

Review of the evidence of the effectiveness and cost effectiveness of interventions to address differences in the uptake of immunisations (including targeted vaccines) in people younger than 19 years

Synopsis for consultation 24 September - 22 October 2008

Jane Tuckerman
Sharangini Rajesh
Ceri Oeppen
Nina Balachander
Anna Bancsi
Paul Jacklin
Jay Banerjee
Andrew Clegg

National Collaborating Centre for Women's and Children's Health
Kings Court, 4th floor
2-16 Goadge Street
London W1T 2QA

Executive Summary

Introduction and aims

This review examines interventions to increase uptake of immunisations in people younger than 19 years. The interventions take place in a variety of settings and are focused at parents, young people and health professionals. The review considers specific sub-questions related to the factors that might influence effectiveness and the facilitators and barriers that influence delivery and uptake.

Method

A comprehensive literature search was conducted. A total of 24,017 titles and abstracts were screened, from which 549 papers were selected for further review. From these papers, 160 studies were identified for inclusion comprising: 57 papers that examined the qualitative evidence (knowledge, values, attitudes and beliefs toward immunisations) and 102 studies that examined the effectiveness of interventions at increasing immunisation uptake. The 102 intervention studies were grouped into the following themes: interventions for increasing demand for vaccinations (51 studies); interventions for enhancing access to vaccination services (30 studies); provider-based interventions for enhancing uptake (16 studies), and legislative interventions for enhancing uptake (6 studies). The quality of these papers was assessed and the relevant data was extracted.

A comprehensive literature search was also conducted for health economics papers and the initial search identified 4,100 articles, from which 139 were selected for further review. These articles were appraised. However, due to the limited quality and quantity of published economic studies addressing the research question; articles were included in the review providing they contained, as a minimum, some potentially relevant cost or resource use data. A total of 10 articles were included in the health economics review.

Key findings

Health Economics

Review of published economic evidence

Ten studies were found that met the inclusion criteria for the review of published economic evidence.

Reminder and recall systems

Eight studies, all from the USA, considered the cost-effectiveness of reminder and recall systems. The study quality varied considerably in terms of their reporting of costs and their costing methodology. Some studies performed appropriate incremental analyses when comparing more than two interventions but others simply compared the cost per effect relative to doing nothing. Attempts to address uncertainty were fairly modest: a number of studies did undertake limited sensitivity analysis, although this focussed on costing rather than any uncertainty about effect size. Most analyses did not consider any longer term “downstream” savings, from averted morbidity and mortality, and in that respect may underestimate the cost effectiveness of increased vaccination uptake.

However, at best these studies have a measure of effectiveness, such as additional immunised child, which is only a proxy for the real outcome of interest, namely the additional health gain through averted morbidity and mortality i.e. additional immunised child. Some of the studies attempt to address this by making reference to a published literature showing a monetary benefit per child immunised in excess of the cost of an additional child immunised. Nevertheless, in doing this they assume that benefit of the additional child immunised is independent of the level of coverage, which is not the case where herd immunity influences the likelihood that a susceptible person will come into contact with an infected individual. None of these studies provide sufficient evidence that remind and recall systems would be cost-effective from an NHS perspective.

Health economics evidence statement 1

There is insufficient evidence to determine the cost-effectiveness of remind and recall systems in increasing immunisation coverage.

Health economics evidence statement 2

There is insufficient evidence to determine the cost effectiveness of immunisation record screening and referral programmes in increasing immunisation coverage for children from low income groups.

Health economics evidence statement 3

There is limited evidence from one USA study which suggests a school based hepatitis B vaccination programme is cost-effective in increasing immunisation coverage.

Studies relating to knowledge, attitudes, values and beliefs (Section 5.1 of full report)

Twenty studies were identified that explored knowledge, values, attitudes and beliefs related to primary vaccinations or primary booster vaccinations. Emerging themes were:

- Parental knowledge and attitudes (Evidence statements 1, 2, 3, 4)
- Fear of side effects and concerns about vaccine safety (Evidence statements 5-7)
- Information sources (Evidence statements 8-10)
- The relationship between parents and health professionals (Evidence statements 11-13)
- Logistics of immunisation delivery (Evidence statements 14-18)
- Immunisation provider knowledge and attitudes (Evidence statement 19)

Parental knowledge and attitudes: Evidence statement 1

There is evidence from a focus group study with 66 parents (Hilton, Hunt, & Petticrew 2006) (Quality +; Applicability B) and an interview study with 22 parents (Tickner, Leman, & Woodcock 2007) (Quality ++; Applicability B) that many parents lack knowledge about immunisation and vaccine-preventable diseases, their incidence in the UK and their severity.

There is also evidence from 20 surveys carried out over a 10 year period (Quality +; Applicability A) that the perceived severity of different vaccine-preventable diseases has changed over time with the perceived severity of some diseases having declined (polio, pertussis, and diphtheria), increased (meningitis C) remained stable (tetanus and mumps), or varied (rubella, Hib and measles) (Yarwood, Noakes, Kennedy, Campbell, & Salisbury 2005).

There is conflicting evidence as to the relationship between how parents perceive the severity of vaccine-preventable diseases and the likelihood of their children having completed their immunisations. A postal survey of 80 parents (Lewendon & Maconachie 2002) (Quality -; Applicability B) suggested that parents of children with incomplete immunisations were less likely to see childhood diseases as severe. Conversely, an interview study with 759 parents (Sutton & Gill 1993) (Quality -; Applicability B), found that there were few differences in the beliefs of parents who had and had not had their children immunised regarding incidence and severity of vaccine-preventable diseases.

Parental knowledge and attitudes: Evidence statement 2

There is evidence from 20 surveys carried out over 10 years involving 15,000 mothers (Quality +; Applicability A) that found that most mothers (90%) agreed that if they had another child they would have them immunised against all childhood diseases (Yarwood, Noakes, Kennedy, Campbell, & Salisbury 2005). However, according to a large nationally representative interview survey of 18,488 mothers (Quality ++; Applicability A), medical reasons (such as a family member having epilepsy or the child being unwell or in hospital) and practical or logistical barriers were the most frequently cited reasons for their child being only partially immunised, whilst parental beliefs and medical reasons were the most frequent reasons for mothers choosing not to immunise their children at all (Samad, Butler, Peckham, Bedford & The Millennium Cohort Study Child Health Group 2006b).

There is evidence from an interview study with 19 mothers and 10 health professionals (Rogers & Pilgrim 1994) (Quality -; Applicability B) and a postal questionnaire with 87 parents (Simpson, Lenton, & Randall 1995) (Quality -; Applicability B) that alternative methods of protection such as homeopathy, other complementary medicine and/or religious beliefs are used by parents who do not agree with immunisation.

Parental knowledge and attitudes: Evidence statement 3

An interview and focus-group study with 21 Somali, Pakistani and Afro-Caribbean mothers (Condon 2002) (Quality +; Applicability B) and a survey of 93 orthodox-Jewish parents (Cunninghame, Charlton, & Jenkins 1994) (Quality +; Applicability B) suggest the parents involved are generally positive about immunisation.

There was conflicting evidence from four qualitative studies as to how serious vaccine-preventable diseases are perceived to be amongst parents living in inner city settings:

One interview and focus group study with 21 Somali, Pakistani and Afro-Caribbean mothers (Condon 2002) (Quality +; Applicability B) found that the severity and incidence of childhood diseases was perceived as high.

Likewise, a survey of orthodox Jewish parents (n=93) in inner-city London found that most parents perceived vaccine-preventable diseases as serious.

However, two studies found there are mixed views on which vaccine-preventable diseases are perceived as being more serious. A questionnaire study with 68 parents in an inner-city setting (Smailbegovic, Laing, & Bedford 2003) (Quality +; Applicability B) found that meningitis was perceived to be the most serious disease, with pertussis, diphtheria and measles perceived as serious or very serious and rubella perceived as mild. An interview study with 13 parents in an inner-city setting (Sporton & Francis 2001) (Quality -; Applicability B) found that diphtheria, tetanus and polio are perceived as serious, whilst measles, mumps and rubella are perceived as mild.

Parental knowledge and attitudes : Evidence statement 4

Evidence from an interview study with 13 parents in an inner-city setting (Sporton & Francis 2001) (Quality -; Applicability B) suggests that parents of non-immunised children have multiple reasons for not immunising their children, including moral reasons, alternative methods of protection (e.g. controlling exposure), practicalities and fears of side effects. Another study, a survey of 68 parents in an inner-city setting (Smailbegovic, Laing, & Bedford 2003) (Quality +; Applicability B) reports that although complementary medicine was used by 29% of parents it was not seen as an alternative to immunisation.

Fear of side effects and concerns about vaccine safety: Evidence statement 5

There is evidence from one study comprising 20 surveys carried out over 10 years involving 15,000 mothers (Yarwood, Noakes, Kennedy, Campbell, & Salisbury 2005) (Quality +; Applicability A) that most mothers (>90%) trust in the safety of immunisation.

There is evidence from five studies that some mothers and parents considered the risks of vaccines greater than the risks of acquiring a vaccine-preventable disease. These studies included: a large scale nationally representative survey of 18,488 mothers (n=3; 1.5% of mothers whose children were not immunised) (Samad, Butler, Peckham, Bedford & The Millennium Cohort Study Child Health Group 2006b) (Quality ++; Applicability A); a questionnaire study with 87 parents who had given negative consent to immunisation (Simpson, Lenton, & Randall 1995) (Quality -; Applicability B); a questionnaire and interview study with 68 mothers who had defaulted on one or more immunisation for their child (Smailbegovic, Laing, & Bedford 2003) (Quality +; Applicability B); a study that included interviews with 19 mothers (Rogers & Pilgrim 1994) (Quality -; Applicability B); and an interview study with 13 parents of unimmunised children (Sporton & Francis 2001) (Quality -; Applicability B).

Some studies indicated that parents making the decision to immunise weigh up of the risks and benefits of immunisation as they perceive them, as illustrated in a postal questionnaire with 87 parents (Simpson, Lenton, & Randall 1995) (Quality -; Applicability B), an interview study with 13 parents in an inner-city setting (Sporton & Francis 2001) (Quality -; Applicability B), a questionnaire study with 68 parents in an inner-city setting (Smailbegovic, Laing, & Bedford 2003) (Quality +; Applicability B), an interview study with 19 mothers and 10 health professionals (Rogers & Pilgrim 1994) (Quality -; Applicability B). However, the decision making-process is complicated and different parents in different studies raised differing perceptions of risks and benefits.

There is evidence from a survey of 18,488 mothers that found that mothers of unimmunised children more often cited general concerns about vaccine safety compared with mothers of partially immunised infants (11.4% versus never reported). (Samad, Butler, Peckham, Bedford & The Millennium Cohort Study Child Health Group 2006b) (Quality ++; Applicability A).

There is evidence to suggest a range of perceived risks of immunisation may influence some parental decisions to delay or avoid immunisations for their children, as suggested by a postal questionnaire with 87 parents (Simpson, Lenton, & Randall 1995) (Quality -; Applicability B), a nationally representative interview survey with 18,488 mothers (Samad, Butler, Peckham, Bedford & The Millennium Cohort Study Child Health Group 2006b) (Quality ++; Applicability A), a postal survey of 80 parents (Lewendon & Maconachie 2002) (Quality -; Applicability B). A fear of vaccines being contraindicated for existing medical conditions such as eczema is indicated by some parents (proportion not stated) in an interview study with 759 parents (Sutton & Gill 1993) (Quality -; Applicability B); or, concerns about combined antigens putting too much stress on a baby's young immune system, are highlighted by an interview study with 22 parents (Tickner, Leman, & Woodcock 2007) (Quality ++; Applicability B) and a postal survey of 80 parents (Lewendon & Maconachie 2002) (Quality -; Applicability B).

Fear of side effects and concerns about vaccine safety: Evidence statement 6

There is evidence from an interview study with 10 orthodox-Jewish mothers (Loewenthal & Bradley 1996) (Quality -; Applicability C) that mothers' fears of bad reactions to vaccines were a reason for low uptake. A multi-method study with 21 Somali, Pakistani and Afro-Caribbean mothers (Condon 2002) (Quality +; Applicability C) indicated that none of the mothers knew anyone who had suffered an adverse reaction to immunisation and all were positive about immunisation.

Fear of side effects and concerns about vaccine safety: Evidence statement 7

There is evidence from a postal questionnaire including 116 health visitors and practice nurses in Scotland (Henderson, Macdonald, & Oates 2004) (Quality +; Applicability B) to suggest that several health professionals (number not stated) are concerned about the ability of infants' immune systems to cope with vaccines.

A study which included focus group with health professionals (Loewenthal & Bradley 1996) (Quality -; Applicability B) found that health professionals thought that parents' fears of side effects were a reason for low uptake and that in close-knit communities negative stories about immunisation were perpetuated.

Information sources : Evidence statement 8

There is evidence from three studies, a postal questionnaire (n=859 parents) (Bedford & Lansley 2006) (Quality +; Applicability B), an interview study (n=759 parents) (Sutton & Gill 1993) (Quality -; Applicability B), a postal survey (n=80 parents) (Lewendon & Maconachie 2002) (Quality -; Applicability B) which suggest that parents find health professionals, NHS literature, friends and the media (including television and the internet) to be important sources of information on immunisation.

A postal questionnaire survey of 859 parents of 18-24 month old children in Berkshire, UK (Bedford & Lansley 2006) (Quality +; Applicability B) found that parents of fully immunised children were more likely to be satisfied with available information than parents whose children were unimmunised or only partially immunised (p<0.0001).

A postal questionnaire including 278 parents in Scotland (Henderson, Macdonald, & Oates 2004) (Quality +; Applicability B) found that parents of children with incomplete immunisations were more likely than parents with completely immunised children to rely on

information from the media (including the internet) and friends than information from health professionals.

A postal questionnaire study of 859 parents (Bedford & Lansley 2006) (Quality +; Applicability B) reported that the majority (70%) were satisfied with information on immunisation and that there were mixed views on the preferred timing of information (e.g. either before the baby's birth, at the first health visitor's call or at the 6-8 week check).

There is evidence from one study, that included a postal survey of 40 parents of partially or unimmunised children and 40 parents of children with complete immunisation in Devon, UK (Lewendon & Maconachie 2002) (Quality -; Applicability B), that parental satisfaction with information may be associated with uptake, as approximately a fifth of parents whose children had not completed immunisation were unhappy with available information versus less than a tenth of parents of immunised children.

Information sources: Evidence statement 9

Three studies (Condon 2002; Redsell, Bedford, Siriwardena, Collier, & Atkinson 2008; Loewenthal & Bradley 1996) indicated a need to tailor immunisation information for particular groups. There is evidence from a multi-method study with 21 Somali, Pakistani and Afro-Caribbean mothers (Condon 2002) (Quality +; Applicability B) and an interview study with 22 health visitors (Redsell, Bedford, Siriwardena, Collier, & Atkinson 2008) (Quality +; Applicability B) that there are concerns about the accessibility of immunisation literature (whether translated or not), particularly for migrants with low literacy levels. Concerns were also raised by Afro-Caribbean mothers in the multi-method study (Condon 2002) (Quality +; Applicability B) who were dissatisfied with the lack of ethnic minority representations in literature on immunisation. One interview study with orthodox-Jewish mothers (n=10) in London (Loewenthal & Bradley 1996), found that the research participants were quite 'cut off' from the media as a source of information and instead relied on sources of information within their social networks.

There is evidence from an interview study with 13 parents in an inner-city setting who had chosen not to immunise their children (Sporton & Francis 2001) (Quality -; Applicability B) and a questionnaire study with 68 parents in an inner-city setting with children with incomplete immunisation (Smailbegovic, Laing, & Bedford 2003) (Quality +; Applicability B) to suggest that some parents mistrusted the information provided (proportion not stated in the first study, 28% in the second study), because they perceived that the information exaggerated the efficacy of vaccines and did not adequately acknowledge the potential side effects of vaccines.

Information sources: Evidence statement 10

Evidence from a postal questionnaire including 116 health visitors and practice nurses in Scotland (Henderson, Macdonald, & Oates 2004) (Quality +; Applicability B) suggests that Department of health circulars and 'the Green Book' are important sources of information. However, the same study and a questionnaire study with 174 health professionals in Liverpool (Reid 1989) (Quality -; Applicability B) indicate that more than three quarters of health professionals would like further training in immunisation.

There is evidence from two studies: the first an interview study with 22 health visitors (Redsell, Bedford, Siriwardena, Collier, & Atkinson 2008) (Quality +; Applicability B) and the second an interview study with 58 health professionals (Alderson, Mayall, Barker, Henderson, & Pratten 1997) (Quality +; Applicability B) to suggest that some health professionals would like more time to discuss immunisation with parents and that some health professionals worried about 'overloading' parents with information particularly if it might cause otherwise compliant parents not to immunise their children.

The relationship between parents and health professionals: Evidence statement 11

Evidence from 20 surveys carried out over 10 years involving 15,000 mothers (Yarwood, Noakes, Kennedy, Campbell, & Salisbury 2005) (Quality +; Applicability A) suggests that the majority of parents discuss immunisation with a health professional prior to uptake. However, the same study and an interview study with 759 parents (Sutton & Gill 1993) (Quality -; Applicability B) found that a substantial minority did not. A postal questionnaire including 278 parents in Scotland (Henderson, Macdonald, & Oates 2004) (Quality +; Applicability B) found that parents with children who were completely immunised were more likely to have discussed immunisation with a health professional. Similar results were found by a postal survey of 80 parents (40 who had completely immunised children and 40 who had partially or unimmunised children) (Lewendon & Maconachie 2002) (Quality -; Applicability B).

There is evidence to suggest that the influence of provider payments for reaching immunisation targets may influence to parental distrust in two studies, an interview study with 13 parents in an inner-city setting (Sporton & Francis 2001) (Quality -; Applicability B) and a questionnaire study with 68 parents in an inner-city setting (Smailbegovic, Laing, & Bedford 2003) (Quality +; Applicability B).

The relationship between parents and health professionals: Evidence statement 12

There is evidence from a multi-method study with 21 Somali, Pakistani and Afro-Caribbean mothers (Condon 2002) (Quality +; Applicability B) that relations between parents and health professionals are variable, with Somali mothers in the study putting all their trust in doctors but Afro-Caribbean mothers feeling pressurised into immunisation. Meanwhile an interview study with 10 orthodox-Jewish mothers (Loewenthal & Bradley 1996) (Quality -; Applicability B) suggested that some mothers felt 'told off' for missing immunisation appointments which discouraged future attendance.

The relationship between parents and health professionals: Evidence statement 13

An interview study with 22 health visitors (Redsell, Bedford, Siriwardena, Collier, & Atkinson 2008) (Quality +; Applicability B) indicated that they felt their role was as information providers to assist with informed consent. Nevertheless, the paper outlines strategies they employed to promote immunisation. The same study and an interview study with 19 mothers and ten health professionals (Rogers & Pilgrim 1994) (Quality -; Applicability B) highlighted the importance of parent-health professional discussions about immunisation as a foundation for future interactions around child health.

Logistics of immunisation delivery: Evidence statement 14

A nationally representative interview survey with 18,488 mothers (Samad, Butler, Peckham, Bedford & The Millennium Cohort Study Child Health Group 2006b) (Quality ++; Applicability A) found that parents of partially unimmunised children were likely to refer to practical or logistical problems with getting to immunisation clinics as reasons for incomplete immunisation. An interview study with 759 parents (Sutton & Gill 1993) (Quality -; Applicability B) found that 25% of parents would prefer immunisation in the home by a health visitor. Another interview study of 22 parents (Tickner, Leman, & Woodcock 2007) (Quality ++; Applicability B) indicated that parents had a preference for a flexible appointment system for immunisation appointments.

Logistics of immunisation delivery : Evidence statement 15

There is evidence from a multi-method study (Condon 2002) (Quality +; Applicability B) and an interview study (Bedford, Masters, & Kurtz 1992) (Quality +; Applicability B) that some parents from two inner-city settings supported immunisation as a requirement for school entry. This requirement was supported by four out of five Afro-Caribbean parents (Condon 2002) and 69% of parents who had not fully immunised their children (Bedford, Masters, &

Kurtz 1992). An interview study with parents of 1,411 children in inner-city London (Bedford, Masters, & Kurtz 1992) (Quality +; Applicability B) found that recent immigration was a practical barrier to immunisation, although the study did not elaborate on the types of barriers caused by immigration.

Logistics of immunisation delivery: Evidence statement 16

There is evidence from an interview study with 10 orthodox-Jewish mothers (Loewenthal & Bradley 1996) (Quality -; Applicability B) and a questionnaire study with 93 orthodox-Jewish parents (Cunningham, Charlton, & Jenkins 1994) (Quality +; Applicability B) that identified a number of interventions that may help to improve immunisation uptake, many of which sought to address practical barriers such as having large families to care for and multiple competing demands on time.

Logistics of immunisation delivery : Evidence statement 17

A questionnaire study with 174 health professionals in Liverpool (Reid 1989) (Quality -; Applicability B) and a survey of 102 general practices (Lewendon & Maconachie 2002) (Quality -; Applicability B) identified a number of interventions that may help to improve immunisation uptake, many of which sought to address the practical barriers to immunisation uptake such as clinic timing and access.

Logistics of immunisation delivery : Evidence statement 18

There is evidence from one study that included interviews with 31 head teachers in inner-city London (Bedford, Masters, & Kurtz 1992) (Quality +; Applicability B) that found that there were mixed views on whether immunisation should take place at school. However, the majority stated they would be in favour of asking about immunisation status on school entry, and would be prepared to recommend that parents have their children fully immunised before school entry.

Immunisation provider knowledge and attitudes: Evidence statement 19

A questionnaire study with 174 health professionals in Liverpool (Reid 1989) (Quality -; Applicability B) and a postal questionnaire including 116 health visitors and practice nurses in Scotland (Henderson, Macdonald, & Oates 2004) (Quality +; Applicability B) suggest that there are mixed unresolved views from health professionals about what constitutes contraindications to some vaccines. Payments for meeting immunisation targets also remain an issue, as illustrated by findings from an interview study with 22 health visitors (Redsell, Bedford, Siriwardena, Collier, & Atkinson 2008) (Quality +; Applicability B) and a postal questionnaire including 116 health visitors and practice nurses in Scotland (Henderson, Macdonald, & Oates 2004) (Quality +; Applicability B). Whilst evidence from an interview study with 58 health professionals (Alderson, Mayall, Barker, Henderson, & Pratten 1997) (Quality +; Applicability B) suggest that some are in favour of immunisation as a requirement for school entry, there is evidence from interviews with 12 school nurses (Bedford, Masters, & Kurtz 1992) (Quality +; Applicability B) that the majority are not in favour of carrying out immunisation in school. Where this has taken place it has greatly increased school nurses' workload, as illustrated in a postal survey of 24 school nurses in Oxfordshire (Saffin 1992) (Quality -; Applicability B).

Measles, mumps and rubella vaccination [MMR] (Section 5.1.3 of full report)

Twenty-one studies were identified that explored knowledge, values, attitudes and beliefs related to the MMR vaccination. Emerging themes were:

- Attitudes to vaccination in general and views on the severity of measles, mumps or rubella (Evidence statement 20)
- Side Effects (Evidence statements 21-24)
- Single MMR vaccines (Evidence statement 25)
- Risks/benefits (Evidence statement 26-27)
- Decision making (Evidence statements 28-29)
- Parents'/Mothers' and Health Professionals' Views on Attitude of Health Professionals, and on Access/Delivery of MMR (Evidence statements 30-31)
- Impact of MMR controversy (Evidence statements 32-34)
- Sources of Information on the MMR Vaccination (Evidence statements 35-44)

Attitudes to vaccination and on the severity of measles, mumps or rubella: Evidence statement 20

There is conflicting evidence from a range of UK-based studies as to how parents perceive the severity of infection with measles, mumps or rubella. Two studies reported that parents felt that infection with measles, mumps, or rubella was serious:

- One questionnaire (Pareek & Pattison 2000) (Quality +; Applicability A) of 300 mothers in Birmingham found that mothers generally felt that the vaccine preventable diseases were serious, with measles perceived to be the most serious disease.
- One questionnaire (Casiday, Cresswell, Wilson, & Panter-Brick 2006) (Quality ++; Applicability B) from North East England, found that of 996 questionnaires returned (36% response rate), 95.5% of parents agreed that measles is a very serious disease.

Conversely, six studies reported that parents perceived infection with measles, mumps or rubella to not be serious diseases:

- One questionnaire (Lunts & Cowper 2002) (Quality -; Applicability A) of parents of children, who had not received their first MMR vaccine in Bristol (131 invited to participate, 93 questionnaires returned: 70% response rate) found that 17 parents (18%) felt that measles, mumps and rubella were not serious diseases in the 'west';
- One study using a focus group (Evans, Stoddart, Condon, Freeman, Grizzell, & Mullen 2001) (Quality +; Applicability A) with 48 parents (43 mothers/ 5 fathers) in Avon and Gloucestershire found parents - both acceptors and non-acceptors - felt that the risk of serious complications from the diseases was small in a country such as the United Kingdom;
- One questionnaire study over a 10 year period (Smith, Yarwood, & Salisbury 2007) (Quality ++; Applicability A) (1004 mothers) found that mumps, measles and rubella were perceived as the least severe of vaccine-preventable diseases.
- One study (McMurray, Cheater, Weighall, Nelson, Schweiger, & Mukherjee 2004) (Quality ++; Applicability A) that interviewed 69 parents (65 mothers and 4 fathers: mean age 34 years) found that parents perceived the disabling long-term impact of autism to be far worse than infection with mumps, measles or rubella;
- One study (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) that resulted from three focus groups and individual interviews with 87 parents (77 mothers and 10 fathers) in Cambridge and Durham found some parents (not further quantified) believed that some children were more vulnerable to infection with measles mumps and rubella than others.
- A postal questionnaire (Mullaney, Heathcock, Victor, Jones, & Smith 2002) (Quality +; Applicability B) of 72 parents 72 participants purposively selected from a range of ages, socio-economic circumstances, and family circumstances in Central Scotland found that

for non MMR accepting parents or those who chose to immunise with single vaccines it was common 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. In the same study some parents (not further quantified) who rejected that diseases are caused by micro-organisms or considered it not necessarily advantageous to avoid diseases altogether believed healthy individuals may benefit from contracting a disease, and suggested mass immunisation in the UK was out-dated.

There was evidence that acceptors and non-acceptors of the MMR vaccine differed in their views as to the severity of measles, mumps and rubella infection and whether they thought their children were actually likely to contract the disease if not immunised:

- A questionnaire (Casiday, Cresswell, Wilson, & Panter-Brick 2006) (Quality ++; Applicability B) from North East England found 84.2% of MMR acceptors and 47.7% of MMR refusers thought that their children could get measles if not vaccinated.
- Likewise a postal questionnaire (Mullaney, Heathcock, Victor, Jones, & Smith 2002) (633 questionnaires returned of 1757; 38% response rate) Quality -; Applicability B) found that MMR acceptors were more likely to believe that catching the disease was more likely, if not immunised and that the diseases were more serious, compared with MMR non-acceptors.
- One case control study (Petrovic, Roberts, Ramsay, & Charlett 2003) (Quality +; Applicability B) (101 cases /200 controls) in North Wales using a self-administered questionnaire to parents found that more non-acceptors viewed that measles was 'very serious' compared with acceptors.

An ethnographic study (Poltorak, Leach, Fairhead, & Cassell 2005) (Quality +; Applicability A) conducted in Brighton and Hove with 17 health professionals and 23 mothers who had children <3 years of age found that many mothers described drawing on the history of vaccination decisions and disease experiences in their own and other families.

Views on side effects: Evidence statement 21

Almost half of mothers reported that the vaccine caused side-effects from a 48-item questionnaire (Pareek & Pattison 2000) (Quality +; Applicability A) of 300 mothers from 8 general practices in Birmingham with general malaise was cited as a common side-effect caused by the MMR vaccine.

Three separate studies reported autism when side effects were discussed. A postal questionnaire (Mullaney, Heathcock, Victor, Jones, & Smith 2002) (Quality -; Applicability B) in 2002 (633 questionnaires returned of 1757; 38% response rate) found that 37% (227 respondents) believed autism to be a side effect of MMR; similarly a questionnaire (Lunts & Cowper 2002) (Quality -; Applicability A) of non immunising parents (131 invited to participate, 93 questionnaires returned: 70% response rate) in Bristol found that 28% of parents were concerned over the alleged link between the MMR vaccine and autism and likewise in a 48-item questionnaire (Pareek & Pattison 2000) (Quality +; Applicability A) of 300 mothers from eight general practices in Birmingham, 29.8% of mothers stated that the vaccine caused autism and 13.1% said it caused Crohn's disease.

There was evidence from a postal questionnaire (Mullaney, Heathcock, Victor, Jones, & Smith 2002) (Quality -; Applicability B) in 2002 (633 questionnaires returned of 1757; 38% response rate) in which a fifth (143) of respondents mentioned bowel disease and 7% (42) referred to brain damage when discussing side effects of the MMR vaccine.

Just under half of all mothers responding to a 48-item questionnaire (Pareek & Pattison 2000) (Quality +; Applicability A) of 300 mothers from eight general practices in Birmingham (41.1%) thought that there were valid contraindications to the MMR vaccine, with a 'child

unwell at time of vaccination' the most commonly cited; 27.7% also cited 'adverse reactions to previous vaccines for family members'.

A questionnaire (Lunts & Cowper 2002) (Quality -; Applicability A) of 131 non immunising parents in Bristol reported the following reasons for declining the first dose of MMR:

68% of parents gave more than one reason

52% mentioned fear of autism

43% had 'alternative' views on autism

24% had a fear of acute vaccine damage

18% reported they had not got around to bringing the child for their vaccination

17% reported a mistrust of GPs, government, pharmaceutical industry

4% of children had medical problems/specific-contraindications

2% did not believe in any immunisations

3% of children were immunised abroad.

Views on side effects: Evidence statement 22

There is evidence from two papers resulting from focus groups and individual interviews with 87 parents in Cambridge and Durham (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) to suggest some (12) parents want more research to enable better understanding of the risk posed by MMR to a small minority of children. There is evidence from one-to-one interviews with 1013 parents in 132 areas of England (Ramsay, Yarwood, Lewis, Campbell, & White 2002) (Quality -; Applicability A) to suggest a higher proportion of mothers are now more concerned about the safety of MMR vaccine than whooping cough vaccine.

- There is evidence to suggest the majority of mothers regard the MMR vaccine as safe: A questionnaire (1004 mothers) (Smith, Yarwood, & Salisbury 2007) (Quality ++ : Applicability A) of attitudes in relating to the MMR over the last 10 years (1996-2006) found that 35% considered it completely safe while 39% considered that it posed a slight risk .
- A 48-item questionnaire (Pareek & Pattison 2000) (Quality +; Applicability A) of 300 mothers (173 surveys returned: response rate 59%) of children in two groups (those aged 5-12 months and those aged 21-35 months) at eight general practices in Birmingham found 76.5% of mothers felt that the MMR vaccine was either 'very safe' or 'safe'.

Often there were differences reported between MMR accepting and MMR refusing parents:

- A questionnaire (Casiday, Cresswell, Wilson, & Panter-Brick 2006) (Quality ++; Applicability B) from parents in a PCT in North East England found that MMR-refusing parents were far less likely to agree that scientific evidence has shown the vaccine to be safe (no link with autism) than parents who had given it to their children ($p < 0.00001$).
- Likewise another questionnaire (Mullaney, Heathcock, Victor, Jones, & Smith 2002) (Quality -; Applicability B) found that parents who immunised were more likely to believe that immunisation was effective in preventing measles and that immunisation was safe.
- A case control study (Petrovic, Roberts, Ramsay, & Charlett 2003) (Quality +; Applicability B) (101 cases /200 controls) in North Wales of parents that found non-acceptors were significantly more likely to have a worry about the MMR vaccine than acceptors (OR 2.19, 95% CI: 1.09-4.39).

There is evidence from two studies to suggest that socioeconomic status impacted on the perception of safety. A study (Ramsay, Yarwood, Lewis, Campbell, & White 2002) (Quality -; Applicability A) using one-to-one interviews with 1013 parents in 132 areas of England reported mothers from higher socioeconomic grades were less likely to agree that MMR was safe (no further details) and a questionnaire (1004 mothers) (Smith, Yarwood, & Salisbury 2007) (Quality ++; Applicability A) showed socioeconomic status impacted on the perception

of safety, with more C2DE mothers than ABC1 mothers considered MMR completely safe (38% versus 31%, $p < 0.05$).

Views on side effects: Evidence statement 23

There is evidence from a questionnaire (Lunts & Cowper 2002) (Quality -; Applicability A) sent to 131 parents of non immunised children (93 questionnaires returned: 70% response rate), in Bristol that found 30% of parents feared of long-term damage to the immune system, too many assaults on their child's 'immature' immune system and fear of an alleged link to autoimmune diseases, cancers and cot death.

Likewise an ethnographic study (Poltorak, Leach, Fairhead, & Cassell 2005) (Quality +; Applicability A) conducted in two areas of Brighton and Hove with 17 health professionals and 23 mothers with children (<3 years of age) found that most (not further quantified) of those concerned about the MMR suggested that three vaccines were too many for the immune system to cope with and a study (Evans, Stoddart, Condon, Freeman, Grizzell, & Mullen 2001) (Quality +; Applicability A) using focus groups with 48 parents (43 mothers/ 5 fathers) in Avon and Gloucestershire found vaccines in general were perceived by some non-acceptors as placing stress on a child's immature immune system, with possible short and long-term consequences for their health such as an increased susceptibility to allergies, asthma, and eczema and the potential for developing autoimmune diseases, cancer, and AIDS.

There is evidence from two papers that resulted from three focus groups and individual interviews with 87 parents in Cambridge and Durham between November 2002 and October 2004 (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) that reveals a strategy amongst parents for dealing with uncertainty and contradictory information was to delay vaccination and opt for single vaccines.

There is evidence from a paper (Hilton, Petticrew, & Hunt 2006) (Quality +; Applicability B) reporting on 18 focus groups with 72 parents living in Central Scotland, that a concern amongst parents regarding the current Childhood Immunisation Programme was that some children might be prone to 'immune-overload'. However, few parents were able to articulate these concerns in any depth.

Views on side effects: Evidence statement 24

There is evidence from a questionnaire (Henderson, Oates, Macdonald, & Smith 2004) (Quality -; Applicability B) of 206 GPs in the Highland region of Scotland that found three times as many were concerned about side effects believed to be associated with the MMR vaccine compared to side effects believed to be associated with Men C, DTP-Hib and polio vaccines. A significantly greater proportion of respondents believed that the benefits of being immunised 'likely' outweighed the possible risks for Men C, DTP-Hib, and polio vaccines compared to the proportion who thought this about the MMR.

Another questionnaire (Smith, McCann, & McKinlay 2001) (Quality -; Applicability B) with 136 General Practitioners, 78 Practice Nurses and 40 Health Visitors found that in July 1998 the majority of health professionals had confidence in the MMR. However, practice nurses and health visitors were less confident about the safety of MMR vaccine than general practitioners.

Single MMR vaccines: Evidence statement 25

There is evidence from a questionnaire (Casiday, Cresswell, Wilson, & Panter-Brick 2006) (Quality ++; Applicability B) parents in from North East England to suggest in parents who had refused the MMR there was no significant association between educational attainment or occupational class and uptake of single-antigen vaccines ($p = 0.438$ and $p = 0.638$, respectively). There was a significant difference between MMR accepting and MMR refusing

parents in terms of belief in the safety of single vaccines, 51.2% of the MMR-accepting parents felt that separate vaccines were safe, compared with 82.7% of MMR-refusing parents ($p < 0.00001$).

In one paper (Hilton, Petticrew, & Hunt 2006) (Quality +; Applicability B) that reported on focus groups with 72 parents living in Central Scotland, three parents who 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.

A postal questionnaire (Mullaney, Heathcock, Victor, Jones, & Smith 2002) (Quality -; Applicability B) of parents from South London (633 questionnaires returned of 1757; 38% response rate) found that if single measles vaccine was available in addition to MMR: 43% of responders said they would choose single vaccines, 19% said they would choose MMR, 24% would be happy to use either, 9% answered 'don't know' to this question, and 2% said they would not vaccinate at all. Of responders whose child had been given MMR, 28% said they would prefer single vaccines.

Views on risks/benefits of MMR vaccination: Evidence statement 26

There is evidence from a study (Evans, Stoddart, Condon, Freeman, Grizzell, & Mullen 2001) (Quality +; Applicability A) reporting on six focus groups with 48 parents (43 mothers/ 5 fathers) in Avon and Gloucestershire that suggests all parents associate immunisation with some risk and very few approach MMR with complete confidence. Likewise another study (Raithatha, Holland, Gerrard, & Harvey 2003) (Quality +; Applicability A) that interviewed 15 parents at a nursery in Norfolk found perception of the risk of the MMR vaccine to be a strong theme which was also related to babies' immune systems.

There is evidence from two papers that resulted from focus groups and individual interviews with 87 parents in Cambridge and Durham (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) to suggest some parents thought to reduce uncertainty and risk by identifying groups of children who seemed to be more likely to suffer adverse outcomes than others. Children who had allergies or digestive disorders had been born prematurely, were generally unwell, or had a family history of these problems or of autism were seen as more likely to be damaged by the MMR. This was often compounded by misinformation provided to parents. In addition, parents who did not plan to immunise their children said that they might reconsider their decision if measles emerged locally. However, some parents' memories of measles being a common childhood illness made this prospect less frightening.

To parents, their own children's health and safety was a more important concern than the small contribution to the health of the population that they could offer by vaccinating their children and contributing to the 'herd immunity'

If parents perceived their own child's vulnerability to measles, mumps and rubella to be low, or their vulnerability to harmful effects from the vaccine as particularly high, then immunising in order to protect others in the community was less appealing.

Views on risks/benefits of MMR vaccination: Evidence statement 27

There is evidence from a questionnaire (Smith, McCann, & McKinlay 2001) (Quality -; Applicability B) with 254 Health professionals carried out in July 1998 to suggest:

- A significant proportion of health professionals were unsure about the need for a second dose of MMR vaccine. Further, only half the sample stated that the second dose was necessary.
- Health professionals were more likely to encourage uptake of first dose than the second dose.

MMR decision making: Evidence statement 28

There is evidence from two papers that resulted from focus groups and individual interviews with 87 parents in Cambridge and Durham between November 2002 and October 2004 (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) that suggest being seen as bad parents and wanting to be respected by health workers made parents, who were unsure about their decision, more likely to comply with medical advice.

There was evidence from three papers; a study (Evans, Stoddart, Condon, Freeman, Grizzell, & Mullen 2001) using focus groups with 48 parents in Avon and Gloucestershire (Quality +; Applicability A) and two papers that resulted from focus groups and individual interviews with 87 parents in Cambridge and Durham between (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) that suggest financial incentives offered to GPs are of concern to parents. Both studies reported a fear of being removed from GP patient lists (to boost the percentage of immunised patients and thus secure the GP's target payment) and for some parents in the former study this had already occurred.

There was evidence from two papers from focus groups and individual interviews with 87 parents in Cambridge and Durham between (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) that suggest parents want to be able to choose which immunisations, if any, their children receive, and they all want the single vaccines for measles, mumps, and rubella to be available as an alternative to MMR.

There was evidence from two papers from focus groups and individual interviews with 87 parents in Cambridge and Durham between (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) that suggest peer pressure was not a significant factor in their decision; more importance was placed on people making their own choice.

There was evidence from an ethnographic study (Poltorak, Leach, Fairhead, & Cassell 2005) (Quality +; Applicability A) conducted in Brighton and Hove in 2003 with 17 health professionals and 23 mothers to suggest the decision to vaccinate did not necessarily reflect resolution or acceptance of the safety of the MMR. Isolation from peers, lack of confidence, lack of knowledge and vulnerability were reasons for vaccination, or at least for handing over judgment about it to health professionals. A need for combined parental responsibility on the issue was also highlighted.

The consequence of decisions and self blame was a theme in two studies; one a paper (Raithatha, Holland, Gerrard, & Harvey 2003) (Quality +; Applicability A) reported interviews with 15 parents at a nursery in Norfolk and a study (Wroe, Bhan, Salkovskis, & Bedford 2005) (Quality +; Applicability A) that reported on 114 questionnaires sent randomly to parents of children aged 10-12 months of age in Bromley. There was also evidence from the latter to suggest that the strongest predictor of MMR decision making was anticipated regret if harm occurred as a result of not immunising.

MMR decision making: Evidence statement 29

There is evidence from a study (Mixer, Jamrozik, & Newsom 2007) (Quality ++; Applicability B) that used mixed methods (quantitative analysis and focus groups with 37 mothers) in Brent, North West London to suggest a highly statistically significant relationship between uptake of MMR1 vaccine and ethnicity. Uptake of MMR1 vaccine was highest amongst children from Indian backgrounds followed by Afro-Caribbean children and lastly white children.

Amongst people of Asian origin, immunisation is seen as beneficial, possibly influencing their uptake; these people followed their cultural tradition of consulting their elders, especially their mother-in-law, for advice about immunisation. Asian mothers were also more likely to consult their general practitioner for advice and were most trusting of such advice.

Conversely, Afro-Caribbean and white mothers were more likely to question the pro-MMR vaccination advice given by healthcare professionals.

Parents'/Mothers' and Health Professionals' Views on Attitude of Health Professionals, and on Access/Delivery of MMR : Evidence statement 30

There is evidence from one focus group study reported in two papers (Casiday 2006; Casiday 2007) (Both Quality +; Applicability A) that resulted from focus groups and individual interviews with 87 parents in Cambridge and Durham that suggest that the decision about MMR was difficult and stressful and parents experienced unwelcome pressure from health professionals to comply.

There is evidence from one-to-one interviews with 69 parents (64 mothers, 5 fathers) and 12 health practitioners at five general practices in Leeds to suggest parents found the influence of primary care providers on the vaccination decision was limited by concerns over consultation legitimacy, discussion opportunity and perception of financial and political partiality. The rushed nature of the consultation which reduced discussion opportunity was also felt by the health practitioner. Parents would prefer new collaborative as well as individual approaches to information exchange designed to relate the risks and benefits of MMR vaccination to the parent's local circumstances and individual child (McMurray, Cheater, Weighall, Nelson, Schweiger, & Mukherjee 2004)(Quality ++; Applicability A).

There was evidence from a postal questionnaire (Mullaney, Heathcock, Victor, Jones, & Smith 2002) of parents (633 questionnaires returned of 1757; 38% response rate) to suggest that about two-thirds of parents did not take up MMR vaccination because they did not receive an appointment for MMR (Mullaney, Heathcock, Victor, Jones, & Smith 2002) (Quality -; Applicability B).

Parents'/Mothers' and Health Professionals' Views on Attitude of Health Professionals, and on Access/Delivery of MMR: Evidence statement 31

There is evidence from a focus group study (Hilton, Hunt, & Petticrew 2007) (Quality +; Applicability B) of 38 parents from across the UK, caring for children with autism, to suggest that parents felt frustrated, annoyed and ignored by health professionals when discussing the MMR vaccine.

Impact of MMR controversy: Evidence statement 32

There is evidence from an in-depth interview study (Raithatha, Holland, Gerrard, & Harvey 2003) (Quality +; Applicability A) of 15 parents in Norfolk to suggest that confidence of parents in government agencies was shaken by MMR controversy, which was further compromised by the BSE crisis. Further there is evidence from a questionnaire survey of 131 parents (70% response rate) in which 28% of parents cited the primary reason for non-uptake of MMR vaccination to be the link between the MMR vaccine and autism, and 52% cited the fear of autism as reason for declining the first dose of MMR (Lunts & Cowper 2002) (Quality -; Applicability A).

Impact of MMR controversy: Evidence statement 33

There is evidence from one focus group study (Hilton, Hunt, & Petticrew 2007) (Quality +; Applicability B) of 38 parents from across the UK caring for children with autism, to suggest that the MMR controversy had a negative impact, resulting in guilt and self-blame. Parents also felt angry toward health professionals' inflexible approach and lack of understanding of the negative impact the MMR controversy had had on them.

Impact of MMR controversy: Evidence statement 34

There is evidence from a semi-structured postal questionnaire (Henderson, Oates, Macdonald, & Smith 2004) (Quality -; Applicability B) of 206 GPs (response rate 73%) to suggest that confidence of health professionals in government agencies was shaken by the MMR controversy, which was further compromised by the BSE crisis.

Sources of information on the MMR Vaccination: Evidence statement 35

There was evidence from three studies on where parents sourced information on the MMR:

- One postal survey with 150 mothers of children aged 5-12 months and 150 mothers of children aged 21-35 (Pareek & Pattison 2000) (Quality +; Applicability A) found the most common source of information to be the health visitor, with television the most commonly cited source of information about side effects.
- A study (Ramsay, Yarwood, Lewis, Campbell, & White 2002) (Quality -; Applicability A) using face-to-face interviews with 1013 mothers showed 74% of mothers reported seeking advice from health professionals before having their children immunised.
- A postal questionnaire completed by 996 parents located with Durham primary care Trust (Casiday, Cresswell, Wilson, & Panter-Brick 2006) (Quality ++; Applicability B) showed 93.8% of parents had consulted one or more sources of information about the MMR vaccination. Health visitors and the 'MMR the Facts' leaflet were the most frequently consulted sources. MMR-refusers were more likely than MMR acceptors to have used health visitors, general practitioners, anti-MMR organisations and other sources of advice ($p < 0.00001$).

There was evidence from a postal questionnaire of 1757 parents to show that acceptors had significantly higher levels of trust than non-acceptors in all sources of information (government ministers, GPs, practice nurses, health visitors, hospital doctors, vaccine manufacturers and scientific experts) (Mullaney, Heathcock, Victor, Jones, & Smith 2002) (Quality -; Applicability B).

Sources of information on the MMR Vaccination: Evidence statement 36

The most trusted source of information on the MMR was similar across studies:

- A postal questionnaire (Casiday, Cresswell, Wilson, & Panter-Brick 2006) (Quality ++; Applicability B) of 996 in Durham found parents trusted their own doctors far more than the medical establishment.
- Likewise in focus groups (Casiday 2006; Casiday 2007) (Quality +; Applicability A) with 87 parents in Cambridge and Durham, advice from medical practitioners' was generally trusted when they showed concern for the individual child, as opposed to merely protecting the population or their own professional reputations.
- One study (McMurray, Cheater, Weighall, Nelson, Schweiger, & Mukherjee 2004) (Quality ++; Applicability A) with 69 parents most frequently cited GPs and health visitors as the best or most trusted source of information on MMR.

There is evidence from two studies, one a study (McMurray, Cheater, Weighall, Nelson, Schweiger, & Mukherjee 2004) (Quality ++; Applicability A) with 69 parents and another a focus group study (Hilton, Petticrew, & Hunt 2007) (Quality +; Applicability B), involving 64 mothers and 8 fathers in Central Scotland to suggest a range of factors influence parents trust in health professionals such as:

- GPs receiving payments for meeting Government immunisation targets
- Partiality and concerns as to acceptability or legitimacy of discussion during consultation
- Health visitors applying unwanted pressure on parents and in some cases ostracizing them for not complying with the recommended vaccines

There is contradictory evidence from a focus group study (Hilton, Petticrew, & Hunt 2007) (Quality +; Applicability B) with 64 mothers and 8 fathers from Central Scotland to suggest

that on one hand Andrew Wakefield was regarded as an important whistle-blower and champion of ordinary parents and that criticism of Wakefield by public health officials appeared counter-productive, and was taken to be evidence of their attempts to suppress the 'truth'. Conversely, some parents implied Wakefield should shoulder much of the blame for their uncertainty about MMR safety (no proportions reported).

There is evidence from an ethnographic study (Poltorak, Leach, Fairhead, & Cassell 2005) (Quality +; Applicability A) conducted in Brighton and Hove with 17 health professionals and 23 mothers to suggest 'many' mothers (no figures provided) do not raise questions with GPs, seeing them as time-constrained and probably partial in their advice and worry about appearing ignorant. Some mothers actively seek out those who will support their particular perspective on vaccination.

There was evidence from two papers that resulting from focus groups and individual interviews with 87 parents in Cambridge and Durham (Casiday 2006; Casiday 2007) (Quality +; Applicability A) to suggest parents value personal relationships, experience and training of health professionals and are reassured by the existence of professional codes of practice.

Sources of information on the MMR Vaccination: Evidence statement 37

There was evidence to suggest considerable mistrust in the government in relation to the MMR:

- A focus groups with 87 parents (Casiday 2006; Casiday 2007) (Quality +; Applicability A) suggests parents do not accept the government's decisions until they evaluate the relevant evidence themselves.
- Similarly, a postal questionnaire (Casiday, Cresswell, Wilson, & Panter-Brick 2006) (Quality ++; Applicability B) of 996 parents from Durham indicated a considerable distrust in the government's role in regulating risk, particularly among the MMR-refusing parents with only 39.4% agreeing that the government would stop MMR if there was evidence of a serious risk and 41.6% agreeing that the government does a good job in protecting us from risks to health.
- A focus group study of 64 mothers and 8 fathers from Central Scotland (Hilton, Petticrew, & Hunt 2007) (Quality +; Applicability B) to suggest that general consensus among parents was that politicians were untrustworthy in matters of health.

There is evidence from one study (Evans, Stoddart, Condon, Freeman, Grizzell, & Mullen 2001) (Quality +; Applicability A) using focus groups with 48 parents in Avon and Gloucestershire, to suggest that parents did not have confidence in statements issued by the government about the safety of MMR and that this led to parents obtaining information from a variety of other sources (no further details provided). Although parents were generally well informed about immunisation, they reported that inadequate information had hampered their decision-making process. For many parents the possible link with autism and Crohn's disease was not resolved, so they were unwilling to accept MMR.

The general view expressed by parents was that politicians serve their own and their party's interests before those of the public.

Sources of information on the MMR Vaccination: Evidence statement 38

There is evidence from a postal questionnaire (Gellatly, McVittie, & Tiliopoulos 2005) (Quality -; Applicability B) of 110 parents from five nurseries in Edinburgh to suggest that current research and helpfulness of leaflets and information packs significantly increased vaccination status.

There is evidence from a focus group study (Evans, Stoddart, Condon, Freeman, Grizzell, & Mullen 2001) (Quality +; Applicability A) with 48 parents in Avon and Gloucestershire, to

suggest that more information from independent sources should be easily available at GP surgeries and community clinics and that available leaflets were limited in scope and failed to address their concerns.

There is evidence from focus groups with 87 parents (Casiday 2006; Casiday 2007) (Quality +; Applicability A) in Durham and Cambridge to show parents (no figures provided) were concerned that epidemiological evidence would overlook some children who might have really been harmed by the vaccine and evidence from a similar study (Hilton, Petticrew, & Hunt 2007) (Quality +; Applicability B) involving 64 mothers and 8 fathers in Central Scotland to suggest parents felt ill equipped to assess research studies for themselves.

Sources of information on the MMR Vaccination: Evidence statement 39

There is evidence to suggest that parents' views on the role of the media varied widely: A focus group study (Quality +; Applicability A) with 48 parents in Avon and Gloucestershire, to suggest that media publicity about the possible link between MMR, autism, and Crohn's disease raised doubts in the minds of people who had not previously questioned the safety of immunisation (Evans, Stoddart, Condon, Freeman, Grizzell, & Mullen 2001).

Similarly in a focus group study (Hilton, Petticrew, & Hunt 2007) of 64 mothers and 8 fathers from Central Scotland (Quality +; Applicability B) parents found it difficult to distance themselves from the debate, and felt particularly drawn to newspaper stories that involved real life people. Some viewed journalists as scaremongers, whilst others thought of them as valuable information providers (no figures provided). Parents felt that the media are acutely aware of the fact that health stories, especially those involving children, are of huge interest to the public.

Sources of information on the MMR Vaccination: Evidence statement 40

There is evidence from three studies to suggest that information acquired through other parents was considered highly:

- An ethnographic study (Poltorak, Leach, Fairhead, & Cassell 2005) (Quality +; Applicability A) with 17 health professionals and 23 mothers in Brighton and Hove suggested mothers rarely seek or give advice but rather learn from hearing and sharing experiences and tips, generally valuing forms of information sharing grounded in the unique relationship and responsibility that each has for their child.
- Likewise a focus group study (Casiday 2006; Casiday 2007) (Quality +; Applicability A) with 87 parents suggested parents' placed great importance on other parents' claims because they felt parents know their own children better than anybody else and are in a unique position to notice changes in their behaviour.
- A focus group study (Hilton, Petticrew, & Hunt 2007) (Quality +; Applicability B) with 64 mothers and 8 fathers from Central Scotland suggested accounts from other parents appeared to carry as much, if not more, weight than either evidence from epidemiological studies or assurances from politicians and public health officials. Parents could understand other parents' concerns and could assess their credibility.

Sources of information on the MMR Vaccination: Evidence statement 41

There is evidence from 38 parents of autistic children from across the UK (34 mothers and 4 fathers) (Hilton, Hunt, & Petticrew 2007) (Quality +; Applicability B) that suggests:

- Parents with autistic children can experience a lack of consistency of care, which adds to their general sense of uncertainty.
- 'Some' parents received unwelcome pressure from health professionals if they had refused the second dose of MMR vaccine for their child with autism or for their second child.

Sources of information on the MMR Vaccination: Evidence statement 42

There is evidence from one study (Poltorak, Leach, Fairhead, & Cassell 2005) (Quality +; Applicability A) that used group interviews with eight general practitioners (GPs), three practice nurses and six health visitors to suggest that:

- Most GPs (no further details) feel little involvement in parents' MMR decisions.
- Health visitors generally appreciated parents' dilemmas and do not want to compromise carefully built trust relationships.
- Vaccination is not the immediate priority for health professionals working with parents who are perceived as deprived, with many related health and social problems.
- Established trust between parents and health professionals does not necessarily affect parents' vaccination decisions.

Sources of information on the MMR Vaccination: Evidence statement 43

There is evidence from a semi-structured questionnaire (Henderson, Oates, Macdonald, & Smith 2004) (Quality -; Applicability B) of 206 General Practitioners' to suggest distrust of government expert groups was shared by some within the medical profession.

Hepatitis B (Section 5.1.4 of full report)

Two studies were identified that explored knowledge, values, attitudes and beliefs related to the hepatitis B vaccine (evidence statements 44-45). Emerging themes were:

- Immunisation in general
- Knowledge of hepatitis B
- Vaccination delivery in schools
- Decision making

Hepatitis B: Evidence statement 44

There is evidence from a questionnaire (Penrice, McMenamin, & Cameron 2000) (Quality -; Applicability B) that sought to determine possible problems encountered with the process of hepatitis B immunisation among GPs caring for babies born to mothers who were HbsAg positive at antenatal screening in Glasgow.

The questionnaire found that barriers to successful completion of hepatitis B immunisation of infants at risk were: lack of coordination, inadequate communication, lack of clarity of responsibility for immunisation and problems with the delivery of medical services to patients from ethnic minority groups. These were not further specified.

61% of GPs thought that hepatitis B immunisation should be their responsibility.

76% of GPs thought that an appointment system similar to that in operation for primary immunisations would help increase successful completion of hepatitis B immunisation for at risk infants.

Hepatitis B: Evidence statement 45

There is evidence from a qualitative study (Hinds & Cameron 2004) (Quality ++; Applicability B) that used nine semi-structured focus group discussions, five with pupils and four with

parents that sought to determine acceptability of universal hepatitis B vaccination among secondary school pupils (aged 12-13 years) and parents in Glasgow.

The study used a grounded theory approach to investigate attitudes. Transcripts were read repeatedly and emergent themes were used to code sections of the text. Data were then delimited by a process of comparing and connecting themes.

The key themes identified were:

Immunisation in general

Most pupils generally disliked vaccinations, however they understood their importance. Most parents who expressed an opinion regarding universal immunisations were in favor, although some felt possible side effects were not always disclosed.

Pupils felt that they liked having vaccines at school as they felt supported.

Knowledge of hepatitis B

Most pupils admitted to knowing little or nothing about hepatitis B. Few parents were well informed and overall there was a general lack of awareness.

The routes of transmission were not well understood by pupils or adults alike and some felt that only drug users were at risk.

Parents, more than pupils, wanted further information on such things as the risk of infection, and its long-term consequences.

Universal hepatitis B vaccination for school pupils

There was confusion amongst parents about the need to vaccinate.

Many pupils had not understood that hepatitis B vaccination involved a series of three injections and the majority was unhappy about having more than one injection although few felt that this would be a barrier.

Many parents felt strongly that they should be provided with information about any potential side effects of hepatitis B vaccination and that they required further evidence of vaccine safety before they could decide as to whether their child should be vaccinated.

Some parents felt that vaccination should be accompanied by a school education programme about transmission of hepatitis B.

A few parents expressed concern that vaccinating against hepatitis B may mean that some adolescents could indulge in high-risk behaviours.

Decision for hepatitis B

Most pupils indicated that they would want to discuss it with their parents or carers.

Most parents wanted their children to have time to discuss issues relating to hepatitis B, although there was disagreement among parents as to whether home or school was the best place for this.

BCG (Section 5.1.5 of full report)

Two studies were identified that explored knowledge, values, attitudes and beliefs related to the BCG vaccination (evidence statements 46-47). Emerging themes were:

- Healthcare professionals' knowledge of current policies
- Parent's knowledge of current policies
- Scarring may be a significant issue for some groups targeted to receive the vaccination.

BCG vaccination: Evidence statement 46

There is evidence from a survey (Gordon, Roberts, & Odeka 2007) (Quality +; Applicability: A) in which all parents (n=133) and professionals (comprising midwives nurses, allied professionals and doctors; n= 120) in antenatal, postnatal, paediatric and neonatal units of a UK hospital were surveyed over a six week period, to determine attitudes and knowledge of the targeted BCG vaccination policy that was introduced in 2005.

The majority of professionals (63.3%) reported that they were aware of a new BCG vaccination policy, however only 6% of parents were aware.

Only 50% of professionals could accurately identify who should receive BCG vaccination under the current policy.

BCG vaccination: Evidence statement 47

There is evidence from one study (Fang, Ko, & Wilson 1993) (Quality rating +: Applicability: A) that used physical examination and interviewing techniques to explore the prevalence and acceptance of BCG scarring among high-school children (n=287) of different ethnic origin in Harrow, UK. The study found that:

- The average scar was 7.26 mm in diameter and the majority of scarring was hyperpigmented (67.8%) and raised (76%).
- There was a similar distribution of scarring across ethnic groups, although the mean diameter was significantly larger among Asian, Oriental, African Caribbean, and Arab groups compared with Caucasians, (p<0.025).
- A significantly higher proportion of girls (23%) found the scar unacceptable compared to boys (7.3%) (p=0.0004).
- Scar size was found to be a significant determinant of acceptance with children who found the scar unacceptable (n=42) having bigger scars compared with the children who accepted (n= 120).
- The site and the colour of scarring were found to have no relationship to scar acceptance.
- In terms of preferred site of vaccination, the majority (79.9%) of children preferred the conventional site (i.e. upper arm) although girls more than boys prefer unconventional sites such as the inner aspect of upper arm, buttock, thighs, and lower leg.

Human Papilloma Virus [HPV] (Section 5.1.6 of full report)

Eleven studies were identified that explored knowledge, values, attitudes and beliefs related to the HPV vaccination. Emerging themes were:

- Knowledge about HPV and cervical cancer (Evidence statements 48-50)
- Knowledge about HPV vaccine alone (Evidence statements 51-52)
- Attitudes and perceptions of vaccinations for sexually transmitted infections (STI's) (Evidence statements 53-58)
- Intention to vaccinate/HPV vaccination acceptance (Evidence statements 59-65)
- Age of HPV vaccination (Evidence statements 66-68)
- Consent for HPV vaccination (Evidence statements 69-70)
- Delivery of the HPV vaccination (Evidence statements 71-74)

- Attitudes to HPV vaccination in general (Evidence statements 75-77)

Knowledge about HPV and cervical cancer: Evidence statement 48

There is evidence from three papers: focus group study of parents of 11-12 year olds (number not stated) (Vallely, Roberts, Kitchener, & Brabin 2008) (Quality ++; Applicability B), focus group study of parents of 8-10 year olds (number not stated) (Noakes, Yarwood, & Salisbury 2006) (Quality - ; Applicability B), and a cross sectional survey of parents (Brabin, Roberts, Farzaneh, & Kitchener 2006) (Quality ++; Applicability A) that suggests parents have little or no awareness of the association between HPV and cervical cancer. When the association between HPV and cancer is suggested, confusion over early detection through cervical screening and the many messages presented in the public domain about carcinogens meant that the seriousness of the threat of cancer was reduced.

Knowledge about HPV and cervical cancer: Evidence statement 49

There is evidence from a survey of 684 mothers of 8-14 year-old girls from across the UK (Marlow, Waller, & Wardle 2007a) (quality +; Applicability A) and a study comprising focus groups of 24 mothers of girls aged 8-14 years (Waller, Marlow, & Wardle 2006) (Quality +; Applicability B) which suggests that most mothers (up to 73%) had not heard of HPV.

After receiving a short information leaflet about HPV (with information on causes, severity and detection of HPV, as well as what HPV is and what the HPV vaccine is), many mothers thought that their daughters would be at significant risk of HPV infection in the future. Many mothers also believed that infection with HPV could be severe. (Marlow, Waller, & Wardle 2007a)

Knowledge about HPV and cervical cancer: Evidence statement 50

There is evidence from a cross-sectional study of girls aged 16-19 years (n=367) carried out in two further education colleges in London which vary according to the proportion of students from low-income families and ethnic minority groups. Only 6% (n=22) said they had heard of HPV before the study. (Marlow, Waller, Evans, & Wardle 2008) (Quality +; Applicability B).

Furthermore, a mixed methods study (Lloyd, Marlow, Waller, & Wardle 2008) (quality -; Applicability B) also conducted in London showed: when compared to control (receiving information on Chlamydia or recycling), intervention groups given HPV information scored significantly higher in terms of HPV knowledge (HPV group 10.2 versus Chlamydia 7.13 ($p < 0.001$) and HPV group 10.2 versus recycling 6.47 ($p < 0.001$).

Knowledge about HPV vaccine: Evidence statement 51

There is evidence from a cross sectional survey of 317 parents (Brabin, Roberts, Farzaneh, & Kitchener 2006) (Quality ++; Applicability A) conducted in Manchester in 2005 that reported few parents, irrespective of background had heard of HPV or the HPV vaccine.

Knowledge about HPV vaccine: Evidence statement 52

There is evidence from a qualitative study of parents of 11-12 year olds, school nurses and young people aged 11-12 years (Vallely, Roberts, Kitchener, & Brabin 2008) (Quality ++; Applicability B), which measured the level of knowledge in 11-12 year olds after viewing a specifically developed educational film on HPV, that found 84.9% knew that there was a new vaccine available that would protect them against cervical cancer. Knowledge of the vaccine was higher in girls (89.3%) compared to boys (76.5%) (Fishers Exact test, $p < 0.001$).

Attitudes and perceptions of vaccinations for sexually transmitted infections (STIs): Evidence statement 53

The is evidence from a qualitative study of parents of 8-10 year olds (Noakes, Yarwood, & Salisbury 2006)(Quality -; Applicability B) that showed:

For parents of 8-10 year old children the link between HPV and sexual activity was highly problematic, as was the idea of sexual activity, safe sex messages and sex education.

Most parents wanted to shield their young children from becoming adults too soon and they wanted them to retain their innocence.

For some parents the issue of sexual transmission of HPV concerned them, they felt that their children may then become complacent about HPV and unprotected sex following vaccination if this was not enforced and delivered in the context of sex education.

**Attitudes and perceptions of vaccinations for sexually transmitted infections (STIs):
Evidence statement 54**

There is evidence from one study comprising focus groups of 24 mothers of 8-14 year old girls (Waller, Marlow, & Wardle 2006) (Quality +; Applicability B), that showed:

Mothers' attitudes to vaccines for sexually transmitted infections (STIs) were mixed.

Mothers that were in the focus group of least educated participants (all had no qualifications) were more in favour of the HPV vaccination than mothers in other focus groups, and were able to acknowledge that one day their children would be sexually active.

Amongst other mothers, (various qualification levels) there was concern that vaccinating children against a STI could have negative consequences and teach children that it's okay to be promiscuous.

**Attitudes and perceptions of vaccinations for sexually transmitted infections (STIs):
Evidence statement 55**

There is evidence from a survey (n=684; 57% response rate) of mothers of 8-14 year old girls from across the UK (Marlow, Waller, & Wardle 2007a) (Quality +; Applicability A), that showed that few mothers (12%) thought that the HPV vaccine would be likely to encourage girls to have sex, although some mothers (18%) felt that it was possible that the vaccination would increase the number of girls having unprotected sex.

**Attitudes and perceptions of vaccinations for sexually transmitted infections (STIs):
Evidence statement 56**

The is evidence from a qualitative study of parents of 11-12 year olds, school nurses and young people aged 11-12 years after viewing a specifically developed educational film on HPV (Vallely, Roberts, Kitchener, & Brabin 2008)(Quality ++; Applicability B), that showed:

Roman Catholic parents expressed concern at not knowing about HPV sooner especially when they had older children. Also, their level of knowledge about what information on STIs was taught in school sex education was limited.

Muslim women rejected the HPV vaccination because daughters would be required to think about "men and sex".

**Attitudes and perceptions of vaccinations for sexually transmitted infections (STIs):
Evidence statement 57**

There is evidence from a focus group study of parents of 11-12 year olds, school nurses and young people aged 11-12 years after viewing a specifically developed educational film on HPV (Vallely, Roberts, Kitchener, & Brabin 2008)(Quality ++; Applicability B), that showed school nurses were concerned that the UK school curriculum does not introduce STIs and cervical screening till after the proposed age of vaccination.

**Attitudes and perceptions of vaccinations for sexually transmitted infections (STIs):
Evidence statement 58**

There is evidence from a cross-sectional study of girls aged 16-19 years (n= 367) recruited from two further education colleges in London, which differed according to the proportion of

students from low-income families and ethnic minority groups, that found that 43% thought that girls in general would be more likely to have sex or unprotected sex if they were vaccinated (Marlow, Waller, Evans, & Wardle 2008) (Quality +; Applicability B).

There is evidence from a mixed methods study (Lloyd, Marlow, Waller, & Wardle 2008) (Quality -; Applicability B) conducted in girls aged 13-15 years in London that found that some girls indicated that they wouldn't have sex just because they were vaccinated.

Intention to vaccinate/HPV vaccination acceptance: Evidence statement 59

There is evidence from one cross sectional survey of 317 parents of 11-12 year olds in Manchester, UK (Brabin, Roberts, Farzaneh, & Kitchener 2006) (Quality ++; Applicability A) which showed 81% of parents agree to HPV vaccination, but that only 38% definitely intended to vaccinate their daughters.

Intention to vaccinate/HPV vaccination acceptance: Evidence statement 60

There is evidence from a focus group study of parents of 8-10 year olds (Noakes, Yarwood, & Salisbury 2006) (Quality -; Applicability B) that showed:

Parents were concerned with the potential side effects of the HPV vaccine and about the sexual nature of transmission. For most, these (side effects) needed to be outweighed by potential benefits of the vaccination.

Intention to vaccinate/HPV vaccination acceptance: Evidence statement 61

There is evidence from three papers, one study comprising focus groups of 24 mothers of 8-14 year old girls (Waller, Marlow, & Wardle 2006) (Quality +; Applicability B), and two papers based on the same survey of mothers of 8-14 year old girls (Marlow, Waller, & Wardle 2007a); (Marlow, Waller, & Wardle 2007b) (Quality +; Applicability B) that showed:

The degree of acceptance of the HPV vaccination varied among mothers of 8 to 14 year old girls, while 75% were positive about HPV vaccination only 27% would definitely vaccinate their daughters; whereas 48% said they probably would. Others were unsure (19%) and 6% were against the HPV vaccine. (Marlow, Waller, & Wardle 2007a)

Although most mothers were keen to have their daughters vaccinated, the majority expressed reservations about the vaccination and wanted more information about HPV and the vaccination (Waller, Marlow, & Wardle 2006).

Factors significantly associated with mothers' lesser acceptance of the HPV vaccine included: concerns about side effects, concerns about giving children too many vaccines, mothers who had delayed, refused, or regretted previous vaccinations, cultural/religious perspectives, communication problems with child and worries about sexual promiscuity (Marlow, Waller, & Wardle 2007a).

Factors significantly associated with mothers' higher acceptance of HPV vaccine included: their daughter being at the older end of the 8 to 14 age range; being able to discuss sex at an early age; worries about the severity and susceptibility of HPV infection; being convinced of the efficacy of the HPV vaccine; believing in authorities; having had a close family member with cancer; and their husband being in favour of, or not minding about, the vaccination of their daughter (Marlow, Waller, & Wardle 2007a).

Intention to vaccinate/HPV vaccination acceptance: Evidence statement 62

There is evidence from a study (Marlow, Waller, & Wardle 2008) (Quality ++; Applicability A) using face-to-face interviews with mothers from England, Scotland and Wales with daughters aged 16 or younger that showed:

74% of mothers were acceptors, while 26% were hesitant towards vaccination.

The age of a mother's youngest daughter was associated with acceptance. Mothers whose youngest daughter was 13–16 years were more likely to be 'acceptors' of HPV vaccination than those with younger daughters (OR = 2.91, 95% CI: 1.27–6.65).

Intention to vaccinate/HPV vaccination acceptance: Evidence statement 63

There is evidence from a qualitative study of parents of 11-12 year olds, school nurses and young people aged 11-12 years (Vallely, Roberts, Kitchener, & Brabin 2008) (Quality ++; Applicability B) following a specifically developed educational film on HPV, which found most girls following were positive towards HPV vaccination.

Intention to vaccinate/HPV vaccination acceptance: Evidence statement 64

There is evidence from a cross-sectional study of female students aged 16-19 years (N=386) (Marlow, Waller, Evans, & Wardle 2008) (Quality +; Applicability B) recruited from two further education colleges in London that varied according to the proportion of students from low-income families and ethnic minority groups, that found that young women who were from a largely white and SES college were more likely to be positive (93.7%) about the HPV vaccination compared with those attending an ethnically diverse, lower SES college (86.1%) (OR 2.38, CI: 1.13-5.05) (Marlow, Waller, Evans, & Wardle 2008).

There is evidence from one study (Lloyd, Marlow, Waller, & Wardle 2008) (Quality -; Applicability B) that used mixed methods to explore emotional, attitudinal and motivational reactions to information on HPV in girls aged 13-15 years in London that showed: Most young women were positive towards vaccination, with 82% to 93.7% indicating they would accept vaccination.

Intention to vaccinate/HPV vaccination acceptance: Evidence statement 65

There is evidence from a cross-sectional study of female students aged 16-19 years (N=386) (Marlow, Waller, Evans, & Wardle 2008) (Quality +; Applicability B) recruited from two further education colleges in London that varied according to the proportion of students from low-income families and ethnic minority groups, that found that young women were less likely to accept HPV vaccination if they were:

- From an Asian background compared to those from white backgrounds;
- Practicing Muslims, Sikh or Hindu. compared to those not practicing a religion;
- Did not speak English as their first language compared with those who did.

Age of HPV vaccination: Evidence statement 66

There is evidence from a cross sectional survey of parents of 11-12 year olds in Manchester UK (Brabin, Roberts, Farzaneh, & Kitchener 2006) (Quality ++; Applicability A) and a qualitative study of parents of 8-10 year olds (Noakes, Yarwood, & Salisbury 2006) (Quality -; Applicability B) to suggest that:

- For most parents vaccination against HPV in early adolescence was well accepted.
- For most parents the ideal age of vaccination was an emotional topic.
- Parents felt that it was necessary children were told what the vaccine was for but felt that primary school was too young to be discussing sexually transmitted infections.
- Some parents suggested an alternative was to vaccinate very young children.

Age of HPV vaccination: Evidence statement 67

There is evidence from a survey of mothers of 8-14 year old girls from four areas of the UK (Marlow, Waller, & Wardle 2007a) (Quality +; Applicability B) to suggest that 80% of mothers agreed that the ideal age for vaccination against HPV infection was 10-14 years.

Age of HPV vaccination: Evidence statement 68

There is evidence from a study comprising focus groups of mothers (n=24) of 8-14 year old girls (Waller, Marlow, & Wardle 2006) (Quality +; Applicability B) to suggest that:

- Most mothers want to discuss vaccination against HPV infection with their daughters. However some mothers felt that their daughter would have had very little if any sex education at school below 10 or 11 years of age and because of this discussing an STI with them could be difficult.
- Most felt that as girls moved into puberty at the age of 11, explaining an STI would be easier.
- Most mothers acknowledged the need to vaccinate against HPV infection before their daughters became sexually active.
- Some mothers were adamant that they would not vaccinate their daughter against HPV infection before the age of nine.
- The appropriate age for vaccination for most mothers was linked to when they felt they could discuss sex, STIs and the HPV vaccination with their daughter.

Consent for HPV vaccination: Evidence statement 69

There is evidence from two studies (Brabin, Roberts, Farzaneh, & Kitchener 2006) (Quality ++; Applicability A) and (Brabin, Roberts, & Kitchener 2007) (Quality ++; Applicability A) that were both based on a cross-sectional study that explored the views of a representative sample of parents in Manchester, UK, which showed that the majority of parents (73.9%) felt the decision to vaccinate their child should be a joint decision after discussion between them and their child. However, 19% would not take the child's view into account. Parents were divided regarding children requesting the vaccination without parental support, with 42% in favour and 48% opposed whilst 46% felt that a well informed child should be able to request vaccination at sexual health clinics without parental consent.

Parents gave a number of reasons why they were supportive or not supportive of their children being able to give consent without their knowledge. These related to:

- Parental involvement in medical decisions
- How parents perceived their child's level of maturity
- Children's rights, privacy, and decision making
- Safety of the vaccine
- Cultural/religious perspectives
- Worries about sexual promiscuity

White and Black-Caribbean parents were more likely to be supportive of their child giving consent independently to the HPV vaccine.

Muslim parents were less likely to be supportive of vaccination without parental consent.

Consent for HPV vaccination: Evidence statement 70

There is evidence from a study using mixed methods (Lloyd, Marlow, Waller, & Wardle 2008) (Quality -; Applicability B) that examined emotional, attitudinal and motivational reactions to information on HPV in girls aged 13-15 years, in London that showed:

- Some young women tended towards self-responsibility, while younger women deferred responsibility for this towards others such as parents or high authorities.
- Most young women felt the decision to be vaccinated should be made as a joint process between themselves and their parents.
- Most indicated that they would want to talk to their mothers about the vaccination.

Delivery of the HPV vaccination: Evidence statement 71

There is evidence from a qualitative study of parents of 8-10 year olds (Noakes, Yarwood, & Salisbury 2006) (Quality - ; Applicability B), that looked at the views of parents of 8-10 year olds and found most parents to be happy with a schools-based programme, with a program delivered in secondary schools rather than primary schools generally more accepted.

Delivery of the HPV vaccination: Evidence statement 72

There is evidence from a cross sectional survey (Brabin, Roberts, & Kitchener 2007) (Quality ++; Applicability A) that explored the views of a representative sample of parents in Manchester, UK on issue of providing the HPV vaccination at sexual health clinics. Almost half (46.7%) of parents agreed with the provision of the HPV vaccination at sexual health clinics, however it is difficult to determine if parents agreed with their child consenting to vaccination without their knowledge or whether it was this method of delivery that was acceptable or a combination.

Delivery of the HPV vaccination: Evidence statement 73

There is evidence from one study (Lloyd, Marlow, Waller, & Wardle 2008) (Quality -; Applicability B) conducted using mixed methods in 13-15 year old girls in London that showed:

- Mixed feeling towards schools based vaccination.
- Some felt that 'automatic' vaccination was a good option, as it may reduce the potential for embarrassment or confusion.
- There was uncertainty with some referring to a lack of trust towards medical professionals and a feeling of being forced into having something (vaccination) that they may not want.

Delivery of the HPV vaccination: Evidence statement 74

There is evidence from a survey (Wagner, White, & Crowcroft 2007) (Quality ++; Applicability A) conducted in immunisation leads in the UK that showed:

- The majority of immunisation leads (76%) felt the preferred place to deliver the routine HPV vaccine for girls aged 12-13 years would be schools.
- 72% felt schools should also deliver a one-off catch up of girls aged 13-16 years.
- Many were concerned regarding the resources, and the extra funding required for delivery. Many felt they would be unable to deliver the vaccination with existing staffing levels.
- They raised issues that all educational establishments/locations would need to be identified as well as a detailed tracking system.
- There was concern that schools may find three visits difficult and may not welcome the disruption particularly when school nurses often worked part time and only during term time and the need to prepare and deliver explanations to staff, parents, and others, may be a significant increase in their workload.

Attitudes to HPV vaccination in general: Evidence statement 75

There is evidence from a focus group study (Noakes, Yarwood, & Salisbury 2006) (Quality -; Applicability B) conducted with an unspecified number of parents of 8-10 year olds that showed:

- Parents felt that getting their children vaccinated against serious diseases was part of their parental responsibility.
- The MMR debate has made parents more fearful of the potential side effects or risks of vaccinations.

- Attitudes towards new vaccinations fall into three groups: trusting, compliant and resistant.

Attitudes to HPV vaccination in general: Evidence statement 76

A focus group study with 24 mothers of 8-14 year old girls (Waller, Marlow, & Wardle 2006) (Quality +; Applicability B) found that mothers were broadly positive about vaccinations in general and the HPV vaccination in particular, although they were concerned about side effects and the possibility of giving a child too many vaccines (Waller, Marlow, & Wardle 2006).

Attitudes to HPV vaccination in general: Evidence statement 77

There is evidence from a mixed methods study (Lloyd, Marlow, Waller, & Wardle 2008) (Quality -; Applicability B) conducted in London that showed:

Girls want to know about the vaccine including its effects, its efficacy and safety.

Among younger students – there is focus on having the injection itself.

School Leaver Booster (Section 5.1.7 of full report)

One study was identified that explored knowledge, values, attitudes and beliefs related to the school leavers' booster (comprising vaccination with a fifth dose of tetanus, diphtheria and polio) vaccination. Emerging themes were:

- Not all PCTs have a school leavers' vaccination programme
- Programmes enable other vaccines to be checked at the same time
- Parents are mostly informed through schools
- Confusion exists as to which PCT has responsibility for children attending private schools and children who live and attend schooling in different PCTs.

School leaver booster: Evidence statement 78

There is evidence from a multiple choice questionnaire (Wagner, White, & Crowcroft 2007) (Quality ++; Applicability A) carried out with immunisation leads across the UK (n=73 representing 46% of PCTs) that sought to determine an understanding of the way in which the school leaver vaccination programme is currently run, and also to assess the potential for measuring uptake of the proposed new HPV vaccination programme. (Information relating to the HPV vaccine is presented in the HPV section of this review.)

77% of PCTs had a school leaving immunisation programme

69% of PCTs with a school leaving immunisation programme check for other vaccinations at the same time.

School leaving boosters are delivered by GPs (34%), school nurses (36%) or a combination of both (30%).

Parents are informed of the school leaving booster through schools (59%), GPs (28%), CHIS generated invitation (23%), and PCT (8%) (some parents were informed by more than one method).

Immunisation leads identified children eligible for school leaving boosters as children attending secondary schools within the respondents' PCT (87%); children attending secondary schools and also resident in their PCT (2%); all children apart from those

attending private schools (9%) and other (2%).

Children resident in one PCT but attending school in another are either expected to be vaccinated in the school they attend (20%), or else no arrangements are made for such children (48%). In some areas these children would be expected to be offered vaccination through their GP (32%).

Catch up campaigns (Section 5.1.8 of full report)

One study was identified that explored knowledge, values, attitudes and beliefs related to catch-up campaigns. Emerging themes were:

- Workload
- Timing
- Team structure

Catch-up campaigns: Evidence statement 79

There is evidence from a questionnaire (Bagnall 1995) (Quality +; Applicability A) that sought to determine and identify lessons for future practice, training needs, operational planning and resource management of school nurses (throughout England) after undertaking a nationwide rubella and measles immunisation programme for 5 to 16 year olds.

The response rate was 57.6%.

92% of nurses had found the campaign a challenge and stimulating.

The timing of the campaign was not ideal for school nurses with the details of it coinciding with the beginning of school holidays, a time when most school nurses do not work.

75% felt confident in undertaking immunisations but a few nurses who did not have access to training admitted to lacking confidence.

The majority (95%) found the campaign tiring and many put in extra time that was not remunerated.

Those that worked within a team structure felt more confident and enjoyed the camaraderie.

96% enjoyed working in a team.

Studies demonstrating effectiveness in increasing uptake of immunisations (Section 5.2 of full report)

Client reminder/recall systems (Evidence statements 80-88)

- Five RCTs suggested automated telephone reminders are effective in increasing immunisations.
- Two RCTs suggested automated telephone reminders delivered in conjunction with other reminders were effective in increasing immunisations.
- There is mixed evidence (two studies) on the effectiveness of personalised telephone reminders in increasing immunisation uptake.
- There is conflicting evidence on the effectiveness of computer-generated letters to increase immunisations; five studies found an increase while two did not.
- There is conflicting evidence on the effectiveness of personalised reminders to increase immunisation uptake: two studies found an increase while two did not.

- Three RCTs suggested that the use of telephone and mail reminders together is effective in increasing immunisations.
- There is conflicting evidence to suggest that increasing the intensity of a reminder intervention increases immunisations: two studies found an increase while one did not.
- One RCT found that messages containing one of three different persuasion strategies - either fear arousal, motherhood-arousal, or rational messages – mailed to parents of preschoolers who were late for their immunisations was not effective at encouraging parents to have their children immunised compared to control.
- One RCT that found that a higher proportion of infants were up-to-date with immunisations at 12 months after receiving either an intervention comprising patient, clinic and system based interventions and focused on either immunisations, or monthly well-child-visits compared with control.
- One before and after study found that providing social services with the immunisation status of looked after children decreased the proportion up-to-date for immunisations compared to pre-assessment.

Client reminder/recall systems: Evidence statement 80

There is evidence that suggests automated telephone reminders are effective in increasing immunisations:

- one non-randomised controlled study (n=213 infants younger than six months) (Alemi, Alemagno, Goldhagen, Ash, Finkelstein, Lavin, Butts, & Ghadiri 1996) (Quality rating +; Applicability B) found that computer-generated telephone reminders significantly improved on-time immunisation rates for DTP, polio, MMR and Hib in children 4-23 months at post assessment compared with no intervention;
- one RCT (Franzini, Rosenenthal, & Spears 2000) (Quality rating -; Applicability C) found that an additional 161 children who received a postcard reminder and 224 children who received an automated telephone message were vaccinated (for DTP) per 1000 children (aged < 12 months) compared to control;
- one RCT (Stehr-Green, Dini, Lindegren, & Patriarca 1993) (Quality rating -; Applicability C) (n=222) found compared to control, computer-generated reminders increased the proportion of preschool-age children (aged two years or less) vaccinated within one month (for DTP and OPV-1, 2 or DTP-3, and DTP-4 and OPV-3 or MMR) after their vaccinations were due;
- one RCT (Lieu, Capra, Makol, Black, & Shinefield 1998) (Quality rating -; Applicability C) that found that a higher proportion of infants received at least one vaccine (DTP, OPV, MMR, Hib, Hep B) by the age of 24 months after receiving either an automated telephone message or letter alone or a letter followed by a telephone message or a telephone message followed by a letter compared to control (no intervention). Between interventions, a single automated telephone message or letter alone were equally effective. However, a letter followed by a telephone message was significantly better than either a letter alone or a telephone message alone. A telephone message followed by a letter was also significantly better than either message alone. By 24 months of age the proportion of children fully immunised (4DTP: 3OPV: 1 MMR: 1 HepB: 1 Hib) was not significant across the four intervention groups (p= 0.11);
- one RCT (n=3006) (Szilagyi, Schaffer, Barth, Shone, Humiston, Ambrose, & Averhoff 2006) (Quality rating ++, Applicability C) from the USA found that although the rates of hepatitis B vaccination in young people (aged 11-14 years) significantly improved in

those who received a telephone reminder compared with those who received usual care (not further described), the rates of uptake of tetanus-diphtheria booster were not significantly different between intervention and control (usual care – no further details).

Automated telephone reminders delivered in conjunction with other reminders were also effective in increasing immunisations:

- one RCT (Dini, Linkins, & Sigafos 2000) (Quality rating +; Applicability C) (n= 1227) found that infants (aged 60-90 days) who received any of three interventions (telephone messages followed by letters; telephone messages alone or letters only) were significantly more likely to have completed immunisations (DTP, OPV, MMR) by 24 months of age compared to control;
- one RCT (LeBaron, Starnes, & Rask 2004) (Quality rating ++; Applicability C) (n= 3050, children aged from 1-14 months followed until 24 months) found that compared to control, three intervention groups (automated reminders/recall, outreach and a combination of the two) had higher immunisation (DTP: OPV: MMR: Hib) series completion rates, but this was significant only for the autodialer group. Individual intervention groups did not differ significantly from each other.

Client reminder/recall systems: Evidence statement 81

There is mixed evidence on the effectiveness of personalised telephone reminders are effective in increasing immunisation uptake:

- one RCT (Vivier, Alario, O'Haire, Dansereau, Jakum, & Peter 2000) (n=264) (Quality rating +; Applicability B) found that children receiving any intervention (either telephone, mail, or a combined mail/telephone reminder) were significantly more likely to receive an immunisation or be up-to-date (for DTP, polio, Hib and MMR) compared to control (no intervention). However, there was no significant difference between groups in terms of receiving immunisations or being up-to-date.
- Conversely, one RCT (n=565; Quality rating +; Applicability B) found immunisation coverage rates in children aged up to 12 months did not significantly improve with an intervention comprising a large-scale, registry based reminder-recall plus voucher incentive compared with voucher incentive alone in an inner-city population in Chicago, USA (Hoekstra, LeBaron, & Johnson-Partlow 1999).

Client reminder/recall systems: Evidence statement 82

There is conflicting evidence on the effectiveness of computer-generated letters to increase immunisations:

- one NRCT (Irigoyen, Findley, Earle, Stambaugh, & Vaughan 2000) (Quality rating +; Applicability C) (n= 1273) found that neither of four interventions (postcards, telephone calls, or postcard and telephone calls or control) impacted significantly on up-to-date immunisation rates (DTP, OPV, MMR) on children (aged 18 months to 4 years) in a low-income community in New York City. However, in pre specified subgroup analysis for children who were not up-to-date at baseline the postcard group and telephone reminder group significantly increased vaccination coverage (DTP, OPV, MMR) compared to controls (no intervention).
- one RCT (Alto, Fury, Condo, Doran, & Aduddell 1994) (n=464; Quality rating +; Applicability C) that found that compared to control, mail and telephone contact with parents significantly increased the proportion of children (aged less than seven years) fully immunised or up-to-date for age and compared to control, mail and telephone contact with parents also significantly increased up take of the MMR but not other vaccines (DTP, OPV, or Hib) compared to control (no intervention).
- one RCT (Abramson 1995) (Abramson, O'Shea, Ratledge, Lawless, & Givner 1995) (Quality rating-; Applicability B) (n=601 newborn babies) found the number of infants up-to-date for primary vaccinations (DTP, OPV, Hib, Hep B) at seven months increased

following the introduction of the vaccine tracking system in infants from families of lower socio-economic status compared to control (no tracking system).

- one RCT (Lieu, Black, Ray, Schwalbe, Lewis, Lavetter, Morozumi, & Shinefield 1997) (n=321; Quality rating +; Applicability B) found that in children aged 20 months who were overdue for MMR a computer generated recall letter plus request to call for an appointment significantly increased the proportion of children at 24 months of age who had received the MMR compared to control (no intervention).
- one RCT (Franzini, Rosenenthal, & Spears 2000) (Quality rating -; Applicability C) found that per 1000 children (aged <12 months) an additional 161 children who received a postcard reminder and 224 children who received an automated telephone message were vaccinated (for DTP) compared to control.
- one RCT (LeBaron, Starnes, & Rask 2004) (Quality rating ++; Applicability C) (n=3050, children aged from 1-14 months followed until 24 months) found that compared to control, three intervention groups (automated reminders/recall, outreach and a combination of the two) had higher immunisation (DTP: OPV: MMR: Hib) series completion rates, but this was significant only for the autodialer group. Individual intervention groups did not differ significantly from each other.

Conversely,

- one RCT (Campbell, Szilagyi, Rodewald, Doane, & Roghmann 1994) (Quality rating -; Applicability C) (n= 288) found no significant difference between two interventions (reminder letters or postcard reminders) compared to control in improving the proportion of newborns who received 3 DTP immunisations by seven months of age New York, US.
- one NRCT (Irigoyen, Findley, Earle, Stambaugh, & Vaughan 2000) (Quality rating +; Applicability C) (n= 1273) that found that neither of four interventions (postcards, telephone calls, or postcard and telephone calls or control) impacted significantly on up-to-date immunisation rates (DTP, OPV, MMR) on children (aged 18 months to 4 years) in a low-income community in New York City.

Client reminder/recall systems: Evidence statement 83

There is conflicting evidence on the effectiveness of personalised reminders to increase immunisation uptake:

- one RCT (Irigoyen, Findley, Wang, Chen, Chimkin, Pena, & Mendonca 2006) (n = 1662; Quality rating +; Applicability C) found that compared to control continuous reminders sent to parents of children (aged 6 weeks to 15 months) significantly increased immunisation coverage for both DTaP and the 4:3:1:3 series. Conversely, reminders (either limited or continuous) had no effect on the likelihood of receiving any subsequent immunisations (DTaP or the 4:3:1:3 series) and there was no difference between those sent limited reminders and controls.
- one before and after study (n=503 children) (Hicks, Tarr, & Hicks 2007) (Quality rating +; Applicability C) found that up-to-date immunisation rates in children aged to 35 months for DTP, OPV, MMR, Hib, and hepatitis B significantly improved from baseline with an intervention comprising language-appropriate reminder cards (which served as the physician order for the vaccine) combined with examination room posters reminding parents to have their children vaccinated if they attended the clinic for other reasons. Pre-specified sub-group analyses also indicated that the proportion of children (aged 13-18 months) up-to-date significantly improved with intervention, whereas the change in those aged 19 to 35 months, although higher with intervention was not significantly different.
- Conversely, one RCT (n=451 children aged 9 to 21 months) (Morgan & Evans 1998) (Quality rating -; Applicability B) (n=451) found no significant difference between either of two interventions (contacting a child's health visitor or mailed reminders to children's parents) or control group in the proportion completing the primary course or measles, mumps, and rubella immunisation compared to control (no intervention).

- There is evidence from one RCT (n=603 children aged 5 to 17 months) (Kempe, Lowery, Pearson, Renfrew, Jones, Steiner, & Berman 2001) (Quality rating -; Applicability B) from the USA found that immunisation reminders (comprising a mailed postcard and up to four telephone calls), failed to significantly increase the proportion of children up-to-date with their immunisations (DTP, polio, MMR, hepatitis B, and Hib) after two months follow-up compared with control (no intervention).

Client reminder/recall systems: Evidence statement 84

There is evidence to suggest that the use of telephone and mail reminders together are effective in increasing immunisations:

- one RCT (Vivier, Alario, O'Haire, Dansereau, Jakum, & Peter 2000) (n=264) (Quality rating +; Applicability B) found that children receiving any intervention (either telephone, mail, or a combined mail/telephone reminder) were significantly more likely to receive an immunisation or be up-to-date (for DTP, polio, Hib and MMR) compared to control (no intervention). There was no significant difference between groups in terms of receiving immunisations or being up-to-date.
- one RCT (LeBaron, Starnes, & Rask 2004) (Quality rating ++; Applicability C) (n=3050, children aged from 1-14 months followed until 24 months) that found that compared to control, three intervention groups (automated reminders/recall, outreach and a combination of the two) had higher immunisation (DTP: OPV: MMR: Hib) series completion rates, but this was significant only for the autodialer group. Individual intervention groups did not differ significantly from each other.
- one RCT (Lieu, Capra, Makol, Black, & Shinefield 1998) (Quality rating -; Applicability C) that found that a higher proportion of infants received at least one vaccine (DTP, OPV, MMR, Hib, Hep B) by the age of 24 months after receiving either an automated telephone message or letter alone or a letter followed by a telephone message or a telephone message followed by a letter compared to control (no intervention). Between interventions, a single automated telephone message or letter alone were equally effective. However, a letter followed by a telephone message was significantly better than either a letter alone or a telephone message alone. A telephone message followed by a letter also significantly better than either message alone. By 24 months of age the proportion of children fully immunised (4DTP: 3OPV: 1 MMR: 1 HepB: 1 Hib) was not significant across the four intervention groups (p=0.11).

Client reminder/recall systems: Evidence statement 85

There is conflicting evidence to suggest that increasing the intensity of a reminder intervention increases immunisations:

- one RCT (Abramson 1995) (Abramson, O'Shea, Ratledge, Lawless, & Givner 1995) (Quality rating-; Applicability B) (n=601 newborn babies) found the number of infants up-to-date for primary vaccinations (DTP, OPV, Hib, Hep B) at seven months increased following the introduction of the vaccine tracking system in infants from families of lower socio-economic status compared to control (no tracking system).
- There is evidence from an RCT (Alto, Fury, Condo, Doran, & Aduddell 1994) (n=464; Quality rating +; Applicability C) which found that compared to control, mail and telephone contact with parents significantly increased the proportion of children (aged less than seven years) fully immunised or up-to-date for age and compared to control, mail and telephone contact with parents also significantly increased up take of the MMR but not other vaccines (DTP, OPV, or Hib) compared to control (no intervention).
- Conversely, one RCT (n=603 children aged 5 to 17 months) (Kempe, Lowery, Pearson, Renfrew, Jones, Steiner, & Berman 2001) (Quality rating -; Applicability B) from the USA found that immunisation reminders (comprising a mailed postcard and up to four telephone calls), failed to significantly increase the proportion of children up-to-date with

their immunisations (DTP, polio, MMR, Hepatitis B, and Hib) after two months follow-up compared with control (no intervention).

Client reminder/recall systems: Evidence statement 86

There is evidence from an RCT (n=243) (Quality rating -; Applicability C) from the USA that found that messages containing one of three different persuasion strategies - either fear arousal, motherhood-arousal, or rational messages – mailed to parents of preschoolers who were late for their immunisations was not effective at encouraging parents to have their children immunised compared to control (no intervention) (Gore, Madhavan, Curry, McClurg, Castiglia, Rosenbluth, & Smego 1998).

Client reminder/recall systems: Evidence statement 87

There is evidence from a cluster RCT (n=11 clinics; 2665 infants) (Quality rating +; Applicability C) that found that a higher proportion infants were up-to-date with immunisations at 12 months after receiving either an intervention comprising patient, clinic and system based interventions and focused on either immunisations or monthly well-child-visits compared with control (no intervention) (Hambidge, Davidson, Phibbs, Chandramouli, Zerbe, LeBaron, & Steiner 2004).

Client reminder/recall systems: Evidence statement 88

There is evidence from one before and after (Ashton-Key & Jorge 2003) (Quality rating -; Applicability B) that found that providing social services with the immunisation status of looked after children (aged 16 months to 17 years 2 months), decreased the proportion up-to-date for immunisations (primary DTP, polio, Hib, MMR, Preschool booster, MMR2 (booster), BCG or the school leavers' booster), compared to pre-assessment, although this difference was not significant.

Multi-component interventions to increase uptake (Evidence statements 89-93)

- There was evidence to suggest multi-component interventions that include the media (in addition to other interventions) are effective in increasing uptake of immunisations: two studies found an increase while one did not.
- Nine studies suggest multi-component interventions that incorporate education and outreach (in addition to other interventions) increase immunisations.
- Two studies suggest that multi-component interventions that increase access through 'walk-in clinics' increase immunisations.
- There was conflicting evidence on the effectiveness of multi-component interventions that included reminders: five studies reported multi-component interventions that included reminders were effective while five studies reported multi-component interventions that included reminders were not effective.
- There is evidence (four studies) to suggest that multi-component interventions that were hospital based were effective in increasing both universal and targeted immunisations

Multi-component interventions: Evidence statement 89

There was evidence to suggest multi component interventions that include the media are effective in increasing uptake of immunisations:

- one before and after study (Rosenberg, Findley, McPhillips, Penachio, & Silver 1995) (n=2676) (Quality rating +; Applicability B) found that a community-based strategies comprising postpartum visits, door-to-door visiting, group presentations, street outreach, flyer campaigns, the media, networking between local organisations and tracking significantly increased the proportion of children (aged 0 to 48 months) up-to-date with immunisations (DTP/OPV/MMR) compared to before the community-based strategies;
- one NRCT (McPhee, Nguyen, Euler, Mock, Wong, Lam, Nguyen, Nguyen, Ha, Do, & Buu 2003) (n=1508; Quality rating + ; Applicability C) found that two interventions; a media education campaign compared to control and community mobilisation strategy compared to control both significantly increased uptake of three doses of hepatitis B among children of the Vietnamese-American population in Texas, USA
- One before and after study (Paunio, Virtanen, Peltola, Cantell, Paunio, Valle, Karanko, & Heinonen 1991) (Quality Rating ++; Applicability B) found that three interventions; a mass media campaign, motivational letters sent to HCPs and informative letters sent to parents of non-vaccinated children increased the total number of children vaccinated with the MMR vaccine. Of those children defined as hard-to-reach, (6-year old children who received the vaccination for the first time), the mass media campaign, the letter to HCP and the letter (to parents and PH nurses) intervention all significantly increased the number of hard to reach children vaccinated with the MMR vaccine;
- Conversely, one controlled before and after study (LeBaron, Starnes, Dini, Chambliss, & Chaney 1998) (Quality rating +, Applicability C) found that a community saturation strategy comprising: door to door assessment, education campaigns followed by mobile van vaccinations, temporary on-site vaccinations, free child care and transportation to clinics, parent incentives, focus groups and collation with local organisations did not significantly increase the proportion of children aged 3-59 months of age who were age appropriately vaccinated (for DTP, OPV and MMR) compared to control (no further details) in nine low socioeconomic communities.

Multi-component interventions: Evidence statement 90

There is evidence to suggest multicomponent interventions that incorporate education and outreach increase immunisations:

- one retrospective cohort study (Brownsoehl, Kennedy, Krotki, & Mainzer 1997) (Quality rating -; Applicability C) (n= 2511) found that an immunisation outreach program comprising computerised tracking, reminders, education and both provider and parent incentives significantly increased completeness rates in children (aged 18-35 months) for all combined series and individual vaccines (DTP, OPV, MMR and Hib) compared to control (no intervention). However the Hib vaccine and series of which Hib was a part (4:3:1:3, that is 4DTP: 3OPV: 1MMR: 3Hib) increased but not significantly compared to control (no intervention);
- one RCT (Wood, Halfon, Donald-Sherbourne, Mazel, Schuster, Hamlin, Pereyra, Camp, Grabowsky, & Duan 1998a) (n=419; Quality rating +; Applicability C) found that compared to the control case, management significantly increased the proportion of African-American infants who were up-to-date with immunisations (3 DTP, 2 OPV, 3 Hib) in the first year of life in inner-city, Los Angeles;
- one RCT (Barnes, Friedman, Namerow, & Honig 1999) (1999) (Quality rating +; Applicability B) found that a volunteer-driven outreach programme comprising outreach, and tracking significantly increased the proportion of children (aged less than two years) up-to-date with the vaccination series (DTP, polio, MMR, Hib, Hep B) compared to control (who were notified of immunisation status at enrolment but received no further contact);
- one cohort Study (Findley, Irigoyen, Sanchez, Guzman, Mejia, Sajous, Levine, Chimkin, & Chen 2004) (n=2433 ; Quality rating -; Applicability C) found that the Start Right Programme, comprising community-based education, outreach and tracking immunisation increased the proportion of children (aged under five) up-to-date (for the

4:3:1:3:3 immunisation series (4 DTP/DTaP, 3 Polio, 1 MMR, 3 Hib and 3 hepatitis B) compared to pre intervention in Northern Manhattan, USA;

- one before and after study (Crittenden & Rao 1994) (n= 93; Quality rating -; Applicability A) that found that a local intervention (comprising case discussions, providing parents with reassurance and education and multidisciplinary home visiting) increased the number of unimmunised children vaccinated for primary vaccines (DPT, Polio, MMR) and the pre-school booster (DT/polio) compared to before the intervention in North East Essex;
- one RCT (Rodewald, Szilagyi, Humiston, Barth, Kraus, & Raubertas 1999) (n=3015; Quality rating -; Applicability C) that found that two interventions tracking outreach only and tracking/outreach and physician prompting significantly increased the proportion of children (aged 0-12 months) up-to-date for DTP, OPV, MMR and Hib compared to control (no intervention). However physician prompting alone did not significantly increase the proportion of children up-to-date compared to control;
- one RCT (Wilcox, Koepke, Levenson, & Thalheimer 2001) (2001) (Quality rating -; Applicability C) that found that a registry driven, community-based outreach programme comprising locating families and assisting them obtain care significantly increased the number of children (aged 6-10 months) who received a vaccination (DTP, OPV, Hib, Hep B) compared to control (no intervention) in Philadelphia, USA;
- one before and after study (Goldstein, Lauderdale, Glushak, Walter, & Daum 1999) (n=1075) (Quality rating +; Applicability C) that found that a community-based outreach programme comprising door knocking and tracking children (aged three months to six years) in a public housing development significantly increased the proportion of children up-to-date for immunisations (DTP, OPV, MMR, Hib) compared to before the programme;
- one cohort study (Waterman, Maes, Hill, Stevenson, Robyn, Anderson, & Yeager 1996) (n=433) (Quality rating -; Applicability B) that found that an immunisation programme comprising free walk-in clinics with a computerised reminder and recall system, education of community health centre staff and community-based outreach and education in schools and churches resulted in a greater increase in the proportion of children (aged two to four years) immunised (4 DTP, 3 OPV and 1 MMR) compared to control (no intervention).

Multi-component interventions: Evidence statement 91

There is evidence to suggest that multi component interventions that increase access through 'walk-in clinics' increase immunisations:

- one before and study (Niederhauser, Walters, & Ganeko 2007) (n=369) (Quality rating +; Applicability B) that found that a "walk-in" immunisation clinic and an individual reminder calendar significantly increased the proportion of children (aged birth to 21 years) up-to-date for immunisations (DTP, polio, MMR, HepB, Td, varicella) compared to pre-intervention in a multiethnic community in Honolulu, Hawaii.
- one cohort study (Waterman, Maes, Hill, Stevenson, Robyn, Anderson, & Yeager 1996) (n=433) (Quality rating -; Applicability B) that found that an immunisation programme comprising free walk-in clinics with a computerised reminder and recall system, education of community health centre staff and community-based outreach and education in schools and churches resulted in a greater increase in the proportion of children (aged two to four 4 years) immunised (4 DTP, 3 OPV and 1 MMR) compared to control (no intervention).

Multi-component interventions: Evidence statement 92

There was conflicting evidence on the effectiveness of multi component interventions that included reminders

Five studies reported multi component interventions that included reminders were effective:

- one RCT (Freed, Freeman, Mauskopf, & Jacobson 1999) (n= 1351; Quality rating -; Applicability C) that found that neither a health message or a law message significantly increased immunisations at seven months for either the 3DTP:2OPV:0MMR:2Hib series or 3DTP:2OPV:0MMR:2Hib:2HepB series between babies (aged seven months) compared to control (no intervention) in North Carolina, US.
- one controlled before and after study (LeBaron, Starnes, Dini, Chambliss, & Chaney 1998) (Quality rating +, Applicability C) that found that: a reminder-recall strategy significantly increased vaccination series completion rates in children aged 3-59 months of age (for DTP, OPV and MMR) compared to control (no further details) attending one of four public clinics serving mainly African Americans and Hispanic people in nine low socioeconomic communities.
- one interrupted time series (n=3184 children aged to two years) (Szilagyi, Schaffer, Shone, Barth, Humiston, Sandler, & Rodewald 2002) (Quality rating -; Applicability C) that found that a community-wide reminder, recall, and outreach (RRO) system increased immunisation rates of recommended vaccines (DTP, polio, MMR and Hib) (in children aged 12 months and 24 months) after three years compared to baseline and after six years compared to baseline. In addition, the disparity between suburbs and inner city immunisation rates significantly decreased after six years compared to baseline.
- one randomised comparative study (Ferson, Fitzsimmons, Christie, & Woollett 1995) (Quality rating +, Applicability C) that found that sending a letter encouraging immunisation plus a leaflet plus the school nurse contacting the parents later by phone significantly increased the proportion of kindergarten children immunised for diphtheria, tetanus and polio and MMR compared to receiving only the letter encouraging immunisation plus a leaflet.
- one cohort study (Hellerstedt, Olson, Oswald, & Pirie 1999) (n=514; Quality rating +; Applicability B) that found that a community based public health nursing programme that included education, a registry and reminder system increased the proportion of infants (aged 4-16 months) immunised for polio and DTP, but decreased the proportion of infants immunised with MMR compared with control (no programme) in rural USA.

Three studies reported multi component interventions that included reminders were not effective:

- one RCT (Mason & Donnelly 2000) (Quality rating +; Applicability B) that found that a personnel reminder letter and a carefully developed leaflet, 'MMR the facts' sent to parents and the child's GP and health visitor did not significantly increase uptake of MMR (in children who had not been vaccinated at 21 months) compared to control (no intervention), in Wales.
- one NRCT (Stille, Christison-Lagay, Bernstein, & Dworkin 2001) (n=315; Quality rating +; Applicability C) that found that there was no significant difference in age-appropriate immunisation rates (DTP, OPV, Hib, HBV) at seven months in infants who received an educational intervention at the first well child care visit, with reinforcement at subsequent visits compared to control (standard information).
- one quasi RCT (Oeffinger, Roaten, Hitchcock, & Oeffinger 1992) (n=238) (Quality rating +; Applicability B) that found that educating new mothers and mailing a reminder letter did not significantly improve immunisation rates of DTP and OPV when infants were aged 2, 4 or 12 months compared to control (no intervention).

Multi-component interventions: Evidence statement 93

There is evidence to suggest that multi component interventions that were hospital based were effective in increasing immunisations:

- one before and after study (Mohr, Randolph, Laughon, & Schaff 2003) (Quality rating +; Applicability B) found that multi component clinic based changes comprising: changing the chart review system, providing nurse incentives and educating parents significantly

increased the proportion of two year old children up-to-date for immunisations (DTP, OPV, MMR, Hib and hepatitis B) compared to baseline in North Carolina, the USA.

- one cohort study (Henning, Pollack, & Friedman 1992) (Quality rating -; Applicability C) found that a significantly higher proportion of babies that received a neonatal hepatitis B surveillance and vaccination programme that comprised contacting women (HBsAg-positive) by telephone, letter, or a home visit and providing education completed all three hepatitis B vaccinations compared control (non programme hospitals).
- one before and after study (Wroe, McKeever, Thackray, & Bhan 2007) (Quality rating: -, Applicability: A) found that a local neonatal BCG programme comprising: risk assessment, screening, setting up an accessible clinic, distributing information and training health professionals increased the proportion of babies offered BCG compared to pre-assessment, in Bromley.
- one before and after study (Tseng, Nesbitt, & O'Sullivan 1997) (Quality -; Applicability A) found that training health visitors, distributing leaflets about BCG to parents and health professionals and increasing the availability of BCG to neonates at risk increased the proportion of eligible babies receiving BCG vaccination compared to pre assessment, in inner London.

Client or family incentives (Evidence statements 94-95)

- One NRCT found that receiving a personalised calendar and incentive significantly increased the proportion of infants up-to-date with immunisations compared to control.
- There is conflicting evidence on the effectiveness of imposing penalties (disincentives) (food or financial) to increase immunisation uptake: three studies found an increase while one did not.

Client or family incentives: Evidence statement 94

There is evidence from one NRCT (Kreuter, Caburnay, Chen, & Donlin 2004) (n=337 ; Quality rating -; Applicability C) that found that receiving a personalised calendar and incentive significantly increased the proportion of infants (aged birth to one year at enrolment) up-to-date for DTP, OPV, MMR, Hib and hepatitis B at the end of the enrollment period and at 24 months of age compared to control (no intervention) in the USA.

Client or family incentives: Evidence statement 95

There is conflicting evidence on the effectiveness of imposing penalties (food or financial) to increase immunisation uptake:

- One before and after study (Hutchins, Rosenthal, Eason, Swint, Guerrero, & Hadler 1999) (Quality rating -, Applicability C) that found that a higher proportion of children who received a programme comprising nurses at WIC sites screening children for immunisations, referring children for immunisations and food vouchers were immunised at 12 and 24 months compared to control (no intervention);
- One RCT (Kerpelman, Connell, & Gunn 2000) (Quality rating +; Applicability C) that found that a financial penalty imposed on parents who were recipients of benefits who failed to provide proof of up-to-date immunisation status for preschool children (aged <6 years) significantly increased the proportion of infants immunised for all immunisations (DTP, polio, MMR, Hib, Hep B) compared to control (not penalised for failing to immunise) in Georgia, USA;
- One retrospective cohort study (Hoekstra, LeBaron, Megaloeconomou, Guerrero, Byers, Johnson-Partlow, Lyons, Mihalek, Devier, & Mize 1998) (n= 16,000; Quality rating +; Applicability C) that found that an initiative that restricted food vouchers to Well Infants

Children enrolled families based on their children's age appropriate immunisations and monitored site immunisation data each month, increased the proportion of age appropriate immunisations (4:3:1 series DTP, OPV, MMR) compared to sites that did not restrict food vouchers or monitoring or used monitoring alone in Chicago, US.

- Conversely, one RCT (Minkovitz, Holt, Hughart, Hou, Thomas, Dini, & Guyer 1999) (Quality rating -; Applicability C) that found that financial penalties to families receiving benefits did not increase the proportion on infants (aged 3 to 24 months) up-to-date for DTP, polio and MMR compared to control (not subject to the penalty) in four metropolitan and two rural areas in Maryland in the USA.

Enhancing access to vaccination services (Evidence statements 96-99)

Reducing out-of-pocket costs

There is conflicting evidence from two studies on the effectiveness of financial incentives to increase immunisation uptake.

Expanding access in medical or public health clinical settings

- One before and after study found that there were significant increases from baseline levels for some immunisations but not for others following an intervention to expand access to immunisation services in a high poverty, medically underserved rural area.
- One cohort study that found that two emergency departments' immunisation programme significantly increased the proportion of pre-school children up-to-date for immunisations.
- Two studies found that hospital based immunisation programmes targeting newborns increased immunisation uptake.

Enhancing access to services: Evidence statement 96

There is conflicting evidence on the effectiveness of financial incentives to increase immunisation uptake:

- One before and after study (Kirschke, Craig, Schaffner, Daugherty, Narramore, & Griffin 2004) (n=23,044; Quality rating -; Applicability C) found that TennCare: Medicaid managed care that required children to have a primary care provider significantly increased the proportion of 2 year old children receiving immunisations (DTP, OPV and MMR) compared to pre TennCare.
- Conversely, one before and after study (Joyce & Racine 2005) (Quality rating +; Applicability B) found that in children aged 19 to 35 months there was no change in the proportions of children vaccinated for the 4:3:1 series (that is 4 DTP, 3 OPV and 1 MMR vaccine) (in any income group) after the implementation of the State Children's Health Insurance Program (SCHIP). However, proportions of children vaccinated for the 4:3:1:3:3 series (that is 4 DTP: 3 OPV: 1 MMR: 3 Hib and 3 hepatitis B vaccines) increased in each group following the intervention.

Enhancing access to services: Evidence statement 97

There is evidence from one before and after study (Mayer, Housemann, & Piepenbrok 1999) (n=3,184; Quality rating -; Applicability C) that found that there were significant increases from baseline levels for some immunisations (DTP-2, DTP-3, DTP-4, OPV-2, OPV-3 and MMR) but not for others (DTP1 and OPV1) in children with an average age of 1 year and 11 months, following an intervention to expand access to immunisation services in a high poverty, medically underserved rural area in the USA.

Enhancing access to services: Evidence statement 98

There was evidence from one prospective cohort study (Quality rating +, Applicability C) that found that two emergency departments' (ED) immunisation programmes in New York City, significantly increased the proportion of pre-school children (no ages provided) up-to-date for immunisations (DTP, Hib, polio, MMR and hepatitis B) one day after an ED visit compared to on admission to the ED. After 6 months, at one ED, there was no difference in the proportion of patients up-to-date for immunisations (66%) compared to that at first ED visit but a significant decrease in the proportion up-to-date for immunisations at the other compared to the first ED visit. (Szilagyi, Rodewald, Humiston, Fierman, Cunningham, Gracia, & Birkhead 1997).

Enhancing access to services: Evidence statement 99

There is evidence to suggest that hospital based immunisation programmes targeting newborns increases immunisation uptake:

- one retrospective cohort study (Larcher, Bourne, Aitken, Jeffries, Hodes, Sloan, Ramsay, Goldberg, & Bramley 2001) (Quality rating -, Applicability B) found that a significantly higher proportion of eligible infants (babies born to hepatitis B carrier mothers) were vaccinated in a selective hospital based hepatitis B immunisation service delivered in Hackney, compared to a neighbouring area (Tower Hamlets) a significantly higher proportion of eligible infants (babies born to hepatitis B carrier mothers) were vaccinated. However, 41% of the comparison group had been lost to follow up which may compromise the reliability of this finding.
- one interrupted time series (Stroffolini & Pasquini 1990) Quality rating -, Applicability B) found that a hepatitis B hospital vaccination programme in Italy significantly increased the proportion of eligible newborn babies (babies born to HBsAg positive women) immunised with 3 doses of the hepatitis B vaccine compared to before the programme.

Vaccination programmes for specific groups or settings (Evidence statements 100-108)

For infants of specific subgroups (minority mothers, disadvantaged or young mothers, travelling communities) there is conflicting evidence on the effectiveness of special health programmes that include or target vaccination uptake:

- Three studies found an increase in the proportion of infants immunised while another three studies did not see an increase, found no difference, or decreased uptake.
- Another three studies looked at the longer term impact of delivering a health programme and two of these studies found the increase in immunisations was not sustained, but in another study found that a programme was effective in the number of children up-to-date for immunisations after a period of time.

For young people one study found that a broad-spectrum health intervention programme in a residential care facility for homeless and runaway youth increased the proportion youth completing the three-dose hepatitis B series.

Vaccination programmes for specific groups: Evidence statement 100

There is evidence from one randomised clinical trial (Norr, Crittenden, Lehrer, Reyes, Boyd, Nacion, & Watanabe 2003) (n=588) (Quality rating -, Applicability B) that found that the

REACH (Resources, Education and Care in the Home)-Futures programme increased the proportion of 12 month old African American and Mexican American infants up to date on all four required immunisation series (immunisations not specified), compared with control (no intervention).

Vaccination programmes for specific groups: Evidence statement 101

There is evidence from one RCT (Taylor, Davis, & Kemper 1997) (n=220; Quality rating +; Applicability B) that found that Group Well Child Care (GWCC) (comprising nurse-led group discussions on topics focused on age appropriate child rearing issues) was not significantly more effective in increasing immunisation up take rates (either 3 DTP/DT, 2 OPV/IPV, 3 HepB and 3 Hib or 3 DTP/DT and 2 OPV/IPV by their 1st birthday) among high-risk children in Seattle, Washington, USA, compared to Well Child Care discussions administered on an one-to-one basis.

Vaccination programmes for specific groups: Evidence statement 102

There is evidence from an RCT (Kitzman, Olds, Henderson, Hanks, Cole, Tatelbaum, McConnochie, Sidora, Luckey, Shaver, Engelhardt, James, & Barnard 1997) (Quality rating -; Applicability C) that found that there was no difference in the proportion of infants completely immunised by 24 months for 4DTP, 3OPV, 1MMR and 1Hib between a group receiving free transportation for scheduled prenatal care appointments plus developmental screening and referral services for the child at 6, 12, and 24 months of age compared with another group who received free round-trip, taxicab transportation for scheduled prenatal care appointments and intensive nurse home-visiting services during pregnancy and postpartum visits through the child's second birthday.

Vaccination programmes for specific groups: Evidence statement 103

There is evidence from one RCT (O'Sullivan & Jacobsen 1992) (n=243) (Quality rating -; Applicability C) that found that a special healthcare programme that included reminder phone-calls and letters for missed appointments significantly increased immunisation uptake (not further specified) of infants of black adolescent mothers compared to control (routine care only)

Vaccination programmes for specific groups: Evidence statement 104

There is evidence from one RCT (El-Mohandes, Katz, El-Khorazaty, Neely-Johnson, Sharps, Jarrett, Rose, White, Young, Grylack, Murray, Katta, Burroughs, Atiyeh, Wingrove, & Herman 2003) (Quality rating +; Applicability C) that found that compared to control (receiving standard social services) a programme among minority mothers in Washington that comprised home-visits, parent-infant developmental play groups, parent support groups and monthly support calls from a family resource specialist significantly increased immunisations at 4 months (1DTP/ 1 polio and 1 Hib), 6 months (2DTP/ 2 polio and 2 Hib) and 9 months (scheduled immunisations). However at 12 months there was no significant difference between groups in terms of those who had completed primary immunisation schedule.

Vaccination programmes for specific groups: Evidence statement 105

There is evidence from one RCT (Koniak-Griffin, Anderson, Brecht, Verzemnieks, Lesser, & Kim 2002) (n=101; Quality rating +; Applicability B) that found that an early intervention programme comprising intense home visiting by public health nurses compared to control (standard pre and post partum home visiting) significantly increased the proportion of children of adolescent mothers who were immunised (2 DTP and 2 OPV) after 12 months. The same study was followed-up a further 12 months later (Quality rating +; Applicability B) and no significant difference was found in immunisation rates between infants (aged 24

months) in the early intervention programme compared to control infants (Koniak-Griffin, Verzemnieks, Anderson, Brecht, Lesser, Kim, & Turner-Pluta 2003)

Vaccination programmes for specific groups: Evidence statement 106

There is evidence from one nested RCT (Johnston, Huebner, Anderson, Tyll, & Thompson 2006) (n=439) (Quality rating +; Applicability B) that found that the Healthy Steps for Young Children programme (comprising postnatal home visits; developmental advice and parent-initiated telephone support; developmental assessments, a literacy programme, and other risk-based screening services; and parenting classes) compared to control (no intervention) increased the proportion of children up-to-date with their immunisations (not further specified) at 24 months.

Vaccination programmes for specific groups: Evidence statement 107

There is evidence from one RCT (Johnson, Howell, & Molloy 1993) (n= 262; Quality rating +; Applicability B) that found that non-professional volunteer community mothers compared to control significantly increased the proportion children (aged up to 1 year) of disadvantaged first time mothers in a deprived area of Dublin who received all three primary vaccines.

Follow-up results for the same study (Johnson, Molloy, Scallan, Fitzpatrick, Rooney, Keegan, & Byrne 2000) (n= 75; Quality rating +; Applicability B) that found that after seven years compared to control a higher proportion of children in the community mother's programme had received MMR and a school booster and significantly more had received vaccines for Hib B and polio.

There is also evidence from a prospective cohort study (Fitzpatrick, Molloy, & Johnson 1997) (n=271) (Quality rating +; Applicability B) that found that compared with the results of a previous study (Johnson, Howell, & Molloy 1993) lay volunteer mothers delivering a childhood development programme for a travelling community in Dublin significantly decreased the proportion of children (aged 0-4 months) who received all three of their primary vaccinations by their 1st birthday.

Vaccination programmes for specific groups: Evidence statement 108

There is evidence from one cohort study (Steele & O'Keefe 2001) (n= 106; Quality rating +; Applicability B) that found that a broad-spectrum health intervention programme in a residential care facility for homeless and runaway youth (aged 16-21 years) increased the proportion youth completing the 3 dose hepatitis B series.

Home Visits (Evidence statements 109-110)

One study found that a home vaccination service for children behind in their vaccination schedule increased the proportion of children receiving immunisations.

One study found that postnatal home visits to children of illicit drug using mothers compared to a telephone contact control group had no significant difference in immunisations.

Home visits: Evidence statement 109

There is evidence from one RCT (1998) (Bond, Nolan, & Lester 1998) (Quality rating ++; Applicability B) that found that a home vaccination service for children aged 9 months to 16 months behind in their vaccination schedule compared to control significantly increased the proportion of children receiving DTP/OPV/Hib, MMR or either in north-west metropolitan Melbourne, Australia.

Home visits: Evidence statement 110

There is evidence from one RCT (Bartu, Sharp, Ludlow, & Doherty 2006) (n=152) (Quality rating ++ ; Applicability B) that found that postnatal home visits to children of illicit drug using mothers compared to a telephone contact control group had no significant difference in immunisations (no further details provided) at 2, 4, and 6 months in Perth, Australia.

Vaccination programmes in schools (Evidence statements 111-112)

There is conflicting evidence on the effectiveness of school based immunisation programmes:

One study found that school-based clinics compared to external clinic-based programmes increased the proportion of young people vaccinated against hepatitis B. Conversely, there is evidence from another study that found that a school based education/promotion programme did not increase the proportion of young people taking up the hepatitis B vaccine. However, impact evaluation showed intervention pupils had a significantly higher mean difference in scores (knowledge gain and change in attitudes about hepatitis B) compared to pupils at control schools.

Two separate studies assessing school based HPV vaccine delivery found that they resulted in uptake of 70.6% (for the first dose) and 68.5% (for the second dose) in the first study and in the second study uptake for the three-dose HPV series was 72% which rose to 79% after a 'catch-up' period.

School vaccination programmes: Evidence statement 111

There is evidence from a cohort study (Guay, Cloutre, Blackburn, Baron, De, Roy, Desrochers, & Milord 2003) (Quality rating -; Applicability C) that found that in territories in Quebec, Canada using school-based clinics compared to external clinic-based programmes the proportion of young people vaccinated against hepatitis B was significantly higher.

Conversely, there is evidence from an RCT (Skinner, Imberger, Nolan, Lester, Glover, & Bowes 2000) (n=17,411; Quality rating +; Applicability B) that found that a school based education/promotion programme compared to control (no programme) did not significantly increase the proportion of young people taking up the first, second or third doses of the hepatitis B vaccine, in Melbourne Australia. Process evaluation revealed that there was no significant difference between schools whose teachers taught a low number of programme items compared with schools whose teachers taught a high number of programme items. In addition, impact evaluation showed intervention students had a significantly higher mean difference in scores (knowledge gain and change in attitudes about hepatitis B) compared to pupils at control schools.

School vaccination programmes: Evidence statement 112

There is evidence from a prospective cohort study (Brabin, Roberts, Stretch, Baxter, Chambers, Kitchener, & McCann 2008) (Quality rating +; Applicability B) that found that a school based HPV programme delivered by two PCTs using educational materials resulted in 70.6% of schoolgirls (aged 12-13) receiving the first dose and 68.5% receiving the second dose.

There is also evidence from a feasibility study (Reeve, De La Rue, Pashen, Culpan, & Cheffins 2008) (Quality +; Applicability C) that found that uptake of the 3 dose HPV series using a school based HPV immunisation programme delivered by a local general practice for girls in years 10, 11 and 12 (ages 14-15, 15-16 & 16-17 years) at two rural local high schools in Australia was 72% which rose to 79% after a 'catch-up' period.

Vaccination programmes in prisons (Evidence statement 113)

One study found that was offering the hepatitis B vaccination to all inmates in the Scottish Prison Service in Glasgow increased the proportion of young people in the injecting-drug-using population vaccinated against hepatitis B.

Prison vaccination programmes: Evidence statement 113

There is evidence from an interrupted-time-series (Hutchinson, Wadd, Taylor, Bird, Mitchell, Morrison, Ahmed, & Goldberg 2004) (Quality rating +; Applicability B) that found that compared to before the hepatitis B vaccination was offered to all inmates in the Scottish Prison Service in Glasgow the proportion of young people (aged 16-20) in the injecting drug using population in Glasgow vaccinated against hepatitis B significantly increased.

Vaccination programmes in hospitals (Evidence statement 114-116)

There was evidence from one study to suggest that vaccination reminders to children during hospitalisation and follow-up with children's physicians increased the proportion of catch-up immunisations after one month. However at nine months, the number of catch-up immunisations was not significant.

There is evidence from three studies to suggest that opportunistic vaccination of hospitalised children was effective. However, another study that found that neither offering vaccinations nor sending letters to a children's primary care group increased the proportion of children vaccinated.

Hospital vaccination programmes: Evidence statement 114

There was evidence from a cohort study by (Muehleisen, Baer, Schaad, & Heininger 2007) (Quality rating +; Applicability B) that found that vaccination reminders to children during hospitalisation and follow-up with children's physicians compared to control significantly increased the proportion of catch up immunisations (any of DTP, polio, MMR, Hep B or Hib B) at one month, however at 9 months, the number of catch up immunisations was not significant.

Hospital vaccination programmes: Evidence statement 115

There is evidence from three studies to suggest that reported opportunistic vaccination in of hospitalised children was effective:

- a before and after study (Conway 1999) (Quality rating -; Applicability B) that found that a NHS hospital initiative (in Leeds) to offer catch up or scheduled immunisations (DTP, Hib B, OPV, and MMR) to children (mean age 1.5 years) during their hospital stay resulted in 65% uptake among eligible children, (excluding those under immunised due to parental choice).

- another a before and after study (Bell, Pritchard, Anderko, & Levenson 1997) (n=2,060) (Quality rating ++; Applicability B) that found that compared to before, an immunisation programme designed to vaccinate hospitalised under immunised children (aged 0-2 years) significantly increased the proportion of hospitalised children fully vaccinated for age in Philadelphia, USA.
- a before and after study (Skull, Krause, Roberts, & Dalton 1999) (Quality rating +; Applicability C) that found that compared to before, providing opportunistic vaccinations in hospital (no vaccines specified) significantly increased the number of opportunistic vaccine given in a paediatric ward but did not significantly increase in an emergency department.

Hospital vaccination programmes: Evidence statement 116

There is evidence from an RCT (Rodewald, Szilagyi, Humiston, Raubertas, Wassilak, Roghmann, & Hall 1996) (quality rating ++, Applicability C) that found that either offering vaccination or sending letters children's primary care group compared to control did not significantly increase the proportion of children vaccinated, after 1 month and 1 year, for DTP, polio, MMR or Hib B who presented to emergency department in the USA.

Provider-based interventions (Section 5.2.3 of full report)

Provider reminder systems: Evidence statement 117

There is evidence that suggests provider reminder systems are effective in increasing immunisation uptake:

- one interrupted time series (ITS) (Quality rating: -, Applicability: A)(Chappel & Fernandes 1996) found that the proportion of high risk babies vaccinated for BCG increased after the introducing of a computer-generated reminder system compared to before the computer-generated reminder system on a postnatal ward in Milton Keynes;
- one before and after study (Brink 1989) (n=200) (Quality rating - ; Applicability C) found that a provider reminder system significantly increased the proportion of infants (aged one year old) immunised for 3 doses of DPT/OPV compared to pre-intervention in a low-income urban population with low-immunisation rates at one year of age in the USA.

Multi-component interventions (Evidence statements 118-121)

There is conflicting evidence on the effectiveness of multi-component programmes aimed at providers to increase immunisations: five studies found an increase while two did not.

Multi-component interventions: Evidence statement 118

There is evidence from one before and after study (Smith, Connery, Knudsen, Scott, Frintner, Outlaw, & Weingart 1999) (Quality rating -; Applicability C) that found that a programme comprising free vaccines, problem resolution, and support regarding Medicaid billing and physician education significantly increased the proportion of children (aged 0-3 years) up-to-date for DTP, OPV and MMR for age compared to pre intervention.

Process evaluation revealed that:

- All the physicians (19/19) viewed the project as an effective means to improve immunisation services to low income children,
- 79% (15/19) reported using posters and other educational materials,
- 74% 14/19 thought that reminder postcards were a helpful tool, however only 42% reported using them,

- 68% thought the MMR recommendations were useful,
- 79% thought the ACIP Standards were useful and
- 58% thought the agency-produced newsletter was useful.

Multi-component interventions: Evidence statement 119

There is conflicting evidence on the effectiveness of multicomponent programmes aimed at providers that incorporate opportunistic immunisation:

- one NRCT (Harper, Madlon-Kay, Luxenberg, & Tempest 1997) (n=519) (Quality rating -; Applicability C) found that a clinic system that assessed and vaccinated preschool-age children at every clinic visit significantly increased the percentage of children up-to-date for vaccinations (4DTP: 3OPV: 1MMR) at age 24 months compared to control (no intervention comparison clinic);
- one controlled before and after study (Harper & Murray 1994) (Quality rating -; Applicability C) that found that screening and vaccinating young people (aged 11-18 years) with MMR regardless of the reason for their clinic appointment increased the mean percentage of immunisations compared to control (no intervention);
- one before and study (Murphy, Harrington, Bury, O'Doherty, O'Kelly, Smith, Vickers, & Johnson 1996) (n=342) (Quality rating ++; Applicability B) found that a collaborative immunisation programme comprising: developing an immunisation list from practice records, checking the list with Health Board records, a three month period of opportunistic immunisations and sending reminders to remaining non-vaccinated children and providing monthly feedback to all practice staff significantly increased the proportion of infants (aged 6 months) vaccinated for DTP and Hib, but not DT compared to pre intervention. In infants aged >15 months the proportion vaccinated for MMR significantly increased post- compared to pre-intervention in Dublin.
- Conversely, one RCT (Szilagyi, Rodewald, Humiston, Pollard, Klossner, Jones, Barth, & Woodin 1996) (n=1055; n=983) (Quality rating -; Applicability B) found that receiving vaccinations without legal guardians' signature did not increase immunisations compared to control (no legal guardians signature intervention) (not further quantified). In the same study a no missed opportunities intervention (screening medical charts for immunisation status at all visits) did not significantly increase the proportion of children up-to date with their immunisations (4DTP: 3OPV: 1MMR) at age 24 months compared to control (no intervention).

Multi-component interventions: Evidence statement 120

There is evidence from one interrupted time series (Gill & Scott 1998) (Quality rating: -; Applicability: A) that found that a local neonatal BCG policy that comprised: shifting the responsibility of BCG vaccination from community medical officers to midwives and health visitors and regular training sessions to equip them to undertake this new responsibility, increased the proportion of eligible babies who received BCG in the first three months of life compared to pre-intervention in the UK.

Multi-component interventions: Evidence statement 121

There is evidence from one before and after study (Minkovitz, Belote, Higman, Serwint, & Weiner 2001) (Quality rating -; Applicability C) that found that staff prompting, clinician incentives and education and feedback did not significantly increase the proportion of children who received the first DTP dose, but significantly increased proportion of infants (aged 24 months) up-to-date for 4DTP:3OPV:1MMR:3Hib:3HepB and 4DTP:3OPV:1MMR compared to pre-intervention.

Provider assessment and feedback (Evidence statements 122-124)

There is conflicting evidence on the effectiveness of provider assessment and feedback to increase immunisation uptake: two studies found an increase while one did not.

Provider assessment and feedback: Evidence statement 122

There is evidence from one cluster RCT (Fried, Keyes-Elstein, Lannon, Margolis, Moore, & Stuart 2004)(n=44; Quality rating - ; Applicability B) that found that medical education and process improvement did not change (not further quantified) the proportion of children aged 24-30 months who received age appropriate immunisations compared to control (no intervention).

Provider assessment and feedback: Evidence statement 123

There is evidence from one before and after study (Morrow, Gooding, & Clark 1995) (n=418) (Quality rating -; Applicability C) that found that a peer review and physician financial incentives programme significantly increased the proportion of children (aged 2-5 years) immunised for MMR compared to pre-intervention.

Provider assessment and feedback: Evidence statement 124

There is evidence from one before and after study (Sinn, Morrow, & Finch 1999) (Quality rating -; Applicability C) that found that a physician-led quality improvement initiative comprising: an opinion leader, academic detailing, goal setting with feedback and peer review significantly increased the proportion of infants who were up-to-date on recommended immunisations for DTP, OPV and MMR at ages 3, 12 and 24 months compared to pre intervention at 10 private practices in the USA.

Provider Incentives (Evidence statement 125)

There is evidence from two studies to suggest provider financial incentives to increase immunisation uptake are effective.

Provider incentives: Evidence statement 125

There is evidence to suggest provider financial incentives to increase immunisation uptake are effective:

- one RCT (Fairbrother, Hanson, Friedman, & Butts 1999) (Quality rating +; Applicability C) found that a physician cash bonus for practice-wide immunisation increased significantly increased the proportion of children (aged 3-35 months) up-to-date for DTP/Hib, OPV, and MMR compared to control (no intervention). However, two other interventions, enhanced fee for service and provider feedback and provider feedback only did not significantly increase the proportion of children up-to-date for immunisations compared to control (no intervention) in the USA.
- one RCT (Fairbrother, Siegel, Friedman, Kory, & Butts 2001) (Quality rating -; Applicability C) found that a physician cash bonus and feedback programme significantly increased the proportion of children up to date for DTP/Hib, OPV, and MMR compared to control (no intervention) 8 months post intervention. At 12 months an enhanced fee for service intervention significantly increased the proportion of children up to date for DTP/Hib, OPV, and MMR compared to control (no intervention) at nine neighbourhoods in New York City.

Provider Continuity of Care (Evidence statement 126)

There is evidence from one study to suggest provider continuity increases immunisation uptake.

Provider continuity: Evidence statement 126

There is evidence from one retrospective cohort study (2002) (Gill, Saldarriaga, Mainous, & Unger 2002) (Quality rating +; Applicability C) that found that having the same provider for prenatal and paediatric care significantly increased the likelihood of having all recommended immunisations by 12 months, compared to both (control) no continuity and clinic continuity in low-income children in the USA.

Provider Education and Training (Evidence statement 127)

There is evidence from one study to suggest that provider education increased the proportion of eligible babies receiving a targeted vaccination.

Provider education and training: Evidence statement 127

There is evidence from one before and after study (Ahmed, Hicks, & Stanwell-Smith 1992) (Quality -: Applicability A) that found that an education campaign targeting health professionals comprising: junior paediatricians receiving a copy of the neonatal BCG policy at the start of their appointment, regular training sessions for health visitors, and monthly infection newsletters being sent to all GPs significantly increased the proportion of eligible babies receiving BCG vaccination and decreased the proportion of babies at low risk of tuberculosis infection receiving BCG vaccination in the UK.

Legislation (Section 5.2.4 of full report)

Legislation (Evidence statements 128-129)

There is evidence from three studies to suggest that legislation requiring immunisation for school entry to increase immunisation uptake is effective in young people.

There is conflicting evidence on the effectiveness of legislation requiring immunisation before day-care entry to increase immunisation uptake: two studies found an increase while one did not.

Legislation: Evidence statement 128

There is evidence to suggest that legislation requiring immunisation for school entry to increase immunisation uptake is effective in young people:

- one before and after study (Averhoff, Linton, Peddecord, Edwards, Wang, & Fishbein 2004) (Quality rating -, Applicability C) found that a significantly higher proportion of pupils in grade 7 had received three doses of hepatitis B vaccine and two doses of the MMR vaccine compared to pupils in grade 5 & 6 and compared to pupils in grades 8-12 following a bill requiring students entering the seventh grade (UK equivalent) to have received 3 doses of HB vaccine and 2 doses of MMR vaccine;
- one cohort study by (Wilson, Fishbein, Ellis, & Edlavitch 2005b) (Quality rating -, Applicability C) found that a middle school entry law requiring hepatitis B vaccinations for

school entry significantly increased the proportion of pupils in grade 9 (aged 14-15 years) immunised against hepatitis B, but not the proportion of pupils immunised for tetanus/diphtheria or MMR compared to schools without a law in the USA.

- one retrospective cohort study (Morita, Ramirez, & Trick 2008) (Quality rating ++; Applicability B) found that a state law in Illinois requiring pupils to complete three doses of hepatitis B at the start of the 5th-grade (UK equivalent Year 6, age 9 to 10 years) or face being excluded from school significantly increased the proportion of young people immunised against hepatitis B compared to prior to the mandate.

Legislation: Evidence statement 129

There is conflicting evidence on the effectiveness of legislation requiring immunisation before day care entry to increase immunisation uptake:

- One before and after study (Bond, Davie, Carlin, Lester, & Nolan 2002) (Quality rating ++; Applicability B) found that a parent incentive scheme linking the payment of child care benefits and maternity allowance to immunisation status and legislation requiring child care proprietors to record and regularly update the immunisation status of each child in their care significantly increased the proportion of children (<3 years old regularly attending child care at least 1 day per week) age appropriately immunised (DTP, OPV, Hib, MMR) and also increased immunisation data held by child care coordinators compared to pre-intervention in metropolitan Melbourne;
- One ecological study (Quality rating +; Applicability B) found that in states requiring infants to complete three doses of hepatitis B vaccine before entry to day care, a significantly greater proportion received three doses of hepatitis B vaccine compared to states without this requirement;
- Conversely, one before and after study (Kolasa, Chilkatowsky, Stevenson, Lutz, Watson, Levenson, & Rosenthal 2003) (n=2847; Quality rating -; Applicability B) found that a law, requiring licensed child care centres to document that each enrolled child is up-to-date for routine immunisations (DTP, polio, MMR, Hib) did not significantly increase the proportion of children (aged ≤59 months) up-to-date for immunisations after 60 days enrolment compared to when they enrolled at child care centres in Philadelphia.

References

- Abramson, J. S., O'Shea, T. M., Ratledge, D. L., Lawless, M. R., & Givner, L. B. 1995, "Development of a vaccine tracking system to improve the rate of age-appropriate primary immunization in children of lower socioeconomic status", *Journal of Pediatrics*, vol. 126, no. 4, pp. 583-586.
- Ahmed, S., Hicks, N. R., & Stanwell-Smith, R. 1992, "Policy and practice - an audit of neonatal BCG immunization in Avon", *Journal of Public Health Medicine*, vol. 14, no. 4, pp. 389-392.
- Alderson, P., Mayall, B., Barker, S., Henderson, J., & Pratten, B. 1997, "Childhood immunization: Meeting targets yet respecting consent", *European Journal of Public Health*, vol. 7, no. 1, pp. 95-100.
- Alemi, F., Alemagno, S. A., Goldhagen, J., Ash, L., Finkelstein, B., Lavin, A., Butts, J., & Ghadiri, A. 1996, "Computer reminders improve on-time immunization rates", *Medical Care*, vol. 34, no. 10 Suppl, p. OS45-OS51.
- Alto, W. A., Fury, D., Condo, A., Doran, M., & Aduddell, M. 1994, "Improving the immunization coverage of children less than 7 years old in a family practice residency", *Journal of the American Board of Family Practice*, vol. 7, no. 6, pp. 472-477.
- Ashton-Key, M. & Jorge, E. 2003, "Does providing social services with information and advice on immunisation status of "looked after children" improve uptake?", *Archives of Disease in Childhood*, vol. 88, no. 4, pp. 299-301.
- Averhoff, F., Linton, L., Peddecord, K. M., Edwards, C., Wang, W., & Fishbein, D. 2004, "A middle school immunization law rapidly and substantially increases immunization coverage among adolescents", *American Journal of Public Health*, vol. 94, no. 6, pp. 978-984.
- Bagnall, P. 1995, "School nurses' response to the measles vaccination campaign", *Nursing Times*, vol. 91, no. 40, pp. 38-39.
- Barnes, K., Friedman, S. M., Namerow, P. B., & Honig, J. 1999, "Impact of community volunteers on immunization rates of children younger than 2 years", *Archives of Pediatrics and Adolescent Medicine*, vol. 153, no. 5, pp. 518-524.
- Bartu, A., Sharp, J., Ludlow, J., & Doherty, D. A. 2006, "Postnatal home visiting for illicit drug-using mothers and their infants: a randomised controlled trial", *Australian and New Zealand Journal of Obstetrics and Gynaecology*, vol. 46, no. 5, pp. 419-426.
- Bedford, H. & Lansley, M. 2006, "Information on childhood immunisation: parents' views", *Community Practitioner*, vol. 79, no. 8, pp. 252-255.
- Bedford, H. E., Masters, J. I., & Kurtz, Z. 1992, "Immunisation status in inner London primary schools", *Archives of Disease in Childhood*, vol. 67, no. 10, pp. 1288-1291.
- Bell, L. M., Pritchard, M., Anderko, R., & Levenson, R. 1997, "A program to immunize hospitalized preschool-aged children: evaluation and impact", *Pediatrics*, vol. 100, no. 2 Pt 1, pp. 192-196.
- Bond, L., Davie, G., Carlin, J. B., Lester, R., & Nolan, T. 2002, "Increases in vaccination coverage for children in child care, 1997 to 2000: an evaluation of the impact of government

incentives and initiatives", *Australian and New Zealand Journal of Public Health*, vol. 26, no. 1, pp. 58-64.

Bond, L. M., Nolan, T. M., & Lester, R. A. 1998, "Home vaccination for children behind in their immunisation schedule: A randomised controlled trial", *Medical Journal of Australia*, vol. 168, no. 10, pp. 487-490.

Brabin, L., Roberts, S. A., Farzaneh, F., & Kitchener, H. C. 2006, "Future acceptance of adolescent human papillomavirus vaccination: A survey of parental attitudes", *Vaccine*, vol. 24, no. 16, pp. 3087-3094.

Brabin, L., Roberts, S. A., & Kitchener, H. C. 2007, "A semi-qualitative study of attitudes to vaccinating adolescents against human papillomavirus without parental consent", *BMC Public Health*, vol. 7, no. 147, p. 20.

Brabin, L., Roberts, S. A., Stretch, R., Baxter, D., Chambers, G., Kitchener, H., & McCann, R. 2008, "Uptake of first two doses of human papillomavirus vaccine by adolescent schoolgirls in Manchester: prospective cohort study", *British Medical Journal* p. bmj.

Brink, S. G. 1989, "Provider reminders. Changing information format to increase infant immunizations", *Medical Care*, vol. 27, no. 6, pp. 648-653.

Browngoehl, K., Kennedy, K., Krotki, K., & Mainzer, H. 1997, "Increasing immunization: a Medicaid managed care model", *Pediatrics*, vol. 99, no. 1, p. E4.

Campbell, J. R., Szilagyi, P. G., Rodewald, L. E., Doane, C., & Roghmann, K. J. 1994, "Patient-specific reminder letters and pediatric well-child-care show rates", *Clinical Pediatrics*, vol. 33, no. 5, pp. 268-272.

Casiday, R. 2006, "Uncertainty, decision-making and trust: lessons from the MMR controversy", *Community Practitioner*, vol. 79, no. 11, pp. 354-357.

Casiday, R., Cresswell, T., Wilson, D., & Panter-Brick, C. 2006, "A survey of UK parental attitudes to the MMR vaccine and trust in medical authority", *Vaccine*, vol. 24, no. 2, pp. 177-184.

Casiday, R. E. 2007, "Children's health and the social theory of risk: Insights from the British measles, mumps and rubella (MMR) controversy", *Social Science and Medicine*, vol. 65, no. 5, pp. 1059-1070.

Centers for Disease Control and Prevention 2000, "Vaccination Coverage Among Adolescents 1 year Before the Institution of a Seventh Grade School Entry Vaccination Requirement -- San Diego, California, 1998", *Morbidity and Mortality Weekly Report*, vol. 49, no. 5, pp. 101-102.

Centers for Disease Control and Prevention (CDC) 2001, "Effectiveness of a middle school vaccination law--California, 1999-2001", *MMWR - Morbidity and Mortality Weekly Report*, vol. 50, no. 31, pp. 660-663.

Chappel, D. & Fernandes, V. 1996, "Improving the coverage of neonatal BCG vaccination", *Journal of Public Health Medicine*, vol. 18, no. 3, pp. 308-312.

Condon, L. 2002, "Maternal attitudes to preschool immunisations among ethnic minority groups", *Health Education Journal*, vol. 61, no. 2, pp. 180-189.

- Conway, S. P. 1999, "Opportunistic immunisation in hospital.", *Archives of Disease in Childhood*, vol. 81, no. 5, pp. 422-425.
- Crittenden, P. & Rao, M. 1994, "The immunisation coordinator: improving uptake of childhood immunisation", *Communicable Disease Report*, vol. CDR Review. 4, no. 7, p. R79-R81.
- Cuninghame, C. J., Charlton, C. P. J., & Jenkins, S. M. 1994, "Immunization uptake and parental perceptions in a strictly orthodox Jewish community in north-east London", *Journal of Public Health Medicine*, vol. 16, no. 3, pp. 314-317.
- Dini, E. F., Linkins, R. W., & Sigafos, J. 2000, "The impact of computer-generated messages on childhood immunization coverage", *American Journal of Preventive Medicine*, vol. 18, no. 2, pp. 132-139.
- El-Mohandes, A. A. E., Katz, K. S., El-Khorazaty, M. N., Neely-Johnson, D., Sharps, P. W., Jarrett, M. H., Rose, A., White, D. M., Young, M., Grylack, L., Murray, K. D., Katta, P. S., Burroughs, M., Atiyeh, G., Wingrove, B. K., & Herman, A. A. 2003, "The effect of a parenting education program on the use of preventive pediatric health care services among low-income, minority mothers: a randomized, controlled study", *Pediatrics*, vol. 111, no. 6, pp. 1324-1332.
- Evans, M., Stoddart, H., Condon, L., Freeman, E., Grizzell, M., & Mullen, R. 2001, "Parents' perspectives on the MMR immunisation: A focus group study", *British Journal of General Practice*, vol. 51, no. 472, pp. 904-910.
- Fairbrother, G., Hanson, K. L., Friedman, S., & Butts, G. C. 1999, "The impact of physician bonuses, enhanced fees, and feedback on childhood immunization coverage rates", *American Journal of Public Health*, vol. 89, no. 2, pp. 171-175.
- Fairbrother, G., Siegel, M. J., Friedman, S., Kory, P. D., & Butts, G. C. 2001, "Impact of financial incentives on documented immunization rates in the inner city: results of a randomized controlled trial", *Ambulatory Pediatrics*, vol. 1, no. 4, pp. 206-212.
- Fang, J. W., Ko, B. M., & Wilson, J. A. 1993, "BCG vaccination scars: incidence and acceptance amongst British high-school children", *Child: Care, Health and Development*, vol. 19, no. 1, pp. 37-43.
- Ferson, M. J., Fitzsimmons, G., Christie, D., & Woollett, H. 1995, "School health nurse interventions to increase immunisation uptake in school entrants", *Public Health*, vol. 109, no. 1, pp. 25-29.
- Findley, S., Irigoyen, M., Sanchez, M., Guzman, L., Mejia, M., Sajous, M., Levine, D., Chimkin, F., & Chen, S. 2004, "Community empowerment to reduce childhood immunization disparities in New York City", *Ethnicity and Disease*, vol. 14, no. 3 SUPPL. 1, p. S1.
- Fitzpatrick, P., Molloy, B., & Johnson, Z. 1997, "Community mothers' programme: extension to the travelling community in Ireland", *Journal of Epidemiology and Community Health*, vol. 51, no. 3, pp. 299-303.
- Franzini, L., Rosenenthal, J., & Spears, W. e. a. 2000, "Cost-effectiveness of childhood immunization reminder/recall systems in urban private practices", *Pediatrics*, vol. 106:177-183, p. -1833.

- Freed, G. L., Freeman, V. A., Mauskopf, A., & Jacobson, R. M. 1999, "Age-appropriate immunization laws: A randomized trial of information dissemination", *Ambulatory Child Health*, vol. 5, no. 1, pp. 43-51.
- Fried, B. J., Keyes-Elstein, L., Lannon, C. M., Margolis, P. A., Moore, D. E., & Stuart, J. M. 2004, "Practice based education to improve delivery systems for prevention in primary care: randomised trial", *British Medical Journal* pp. 388-392.
- Gellatly, J., McVittie, C., & Tiliopoulos, N. 2005, "Predicting parents' decisions on MMR immunisation: A mixed method investigation", *Family Practice*, vol. 22, no. 6, pp. 658-662.
- Gill, J. & Scott, J. 1998, "Improving the uptake of selective neonatal BCG immunisation", *Communicable Disease and Public Health*, vol. 1, no. 4, pp. 281-282.
- Gill, J. & Scott, J. 2001, "Improving the uptake of selective neonatal BCG immunisation", *Nurse 2 Nurse*, vol. 1, no. 10, pp. 25-26.
- Gill, J. M., Saldarriaga, A., Mainous, I. I. I. A., & Unger, D. 2002, "Does continuity between prenatal and well-child care improve childhood immunizations?", *Family Medicine*, vol. 34, no. 4, pp. 274-280.
- Goldstein, K. P., Lauderdale, D. S., Glushak, C., Walter, J., & Daum, R. S. 1999, "Immunization outreach in an inner-city housing development: reminder-recall on foot", *Pediatrics*, vol. 104, no. 6, p. e69.
- Gordon, M., Roberts, H., & Odeka, E. 2007, "Knowledge and attitudes of parents and professionals to neonatal BCG vaccination in light of recent UK policy changes: a questionnaire study", *BMC Infectious Diseases*, vol. 7, p. 82.
- Gore, P., Madhavan, S., Curry, D., McClurg, G., Castiglia, M., Rosenbluth, S. A., & Smego, R. A. 1998, "Persuasive messages. Development of persuasive messages may help increase mothers' compliance of their children's immunization schedule", *Marketing Health Services*, vol. 18, no. 4, pp. 32-43.
- Guay, M., Clouatre, A., Blackburn, M., Baron, G., De, W. P., Roy, C., Desrochers, J., & Milord, F. 2003, "Effectiveness and cost comparison of two strategies for hepatitis B vaccination of schoolchildren", *Canadian Journal of Public Health*, vol. 94, no. 1, pp. 64-67.
- Hambidge, S. J., Davidson, A. J., Phibbs, S. L., Chandramouli, V., Zerbe, G., LeBaron, C. W., & Steiner, J. F. 2004, "Strategies to improve immunization rates and well-child care in a disadvantaged population: a cluster randomized controlled trial", *Archives of Pediatrics and Adolescent Medicine*, vol. 158, no. 2, pp. 162-169.
- Harper, P. G., Madlon-Kay, D. J., Luxenberg, M. G., & Tempest, R. 1997, "A clinic system to improve preschool vaccinations in a low socioeconomic status population", *Archives of Pediatrics and Adolescent Medicine*, vol. 151, no. 12, pp. 1220-1223.
- Harper, P. G. & Murray, D. M. 1994, "An organizational strategy to improve adolescent measles-mumps-rubella vaccination in a low socioeconomic population. A method to reduce missed opportunities.", *Archives of Family Medicine*, vol. 3, no. 3, pp. 257-262.
- Hellerstedt, W. L., Olson, S. M., Oswald, J. W., & Pirie, P. L. 1999, "Evaluation of a community-based program to improve infant immunization rates in rural Minnesota", *American Journal of Preventive Medicine*, vol. 16, no. 3 SUPPL., pp. 50-57.

Henderson, R., Macdonald, H., & Oates, K. 2004, "Low uptake of immunisation: contributing factors", *Community Practitioner* pp. 95-100.

Henderson, R., Oates, K., Macdonald, H., & Smith, W. C. 2004, "General practitioners' concerns about childhood immunisation and suggestions for improving professional support and vaccine uptake", *Communicable Disease and Public Health*, vol. 7, no. 4, pp. 260-266.

Henning, K. J., Pollack, D. M., & Friedman, S. M. 1992, "A neonatal hepatitis B surveillance and vaccination program: New York City, 1987 to 1988", *American Journal of Public Health*, vol. 82, no. 6, pp. 885-888.

Hicks, P., Tarr, G. A. M., & Hicks, X. P. 2007, "Reminder cards and immunization rates among Latinos and the rural poor in Northeast Colorado", *Journal of the American Board of Family Medicine*, vol. 20, no. 6, pp. 581-586.

Hilton, S., Hunt, K., & Petticrew, M. 2007a, "Gaps in parental understandings and experiences of vaccine-preventable diseases: A qualitative study", *Child: Care, Health and Development*, vol. 33, no. 2, pp. 170-179.

Hilton, S., Hunt, K., & Petticrew, M. 2007b, "MMR: Marginalised, misrepresented and rejected? Autism: A focus group study", *Archives of Disease in Childhood*, vol. 92, no. 4, pp. 322-327.

Hilton, S., Petticrew, M., & Hunt, K. 2006, "'Combined vaccines are like a sudden onslaught to the body's immune system': Parental concerns about vaccine 'overload' and 'immune-vulnerability'", *Vaccine*, vol. 24, no. 20, pp. 4321-4327.

Hilton, S., Petticrew, M., & Hunt, K. 2007, "Parents' champions vs. vested interests: Who do parents believe about MMR? A qualitative study", *BMC Public Health*, vol. 7,;#2007. Article Number.

Hinds, A. & Cameron, J. C. 2004, "Acceptability of universal hepatitis B vaccination among school pupils and parents", *Communicable Disease and Public Health*, vol. 7, no. 4, pp. 278-282.

Hoekstra, E. J., LeBaron, C. W., & Johnson-Partlow, T. 1999, "Does reminder-recall augment the impact of voucher incentives on immunization rates among inner-city infants enrolled in WIC?", *Journal of Pediatrics*, vol. 135, no. 2 Pt 1, pp. 261-263.

Hoekstra, E. J., LeBaron, C. W., Megaloeconomou, Y., Guerrero, H., Byers, C., Johnson-Partlow, T., Lyons, B., Mihalek, E., Devier, J., & Mize, J. 1998, "Impact of a large-scale immunization initiative in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)", *JAMA: the journal of the American Medical Association*, vol. 280, no. 13, pp. 1143-1147.

Hutchinson, S. J., Wadd, S., Taylor, A., Bird, S. M., Mitchell, A., Morrison, D. S., Ahmed, S., & Goldberg, D. J. 2004, "Sudden rise in uptake of hepatitis B vaccination among injecting drug users associated with a universal vaccine programme in prisons", *Vaccine*, vol. 23, no. 2, pp. 210-214.

Irigoyen, M. M., Findley, S., Earle, B., Stambaugh, K., & Vaughan, R. 2000, "Impact of appointment reminders on vaccination coverage at an urban clinic", *Pediatrics*, vol. 106, no. 4 part 2, p. -23.

Irigoyen, M. M., Findley, S., Wang, D., Chen, S., Chimkin, F., Pena, O., & Mendonca, E. 2006, "Challenges and successes of immunization registry reminders at inner-city practices", *Ambulatory Pediatrics*, vol. 6, no. 2, pp. 100-104.

Johnson, Z., Howell, F., & Molloy, B. 1993, "Community mothers' programme: randomised controlled trial of non-professional intervention in parenting", *British Medical Journal*, vol. 306, no. 6890, pp. 1449-1452.

Johnson, Z., Molloy, B., Scallan, E., Fitzpatrick, P., Rooney, B., Keegan, T., & Byrne, P. 2000, "Community Mothers Programme--seven year follow-up of a randomized controlled trial of non-professional intervention in parenting", *Journal of Public Health Medicine*, vol. 22, no. 3, pp. 337-342.

Johnston, B. D., Huebner, C. E., Anderson, M. L., Tyll, L. T., & Thompson, R. S. 2006, "Healthy steps in an integrated delivery system: child and parent outcomes at 30 months", *Archives of Pediatrics and Adolescent Medicine*, vol. 160, no. 8, pp. 793-800.

Joyce, T. & Racine, A. 2005, "CHIP shots: association between the State Children's Health Insurance Programs and immunization rates", *Pediatrics*, vol. 115, no. 5, p. -34.

Kempe, A., Lowery, N. E., Pearson, K. A., Renfrew, B. L., Jones, J. S., Steiner, J. F., & Berman, S. 2001, "Immunization recall: effectiveness and barriers to success in an urban teaching clinic.", *Journal of Pediatrics*, vol. 139, no. 5, pp. 630-635.

Kirschke, D. L., Craig, A. S., Schaffner, W., Daugherty, J. R., Narramore, J., & Griffin, M. R. 2004, "Childhood Immunization Rates before and after the Implementation of Medicaid Managed Care", *Archives of Pediatrics and Adolescent Medicine*, vol. 158, no. 3, pp. 230-235.

Kitzman, H., Olds, D. L., Henderson, J., Hanks, C., Cole, R., Tatelbaum, R., McConnochie, K. M., Sidora, K., Luckey, D. W., Shaver, D., Engelhardt, K., James, D., & Barnard, K. 1997, "Effect of prenatal and infancy home visitation by nurses on pregnancy outcomes, childhood injuries, and repeated childbearing: A randomized controlled trial", *Journal of the American Medical Association*, vol. 278, no. 8, pp. 644-652.

Kolasa, M. S., Chilkatowsky, A. P., Stevenson, J. M., Lutz, J. P., Watson, B. M., Levenson, R., & Rosenthal, J. 2003, "Do laws bring children in child care centers up to date for immunizations?", *Ambulatory Pediatrics*, vol. 3, no. 3, pp. 154-157.

Koniak-Griffin, D., Anderson, N. L. R., Brecht, M. L., Verzemnieks, I., Lesser, J., & Kim, S. 2002, "Public health nursing care for adolescent mothers: Impact on infant health and selected maternal outcomes at 1 year postbirth.", *Journal of Adolescent Health*, vol. 30, no. 1, pp. 44-54.

Koniak-Griffin, D., Verzemnieks, I. L., Anderson, N. L. R., Brecht, M., Lesser, J., Kim, S., & Turner-Pluta, C. 2003, "Nurse visitation for adolescent mothers: two-year infant health and maternal outcomes", *Nursing Research*, vol. 52, no. 2, pp. 127-136.

Kreuter, M. W., Caburnay, C. A., Chen, J. J., & Donlin, M. J. 2004, "Effectiveness of individually tailored calendars in promoting childhood immunization in urban public health centers", *American Journal of Public Health*, vol. 94, no. 1, pp. 122-127.

Larcher, V. F., Bourne, J., Aitken, C., Jeffries, D., Hodes, D., Sloan, D., Ramsay, M., Goldberg, D., & Bramley, C. 2001, "Overcoming barriers to hepatitis B immunisation by a dedicated hepatitis B immunisation service", *Archives of Disease in Childhood*, vol. 84, no. 2, pp. 114-119.

LeBaron, C. W., Starnes, D., Dini, E. F., Chambliss, J. W., & Chaney, M. 1998, "The impact of interventions by a community-based organization on inner-city vaccination coverage: Fulton County, Georgia, 1992-1993", *Archives of Pediatrics and Adolescent Medicine*, vol. 152, no. 4, pp. 327-332.

LeBaron, C. W., Starnes, D. M., & Rask, K. J. 2004, "The impact of reminder-recall interventions on low vaccination coverage in an inner-city population", *Archives of Pediatrics and Adolescent Medicine*, vol. 158, no. 3, pp. 255-261.

Lewendon, G. J. & Maconachie, M. 2002, "Why are children not being immunised? Barriers to immunisation uptake in South Devon", *Health Education Journal*, vol. 61, no. 3, pp. 212-220.

Lieu, T. A., Black, S. B., Ray, P., Schwalbe, J. A., Lewis, E. M., Lavetter, A., Morozumi, P. A., & Shinefield, H. R. 1997, "Computer-generated recall letters for underimmunized children: how cost-effective?", *Pediatric Infectious Disease Journal*, vol. 16, no. 1, pp. 28-33.

Lieu, T. A., Capra, A. M., Makol, J., Black, S. B., & Shinefield, H. R. 1998, "Effectiveness and cost-effectiveness of letters, automated telephone messages, or both for underimmunized children in a health maintenance organization", *Pediatrics*, vol. 101, no. 4, p. E3.

Lloyd, G. P., Marlow, L. A. V., Waller, J., & Wardle, J. Adolescents' reactions to HPV information: an experimental study. 2008.
Ref Type: Unpublished Work

Loewenthal, K. M. & Bradley, C. 1996, "Immunization uptake and doctors' perceptions of uptake in a minority group: Implications for interventions", *Psychology, Health and Medicine*, vol. 1, no. 2, pp. 223-230.

Lunts, E. & Cowper, D. 2002, "Parents refusing MMR: do GPs and health visitors understand why?", *Community Practitioner*, vol. 75, no. 3, pp. 94-96.

Marlow, L. A., Waller, J., & Wardle, J. 2007a, "Parental attitudes to pre-pubertal HPV vaccination", *Vaccine*, vol. 25, no. 11, pp. 1945-1952.

Marlow, L. A., Waller, J., & Wardle, J. 2007b, "Trust and experience as predictors of HPV vaccine acceptance", *Human Vaccines*, vol. 3, no. 5, pp. 171-175.

Marlow, L. A. V., Waller, J., Evans, R. E. C., & Wardle, J. Predictors of adolescent interest in HPV vaccination. 2008.
Ref Type: Unpublished Work

Marlow, L. A. V., Waller, J., & Wardle, J. 2008, "Sociodemographic predictors of HPV testing and vaccination acceptability: results from a population-representative sample of British women", *Journal of Medical Screening*, vol. 15, pp. 91-96.

Mason, B. W. & Donnelly, P. D. 2000, "Targeted mailing of information to improve uptake of measles, mumps, and rubella vaccine: a randomised controlled trial", *Communicable Disease and Public Health*, vol. 3, no. 1, pp. 67-68.

Mayer, J. P., Housemann, R., & Piepenbrok, B. 1999, "Evaluation of a campaign to improve immunization in a rural HeadStart program", *Journal of Community Health*, vol. 24, no. 1, pp. 13-27.

McMurray, R., Cheater, F. M., Weighall, A., Nelson, C., Schweiger, M., & Mukherjee, S. 2004, "Managing controversy through consultation: a qualitative study of communication and

trust around MMR vaccination decisions.[see comment]", *British Journal of General Practice*, vol. 54, no. 504, pp. 520-525.

McPhee, S. J., Nguyen, T., Euler, G. L., Mock, J., Wong, C., Lam, T., Nguyen, W., Nguyen, S., Ha, M. Q., Do, S. T., & Buu, C. 2003, "Successful promotion of hepatitis B vaccinations among Vietnamese-American children ages 3 to 18: results of a controlled trial", *Pediatrics*, vol. 111, no. 6, pp. 1278-1288.

Minkovitz, C., Holt, E., Hughart, N., Hou, W., Thomas, L., Dini, E., & Guyer, B. 1999, "The effect of parental monetary sanctions on the vaccination status of young children: An evaluation of welfare reform in Maryland", *Archives of Pediatrics and Adolescent Medicine*, vol. 153, no. 12, pp. 1242-1247.

Minkovitz, C. S., Belote, A. D., Higman, S. M., Serwint, J. R., & Weiner, J. P. 2001, "Effectiveness of a practice-based intervention to increase vaccination rates and reduce missed opportunities", *Archives of Pediatrics and Adolescent Medicine*, vol. 155, no. 3, pp. 382-386.

Mixer, R. E., Jamrozik, K., & Newsom, D. 2007, "Ethnicity as a correlate of the uptake of the first dose of mumps, measles and rubella vaccine", *Journal of Epidemiology and Community Health*, vol. 61, no. 9, pp. 797-801.

Mohr, J. J., Randolph, G. D., Laughon, M. M., & Schaff, E. 2003, "Integrating improvement competencies into residency education: A pilot project from a pediatric continuity clinic", *Ambulatory Pediatrics*, vol. 3, no. 3, pp. 131-136.

Morgan, M. Z. & Evans, M. R. 1998, "Initiatives to improve childhood immunisation uptake: a randomised controlled trial", *British Medical Journal* pp. 1569-1570.

Morita, J. Y., Ramirez, E., & Trick, W. E. 2008, "Effect of a school-entry vaccination requirement on racial and ethnic disparities in hepatitis B immunization coverage levels among public school students", *Pediatrics*, vol. 121, no. 3, p. e547-e552.

Morrow, R. W., Gooding, A. D., & Clark, C. 1995, "Improving physicians' preventive health care behavior through peer review and financial incentives", *Archives of Family Medicine*, vol. 4, no. 2, pp. 165-169.

Muehleisen, B., Baer, G., Schaad, U. B., & Heining, U. 2007, "Assessment of immunization status in hospitalized children followed by counseling of parents and primary care physicians improves vaccination coverage: an interventional study", *Journal of Pediatrics*, vol. 151, no. 6, pp. 704-706.

Mullaney, C., Heathcock, R., Victor, C., Jones, I., & Smith, H. In the context of controversy over safety of MMR and an outbreak of measles, what parental factors are associated with uptake of MMR? 2002.
Ref Type: Unpublished Work

Murphy, A. W., Harrington, M., Bury, G., O'Doherty, K., O'Kelly, F., Smith, M., Vickers, L., & Johnson, H. 1996, "Impact of a collaborative immunisation programme in an inner city practice", *Irish Medical Journal*, vol. 89, no. 6, pp. 220-221.

Niederhauser, V., Walters, M., & Ganeko, R. 2007, "Simple solutions to complex issues: Minimizing disparities in childhood immunization rates by providing walk-in shot clinic access.", *Family and Community Health*, vol. 30, no. 2, Suppl, p. S80-S91.

- Noakes, K., Yarwood, J., & Salisbury, D. 2006, "Parental response to the introduction of a vaccine against human papilloma virus", *Human Vaccines*, vol. 2, no. 6, pp. 243-248.
- Norr, K. F., Crittenden, K. S., Lehrer, E. L., Reyes, O., Boyd, C. B., Nacion, K. W., & Watanabe, K. 2003, "Maternal and Infant Outcomes at One Year for a Nurse-Health Advocate Home Visiting Program Serving African Americans and Mexican Americans.", *Public Health Nursing*, vol. 20, no. 3, pp. 190-203.
- O'Sullivan, A. L. & Jacobsen, B. S. 1992, "A randomized trial of a health care program for first-time adolescent mothers and their infants", *Nursing Research*, vol. 41, no. 4, pp. 210-215.
- Oeffinger, K. C., Roaten, S. P., Hitchcock, M. A., & Oeffinger, P. K. 1992, "The effect of patient education on pediatric immunization rates", *Journal of Family Practice*, vol. 35, no. 3, pp. 288-293.
- Pareek, M. & Pattison, H. M. 2000, "The two-dose measles, mumps, and rubella (MMR) immunisation schedule: Factors affecting maternal intention to vaccinate", *British Journal of General Practice*, vol. 50, no. 461, pp. 969-971.
- Paunio, M., Virtanen, M., Peltola, H., Cantell, K., Paunio, P., Valle, M., Karanko, V., & Heinonen, O. P. 1991, "Increase of vaccination coverage by mass media and individual approach: Intensified measles, mumps, and rubella prevention program in Finland", *American Journal of Epidemiology*, vol. 133, no. 11, pp. 1152-1160.
- Penrice, G. M., McMenamin, J., & Cameron, S. O. 2000, "Hepatitis B immunisation of infants at risk", *Communicable Disease and Public Health*, vol. 3, no. 3, pp. 215-216.
- Petrovic, M., Roberts, R. J., Ramsay, M., & Charlett, A. 2003, "Parents' attitude towards the second dose of measles, mumps and rubella vaccine: a case-control study", *Communicable Disease and Public Health*, vol. 6, no. 4, pp. 325-329.
- Poltorak, M., Leach, M., Fairhead, J., & Cassell, J. 2005, "'MMR Talk' and Vaccination Choices: An Ethnographic Study in Brighton", *Social Science & Medicine*, vol. 61, no. 3, pp. 709-719.
- Raithatha, N., Holland, R., Gerrard, S., & Harvey, I. 2003, "A qualitative investigation of vaccine risk perception amongst parents who immunize their children: A matter of public health concern", *Journal of Public Health Medicine*, vol. 25, no. 2, pp. 161-164.
- Ramsay, M. E., Yarwood, J., Lewis, D., Campbell, H., & White, J. M. 2002, "Parental confidence in measles, mumps and rubella vaccine: Evidence from vaccine coverage and attitudinal surveys", *British Journal of General Practice*, vol. 52, no. 484, pp. 912-916.
- Redsell, S. A., Bedford, H., Siriwardena, N., Collier, J., & Atkinson, P. Health visitors' role in communicating with parents about childhood immunisation. 2008. Ref Type: Unpublished Work
- Reeve, C., De La Rue, S., Pashen, D., Culpan, M., & Cheffins, T. 2008, "School-based vaccinations delivered by general practice in rural north Queensland: an evaluation of a new human papilloma virus vaccination program", *Communicable Diseases Intelligence*, vol. 32, no. 1, pp. 94-98.
- Reid, J. A. 1989, "Vaccination viewpoints", *Health Visitor*, vol. 62, no. 4, pp. 121-123.

- Rodewald, L. E., Szilagyi, P. G., Humiston, S. G., Barth, R., Kraus, R., & Raubertas, R. F. 1999, "A randomized study of tracking with outreach and provider prompting to improve immunization coverage and primary care", *Pediatrics*, vol. 103, no. 1, pp. 31-38.
- Rodewald, L. E., Szilagyi, P. G., Humiston, S. G., Raubertas, R. F., Wassilak, S., Roghmann, K. J., & Hall, C. B. 1996, "Effect of emergency department immunizations on immunization rates and subsequent primary care visits", *Archives of Pediatrics and Adolescent Medicine*, vol. 150, no. 12, pp. 1271-1276.
- Rogers, A. & Pilgrim, D. 1994, "Rational non-compliance with childhood immunisation: personal accounts of parents and primary health care professionals," in *Uptake of Immunisation: Issues for Health Education*, Health Education Authority, ed., London.
- Rosenberg, Z., Findley, S., McPhillips, S., Penachio, M., & Silver, P. 1995, "Community-based strategies for immunizing the 'hard-to-reach' child: The New York State immunization and primary health care initiative", *American Journal of Preventive Medicine*, vol. 11, no. 3 SUPPL., pp. 14-20.
- Saffin, K. 1992, "School nurses immunising without a doctor present", *Health Visitor*, vol. 65, no. 11, pp. 394-396.
- Samad, L., Butler, N., Peckham, C., & Bedford, H. 2006, "Incomplete immunisation uptake in infancy: Maternal reasons", *Vaccine*, vol. 24, no. 47-48, pp. 6823-6848.
- Simpson, N., Lenton, S., & Randall, R. 1995, "Parental refusal to have children immunised: extent and reasons", *British Medical Journal*, vol. 310, no. 6974, p. 227.
- Sinn, J. S., Morrow, A. L., & Finch, A. B. 1999, "Improving immunization rates in private pediatric practices through physician leadership", *Archives of Pediatrics and Adolescent Medicine*, vol. 153, no. 6, pp. 597-603.
- Skinner, S. R., Imberger, A., Nolan, T., Lester, R., Glover, S., & Bowes, G. 2000, "Randomised controlled trial of an educational strategy to increase school-based adolescent hepatitis B vaccination", *Australian and New Zealand Journal of Public Health*, vol. 24, no. 3, pp. 298-304.
- Skull, S., Krause, V., Roberts, L., & Dalton, C. 1999, "Evaluating the potential for opportunistic vaccination in a Northern Territory hospital", *Journal of Paediatrics and Child Health*, vol. 35, no. 5, pp. 472-475.
- Smallbegovic, M. S., Laing, G. J., & Bedford, H. 2003, "Why do parents decide against immunization? The effect of health beliefs and health professionals", *Child: Care, Health and Development*, vol. 29, no. 4, pp. 303-311.
- Smith, A., McCann, R., & McKinlay, I. 2001, "Second dose of MMR vaccine: health professionals' level of confidence in the vaccine and attitudes towards the second dose", *Communicable Disease and Public Health*, vol. 4, no. 4, pp. 273-277.
- Smith, A., Yarwood, J., & Salisbury, D. M. 2007, "Tracking mothers' attitudes to MMR immunisation 1996-2006", *Vaccine*, vol. 25, no. 20, pp. 3996-4002.
- Smith, S. W., Connery, P., Knudsen, K., Scott, K. L., Frintner, M. P., Outlaw, G., & Weingart, S. 1999, "A preschool immunization project to enhance immunization levels, the public-private relationship, and continuity of care", *Journal of Community Health*, vol. 24, no. 5, pp. 347-358.

Sporton, R. K. & Francis, S. A. 2001, "Choosing not to immunize: are parents making informed choices", *Family Practice*, vol. 18, pp. 181-188.

Steele, R. W. & O'Keefe, M. A. 2001, "A program description of health care interventions for homeless teenagers", *Clinical Pediatrics*, vol. 40, no. 5, pp. 259-263.

Stehr-Green, P. A., Dini, E. F., Lindegren, M. L., & Patriarca, P. A. 1993, "Evaluation of telephoned computer-generated reminders to improve immunization coverage at inner-city clinics", *Public Health Reports*, vol. 108, no. 4, pp. 426-430.

Stille, C. J., Christison-Lagay, J., Bernstein, B. A., & Dworkin, P. H. 2001, "A simple provider-based educational intervention to boost infant immunization rates: A controlled trial", *Clinical Pediatrics*, vol. 40, no. 7, pp. 365-373.

Stroffolini, T. & Pasquini, P. 1990, "Five years of vaccination campaign against hepatitis B in Italy in infants of hepatitis B surface antigen carrier mothers", *Italian Journal of Gastroenterology*, vol. 22, no. 4, pp. 195-197.

Sutton, S. & Gill, E. 1993, "Immunisation uptake: the role of parental attitudes," in *Immunisation Research: a Summary Volume*, V. Hey, ed., Health Education Authority, London.

Szilagyi, P. G., Rodewald, L. E., Humiston, S. G., Fierman, A. H., Cunningham, S., Gracia, D., & Birkhead, G. S. 1997, "Effect of 2 urban emergency department immunization programs on childhood immunization rates", *Archives of Pediatrics and Adolescent Medicine*, vol. 151, no. 10, pp. 999-1006.

Szilagyi, P. G., Rodewald, L. E., Humiston, S. G., Pollard, L., Klossner, K., Jones, A. M., Barth, R., & Woodin, K. A. 1996, "Reducing missed opportunities for immunizations: Easier said than done", *Archives of Pediatrics and Adolescent Medicine*, vol. 150, no. 11, pp. 1193-1200.

Szilagyi, P. G., Schaffer, S., Barth, R., Shone, L. P., Humiston, S. G., Ambrose, S., & Averhoff, F. 2006, "Effect of telephone reminder/recall on adolescent immunization and preventive visits: Results from a randomized clinical trial", *Archives of Pediatrics and Adolescent Medicine*, vol. 160, no. 2, pp. 157-163.

Szilagyi, P. G., Schaffer, S., Shone, L., Barth, R., Humiston, S. G., Sandler, M., & Rodewald, L. E. 2002, "Reducing geographic, racial, and ethnic disparities in childhood immunization rates by using reminder/recall interventions in urban primary care practices", *Pediatrics*, vol. 110, no. 5.

Taylor, J. A., Davis, R. L., & Kemper, K. J. 1997, "Health care utilization and health status in high-risk children randomized to receive group or individual well child care", *Pediatrics*, vol. 100, no. 3, p. E1.

Tickner, S., Leman, P. J., & Woodcock, A. 2007, "'It's just the normal thing to do': Exploring parental decision-making about the 'five-in-one' vaccine", *Vaccine*, vol. 25, no. 42, pp. 7399-7409.

Tseng, E., Nesbitt, A., & O'Sullivan, D. 1997, "Audit of the implementation of selective neonatal BCG immunisation in south east London", *Communicable Disease Report*, vol. 7, no. 11, p. R165-R168.

Vallely, L. A., Roberts, S. A., Kitchener, H. C., & Brabin, L. 2008, "Informing adolescents about human papillomavirus vaccination: What will parents allow?", *Vaccine*, vol. 18, pp. 2203-2210.

Vivier, P. M., Alario, A. J., O'Haire, C., Dansereau, L. M., Jakum, E. B., & Peter, G. 2000, "The impact of outreach efforts in reaching underimmunized children in a Medicaid managed care practice", *Archives of Pediatrics and Adolescent Medicine*, vol. 154, no. 12, pp. 1243-1247.

Wagner, K., White, J., & Crowcroft, N. 2007, *Health Protection Agency survey of Primary Care Trust teenage vaccination programmes*.

Waller, J., Marlow, L. A., & Wardle, J. 2006, "Mothers' attitudes towards preventing cervical cancer through human papillomavirus vaccination: a qualitative study", *Cancer Epidemiology, Biomarkers and Prevention*, vol. 15, no. 7, pp. 1257-1261.

Waterman, S. H., Maes, E. F., Hill, L. L., Stevenson, J. M., Robyn, B., Anderson, K. N., & Yeager, K. K. 1996, "A model immunization demonstration for Preschoolers in an Inner-City Barrio, San Diego, California, 1992-1994", *American Journal of Preventive Medicine*, vol. 12, no. 4 SUPPL., pp. 8-13.

Wilcox, S. A., Koepke, C. P., Levenson, R., & Thalheimer, J. C. 2001, "Registry-driven, community-based immunization outreach: A randomized controlled trial.", *American Journal of Public Health*, vol. 91, no. 9, pp. 1507-1511.

Wilson, T. R., Fishbein, D. B., Ellis, P. A., & Edlavitch, S. A. 2005, "The impact of a school entry law on adolescent immunization rates", *Journal of Adolescent Health*, vol. 37, no. 6, pp. 511-516.

Wood, D., Halfon, N., Donald-Sherbourne, C., Mazel, R. M., Schuster, M., Hamlin, J. S., Pereyra, M., Camp, P., Grabowsky, M., & Duan, N. 1998, "Increasing immunization rates among inner-city, African American children: A randomized trial of case management", *JAMA: the journal of the American Medical Association*, vol. 279, no. 1, pp. 29-34.

Wroe, A. L., Bhan, A., Salkovskis, P., & Bedford, H. 2005, "Feeling bad about immunising our children", *Vaccine*, vol. 23, no. 12, pp. 1428-1433.

Wroe, A. L., McKeever, C., Thackray, S., & Bhan, A. 2007, "Improving the selective neonatal BCG program", *Public Health Nursing*, vol. 24, no. 1, pp. 60-65.

Yarwood, J., Noakes, K., Kennedy, D., Campbell, H., & Salisbury, D. 2005, "Tracking mothers attitudes to childhood immunisation 1991-2001", *Vaccine*, vol. 23, no. 48-49, pp. 5670-49.

Yusuf, H. R., Coronado, V. G., Averhoff, F. A., Maes, E. F., Rodewald, L. E., Battaglia, M. P., & Mahoney, F. J. 1999, "Progress in coverage with hepatitis B vaccine among US children, 1994- 1997", *American Journal of Public Health*, vol. 89, no. 11, pp. 1684-1689.