



‘Combined vaccines are like a sudden onslaught to the body’s immune system’: Parental concerns about vaccine ‘overload’ and ‘immune-vulnerability’

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Abstract

The recent controversy surrounding the safety of the measles, mumps, and rubella vaccine (MMR) has heightened parents’ concerns about the safety of vaccines, and led some to believe that giving vaccines in a combined form may ‘overload’ children’s immune systems. However, to date no studies have been published examining how British parents conceptualise the notion of ‘immune-overload’ or how they relate this concept to their own children. Eighteen focus groups were conducted with parents between November 2002 and March 2003. The literature on vaccine decision-making suggests that parents base their immunisation decisions on two key risks: those posed by the diseases, and those associated with the vaccines aimed at preventing those diseases. Our study suggested that for some parents a third factor plays an important role, namely their assessment of the ability of their child’s immune system to ‘cope’ with the challenge of combined vaccines, or to fight the disease. We conclude that although there is no scientific evidence that supports parents’ fears about combined vaccines causing ‘immune-overload’, policy makers need to recognise these concerns if they are to successfully persuade parents that combined vaccines are safe.

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1. Introduction

Since its inception in the late 19th Century, immunisation has contributed to the decline and control of many once-common infectious diseases. The paradox of this success is that, as parents have become less familiar with these diseases, they have become more questioning about the safety and necessity of immunisation. The most recent example of this is the controversy surrounding the safety of the MMR vaccine precipitated by the publication of a case series of 12 children which raised the possibility of a link between the MMR vaccine, autism, and inflammatory bowel disease [1]. At a press conference on the day of publication one of the

authors, Dr. Andrew Wakefield, suggested that there might be a case for splitting the MMR vaccine into its three separate component parts, each given a year apart. Although Wakefield’s findings have neither been replicated [2], nor supported by the vast majority of studies, [3–6,7] his claims led many parents to decide to withhold or postpone MMR vaccination for their child.

In recognition of the growing public concern about the safety of the MMR vaccine, several studies have explored parents’ decision-making about MMR. Evans and colleagues suggest that parents conduct an informal risk-benefit analysis and that, for some parents, it is easier to live with the risk of their child naturally contracting a disease than ‘causing’ their child damage through vaccination [8]. This finding is consistent with earlier work on omission bias [9,10] which suggested people feel more responsible for a child’s death if it is the result of vaccination (commis-

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sion) than from contracting a vaccine-preventable disease (omission). Another recent study found that parents who consider that diseases pose a threat to their child's health and who consider immunisation to be safe and effective are more likely to have their children immunised. In contrast, parents who consider that the diseases pose little or no threat to their child's health, and who consider immunisation to be ineffectual or to pose a risk to their child, are less likely to do so [11]. Further qualitative research has suggested that there are some potentially serious misunderstandings and gaps in parents' knowledge about vaccine-preventable diseases, which generally led to a diminished sense of urgency or need for vaccination [12]. Raithatha and colleagues have suggested that, in weighing up the risks of vaccines against the risks of disease, parents consider the immunisation process and their trust in government and health professionals. Raithatha et al. warn that it is vital not to assume that parents who currently immunise will continue to do so, and suggest the MMR vaccine scare may have triggered a wider reappraisal of vaccine risk [13].

Although the vast majority of parents continue to have their children vaccinated, there has always been a minority of people opposed to vaccination. Indeed, concerns about the safety of vaccines pre-date the publication of Wakefield et al.'s (1998) paper, and concerns over vaccine safety are neither confined to the United Kingdom, nor limited to the MMR debate. For example, the controversy surrounding the safety of the pertussis vaccine in the 1970s led large numbers of parents to refuse it, resulting in a fall in vaccine coverage, several epidemics, and many fatalities. In Scotland the epidemics accounted for an estimated 100,000 notifications and up to 75 deaths [14]. Nicoll et al. suggest a similar picture in England and Wales, estimating over 300,000 notifications and at least 70 deaths [15]. One of the first qualitative studies to investigate British mothers' experiences of childhood immunisation following the pertussis controversy found that problems arising from transport and time-constraints were not the only reasons to account for why children had missed appointments. They suggested that immunisation behaviours were influenced by attitudes towards, and knowledge of, infant immunisation [16]. A study conducted in the United States of America explored parents' perceptions of vaccines and found that parents perceive vaccines to be only partly effective [17]. Similarly, an Australian study found that some parents opted not to immunise because they were concerned about the unknown, long-term side-effects of vaccines and believed that vaccines may place stress on the immune system rather than strengthening it [18]. Concerns about vaccine safety are not just confined to industrial countries. For instance, rumours about alleged adverse health effects associated with oral polio vaccine in Nigeria contributed to a temporary reduction in uptake [19].

There is no scientific evidence that supports parents' fears about combined vaccines causing immune overload. Nev-

ertheless, in order to allay parents' fears Miller and colleagues sought clinical evidence to examine whether the MMR vaccine was associated with an increased susceptibility to infection requiring hospitalisation in the post-vaccination period [20]. Using computerised discharge records they identified 395 children who were admitted to hospital over a 4-year period with a bacterial infection within a 12-week period post-MMR vaccination. No increased risk of infection was found post-MMR vaccination and they concluded that the MMR vaccine does not impair the ability to respond to the immune challenge of infection. Although Miller's study may have allayed some parents' fears, there is still little research exploring how parents conceptualise putative MMR-associated risks to their children's health, nor how they conceptualise the notion of immune-overload. Without understanding these issues it is difficult to ascertain whether the current reappraisal of vaccine risk that Raithatha et al. highlight is, as they suggest, a consequence of the recent MMR debate, whether it is part of a wider sense among parents that children are becoming over-immunised against diseases that no longer pose a significant threat to their children's health, or whether it is, as Lupton suggests, related to the increasing media focus on the immune system in Western culture [21]. Here we report on a qualitative study which explores parents' concerns about immune overload and examines how parents relate this concept to their own children's health and vaccine decision-making.

2. Methods

Eighteen focus groups were conducted between November 2002 and March 2003. This method was selected because it offered considerable scope for participants to set the agenda and develop discussion around topics important to them [22]. The 72 participants were purposively selected to ensure the maximum variation possible [23]. Participants were from a range of ages, socio-economic circumstances, and family circumstances, including first-time mothers, more experienced mothers, single fathers, and parents with multiple social problems. The sample also included parents with a range of vaccine decision-making outcomes, including parents who had fully immunised, opted for single vaccines, rejected MMR, and rejected all vaccinations (see Table 1). Four groups were conducted with parents who were anticipated to have a particular interest in vaccination: two with parents who had autistic children, and two with parents who had an immune-compromised child following chemotherapy. By necessity, some focus groups were with parents from pre-existing groups, some with people who had passing acquaintance (e.g. children in same play scheme), and some with people who were strangers to each other. The pilot work suggested that parents were highly involved with the topic and that small groups, of between three and five persons, were necessary to allow each parent enough time to express their

Table 1
Participants in the focus groups

Group number and brief description	Participants' pseudonym (ages of children)
G1 NCT group in affluent area	Trudie (girl 8 years/girl 7 months), Violet (girl 2 years), Mel (boy 4 years/girl 15 months)
G2 First time mothers	Joanne (boy 5 months), Elaine (girl 4 months), Louise (boy 5 months), Beathan (girl 6 months)
G3 Ante-natal group with second time mothers	Sian (stepson 4 years/boy stillborn/8 months pregnant, Dawn (boy 4 years/boy 3 years), Ruth (boy 1 year), Beatrice (boy 18 months), Iona (boy 12 years/girl 7 years, girl 5 years/boy 3 years)
G4 Recruited from low MMR uptake area in deprived area	Joan (girl 20 months), Sheila (girl 10 years/girl 3 years/boy 21 months), Alan (boy 2 years)
G5 Recruited from high uptake area in affluent area	Fiona (girl 6 years/boy 5 months), Alison (boy 15 months), Lauren (boy 14 months), Cassie (girl 3 years/boy 9 months), Karen (girl 7 years/girl 4 years/boy 4 months), Anna (girl 7 years/boy 4 years/girl 3 years/girl 14 months)
G6 Low MMR uptake area in deprived area	Cathy (girl 3 years/boy 2 years), Bob (boy 3 years/boy 7 months), Ella (boy 5 years), Helen (girl 4 years/boy 2 years)
G7 High MMR uptake area in deprived area	Tracy (boy 10 years/girl 4 years/girl 2 years), Samantha (boy 16 months), Lydia (boy 6 years), Angie (boy 5 years/boy 18 months), Mary (girl 5 years)
G8 Young single mothers living in deprived area	Kate (boy 2 years), Margaret (boy 2 years), Lisa (girl 23 months), Ann (boy 6 months), Lynne (boy 13 months), Natalie (boy 15 months), Ros (boy 20 months), Lucy (15 boy 11 weeks)
G9 First-time mothers living in affluent area	Rhona (boy 11 weeks), Catrina (girl 11 weeks), Judith (girl 11 weeks), Charlotte (girl 5 months), Celia (girl 6 months)
G10 Single fathers in deprived area	William (12 years/girl 5 years), Kenny (boy 3 years/boy 3 months), Robert (girl 17 years/boy 6 years)
G11 Parents with multiple parenting problems in deprived area	Sheena (girl 7 years/boy 6 years/boy 2 years), Michelle (boy 2 years/girl 6 months), Patsy (twin boys 2 years/boy 2 months), Frank (as for Patsy)
G12 Parents who opted to immunise their child with separate measles, mumps, and rubella vaccines	Dave (girl 7 years/girl 21 months, Jenny (boy 2 years), Joe (boy 2 years)
G13 Parents who had rejected MMR	Sue (boy 6 years/boy 4 years/boy 13 months), Aleena (girl 5 years/girl 3 years/girl 5 months), Hannah (boy 4 years/boy 2 years)
G14 Parents who had rejected all immunisation	Molly (boy 5 years/boy 2 years), Kitty (boy 6 years/boy 4 years/boy 2 years), Lola (boy 6 years/boy 4 years/boy 2 years), Debbie (boy 5 years/boy 3 years/girl 23 months/girl 4 weeks)
G15 Parents of an autistic child	Lesley, Dianna, Jacqueline (precise ages of children omitted to protect their identity—all boys aged between 4 and 7 years)
G16 Parents of an autistic child	Stella, Alison, Caroline (precise ages of children omitted to protect their identity—all boys aged between 4 and 9 years)
G17 Parents of an immunocompromised child	Sally (girl 9 years), Rebecca (girl 8 years), Pamela (girl 8 years)
G18 Parents of an immunocompromised child	Jill (girl 14 years), Cara (girl 8 years), Jessie (boy 16 years)

views and opinions. During the main fieldwork period the Iraqi War dominated the news in Britain, and news coverage of the MMR vaccine had a low profile.

A brief topic guide developed through pilot work included beliefs about childhood immunisation and the vaccines in the current Childhood Immunisation Programme, experiences of childhood infectious diseases, and factors affecting vaccination decision-making.

All groups were facilitated by SH, recorded with the respondents' permission and transcribed in full. The topic guide was kept brief and SH encouraged parents to lead much of the discussion. SH only intervened to prompt parents to explain, confirm or justify their position so that their opinions could be examined in greater depth. Incorrect assumptions were only clarified by the facilitator during the debriefing session that followed the focus groups and parents were encouraged to take leaflets and seek explanations from trained professionals.

To enable systematic comparisons to be made across the large amounts of data, each transcript was checked and imported into NVivo 2.0. Data were thematically coded and,

following the principle of the constant comparative method [24], each transcript was repeatedly re-examined and cross-compared to identify common themes and explore parents' underlying reasoning. Once all the relevant extracts of data pertinent to 'fears about vaccines', 'immune-overload' and 'status of the immune system' had been retrieved and checked we started to develop a coding frame around which to develop research questions. Particular attention was paid to deviant or contradictory cases [25] and to group dynamics [26].

Ethical approval for the study was obtained from the University of Glasgow ethics committee for non-clinical research involving human subjects. All names used are pseudonyms.

3. The findings

For many parents the controversy surrounding the MMR vaccine raised many questions. Two that were of particular concern were: whether children's immune systems are mature enough to cope with receiving several antigens in one vaccine, and whether some children's immune systems are

less able to cope with the challenge of vaccination and more prone to long-term damage from combined vaccines. These are considered in turn.

3.1. Conceptualising immune-overload: are children's immune systems able to cope with combined vaccines?

A main concern parents raised about the current Childhood Immunisation Programme was that some children might be prone to 'immune-overload'. Despite these concerns, few parents were able to articulate them in any depth: when asked to clarify what they meant by 'overloading' the immune system, the question was often met by silence. For example, phrases such as 'go to pot' and 'knacker' were used but did not shed light on parents' understanding of the precise mechanisms which might underlie the concept of 'overload'. The main concern parents expressed was that vaccines combining several antigens could potentially overwhelm the child's immature immune system, causing health problems at a later date. Some parents linked this fear to their decisions about immunisation. For instance, one mother who had rejected the MMR vaccine (but not the others) for her child stated: "the worry is putting all three in at one time, into that wee body. Individual ones for me is the way, it makes sense to not bombard it with too much chemicals all at one go" (G5: Anna aged 33). Similarly, another stated: "I don't know . . . I just feel they are putting all these drugs into the kids and at some stage you have to say stop, that's enough, they don't need any more vaccinations . . ." (G2: Joanne aged 37). Indeed, three parents who had sought single vaccines for their children had done so in order to space out the vaccines and to reduce the perceived risk of overwhelming their children's immune systems. Joe explained:

I mean but you think about it, you know, if you were given a shot of caffeine and it was just caffeine with no water in it, you know, that's gonna be far more potent for your body than you know, giving it with water, caffeine with water. You know, so why would you not expect your children to have a bad reaction if they're given something that's so potent? **G12: Joe aged 36.**

However, this reasoning was often inherently illogical in that many of the parents who talked about separating the components of the MMR vaccine had already given their children the combined diphtheria, tetanus and pertussis (DTP) vaccines at 2, 3, and 4 months of age, and seemed quite unconcerned about the combination of these three antigens. This inconsistency was spontaneously mentioned by a small minority of parents and may reflect the fact that many parents are ambivalent or uncertain about the nature of the link between combined vaccines and immune-overload. These parents gave the explanation that DTP is given when a baby is only 2, 3, and 4 months old at a time when parents are overwhelmed with the new task of parenthood and have not had an opportunity to fully consider the various arguments about immunisation. For example, Violet reflected on her earlier

decisions about immunisation and believed that she had not had time to assess the risks of the combined DTP vaccines. She spoke about just 'emerging' from a 'state of not knowing whether it was night or day' when she was told her daughter should have DTP. She went on to assert: "I'm sure if the timing of diphtheria, tetanus, whooping cough and Hib was later like MMR, there would be a lot more discussion about it" (G1: Violet aged 36). Another explanation parents gave for their attribution of greater potential for immune damage to MMR than to DTP was that parents understood that Wakefield appeared to be specifically identifying the need for the MMR vaccine to be administered through three separate vaccines. A few parents reasoned that this was because the MMR vaccine contains a weakened version of the live measles, mumps and rubella virus. These parents were unsure of the origins of the DTP vaccine, but suggested they were probably less risky.

Across the groups many parents felt that, if given the choice by the NHS, they would follow Wakefield's advice and opt to space the vaccines out and give their children single vaccines rather than the combined MMR vaccine.

The most vocal groups to speak critically about vaccination were a group of mothers who had opted not to give the MMR vaccine (Group 13) and another group (Group 14) who had rejected all immunisations fearing that they may be harmful to their child's immune system. One mother argued that administering three antigens in one vaccine is an unnatural way of encountering diseases. She stated:

Well from what I've heard, combined vaccines are like a sudden onslaught to the body's immune system, normally you would catch it through the mouth and there are so many defences that it goes past before it gets there. But when they inject them, it goes straight into the bloodstream and it doesn't pass all those defences and the body just gets a shock, where did this come from? **G14: Molly aged 37.**

A mother of four also said she feared immune-overload and stated that: "I don't think they (doctors) know enough about the immune system when they're 2 months old, it's still developing . . ." (G13: Aleena aged 35). Both these groups represent some of the least enthusiastic voices on immunisation and, unlike many other parents, their concerns about the risks associated with vaccines were not confined to the MMR vaccine.

3.2. Immune vulnerability: are some children's immune systems less able to cope and more prone to long-term damage from combined vaccines?

Parents commonly spoke about ensuring that their children were in good health on the day of immunisation and about how they would not take an ill child for vaccination even if the illness was minor. There were many instances where parents spoke about deciding not to immunise with MMR on the grounds that they believed that their child's immune system was unable to cope with the stress of receiving several

antigens at once. For example one mother stated: “If they’re not well I just cancel the appointment, cos I don’t think it is worth the risk of causing them long-term problems” (G4 Sheila aged 36).

Within all of the groups parents mentioned that illnesses such as common colds, recurrent ear and chest infections, urinary tract infections, eczema, asthma, and allergies were signs of a child having a more fragile and thus vulnerable immune system. Indeed, some parents cited the unexplained rise in the incidence of childhood asthma and allergies as evidence of possible long-term damage resulting from immune-overload. The main concern that parents expressed was that, for children who already appear to have difficulty coping with common infections, the MMR vaccine could overwhelm their already fragile immune system, causing long-term damage. These parents often described their children as being particularly vulnerable or susceptible to damage. Indeed, all three parents who had opted to pay privately for the single measles, mumps and rubella vaccines did so because of this fear. One mother, for example, stated:

Jenny: Well, my boy, he has been ill, see from day one he has been ill with everything, everything.

Facilitator: What kind of things?

Jenny: Everything. You name it . . . he’s had colds, just one after the other, he’s got eczema all over him and then just allergies, everything. When he had the meningitis jag, his legs all blew up and he was really ill with it. I went . . . I went to the doctor and they said no, that wasn’t to do with meningitis C. **G12: Jenny aged 19.**

There were also a few instances where parents spoke about their child being so ‘healthy’ that they do not need to have vaccinations. For example one mother who described her children as having ‘robust’ immune systems stated: “I’m really lucky because my two are extremely healthy, you know, look up the dictionary, the word ‘healthy’ there would be pictures of my two in there . . . I think they are strong and could fight these infections . . .” **G3 Dawn aged 36.** She felt confident that her children would be able to successfully fight the diseases and reasoned that her children would be unlikely to benefit from immunisation. These ideas were also expressed by other parents who rejected the whole premise that diseases are caused by micro-organisms or who considered that it is not necessarily advantageous to avoid diseases altogether. They believed that a healthy individual may benefit from contracting a disease, thus developing life-long immunity to that disease, and suggested that mass immunisation in the UK has become out-dated.

It was common for parents who did not immunise or who chose to immunise with single vaccines to mention that they felt children’s immune systems varied greatly, and that some children were better at fighting infections and others more susceptible to contracting infections. Parents with several children spoke about the differences they had noticed between their children. For example, a mother of

three explained her reasons for deciding not to immunise her middle child with MMR:

. . . the second one had lots of colds, he had allergies and eczema, and em, it just seemed to be too much on his wee immune system and I just felt it was too risky, whereas the third one is a much more robust child . . . **Group 13: Sue aged 36.**

She later mentioned that she had given what she considered a less potent homeopathic alternative, and was surprised that her son had had quite a severe reaction to it. This reinforced her opinion that this son’s immune system was more delicate and less robust than those of her two other sons, and she spoke about feeling reassured that she had made the right decision for him in refusing MMR.

The fear of long-term damage to the immune system arose spontaneously in all the groups. For instance one mother questioned: “. . . by over-immunising children, are we in the West modifying our children’s immune system, making them more vulnerable to contracting diseases in the future and damaging them in some way?” (G2 Joanne aged 37). Whilst many parents feared that MMR could cause long-term damage to the immune system, there were only a few parents who considered that they had any direct experience of such adverse reactions, the exception being some of the parents with autistic children. Four of the six parents caring for a child with autism attributed their child’s autism directly to the MMR vaccine. However, it was more common for parents to speak of their children having had a mild short-term reaction and to offer third-hand accounts of other parents’ experiences of adverse reactions. These indirect accounts of adverse reactions ranged from hearing about a child who developed a lump on her leg at the injection site to contracting meningitis and being hospitalised in intensive care following MMR vaccination.

4. Discussion

The aim of this focus group study was to conduct an in-depth exploration of parents’ beliefs and concerns about childhood immunisation. The exploratory nature of the inquiry predisposed the study towards the use of qualitative methods that are particularly useful when the aim is to gain an ‘in-depth understanding’, rather than ‘overall picture’, of a topic. The findings from this study offer original insights into parents’ perceptions about childhood immunisation and immunisation behaviours which we anticipate will usefully contribute to the refinement of large population-based studies [27] and to the existing body of theory and knowledge on understanding immunisation behaviours.

Much of the literature on vaccine decision-making suggests that, when they make decisions about whether or not to immunise their children, parents carry out a risk assessment based on two key factors: the risk posed by the diseases, and the risk of the vaccines aimed at preventing these diseases

[8,9,11,13]. Our study suggested that a third factor plays an important role in influencing whether parents will seek or withhold MMR (and possibly other) immunisation for their child. This is parents' assessment of the ability of their child's immune system to 'cope' with the challenge of combined vaccines, or to fight the disease.

Parents liberally referred to two closely related concepts, 'immune-overload' and 'immune-vulnerability'. It was observed that 'immune-overload' was used as a generic term to describe the notion of the immune system being 'overwhelmed' by receiving too many antigens at too young an age. By contrast when parents were referring to 'immune vulnerability' they used the concept quite specifically to describe how well they perceived their child's immune system could cope with the invasion of pathogens generally, and not just with the antigens contained within vaccines. For this reason parents mentioned that having recurrent common colds, ear, chest and urinary tract infections, and or chronic conditions such as eczema, asthma, and allergies, were symptomatic of having a 'deficient' immune system. The main concern that parents expressed was that for some children with deficient immune systems, the MMR vaccine could be harmful and potentially cause long-term health damage. It was common for parents to mention that they felt children's immune systems varied greatly and for parents with more than one child to talk about tailoring the immunisation programme to meet the needs of each of their children. Parents spoke of making different decisions about vaccines depending on their assessment of their child's health status. If a parent assessed that their child had a 'deficient' immune system they were more likely to delay or withhold immunisation.

Consistent with the findings of Miller et al. and Offit [20,28], parents in this study feared their child's immune system might be vulnerable to the stress of receiving several antigens at once. Parents' main anxiety about 'immune-overload' seemed to centre on the concern that too many antigens given together could 'overwhelm' the immature immune system causing long-term damage. In fact it was common for parents to believe that immunisation initially suppresses rather than boosts the immune system, leaving children, at least temporarily, more vulnerable to contracting diseases. This view is of interest because it is in direct contrast to the intended effect of immunisation, and the findings of Miller et al.'s study [15] which report that the immune system is able to respond to fight other infections immediately following vaccination. It is important to note that parents often changed their minds, contradicted themselves and spoke with uncertainty and ambivalence on matters of vaccine safety. For example, although many parents talked negatively about the fact the MMR vaccine combines three antigens into one vaccine, most of these parents did not seem unduly concerned about the fact that they had already allowed their children to have the combined DTP vaccine at 2, 3, and 4 months of age. These inconsistencies between parents' views and actions were evident throughout conversations about 'immune-overload', and reflect the fact that many parents are anxious and confused about whether

combined vaccines overwhelm the immune system and cause long-term damage.

Our data offer some support to Raithatha and colleagues' [13] suggestion that the MMR controversy may have triggered a more widespread reappraisal of vaccine risk amongst parents. Although parents in this study tended to focus more attention on the MMR vaccine and less on other vaccines in the Childhood Immunisation Programme, it was common across the different groups for parents to raise concerns about the safety of combined vaccines. This study suggests that parents might benefit from more detailed explanations of the development of the immune system and its response to combined vaccines, and advice on whether mild infections or illness are contraindications to vaccination.

5. Conclusion

As the Childhood Immunisation Programme has developed in Britain over the past century, the number of vaccines included has increased. For example, in the 1900s a child might only receive the smallpox vaccine, whereas by the 1950s children would have been offered five vaccines (diphtheria, pertussis, tetanus, polio, and smallpox). Today the programme offers protection against nine diseases (diphtheria, pertussis, tetanus, polio, haemophilus influenza type b, meningococcal infection, measles, mumps, and rubella), with the administration of several combined vaccines at target ages. Whilst vaccines combining several antigens offer many advantages in the delivery of the Childhood Immunisation Programme, our data suggest that a growing minority of parents are becoming increasingly concerned about whether combined vaccines could do more harm than good.

The findings from this study are particularly relevant following the introduction to the Childhood Immunisation Programme of the five-antigen vaccine Dtap/IPV/Hib in September 2004. Whilst Bedford and Elliman [29] have pointed out that this alteration does not add protection against any additional diseases to the immunisation schedule, but rather offers protection "in a slightly different, more acceptable, formation" (p. 411), the extent to which parents comply with the new schedule may depend on how safe they perceive combined vaccines to be. Our study suggests that parents' anxieties about vaccine safety may increasingly centre on notions of 'immune-overload' and on whether some children are inherently more susceptible to immune damage rather than focusing on more specific concerns such as whether the MMR vaccine causes autism. Although several websites already address the issue of immune overload (<http://www.immunisation.nhs.uk/faqphp?id=16>; www.mmrthefacts.nhs.uk/; www.meningitis.org) it seems wise for policy makers to consider how best to build on this information. Failure to address any gaps in parents' understandings of their children's immune systems or their fears about 'immune-overload' may result in some parents casting a more critical eye over the entire Childhood Immunisation

Programme with potential consequences for the uptake of immunisation for a range of childhood infectious diseases.

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References

- [1] Wakefield AJ, Murch SH, Anthony A, Linnell J, Casson DM, Malik M, et al. Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *Lancet* 1998;351:637–41.
- [2] Thjodleifsson B, Davidsdottir K, Agnarsson U, Sigthorsson G, Kjeld M, Bjarnason I. Effect of Pentavac and measles–mumps–rubella vaccination on the intestine. *GUT* 2002;51:816–7.
- [3] Taylor B, Miller E, Paddy Farrington C, Petropoulos M, Favot-Mayaud JL. Autism and measles, mumps, and rubella vaccine: no epidemiological evidence for a causal association. *Lancet* 1999;353(20):2026–9.
- [4] Kaye J, del Mar Melero-Montes M, Hershel J. Mumps, measles, and rubella vaccine and the incidence of autism recoded by general practitioner: a time trend analysis. *Br Med J* 2001;322:0–2.
- [5] Fombonne E, Chakrabarti S. No evidence for a new variant of measles–mumps–rubella-induced autism. *Pediatrics* 2001;108(4):e58.
- [6] Taylor B, Miller E, Lingham R, Andrews N, Simmons A, Stowe J. Measles, mumps and rubella vaccination and bowel problems or developmental regression in children with autism: population study. *Br Med J* 2002;324:393–6.
- [7] Smeeth L, Cook C, Fombonne E, Heavey L, Rodrigues L, Smith PG, et al. MMR vaccination and pervasive development disorders: a case-control study. *Lancet* 2004;364:963–9.
- [8] Evans M, Stoddart H, Condon L, Freeman E, Grizzell M, Mullen R. Parents' perspectives on the MMR immunisation: a focus group study. *Br J Gen Practice* 2003;51:904–10.
- [9] Ritov I, Baron J. Reluctance to vaccinate: omission bias and ambiguity. *J Behav Decision Making* 1990;3:263–77.
- [10] Asch DA, Baron J, Hershey JC, Kunreuther H, Meszaros J, Ritov I, et al. Omission bias and pertussis vaccination. *Med Decision Making* 1994;14(2):119–23.
- [11] Smailbegovic MS, Laing G, Bedford H. Why do parents decide against immunization? The effect of health beliefs and health professionals. *Child: Care, Health and Development* 2003;29:303–11.
- [12] Hilton S, Hunt K, Petticrew M. Gaps in parental understandings and experiences of vaccine-preventable diseases. A qualitative study. *Child: Care, Health Development* 2006; in press.
- [13] Raitthatha N, Holland R, Gerrard S, Harvey I. A qualitative investigation of vaccine risk perception amongst parents who immunize their children: a matter of public health concern. *J Public Health Med* 2003;25(2):161–4.
- [14] Scottish Executive: Report of the Expert Group, MMR: Report of the MMR Expert Group 2002. Scottish Executive: Edinburgh.
- [15] Nicoll A, Elliman D, Ross E. MMR vaccination and autism. *Br Med J* 1998;316:715–6.
- [16] New SJ, Senior ML. "I don't believe in needles": qualitative aspects of a study into the uptake of infant immunisation in two English health authorities. *Social Sci Med* 1991;33(4):509–18.
- [17] Keane V, Stanton B, Horton L, Aronson R, Galbraith J, Hughart N. Perceptions of vaccine efficacy, illness, and health among inner-city parents. *Clin Pediatr* 1993;2–7.
- [18] Bond L, Nolan T, Pattison P, Carlin J. Vaccine preventable diseases and immunisations: a qualitative study of mothers' perceptions of severity, susceptibility, benefits and barriers. *Aust NZ J Public Health* 1998;22:440–6.
- [19] Samba E, Nkrumah F, Leke R. Getting polio eradication back on track in Nigeria. *N Engl J Med* 2004;350(7):645.
- [20] Miller E, Andrews N, Waight P, Taylor B. Bacterial infections, immune overload, and MMR vaccine. *Arch Dis Child* 2003;88:222–3.
- [21] Lupton D. Representation of medicine, illness and disease in elite and popular culture. In: *Medicine as culture*. London: Sage; 2003. p. 68.
- [22] Barbour R, Kitzinger J, editors. *Developing focus group research: politics, theory and practice*. London: Sage Publications; 1999.
- [23] Pope C, Ziebland S, Mays N. Analysing qualitative data. *Br Med J* 2000;320:114–6.
- [24] Lincoln YS, Guba EG. *Naturalistic inquiry*. Beverly Hill, CA: Sage; 1985.
- [25] Bloor M, Frankland J, Thomas M, Robson K. *Focus groups in social research*. London: Sage; 2001.
- [26] Kitzinger J. The methodology of focus groups: The importance of interaction between research participants. *Socio Health Ill* 1994;16(1):103–21.
- [27] Yarwood J, Noakes K, Kennedy D, Campbell H, Salisbury DM. Tracking mothers attitudes to childhood immunisation 1991–2001. *Vaccine* 2005;23:5670–87.
- [28] Offit PA, Quarlest J, Gerber MA, Hackett CJ, Marcuse EK, Kollman TR, et al. Addressing parents' concerns: do multiple vaccines overwhelm or weaken the infants immune system? *Pediatrics* 2002;109(1):1124–9.
- [29] Bedford H, Elliman D. Misconceptions about the new combination vaccine. *Br Med J* 2004;329:411–2.