Corresponding Author (gemma.lasseter@bristol.ac.uk) who will

consider whether the request is in line with the obtained ethical approval.

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### Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.vaccine.2019.12.009>.

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