National Institute for Health and Care Excellence

Final

Vaccine uptake in the general population

[J] Evidence review for the acceptability and effectiveness of interventions to increase routine vaccine uptake

NICE guideline NG218

Evidence review underpinning recommendations 1.2.6, 1.3.6, 1.3.28, 1.3.27, 1.3.30, 1.3.34 to 1.3.37 and 3 research recommendations in the NICE guideline

May 2022

Final

This evidence review was developed by the Guideline Development Team

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1.1 Review question

What are the barriers to, and facilitators for, increasing the uptake of routine vaccines?

Sub-question: What is the acceptability and effectiveness of specific interventions to increase routine vaccine uptake?'

1.1.1 Introduction

The UK has a routine vaccination schedule covering key vaccinations for different stages in life including childhood, adolescence, pregnancy, and old age (65 years and older). Current practice is for healthcare practitioners to advise people to accept these vaccinations at the relevant times unless contraindicated. However, the incorrect linking of the MMR vaccine to autism resulted in a reduction in MMR vaccination which is now being reflected in an increase in the number of cases of measles. There were 991 confirmed cases of measles in England in 2018 compared with 284 in 2017 and the World Health Organization no longer considers measles 'eliminated' in the UK. Although vaccination levels in general in the UK are relatively high, levels of uptake vary between vaccines and the age groups they are targeted at. For example, 5-in-1 coverage of children measured at 5 years was 95.2% in 2019/2020, while 83.9% of Year 9 females completed the 2-dose HPV vaccination course in 2018/19. By contrast, from April 2018 to March 2019, shingles vaccine uptake for the 70-year-old routine cohort was only 31.9%, pneumococcal vaccine uptake for all people aged 65 years and over was 69.2%, and pertussis vaccine coverage in pregnant women was 68.8%. However, vaccination rates need to be actively maintained and ideally increased in the face of increasing vaccine scepticism and misinformation. The COVID-19 pandemic has also reduced routine vaccination rates and is likely to continue to disrupt routine vaccinations in the foreseeable future. In addition, certain population groups (such as some Gypsy, Roma and Travellers and migrants) have lower levels of vaccination than the general public and additional or different actions may be required to increase their vaccination rates.

Reasons for low uptake may include poor access to healthcare services; inaccurate claims about safety and effectiveness, which can lead to increased concerns and a reduction in the perceived necessity of vaccines; and insufficient capacity within the healthcare system for providing vaccinations. In addition, problems with the recording of vaccination status and poor identification of people who are eligible to be vaccinated may have contributed to this problem. While some barriers to vaccine uptake are obvious, others remain unclear and there are likely to be additional barriers that affect specific population groups, such as Gypsy, Roma and Travellers and migrants. In addition, less is known about the facilitators for vaccine uptake. Information about facilitators and the acceptability of interventions are needed to support the successful implementation of these interventions to increase uptake. This review is part of a larger review of barriers to and facilitators for vaccine uptake. It aims to examine the acceptability, implementation and effectiveness of specific named interventions as part of a mixed-methods analysis. The protocol for this review, together with the barriers and facilitators review, is detailed in Appendix A and summarised in Table 1.

1.1.2 Summary of the protocol

Table 1 SPIDER table

Type of review	Qualitative evidence synthesis
Sample	Inclusions: • All people who are eligible for vaccines on the routine UK vaccination schedule and their families and carers (if appropriate). • Staff including, but not limited to, those providing advice about or administering vaccines and those people with relevant administrative or managerial responsibilities. Exclusions: • None
Phenomenon of Interest	Interventions to increase the uptake of routine vaccines
Design	Studies using qualitative methods: • Systematic reviews of included study designs • Qualitative studies that collect data from focus groups and interviews • Qualitative studies that collect data from open-ended questions from questionnaires/ surveys • Mixed method study designs (qualitative evidence that matches the above study designs only)
Evaluation	Themes will be identified from the literature and not pre-specified. Relevant themes may include the thoughts, views and perceptions of individuals, parents or carers and staff about specific interventions to increase vaccine regarding: • acceptability • implementation • accessibility
Research type	Qualitative and mixed methods studies

1.1.3 Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Declarations of interest were recorded according to NICE's conflicts of interest policy.

Methods specific to this review question are described in the review protocol in Appendix A and the methods document.

Please note that the review protocol also includes a quantitative question about interventions to increase uptake. This part of the work is presented in evidence review C to ensure the size of the evidence reviews remains manageable. This review is part of a larger qualitative review looking at the barriers to and facilitators for vaccine uptake.

The following additional methods apply to both qualitative reviews:

1. This review refers to the UK routine vaccination schedule. The November 2019 schedule was used for these reviews and is available with the current version of the complete routine immunisation schedule.
2. In this guideline, the term pregnant woman is used to include women who are pregnant as well as transgender or non-binary people who are pregnant. This terminology is used to maintain consistency with NHS websites.

3. A date limit of 1990 was used for all reviews because the vaccination schedule for babies changed in 1990. This will include papers published after the MMR scandal of 1998 when attitudes to vaccinations changed in the UK and the numbers of vaccine related studies increased greatly.
4. The countries of interest were limited to those in the Organisation for Economic Co-operation and Development (OECD) because less economically developed countries are likely to have different reasons for low levels of vaccine uptake associated with less well-developed healthcare systems. As a result, interventions to improve uptake and the view about barriers and facilitators to vaccine uptake in these countries are less likely to be relevant for the UK.
5. They agreed that UK studies could be prioritised if a large number of studies were identified. Where there was insufficient evidence from the UK alone this prioritisation was extended to include studies based in Australia, Canada, Ireland, the Netherlands and Scandinavia (Denmark, Norway, and Sweden) because they also have universal healthcare and similar populations to the UK.
6. To make analysis easier the review work was divided into categories based on subgroups listed in the protocol. These were: pregnant women; people aged 65 years and older; 0-5 year olds and 11-8 year olds.
7. The decision to only look at UK evidence or the extended OECD subset was made at the subgroup level so, for example, where we found sufficient evidence for the views of parents concerning HPV vaccinations we didn't look for papers on this topic in the wider literature. The decision that there is sufficient evidence was made based on the number and richness of the included studies in consultation with the committee to ensure that they are able to make recommendations.
8. The committee noted that it was the presence of a vaccination against a disease on the routine schedule rather than the formulation of the vaccination that was important and therefore studies would not be excluded for using different formulations to the UK.
9. Routine vaccination schedules of countries other than the UK were checked using the WHO vaccine-preventable diseases: monitoring system unless a more up -to-date, approved, national/regional immunisation schedule is identified online. The routine vaccination schedule covers all routine vaccines from 8 weeks to 70 years old and includes the pertussis vaccine for pregnant women. People who are also eligible for selective immunisation programmes (e.g., high-risk groups) or additional vaccines will be included for routine vaccines only.
10. The committee agreed that studies from the OECD would be judged as highly relevant initially and then downgraded at the study level if there was a reason to believe that the individual study was not completely relevant to the UK population. In addition, a finding identified from an otherwise highly relevant or relevant study could be downgraded if it was not relevant to the UK population. Committee input was used to determine where it was appropriate to downgrade in this manner.
11. Where a study was conducted in a country which has some differences in routine vaccine schedule compared to the UK but reports on barriers and facilitators to vaccine uptake in general, rather than a specific vaccine, it was included in the review and not downgraded.
12. For studies looking at specific vaccines to be considered for inclusion, the vaccinations included in the study must be in the routine vaccination schedule of the UK and the country where the study was conducted.
13. Finding from open ended questions from questionnaires were only included in the qualitative reviews when insufficient evidence is available from studies using focus groups and interviews because these usually provide a much richer source of data than open-ended questions in surveys.
14. The committee agreed not to include grey literature in the search for this topic because they thought it would be time consuming to identify and that it would be hard to find relevant literature. They agreed that if insufficient evidence is identified from the included study types, they would consider a focused call for evidence instead or look at indirect evidence.

15. The committee agreed that the barriers may be perceived or actual barriers (e.g., the individual may think that access is a problem because clinics aren't' available at convenient times/locations but if this is not the case in their area the barrier is one of perception rather than an actual physical barrier).
16. Catch up campaigns included in this guideline are as follows: opportunistic campaigns for people who missed a vaccination, and catch-up campaigns in under-vaccinated groups.
17. The scope of this guideline does not include flu vaccination as that is covered by another guideline (NICE flu guideline NG103).

The following additional methods apply to this qualitative review specifically:

1. Qualitative studies were included in this review if they examined a specific intervention programme and had an accompanying quantitative study which reported on vaccine uptake outcomes (see protocol deviation below).
2. Qualitative studies from the USA were excluded as the committee thought that that views about vaccines and vaccinations may differ due to differences between the healthcare systems in the USA and the UK. As such, the results from USA-based studies may not be generalisable to the UK population.
3. Quantitative data from papers associated with the interventions identified in the qualitative part of this review are included, and quality assessed using GRADE where appropriate.
4. Data for the Celebrate and Protect reminders programme for children aged 0-5 years was only available as part of a non-peer-reviewed report (Gibson 2014) and outcomes were therefore considered at higher risk of bias. This report stated the % vaccine uptake, but not the number of children in each arm. The percentages have therefore been reported to give the committee an indication of the effectiveness of the intervention, and outcomes were quality assessed using a modified version of GRADE. Quality was therefore based on risk of bias, directness and heterogeneity but not imprecision as it was not possible to calculate risk ratios.
5. A mixed methods approach was taken to assess the effectiveness of an intervention alongside views of different aspects of that intervention. Diagrams were created which outlined the main aspects of each intervention. These were linked to the main themes extracted from the qualitative studies and examples were included to highlight people's views in relation to those themes. Examples were coded to demonstrate which groups of people had reported those views (such as parents, healthcare staff and young people). For the interventions for 11-18 year olds, forest plots were included in the diagram to show whether the intervention was effective. For the 0-5 years group (Celebrate and Protect programme), insufficient data was available to produce a forest plot and so the differences in percentage vaccine uptake per arm was presented below the diagram.
6. Two studies (Chantler 2020 and Gibson 2014) were cluster non-randomised trials. For these studies, a modified risk of bias assessment was used. This checklist was composed of the ROBINS-I tool for non-randomised trials, with an additional section related to clustering methods taken from the Cochrane Cluster Risk of Bias 2.0 tool.
7. Where cluster RCTs were included any data provided that was already adjusted for clustering was presented. Otherwise we adjusted for clustering using an ICCs supplied in the studies or 0.05 otherwise because this was the most common ICC in the education review (evidence review E) and the MMR decision aid paper (Shourie 2013) was already included in that review with this adjustment.

Protocol deviation

The quantitative paper reporting on the effectiveness of incentivised consent forms (Forster 2017) reported consent form return as an outcome but did not report vaccine uptake. Although consent form return was not stated as an outcome in the quantitative protocol, this was included in the current review to provide an indication of the effectiveness of the intervention in the absence of specific information about vaccine uptake. The quality of this

outcome was subsequently downgraded to relevant due to being partially indirectly applicable to the review.

1.1.4 Qualitative and quantitative evidence

A literature search was conducted which identified 9226 articles. Of these, 505 potentially relevant qualitative studies were identified after screening the titles and abstracts against the review protocol. Once assessed in full 5 qualitative studies matched the protocol for this part of the review because they accompanied a specific intervention to increase uptake. (See evidence review B for included studies for the barriers and facilitators component of this review question.)

One qualitative study examined the views of participants of a reminder programme for the vaccination of babies and children aged 0-5 years, and another assessed the use of a parental decision aid for the MMR vaccine. Three papers evaluated HPV vaccination programmes for young people aged 11-18 years, 1 comparing the use of e-consent forms to standard paper consent forms and 2 papers for the same intervention which offered a financial incentive for young people who returned their consent forms.

The searches were re-run in April 2021 and 3 additional papers were identified as part of the reruns, all of which evaluated the use of the same HPV vaccination programme with a new method of gaining consent where all young people were invited to vaccination sessions, irrespective of whether they had returned a signed consent form. No evidence was found for pregnant women or people aged 65 years and older. All included evidence was based in the UK.

Quantitative evidence was available for each of the interventions identified in the qualitative evidence search. Further information about these quantitative studies is included in the section below.

See Appendix C for a diagram of the qualitative evidence study selection.

1.1.4.1 Included studies

Please refer to the complete routine immunisation schedule for an explanation of the abbreviations of vaccine names used below.

Babies and children aged 0-5 years old

Two qualitative studies were included, each with an associated quantitative paper. One study evaluated the use of the Celebrate and Protect vaccine reminders programme for childhood vaccines, and the other examined the use of a web-based decision aid aimed at parents whose children were eligible for the MMR vaccine.

The Celebrate and Protect programme

The programme involved reminders being sent to the parents or carers of a child before their scheduled vaccinations. The first reminder was sent in the form of a celebration card for newborn babies with a reminder to contact their GP and book a 6-8 week check. Birthday cards were sent to 1 year old children with a reminder to book vaccinations and to 4 year olds who had not yet received their immunisations. Celebration/reminder cards also contained information signposting parents and carers to the Personal Child Health Record and immunisation websites.

The qualitative study used semi-structured interviews with policymakers and practitioners and focus groups with parents and carers. The quantitative study reported on vaccine uptake at 12 months, 24 months and 5 years of age. The quantitative study was a non-peer reviewed article and so the quality of vaccine uptake outcomes were downgraded for risk of bias.

The web-based decision aid

Parents were sent a flyer that provided them with a website address and password so they could access the decision aid. The decision aid provided parents with background information on measles, mumps and rubella as well as the immunisation schedule and how the MMR vaccine works. Information was also provided on common symptoms and complications of each of the three diseases, as well as safety and side-effects of the vaccine. Interactive content was also included to help with the decision- making process, prompting parents to consider their reasons for or against vaccination and to record their intentions towards the MMR vaccine.

The qualitative study used a combination of questionnaires and semi-structured telephone interviews with parents to examine their views on the content of the intervention and its effect on decision making. Outcomes were assessed 1 week after parents accessed the decision aid.

See Table 2 and Table 3 for a summary of the characteristics of these studies.

Young people aged 11-18 years old

Three qualitative studies were included. One mixed-methods study evaluated an e-consent school-based intervention for HPV vaccinations. Two qualitative studies examined the same school-based HPV intervention, which promoted financial incentives for consent form return.

The e-consent intervention

The intervention provided parents and carers with a link to an online portal which included an electronic consent form and information about the vaccination programme. Parents and carers could use the portal to register their child and either agree to, or decline, the vaccination. The portal also gave nurses the ability to screen consent form return and to update records during immunisation sessions.

For the qualitative outcomes in the mixed methods study for the e-consent intervention, semi-structured interviews were held with Trust staff, parents or carers and young people. Focus groups were also conducted with some of the young people. The quantitative outcome of the study was number of people vaccinated at school immunisation sessions.

The financial incentives intervention

Girls in year 8 of secondary school (aged 12-13 years) were given standard information about the HPV vaccine and a consent form to be signed by their parents or carers. Girls were told (verbally by their teachers and via a letter provided with the consent form) that if they returned the signed consent form they would be entered into a prize draw to win one of several £50 shopping vouchers. Girls were entered into the draw regardless of whether the consent form said ‘yes’ or ‘no’ to the vaccination.

The first qualitative study, during the pilot phase of the project (Rockliffe 2018), gave questionnaires to girls and their parents to explore their opinions on the intervention. Staff members involved in running the intervention took part in telephone interviews. The second study (Rockliffe 2020), completed when the intervention was repeated the following year, used focus groups and questionnaires to explore girls’ perceptions of the incentives. One quantitative paper reported on the effectiveness of this intervention. The outcome from this paper was consent form return, rather than vaccine uptake, but was included to provide an indication of effectiveness in the absence of any information on uptake.

The intervention with a new method of obtaining consent

All female students in year 8 of secondary school (aged 12-13 years) were given an information leaflet about the HPV vaccination programme alongside a consent form for their parents or carers to either consent or refuse to vaccination. Vaccination sessions were

modified so that all young people were invited to the vaccination session, rather than just those who had returned a consent form. During the vaccination session, young people with a consent form signed by their parent received the vaccine. Those who wanted to receive the vaccine but had not returned a parental consent form spent more time with an immunisation nurse who attempted to contact a parent or carer by telephone to ask for verbal parental consent. If verbal consent was obtained then the young person was given the vaccine. If a parent or carer could not be contacted, then young people were assessed for competence by the immunisation nurse. This involved a discussion of their understanding of the purpose of the vaccine and possible side effects, and any health issues that needed to be taken into consideration. If a young person was assessed as competent, reported that they had discussed the vaccine with their parents or carers, and said that it would not cause disagreement within the family, they could provide written consent and be given the vaccine. Young people who were not deemed competent, or indicated that vaccination would cause disagreement at home, were not vaccinated and instead were given information about community-based clinics run by the immunisation nurses where the vaccine could be administered.

The 3 qualitative studies used semi-structured interviews with immunisation team members, school staff, parents and young people to examine people's views of the intervention and understanding of the self-consent procedure. The quantitative study reported vaccine uptake in the 2 areas that took part in the intervention using an uncontrolled-before-after design which did not include a comparator arm.

See Table 4, and Table 5 for a summary of the characteristics of these included studies.

The references for included studies are listed in Section 1.1.14

1.1.4.2 Excluded studies

The reasons for excluding studies at the full text stage are detailed in appendix J. Common reasons for excluding studies were ineligible study designs and participants with age ranges that did not overlap age ranges within the routine immunisation schedule.

1.1.5 Summary of studies included in the qualitative and quantitative reviews

Babies and children aged 0-5 years

Table 2 Summary of characteristics of included qualitative studies for vaccination of babies and children aged 0-5 years old

Author	Design and type of analysis	Country	Setting	Sample size	Objective	Population	Vaccine(s)	Associated quantitative study
Lwembe 2016	Semi-structured interviews and focus groups with thematic analysis	UK	9 London primary care trusts	15 policymakers, 9 primary care staff, 31 parents/carers	To assess the effectiveness and acceptability of the 'Celebrate and Protect' programme	0-5	Childhood vaccinations	Gibson 2014
Jackson 2010	Semi-structured interviews and questionnaires	UK	2 childhood organisations in Northern England	27 parents (5 took part in interviews)	Feasibility study to assess the acceptability of an MMR decision aid	0-5	MMR (Measles, mumps, and rubella)	Shourie 2013

Table 3 Summary of characteristics of included quantitative studies for vaccination of babies and children aged 0-5 years old

Author	Country	Sample size	Study design	Setting	Target population for vaccination	Interventions	Control	Vaccine(s)	Relevant outcomes
Gibson 2014	UK	Total unknown. Intervention arm: 16 programme managers, 9 providers, 31 parents/carers Control arm: numbers not reported	Cluster non-randomised controlled trial	9 London primary care trusts	Children up to 5 years	Celebrate & Protect reminders programme	Usual practice	Childhood vaccinations	Vaccine uptake
Shourie 2013	UK	127	Cluster RCT	GP practices	Children aged 3-12 months who are	Web-based decision aid	Usual practice	MMR	Vaccine uptake

Author	Country	Sample size	Study design	Setting	Target population for vaccination	Interventions	Control	Vaccine(s)	Relevant outcomes
					eligible for the MMR vaccine				

Young people aged 11-18 years

Table 4 Summary of characteristics of included qualitative studies for vaccination of young people aged 11-18 years old

Author	Design and type of analysis	Country	Setting	Sample size	Objective	Population	Vaccine(s)	Associated quantitative study
Audrey 2020 and 2021	Semi-structured interviews with thematic analysis	UK	Schools in 2 South West England Local Authorities	4 mainstream secondary schools, 5 alternative education settings: 1 immunisation manager, 3 immunisation nurses, 8 staff, 22 parents, 19 female students	• To consider the practicalities and implications of implementing new parental telephone consent and adolescent self-consent procedures for the HPV vaccine • To consider how acceptable the procedures associated with a new HPV intervention were to young people, parents and carers, school staff and immunisation nurses (follow-up from Audrey 2020)	11-18	HPV (Human papillomavirus)	Fisher 2020b
Chantler 2020	Semi-structured interviews with thematic analysis	UK	Secondary schools	28 schools: 3219 female students	To evaluate the effects of an electronic consent form on uptake of the first dose of the HPV vaccine	11-18	HPV	Mixed methods
Fisher 2020a	Semi-structured interviews with thematic analysis	UK	Schools in 2 South West England Local Authorities	4 mainstream secondary schools, 5 alternative education settings: 1 immunisation manager, 3 immunisation nurses, 8 staff, 22 parents, 19 female students	To consider the perspectives of young women, parents and professionals about HPV vaccination, and how this was influenced by the content and form of the information provided	11-18	HPV	Fisher 2020b

Author	Design and type of analysis	Country	Setting	Sample size	Objective	Population	Vaccine(s)	Associated quantitative study
					in the intervention (follow-up from Audrey 2020)			
Rockliffe 2018	Semi-structured interviews for staff. Questionnaires with open responses for students and parents*	UK	Schools in 3 London boroughs	6 schools: 6 staff, 31 parents, 181 female students	To assess the acceptability of incentivised vaccine consent form return (prize draw for students to win a shopping voucher)	11-18	HPV	Forster 2017
Rockliffe 2020	Focus groups and questionnaires with open responses*	UK	Schools in 3 London boroughs	Study 1 (focus groups): 36 female students Study 2 (questionnaires):	To assess the acceptability of incentivised vaccine consent form return (follow-up from Rockliffe 2018) and explore how incentives might change behaviour	11-18	HPV	Forster 2017
*Included because this study collected data from open-ended questions from questionnaires/surveys and there was a shortage of studies reporting on data from focus groups and interviews.								

Table 5 Summary of characteristics of included quantitative studies for vaccination of young people aged 11-18 years old

Author	Country	Sample size	Study design	Setting	Target population for vaccination	Interventions	Control	Vaccine(s)	Relevant outcomes
Chantler 2020	UK	28 schools (3219 female students)	Cluster non-randomised controlled trial	14 secondary schools in South London	Young people aged 11-18 years	Electronic consent form	Paper consent form	HPV	Vaccine uptake
Fisher 2020b	UK	6986	Controlled before-after study	Secondary schools in 2 Local authorities in South West England	Young people aged 11-18 years (girls in year 8 – 12-13 years old)	New process for obtaining consent	No intervention – usual processes in a similar area	HPV	Vaccine uptake
Forster 2017	UK	9 schools (593 female students)	Cluster RCT	Schools in 3 London boroughs	Young people aged 11-18 years (girls in	Incentivised consent form	Standard consent form	HPV	Consent form return*

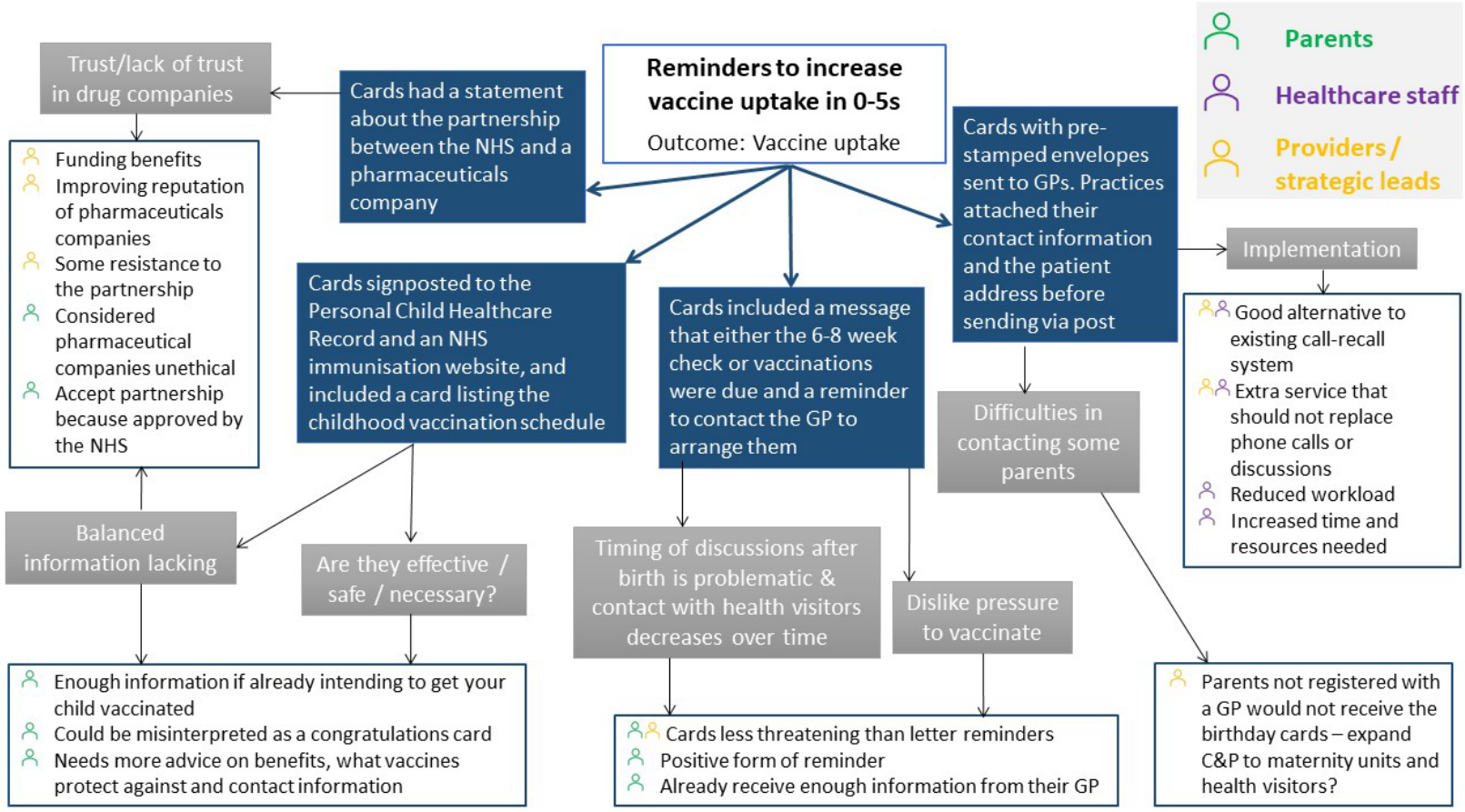
Author	Country	Sample size	Study design	Setting	Target population for vaccination	Interventions	Control	Vaccine(s)	Relevant outcomes
					year 8 – 12-13 years old)				
* Used as a proxy for vaccine uptake. See protocol deviation above and committee discussion.									

See Appendix D for more details about the included studies.

1.1.6 Summary of the qualitative evidence

Babies and children aged 0-5 years

Figure 1 Mixed methods summary of the effectiveness of the Celebrate and Protect reminders programme on childhood vaccine uptake, and the views of people involved in trialling the intervention. See the findings in Table 6 for more details.



Vaccine	Effect
12 months of age	
Diphtheria, tetanus, pertussis, polio, Hib	Uptake 2.3 percentage points higher for control
Meningitis C	Uptake 2.6 percentage points higher for control

Vaccine	Effect
24 months of age	
Hib and Meningitis C	Uptake 1.1 percentage points higher for Celebrate & Protect
MMR 1st dose	Uptake 1.8 percentage points higher for Celebrate & Protect

Vaccine	Effect
5 years of age	
MMR 1st dose	Uptake 3.6 percentage points higher for Celebrate & Protect
MMR 2nd dose	Uptake 1.8 percentage points higher for Celebrate & Protect

Table 6 Summary of the themes for vaccination of children aged 0-5 years using the Celebrate and Protect (reminder) programme

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
Acceptability				
1 (Lwembe 2016)	Some providers thought the cards were a useful way to communicate with parents and that they enhanced existing call/recall systems. Vaccination is difficult to discuss with some parents, and the cards were useful for the parents who see vaccination letters as threatening.	"…Celebrate and Protect supports communication…it makes things easier…" Moreover, in their experiences, "…mothers are reluctant to go to practices (for vaccination) unless invited as they feel surgeries are busy" and "do not like letters that sound threatening"	Downgraded once for methodological limitations and twice for adequacy	Very low
1 (Lwembe 2016)	Some parents felt that the cards were a more positive reminder for vaccination than the letters they received, while others thought they already received enough information from their GP and that the cards weren't necessary	"…do you see what I mean? You need to get your child to the clinic. You need to get them immunised. This [celebration card] is like; it is more of a positive reinforcement. The letter is more; you have been told off. This is more like… it is colourful…" "…good idea… a good reminder…because you have a little baby, sleepless nights, sometimes you might forget to make an appointment" "…Well I…I don't really need because I have …the Red Book…my doctor rang me and sent a text, so I get reminded all the time". "I still think it's a really good idea… (but)… a letter would be better I wouldn't need a pretty card"	Downgraded once for methodological limitations and twice for adequacy	Very low

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
Accessibility				
1 (Lwembe 2016)	Some providers thought the intervention should be expanded to maternity units and health visitors as parents who were not registered with a GP would not receive the reminder cards	"…(Celebrate and Protect) doesn't cover new parents/carers … they do not see us … see health visitor…health visitors remind them but [the] call has not come from [the] surgery so mothers forget…" "some parents take time to register their new-born"	Downgraded once for methodological limitations and twice for adequacy	Very low
Content				
1 (Lwembe 2016)	Parents thought that the cards had enough information for people who already intended to have their child vaccinated. Some people thought that, without more information, the card might be misinterpreted as just a congratulations card.	"…I think it's a very good idea and it's wonderful, however…I'd presume.... it's just a card, a congratulation card…" (Group 3-parents/carers).	Downgraded once for methodological limitations and twice for adequacy	Very low
1 (Lwembe 2016)	Parents suggested that the cards should either include more information about the benefits of vaccination, and what each vaccine protects against, or advice on who to contact if a parent wants more information	"…There's nothing on here to say why you should have your baby immunised…" "…Quite dry information, it just gives you the name of the inoculation. I'm not a doctor… Haemophilus influenzae Type B, what does that protect my baby with…?" "… although I always had the intention to keep up with all the immunisation, I was always a little bit sceptical and worried about immunisation…I would like to be more informed about the [unclear] side effects of the immunisation…"	Downgraded once for methodological limitations and once for adequacy	Low

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
Implementation				
1 (Lwembe 2016)	Strategic leads thought that the programme was low-cost, but reported a variation in engagement from practices. Of the practices that implemented Celebrate and Protect, some used it as an alternative to their existing call-recall system, while some practitioners and parents thought it should be used as an extra service and should not replace face-to-face discussions or phone calls.	"…there are practice variances - with some with total buy in and some that do not want to know/do not want any extra workload" "…Celebrate and Protect.... birthday cards have lessened my workload…don't have to make phone calls.... surgery does not have to pay for postage.... reduced workload as do not have to speak to address concerns…" "… I think you can't take away from people, like face to face or call…""…and if then they (mothers) say no then they can actually talk to them about the reason, so you're addressing…any other issues that they might have…"	Downgraded once for methodological limitations and once for adequacy	Low
1 (Lwembe 2016)	Practitioners had a range of opinions about the programme, with some indicating that it reduced their workload, while others reported that it took extra time or resources to implement the system, such as generating address labels	"[we did] not needed any support from lead PCT for Celebrate and Protect all very straightforward…with information pack…useful guide on how to do labels...." ".... working fine…not much extra work per month...." "…Cards were (in a box) waiting for me when I returned from Maternity leave""…difficult in our practice…" "…takes time…writing names and address on envelope.... do not generate labels…"	Downgraded once for methodological limitations and once for adequacy	Low
Sources of information				
1 (Lwembe 2016)	Some policymakers and practitioners were not overly concerned with the project working closely with a pharmaceuticals company, because of the funding benefits	"…growing reality…cannot afford purely a PH project as high costs.... three times costs for distribution and procurement""…in the new world …you want to continue [working] with	Downgraded once for methodological	Low

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
	for the project and the improving reputation of these companies. Others reported local resistance to the project.	Sanofi.... they will make a corporate social responsibility contribution....” “couple of years ago…probably would have had more reservations…but now as long as ethical issues are covered as required by DH policy document…we need to get used to working with private providers”“ Personally ‘don’t have an issue”, because the “reputation of pharmaceuticals is changing”…	limitations and once for adequacy	
1 (Lwembe 2016)	Some parents were accepting of the partnership because they could see it had been approved by the NHS. Others were more concerned because of information they had seen about pharmaceuticals companies that they considered unethical	“…If the NHS have approved, then I am okay with it…” “…I saw on the telly about price fixing with pharmaceutical companies, where they offer GPs incentives to prescribe their product....”	Downgraded once for methodological limitations and twice for adequacy	Very low

See Appendix F for full GRADE-CERQual tables

Figure 2 Mixed methods summary of the effectiveness of an MMR web-based decision aid on MMR vaccine uptake, and the views of people involved in trialling the intervention. See the findings in Table 7 for more details.

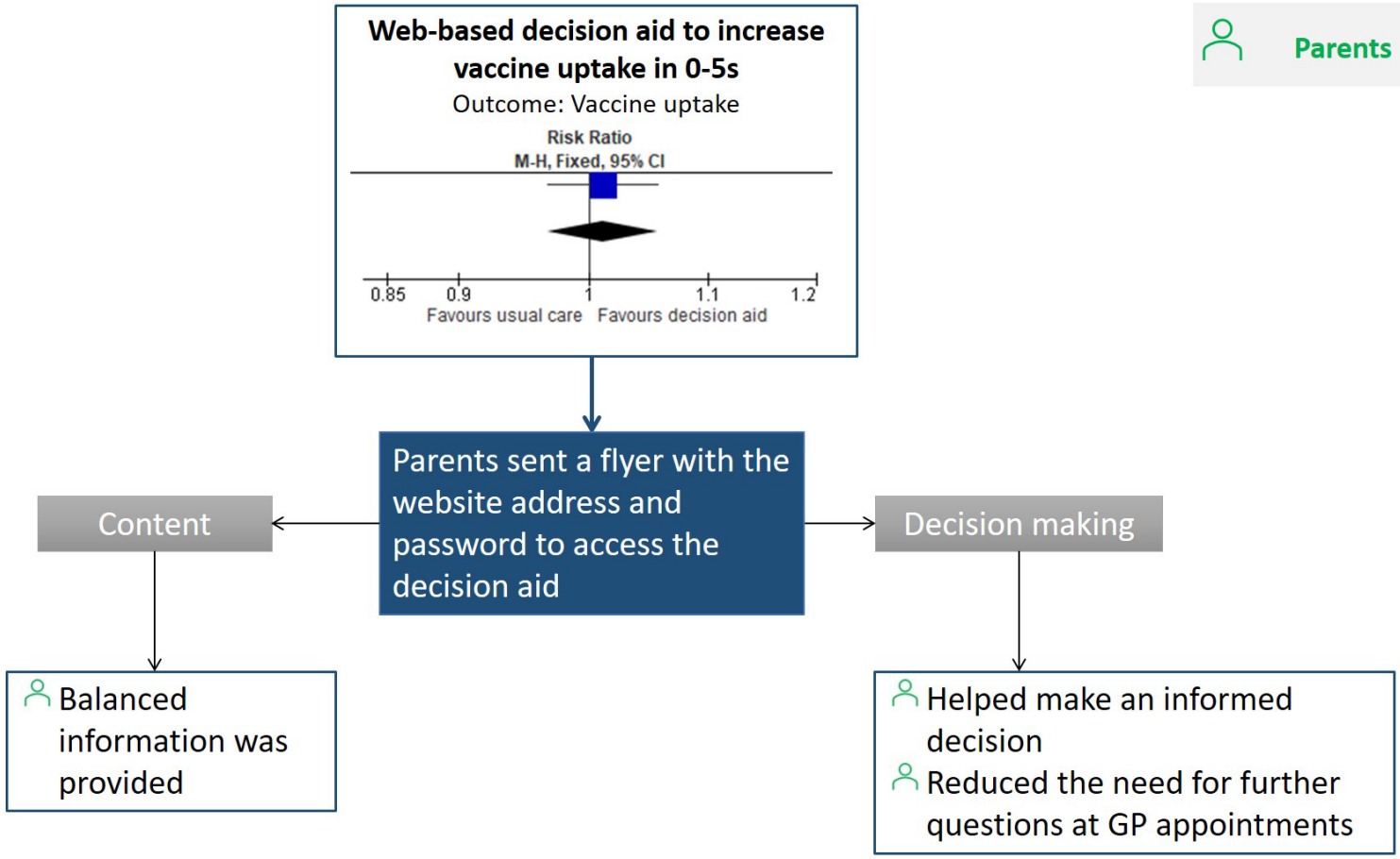


Table 7 Summary of the themes for vaccination of children aged 0-5 years using an MMR web-based decision aid

Studies	Theme	Illustrative quotes (where available)	CERQual explanation	Confidence
Content				
1 (Jackson 2010)	Some parents felt that the information in the decision aid was presented in a balanced way that reported both the potential benefits and harms	"It went through, you know the statistics for something happening, you know, something good, and something bad, and yeah, it didn't sort of hold anything back. If there was anything they had to put on and it was negative, they still gave you it. It wasn't just 'we want you to have MMR so we'll just give you all the good side'. They gave you a balance."	Downgraded twice for methodological limitations and twice for adequacy	Very low
Decision making				
1 (Jackson 2010)	Most of the parents interviewed felt that the decision aid helped them make an informed choice on MMR vaccination and reduced their need to ask further questions to healthcare practitioners	"To a point, it's [the decision aid] been too useful because when I actually went to take [name of son] to have his MMR done, and they said, 'have you any questions?' I thought well no actually because I mean I'm pretty happy with what we're doing"	Downgraded twice for methodological limitations and twice for adequacy	Very low

See Appendix F for full GRADE-CERQual tables

Young people aged 11-18 years

Figure 3 Mixed methods summary of the effectiveness of e-consent forms on HPV vaccine uptake, and the views of people involved in trialling the intervention.

See the findings in Table 8 for more details.

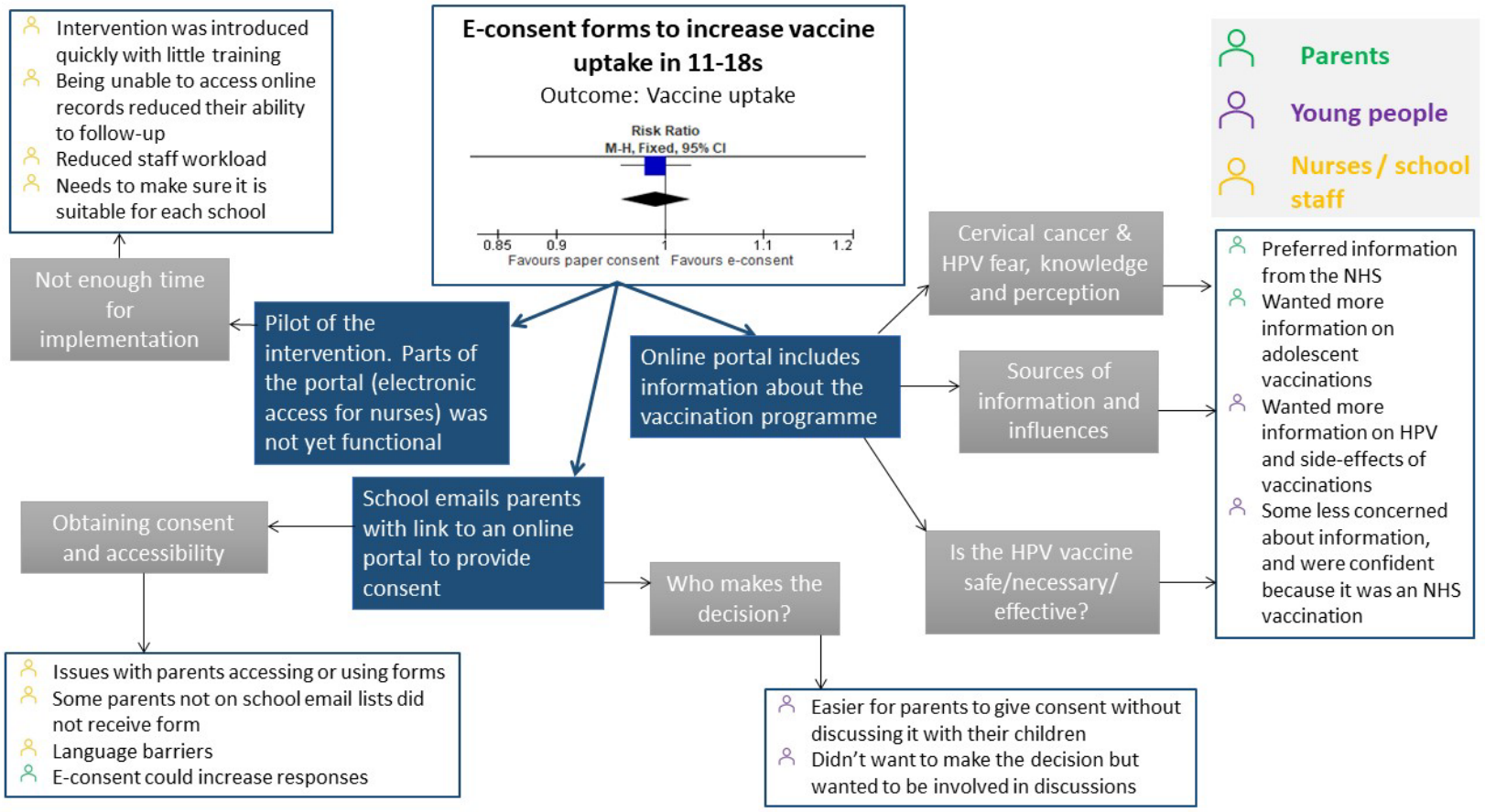


Table 8 Summary of the themes for vaccinating young people aged 11-18 years using e-consent forms

Studies	Theme	Illustrative quotes (where available)	CERQual explanation	Confidence
Accessibility				
1 (Chantler 2020)	Some parents felt positive about the use of e-consent forms, but schools reported issues with parents either accessing or using the forms, as well as language barriers. Some parents who were not on school email lists did not receive the consent form	"I thought it was very easy. I think you're probably going to get more responses that way from parents in this day and age. However, the downside is obviously you may not get that chance to discuss it." "my dad said I should have the vaccine, but he did not understand the whole google business about it"	Downgraded once for methodological limitations and once for adequacy	Low
Decision making				
1 (Chantler 2020)	Students thought that the use of an e-consent form meant that it was easier for their parents to give consent without discussing it with them. Students did not necessarily want to make the decision themselves but wanted to be involved in discussions about the vaccine so they were aware of what was happening and why	"…because like if it's emailed, like your mum doesn't have to share it with you. And like if I have something done like an injection, I'd like to know what's going on and when. But like she filled out the form without like telling me, so like if they'd been given out in school then I could have read it and see what's happening." "I wouldn't like to be given the option to like not to have the injection done…so I'm kind of glad that my mum just decided like on her own. But I would have liked her to talk it through with me…"	Downgraded once for methodological limitations and twice for adequacy	Very low
Implementation				
1 (Chantler 2020)	Staff were concerned about the speed at which the intervention was introduced, with little training. They also indicated that the decision to implement e-consent forms should involve discussions with each	"…think as well, it was probably four days before our first session, we didn't know what we were doing… so I do feel we are running before we can walk" "I would also say the idea of just changing to econsent… schools need different things… it	Downgraded once for methodological limitations and once for adequacy	Low

Studies	Theme	Illustrative quotes (where available)	CERQual explanation	Confidence
	individual school to make sure it is appropriate	is really important to work with the school and a make sure that they are happy with everything and it suits that school, because some schools it might just not suit right now. It might suit them in a couple of years, but right now it just doesn't work"		
1 (Chantler 2020)	Staff felt that being unable to review consent form return online restricted their ability to follow-up on unreturned forms. However, some staff reported that the use of e-consent forms had reduced their workload	"…we had 80 consent forms outstanding at a big school. But, normally, if you only have a couple it's fine. It meant us was making calls all morning, it took a nurse out of immunising to be able to do that, so that did have a big impact"	Downgraded once for methodological limitations, once for relevance and once for adequacy	Very low
Sources of information				
1 (Chantler 2020)	Parents preferred information that was from the NHS and would have liked more information on adolescent vaccinations. However, none of them accessed the information that came with the reminder	None available	Downgraded once for methodological limitations and twice for adequacy	Very low
1 (Chantler 2020)	Students would have liked more information about HPV and the side effects of vaccinations. Others were less concerned with information as they accepted that they should have the vaccine, and had confidence in the vaccine as it was from the NHS	"I think because it's like by the NHS—it kind of gives it validation."	Downgraded once for methodological limitations and twice for adequacy	Very low

See 110Appendix F for full GRADE-CERQual tables

Figure 4 Mixed methods summary of the effectiveness of incentivised consent forms on HPV vaccine uptake, and the views of people involved in trialling the intervention.

See the findings in Table 9 for more details.

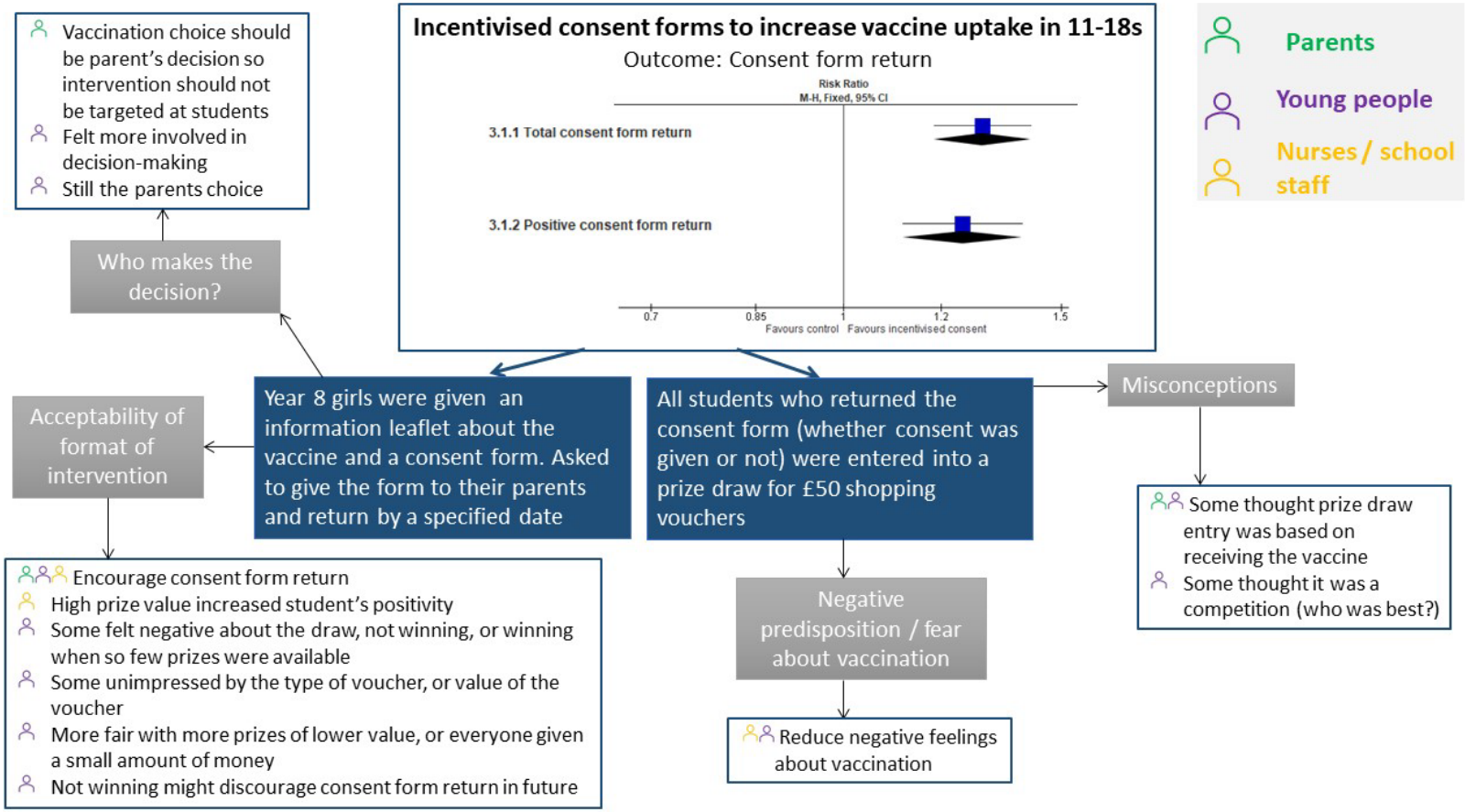


Table 9 Summary of the themes for vaccinations of for young people aged 11-18 years using incentivised consent forms

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
Acceptability				
2 (Rockliffe 2018, Rockliffe 2020)	Many of the students and parents liked the incentive idea and thought it encouraged consent form return. However, some students reported negative emotions when they heard about the draw or when they didn't win. Some also felt guilty about winning when there were so few prizes available. Some said that not winning might discourage consent form return in future	"I think it's a really cool idea and definitely encourages people to bring their forms back into school" "I think it was a good prize [£50-1/10]. I mean, you can't expect much but it was a good prize. . . I think it was kind of motivating because, you know, you get shopping in return"	Downgraded once for methodological limitations	Moderate
2 (Rockliffe 2018, Rockliffe 2020)	Some girls thought the prize was relevant to their age group but others were not impressed by the type of voucher, or the value of the voucher. Some girls suggested that it would be more fair if there were more prizes of lower value, or everyone was given a small amount of money for consent form return.	"Because if it's like one out of100 people winning it that one person's winning it. And, if the money is quite low then they wouldn't be that like jealous. But if it's really high then there might be more chance of people getting annoyed about it"	Downgraded once for methodological limitations and once for adequacy	Low
2 (Rockliffe 2018, Rockliffe 2020)	Some students and parents thought the incentive was unnecessary and should focus on health education instead.	"I think that it is unnecessary because the consent form is very important and the girls should know well enough that it's essential to bring it back to school" "I think it's a good idea to encourage the girls, however seems like a "bribe". Perhaps more health education is required?"	Downgraded once for methodological limitations and once for adequacy	Low
Decision making				
2 (Rockliffe 2018, Rockliffe 2020)	Some parents thought that vaccination choice should be the parents' decision and so the intervention should not be targeted at students	"As the 12 year old child still needs parental consent it is unclear why the form is not sent to/returned by the adult -	Downgraded once for methodological limitations and once for adequacy	Low

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
		no need to involve/bribe the child in this transaction surely?"		
2 (Rockliffe 2018, Rockliffe 2020)	However, some of the students liked the incentive as it meant they felt more involved in decision making, even though the final decision was the parents' choice	"I guess it was motivation to give in your HPV vaccines [consent forms] but I think quite a lot of parents were just forcing us to do it anyway so. . ."	Downgraded once for methodological limitations and twice for adequacy	Very low
Misconceptions				
2 (Rockliffe 2018, Rockliffe 2020)	Some parents and students mistakenly thought that entry into the prize draw was fake or based on receiving the vaccine, rather than consent form return. Others mistook the nature of the draw, thinking that it was a competition, where the people who did best or were most brave during the vaccination won the prize	"I would have had the jab anyway but I know that a lot of people were more likely to have it because of the voucher" "Because it's like, it's kind of offering a lot of money to a lot of people. It kind of just seems a bit odd. So, like, if it was like, £10 to the same amount of people. Or £50 to, like, a smaller amount of people then it might be more believable"	Downgraded once for methodological limitations and once for adequacy	Low
Perceptions				
1 (Rockliffe 2018)	Staff members and students thought that the intervention would encourage consent form return and reduce negative feelings associated with vaccination. Staff believed that girls responded positively to the prize draw incentive, and this positivity was increased by the relatively high value of the prize	"Um, they were, they were really keen actually… yeah, that, that was, um, quite a big… because it was quite a big prize actually, so I think, yeah, they were, they were so pleased" "I think that the injections are a little bit scary and being entered into the prize draw makes it seem more fun and better"	Downgraded twice for methodological limitations and once for adequacy	Very low

See Appendix F for full GRADE-CERQual tables.

Figure 5 Mixed methods summary of the effectiveness of using a new process to obtain consent on vaccination day.

See the findings in Table 9 for more details.

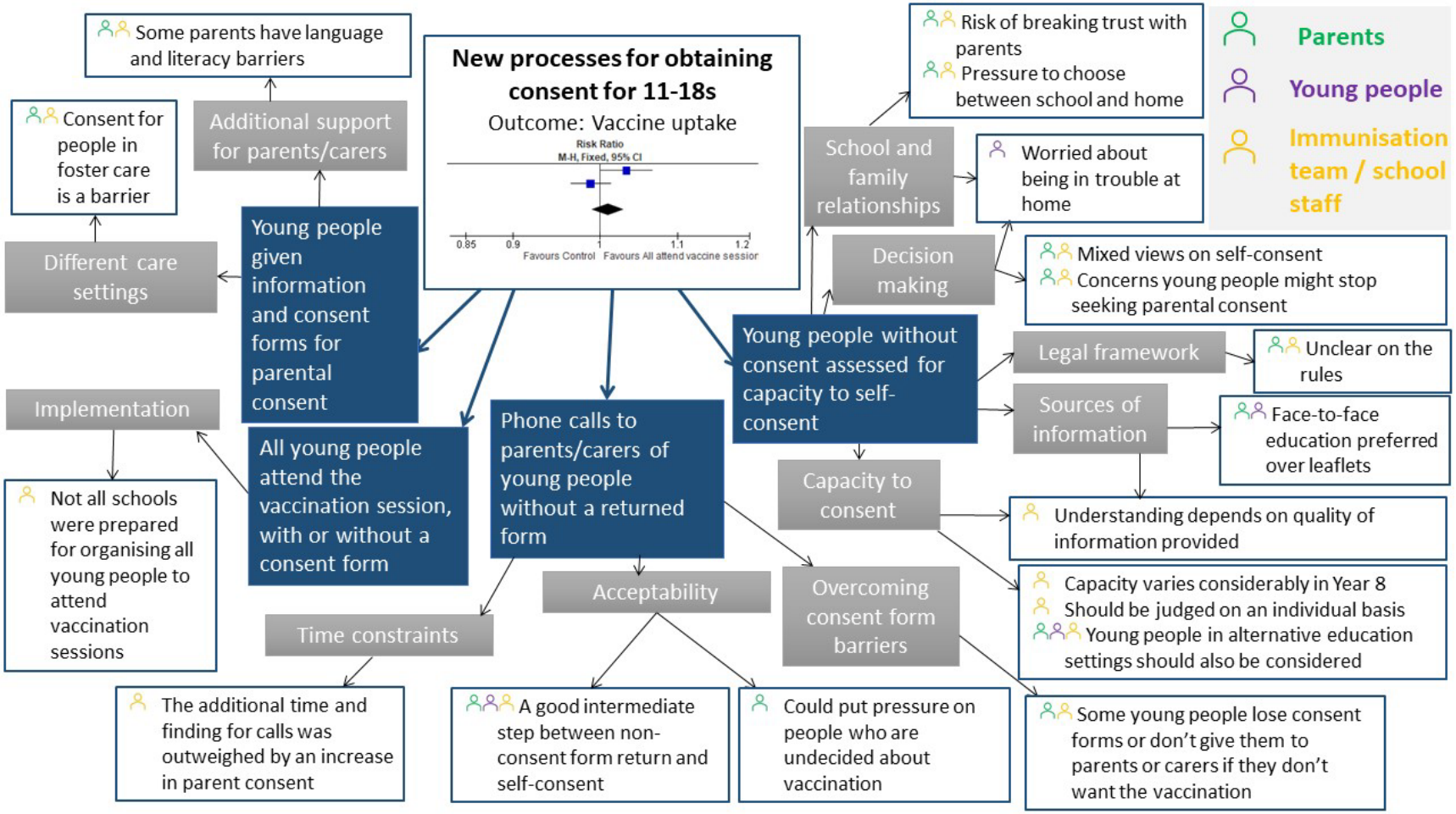


Table 10 Summary of the themes for vaccinations for young people aged 11-18 using a new process to obtain consent on vaccination day

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
Acceptability				
3 (Audrey 2020, Audrey 2021, Fisher 2020a)	The immunisation team, parents and students were in favour of phone calls to parents or carers when a consent form had not been returned. This was seen as a good intermediate step between non-consent form return and a young person giving self-consent. However, some parents questioned whether this could put additional pressure on parents or carers who were undecided about vaccination.	"Initially when we talked about self-consent there were lots of concerns. Certainly, as a team, that's why we suggested we do parental verbal consents as a step before going to self-consent, so I think we're quite happy with that" "Even though there is a self-consenting process, the school nurses are quite good at phoning the - they're very good at phoning the parents here, and also the girls would generally want to phone the parents as well." 'The school had to ring her [participant's mother] to make sure that she was giving her consent…Because she read the information and she signed it but then she didn't give it back to me so I couldn't get it back to school in time. 'If the parents, let's say, have a religious problem and they haven't formed an opinion as yet and they feel emotional about the topic and they don't know where the position is and all of a sudden you have a professional calling say 'Yes or no please'. Now that creates quite a bit of pressure"	Downgraded once for methodological limitations	Moderate
3 (Audrey 2020, Audrey 2021, Fisher 2020a)	There were mixed views over self-consent. Some saw it was a positive process to avoid a young person missing out on immunisation if their parent or carer has forgotten to sign the	We have had some people that we've self-consented and the parents have come back and said 'Thank you very much', you know, 'I haven't been very	Downgraded once for methodological limitations	Moderate

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
	form, and thought that it is a decision that the girl should be able to make about her own life. Others were concerned that this could leave a young person under pressure to tell their family that they had self-consented to vaccination	organised today, things have been a bit mad, I really did want her to have it done so that's great, thank you very much'" "She was very aware of what the vaccination was about... we felt she was able to give her consent so we went ahead and gave the vaccination on the basis of selfconsent and then had a huge complaint from parents because actually they'd signed the form to say no but the girl hadn't handed that in... I think she was a very bright girl and knew how to get it without her parents' consent 'cos she knew her parents would say no... that girl won't get her second dose next year 'cos now we know the parents have adamantly said no, she's not to receive it... I think that's very sad"		
Accessibility				
1 (Fisher 2020a)	Staff and parents highlighted the additional needs of some parents, such as language and literacy barriers. They discussed the importance of making sure that additional support is provided to these parents to make sure the information provided is appropriate for them to understand	"If there are parents who have their own learning needs, we would probably need to be talking to them, not just sending the note home." 'There's still a few parents here who can't read so hopefully the students would explain to them." "If they could just put the information out in clearer form everybody would be able to understand it."	Downgraded once for methodological limitations and once for adequacy	Low
2 (Audrey 2020, Audrey 2021)	The consent process for young people living in the care of the local authority or a foster family was raised as a barrier to vaccination.	"Their foster carers are not allowed to sign it, but actually the foster carer is there with them, talking to them about it. So actually, you know, it should be I think a joint decision, particularly as I	Downgraded once for methodological limitations and twice for adequacy	Very low

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
		say we've had so many problems getting hold of social workers. But we have got a policy in place for that for September so hopefully that might improve…Just that we let social workers know at the beginning of the academic year and get consent at the beginning of the year."		
Alternative education settings				
2 (Audrey 2020, Audrey 2021)	Parents, staff and immunisation teams thought it was important that nurses are familiar with the additional needs of each young person and using that information to help judge capacity to self-consent. Some young people were concerned they would be overlooked for self-consent because of their additional needs.	"I think with the type of students we've got I don't think, you know, a nurse would want to make that decision. I don't know [laughs] but I think that would be putting quite a lot of pressure on them as well actually to judge capacity." "I think you'd have to take it on an individual case because a lot of the children are really bright and switched on and know a lot about a lot of things and it's not saying they wouldn't understand but I think because the extra, the nature of their disability, I think you would have to be a bit more careful with consent." "My biggest fear is having my agency taken away from me based on me being disabled and thus perceived as not being able to make a decision, but I can."	Downgraded once for methodological limitations and once for adequacy	Low
Capacity to consent				
1 (Audrey 2020)	There were mixed views on the age at which a young person was able to make an informed decision about vaccination. Some staff thought that by year 8 (age 12-13), young people should be able to make this choice, but others thought	"I still think that it's a little bit young, 13, to be self-consenting" "Once they get to Year 8 [aged 12–13 years] many of them, are in a good	Downgraded once for methodological limitations	Moderate

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
	the decision should be made on an individual basis because the capacity to consent varies considerably at this age	position I would say to make an informed choice" "Year 8 is a hard one. Some of them are still babies when they come and talk to you, they can't even say the word sex or pregnant without getting all embarrassed. And some of them are really mature, really sensible, really know their own mind and can give consent, so it's a really tricky age. I would love to say yes they should all be able to consent for their own health matters and be able to consent for them but truly some of them are not mature enough so it's a real split at that age I think"		
Consent form return				
2 (Audrey 2021, Fisher 2020a)	Paper consent forms were highlighted considered a potential barrier to vaccination because there is the possibility that a young person could lose it, not give it to their parents, or not return it if they don't want the vaccination. Consent forms mailed to the parents or verbal consent were both considered ways to overcome this	"It's maybe that the kid doesn't give their parents the letter 'cos maybe they've skimmed it through, they decide that they don't want it and then they just don't give it to the parents." "If she [her daughter] knows it's for an injection, she'll probably throw it in the bin or something 'cos that's what she's like. I mean that's what most girls are like isn't it? If they don't want to have-well who wants to have an injection?"	Downgraded once for methodological limitations	Moderate
Decision making				
3 (Audrey 2020, Audrey 2021, Fisher 2020a)	Some parents thought it was important the school-based vaccinations were determined by parental consent while others were less concerned about the need for their consent.	"As parents we make those decisions for our children on what we feel is best" ''If they couldn't get hold of me and she was in there, and they told me afterwards 'We decided we didn't have your consent, and we talked, and we felt	Downgraded once for methodological limitations	Moderate

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
		she was competent and we went ahead', I would not have a problem with that" "'There would be a tiny bit of me that would be worried if I wasn't in the loop that she just made some crazy decision with her mates not to go ahead with it" "I think being able to say 'No, actually I want a vaccine', I think it's really important because it is their health and it is their body and it is them that it's going to affect"		
3 (Audrey 2020, Audrey 2021, Fisher 2020a)	The immunisation team discussed how the processes for self-consent, such as young people saying whether they had discussed vaccination with their family, helped them to make decisions on capacity to consent. However, there were some concerns that an increase in the number of people self-consenting could lead to young people not seeking parental consent	'Whether it would cause more problems because they think "Oh it doesn't matter if I haven't got my consent form because I can self-consent anyway" and then obviously we have the problems of not everyone is suitable to self-consent, or if you've not discussed it with parents then we are not going to take your self consent. So, obviously I'm not for holding information back from them, but I don't know what we would gain from that information being pushed more to them… it opens up more cans of worms the more self-consent we do [laughs].'	Downgraded once for methodological limitations and once for adequacy	Low
Implementation				
1 (Audrey 2021)	Immunisation teams indicated that not all schools were prepared for the organisation associated with inviting all young people to vaccination sessions	"Some of them [schools] have not read the information that we gave them, and emailed to them, and gave them hard copies of at every opportunity! They still swear blind that they didn't know what was happening [laughs]… the consents and what we're doing, and the fact that we need everybody down, we need to	Downgraded once for methodological limitations and twice for adequacy	Very low

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
		speak to everybody… I think it doesn't get read"		
1 (Audrey 2021)	The immunisation team thought that the benefits of obtaining consent were thought to outweigh the drawbacks of the additional time needed to phone parents	"It's a lot of work and for those schools that you get 30, 40 plus consent forms not coming back in, and you've got all those young people with you and you're trying to make all these phone calls. Yes, it is frustrating but actually, the fact that they get a good percentage of those come back as positives, actually that's good because those young people wouldn't necessarily have got vaccinated otherwise."	Downgraded once for methodological limitations and twice for adequacy	Very low
1 (Audrey 2021)	Very few girls had to self-consent for vaccination but the immunisation team discussed how there were a number of processes to help them assess whether or not a girl could self-consent	"I would have a little chat with the girl and find out whether her parents are aware of the day and aware of the form and whether they've seen it… they've had to have chatted to the child about them wanting to have the immunisation for me to be happy to self-consent them.' 'We talk through the leaflet with them, talk about what HPV is and we ask them a few questions afterwards, the form that we go through, ask them a few questions about what is the name of the illness we're trying to protect, what can happen if you do get HPV virus, how many doses will you have. If they can't answer, even though you've just gone through the information with them, we wouldn't take their self-consent."	Downgraded once for methodological limitations and once for adequacy	Low
School-family relationships				
1 (Audrey 2021)	Trust between the school and parents or carers was considered very important, and school staff did not want to break this relationship. Some	"break down the trust between the school and the parent... I would be really upset if I didn't know about it and it took	Downgraded once for methodological	Low

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
	parents indicated that they would not be happy about vaccination taking place without their knowledge while some staff thought it was ok if there was a clear process in place to judge capacity to consent.	place and I hadn't been able to have a conversation, I'd be angry" "As long as it's all upfront and clear from the beginning then there's absolutely no reason why a student can't, shouldn't self-consent... they [parents] would be more likely to return the form if they didn't want to have it done with a note saying 'Look, I don't consent, OK' as opposed to just not returning the form at all"	limitations and once for adequacy	
1 (Audrey 2021)	There were concerns about the effect of self-consent on relationships between family members. It was suggested that self-consent could put young people under pressure to choose between the school and their family. Young people also had concerns about getting into trouble with their parents if they self-consented.	"The child should not be left alone with that decision and with being torn apart, between the school says one thing and the parent says another thing" "It's not right the kid should be prevented from being able to make that choice because of the parent, but at the same time, you do have to protect the kid and make sure they won't get into trouble for making that decision"	Downgraded once for methodological limitations and once for adequacy	Low
Sources of information				
2 (Audrey 2020, Fisher 2020a)	Staff thought that the quality of information provided to young people about vaccination would affect their capacity to make informed choices. Young people and their parents both thought that face-to-face education in schools from healthcare practitioners would be more effective than information leaflets.	"It's really important that students have been educated about what the vaccination is, why they're having the vaccination, something to do with the science behind it because otherwise they're not in a position I'd say to be able to make that informed choice" "When no one tells you, the girls just start, well the girls at my school just started making stuff up. Oh, the needles are really long and you're going to die and stupid stuff like that and that got some of girls really scared so it's good	Downgraded once for methodological limitations	Moderate

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
		to give them at least some information so they know the basics." "I would think more a healthcare professional because people wouldn't want to listen to teachers to be completely honest. When the teacher starts talking at you, it's when people generally switch off, but at least if it's someone external they try to listen" "I think if you have sessions within schools then that's a lot more structured, you have to focus, you have to learn … so that's something that has to happen, but if it's a leaflet that can get lost or screwed up, that's got so much potential to not get anywhere"		
Understanding the legal framework				
1 (Audrey 2020)	School staff and parents were both unclear on the legal framework surrounding self-consent for vaccination. Some young people were in favour of being able to give their own consent	''I think they have to be 16 to give consent for sexual activity so I think for injections and things like that, I still think it should be 16" 'We all think it's the parents but actually they [young women] can give consent, is that correct?" ''I think they should just stick to legally what's right.. . I think there's a lot more benefits that outweigh one angry parent emailing the school"	Downgraded once for methodological limitations and once for adequacy	Low
Vaccination beliefs				
1 (Audrey 2020)	Most parents were in favour of vaccination but there was an understanding that obtaining consent or self-consent where a family have anti-vaccination beliefs may be difficult	'The concern is where you've got families that maybe are very anti and wouldn't consent and that's going to cause all kinds of logistical problems" ''I think there's more fear in special needs schools because there is still the	Downgraded once for methodological limitations and twice for adequacy	Very low

Studies	Finding	Illustrative quotes (where available)	CERQual explanation	Confidence
		anecdotal evidence that vaccines, particularly the MMR, have caused the harm"		

See Appendix F for full GRADE-CERQual tables.

1.1.7 Summary of the quantitative evidence

Babies and children aged 0-5 years

Table 11 Babies and children aged 0-5 years using reminders (Celebrate and Protect Programme)

No. studies	Vaccine	Celebrate and Protect	Control	Quality	Interpretation of effect
Vaccine uptake[1]					
1 (Gibson 2014)	12 months of age (Diphtheria, tetanus, pertussis, polio, Hib)	85.7%	88.0%	Very low[2]	Uptake 2.3 percentage points higher for control
1 (Gibson 2014)	12 months of age (Meningitis C)	89.5%	92.1%	Very low[2]	Uptake 2.6 percentage points higher for control
1 (Gibson 2014)	24 months of age (Hib and Meningitis C)	84.4%	83.3%	Very low[2]	Uptake 1.1 percentage points higher for Celebrate & Protect
1 (Gibson 2014)	24 months of age (MMR 1st dose)	86.3%	84.5%	Very low[2]	Uptake 1.8 percentage points higher for Celebrate & Protect
1 (Gibson 2014)	5 years of age (MMR 1st dose)	91.3%	87.7%	Very low[2]	Uptake 3.6 percentage points higher for Celebrate & Protect
1 (Gibson 2014)	5 years of age (MMR 2nd dose)	80.5%	78.7%	Very low[2]	Uptake 1.8 percentage points higher for Celebrate & Protect

1. Study did not report number of participants so risk ratios could not be calculated. Percentage vaccine uptake per arm is reported instead. No p- vales were provided by the study for these comparisons.
2. Risk ratios could not be calculated so quality was assessed using a modified version of GRADE. Quality assessment based on risk of bias, directness and heterogeneity.

See Appendix F for full GRADE tables.

Table 12 Babies and children aged 0-5 years using an MMR web-based decision aid

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Vaccine uptake (RR >1 favours e-consent forms)							
1 (Shourie 2013)	Cluster RCT	127	RR 1.01 (0.97, 1.06)	99 per 100	100 per 100 (96, 100)	The study could not differentiate change in vaccine uptake between use of a web-based decision aid and usual practice	Low

See Appendix F for full GRADE tables

Young people aged 11-18 years

Table 13 Young people aged 11-18 years using electronic consent forms

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Vaccine uptake (RR >1 favours e-consent forms)							
1 (Chantler 2020)	Cluster non-RCT	3219	RR 0.99 (0.96, 1.02)	81 per 100	80 per 100 (78, 83)	The study could not differentiate change in vaccine uptake between e-consent forms and paper consent forms	Very low

See Appendix F for full GRADE tables

Table 14 Young people aged 11-18 years using incentivised consent forms

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Consent form return (RR >1 favours incentivised consent form)							
1 (Forster 2017)	Cluster RCT	593	RR 1.30 (1.18, 1.42)	67 per 100	87 per 100 (79, 95)	Favours incentivised consent forms	Low
Positive consent form return (RR >1 favours incentivised consent form)[1]							
1 (Forster 2017)	Cluster RCT	593	RR 1.25 (1.12, 1.39)	76 per 100	96 per 100 (86, 100)	Favours incentivised consent forms	Low

1. Proportion of consent forms returned that agreed to vaccination

See Appendix F for full GRADE tables

Table 15 Young people aged 11-18 years using a new process to obtain consent on vaccination day

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Local Authority 1							
1 (Fisher 2020b)	Controlled before-after study	4384	RR 1.03 (1.00, 1.07)	80 per 100	82 per 100 (80, 85)	The study could not differentiate change in vaccine uptake between all young people attending vaccination sessions and control	Very low
Local Authority 2							
1 (Fisher 2020b)	Controlled before-after study	2602	RR 0.99 (0.97, 1.01)	85 per 100	86 per 100 (84, 88)	The study could not differentiate change in vaccine uptake between all young people attending vaccination sessions and control	Very low
Pooled Local Authority data							
1 (Fisher 2020b)	Controlled before-after study	6986	RR 1.01 (0.99, 1.03)	85 per 100	86 per 100 (84, 88)	The study could not differentiate change in vaccine uptake between all young people attending vaccination sessions and control	Very low

See Appendix F for full GRADE tables

1.1.8 Economic evidence

A single systematic review was conducted to identify economic evaluations relevant to any of the quantitative review questions in the guideline. The search returned 5,716 records which were sifted against the review protocol. Of these publications 5,669 were excluded based on title and abstract. On full paper inspection 43 studies did not meet the inclusion criteria for any review question. Inclusion was restricted to cost-utility analyses from OECD countries comparing interventions to increase vaccine uptake for vaccines in the UK immunisation schedule as described in the green book. Four published economic analyses were included in the evidence synthesis.

Due to a lack of cost-utility evidence in children, an additional inclusion set was used to identify studies in children and adolescents (0-18 years), where outcomes were not restricted to QALYs only (and therefore cost-effectiveness studies were also included). An additional six studies from the search were included on this basis to provide evidence in the younger population.

The search was rerun in April 2021 to identify any newly published papers and returned 544 publications, of which 541 were excluded based on title and abstract and two were excluded at the full text inspection. One additional published cost-utility analysis from this search was included in the evidence synthesis.

1.1.8.1 Included studies

None of the 11 studies identified in the systematic review were relevant to this review question.

1.1.8.2 Excluded studies

A list of studies excluded at full text from the cost-effectiveness review can be found in Appendix J.

1.1.9 Economic model

The committee discussed incentives for consent form return for school-based vaccinations and, due to the anticipated resource impact, a costing analysis was undertaken to better estimate the costs associated with this intervention.

The incremental cost per additional person vaccinated against was calculated for incentives plus phone reminders compared with phone reminders only. Positive consent form return was used as a proxy for vaccination. Effectiveness evidence for the incentive intervention was taken from the Forster 2017 study where the incentive was a 1 in 10 chance of winning a £50 voucher. Alternative incentive values were also considered in the costing analysis, however there are limitations to these results as the effectiveness data is only available for the base-case analysis.

The cost per additional person vaccinated for each incentive value scenario and under two baseline uptake scenarios is presented in Table 16. Further details of the costing analysis are provided in Appendix I.

Table 16: Incremental cost per additional person vaccinated

	1 in 10 chance, £50 voucher	1 per school chance, £50 voucher	Fixed amount £3 per student	Free school-based perk
ICER (average UK baseline uptake)	£97.81	Dominant (cheaper and	£51.68	Dominant (cheaper and

	1 in 10 chance, £50 voucher	1 per school chance, £50 voucher	Fixed amount £3 per student	Free school-based perk
		higher uptake)		higher uptake)
ICER (low baseline uptake scenario)	£34.07	Dominant (cheaper and higher uptake)	£13.07	Dominant (cheaper and higher uptake)

1.1.10 Economic evidence statements

One original costing analysis found that for school-aged children eligible for the HPV vaccination, incentivising consent form return resulted in lower costs and higher vaccine uptake if the incentive was either a free-to-provide incentive or a 1 per school chance at winning a £50 voucher. For other incentive scenarios (a 1 in 10 chance of winning a £50 voucher, or a fixed amount of £3 per student) the cost per additional person vaccinated was between £13.07 and £97.81.

1.1.11 The committee's discussion and interpretation of the evidence

1.1.11.1 The outcomes that matter most

For the qualitative section of the review, views of young people, parents and carers and healthcare practitioners were all considered. For the HPV vaccine, the views of both young people and their parents and carers were considered particularly important because they are the groups responsible for consenting to the vaccine and for ensuring that consent forms are returned. For babies and children aged 0-5 years the views of the parents and carers were considered most important. However, the views of staff involved in delivering the interventions were also important, especially where they covered factors relating to implementation. The committee agreed that the most important findings were those concerning the acceptability of an intervention to its target; issues to do with implementing the intervention; and whether there were unintended consequences.

For the quantitative studies, the primary outcome was vaccine uptake. The committee agreed that this outcome was the most important for individuals, their parents and carers (as appropriate), and healthcare practitioners because the aim of this guideline is to increase vaccine uptake. None of the included studies reported the protocol's secondary outcomes, which were the proportion of people offered vaccinations and the numbers of people who develop the diseases the vaccines are aimed at preventing. Offers of vaccination was not considered as important as uptake because an offer may not necessarily result in a vaccination. Consent form return, and proportion of consent forms returned that agreed to vaccination, were not included in the protocol, but in the absence of information on vaccine uptake, were also considered important by the committee (see protocol deviation).

1.1.11.2 The quality of the evidence

Evidence was only identified for interventions targeted at young people aged 11-18 years and for babies and children aged 0-5 years. No qualitative papers accompanying interventions were identified for people aged 65 years and over or for pregnant women.

Babies and children aged 0-5 years

The qualitative evidence for the Celebrate and Protect reminders programme was low to very low quality and was from a single study which provided limited information about recruitment

methods. The quantitative evidence for vaccine uptake was very low quality, as it was from a non-peer-reviewed report which did not report how many participants were in the control arm or how they were recruited. The limited details on the methods used for recruitment meant that it was not possible to calculate effect sizes and confidence intervals for vaccine uptake, and so the only data that was available was percentage uptake per trial arm. Percentage vaccine uptake was not one of the outcomes stated in the protocol, but the study was included to provide the committee with an indication of the effectiveness of the intervention, with the quality of the outcomes downgraded for risk of bias. This approach was taken with the agreement of the committee.

Qualitative evidence for the use of an MMR web-based decision aid was very low quality and the evidence for vaccine uptake was low quality. Very few parents were included in the semi-structured interviews used in the study, and only two themes were identified with limited evidence to support each theme. The qualitative evidence was from a pilot of the intervention which did not provide information on vaccine uptake, and so the quantitative evidence was instead provided from a study published 3 years after the feasibility study had been completed. The effectiveness data is therefore from a different group to those who provided their views on the intervention; however, the newer study does not report changing the intervention from the format used in the pilot. Finally, this intervention was carried out on a population with high vaccine uptake, with 100% of children being given the vaccine in the intervention arm, and 98% in the control arm. It was therefore difficult to determine the effectiveness of the decision aid, which could potentially show a greater effect in a population with lower vaccine uptake.

Young people aged 11-18 years

For young people aged 11-18, the qualitative evidence for the use of e-consent forms was low to very low quality and the quantitative evidence for vaccine uptake was very low quality. The evidence was from a mixed-methods study of a pilot project designed to evaluate the implementation of the intervention. The quality of qualitative outcomes was downgraded as they were obtained from a single study with limited detail provided to support the themes. While the views on effectiveness of the intervention were directly applicable to the review, the views on implementation were only relevant (rather than highly relevant) as the part of the intervention which allowed nurses to monitor consent form return and update vaccination records was not fully functional during the pilot phase.

Qualitative evidence for the use of incentivised consent forms for the HPV vaccine ranged from very low to moderate quality, and the quantitative outcome was low quality. The effectiveness of this intervention was assessed by the number of consent forms returned, rather than vaccine uptake. Although this is not the stated outcome for this review, the committee discussed whether consent form return was an appropriate outcome that would provide an accurate reflection of changes in vaccine uptake. It was decided that, although vaccine consent forms could be returned with non-consent to the vaccine, it was likely that many of those returned would consent to vaccination. This was supported by an additional outcome in the incentivised consent form study, which reported the proportion of consent forms returned with a positive outcome (consented to vaccination). In the incentivised consent form arm, not only were more consent forms returned, but there was a higher proportion of positive consent forms returned in the intervention arm than in the control arm. In addition, in both arms over 85% of the returned forms gave consent for vaccination. Consent form return was therefore included as a proxy outcome for vaccine uptake, with the quality of the evidence downgraded once for indirectness. It was also highlighted that the evidence for this intervention was from an area of relatively low vaccine uptake. Although there was no evidence for the use of incentives in areas of higher uptake, the committee decided that, given the effectiveness of the intervention, incentives should be recommended to providers in all areas (see below for more details).

As there was limited evidence on this subject, the committee also decided to include a research recommendation to examine the effectiveness and acceptability of school-based incentive schemes. They included both financial and non -financial incentives and specified that the incentives did not have to be aimed at incentivising uptake directly but could be aimed at promoting other behaviours (for example, consent form return) that ultimately result in increased vaccine uptake. (See below for the committee's discussion about the potential issues raised by the use of financial incentives for vaccine uptake.) The committee discussed whether lower levels of incentive would have been equally effective in Forster 2017; and wondered at what level would the incentive cease to be effective. As a result, the economist carried out a costing exercise to estimate the resource implications of recommending incentives to increase consent form return (see the cost-effectiveness and resource use section below). This involved a range of scenarios and the remaining uncertainty around the level of incentive needed for cost-effectiveness resulted in the committee adding consideration of the levels, as well as types, of incentive that could be effective to the research recommendation. This research recommendation is explained in detail in Appendix K

Qualitative evidence for the use of new methods of obtaining consent (Audrey 2020, Audrey 2021, Fisher 2020a) ranged from very low to moderate quality and the quantitative outcome was very low quality. Both qualitative and quantitative evidence was directly applicable to the review, and while the quantitative evidence did not show an increase in vaccine uptake with the new methods of obtaining consent, the committee thought that the qualitative evidence raised some important issues that are relevant to the current methods used for school-based vaccinations. The new methods of obtaining consent described in the study are similar to those used in current practice and so the committee decided that the qualitative findings were directly relevant and could be applied to the current processes involved in obtaining consent for school-based vaccinations.

People aged 65 years and over and pregnant women

As no evidence was identified for either people aged 65 years and over or pregnant women, the committee could not make recommendations on specific interventions to increase vaccination uptake in either of these groups based on this review. Limited qualitative and quantitative evidence was identified for these groups in the intervention reviews and the main qualitative review on barriers to and facilitators for vaccine uptake. The committee therefore decided to make a research recommendation for each of these populations to identify whether there are any interventions that are both acceptable and effective at increasing vaccine uptake (for the research recommendation for people aged 65 years and over, see Appendix K in the review B on the barriers to and facilitators for vaccine uptake for more details; for pregnant women see Appendix K in the vaccinations for pregnant women review F for more details).

1.1.11.3 Barriers and facilitators for routine vaccinations

Babies and children aged 0-5 years

For babies and children, the qualitative evidence associated with the Celebrate and Protect intervention indicated that contact with parents soon after the birth of a child can be a problem, and some parents highlighted that they would like more, balanced, information about vaccinations. It was unclear from the quantitative evidence whether the intervention was effective at increasing uptake as the data was reported as % with no indication of variation. The committee agreed that there was insufficient evidence of benefit (increased vaccine uptake) to support recommending this particular intervention. They also noted that the funding for this intervention came from a pharmaceutical company and that this may have affected parents' responses to the intervention and, as a result, its effectiveness.

When discussing birthday celebration and reminder cards as a method of increasing childhood vaccination uptake, the committee highlighted concerns over a potential scenario where a child has died, and the relevant information has yet to be updated in their GPs system, resulting in a celebration card being sent to the family. Although this could also happen for vaccine reminder letters, the committee thought that receiving a celebration card for a child who has died would be a much worse scenario and would cause unnecessary pain to the bereaved family. The committee noted that they had already recommended using invitations/ reminders for vaccination with information based on the evidence in the reminders and education reviews (evidence reviews C and E respectively) and that these recommendations did not need amending based on the celebrate and protect intervention.

The quantitative evidence for the MMR decision aid had already been considered in the education review (evidence review E) alongside other studies looking at decision aids. The evidence from Shourie 2013 could not differentiate vaccine uptake between people using the MMR decision aid and usual care, but this may be due at least in part to the very high baseline vaccination rate in this study. The committee noted that the main themes identified in the qualitative evidence from this review showed that parents thought the decision aid helped them make informed decisions about vaccination and that that the presentation of information about the benefits and harms of vaccination was useful. The desire to make an informed decision based on information that is perceived to be balanced was also reflected in the main barriers and facilitators review (evidence review B). Based on the evidence in review E, the committee decided against making a specific separate recommendation in favour of using decision aids, however they agreed when they are available on trusted sites, they could potentially be a useful method of helping people make decisions about whether to be vaccinated or have their children vaccinated. This was supported by the qualitative findings with parents highlighting how the decision aid helped with decision making and reduced the need for them to ask further questions before reaching a decision.

Young people aged 11-18 years

One of the main barriers to young people receiving the HPV vaccine in schools relates to difficulties with gaining consent, as is the case when consent forms are not returned. This leads to immunisation providers spending lots of time chasing up non-responders to try to obtain consent. Evidence for the use of incentivised consent forms showed an increase in the number of forms returned when entry into a prize draw was offered. The committee therefore thought that this may be a useful method of increasing the number of forms returned. The committee discussed whether there were potential ethical issues surrounding the offer of financial incentives relating to vaccinations (see evidence review G for more discussion about this issue). However, it was highlighted that the incentive used in the evidence was based on consent form return rather than receiving the vaccination. The committee decided that this was a more acceptable form of intervention as it was promoting decision making about the vaccination, rather than the vaccination itself. However, it was noted that financial incentives may not be appropriate in all settings, such as faith schools, where a prize draw could be considered a form of gambling. The committee therefore decided not to specify what the intervention should be and instead the decision on exactly what incentive is offered can be made at a local level, by people who have an awareness of the particular school, the local community and its beliefs. The committee discussed how other potential incentives could include vouchers or lunch passes, which may be more acceptable in some settings than financial rewards. In addition, they also did not specify the target of the intervention. In the Forster studies (2018 and 2020) the intervention was aimed at students, but other interventions may be better suited to targeting parents and so the committee left this open for the providers to decide. Finally, the recommendation was not limited to areas of low uptake because the committee noted that the use of incentives for consent form uptake could also provide benefits in areas of high uptake by reducing the time needed for the immunisation team to chase up non-responders.

The committee considered whether e-consent forms could remove some of the barriers associated with non-return of paper consent forms. However, the evidence highlighted that while some parents preferred e-consent forms, others may not have access to the technology needed to access and return them online. Given that the evidence could not differentiate between vaccine uptake when e-consent or paper consent forms were used, the committee decided that they could not make a recommendation in favour of a single option. Instead, it thought that schools would be better placed to decide on the best option to suit their local community and decided against making a recommendation based on methods of consent form return, although they noted that e-consent forms are already in use in many areas.

The evidence for both e-consent and incentivised consent form return highlighted the importance of young people being made aware of vaccines and the vaccination process. One of the main themes relating to the HPV vaccine was that young people want to be involved in discussions surrounding the vaccine, such as the benefits and harms associated with vaccination. As this was a common theme in both qualitative studies and had been raised in the main barriers and facilitators review as well, the committee decided it was important to highlight this in a recommendation to try to help parents, carers and young people make an informed choice about vaccination. The committee decided that information about Gillick competence should also be included so that parents and young people are all fully aware of all the options surrounding vaccine consent. An additional recommendation was made, specifically aimed at young people, which highlighted the importance of school-based education. Although the qualitative evidence reported a range of views on the most appropriate method of giving young people information about vaccination, school-based education was commonly stated as one of these options. It was the committee's experience that this is standard practice in some schools, and they agreed that this was an important way of providing information about vaccinations delivered in school settings to children of appropriate ages and young people. They noted that the information provided could be tailored to their needs and level of understanding as young people would be able to understand more complex information than children.

The committee agreed that consent is a particularly important issue relating to school-based vaccinations because the person giving consent may not be present at the time of the vaccination. In addition, the evidence from studies looking at vaccinations for 11-18 year olds in this review, alongside the evidence from the qualitative review (evidence review B), highlighted that while immunisation teams are well trained to assess Gillick competence, some people do not feel comfortable with the concept of young people being allowed to self-consent for vaccination. This is therefore an issue which needs to be carefully considered.

Although the aim of the recommendation for incentivised consent form return is to increase the number of young people who return their vaccination forms, there will still be times when a young person does not have a signed consent form at the time of a school vaccination session. If a nurse is unable to contact the parents or carers of the young person to ask for their views, then they can instead make an assessment over whether the young person is capable of making the choice about vaccination themselves. The studies on new methods of obtaining consent suggested that this could take place at the time of a routine vaccination session, and the committee agreed that, where possible this would be useful. However, they thought that time constraints would often make this difficult to achieve in practice. Instead, they agreed that Gillick competence assessments and vaccinations for those who are considered competent should be offered at the earliest opportunity, which could either be during a routine vaccination session or during catch-up sessions for young people who have been identified as not up to date with their vaccinations.

An alternative scenario for assessing Gillick competence is when the parent or carer has returned the consent form and has refused vaccination, but the young person has different views to their parents and wishes to be vaccinated. The committee thought that if a young person is assessed as competent then, where possible, they should still be offered

vaccination and that this could be assessed as part of the catch-up process. To do otherwise might be discriminatory as the young people who lacked parental consent (or refusal) could be assessed for Gillick competence but the young people whose parents had refused vaccination would be denied this opportunity. However, the committee were aware of the potential issues associated with going against parental wishes. In addition, although the committee thought that offering a Gillick competence assessment is important, their experience was that there are not always clear systems in place to ensure that vaccination teams feel supported when carrying out this assessment. The studies on new methods of obtaining consent included processes that immunisation nurses had to follow to guide their Gillick competence assessments, such as young people being asked if they had discussed vaccination with their family and whether being vaccinated could cause conflict with their parents or carers. The immunisation nurses reported that this helped them to make decisions on a person's capacity to consent. As a result, the committee agreed that it was important that school aged immunisation providers have a policy on Gillick competence in place and that this should include guidance about what action to take when a young person's vaccination preference is different from their parents to help to support the decisions of the immunisation teams in the schools. They also included cross references to help ensure that the assessment of Gillick competence is be carried out in line with national guidance, such as that set out in the Green book and by the General Medical Council.

When discussing consent, the committee noted that parental refusal might be limited to specific vaccinations (for example, HPV) and that that there are some settings, such as faith schools, where it may be deemed unacceptable for young people to be vaccinated if this is against the parents' wishes. This was considered a key issue, as assessing for Gillick competence in this scenario could potentially damage the ability of the immunisation team to access the school for other vaccination campaigns. The committee highlighted a qualitative study (Chantler 2019) which investigated methods of obtaining consent for school vaccinations. The findings of this study reinforced the concerns of some schools about young people being allowed to self-consent to vaccination, and highlighted that, in some cultures, a young person may feel unable to go against the decisions of their parents. It is therefore important that school aged immunisation providers and vaccination teams tailor their approach to Gillick competence assessments based on local populations. This will maximise the number of young people that are vaccinated but also ensure that the actions of vaccination teams do not have any unintended consequences.

1.1.11.4 Cost effectiveness and resource use

In the absence of published economic evidence for this section, the committee used their expertise to inform discussion around the expected resource and cost impact of these recommendations.

The committee considered the evidence on incentives and recommended that incentives be offered by providers as a method to increase the number of consent forms returned for school-based vaccinations. A costing analysis was conducted to estimate the resource implications of recommending incentives to increase consent form return. The costing analysis compared vaccine uptake of incentives followed by phone reminders with phone reminders alone, using positive consent form return as a proxy for vaccine uptake as agreed by the committee. Incremental cost per additional person vaccinated was calculated for different incentive values, with the base-case assumption of a 1 in 10 chance of winning a £50 voucher being associated with an ICER of £97.81. Lower value incentive scenarios selected by the committee (one £50 voucher per school or free school-based perks) were also modelled and were cost saving when compared to phone reminders only, as the increased form returns with incentives led to lower numbers of nurse phone calls required than without incentives. However, the committee noted that the efficacy evidence for incentives was based on the base-case incentive value of a 1 in 10 chance of winning a £50 voucher, and that lower value incentives may not be as effective. Nonetheless, the committee felt that whilst these lower value incentives would be unlikely to change the mind

of someone who had actively decided not to be vaccinated, they would likely be effective in improving consent form returns from people with no objections to vaccination that had simply neglected to complete the necessary paperwork. This would likely save money downstream from providers having to contact less families to chase up unreturned consent forms.

A low uptake scenario was also conducted using data from a local authority with low vaccine uptake. The ICER associated with this low uptake scenario was £34.07, suggesting that the combination of incentives plus reminders is more cost-effective in populations with low vaccine uptake. The committee felt that although the intervention was more cost-effective in populations with low uptake areas, it was justified to recommend incentives for consent form return in the general population. The committee considered that one of the reasons some areas have higher uptake than others is that the school nursing teams may already be doing a lot of outreach work and phone call reminders to return consent forms, which is very resource intensive. In this situation the incentive intervention was considered to be useful as it would likely reduce the number of phone calls required and displace some of the associated costs.

The committee discussed the issue of consent for school-based vaccinations and recommended that providers ensure sufficient information, including information on who can consent for vaccination, is provided to both young people and their parents for decision making, and that parents are encouraged to discuss vaccination with their children. This recommendation is unlikely to have resource implications as this additional information can be included with the information already provided and detailed in the recommendation on what invitations should contain.

The committee recommended that providers have a policy in place to support school immunisation teams in assessing Gillick competence. This recommendation is likely to require some development from vaccination providers to communicate a consistent policy to their immunisation teams, but this is anticipated to be associated with minimal additional costs.

The committee recommended that, in the absence of parental consent to vaccination, children and young people should be offered the opportunity to be assessed for Gillick competence for the ability to self-consent. Due to time constraints in the routine vaccination sessions, the committee suggested that these opportunities are provided at catch-up vaccination sessions. School-based catch-up vaccination sessions are often offered in usual practice already and provided school nursing teams are already present at the sessions, it is not anticipated that adding this opportunity to be assessed for Gillick competence will have additional resource implications.

The committee discussed consent for vaccinations for other groups, such as those who may need additional support to consent or those who lack capacity to consent, and recommended that the NICE guidance on these groups should be followed to ensure people receive the appropriate vaccinations. Since this recommendation refers to existing NICE guidance it is not expected to have additional resource use, as the support required in the vaccination context would be the same support these people would receive for making other healthcare decisions.

1.1.11.5 Other factors the committee took into account

Catch up sessions and tailoring immunisation programmes

Catch-up sessions are part of routine practice, and the committee discussed the importance of these to ensure that children and young people are given additional opportunities to be up to date with the routine adolescent vaccination schedule. In addition, they note that catch-up sessions in schools would ensure that children and young people who are not up to date with their vaccinations have other opportunities to be vaccinated. These sessions are currently limited to children and young people who had missed school-aged vaccinations, but they

could be expanded to provide opportunities to catch up on earlier preschool vaccinations. At the moment, children and young people have to be directed to their GP to be offered these vaccinations. The committee noted that some children or young people will be unable to attend the school-aged catch-up sessions, for example due to sickness, exclusion or extended leave, so alternative provisions are necessary to ensure that they can be offered their overdue vaccinations. This could involve signposting to GPs or other places where the vaccinations are available. To help with identifying these children and young people, CHIS can provide vaccination histories to providers and the committee made a recommendation for CHIS to do so.

Catchup sessions commonly occur in schools but can be carried out in other settings, such as GP surgeries. The committee noted that very little evidence for catch-up sessions had been identified as part of the evidence reviews for this guideline. One study (Altinoluk-Davis 2020) was identified as part of evidence review D (on improving access to vaccinations). It was carried out in the UK and showed that a nurse led catch up at school resulted in more MMR vaccinations than a reminder to have a catch-up vaccination at a general practice. The committee used this study to provide support for their recommendation for school-based catch-up sessions. However, this study only looked at MMR vaccinations and was a cohort study rather than an RCT, so the results were judged to be of low quality. Some evidence in the qualitative review evaluated the use of a catch-up campaign for young people, based in GP surgeries (see evidence review B). Based on the importance of enabling children and young people who have missed vaccinations to be identified and vaccinated later, the committee agreed that despite the findings of the studies above more research was still needed on this topic. They therefore made a research recommendation to compare the effectiveness and acceptability of school-based and GP-based catch-up campaigns in the UK (see Appendix K). This will help providers establish the most appropriate and acceptable setting or settings for catch-up sessions as these may vary depending on the vaccination.

The committee also discussed the importance of tailoring interventions to increase vaccine uptake to specific communities to increase their effectiveness. They were aware that the WHO has a specific programme called ‘Tailoring Immunisation Programmes’ (TIP) but noted that this approach had not been evaluated to determine whether it was effective as a method of designing and testing interventions to increase routine vaccine. The committee therefore wrote a research recommendation on this topic (see Appendix K for more details).

Consent for non-school-based vaccinations

The committee noted that vaccinations that are given in schools differ from other vaccines, as this is the only scenario where the person giving consent is not the person receiving the vaccine, and they are not with the person receiving the vaccine at the time of vaccination as is the case with parents of young children. Given these differences in the vaccination process, the committee did not think that the evidence for incentivised consent form return could be applied to other vaccination groups, such as babies and children, pregnant women or people who are aged 65 years and over. Instead, it was decided that additional evidence is needed to identify whether incentives are also effective at increasing vaccination uptake in these other groups. This supported the findings of the infrastructure review that more research is needed to determine the most effective methods to increase vaccine uptake for all ages and groups. The committee therefore made a research recommendation aimed at examining whether incentives are also effective at increasing vaccine uptake in these groups (see Appendix K, evidence review G).

Although most of the evidence relating to consent in this review was for young people aged 11-18 years, the committee discussed how issues relating to vaccine consent can also be a barrier to uptake for some groups of adults. This is particularly important for individuals who need support with decision making or who may lack the mental capacity to consent for vaccination and are at risk of not being vaccinated as a result. Although there was no evidence for these other populations, the committee thought it was important to promote

equality by ensuring that all people are given the support necessary to make informed decisions on vaccination. An additional recommendation was therefore included which links to the NICE guideline on decision making and mental capacity. This will provide clinicians with guidance on what to consider when discussing consent for non-school-based vaccinations. The committee were also aware that there is a NICE guideline on Advocacy services for adults with health and social care needs that is being developed and is likely to be relevant to this topic when it publishes in 2022.

Future proofing the recommendations

In the evidence reviews we looked for evidence regarding routine vaccinations for people aged 65 and over because this was the age limit for vaccinations for older people on the NHS routine schedule at the time the work was carried out. Since there was limited evidence for this age group, we also included data from relevant studies including people aged 50 and over, where the majority of participants were in our target age group, or the mean age was 65 or over with committee agreement taken on a review-by-review basis. These studies were downgraded for applicability where the committee deemed it appropriate.

According to the Joint Committee on Vaccination and Immunisation minutes from the meeting on 22 June 2021 shingles vaccination eligibility is changing to include people aged 60 and over and this will be introduced in a phased manner down from the current age of 70 years. It is unclear when this change will be initiated or completed. In order to future proof the guideline recommendations we have therefore changed those mentioning people aged 65 and over to refer to older people instead and defined them as follows: adults who are eligible for routine vaccination on the UK schedule, excluding pregnancy-related vaccinations. We also suggest that people consult the green book for information about current age limits and vaccinations for older people. The content of the recommendations has not been changed otherwise as this was not deemed necessary. The majority of recommendations that apply to older people are also more generally applicable and have not been altered because they do not mention groups of people by age. The committee discussions of the evidence have also been retained in their original form, with the addition of the information about the use of the term older people where the relevant recommendations that specifically mentioned people aged 65 and over are discussed.

1.1.12 Recommendations supported by this evidence review

This evidence review supports recommendations 1.2.6, 1.3.6, 1.3.28, 1.3.27, 1.3.30, 1.3.34-1.3.37 and the research recommendations on incentives for school-based vaccinations; GP versus school-based catch-up campaigns and the use of the World Health Organisation 'Tailoring Immunisation Programmes' (TIP) approach in designing interventions to increase vaccine uptake. Other evidence supporting these recommendations can be found in: evidence review B: the barriers to and facilitators to vaccine uptake; evidence review, evidence review D: increasing vaccine uptake by improving access; E: education interventions to increase the uptake of routine vaccines.

1.1.13 References – included studies

Mixed methods

Chantler T, Pringle E, Bell S et al. (2020) Does electronic consent improve the logistics and uptake of HPV vaccination in adolescent girls? A mixed-methods theory informed evaluation of a pilot intervention. BMJ open 10(11): e038963

Qualitative

Audrey S, Evans K, Farr M, Ferrie J, Yates J, Roderick M FH (2021) Implementing new consent procedures for schools-based human papillomavirus vaccination: a qualitative study. British Journal of Child Health 2(2)

Audrey, S., Farr, M., Roderick, M. et al. (2020) How acceptable is adolescent self-consent for the HPV vaccination: Findings from a qualitative study in south-west England. Vaccine 38(47): 7472-7478

Fisher, H., Evans, K., Ferrie, J. et al. (2020) Young women's autonomy and information needs in the schools-based HPV vaccination programme: a qualitative study. BMC public health 20(1): 1680

Jackson, C., Cheater, F.M., Peacock, R. et al. (2010) Evaluating a web-based MMR decision aid to support informed decision-making by UK parents: A before-and-after feasibility study. Health Education Journal 69(1): 74-83

Lwembe S, Green SA, Tanna N et al. A qualitative evaluation to explore the suitability, feasibility and acceptability of using a 'celebration card' intervention in primary care to improve the uptake of childhood vaccinations. BMC family practice 17: 101

Rockliffe L; Stearns S; Forster AS (2020) A qualitative exploration of using financial incentives to improve vaccination uptake via consent form return in female adolescents in London. PloS one 15(8): e0237805

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Quantitative

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Appendices

Appendix A – Review protocol

Review protocol of the barriers to, and facilitators for, vaccine uptake and interventions to increase vaccine uptake.

Please note that the review protocol includes a quantitative question about interventions to increase uptake. This part of the work is presented in evidence review C to ensure the size of the evidence reviews remains manageable.

ID	Field	Content
1.	Review title	Identifying effective interventions to improve uptake of routine vaccines and the barriers to, and facilitators for, vaccine uptake.
2.	Review questions	What are the most effective interventions for increasing the uptake of routine vaccines? What are the barriers to, and facilitators for, increasing the uptake of routine vaccines?
3.	Objectives	To identify the barriers to, and facilitators to vaccine uptake and effective strategies to improve routine vaccine uptake.
4.	Searches	The following databases will be searched: • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Embase • MEDLINE • Medline in process • Medline epubs ahead of print • Emcare • Psycinfo • Sociological Abstracts • ASSIA • DARE • Econlit (economic searches) • NHS EED (economic searches) • HTA (economic searches) • Other subject specific databases as appropriate for the quantitative review Searches will be restricted by: • Studies published since 1990 • English language • Human studies

		• Qualitative, Systematic Review, RCT, OECD geographic filters as appropriate Other searches: • Reference searching where appropriate • Citation searching where appropriate • Inclusion lists of systematic reviews • Websites where appropriate The searches will be re-run 6 weeks before final submission of the review and further studies retrieved for inclusion. The full search strategies for MEDLINE database will be published in the final review.
5.	Condition being studied	Uptake of vaccines on the routine NHS schedule
6.	Population	Inclusion: • All people who are eligible for vaccines on the routine UK immunisation schedule and their families and carers (if appropriate). • Staff including, but not limited to, those providing advice about or administering vaccines and those people with relevant administrative or managerial responsibilities. Exclusion: None
7.	Interventions and factors of interest	<u>RQ2.1 Quantitative review</u> Interventions including, but not confined to: 1. Information, education and methods of communicating them Interventions to provide information including: • online campaigns including social media and apps • radio campaigns • letters by mail • printed materials (e.g. leaflets) • multi-media campaigns • TV and online advertising (including pop up adverts) • posters • online information exchange- fill in questionnaire and get information Educational interventions (delivery methods): • face-to-face sessions • telephone conversations • social media with responses • interactive multi-media interventions (e.g. case studies on GP websites; e-learning) • interactive community events (e.g. talks with question and answer sessions)

		• peer education (carried out by a community member who shares similar life experiences to the community they are working with)
		• lay education (carried out by community members working in a non- professional capacity)
		• multicomponent interventions targeting education
		• vaccine hotlines and special advisory clinics for health professionals
		
		Who provides the information and/or advice and how they do so, including:
		• Vaccine champions:
		  ○ Practitioners
		  ○ Peers
		  ○ Community leaders
		• Interventions to train staff and other people on how best to communicate the information/ run educational sessions.
		• Recommendations to vaccinate from people/groups including:
		  ○ Medical and other staff (for example, GPs, nurse, health visitors, midwives,)
		  ○ Social workers
		  ○ Community leaders
		  ○ Religious leaders
		  ○ Peers
		  ○ Teachers
		
		Information and education can be provided during home visits, during interactions with health and social care workers, at support group meetings for people using other services etc. This may involve providing a contact point for more information.
		
		Types of information include PHE bulletins and local bulletins for providers.
		
		2. Vaccination reminders aimed at providers or individuals including:
		
		Reminder and recall systems (aimed at provider)
		• clinical alerts and prompts
		• national alerts to local teams
		• local recall initiatives
		
		Personal invitation to be vaccinated from:
		• GP
		• community pharmacist
		• health or social care worker
		• from several professionals
		
		Reminders to individuals/ eligible groups by:
		• text messages
		• electronic invitations (via apps)

		• emails • letter • phone calls • posters • postcards 3. Interventions targeting acceptability: • Alternative forms of vaccinations (e.g. injections, formulations) • Alternative settings • Alternative vaccine providers (e.g. doctor administering vaccine instead of nurse) 4. Interventions to improve access including: Expanding access in healthcare, such as: • Reducing distance/time to access vaccinations • Out of hour or drop-in services • Delivering vaccines in clinical settings in which they were previously not provided Vaccination clinics in community settings: • community pharmacies • antenatal clinics • specialist clinics (e.g. drug and alcohol services, mental health services) • community venues (e.g. libraries, children's centres) Dedicated clinics for specific/ all routine vaccinations • Mass vaccination clinics in community or other settings (e.g. schools) • Walk in or open access immunisation clinics Extended hours clinics • weekends evenings (after 6 pm) • early mornings (before 8 am) • 24-hour access Outreach interventions or mobile services • home or domiciliary or day centre visits • support group meeting visits • residential or care home visits • special school visits • inpatient visits • custodial visits • immigration settings • mobile clinics (e.g. in community) Parallel clinics • Offer vaccination in parallel with regular appointments (e.g. with midwives, clinicians, inpatient and outpatient clinics, long stay wards, etc.) • coordinated timing of other programmes (such as child developmental checks)

		Opportunistic vaccinations: • visits to GP, practice nurse or consultant for other medical conditions including STI clinics, drug and alcohol programmes • having vaccinations provided in hospitals or accident and emergency departments • may involve a dedicated person to administer the vaccines. 5. Interventions to improve infrastructure (targeting processes, staffing and settings): Booking systems • dedicated vaccination lines or online systems Organisation of local provider-based systems: • Local area approaches • Systems and processes in place to work with the community • Practice level approaches • Assigned lead for a specific vaccination programme • Having staff who are competent to deliver vaccinations available in multiple settings • Having staff with responsibilities for training practitioners, answering complex questions, co-ordinating immunisations etc. Systems involved in the recording and identification of eligibility and status (covered in RQ1- see this review protocol for a list of potential interventions) Incentives based interventions: • Incentive (and disincentives for not vaccinating) schemes (for individuals) o voucher schemes (not to cover cost of vaccination or healthcare) o payment to cover travel costs o fines/ penalties for not vaccinating o entry to childcare settings/ schools blocked in the absence of proof of vaccination status • Mandatory vaccination • Incentive schemes (for providers) o targets o quality and outcomes framework o voucher schemes Audit and feedback on uptake rates for providers • Weekly statistics • Content and delivery of feedback • Practical relevance (e.g. how many more people need to be vaccinated to achieve a target number) • Comparison data (e.g. between GP practices) 6. Multicomponent interventions:

		• Interventions which include more than one component and target multiple issues (for example the intervention could include an educational component and changes in the timing of clinics) will be analysed separately, but with other similar multicomponent interventions where possible. • Multicomponent interventions which include more than one component that is targeting a single issue will be included in the relevant category instead. RQ2.2 Qualitative review Barriers to, and facilitators for, routine vaccine uptake including, but not limited to: • Thoughts, views and perceptions of individuals, parents or carers and staff • Issues relating to acceptability • Issues relating to accessibility • Issues relating to infrastructure • Issues relating to mis-information or a lack of information and communication of information • Issues relating to informed refusal • collective benefit / altruistic motives

8.	Comparators	RQ2.1 Quantitative review.
		• Usual approaches to increase vaccine uptake
		• Other interventions to increase vaccine uptake
		  ○ Other interventions targeting same issue/ theme (for example education)
		  ○ Other interventions targeting different issues/ theme (for example education versus infrastructure)
		
		RQ2.2 Qualitative review.
		
		Not applicable

9.	Types of study to be included	RQ1.1 Quantitative review. Systematic reviews of included study designs. Then as needed: • Randomised controlled trials • Non-randomised controlled trials • Controlled before-and-after studies • Interrupted time series • Cohort studies • Before and after studies • Mixed method study designs (quantitative evidence that matches the above study designs only) RQ1.2 Qualitative review • Systematic reviews of included study designs • Qualitative studies that collect data from focus groups and interviews

		• Qualitative studies that collect data from open-ended questions from questionnaires/ surveys • Mixed method study designs (qualitative evidence that matches the above study designs only) For the mixed methods synthesis, published mixed methods studies will also be included if the study does not present quantitative and qualitative evidence separately, but only if the individual study designs meet the inclusion criteria for both the qualitative and quantitative reviews as detailed above.
10.	Other exclusion criteria	Interventions to increase uptake of these vaccines/ conditions: • Selective immunisation programmes, as defined in the Green Book and additional vaccines for people with underlying medical conditions because they do not form part of the routine schedule. • Seasonal vaccinations because they are not part of the routine vaccination schedule, apart from Flu, which is covered by a separate NICE guideline and excluded for this reason (see section 14 for reasons underlying a possible deviation from this exclusion). • Travel vaccines- not on routine schedule • Areas covered by NICE's guideline on tuberculosis. • Catch-up campaigns alongside the introduction of a new vaccine Only papers published in the English language will be included. Questionnaires and surveys will not be included, (apart from those reporting open-ended questions from questionnaires/surveys). Where studies from the USA (or other countries with similar health insurance-based systems) are included in the qualitative reviews any barriers/ facilitators relating to financial incentives (such as payment for vaccines or affording health insurance) will not be recorded as these are not relevant for the UK. In addition, in countries where vaccines or health care are paid for by the user studies looking at any financial incentive-based interventions are excluded.
11.	Context	The Department of Health and Social Care in England has asked NICE to produce a guideline on vaccine uptake in the general population. In recent years, UK vaccination rates have declined, resulting in increases in vaccine preventable diseases, particularly measles. There were 991 confirmed cases in England in 2018 compared with 284 in 2017 and the World Health Organization no longer considers measles 'eliminated' in the UK.

		Reasons for low uptake include poor access to healthcare services; inaccurate claims about safety and effectiveness, which can lead to doubts about vaccines; and insufficient capacity within the healthcare system for providing vaccinations. In addition, problems with the recording of vaccination status and poor identification of people who are eligible to be vaccinated may have contributed to this problem.
12.	Primary outcomes (critical outcomes)	RQ2.1 Quantitative outcomes: Changes in: • Vaccine uptake (overall for a specific vaccine or vaccines and for each dose where a vaccine is administered in multiple doses) RQ2.2. Qualitative outcomes: The outcomes will be generated using emergent coding, but are expected to include the following: • Thoughts, views and perceptions of individuals, parents or carers and staff • Issues relating to acceptability • Issues relating to accessibility • Issues relating to infrastructure • Issues relating to mis-information or a lack of information and communication of information • Issues relating to informed refusal
13.	Secondary outcomes (important outcomes)	RQ2.1 Quantitative outcomes: Changes in: • the proportion of people offered vaccinations • the numbers of people who develop the disease the vaccination was aimed at preventing
14.	Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into EPPI reviewer and de-duplicated. 10% of the abstracts will be reviewed by two reviewers, with any disagreements resolved by discussion or, if necessary, a third independent reviewer. The qualitative review search results and quantitative systematic review search results will be sifted using the EPPI reviewer priority screening functionality, but the whole data base will still be screened in each case. However, when sifting for primary studies for specific sections of the quantitative review priority screening may be used to terminate screening before the end of the search is reached. In this case, at least 50% of the identified abstracts will be screened. After this point, screening will only be terminated if a pre-specified threshold of 500 references is met for a number of abstracts being screened without a single new include being identified. A random 10% sample of the studies remaining in the database when the threshold is met will be additionally screened, to check if a substantial number of relevant studies are not being

		correctly classified by the algorithm, with the full database being screened if concerns are identified. The full text of potentially eligible studies will be retrieved and will be assessed in line with the criteria outlined above. Data will be extracted from the included studies into a standardised form (see Developing NICE guidelines: the manual section 6.4) for assessment of study quality and evidence synthesis. Extracted information for the quantitative review will include: study type; study setting; study population and participant demographics and baseline characteristics; details of the intervention and comparator used; study methodology; inclusion and exclusion criteria; recruitment and study completion rates; outcomes and times of measurement and information for assessment of the risk of bias. For the qualitative review, extracted information will include study type; study setting; sample characteristics; study methodology; inclusion and exclusion criteria; themes reported and information for assessment of the risk of bias. If insufficient evidence is identified to make recommendations, we will consult the committee and consider a call for evidence (as detailed in the NICE manual) or include more indirect evidence from other relevant guidelines (for example, the NICE flu guideline).
15.	Risk of bias (quality) assessment	Risk of bias will be assessed using appropriate checklists as described in Developing NICE guidelines: the manual. Systematic reviews will be assessed using the ROBIS checklist. For the quantitative review, randomised controlled trials will be assessed using the Cochrane risk of bias v2.0 checklist. Non-randomised controlled trials and cohort studies will be assessed using the Cochrane ROBINS-I checklist. Controlled/ uncontrolled before and after studies, and interrupted time series will be assessed using the EPOC tool. Any mixed methods studies with quantitative data that can be extracted separately will be assessed using ROBINS-I, Cochrane risk of bias v2.0, or EPOC appropriate. Qualitative studies will be assessed using the CASP qualitative checklist. Any mixed methods studies with qualitative data that can be extracted separately will be assessed using the CASP qualitative checklist. Mixed methods studies where separate quantitative and qualitative data cannot be assessed separately will be assessed using the mixed methods appraisal tool (2018 version).

16.	Strategy for data synthesis	A mixed methods approach will be used to address this topic area. The quantitative and qualitative reviews will be conducted separately (segregated study design) but at the same time. The evidence from the reviews will then be analysed in relation to each other (convergent synthesis of results). (See below for more details. The findings will **not** be integrated by transforming one type of evidence into the other (e.g. quantitative findings into qualitative findings). <u>RQ1.1 Quantitative review</u> Where possible, meta-analyses of outcome data will be conducted for all comparators that are reported by more than one study, with reference to the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al. 2011). Data will be separated into the groups identified in section 17. Continuous outcomes will be analysed as mean differences, unless multiple scales are used to measure the same factor. In these cases, standardised mean differences will be used instead. Pooled relative risks will be calculated for dichotomous outcomes (using the Mantel–Haenszel method) reporting numbers of people having an event. Absolute risks will be presented where possible. Fixed- and random-effects models (der Simonian and Laird) will be fitted for all comparators, with the presented analysis dependent on the degree of heterogeneity in the assembled evidence. Fixed-effects models will be deemed to be inappropriate if one or both of the following conditions is met: • Significant between study heterogeneity in methodology, population, intervention or comparator was identified by the reviewer in advance of data analysis. • The presence of significant statistical heterogeneity in the meta-analysis, defined as $I^2 \geq 50\%$. In any meta-analyses where some (but not all) of the data comes from studies at high risk of bias, a sensitivity analysis will be conducted, excluding those studies from the analysis. Results from both the full and restricted meta-analyses will be reported. Similarly, in any meta-analyses where some (but not all) of the data comes from indirect studies, a sensitivity analysis will be conducted, excluding those studies from the analysis. GRADE will be used to assess the quality of the outcomes. Outcomes using evidence from RCTs, non-randomised trials and cohort studies will be rated as high quality initially and downgraded from this point. Controlled before and after studies and interrupted time series will be rated as low quality

		initially. Reasons for upgrading the certainty of the evidence will also be considered. Where 10 or more studies are included as part of a single meta-analysis, a funnel plot will be produced to graphically assess the potential for publication bias. Meta-analyses will be carried out separately for each study type per outcome, but the similarities and differences between the results obtained from the different study types will be noted. <u>RQ1.2 Qualitative review:</u> Where multiple qualitative studies are identified for a single question, information from the studies will be combined using a thematic synthesis. By examining the findings of each included study, descriptive themes will be independently identified and coded in NVivo v.11. If there are less than 5 studies, Nvivo v.11 will not be used. Once all of the included studies have been examined and coded, the resulting themes and sub-themes will be evaluated to examine their relevance to the review question, the importance given to each theme, and the extent to which each theme recurs across the different studies. The qualitative synthesis will use these 'descriptive themes' to develop 'analytical themes', which will be interpreted by the reviewer in light of the overarching review questions. Code saturation may be used as a reason to stop extracting data from new qualitative studies. CERQual will be used to assess the confidence we have in the summary findings of each of the identified themes. Evidence from all qualitative study designs (interviews, focus groups etc.) is initially rated as high confidence and the confidence in the evidence for each theme will be downgraded from this initial point. <u>Synthesising the findings of mixed method reviews.</u> Where mixed methods studies are identified that present data in a form that cannot be extracted and analysed separately as quantitative and qualitative data, the results of the studies will be reported separately for each study. Any correlations or discrepancies between the findings of the mixed methods studies and the syntheses of the quantitative and qualitative findings of the above analyses will be noted. <u>Mixed method synthesis of findings</u> <u>from the quantitative and qualitative reviews</u> Where appropriate, a synthesis matrix will be produced to combine results from the different individual analysis methods.

		Findings from one analytical approach will be compared to findings from the second approach, and outcomes paired up if they provided relevant information on the same underlying topic. The agreement between the findings of the two approaches will be qualitatively assessed, with each paired set of findings put into one of the three categories relating to the strength of the identified correlation. The results may be presented as a concept diagram with quantitative findings mapped onto the qualitative ones if this is thought to be informative.

17.	Analysis of sub-groups	<u>RQ2.1. Quantitative review</u>
		
		Results will be separated into the following for analysis:
		
		• Age/time when vaccine is due:
		  ○ During pregnancy
		  ○ 0-5 years
		  ○ 11 to 18 years
		  ○ 65 years and older
		
		• Population groups with potential equality issues:
		  ○ Children excluded from mainstream education (including pupil referral units) and non-attenders.
		  ○ Care home residents or people in long-term care
		  ○ Looked after children
		  ○ Religious groups or groups with special beliefs (e.g. anthroposophical views)
		  ○ Travellers/ gypsies
		  ○ Migrants and asylum seekers
		
		• Settings:
		  ○ care homes (covered above for residents)
		  ○ hospitals
		  ○ community versus healthcare
		  ○ educational settings
		
		• Mandatory versus partially mandatory, opt-outs allowed or completely optional vaccine schedules
		
		• Numbers of doses of vaccines
		
		• Study type: RCT, non-randomised studies (NRTs, CBA, ITS)
		
		• Interventions that are part of a catch up campaign versus interventions that are not part of a catch up campaign
		
		• System levels:
		  ○ health system level (for example clinical commissioning group [CCG], local authority, regional and national level)

		○ service provider level (for example GP practices, practitioners) ○ individual level (for example patients or service users including carers) ○ mixed levels • For interventions that use information/ education to increase uptake the results will also be presented for generic versus tailored interventions. <u>RQ2.2 Qualitative review</u> • Views of individuals, their parents and carers (where relevant) versus staff. • Age/time when vaccine is due: ○ During pregnancy ○ 0-5 years ○ 11 to 18 years ○ 65 years and older • Views of population groups with potential equality issues: ○ Children excluded from mainstream education (including pupil referral units) and non-attenders. ○ Care home residents or people in long-term care ○ Looked after children ○ Religious groups or groups with special beliefs (e.g. anthroposophical views) ○ Travellers, migrants and asylum seekers • Settings: ○ care homes (residents covered above) ○ hospitals ○ community versus healthcare ○ educational settings • Mandatory versus partially mandatory, opt-outs allowed or completely optional vaccine schedules • Views concerning catch up campaigns versus non catch up campaigns • System level issues: ○ health system level (for example clinical commissioning group [CCG], local authority, regional and national level) ○ service provider level (for example GP practices, practitioners) ○ individual level (for example patients or service users) ○ mixed levels

<table>
<tr><td>18.</td><td>Type and method of review</td><td colspan="3">☒ Intervention (multicomponent review)
☐ Diagnostic
☐ Prognostic
☐ Qualitative
☐ Epidemiologic
☐ Service Delivery
☒ Mixed method (all other quantitative reviews)</td></tr>
<tr><td>19.</td><td>Language</td><td colspan="3">English</td></tr>
<tr><td>20.</td><td>Country</td><td colspan="3">England</td></tr>
<tr><td>21.</td><td>Anticipated or actual start date</td><td colspan="3">January 2020</td></tr>
<tr><td>22.</td><td>Anticipated completion date</td><td colspan="3">October 2021</td></tr>
<tr><td rowspan="8">23.</td><td rowspan="8">Stage of review at time of this submission</td><td>Review stage</td><td>Started</td><td>Completed</td></tr>
<tr><td>Preliminary searches</td><td></td><td></td></tr>
<tr><td>Piloting of the study selection process</td><td></td><td></td></tr>
<tr><td>Formal screening of search results against eligibility criteria</td><td></td><td>h</td></tr>
<tr><td>Data extraction</td><td></td><td></td></tr>
<tr><td>Risk of bias (quality) assessment</td><td></td><td></td></tr>
<tr><td>Data analysis</td><td></td><td></td></tr>
</table>

24.	Named contact	**5a. Named contact** Guideline Updates Team **5b Named contact e-mail** VaccineUptake@nice.org.uk **5e Organisational affiliation of the review** National Institute for Health and Care Excellence (NICE)
25.	Review team members	From the Guideline Updates Team: • Marie Harris 2006ingh • Toby Mercer • Stephen Sharp • Joshua Pink • Stacey Chang-Douglass • Elizabeth Barrett
26.	Funding sources/sponsor	This systematic review is being completed by the Guideline Updates Team which receives funding from NICE.
27.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.
28.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: https://www.nice.org.uk/guidance/indevelopment/gid-ng10139
29.	Other registration details	None
30.	Reference/URL for published protocol	None
31.	Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication

		• publicising the guideline through NICE's newsletter and alerts • issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.
32.	Keywords	Vaccine uptake, NHS routine vaccination schedule, interventions and barriers and facilitators.
33.	Details of existing review of same topic by same authors	None
34.	Current review status	☐ Ongoing ☐ Completed but not published ☒ Completed and published ☐ Completed, published and being updated ☐ Discontinued
35..	Additional information	None
36.	Details of final publication	www.nice.org.uk

Appendix B – Literature search strategies

A search for qualitative evidence to answer the review question what are the barriers to, and facilitators for, increasing the uptake of routine vaccines? was run on 31st December 2019 and 10th January 2020 in the following databases Medline, Medline in Process, Medline Epub ahead of print, Embase, Emcare and Psycinfo (all via the Ovid Platform), the Cochrane Database of Systematic Reviews (via the Wiley 2015 Platform), Applied Social Sciences Index and Abstracts, Sociological Abstracts and British Nursing Index (all via the Proquest platform). The Medline strategy is shown below. NICE inhouse qualitative and OECD country geographic filters were used where appropriate and the search limited to records published since 1990 and in the English language. The strategy was translated for all databases and re run on ddmmyy.

1 Diphtheria/

2 diphtheria*.tw.

3 Tetanus/

4 (tetanus or tetani).tw.

5 Whooping Cough/

6 (pertuss* or "whooping cough").tw.

7 Haemophilus influenzae type b/

8 ("Haemophilus influenza* type b" or "Hemophilus influenza* type b" or hib).tw.

9 Hepatitis B/

10 "hepatitis b".tw.

11 exp Poliomyelitis/

12 (Polio* or (infantile adj1 paralysis)).tw.

13 exp Pneumococcal Infections/

14 (Pneumococcal adj4 (disease* or infection*)).tw.

15 (streptococcus pneumoniae adj4 Infection*).tw.

16 exp Meningococcal Infections/

17 (Meningococcal adj4 (disease* or infection*)).tw.

18 Rotavirus Infections/ or Rotavirus/

19 rotavirus.tw.

20 Measles/

21 (measles or rubeola or mmr).tw.

22 Mumps/

23 (mumps or (epidemic adj2 (parotitides or parotitis))).tw.

24 Rubella/ or Rubella virus/

25 (rubella or ((german or "three day") adj2 measle*)).tw.

26 human papillomavirus 16/ or human papillomavirus 18/ or exp papillomavirus Infections/ or exp human papillomavirus 11/

27 (hpv or papillomavirus).tw.

28 Condylomata Acuminata/

29 (condyloma* adj1 acuminat*).tw.

30 ((genital or veneral) adj2 wart*).tw.

31 exp Herpes Zoster/

32 (shingles or herpes zoster or zona).tw.

33 or/1-32

34 exp Vaccination/

35 Vaccines/ or exp bacterial vaccines/ or cancer vaccines/ or exp toxoids/ or exp vaccines combined/ or exp viral vaccines/

36 exp Immunization programs/

37 vaccin*.tw.

38 exp Immunization/

39 (immunis* or immuniz*).tw.

40 (immunologic* adj4 (sensitiz* or sensitis* or stimulation*)).tw.

41 (immunostimul* or variolation*).tw.

42 or/34-41

43 33 and 42

44 exp Diphtheria toxoid/ or exp tetanus toxoid/ or Haemophilus Vaccines/ or meningococcal Vaccines/ or exp Pertussis Vaccine/ or exp Streptococcal vaccines/ or exp Vaccines Combined/ or exp Measles vaccine/ or exp Mumps Vaccine/ or exp papillomavirus vaccines/ or exp Poliovirus Vaccines/ or Rotavirus Vaccines/ or exp Rubella Vaccine/ or Hepatitis B vaccines/ or Herpes Zoster Vaccine/

45 43 or 44

46 (barrier* or facilitat* or hinder* or block* or obstacle* or restrict* or restrain* or obstruct* or inhibit* or impede* or delay* or constrain* or hindrance or enhance* or encourag* or support* or promot* or optimiz* or optimis* or adher* or motivat* or incentive* or persuad* or persuasion or intend* or intention or counsel* or hesitan*).tw.

47 (uptake or ((increas* or improv* or rais* or higher) adj4 (rate* or immuni* or vaccin* or complian*))).tw.

48 Attitude/

49 Attitude to health/

50 Health Knowledge, Attitudes, Practice/

51 exp "Treatment Adherence and Compliance"/

52 (accept* or compli* or particip* or adher* or nonadher* or non-adher* or cooperat* or co-operat* or dropout* or drop-out* or empower* or engage* or involve*).tw.

53 exp patients/px

54 (experience* or belief* or stress* or emotion* or anx* or fear* or concern* or uncertain* or unsure or thought* or feeling* or felt* or view* or opinion* or perception* or perspective* or attitud* or satisfact* or know* or understand* or aware* or sad*).tw.

55 stress, psychological/

56 adaptation, psychological/

57 emotions/

58 anxiety/

59 fear/

60 sadness/

61 exp Health Services Accessibility/

62 (access* or availab* or usab* or convenien*).tw.

63 Healthcare disparities/

64 (equit* or inequit* or equal* or inequali* or fair* or disparit* or variab* or variation or varied).tw.

65 exp Socioeconomic factors/

66 (socioeconomic adj1 (factor* or status)).tw.

67 (poverty or poor* or rich* or low income or low-income or middle income or middle-income or high income or high-income).tw.

68 ((social or middle or low* or working or upper) adj1 class*).tw.

69 Health Plan Implementation/ or Implementation Science/

70 (implement* or feasibil* or practical* or practicabil* or suitab* or viab* or achievab*).tw.

71 Culture/ or Cultural Characteristics/ or Cultural Diversity/ or Superstitions/ or Taboo/

72 ((cultur* or custom*) adj4 (belief* or believe*)).tw.

73 Religion/ or Buddhism/ or Christianity/ or Hinduism/ or Islam/ or Judaism/

74 (religio* or buddhis* or christian* or hindu* or islam* or muslim* or judaism or jew*).tw.

75 or/48-74

76 46 or 47 or 75

77 45 and 76

78 animals/ not humans/

79 77 not 78

80 limit 79 to ed=19900101-20191231

81 limit 80 to english language/

82 afghanistan/ or exp africa/ or albania/ or andorra/ or antarctic regions/ or argentina/ or exp asia, central/ or exp asia, northern/ or exp asia, southeastern/ or exp atlantic islands/ or bahrain/ or bangladesh/ or Bhutan/ or bolivia/ or borneo/ or "bosnia and Herzegovina"/ or brazil/ or bulgaria/ or exp central america/ or exp china/ or colombia/ or "Commonwealth of Independent States"/ or croatia/ or "Democratic People's Republic of Korea"/ or ecuador/ or gibraltar/ or guyana/ or exp india/ or indonesia/ or iran/ or iraq/ or jordan/ or kosovo/ or kuwait/ or lebanon/ or liechtenstein/ or macau/ or "macedonia (republic)"/ or exp melanesia/ or moldova/ or monaco/ or mongolia/ or montenegro/ or nepal/ or Netherlands Antilles/ or New Guinea/ or oman/ or pakistan/ or paraguay/ or peru/ or philippines/ or qatar/ or "republic of Belarus"/ or romania/ or exp russia/ or saudi arabia/ or serbia/ or sri lanka/ or suriname/ or syria/ or taiwan/ or exp transcaucasia/ or ukraine/ or uruguay/ or united arab emirates/ or exp ussr/ or venezuela/ or yemen/

83 australasia/ or exp australia/ or austria/ or exp Baltic States/ or belgium/ or exp canada/ or chile/ or czech republic/ or europe/ or European Union/ or exp france/ or exp germany/ or greece/ or hungary/ or ireland/ or Israel/ or exp italy/ or exp japan/ or korea/ or luxembourg/ or mexico/ or netherlands/ or new zealand/ or north america/ or poland/ or portugal/ or exp "republic of korea"/ or exp "Scandinavian and Nordic Countries"/ or slovakia/ or slovenia/ or spain/ or switzerland/ or turkey/ or exp united kingdom/ or exp united states/ or "Organisation for Economic Co-Operation and Development"/ or Developed Countries/

84 82 not (82 and 83)

85 81 not 84

86 Qualitative Research/

87 Nursing Methodology Research/

88 Interview.pt.

89 exp Interviews as Topic/

90 Questionnaires/

91 Narration/

92 Health Care Surveys/

93 (qualitative$ or interview$ or focus group$ or questionnaire$ or narrative$ or narration$ or survey$).tw.

94 (ethno$ or emic or etic or phenomenolog$ or grounded theory or constant compar$ or (thematic$ adj4 analys$) or theoretical sampl$ or purposive sampl$).tw.

95 (hermeneutic$ or heidegger$ or husser$ or colaizzi$ or van kaam$ or van manen$ or giorgi$ or glaser$ or strauss$ or ricoeur$ or spiegelberg$ or merleau$).tw.

96 (metasynthes$ or meta-synthes$ or metasummar$ or meta-summar$ or metastud$ or meta-stud$ or metathem$ or meta-them$).tw.

97 "critical interpretive synthes*".tw.

98 (realist adj (review* or synthes*)).tw.

99 (noblit and hare).tw.

100 (meta adj (method or triangulation)).tw.

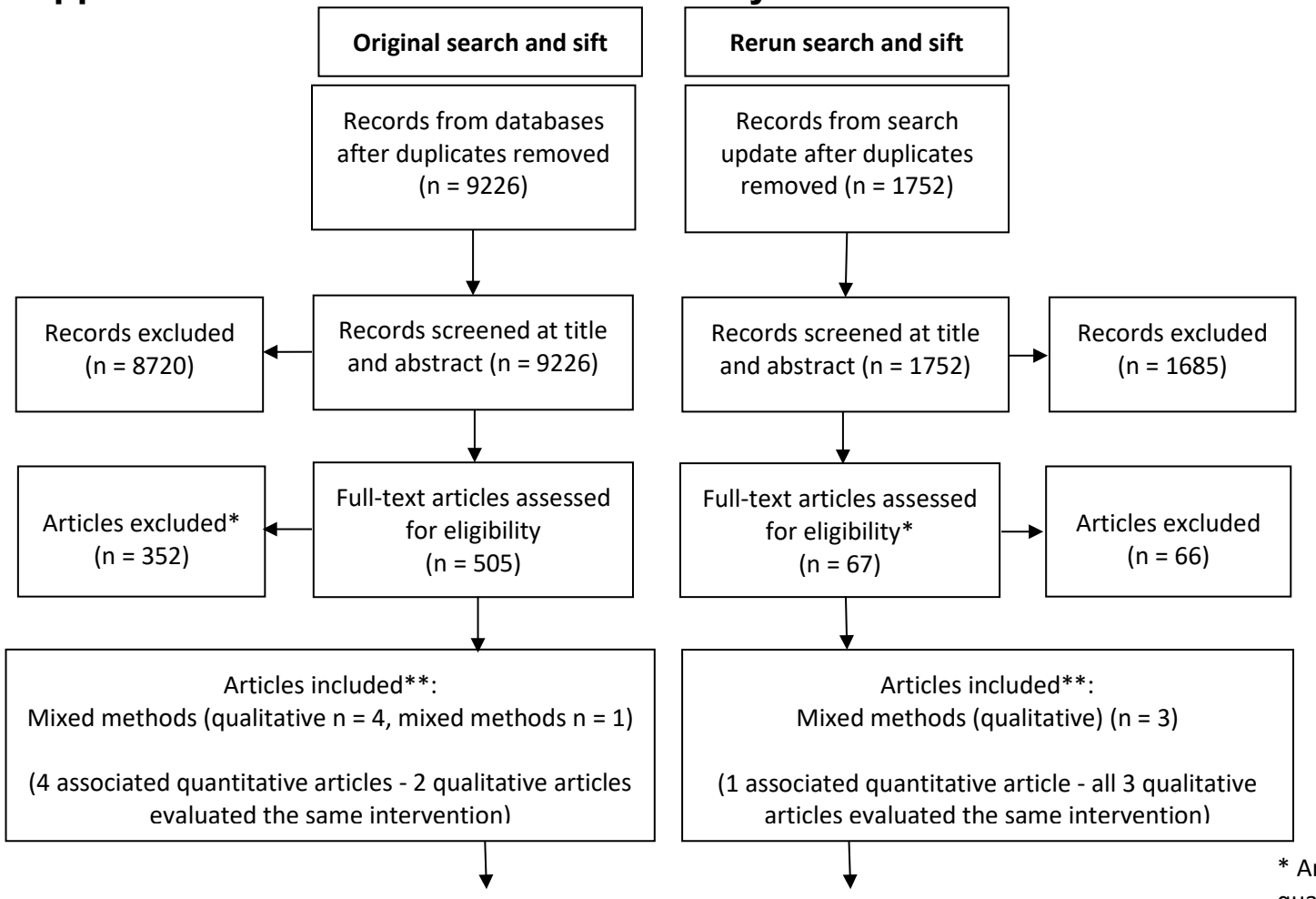
101 (CERQUAL or CONQUAL).tw.

102 ((thematic or framework) adj synthes*).tw.

103 or/86-102

104 85 and 103

Appendix C – Qualitative evidence study selection



* Articles excluded as part of the combined quantitative search for all reviews
** Articles that were included specifically for the mixed methods review. The rest of the 215 articles were included in other reviews.

Appendix D – Evidence tables

Mixed methods evidence

Chantler, 2020

Bibliographic Reference	Chantler T; Pringle E; Bell S; Cooper R; Edmundson E; Nielsen H; Roberts S; Edelstein M; Mounier-Jack S; Does electronic consent improve the logistics and uptake of HPV vaccination in adolescent girls? A mixed-methods theory informed evaluation of a pilot intervention.; BMJ open; 2020; vol. 10 (no. 11)

Study Characteristics

Study design	Mixed methods Quantitative: Cluster non-randomised controlled trial (Schools were divided into low, medium or high based on the proportion of pupils receiving free school meals and with English as an additional language. Each e-consent school was matched, as closely as possible, to a paper consent school in the same terciles for both characteristics) Qualitative: Semi-structured interviews
Aim of study	To assess whether an electronic consent form increased consent form return and the uptake of the first dose of HPV vaccine in adolescent girls. Qualitative analysis captured how year experience of the intervention in year 1 informed adaptations to the intervention prior to reuse in year 2.
Behavioural model used	Theory of change
Study location	UK
Study setting	14 secondary schools in South London boroughs
Study dates	June 2018 - July 2018 (year 1) and June 2019 - July 2019 (year 2)
Sources of funding	National Institute for Health Research Health Protection Research Unit in Immunisation in partnership with Public Health England
Inclusion Criteria	Schools in 7 South London boroughs Purposive sampling with the aim of including schools that differed in terms of denomination (private, state, grammar), type (mixed, single sex), sociodemographic, size, vaccination uptake and level of support to the programme. All girls eligible for vaccination were given consent forms
Exclusion criteria	None reported
Intervention details	Electronic consent form developed by Hounslow and Richmond Community Healthcare NHS Trust. Consisted of an online portal with an e-consent form and with information about the vaccination programme where parents could register their child and agree or decline the HPV vaccination. The intervention aimed to: 1. give parents to an online portal with information about the vaccination programme, where they could register their child and agree or decline the vaccination. 2. give nurses electronic access to the portal to facilitate screening and enable them to update records during immunisation sessions. 3. enable automatic updating of central vaccination record databases. Parts of the online portal and data platform (those related to nurse access and automatic updating of databases) were not fully functioning before the intervention

	was first used in June 2018 and so the way that nurses screened students' information and consent forms before and during immunisation sessions was modified.
Comparator details	Limited information. A standard paper consent form was issued for parental consent for the vaccine
Quantitative outcome measures	Vaccine uptake Number of children who received the vaccination at the scheduled school vaccination session
Number of participants	28 schools (14 e-consent and 14 paper). 1733 girls in paper consent (control) group, 1486 in e-consent group
Duration of follow-up	Until next scheduled school vaccination session
Study methods	Mixed-methods theory-informed evaluation study which used a 'Theory of Change' as an evaluation framework. Participants were recruited using purposive sampling with the aim of including schools that differed in terms of denomination (private, state, grammar), type (mixed, single sex), sociodemographic, size, vaccination uptake and level of support to the programme. Schools were divided into low, medium or high based on the proportion of pupils receiving free school meals and with English as an additional language. Each e-consent school was matched, as closely as possible, to a paper consent school. Quantitative methods: Nurses completed a 'tally sheet', with details of the consents received prior to or during the session, any absences and the number of vaccinations given. For both paper and e-consent schools, the proportion of the pupils who did not return a consent form, the proportion vaccinated at the planned session, and the proportion who received consent for the vaccination was calculated. Qualitative methods: Year 1 data collection followed the first year of the e-consent intervention. Year 2 data collection examined the use of e-consent in a different subset of schools. Members of the evaluation team observed the immunisation sessions to evaluate implementation and school staff involved in implementation were asked to complete a feedback form with questions about the organisation of immunisation sessions and the usability and acceptability of e-consent and paper consent. Semi-structured interviews (individual for the programme manager and in groups of 2-4 for immunisation teams) were conducted for Trust staff. In year 1, interviews were also conducted with parents and children either in family homes, by phone, or via Skype. Data was analysed using a thematic approach based on the Theory of Change, and inductive coding was used to capture themes.
Qualitative population and perspective	28 schools (14 paper and 14 e-consent schools) were included with 3219 girls (1733 in paper consent and 1486 in e-consent schools) taking part. In year 1, 15 members of Trust staff who delivered the intervention were interviewed, 12 parents and 5 children were interviewed (9 vaccine acceptors and 3 decliners). In year 2, 14 members of Trust staff were interviewed and 8 children took part in a focus group (all from a single school).
Relevant themes	1. Accessibility - Accessing and using the consent form "I thought it was very easy. I think you're probably going to get more responses that way from parents in this day and age", "my dad said I should have the vaccine, but he did not understand the whole google business about it" 2. Decision making - Student awareness and involvement in decision making '…because like if it's emailed, like your mum doesn't have to share it with you. And like if I have something done like an injection, I'd like to know what's going on and when"

	3. Implementation - Speed of implementation, effects on workload "it was probably four days before our first session, we didn't know what we were doing… so I do feel we are running before we can walk." 4. Sources of information - Amount of information, recommended-recommended vaccines "I think because it's like by the NHS—it kind of gives it validation."
Additional information	Quantitative results only available for year 1 of the pilot intervention. Qualitative results are available for both years (results not separated by year)

Risk of bias (quantitative – modified checklist: combined ROBINS-I and Cochrane cluster 2.0)

Section	Question	Answer
1a. Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	High *(No randomisation: e-consent schools were matched to a paper consent school based on proportion receiving free school meals and number with English as an additional language)*
1b. Bias arising from the timing of identification and recruitment of individual participants in relation to timing of randomisation	Risk of bias judgement for the timing of identification and recruitment of individual participants in relation to timing of randomisation	Low
2. Bias due to confounding	Risk of bias judgement for confounding	Serious *(Limited information about confounding and analysis methods)*
3. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Moderate *(No information about correcting for selection bias)*
4. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low
5. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Low
6. Bias due to missing data	Risk of bias judgement for missing data	Serious *(Participants were excluded where outcome data was unavailable. No information about the proportion of missing data for each group)*
7. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Low
8. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	Critical *(Study was non-randomised, provided limited information on analysis methods and confounding variables. No information about the proportions of missing data in each group)*

Section	Question	Answer
	Directness	Directly applicable

Risk of bias (qualitative - CASP qualitative checklist)

Section	Question	Answer
Aims of the research	Was there a clear statement of the aims of the research?	Yes
Appropriateness of methodology	Is a qualitative methodology appropriate?	Yes
Research Design	Was the research design appropriate to address the aims of the research?	Yes
Recruitment Strategy	Was the recruitment strategy appropriate to the aims of the research?	Yes
Data collection	Was the data collected in a way that addressed the research issue?	Yes
Researcher and participant relationship	Has the relationship between researcher and participants been adequately considered?	Can't tell
Ethical Issues	Have ethical issues been taken into consideration?	Can't tell *(Study received ethics approval but no information about how the research was explained to participants)*
Data analysis	Was the data analysis sufficiently rigorous?	Yes
Findings	Is there a clear statement of findings?	Yes
Research value	How valuable is the research?	The research is valuable
Overall risk of bias and relevance	Overall risk of bias	Moderate *(No information about how the study was explained to participants and no clear consideration of the relationship between researchers and participants)*
	Relevance	Highly relevant *Views on e-consent forms* Relevant *Views from nursing staff on the online portal for screening and updating records (not fully functioning for the pilot but was implemented later)*

Qualitative evidence

Audrey, 2020

Bibliographic Reference	Audrey, S.; Farr, M.; Roderick, M.; Evans, K.; Fisher, H.; How acceptable is adolescent self-consent for the HPV vaccination: Findings from a qualitative study in south-west England; Vaccine; 2020; vol. 38 (no. 47); 7472-7478

Study Characteristics

Study design	Semi structured interviews
Aim of study	To consider how acceptable the procedures associated with a new HPV intervention were to young women, parents and carers, school staff and immunisation nurses
Study location	UK
Study setting	School based vaccinations
Study dates	2017/18 - 2018/19 school years
Sources of funding	National Institute for Health Research under its Research for Patient Benefit Programme
Inclusion Criteria	Mainstream schools in the South West of England where at least 12 female Year 8 students were not vaccinated during the 2016/17 programme year All alternative education providers in the area
Exclusion criteria	Lack of parental consent to take part in the study
Intervention details	The study evaluated new consent procedures instead of the traditional procedure where only young women with written parental consent were invited to attend HPV vaccination session. The new procedures allowed all eligible young women to attend, irrespective of whether they had returned a parental consent form. The immunisation team sought verbal parental consent by telephone and, if parents could not be contacted, adolescent self-consent was considered
Qualitative study methods	The intervention took place in two local authorities in south-west England where uptake rates of the HPV vaccination programme were ranked 112th and 106th of 119 English LAs (excluding London). School recruitment took place during the 2017/18 and 2018/19 programme years. 15 schools met the inclusion criteria and four (26.7%) consented to take part. All alternative education provider settings (n = 17) were invited to participate in the study, of which five (29.4%) consented. During the 2018/19 programme year all Year 8 young women who had not returned a completed parental consent form for vaccination were invited to take part. Topic guides were developed to cover the same key issues (beliefs about the HPV vaccine, views and experiences of the HPV vaccination programme, and opinions about the new consent procedures) with some adaptations relevant to the differing roles of immunisation nurses, mainstream school staff, alternative education providers, parents and young women. Interviews took place in schools, community organisations, private homes or by telephone, depending on the preferences of interviewees. Interviews were one-to-one, or in pairs or small groups, to suit the participants. All recordings were transcribed verbatim and thematic analysis used with both an inductive and deductive approach to analyse the content, focusing on our main

	research questions while identifying key issues emerging from the data. Coding of all transcripts was undertaken by one researcher and a second researcher double-coded a sub-set of 12 transcripts to check for meaning, relevance and reliability. Consensus meetings were undertaken to review, refine and confirm the main themes and codes relevant to the acceptability of the new consent procedures.
Qualitative population and perspective	53 participants: 1 health service manager and three immunisation nurses who comprised the core immunisation team (all female); five school staff (four female, one male) at alternative education provision for young people with a range of physical and sensory disabilities, or with differing educational and behavioural needs; three staff at mainstream schools (two female, one male); 19 young women (eight Year 8 female students recruited through participating schools, and 11 young women aged 12–17 years attending community organisations), and; 22 parents (21 mothers and one father recruited through community organisations providing support for parents and families). Of the 19 young women interviewed: eight were from BAME communities; all of them received the HPV vaccine; 12 returned a signed parental consent form (one of whom had signed the form herself), six received the vaccine following parental verbal consent at the vaccination session, and 1 self-consented.
Relevant themes	Six relevant themes were identified: 1. Understanding the legal framework: Parents and school staff were unsure of the legal framework regarding self-consent: "We all think it's the parents but actually they [young women] can give consent, is that correct?" 2. Primacy of parental consent: There were mixed opinions on whether consent should be the parent's choice, or whether young people should be able to consent for themselves 'I don't think it's fair if a child wants to have a vaccine for their future, so they don't get ill, and their parents say no"; ''It's her body so if she wants that, I think her parents should understand that if she wants to take the consequences, if they believe there are any, like it's her decision" 3. Vaccination beliefs: Most participants supported vaccination but discussed how letting young people consent for themselves is more difficult when a parent is against vaccination "'I would want my kids to be vaccinated, I would think it would be a positive thing. But then it's not going to be so positive if it's somebody that didn't want them to be vaccinated" 4. Capacity to consent: Participants had mixed views about the age at which young people could self-consent. It may vary between individual students "'Year 8 is a hard one. Some of them are still babies when they come and talk to you, they can't even say the word sex or pregnant without getting all embarrassed. And some of them are really mature, really sensible, really know their own mind and can give consent, so it's a really tricky age. I would love to say yes they should all be able to consent for their own health matters and be able to consent for them but truly some of them are not mature enough so it's a real split at that age I think" 5. Prioritising relationships: There were concerns over whether allowing young people to self-consent could damage trust between the parents and the school, or between family members ''I suppose ultimately parental relationships are really important to us. . . I would hate to drive a wedge in between us and the family" 6. Self-consent in practice: Participants had mixed experiences of situations where young people have been vaccinated based on self-consent "We have had some people that we've self-consented and the parents have come back and said 'Thank you very much', you know, 'I haven't been very organised today, things have been a bit mad, I really did want her to have it done so that's great, thank you very much'"; ''We have had a couple I know that have called in most upset that we'd taken self-consent"
Additional information or if only extracted	During the 2017/18 programme year, only four young people self-consented. All were given information about the study and invited to participate in an interview but did not get parental consent to take part. Because of the relatively low number of people who self-consent, the inclusion criteria was changed in the 2018/19 programme year to

some of the data and why etc.	include all Year 8's where a completed parental consent form for vaccination had not been received by the school. The number of young people recruited in school settings was lower than anticipated so community groups for parents and young people in Bristol and South Gloucestershire were also approached, with 6 agreeing to help with recruitment

Risk of bias (CASP qualitative checklist)

Section	Question	Answer
Aims of the research	Was there a clear statement of the aims of the research?	Yes
Appropriateness of methodology	Is a qualitative methodology appropriate?	Yes
Research Design	Was the research design appropriate to address the aims of the research?	Yes
Recruitment Strategy	Was the recruitment strategy appropriate to the aims of the research?	Yes
Data collection	Was the data collected in a way that addressed the research issue?	Yes
Researcher and participant relationship	Has the relationship between researcher and participants been adequately considered?	Can't tell
Ethical Issues	Have ethical issues been taken into consideration?	Yes
Data analysis	Was the data analysis sufficiently rigorous?	Yes
Findings	Is there a clear statement of findings?	Yes
Research value	How valuable is the research?	The research is valuable
Overall risk of bias and relevance	Overall risk of bias	Moderate *(Only the views of girls who had the vaccine were considered)*
Overall risk of bias and relevance	Relevance	Highly relevant

Audrey, 2021

Bibliographic Reference	Audrey S, Evans K, Farr M, Ferrie J, Yates J, Roderick M FH; Implementing new consent procedures for schools-based human papillomavirus vaccination: a qualitative study; British Journal of Child Health; 2021; vol. 2 (no. 2)

Study Characteristics

Study design	Semi structured interviews
Aim of study	To consider the practicalities and implications of implementing new consent procedures, including parental telephone consent and adolescent self-consent, in two local authority areas in the southwest of England
Study location	UK
Study setting	School based vaccination
Study dates	2017 - 2019
Sources of funding	National Institute for Health Research under its Research for Patient Benefit Programme
Inclusion Criteria	Year 8 female students who could speak English
Exclusion criteria	None reported
Intervention details	Same intervention as Audrey 2020 - intervention with new methods of obtaining consent for HPV vaccination
Qualitative study methods	Mainstream schools with at least 12 female Year 8 students who had not been vaccinated during the 2016/17 programme year were sent information packs about the study and invited to participate. Depending on preference, young women and parents were interviewed separately, with their parent/daughter or with a peer/peers. The interviews were conducted by one researcher and took place within schools, community organisations, homes or workplaces. Interviews were halted after data saturation was reached. Digitally recorded, semi-structured interviews were used with topic guides focusing on understanding of HPV and the vaccination programme, adolescent consent for healthcare, views of the new consent procedures, experiences of the new procedures in practice, implications for other schools-based adolescent vaccination programmes. Thematic analysis was done using the framework approach. Both inductive and deductive approaches were used, focusing on the main research questions regarding participants views and experiences of the vaccination programme and adolescent consent while capturing additional issues as they emerged from the data.
Qualitative population and perspective	Participants from 4 mainstream schools and 5 alternative educational settings. 53 participants were interviewed: • The immunisation programme manager and three immunisation nurses (who comprised the permanent team delivering the HPV vaccination programme) • Three members of staff in mainstream schools • A staff member from each of the five alternative educational settings • A total of 22 parents (21 mothers and one father), of whom five had daughters participating in the study • 19 young women. Eight (aged 12–13 years) were recruited at school and experienced the new consent procedures, and 11 (aged 13–17 years) were recruited from community organisations
Relevant themes	Themes were presented in relation to different stages of the vaccination process: 1. School preparedness: Some schools were not prepared for inviting all girls to the vaccination session, irrespective of whether they had a consent form "…

	the consents and what we're doing, and the fact that we need everybody down, we need to speak to everybody… I think it doesn't get read." 2. Written parental consent: Although most consent forms were returned, it was acknowledged that some would not be for a variety of reasons, such as not being given to parents, being signed but not returned, or that written consent is not suitable for some households "The vast majority of them [parental consent forms] will come back on or before the deadline and then, no matter how much chasing you do with a particular, with a very small group of students thankfully, you will still never get them all returned." 3. Telephone consent: Staff, parents and students were satisfied with phone calls as a method of obtaining consent. The benefits were thought to outweigh the drawbacks associated with the time needed for the immunisation team to make the calls " 'It's a lot of work and for those schools that you get 30, 40 plus consent forms not coming back in, and you've got all those young people with you and you're trying to make all these phone calls. Yes, it is frustrating but actually, the fact that they get a good percentage of those come back as positives, actually that's good because those young people wouldn't necessarily have got vaccinated otherwise.' 4. Self-consent: Very few students were assessed for self-consent, and the immunisation team identified situations where this process had been effective, but also times where a student had been vaccinated against her parents wishes 5. Catch-up clinics: Immunisation teams thought there were positives of clinic sessions, if a girl needed more time to think about the vaccination, or if she didn't want to have it in school. However, it was highlighted that the school-based system was more convenient than having to phone for an appointment "That's why it is better if we can go through the young people in schools [be]cause parents, if they're not going to engage, won't take them anywhere.' 6. Alternative educational settings and additional needs: School staff and parents highlighted the importance of the immunisation team understanding the additional needs of the students and basing the process on an individual students' needs "I think you'd have to take it on an individual case because a lot of the children are really bright and switched on and know a lot about a lot of things and it's not saying they wouldn't understand but I think because the extra, the nature of their disability, I think you would have to be a bit more careful with consent."

Risk of bias (CASP qualitative checklist)

Section	Question	Answer
Aims of the research	Was there a clear statement of the aims of the research?	Yes
Appropriateness of methodology	Is a qualitative methodology appropriate?	Yes
Research Design	Was the research design appropriate to address the aims of the research?	Yes
Recruitment Strategy	Was the recruitment strategy appropriate to the aims of the research?	Yes
Data collection	Was the data collected in a way that addressed the research issue?	Yes

Section	Question	Answer
Researcher and participant relationship	Has the relationship between researcher and participants been adequately considered?	Can't tell
Ethical Issues	Have ethical issues been taken into consideration?	Yes
Data analysis	Was the data analysis sufficiently rigorous?	Yes
Findings	Is there a clear statement of findings?	Yes
Research value	How valuable is the research?	The research is valuable
Overall risk of bias and relevance	Overall risk of bias	Moderate *(Only the views of girls who had the vaccine were considered)*
Overall risk of bias and relevance	Relevance	Highly relevant

Fisher, 2020a

Bibliographic Reference Fisher, H.; Evans, K.; Ferrie, J.; Yates, J.; Roderick, M.; Audrey, S.; Young women's autonomy and information needs in the schools-based HPV vaccination programme: a qualitative study; BMC public health; 2020; vol. 20 (no. 1); 1680

Study Characteristics

Study design	Semi structured interviews
Aim of study	To consider the perspectives of young women, parents and professionals about HPV vaccination, and how this was influenced by the content and form of the information provided in the intervention
Study location	UK
Study setting	School based vaccination
Study dates	2017/18 – 2018/19 school year
Sources of funding	British Heart Foundation, Cancer Research UK, Economic and Social Research Council, Medical Research Council, the Welsh Government and the Wellcome Trust
Inclusion Criteria	Mainstream schools in the South West of England where at least 12 female Year 8 students were not vaccinated during the 2016/17 programme year All alternative education providers in the area
Exclusion criteria	None reported

Intervention details	Parental or young person consent - follow up study from Audrey 2020
Qualitative study methods	Observations of vaccination sessions took place in three of the mainstream schools during and field notes recorded the context and any specific incidents relevant to uptake. Topic guides were developed to cover these issues (beliefs about the HPV vaccine, views and experiences of the HPV vaccination programme, and opinions about the new consent procedures) with some adaptations relevant to the differing roles of immunisation nurses, mainstream school staff, alternative education providers, parents and young women. Semi-structured interviews were used. Interviews with girls and their parents either took place separately, with their parent/daughter or with a peer/peers. Thematic analysis was used with both inductive and deductive approach to analyse the content, focusing on the main research questions while identifying key issues emerging from the data. One researcher coded the transcript and another double-coded them and checked for meaning, relevance and reliability
Qualitative population and perspective	The immunisation programme manager, 3 immunisation nurses, 3 members of staff from mainstream schools, 1 member of staff from the alternative education providers, 22 parents and 19 girls who had the vaccine
Relevant themes	2 themes were identified, with 5 sub-themes in total: 1. Young people's autonomy – school-based vaccination sessions: Much of the vaccination sessions are dictated by staff and based on parental consent "'If my mum picks up [the phone], I'm having the jab" 2. Young people's autonomy – autonomy during consent procedures: Participants felt that young people had some responsibility in the role of retuning their signed consent forms "Even though it's prioritising parental consent, you're putting that responsibility on the child to get that important literature home and get it processed and get it back into school but they're not actually responsible for it. It's kind of quite strange 3. Communication about the vaccine programme - information for young women: Some suggested that the information was targeted at parents, or that information leaflets alone weren't enough to engage young people. Information led to discussion between some families but not others "You need to guide them through it a bit more rather than just sending information and expecting them to read it and act on it. I think they probably wouldn't at a young age.' 4. Communication about the vaccine programme – young women's communication preferences: School-based and face-to-face education about the vaccine and the vaccination session was preferred "'I think if you have sessions within schools then that's a lot more structured, you have to focus, you have to learn … so that's something that has to happen, but if it's a leaflet that can get lost or screwed up, that's got so much potential to not get anywhere" 5. Communication about the vaccine programme – information for parents: Leaflets alone were not considered enough by participants. There were concerns about people who look up more information from other sources and may be presented with misinformation "When you search something on the internet obviously there needs to be some way that the parent can distinguish between the two because there's always going to be one for and one against and they're both going to be telling it from their point of view"

Risk of bias (CASP qualitative checklist)

Section	Question	Answer
Aims of the research	Was there a clear statement of the aims of the research?	Yes
Appropriateness of methodology	Is a qualitative methodology appropriate?	Yes
Research Design	Was the research design appropriate to address the aims of the research?	Yes
Recruitment Strategy	Was the recruitment strategy appropriate to the aims of the research?	Yes
Data collection	Was the data collected in a way that addressed the research issue?	Yes
Researcher and participant relationship	Has the relationship between researcher and participants been adequately considered?	Can't tell
Ethical Issues	Have ethical issues been taken into consideration?	Yes
Data analysis	Was the data analysis sufficiently rigorous?	Yes
Findings	Is there a clear statement of findings?	Yes
Research value	How valuable is the research?	The research is valuable
Overall risk of bias and relevance	Overall risk of bias	Moderate *(Only the views of girls who had the vaccine were considered)*
Overall risk of bias and relevance	Relevance	Highly relevant

Jackson, 2010

Bibliographic Reference	Jackson, C.; Cheater, F.M.; Peacock, R.; Leask, J.; Trevena, L.; Evaluating a web-based MMR decision aid to support informed decision-making by UK parents: A before-and-after feasibility study; Health Education Journal; 2010; vol. 69 (no. 1); 74-83

Study Characteristics

Study design	Semi structured interviews and questionnaire which included open-ended questions
Aim of study	Feasibility study designed to assess the acceptability of the Australian MMR decision aid adapted for use by UK parents
Behavioural model used	Not reported

Study location	England
Study setting	Two childcare organisations located in a moderately deprived community in one city in the north of England
Study dates	May 2006 - July 2006
Sources of funding	Department of Health Public Health Initiative Award
Inclusion Criteria	Parents of children eligible (approaching eligibility) for first- or second-dose MMR vaccination (aged six months to five years) English-language literate and had internet access.
Exclusion criteria	None reported
Intervention details	Parents were sent a flyer with the website address and password to access the decision aid. The aid was based on a decision aid developed in Australia in 2004, with some content adapted to be relevant to the UK. Content included background information on what MMR is, the immunisation schedule and how the MMR vaccine works. Information was also provided on common symptoms and complications of each of the three diseases as well as safety and side-effects of the vaccine. Interactive content was included to help the decision making process, prompting parents to consider their reasons for or against vaccination and to record their intentions towards the MMR vaccine
Number of participants	27 parents (5 took part in interviews)
Duration of follow-up	3 months
Qualitative study methods	Questionnaire was sent out to all parents (30 parents) at 1 week and 3 months after the intervention. Acceptability was assessed based on the 1 week questionnaire and semi-structured phone interviews. The questionnaire included multiple choice items (which did not meet the inclusion criteria for this review) and open-ended questions to examine parents' views on the decision aid and it's impact on their decision making process. 5 parents were randomly selected for the interviews. Interviews were recorded and transcribed fully. No further information was provided.
Qualitative population and perspective	Parents of children who are aged 6 months - 5 years and are eligible for MMR vaccination
Relevant themes	1. Content - The information was presented in a balanced way ""“It went through, you know the statistics for something happening, you know, something good, and something bad, and yeah, it didn’t sort of hold anything back. If there was anything they had to put on and it was negative, they still gave you it. It wasn’t just ‘we want you to have MMR so we’ll just give you all the good side’. They gave you a balance.” 2. Decision making - The decision aid helped parents make informed decisions and reduced their need to ask further questions “To a point, it’s [the decision aid] been too useful because when I actually went to take [name of son] to have his MMR done, and they said, ‘have you any questions?’ I thought well no actually because I mean I’m pretty happy with what we’re doing”

Additional information or if only extracted some of the data and why etc.	Education intervention. Only data from the open-ended questions in the questionnaire were extracted as the multiple choice outcomes did not meet the inclusion criteria for this review.

Risk of bias (CASP qualitative checklist)

Section	Question	Answer
Aims of the research	Was there a clear statement of the aims of the research?	Yes
Appropriateness of methodology	Is a qualitative methodology appropriate?	Yes
Research Design	Was the research design appropriate to address the aims of the research?	Yes
Recruitment Strategy	Was the recruitment strategy appropriate to the aims of the research?	Can't tell *(Limited information about recruitment methods and no explanation of reasons for low recruitment (36% of those invited))*
Data collection	Was the data collected in a way that addressed the research issue?	Can't tell *(Limited information about the interviews and very small number of people (5) were asked to take part in the interviews)*
Researcher and participant relationship	Has the relationship between researcher and participants been adequately considered?	Can't tell
Ethical Issues	Have ethical issues been taken into consideration?	Can't tell *(No information about how the study was explained to participants and limited information about gaining consent)*
Data analysis	Was the data analysis sufficiently rigorous?	Can't tell *(Limited information about analysis methods)*
Findings	Is there a clear statement of findings?	Yes
Research value	How valuable is the research?	The research has some value *(Feasibility study to justify more detailed research on the decision aid)*
Overall risk of bias and relevance	Overall risk of bias	High *(Limited information about recruitment methods. No explanation of low study participation and very few parents were invited to take part in interviews. No information about how the study was explained to*

Section	Question	Answer
		participants and very limited description of the analysis methods.)
	Relevance	Highly relevant

Lwembe et al., 2016

Bibliographic Reference Lwembe S; Green SA; Tanna N; Connor J; Valler C; Barnes R; A qualitative evaluation to explore the suitability, feasibility and acceptability of using a 'celebration card' intervention in primary care to improve the uptake of childhood vaccinations.; BMC family practice; 2016; vol. 17

Study Characteristics

Study design	Focus Groups With parents and carers of children under 5 Semi structured interviews Phone interviews with policy makers and practitioners
Aim of study	To provide a qualitative evaluation to assess the feasibility, suitability and acceptability of the delivery of the 'Celebrate and Protect' programme by identifying specific barriers and facilitators to delivering the programme and to provide some suggestions for learning in future programmes.
Behavioural model used	Not reported
Study location	UK
Study setting	9 London PCTs (Barking & Dagenham, Bexley, Greenwich, Kensington & Chelsea, Hammersmith & Fulham, Newham, Tower Hamlets, Waltham Forest and Westminster)
Study dates	July 2012 - February 2013 (programme began in July 2012, focus groups held between October 2012 - February 2013)
Sources of funding	NHS, Local Government and Sanofi Pasteur MSD
Inclusion Criteria	Policymakers, primary care staff and parents/carers of children under 5 the sample was not specifically designed to be representative the participants were of diverse ethnic and socio-economic backgrounds
Intervention details	The Celebrate and Protect Programme: aimed to increase uptake of childhood vaccination by supplementing current GP practices' current call/recall activities. A celebration card and immunisation schedule was sent out by the GP practice staff to families of children before their vaccination was scheduled. The celebration card was sent to parents/carers of children under five to attend an initial 6–8 week check (new-borns) and vaccination appointments (1 year olds and 4 year olds) with their GP practice. Cards continued to be sent out until the first or fourth birthday. The card intended to celebrate the birth or birthday of a child and act as a 'call to action' for the parent/carers to contact the practice and book a health check or vaccination. The card for new-borns included a message inviting parents/carers to make an appointment with the practice to discuss any questions they had about the baby's health and for the baby to be examined, when it is usual for babies to receive their first set of vaccinations. Cards distributed within PCTs that had a universal tuberculosis (TB)

	vaccination programme included an additional message for parents/carers to make an appointment for TB vaccination. Birthday cards for 1 year olds included a message that the child's vaccinations were due and an invitation to contact the GP practice to make an appointment. Birthday cards were only sent to 4 year olds who had not yet received their immunisations. The cards also contained information signposting parents/carers to the 'Red Book' (the Personal Child Health Record), and www.immunisation.nhs.uk, along with an insert with information about the recommended schedule of vaccinations.
Qualitative study methods	Three sample groups were identified (15 policymakers identified by purposive sampling, 9 primary care staff recruited by canvassing 23% of GP practices involved in the first phase of the trial, and 31 parents/carers of children under 5, recruited via PCT immunisation coordinators with the aim of identifying 2-3 participants from each PCT (6 of the 9 PCTs were eventually represented). Semi-structured telephone interviews were undertaken with all policymakers and practitioners by a member of the evaluation team. Focus groups were selected as the most appropriate data collection methods for parents and carers to include as many views as possible but with limited available resources (3 focus groups in East, South-East and North West London). These were facilitated by a member of the evaluation team using a topic guide. Focus groups and interviews were audio-recorded, transcribed by a project administrator and validated by two evaluation team members. Data was analysed thematically using the Johnson and Sholes (2005) suitability, feasibility and acceptability framework
Qualitative population and perspective	Policymakers, primary care staff and parents/carers of children under 5
Relevant themes	1. Acceptability - Communication with parents, methods of communication "You need to get your child to the clinic. You need to get them immunised. This [celebration card] is like; it is more of a positive reinforcement. The letter is more; you have been told off." 2. Accessibility - Ensuring all parents receive the intervention "…(Celebrate and Protect) doesn't cover new parents/carers … they do not see us … see health visitor…health visitors remind them but [the] call has not come from [the] surgery so mothers forget…" 3. Content - Need for vaccine information and knowing who to contact "…There's nothing on here to say why you should have your baby immunised…" "…Quite dry information, it just gives you the name of the inoculation. I'm not a doctor… 4. Implementation - Using the intervention as a replacement or an addition to existing services "birthday cards have lessened my workload…don't have to make phone calls.... surgery does not have to pay for postage.... reduced workload as do not have to speak to address concerns…" 5. Sources of information - Views on the pharmaceuticals company's role in the intervention "as long as ethical issues are covered as required by DH policy document…we need to get used to working with private providers", "…I saw on the telly about price fixing with pharmaceutical companies, where they offer GPs incentives to prescribe their product...."
Additional information	Reminder intervention

Risk of bias (CASP qualitative checklist)

Section	Question	Answer
Aims of the research	Was there a clear statement of the aims of the research?	Yes
Appropriateness of methodology	Is a qualitative methodology appropriate?	Yes
Research Design	Was the research design appropriate to address the aims of the research?	Yes
Recruitment Strategy	Was the recruitment strategy appropriate to the aims of the research?	Yes *(Partly - parents/carers recruited were not necessarily registered to one of the GP practices participating in the first wave of the programme. Fewer primary care staff participated than expected)*
Data collection	Was the data collected in a way that addressed the research issue?	Yes
Researcher and participant relationship	Has the relationship between researcher and participants been adequately considered?	Can't tell *(Limited information about recruitment methods and whether the choice of location or data collection method may have affected the results)*
Ethical Issues	Have ethical issues been taken into consideration?	Can't tell *(States that informed consent was obtained but limited other information)*
Data analysis	Was the data analysis sufficiently rigorous?	Yes
Findings	Is there a clear statement of findings?	Yes
Research value	How valuable is the research?	The research has some value
Overall risk of bias and relevance	Overall risk of bias	Moderate *(Limited information about recruitment methods and whether the choice of location or data collection method may have affected the results. Limited information about informed consent)*
	Relevance	Highly relevant

Rockliffe, 2020

Bibliographic Reference Rockliffe L; Stearns S; Forster AS; A qualitative exploration of using financial incentives to improve vaccination uptake via consent form return in female adolescents in London.; PloS one; 2020; vol. 15 (no. 8)

Study Characteristics

Study design	Focus Groups Focus groups in study 1 and free text questionnaire responses in study 2
Aim of study	1. To assess the acceptability of financial incentives to promote vaccine consent form return among adolescents. 2. To explore the potential mechanisms by which financial incentives might change behaviour amongst this group
Behavioural model used	Not reported
Study location	UK
Study setting	Secondary schools in London
Study dates	Study 1: March 2018 - April 2018. Study 2: July 2016 - January 2017
Sources of funding	Cancer Research UK
Inclusion Criteria	Female students aged 13-14 from 2 secondary schools in London who had previously taken part in the feasibility trial when aged 12-13 Study 1 Female students aged 12-13 from 3 secondary schools who had been offered the incentive during the previous 4 weeks Study 2
Exclusion criteria	None reported
Intervention details	Incentivised HPV vaccine consent form return (see Rockliffe 2018)
Qualitative study methods	The study was made up of 2 studies. Study 1 used focus groups with adolescent girls to explore the acceptability of incentivising HPV vaccination consent form return. Six focus groups were conducted in schools with an average of 6 students per group. Discussions were directed using a topic guide that explored participants' experience of being offered the incentive in the previous trial, attitudes towards the use of incentives in the context of vaccination in general, and preferences for the nature of the incentive. Participants were also asked about two alternatives :1. every person is offered £3 if they returned the consent form and 2. individuals are offered entry into a prize draw to win a £300 shopping voucher with one winner if they return the consent form. Study 2 used free text responses from a questionnaire where girls were asked to respond to the question "What did you think about being entered into a prize draw to win a £50 voucher if you returned the HPV vaccine consent form?". Participants could provide multiple opinions and data was used for triangulation of Study 1 findings. Participants were recruited from the group of students that took part in the feasibility trial (Forster 2017). Data was analysed using Braun and Clarke's phases of thematic analysis for Study 1, using Sekhon's framework of acceptability as a guide. Two researchers applied the coding framework to the free-text data generated in Study 2. Disagreements were resolved by discussion.
Qualitative population and perspective	36 girls took part in Study 1, of which 26 returned the form and had the vaccine, 2 had not returned the form and 8 had received no doses of the vaccine. In Study 2, 80% of those invited to complete a questionnaire returned it. 93% of those had returned their consent form and 89% had received the dose of the vaccine.
Relevant themes	1. Acceptability - Positive and negative emotions associated with the prize draw, relevance and appropriateness of the incentive "I think it was a good prize. I mean, you can't expect much but it was a good prize. . . I think it was kind of motivating

	because, you know, you get shopping in return", "if the money is quite low then they wouldn't be that like jealous. But if it's really high then there might be more chance of people getting annoyed about it" 2. Decision making - Child involvement in decision making "I guess it was motivation to give in your HPV vaccines [consent forms] but I think quite a lot of parents were just forcing us to do it anyway so..." 3. Misconceptions - Confusion over the validity of the prize "if it was like, £10 to the same amount of people. Or £50 to, like, a smaller amount of people then it might be more believable"
Additional information	Some participants may have participated in both studies, but data were collected anonymously so it is not possible to determine how often this occurred

Risk of bias (CASP qualitative checklist)

Section	Question	Answer
Aims of the research	Was there a clear statement of the aims of the research?	Yes
Appropriateness of methodology	Is a qualitative methodology appropriate?	Yes
Research Design	Was the research design appropriate to address the aims of the research?	Yes
Recruitment Strategy	Was the recruitment strategy appropriate to the aims of the research?	Yes
Data collection	Was the data collected in a way that addressed the research issue?	Yes
Researcher and participant relationship	Has the relationship between researcher and participants been adequately considered?	Can't tell *(Limited information about the relationship between researchers and participants)*
Ethical Issues	Have ethical issues been taken into consideration?	Yes
Data analysis	Was the data analysis sufficiently rigorous?	Yes
Findings	Is there a clear statement of findings?	Yes
Research value	How valuable is the research?	The research is valuable
Overall risk of bias and relevance	Overall risk of bias	Low
	Relevance	Highly relevant

Rockliffe, 2018

Bibliographic Reference	Rockliffe, Lauren; Chorley, Amanda J; McBride, Emily; Waller, Jo; Forster, Alice S; Assessing the acceptability of incentivising HPV vaccination consent form return as a means of increasing uptake.; BMC public health; 2018; vol. 18 (no. 1); 382

Study Characteristics

Study design	Semi structured interviews and questionnaire
Aim of study	To assess the acceptability of the incentive (chance to win a shopping voucher for vaccine consent form return) for adolescent girls, their parents, and participating school staff
Behavioural model used	Not reported
Study location	UK
Study setting	Schools in 3 London boroughs (Enfield, Southwark and Lambeth)
Study dates	July 2016 - January 2017
Sources of funding	Cancer Research UK and Public Health England
Inclusion Criteria	Secondary schools in Enfield, Southwark and Lambeth with female year 8 students
Exclusion criteria	None reported
Intervention details	Year 8 girls were given standard information about the HPV vaccination and a consent form to be signed by their parent, and returned to school. Girls were offered the opportunity to be entered into a prize draw to win one of several £50 Love2shop vouchers if they returned their consent form, signed by their parent. This was communicated to girls verbally by their form tutors and via a letter. Girls returning a signed consent form were entered into the prize draw regardless of whether the form said 'yes' or 'no' to vaccination. The prize draws were at the school level and eligible girls had a 1-in-10 chance of winning.
Qualitative study methods	All schools in the 3 London boroughs were invited to take part. 6 schools participated and year 8 girls from these schools, their parents and staff members took part. Girls and their parents were asked to complete a questionnaire 1 week after vaccination day, assessing unintended consequences of the intervention, possible mechanisms of action and attitudes towards the incentive. Attitudes were assessed using two free-text response acceptability questions (the focus of this study) which asked the question "What did you think about being entered into a prize draw to win a £50 voucher if you returned the HPV vaccine consent form?" Parents were provided with information about the aim of the trial and use of the incentive, and asked via questionnaire whether they thought it was a good idea. Staff members involved in running the trial were interviewed via telephone using a semi-structured interview guide which covered topics relating to the acceptability of the incentive. Topics assessing incentive acceptability included 'attitudes towards the incentive', 'initial thoughts about taking part', and 'overall experience of participating in the trial'. Data was analysed thematically, with questionnaire responses and interview data analysed separately. Two reviewers coded the data and a coding frame was developed. Inter-rating reliability was assessed and discrepancies were resolved.

Qualitative population and perspective	80% of girls who were offered the incentive returned the questionnaire and 17% of parents. Six staff from 4 of the 6 participating schools were interviewed (1 school in the control arm and 3 in the intervention arm)
Relevant themes	1. Acceptability - Positive and negative emotions associated with the prize draw, relevance and appropriateness of the incentive “I think it's a really cool idea and definitely encourages people to bring their forms back into school”, “I think that it is unnecessary because the consent form is very important and the girls should know well enough that it's essential to bring it back to school” 2. Decision making - Student-focused intervention for parent/carer decisions “As the 12 year old child still needs parental consent it is unclear why the form is not sent to/returned by the adult - no need to involve/bribe the child in this transaction surely?" 3. Misconceptions - Confusion over the conditions for entering the prize draw “It would help them to get the vaccination because of the prize they might win” 4. Perceptions - Encouraging consent form return and response to the incentive “Um, they were, they were really keen actually… yeah, that, that was, um, quite a big… because it was quite a big prize actually, so I think, yeah, they were, they were so pleased”

Risk of bias (CASP qualitative checklist)

Section	Question	Answer
Aims of the research	Was there a clear statement of the aims of the research?	Yes
Appropriateness of methodology	Is a qualitative methodology appropriate?	Yes
Research Design	Was the research design appropriate to address the aims of the research?	Can't tell *(Stated the methods used for data collection but not explained why they were chosen)*
Recruitment Strategy	Was the recruitment strategy appropriate to the aims of the research?	Can't tell *(Described who was invited to take part but 85% of schools invited did not respond or declined the invitation. No discussion about the reasons for low recruitment)*
Data collection	Was the data collected in a way that addressed the research issue?	Can't tell *(The authors discussed what methods were used but did not explain why.)*
Researcher and participant relationship	Has the relationship between researcher and participants been adequately considered?	Can't tell *(Limited consideration of the relationship between researchers and participants)*
Ethical Issues	Have ethical issues been taken into consideration?	Can't tell *(Study was granted ethical approval but limited explanation of how the study was explained to participants before obtaining their consent)*

Section	Question	Answer
Data analysis	Was the data analysis sufficiently rigorous?	Yes
Findings	Is there a clear statement of findings?	Yes
Research value	How valuable is the research?	The research is valuable
Overall risk of bias and relevance	Overall risk of bias	High *(A low percentage of schools accepted the invitation to take part in the study, but no discussion of the reasons behind this. Limited information about why data collection methods were chosen. Limited information about how the study was explained to participants)*
	Relevance	Highly relevant

Quantitative evidence

Fisher, 2020

Bibliographic Reference Fisher H; Hickman M; Ferrie J; Evans K; Bell M; Yates J; Roderick M; Reynolds R; MacLeod J; Audrey S; Impact of new consent procedures on uptake of the schools-based human papillomavirus (HPV) vaccination programme.; Journal of public health (Oxford, England); 2020

Study details

Secondary publication of another included study- see primary study for details	Audrey 2020
Other publications associated with this study included in review	Audrey 2021, Fisher 2020
Trial registration number and/or trial name	South West Template Pathway on Self Consent for School Aged Immunisations
Study type	Uncontrolled before-and-after studies
Study location	UK
Study setting	Schools in 2 Local Authorities in South West England
Study dates	Pre-intervention: 2015-16 and 2016-2017 Post-intervention: 2017-2018 and 2018-2019
Sources of funding	Joint funding (MR/KO232331/1) from the British Heart Foundation, Cancer Research UK, Economic and Social Research Council, Medical Research Council, the Welsh Government and the Wellcome Trust, under the auspices of the UK Clinical Research Collaboration

Inclusion criteria	Two local authorities in South West England Data provided covered the two local authorities that implemented the new consent procedures and covered urban or rural/urban areas
Exclusion criteria	Individual records were excluded if the school identifying code was absent or invalid, the date of birth was invalid, or partial postcode was missing or invalid
Intervention(s)	Under the new procedures, where written parental consent is not received the immunization team make telephone calls to seek parental verbal consent during the vaccination session. Additionally, if parents cannot be contacted during the vaccination session, young women considered 'Gillick-competent' by the immunization team can self-consent if they confirm that they have discussed the vaccine with their parents and it would not cause a problem at home if they were vaccinated without written or verbal parental consent. Young women who do not receive the vaccine on the day are provided with written information about community catch-up clinics.
Outcome measures	Vaccine uptake By Local Authority
Number of participants	2 Local Authorities
Duration of follow-up	2 years

Study arms

Local Authority 1 (N = 4384)
New HPV vaccination programme with all young people attending vaccination sessions, irrespective of whether they have returned a consent form

Local Authority 2 (N = 2602)
New HPV vaccination programme with all young people attending vaccination sessions, irrespective of whether they have returned a consent form

Risk of bias (GUT EPOC risk of bias)

Section	Question	Answer
Random sequence generation	Was the allocation sequence adequately generated?	NA
Allocation concealment	Was the allocation adequately concealed?	NA
Baseline characteristics	Were baseline characteristics similar?	NA
Incomplete outcome data	Were incomplete outcome data adequately addressed?	Unclear

Knowledge of the allocated interventions	Was knowledge of the allocated interventions adequately prevented during the study?	NA
Protection against contamination	Was the study adequately protected against contamination?	NA
Selective outcome reporting	Was the study free from selective outcome reporting?	Yes
Other risks of bias	Was the study free from other risks of bias?	No *(Study used routinely collected data on vaccinations delivered in school and community settings to all young people registered with a GP and eligible for routine HPV vaccination during the study period. This did not provide information on baseline characteristics, and some records had to be excluded because of invalid data)*
Overall judgements of risk of bias and directness	Overall risk of bias	High risk of bias *(Uncontrolled design with no information about baseline characteristics and some records had to be excluded because of invalid data. The authors reported that different data sources reported different levels of uptake)*
Overall judgements of risk of bias and directness	Overall directness	Directly applicable

Forster, 2017

Bibliographic Reference	Forster, Alice S; Cornelius, Victoria; Rockliffe, Lauren; Marlow, Laura Av; Bedford, Helen; Waller, Jo; A cluster randomised feasibility study of an adolescent incentive intervention to increase uptake of HPV vaccination.; British journal of cancer; 2017; vol. 117 (no. 8); 1121-1127

Study details

Other publications associated with this study included in review	Quantitative outcomes related to Rockliffe 2018
Study type	Cluster randomised controlled trial
Study location	UK
Study setting	Schools in 3 London boroughs (Enfield, Lambeth, Southwark)

Study dates	July 2016 - January 2017
Sources of funding	Cancer Research UK
Inclusion criteria	All secondary schools in the 3 London boroughs Parents of all girls eligible for the vaccine (year 8 girls) were given the option to opt out of the study
Exclusion criteria	None reported
Intervention(s)	Girls were provided with an information leaflet about the HPV vaccine and a consent form from the school, which they were asked to hand deliver to their parents and return before a prescribed date. They were also told by their form tutor and in a letter that they would be eligible to be entered into a prize draw to win a £50 Love2Shop voucher if they returned their consent form, signed by a legal guardian, before a prescribed date. Eligibility for entry into the prize draw was dependent on consent form return only, not vaccine receipt. All girls who returned their consent form were entered into a prize draw for each school, with girls having a 1 in 10 chance of winning. The draw was made following the first dose of the HPV vaccine,
Comparator	Girls were provided with an information leaflet about the HPV vaccine and a consent form from the school, which they were asked to hand deliver to their parents and return before a prescribed date. There was no prize draw or incentive offered for consent form return
Outcome measures	Consent form return
Number of participants	9 schools, 593 female students
Duration of follow-up	Duration of vaccination programme
Loss to follow-up	Intervention: 1 school, 12 girls Control: 2 schools, 6 girls
Additional comments	Outcome was number of consent forms returned, not vaccine uptake (consent form return outcome was used as a proxy for vaccine uptake but quality was downgraded for directness) Outcome was adjusted for clustering effects using the ‘vce’ command in STATA

Study arms

Incentivised consent form return (N = 4) 4 schools, 267 female students
Standard consent form (N = 5) 5 schools, 326 female students

Risk of bias (Cochrane Cluster risk of bias 2.0)

Section	Question	Answer
1a. Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Some differences in baseline characteristics for ethnicity, religion and deprivation)*
1b. Bias arising from the timing of identification and recruitment of individual participants in relation to timing of randomisation	Risk of bias judgement for the timing of identification and recruitment of individual participants in relation to timing of randomisation	Low *)*
2. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Low
3. Bias due to missing outcome data	Risk of bias judgement for missing outcome data	Low
4. Bias in measurement of the outcome	Risk of bias judgement for measurement of the outcome	Low
5. Bias in selection of the reported result	Risk of bias for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	Some concerns *(Differences in baseline characteristics)*
	Overall Directness	Partially indirect *(Reported outcome is based on consent form return rather than vaccine uptake)*

Gibson, 2014

Bibliographic Reference Gibson K; Celebrate and Protect: A mixed methods evaluation; 2014; 1-52

Study details

Other publications associated with this study included in review	Quantitative report associated with Lwembe 2016
Study type	Cluster non-randomised controlled trial
Study location	UK

Study setting	Practices in 9 London PCTs (Barking & Dagenham, Bexley, Greenwich, Kensington & Chelsea, Hammersmith & Fulham, Newham, Tower Hamlets, Waltham Forest, Westminster)
Study dates	October 2012 - February 2013
Inclusion criteria	Strategic leads in the PCT, programme management team, healthcare professionals, primary care staff and parents/carers Unclear how these were identified
Exclusion criteria	None reported
Intervention(s)	The Celebrate and Protect programme. A personalised celebration card and an information leaflet with a vaccination schedule, sent out by the GP practice to parents/carers registered at the practice following the birth of a child, or prior to the first or fourth birthday of a child registered at the practice. The card intended to celebrate the birth of a child or a child's birthday and act as a call to action for the parent /guardian to contact the practice and book a vaccination or health check.
Comparator	Control - no reminder card programme. No further information provided
Outcome measures	Vaccine uptake Estimated from charts presented in the report
Duration of follow-up	12 months
Additional comments	Non-peer reviewed report No information about whether the results were adjusted for clustering. We could not adjust them ourselves as the study did not provide sample sizes for the control arm.

Study arms

Celebrate and Protect (N = 56) 16 strategic leads/programme management team, nine providers and 31 parents/carers
Control (N = ?) Number of providers, practices and parents/carers in the control arm not reported

Risk of bias (modified checklist: combined ROBINS-I and Cochrane cluster 2.0)

Section	Question	Answer
1a. Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	High *(Group allocation not randomised. No information about baseline characteristics and unclear how the practices not randomised to the intervention were selected)*
1b. Bias arising from the timing of identification and recruitment of individual participants in relation to timing of randomisation	Risk of bias judgement for the timing of identification and recruitment of individual participants in relation to timing of randomisation	Some concerns *(No information about baseline characteristics)*

Section	Question	Answer
2. Bias due to confounding	Risk of bias judgement for confounding	Moderate *(No information about confounding variables and limited information about analysis)*
3. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low
4. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Moderate
5. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Moderate
6. Bias due to missing data	Risk of bias judgement for missing data	Serious *(Data only available for 3 of the 9 PCTs in the intervention because of incomplete data sets. No information about data excluded from the control arm)*
7. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Low
8. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	Critical *(Data is from a non-peer reviewed report. The study was non-randomised, did not provide information on baseline characteristics and provided limited information on analysis methods. Unclear how practices were selected for the control arm and data from a high proportion of the centres included in the intervention were excluded from the analysis)*
	Directness	Directly applicable

Shourie, 2013

Bibliographic Reference	Shourie, S; Jackson, C; Cheater, F M; Bekker, H L; Edlin, R; Tubeuf, S; Harrison, W; McAleese, E; Schweiger, M; Bleasby, B; Hammond, L; A cluster randomised controlled trial of a web based decision aid to support parents' decisions about their child's Measles Mumps and Rubella (MMR) vaccination.; Vaccine; 2013; vol. 31 (no. 50); 6003-10

Study details

Study type	Cluster randomised controlled trial
Study location	UK
Study setting	Community (participants were at home)

Study dates	May 2009 - September 2010
Sources of funding	National Institute for Health Research, Research for Patient Benefit Programme
Inclusion criteria	First-time parents with a child aged 3–12 months being offered the first dose of the MMR vaccine An email address and sufficient English language skills
Exclusion criteria	None
Intervention(s)	**Intervention 1:** Parents were posted a web link to the MMR decision aid and received usual practice from their GP practice (same as in the usual practice arm). **Intervention 2 (not relevant to this review):** Parents were sent a Health Scotland leaflet titled 'MMR your questions answered' and received usual practice (same as in the usual practice arm).
Comparator	Parents received an invite from their GP practice to have their child vaccinated for the first dose MMR at 12–13 months, usually including a leaflet with facts about the vaccine ('MMR the Facts') and an offer of a consultation if they had any concerns.
Outcome measures	Vaccine uptake
Number of participants	50 GP practices, 230 parents (127 parents in the 2 arms relevant to this review)
Duration of follow-up	When children reached 15 months of age
Additional comments	Intervention 2 (Health Scotland leaflet) was not relevant to this review as no associated qualitative studies were found. Information on this intervention is included in the education review

Study arms

MMR decision aid (N = 50)

14 clusters

Loss to follow-up	5 GP practices, 6 parents

Usual practice (N = 77)

18 clusters

Loss to follow-up	6 GP practices, 8 parents

Characteristics

Arm-level characteristics

	MMR decision aid (N = 50)	**MMR leaflet (N = 93)**	**Usual practice (N = 77)**
Mean age of parent *(years)*			
Mean/SD	32.2 (5.51)	33.29 (5.58)	31.43 (5.25)

	MMR decision aid (N = 50)	MMR leaflet (N = 93)	Usual practice (N = 77)
Mean age of child *(Months)*			
Mean/SD	9 (2.35)	8.04 (2.63)	8.33 (2.4)

Risk of bias (Cochrane Cluster risk of bias 2.0)

Section	Question	Answer
1a. Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(At baseline, participants in the decision aid arm had a higher number of people who had decisional conflict than parents in the control arm)*
1b. Bias arising from the timing of identification and recruitment of individual participants in relation to timing of randomisation	Risk of bias judgement for the timing of identification and recruitment of individual participants in relation to timing of randomisation	Low
2. Bias due to deviations from intended interventions (If your aim is to assess the effect of assignment to intervention, answer the following questions).	Risk of bias judgement for deviations from intended interventions	Some concerns *(Usual practice already involved sending an information leaflet)*
3. Bias due to missing outcome data	Risk of bias judgement for missing outcome data	Low
4. Bias in measurement of the outcome	Risk of bias judgement for measurement of the outcome	Low *(Outcome assessors may have been aware of the intervention but outcomes were objective)*
5. Bias in selection of the reported result	Risk of bias for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	Some concerns *(There were differences regarding decisional conflict at baseline between the arms. Usual practice involved sending out a leaflet)*
	Overall Directness	Directly applicable

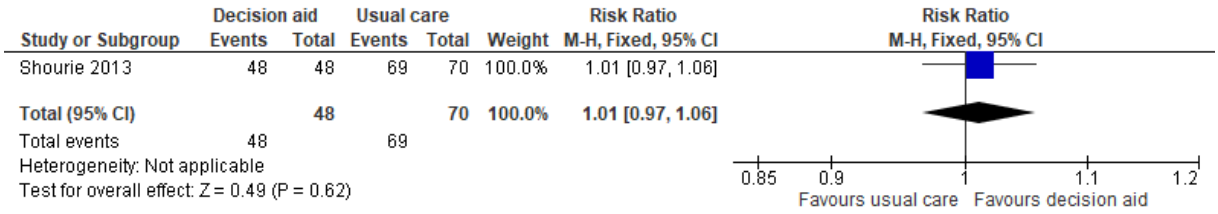
Appendix E – Forest plots and table of results

Vaccination of babies and children aged 0-5 years (Celebrate and Protect Programme)

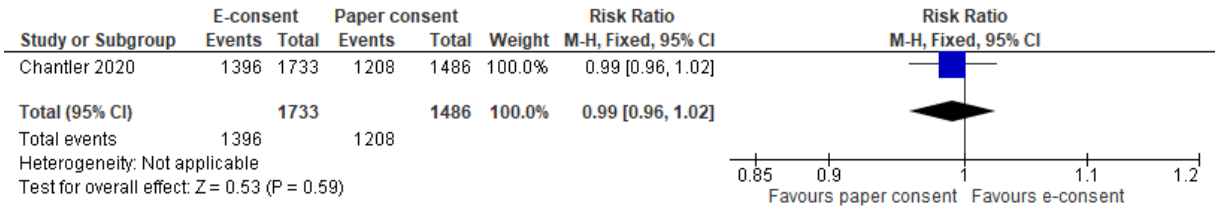
Table 17 Results from the Celebrate and Protect Programme (cluster non-randomised controlled trial

Vaccination	Celebrate and Protect	Control
12 months of age (Diphtheria, tetanus, pertussis, polio, Hib)	85.7%	88.0%
12 months of age (Meningitis C)	89.5%	92.1%
24 months of age (Hib and Meningitis C)	84.4%	83.3%
24 months of age (MMR 1st dose)	86.3%	84.5%
5 years of age (MMR 1st dose)	91.3%	87.7%
5 years of age (MMR 2nd dose)	80.5%	78.7%

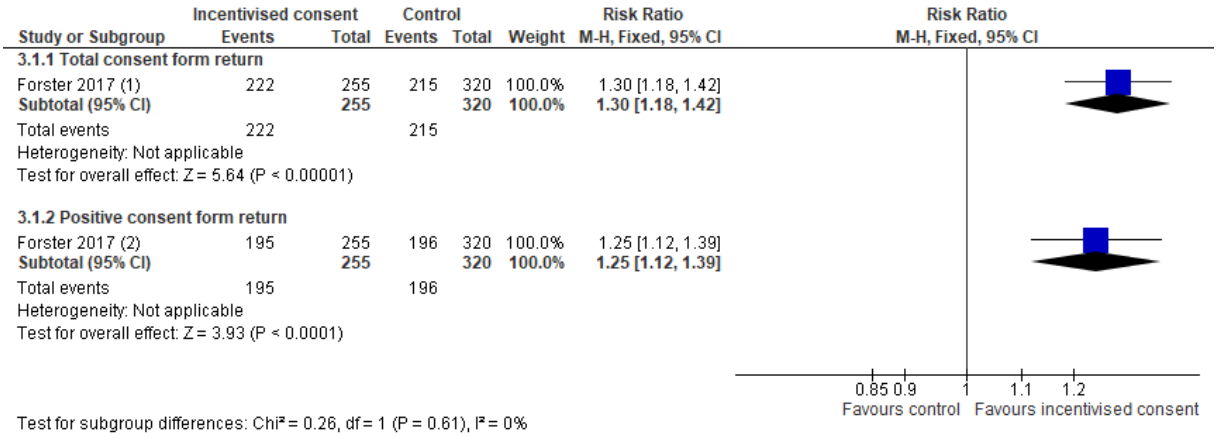
MMR vaccine uptake in babies and children aged 0-5 years using a decision aid (cluster RCT- data adjusted for clustering)



HPV vaccine uptake in young people aged 11-18 years using electronic consent forms (cluster non-randomised controlled trial)



HPV vaccination consent form return in young people aged 11-18 years using incentivised consent form return (cluster RCT- data adjusted for clustering)



Study or Subgroup	Incentivised consent Events	Total	Control Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
3.1.1 Total consent form return						
Forster 2017 (1)	222	255	215	320	100.0%	1.30 [1.18, 1.42]
Subtotal (95% CI)		**255**		**320**	**100.0%**	**1.30 [1.18, 1.42]**
Total events	222		215			
Heterogeneity: Not applicable						
Test for overall effect: Z = 5.64 (P < 0.00001)						
3.1.2 Positive consent form return						
Forster 2017 (2)	195	255	196	320	100.0%	1.25 [1.12, 1.39]
Subtotal (95% CI)		**255**		**320**	**100.0%**	**1.25 [1.12, 1.39]**
Total events	195		196			
Heterogeneity: Not applicable						
Test for overall effect: Z = 3.93 (P < 0.0001)						

Test for subgroup differences: Chi² = 0.26, df = 1 (P = 0.61), I² = 0%

Footnotes
(1) Total number of consent forms returned, whether they agreed or disagreed to vaccination
(2) Proportion of consent forms returned that agreed to vaccination

HPV vaccine uptake in young people aged 11-18 years using a new process to obtain consent on vaccination day (controlled before-after study)

Study or Subgroup	All attend vaccine session Events	Total	Control Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Fisher 2020 (1)	1949	2362	1201	1504	47.3%	1.03 [1.00, 1.07]
Fisher 2020 (2)	1205	1381	2477	2809	52.7%	0.99 [0.97, 1.01]
Total (95% CI)		**3743**		**4313**	**100.0%**	**1.01 [0.99, 1.03]**
Total events	3154		3678			
Heterogeneity: Chi² = 4.79, df = 1 (P = 0.03); I² = 79%						
Test for overall effect: Z = 1.02 (P = 0.31)						

Footnotes
(1) Local Authority 1
(2) Local Authority 2

Appendix F – GRADE-CERQual and GRADE tables

F.1 GRADE-CerQual tables

F.1.1 Babies and children aged 0-5 years

Table 18 Themes for the vaccination of babies and children aged 0-5 years using the Celebrate and Protect (reminder) programme

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
Acceptability							
1 (Lwembe 2016)	Semi-structured interviews and focus groups	Some providers thought the cards were a useful way to communicate with parents and that they enhanced existing call/recall systems. Vaccination is difficult to discuss with some parents, and the cards were useful for the parents who see vaccination letters as threatening.	Serious[1]	High	High	Low[2]	Very low
1 (Lwembe 2016)	Semi-structured interviews and focus groups	Some parents felt that the cards were a more positive reminder for vaccination than the letters they received, while others thought they already received enough information from their GP and that the cards weren't necessary	Serious[1]	High	High	Low[2]	Very low
Accessibility							
1 (Lwembe 2016)	Semi-structured interviews and focus groups	Some providers thought the intervention should be expanded to maternity units and health visitors as parents who were not registered with a GP would not receive the reminder cards	Serious[1]	High	High	Low[2]	Very low
Content							

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
1 (Lwembe 2016)	Semi-structured interviews and focus groups	Parents thought that the cards had enough information for people who already intended to have their child vaccinated. Some people thought that, without more information, the card might be misinterpreted as just a congratulations card.	Serious[1]	High	High	Low[2]	Very low
1 (Lwembe 2016)	Semi-structured interviews and focus groups	Parents suggested that the cards should either include more information about the benefits of vaccination, and what each vaccine protects against, or advice on who to contact if a parent wants more information	Serious[1]	High	High	Moderate[3]	Low
Implementation							
1 (Lwembe 2016)	Semi-structured interviews and focus groups	Strategic leads thought that the programme was low-cost, but reported a variation in engagement from practices. Of the practices that implemented Celebrate and Protect, some used it as an alternative to their existing call-recall system, while some practitioners and parents thought it should be used as an extra service and should not replace face-to-face discussions or phone calls.	Serious[1]	High	High	Moderate[3]	Low
1 (Lwembe 2016)	Semi-structured interviews and focus groups	Practitioners had a range of opinions about the programme, with some indicating that it reduced their workload, while others reported that it took extra time or resources to implement the system, such as generating address labels	Serious[1]	High	High	Moderate[3]	Low
Sources of information							
1 (Lwembe 2016)	Semi-structured interviews	Some policymakers and practitioners were not overly concerned with the project working closely with a pharmaceuticals company, because of the funding benefits for the project	Serious[1]	High	High	Moderate[3]	Low

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
	and focus groups	and the improving reputation of these companies. Others reported local resistance to the project.					
1 (Lwembe 2016)	Semi-structured interviews and focus groups	Some parents were accepting of the partnership because they could see it had been approved by the NHS. Others were more concerned because of information they had seen about pharmaceuticals companies that they considered unethical	Serious[1]	High	High	Low[2]	Very low

1. Finding was downgraded once because it was identified in a study at moderate risk of bias
2. Finding was downgraded twice for adequacy because it was supported by a single study that was not particularly detailed or rich in the results that fed into this finding
3. Finding was only downgraded once for adequacy because it was supported by a single study that provided some detail or richness in the results that fed into this finding

Table 19 Themes for the MMR vaccination of babies and children aged 0-5 years using a web-based decision aid

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
Content							
1 (Jackson 2010)	Semi-structured interviews and questionnaires	Some parents felt that the information in the decision aid was presented in a balanced way that reported both the potential benefits and harms	Very serious[1]	High	High	Low[2]	Very low
Decision making							
1 (Jackson 2010)	Semi-structured interviews and questionnaires	Most of the parents interviewed felt that the decision aid helped them make an informed choice on MMR vaccination and reduced their need to ask further questions to healthcare practitioners	Very serious[1]	High	High	Low[2]	Very low

1. Finding was downgraded twice because it was identified in a study at high risk of bias

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
2. Finding was downgraded twice for adequacy because it was supported by a single study that was not particularly detailed or rich in the results that fed into this finding							

F.1.2 Young people aged 11-18 years

Table 20 Themes for the vaccination of young people aged 11-18 years using electronic consent forms

Studies	Study design	Theme	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
Accessibility							
1 (Chantler 2020)	Semi-structured interviews	Some parents felt positive about the use of e-consent forms, but schools reported issues with parents either accessing or using the forms, as well as language barriers. Some parents who were not on school email lists did not receive the consent form	Serious[1]	High	High	Moderate[4]	Low
Decision making							
1 (Chantler 2020)	Semi-structured interviews	Students thought that the use of an e-consent form meant that it was easier for their parents to give consent without discussing it with them. Students did not necessarily want to make the decision themselves but wanted to be involved in discussions about the vaccine so they were aware of what was happening and why	Serious[1]	High	High	Low[2]	Very low
Implementation							
1 (Chantler 2020)	Semi-structured interviews	Staff were concerned about the speed at which the intervention was introduced, with little training. They also indicated that the decision to implement e-consent forms should involve discussions with each	Serious[1]	High	High	Moderate[4]	Low

Studies	Study design	Theme	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
		individual school to make sure it is appropriate					
1 (Chantler 2020)	Semi-structured interviews	Staff felt that being unable to review consent form return online restricted their ability to follow-up on unreturned forms. However, some staff reported that the use of e-consent forms had reduced their workload	Serious[1]	Moderate[3]	High	Moderate[4]	Very low
Sources of information							
1 (Chantler 2020)	Semi-structured interviews	Parents preferred information that was from the NHS and would have liked more information on adolescent vaccinations. However, none of them accessed the information that came with the reminder	Serious[1]	High	High	Low[2]	Very low
1 (Chantler 2020)	Semi-structured interviews	Students would have liked more information about HPV and the side effects of vaccinations. Others were less concerned with information as they accepted that they should have the vaccine, and had confidence in the vaccine as it was from the NHS	Serious[1]	High	High	Low[2]	Very low

1. Finding was downgraded once because it was identified in a study at moderate risk of bias
2. Finding was downgraded twice for adequacy because it was reported in a single study that was not particularly detailed or rich in the results that fed into this finding
3. Finding was downgraded once for relevance because it was based on part of the intervention (nurses being able to screen consent form return and update records online) that was not fully functioning when they study took place
4. Finding was downgraded only once for adequacy because it was supported by a single study that provided some detail or richness in the results that fed into this finding

Table 21 Themes for the vaccination of young people aged 11-18 years using incentivised consent forms

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
Acceptability							
2 (Rockliffe 2018, Rockliffe 2020)	Semi-structured interviews, focus groups and questionnaires	Many of the students and parents liked the incentive idea and thought it encouraged consent form return. However, some students reported negative emotions when they heard about the draw or when they didn't win. Some also felt guilty about winning when there were so few prizes available. Some said that not winning might discourage consent form return in future	Serious[1]	High	High	Moderate[3]	Moderate
2 (Rockliffe 2018, Rockliffe 2020)	Semi-structured interviews, focus groups and questionnaires	Some girls thought the prize was relevant to their age group but others were not impressed by the type of voucher, or the value of the voucher. Some girls suggested that it would be more fair if there were more prizes of lower value, or everyone was given a small amount of money for consent form return.	Serious[1]	High	High	Moderate[3]	Low
2 (Rockliffe 2018, Rockliffe 2020)	Semi-structured interviews, focus groups and questionnaires	Some students and parents thought the incentive was unnecessary and should focus on health education instead.	Serious[1]	High	High	Moderate[3]	Low

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
Decision making							
2 (Rockliffe 2018, Rockliffe 2020)	Semi-structured interviews, focus groups and questionnaires	Some parents thought that vaccination choice should be the parents' decision and so the intervention should not be targeted at students	Serious[1]	High	High	Moderate[3]	Low
2 (Rockliffe 2018, Rockliffe 2020)	Semi-structured interviews, focus groups and questionnaires	However, some of the students liked the incentive as it meant they felt more involved in decision making, even though the final decision was the parents' choice	Serious[1]	High	High	Low[2]	Very low
Misconceptions							
2 (Rockliffe 2018, Rockliffe 2020)	Semi-structured interviews, focus groups and questionnaires	Some parents and students mistakenly thought that entry into the prize draw was fake or based on receiving the vaccine, rather than consent form return. Others mistook the nature of the draw, thinking that it was a competition, where the people who did best or were most brave during the vaccination won the prize	Serious[1]	High	High	Moderate[3]	Low
Perceptions							
1 (Rockliffe 2018)	Semi-structured interviews and questionnaires	Staff members and students thought that the intervention would encourage consent form return and reduce negative feelings associated with vaccination. Staff believed that girls responded positively to the prize draw incentive, and this positivity was increased by the relatively high value of the prize	Very serious[4]	High	High	Moderate[3]	Very low

1. Finding was downgraded once because some of the findings were from a study at moderate risk of bias

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
2. Finding was downgraded twice for adequacy because it was supported by few studies that were not particularly detailed or rich in the results that fed into this finding 3. Finding was only downgraded once for adequacy because it was supported by few studies that provided some detail or richness in the results that fed into this finding 4. Finding was downgraded twice because it was from a single study at high risk of bias							

Table 22 Themes for the vaccination of young people aged 11-18 years for all young people attending vaccination sessions

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
Acceptability							
3 (Audrey 2020, Audrey 2021, Fisher 2020a)	Semi-structured interviews	The immunisation team, parents and students were in favour of phone calls to parents or carers when a consent form had not been returned. This was seen as a good intermediate step between non-consent form return and a young person giving self-consent. However, some parents questioned whether this could put additional pressure on parents or carers who were undecided about vaccination.	Serious[1]	High	High	High	Moderate
3 (Audrey 2020, Audrey 2021, Fisher 2020a)	Semi-structured interviews	There were mixed views over self-consent. Some saw it was a positive process to avoid a young person missing out on immunisation if their parent or carer has forgotten to sign the form, and thought that it is a decision that the girl should be able to make about her own life. Others were concerned that this could leave a young person under pressure to tell their family that they had self-consented to vaccination.	Serious[1]	High	High	High	Moderate
Accessibility							

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
1 (Fisher 2020a)	Semi-structured interviews	Staff and parents highlighted the additional needs of some parents, such as language and literacy barriers. They discussed the importance of making sure that additional support is provided to these parents to make sure the information provided is appropriate for them to understand	Serious[2]	High	High	Moderate[3]	Low
2 (Audrey 2020, Audrey 2021)	Semi-structured interviews	The consent process for young people living in the care of the local authority or a foster family was raised as a barrier to vaccination.	Serious[1]	High	High	Low[4]	Very low
Alternative education settings							
2 (Audrey 2020, Audrey 2021)	Semi-structured interviews	Parents, staff and immunisation teams thought it was important that nurses are familiar with the additional needs of each young person and using that information to help judge capacity to self-consent. Some young people were concerned they would be overlooked for self-consent because of their additional needs.	Serious[1]	High	High	Moderate[5]	Low
Capacity to consent							
1 (Audrey 2020)	Semi-structured interviews	There were mixed views on the age at which a young person was able to make an informed decision about vaccination. Some staff thought that by year 8 (age 12-13), young people should be able to make this choice, but others thought the decision should be made on an individual basis because the capacity to consent varies considerably at this age	Serious[2]	High	High	High	Moderate
Consent form return							
2 (Audrey 2021, Fisher 2020a)	Semi-structured interviews	Paper consent forms were highlighted considered a potential barrier to vaccination because there is the possibility that a young person could lose it, not give it to their parents,	Serious[1]	High	High	High	Moderate

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
		or not return it if they don't want the vaccination. Consent forms mailed to the parents or verbal consent were both considered ways to overcome this					
Decision making							
3 (Audrey 2020, Audrey 2021, Fisher 2020a)	Semi-structured interviews	Some parents thought it was important the school-based vaccinations were determined by parental consent while others were less concerned about the need for their consent.	Serious[1]	High	High	High	Moderate
3 (Audrey 2020, Audrey 2021, Fisher 2020a)	Semi-structured interviews	The immunisation team discussed how the processes for self-consent, such as young people saying whether they had discussed vaccination with their family, helped them to make decisions on capacity to consent. However, there were some concerns that an increase in the number of people self-consenting could lead to young people not seeking parental consent	Serious[1]	High	High	Moderate[5]	Low
Implementation							
1 (Audrey 2021)	Semi-structured interviews	Immunisation teams indicated that not all schools were prepared for the organisation associated with inviting all young people to vaccination sessions	Serious[2]	High	High	Low[4]	Very low
1 (Audrey 2021)	Semi-structured interviews	The immunisation team thought that the benefits of obtaining consent were thought to outweigh the drawbacks of the additional time needed to phone parents	Serious[2]	High	High	Low[4]	Very low
1 (Audrey 2021)	Semi-structured interviews	Very few girls had to self-consent for vaccination but the immunisation team discussed how there were a number of processes to help them assess whether or not a girl could self-consent	Serious[2]	High	High	Moderate[3]	Low
School-family relationships							

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence
1 (Audrey 2021)	Semi-structured interviews	Trust between the school and parents or carers was considered very important, and school staff did not want to break this relationship. Some parents indicated that they would not be happy about vaccination taking place without their knowledge while some staff thought it was ok if there was a clear process in place to judge capacity to consent.	Serious[2]	High	High	Moderate[3]	Low
1 (Audrey 2021)	Semi-structured interviews	There were concerns about the effect of self-consent on relationships between family members. It was suggested that self-consent could put young people under pressure to choose between the school and their family. Young people also had concerns about getting into trouble with their parents if they self-consented.	Serious[2]	High	High	Moderate[3]	Low
Sources of information							
2 (Audrey 2020, Fisher 2020a)	Semi-structured interviews	Staff thought that the quality of information provided to young people about vaccination would affect their capacity to make informed choices. Young people and their parents both thought that face-to-face education in schools from healthcare practitioners would be more effective than information leaflets.	Serious[1]	High	High	High	Moderate
Understanding the legal framework							
1 (Audrey 2020)	Semi-structured interviews	School staff and parents were both unclear on the legal framework surrounding self-consent for vaccination. Some young people were in favour of being able to give their own consent	Serious[2]	High	High	Moderate[3]	Low
Vaccination beliefs							
1 (Audrey 2020)	Semi-structured interviews	Most parents were in favour of vaccination but there was an understanding that obtaining consent or self-consent where a family have anti-vaccination beliefs may be difficult	Serious[2]	High	High	Low[4]	Very low

1. Finding was downgraded once because the findings were from studies at moderate risk of bias

Studies	Study design	Finding	Methodological limitations	Relevance	Coherence	Adequacy	Confidence

2. Finding was downgraded once because the findings were from a single study at moderate risk of bias
3. Finding was downgraded once for adequacy because it was supported by a single study that provided some detail or richness in the results that fed into this finding
4. Finding was downgraded twice for adequacy because it was supported by a single study that was not particularly detailed or rich in the results that fed into this finding
5. Finding was downgraded once for adequacy because it was supported by studies that provided some detail or richness in the results that fed into this finding

F.2 GRADE tables

F.2.1 Babies and children aged 0-5 years

Table 23 Babies and children aged 0-5 years using the Celebrate and Protect (reminders) programme[1]

No. of studies	Study design	Sample size	Celebrate & Protect (% vaccine uptake)	Control (% vaccine uptake)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
12 months of age (Diphtheria, tetanus, pertussis, polio, Hib)									
1 (Gibson 2014)	Non-randomised cluster	Not reported	85.7%	88.0%	Critical[2]	N/A[3]	Not serious	N/A[4]	Very low
12 months of age (Meningitis C)									
1 (Gibson 2014)	Non-randomised cluster	Not reported	89.5%	92.1%	Critical[2]	N/A[3]	Not serious	N/A[4]	Very low

No. of studies	Study design	Sample size	Celebrate & Protect (% vaccine uptake)	Control (% vaccine uptake)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
24 months of age (Hib and Meningitis C)									
1 (Gibson 2014)	Non-randomised cluster	Not reported	84.4%	83.3%	Critical[2]	N/A[3]	Not serious	N/A[4]	Very low
24 months of age (MMR 1st dose)									
1 (Gibson 2014)	Non-randomised cluster	Not reported	86.3%	84.5%	Critical[2]	N/A[3]	Not serious	N/A[4]	Very low
5 years of age (MMR 1st dose)									
1 (Gibson 2014)	Non-randomised cluster	Not reported	91.3%	87.7%	Critical[2]	N/A[3]	Not serious	N/A[4]	Very low
5 years of age (MMR 2nd dose)									
1 (Gibson 2014)	Non-randomised cluster	Not reported	80.5%	78.7%	Critical[2]	N/A[3]	Not serious	N/A[4]	Very low

1. Modified GRADE table. Study did not report number of participants so not possible to calculate risk ratios or absolute risk. Quality assessment based on risk of bias and indirectness.
2. Single study at critical risk of bias. Quality of the outcome downgraded three times.
3. Single study. Inconsistency not applicable.
4. Not possible to calculate risk ratios so imprecision could not be assessed.

Table 24 Babies and children aged 0-5 years using an MMR web-based decision aid

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk (control)	Absolute risk (intervention)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Vaccine uptake (RR >1 favours web-based decision aid)										
1 (Shourie 2013)	Cluster RCT	127	RR 1.01 (0.97, 1.06)	99 per 100	100 per 100 (96, 100)	Moderate[1]	N/A[3]	Not serious	Serious[2]	Low

1. Single study with some concerns about risk of bias. Quality of the outcome downgraded once
2. Confidence intervals crossed the line of no effect. Quality of the outcome downgraded once
3. Single study. Inconsistency not applicable

F.2.2 Young people aged 11-18 years

Table 25 Young people aged 11-18 years using electronic consent forms

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk (control)	Absolute risk (intervention)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Vaccine uptake (RR >1 favours e-consent form)										
1 (Chantler 2020)	Non-randomised cluster	3219	RR 0.99 (0.96, 1.02)	81 per 100	80 per 100 (78, 83)	Very serious [1]	N/A[3]	Not serious	Serious[2]	Very low

1. Single study at critical risk of bias. Quality of the outcome downgraded twice
2. Confidence intervals crossed the line of no effect. Quality of the outcome downgraded once

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk (control)	Absolute risk (intervention)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
3. Single study. Inconsistency not applicable										

Table 26 Young people aged 11-18 years using incentivised consent forms

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk (control)	Absolute risk (intervention)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Vaccine consent form return (RR >1 favours incentivised consent form)										
1 (Forster 2017)	Cluster RCT[4]	593	RR 1.30 (1.18, 1.42)	67 per 100	87 per 100 (79, 95)	Serious[1]	N/A[3]	Serious[2]	Not serious	Low
Positive consent form return (RR >1 favours incentivised consent form)[5]										
1 (Forster 2017)	Cluster RCT[4]	593	RR 1.25 (1.12, 1.39)	76 per 100	96 per 100 (86, 100)	Serious[1]	N/A[3]	Serious[2]	Not serious	Low

1. Single study with some concerns over risk of bias. Quality of the outcome downgraded once
2. Single study which is partially indirectly applicable to the review (consent form return used as a proxy outcome for vaccine uptake). Quality of the outcome downgraded once
3. Single study. Inconsistency not applicable
4. Outcomes adjusted for clustering
5. Proportion of consent forms returned that agreed to vaccination

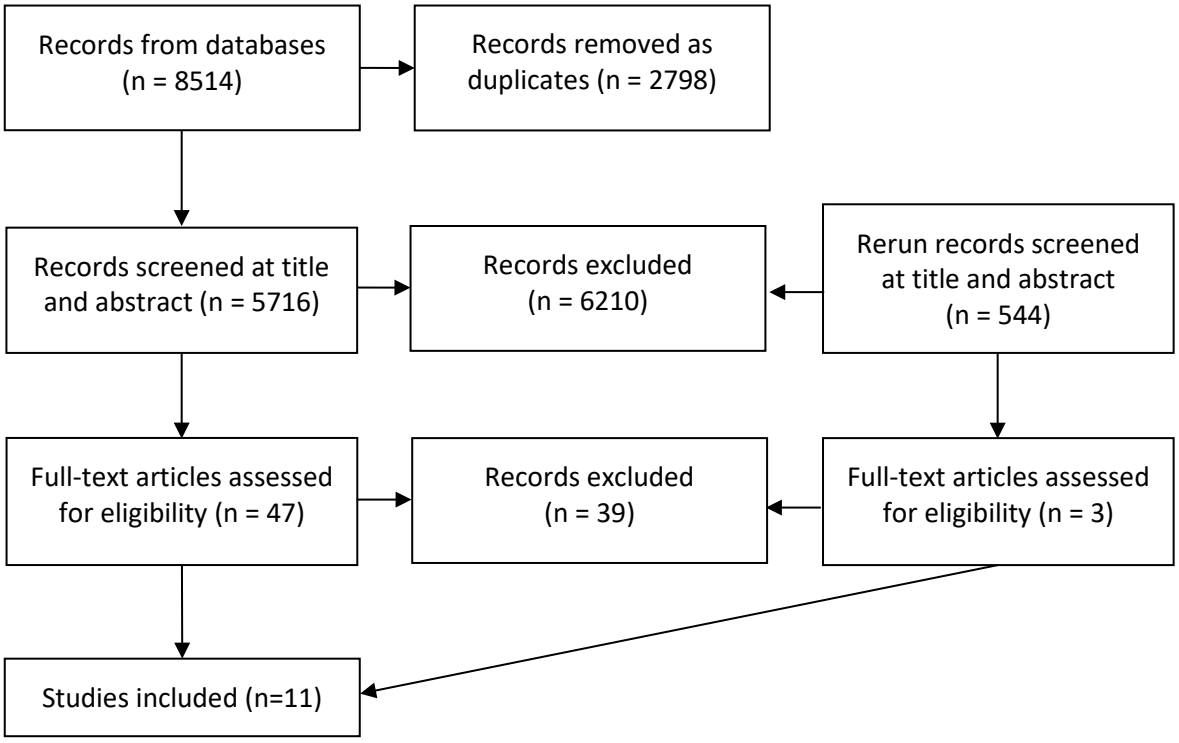
Table 27 Young people aged 11-18 years using a new process to obtain consent on vaccination day

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk (control)	Absolute risk (intervention)	Risk of bias	Inconsistency	Indirectness	Imprecision	Quality
Local Authority 1 (RR >1 favours all young people attending vaccination session)										
1 (Fisher 2020b)	Uncontrolled before-after study	4384	RR 1.03 (1.00, 1.07)	80 per 100	82 per 100 (80, 85)	Very serious[3]	N/A[1]	Not serious	Serious[2]	Very low
Local Authority 2 (RR >1 favours all young people attending vaccination session)										
1 (Fisher 2020b)	Uncontrolled before-after study	2602	RR 0.99 (0.97, 1.01)	85 per 100	86 per 100 (84, 88)	Very serious[3]	N/A[1]	Not serious	Serious[2]	Very low
Pooled Local Authority data (RR >1 favours all young people attending vaccination session)										
1 (Fisher 2020b)	Uncontrolled before-after study	6986	RR 1.01 (0.99, 1.03)	85 per 100	86 per 100 (84, 88)	Very serious[3]	N/A[1]	Not serious	Serious[2]	Very low

1. Single study. Inconsistency not applicable.
2. Confidence intervals crossed the line of no effect. Quality of the outcome downgraded once
3. Single study at high risk of bias. Quality of the outcome downgraded twice.

Appendix G – Economic evidence study selection

None of the economic evidence identified was relevant for this review question.



Appendix H – Economic evidence tables

No economic evidence was identified for this review question.

Appendix I – Health economic model

The committee discussed incentives for consent form return for school-based vaccinations and, due to the anticipated resource impact, a costing analysis was undertaken to better estimate the costs associated with this intervention.

The costing exercise was based on the Forster 2017 study. In this study the incentive for consent form return was a 1 in 10 chance of winning a £50 voucher. For the costing analysis this incentive scenario was used as the base-case, and alternative values for incentives were selected by the committee based on things they felt could be implementable in practice, and used as additional scenarios . These alternative values were; one person per school chance of winning a £50 voucher, a fixed amount of £3 per student, and a free in-school perk such as a lunch queue pass. In each case, the effectiveness data from the Forster study were used, as it is not known how differences in the incentive used would affect changes in consent form return. The Forster study reported numbers of positive consent forms returned, which was taken as a proxy for vaccination, as the committee considered it unlikely many children with positive consent forms would fail to be vaccinated.

The incentive scheme for consent form return would be implemented before vaccinations are scheduled to be given, and before any other uptake interventions can be applied, compared to the same scenario but without this initial incentive scheme. It is expected that using an incentive scheme would increase the numbers of consent forms returned, and therefore reduce the resource use in follow-up of people who did not return forms. The analysis therefore compares two strategies; one where an incentive is offered and then reminders given to those still not returning consent forms, and a second option where no incentive is offered, and then reminders are given to those not returning consent forms

The cost per person receiving the incentive was calculated for each scenario in Table 28. Data on the number of pupils and number of schools in England was taken from government education statistics (GOV.UK; Schools, pupils and their characteristics 2020/2021), with 615,634 pupils in school year 8 and 3,456 secondary schools in England.

Table 28: Costs of incentive scenarios

Scenario	Cost per individual
Scenario 1 – 1x £50 voucher per school	£0.32
Scenario 2 – 1 in 10 chance of winning £50 voucher	£5.00
Scenario 3 – fixed amount of £3 per student	£3.00
Scenario 4 – free item e.g. lunch queue pass or in-school perk	£0.00

The committee discussion indicated that in usual practice if consent forms have not been returned, a nurse will phone the individual/parent/carer to obtain consent. The cost of this follow-up phone call was assumed to be £7.80 per call based on the PSSRU estimate for a telephone appointment lasting 6.56 minutes with a practice nurse. For costing purposes, a practice nurse was assumed to be a reasonable proxy for school nurses who would likely be those making the phone calls.

The uptake data was taken from Forster 2017 for the incentives intervention and from Ferson 1995 and Vivier 2000 for the phone reminder, and are presented in Table 29.

Table 29: Uptake data

Parameter	Value	Source
Proportion of forms returned and “positive” – control arm	61.25%	Forster 2017
Proportion of forms returned and “positive” – incentive arm	76.47%	Forster 2017
Odds ratio – positive form return with incentives	2.06	Forster 2017

Parameter	Value	Source
Baseline uptake of HPV vaccine	88.01%	Published national uptake data
Control arm uptake (reminders data)	24.79%	Ferson 1995 and Vivier 2000
Odds ratio (uptake with reminders)	2.34	Ferson 1995 and Vivier 2000

Vaccine uptake with phone reminders only:

To calculate the change in uptake using phone reminders only (Table 30), the baseline uptake probability of 88.01% is first adjusted using the control arm uptake data from the phone reminders studies to account for those who would be vaccinated without the phone call, giving a probability of vaccine uptake before phone call reminder of 84.06%. This adjustment is necessary because phone call reminders are used in current practice in some areas, so it is likely that the real-world baseline uptake data includes people who have had a phone call reminder. This adjustment is designed to estimate the proportion of people who would be vaccinated before the impact of any reminder or incentive intervention is included. The baseline odds of uptake before phone reminders in the relevant RCTs was 0.33 (calculated from the probability of 24.79%) and applying the OR of 2.34 gives an odds of uptake with phone reminders of 0.77 or a probability of 43.54%. Applying this additional 43.54% to those not already vaccinated gives a total probability of vaccination with phone call reminders of 91%.

Table 30: Calculation of uptake with phone reminders only

Calculated parameter	Value	Source
Probability of vaccine uptake before reminder	84.06%	Adj uptake = (baseline uptake – trial uptake) / (1 - trial uptake)
Control arm uptake (odds)	0.33	Odds = probability/(1-probability)
Uptake with reminders (odds)	0.77	Baseline odds*odds ratio
Additional uptake with reminder (probability)	43.54%	Probability = odds/(1+odds)
Total vaccinated with reminder	91%	Total uptake = Adj uptake + (1 – adj uptake)*additional uptake

Vaccine uptake with incentives plus phone reminder:

The baseline uptake rate for the HPV vaccine is 88.01% (GOV.UK; HPV vaccination coverage in adolescent females in England 2018-2019), giving a baseline odds of being vaccinated of 7.34. Applying the OR of 2.06, the odds of positive consent form return with the incentive intervention is calculated to be 15.09, or a probability of 93.79%. To add in the phone call reminders component this 93.79% is adjusted using the control arm data for the reminder intervention, where the control arm uptake rate was 24.79%, giving a post-incentive pre-reminder uptake of 91.74%. Applying the 43.54% for additional uptake with phone reminders, the probability of vaccine uptake after the incentive and phone reminder is 95.33%.

Table 31: Calculation of uptake with incentives and phone reminders

Calculated parameter	Value	Source
Baseline odds of vaccine uptake	7.34	Odds = probability/(1-probability)
Consent form return/uptake with incentives (odds)	15.09	Baseline odds*odds ratio
Consent form return/uptake with incentives (probability)	93.79%	Probability = odds/(1+odds)
Probability of vaccine uptake after incentives and before reminder	91.74%	Adj uptake = (baseline uptake – trial uptake) / (1 - trial uptake)
Additional uptake with reminder (probability)	43.54%	Table 30
Total vaccinated with incentive and reminder	95.33%	Total uptake = Adj uptake + (1 – adj uptake)*additional uptake

The cost of the incentive plus phone reminder combination is calculated as the incentive cost per person plus the cost of the phone reminder only applied to those who did not return positive consent forms following the incentive, i.e. 100% - 93.79% = 6.21%. The incremental cost per additional person vaccinated (using positive consent form return as a proxy for vaccination) for the incentive plus phone reminder combination compared with phone reminders only was calculated by taking the difference in costs over the difference in uptake and is presented alongside the cost per person for the incentive combination in Table 32. In Table 32 and Table 33 two of the incentive scenarios are dominant and have a negative ICER compared with reminder only, which means these interventions are less costly than reminders only and result in higher overall uptake.

Table 32: Cost-effectiveness of incentives in the average baseline uptake scenario

Average UK uptake scenario	1 in 10 chance, £50 voucher	1 per school chance, £50 voucher	Fixed amount £3 per student	Free school-based perk
Cost per person (incentive+reminder vs nothing)	£5.48	£0.81	£3.48	£0.48
Incentive+reminder vs reminder only (ICER)	£97.81	Dominant (-£10.06)	£51.68	Dominant (-£17.50)

A low uptake scenario was also considered, using a baseline uptake of 70.2%, from the local authority with the lowest HPV uptake reported in 2018/19. The results of the low uptake scenario are presented in Table 33, and the incentive plus reminder combination is more cost-effective in this scenario, with an ICER of £34.07 in the base-case. This is primarily because in areas with lower uptake, the successful use of incentives to increase consent form return rates reduces the amount of follow-up nurses have to do with families who have not returned forms.

Table 33: Cost-effectiveness of incentives in the low baseline uptake scenario

Low uptake scenario	1 in 10 chance, £50 voucher	1 per school chance, £50 voucher	Fixed amount £3 per student	Free school-based perk
Cost per person (incentive+reminder vs nothing)	£6.33	£1.66	£4.33	£1.33
Incentive+reminder vs reminder only (ICER)	£34.07	Dominant (-£15.05)	£13.07	Dominant (-£18.43)

Appendix J – Excluded studies

Clinical studies

Excluded from the original search

Study	Reason for exclusion
Abdullahi, L.H., Kagina, B.M., Ndze, V.N. et al. (2020) Improving vaccination uptake among adolescents. Cochrane Database of Systematic Reviews 2020(1): cd011895	- Systematic review used as source of primary studies
Abuelenen, T., Khalil, S., Simoneit, E. et al. (2020) Prevent and Protect: A Vaccination Initiative for Uninsured Patients at a Student-Run Free Clinic. Journal of community health	- The intervention is a free vaccine- not in scope *Also, the comparator is the US national vaccine uptake.*
Achat, H; McIntyre, P; Burgess, M (1999) Health care incentives in immunisation. Australian and New Zealand journal of public health 23(3): 285-8	- Systematic review used as source of primary studies
Acosta, J., Benages, C., Diaz, M.A. et al. (2016) Preventing pertussis in the early infant: Development and results of a prenatal vaccination program. Acta Medica International 3(2): 78-81	- Does not contain an outcome of relevance to this review *This study looks at infants who have had whooping cough and compares the outcomes of vaccinated vs unvaccinated participants.*
Adams, Jean, Bateman, Belinda, Becker, Frauke et al. (2015) Effectiveness and acceptability of parental financial incentives and quasi-mandatory schemes for increasing uptake of vaccinations in preschool children: systematic review, qualitative study and discrete choice experiment. Health technology assessment (Winchester, England) 19(94): 1-176	- Systematic review used as source of primary studies
Adams, Jean, McNaughton, Rebekah J, Wigham, Sarah et al. (2016) Acceptability of Parental Financial Incentives and Quasi-Mandatory Interventions for Preschool Vaccinations: Triangulation of Findings from Three Linked Studies. PloS one 11(6): e0156843	- Not a relevant study design

Adjei Boakye, Eric, Tobo, Betelihem B, Osazuwa-Peters, Nosayaba et al. (2017) A Comparison of Parent- and Provider-Reported Human Papillomavirus Vaccination of Adolescents. American journal of preventive medicine 52(6): 742-752	- Study does not contain an intervention aimed at increasing vaccine uptake *This study looks at reporting vaccine uptake in terms of provider records vs parental recall.*
Afzal, Muhammad, Yaqub, Asma, Khalid, Sobia et al. (2017) An effective and doable interventional strategy to enhance vaccination coverage - are we ready to change?. JPMA. The Journal of the Pakistan Medical Association 67(11): 1719-1722	- Study took place in a non-OECD country
Albert, S.M., Nowalk, M.P., Yonas, M.A. et al. (2012) Standing orders for influenza and pneumococcal polysaccharide vaccination: correlates identified in a national survey of U.S. Primary care physicians. BMC family practice 13: 22	- Does not contain an outcome of relevance to this review
Alemi, F, Alemagno, SA, Goldhagen, J et al. (1996) Computer reminders improve on-time immunization rates. Medical care 34(10suppl): OS45-51	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Amirian, I, Huston, S, Ha, D et al. (2017) Results of immunization delivery enhancement intervention on pneumococcal and herpes zoster immunization planning in alabama and california community pharmacies. Journal of the american pharmacists association 57(3)	- Conference abstract
Andrews, R.M. (2005) Assessment of vaccine coverage following the introduction of a publicly funded pneumococcal vaccine program for the elderly in Victoria, Australia. Vaccine 23(21): 2756-2761	- Not a relevant study design *This is a survey. Furthermore, there is no intervention to increase uptake beyond making a vaccine freely available.*
Andrews, Ross M, Skull, Susan A, Byrnes, Graham B et al. (2005) Influenza and pneumococcal vaccine coverage among a random sample of hospitalised persons aged 65 years or more, Victoria. Communicable diseases intelligence quarterly report 29(3): 283-8	- The intervention is a free vaccine- not in scope
Anonymous (1979) AAP immunization schedules. IMJ. Illinois medical journal 155(5): 310-1	- Full text paper or book article is unavailable

	This is probably the 1979 edition of the immunisation schedule published by the American Academy of Pediatrics
Anonymous (2013) Nursing interventions help protect older adults. Nursing 43(4): 26	- Not a review of published literature *Brief commentary about a review article.*
Anonymous. (2005) Automated standing orders to nurses increase influenza and pneumococcal vaccination rates among inpatients compared with reminders to physicians. Evidence-Based Healthcare and Public Health 9(3): 211-212	- Duplicate reference *This is a summary of Dexter 2004*
Arslan I, Beyazova U, Aksakal N et al. (2012) New opportunity for vaccinating older people: well-child clinic visits. Pediatrics international : official journal of the Japan Pediatric Society 54(1): 45-51	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Ashton-Key M and 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 88(4): 299-301	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Atkins K, van Hoek AJ, Watson C et al. Seasonal influenza vaccination delivery through community pharmacists in England: evaluation of the London pilot. BMJ open 6(2): e009739	- Data not reported in an extractable format *This is a before-and-after study but no patient numbers are provided for before 2013/2014 when the intervention was introduced. Therefore, the data is not in an extractable format.*

Atkinson, K.M., Wilson, K., Murphy, M.S.Q. et al. (2019) Effectiveness of digital technologies at improving vaccine uptake and series completion - A systematic review and meta-analysis of randomized controlled trials. Vaccine 37(23): 3050-3060	- Systematic review used as source of primary studies
Au, L; Tso, A; Chin, K (1997) Asian-American adolescent immigrants: the New York City schools experience. The Journal of school health 67(7): 277-9	- Vaccine on UK routine schedule but wrong context for administration *In the UK, HepB vaccine is given to 0-1 year olds, not 7-13 year olds*
Averhoff, F., Linton, L., Peddecord, K.M. et al. (2004) A middle school immunization law rapidly and substantially increases immunization coverage among adolescents. American Journal of Public Health 94(6): 978-984	- Vaccine on UK routine schedule but wrong context for administration *The intervention is for HepB and MMR. In the UK, these are relevant for 0-4 years. However, the study looks at interventions specific to 10-12 year olds at school.*
Bacci, Jennifer L, Hansen, Ryan, Ree, Christina et al. (2019) The effects of vaccination forecasts and value-based payment on adult immunizations by community pharmacists. Vaccine 37(1): 152-159	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Bach, A.T., Kang, A.Y., Lewis, J. et al. (2019) Addressing common barriers in adult immunizations: a review of interventions. Expert Review of Vaccines 18(11): 1167-1185	- Systematic review used as source of primary studies
Bakare, Mobolaji, Shrivastava, Rakesh, Jeevanantham, Vinodh et al. (2007) Impact of two different models on influenza and pneumococcal vaccination in hospitalized patients. Southern medical journal 100(2): 140-4	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Balzarini, F., Frascella, B., Oradini-Alacreu, A. et al. (2020) Does the use of personal electronic health records increase vaccine uptake? A systematic review. Vaccine 38(38): 5966-5978	- Systematic review used as source of primary studies

Bangure, Donewell, Chirundu, Daniel, Gombe, Notion et al. (2015) Effectiveness of short message services reminder on childhood immunization programme in Kadoma, Zimbabwe - a randomized controlled trial, 2013. BMC public health 15: 137	- Study took place in a non-OECD country
Bardenheier, Barbara, Shefer, Abigail, Tiggle, Ronald et al. (2005) Nursing home resident and facility characteristics associated with pneumococcal vaccination: national nursing home survey, 1995-1999. Journal of the American Geriatrics Society 53(9): 1543-51	- The study did not report any of the outcomes specified in the protocol
Baroy, Justin, Chung, Danny, Frisch, Ryan et al. (2016) The impact of pharmacist immunization programs on adult immunization rates: A systematic review and meta-analysis. Journal of the American Pharmacists Association : JAPhA 56(4): 418-26	- Systematic review used as source of primary studies
Bassani, Diego G, Arora, Paul, Wazny, Kerri et al. (2013) Financial incentives and coverage of child health interventions: a systematic review and meta-analysis. BMC public health 13suppl3: 30	- Systematic review of non-OECD countries
Baumann, A., Andersen, B., Ostergaard, L. et al. (2019) Sense & sensibility: Decision-making and sources of information in mothers who decline HPV vaccination of their adolescent daughters. Vaccine: X 2: 100020	- Not a relevant study design
Baxter D (2013) Approaches to the vaccination of pregnant women: experience from Stockport, UK, with prenatal influenza. Human vaccines & immunotherapeutics 9(6): 1360-1363	- Data not reported in an extractable format *The number of participants in each arm was not provided.*
Becker DM, Gomez EB, Kaiser DL et al. (1989) Improving preventive care at a medical clinic: how can the patient help?. American journal of preventive medicine 5(6): 353-359	- Study published before 1990 date limit set in review protocol
Bedford, H. (2014) Randomised controlled trial: Pro-vaccine messages may be counterproductive among vaccine-hesitant parents. Evidence-Based Medicine 19(6): 219	- Does not contain an outcome of relevance to this review *This study measures intention, not uptake.*
Bedwick, Brian W; Garofoli, Gretchen K; Elswick, Betsy M (2017) Assessment of targeted automated messages on herpes zoster immunization numbers in an independent community pharmacy.	- Does not contain an outcome of relevance to this review

Journal of the American Pharmacists Association : JAPhA 57(3s): 293-s297e1	
Beggs, Ashton E, Morrical-Kline, Karie A, Wilhoite, Jessica E et al. (2013) Effect of an intervention on medical resident knowledge and adult immunization rates. Family medicine 45(2): 118-21	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Belmaker, I, Dukhan, L, Elgrici, M et al. (2006) Reduction of vaccine-preventable communicable diseases in a Bedouin population: summary of a community-based intervention programme. Lancet (London, England) 367(9515): 987-91	- Study took place in a non-OECD country
Benabbas, R., Shan, G., Akindutire, O. et al. (2019) The Effect of Pay-for-Performance Compensation Model Implementation on Vaccination Rate: A Systematic Review. Quality management in health care 28(3): 155-162	- Systematic review used as source of primary studies
Berenson, Abbey B, Rahman, Mahbubur, Hirth, Jacqueline M et al. (2015) A brief educational intervention increases providers' human papillomavirus vaccine knowledge. Human vaccines & immunotherapeutics 11(6): 1331-6	- Study does not contain an intervention aimed at increasing vaccine uptake
Berg GD, Fleegler E, vanVonno CJ et al. (2005) A matched-cohort study of health services utilization outcomes for a heart failure disease management program. Disease management : DM 8(1): 35-41	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Berg, Gregory D, Thomas, Eileen, Silverstein, Steven et al. (2004) Reducing medical service utilization by encouraging vaccines: randomized controlled trial. American journal of preventive medicine 27(4): 284-8	- Study does not contain an intervention aimed at increasing vaccine uptake *The 2 marketing pieces were identical and aimed at increasing influenza vaccine uptake - not pneumonia vaccine uptake. Pneumonia vaccine uptake was measured coincidentally.*
Betsch, Cornelia, Rossmann, Constanze, Pletz, Mathias W et al. (2018) Increasing influenza and pneumococcal vaccine uptake in the elderly: study protocol for the multi-methods prospective intervention study Vaccination60. BMC public health 18(1): 885	- Protocol for a future study

Bigham, M., Remple, V.P., Pielak, K. et al. (2006) Uptake and behavioural and attitudinal determinants of immunization in an expanded routine infant hepatitis B vaccination program in British Columbia. Canadian Journal of Public Health 97(2): 90-95	- Study does not contain an intervention aimed at increasing vaccine uptake *The intervention is nothing more than a free vaccine.*
Bitton, A., Baughman, A.W., Carlini, S. et al. (2016) Enhanced primary care and impact on quality of care in Massachusetts. American Journal of Managed Care 22(5): e169-e174	- Not a relevant study design
Bloom, H.G.; Wheeler, D.A.; Linn, J. (1999) A managed care organization's attempt to increase influenza and pneumococcal immunizations for older adults in an acute care setting. Journal of the American Geriatrics Society 47(1): 106-110	- Does not contain an outcome of relevance to this review *This study does not have a comparator*
Bloom, HG, Bloom, JS, Krasnoff, L et al. (1988) Increased utilization of influenza and pneumococcal vaccines in an elderly hospitalized population. Journal of the American Geriatrics Society 36(10): 897-901	- Study published before 1990 date limit set in review protocol
Bonafide, Katherine E and Vanable, Peter A (2015) Male human papillomavirus vaccine acceptance is enhanced by a brief intervention that emphasizes both male-specific vaccine benefits and altruistic motives. Sexually transmitted diseases 42(2): 76-80	- Does not contain an outcome of relevance to this review
Bond, L., Davie, G., Carlin, J.B. et al. (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 26(1): 58-64	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Boom JA, Nelson CS, Kohrt AE et al. (2010) Utilizing peer academic detailing to improve childhood immunization coverage levels. Health promotion practice 11(3): 377-386	- Does not contain an outcome of relevance to this review *Study does not measure uptake. It measures "coverage" and explains this is not uptake but does not fully explain*

	what the criteria are for adequate coverage.
Boom, Julie A, Nelson, Cynthia S, Laufman, Larry E et al. (2007) Improvement in provider immunization knowledge and behaviors following a peer education intervention. Clinical pediatrics 46(8): 706-17	- Does not contain an outcome of relevance to this review *The data is a survey of opinions and attitudes.*
Borgiel, Alexander E M, Williams, J Ivan, Davis, David A et al. (1999) Evaluating the effectiveness of 2 educational interventions in family practice: CMAJ. Canadian Medical Association. Journal 161(8): 965-70	- Does not contain an outcome of relevance to this review *Does not measure vaccine uptake*
Bouchez, M., Ward, J.K., Bocquier, A. et al. (2021) Physicians' decision processes about the HPV vaccine: A qualitative study. Vaccine 39(3): 521-528	- Not a relevant study design *Qualitative study - considered for the qualitative review*
Brabin, Loretta, Roberts, Stephen A, Stretch, Rebecca et al. (2008) Uptake of first two doses of human papillomavirus vaccine by adolescent schoolgirls in Manchester: prospective cohort study. BMJ (Clinical research ed.) 336(7652): 1056-8	- Does not contain an outcome of relevance to this review *There is no comparator*
Brackett, Amber; Butler, Michell; Chapman, Liza (2015) Using motivational interviewing in the community pharmacy to increase adult immunization readiness: A pilot evaluation. Journal of the American Pharmacists Association : JAPhA 55(2): 182-6	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Bradshaw, C., DiFrisco, E., Schweizer, W. et al. (2020) Improving birth dose hepatitis B vaccination rates: A quality improvement intervention. Hospital Pediatrics 10(5): 430-437	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Braeckman, T., Van Herck, K., Raes, M. et al. (2011) Rotavirus vaccines in Belgium: Policy and impact. Pediatric Infectious Disease Journal 30(suppl1): 21-s24	- Does not contain an outcome of relevance to this review

Brewer, NT, Gilkey, MB, Malo, TL et al. (2018) Efficient and participatory strategies for recommending HPV vaccination: a randomized controlled trial. Pediatrics 141(1)	- Conference abstract
Brewer, NT, Hall, ME, Malo, TL et al. (2017) Announcements Versus Conversations to Improve HPV Vaccination Coverage: a Randomized Trial. Pediatrics 139(1)	- Data not reported in an extractable format *Data was given as percentages without participant numbers*
Brigham, Kathryn S, Woods, Elizabeth R, Steltz, Sarah K et al. (2012) Randomized controlled trial of an immunization recall intervention for adolescents. Pediatrics 130(3): 507-14	- Data not reported in an extractable format *The study reports combined uptake data for 3 vaccinations but chickenpox vaccination is not on the UK routine schedule.*
Brimberry, R (1988) Vaccination of high-risk patients for influenza. A comparison of telephone and mail reminder methods. The Journal of family practice 26(4): 397-400	- Study published before 1990 date limit set in review protocol - The study did not report any of the outcomes specified in the protocol *Focused on flu vaccination which is out of scope*
Brink SG (1989) Provider reminders. Changing information format to increase infant immunizations. Medical care 27(6): 648-653	- Study published before 1990 date limit set in review protocol
Briss P A, Rodewald L E, Hinman A R, Shefer A M, Strikas R A, Bernier R R, Carande-Kulis V G, Yusuf H R, Ndiaye S M, Williams S M (2000) Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. American Journal of Preventive Medicine 18(1 Supplement): 97-140	- Review article but not a systematic review

Briss, P A, Rodewald, L E, Hinman, A R et al. (2000) Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. The Task Force on Community Preventive Services. American journal of preventive medicine 18(1suppl): 97-140	- Duplicate reference
Briss, P.A., Rodewald, L.E., Hinman, A.R. et al. (2000) Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. American Journal of Preventive Medicine 18(1suppl1): 97-140	- Duplicate reference
Britto, Maria T, Schoettker, Pamela J, Pandzik, Geralyn M et al. (2007) Improving influenza immunisation for high-risk children and adolescents. Quality & safety in health care 16(5): 363-8	- The study did not report any of the outcomes specified in the protocol
Brousseau, Nicholas, Sauvageau, Chantal, Ouakki, Manale et al. (2010) Feasibility and impact of providing feedback to vaccinating medical clinics: evaluating a public health intervention. BMC public health 10: 750	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Bryan AR; Liu Y; Kuehl PG (2013) Advocating zoster vaccination in a community pharmacy through use of personal selling. Journal of the American Pharmacists Association : JAPhA 53(1): 70-77	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Burka, A.T., Fann, J.P., Lamb, K.D. et al. (2019) Evaluation of a novel discharge reminder tool on pneumococcal vaccination in hospitalized elderly veterans. JACCP Journal of the American College of Clinical Pharmacy 2(5): 462-467	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Burns, Ilene Timko; Zimmerman, Richard Kent; Santibanez, Tammy A (2002) Effectiveness of chart prompt about immunizations in an urban health center. The Journal of family practice 51(12): 1018	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Burson, Randall C, Buttenheim, Alison M, Armstrong, Allison et al. (2016) Community pharmacies as sites of adult vaccination: A systematic review. Human vaccines & immunotherapeutics 12(12): 3146-3159	- Systematic review used as source of primary studies

Calihan, Jessica B, MD, MS, Tomaszewski, Kathy, RN, Wheeler, Noah, MPH et al. (2020) USING REPRODUCTIVE HEALTH VISITS TO ENGAGE ADOLESCENT AND YOUNG ADULT WOMEN IN PRIMARY CARE. Journal of Adolescent Health 66(2s)	- Conference abstract
Calo, William A, Gilkey, Melissa B, Leeman, Jennifer et al. (2019) Coaching primary care clinics for HPV vaccination quality improvement: Comparing in-person and webinar implementation. Translational behavioral medicine 9(1): 23-31	- Does not contain an outcome of relevance to this review
Cardozo LJ, Steinberg J, Lepczyk MB et al. (1998) Delivery of preventive healthcare to older African-American patients: a performance comparison from two practice models. The American journal of managed care 4(6): 809-816	- Data not reported in an extractable format *Data in graph form with no* error *bars (no SD, SE or CI provided).*
Carney, Patricia A, Hatch, Brigit, Stock, Isabel et al. (2019) A stepped-wedge cluster randomized trial designed to improve completion of HPV vaccine series and reduce missed opportunities to vaccinate in rural primary care practices. Implementation science : IS 14(1): 30	- Protocol for a future study
Carolan, Kate, Verran, Joanna, Crossley, Matthew et al. (2018) Impact of educational interventions on adolescent attitudes and knowledge regarding vaccination: A pilot study. PloS one 13(1): e0190984	- Does not contain an outcome of relevance to this review
Carter, W B; Beach, L R; Inui, T S (1986) The flu shot study: using multiattribute utility theory to design a vaccination intervention. Organizational behavior and human decision processes 38(3): 378-91	- Study published before 1990 date limit set in review protocol - The study did not report any of the outcomes specified in the protocol
Caskey, R; Weiner, S; Gerber, B (2011) Exam-room based education to influence vaccination behavior among veteran patients in a primary care setting. Journal of general internal medicine 26: S271	- Conference abstract
Cassidy B, Braxter B, Charron-Prochownik D et al. (2014) A quality improvement initiative to increase HPV vaccine rates using an educational and reminder strategy with parents of preteen girls. Journal of pediatric health care : official publication of National Association of Pediatric Nurse Associates & Practitioners 28(2): 155-164	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review

Cataldi, J.R., Habesland, M., Anderson-Mellies, A. et al. (2020) The potential population-based impact of an HPV vaccination intervention in Colorado. Cancer Medicine 9(4): 1553-1561	- Does not contain an outcome of relevance to this review *The paper is a follow up study looking at implementing a relevant intervention in Colorado rather then the effectiveness of the intervention itself.*
Cates, Joan R, Diehl, Sandra J, Crandell, Jamie L et al. (2014) Intervention effects from a social marketing campaign to promote HPV vaccination in preteen boys. Vaccine 32(33): 4171-8	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Chamberlain, Allison T, Seib, Katherine, Ault, Kevin A et al. (2016) Impact of a multi-component antenatal vaccine promotion package on improving knowledge, attitudes and beliefs about influenza and Tdap vaccination during pregnancy. Human vaccines & immunotherapeutics 12(8): 2017-2024	- Does not contain an outcome of relevance to this review
Chan, Sophia S C, Leung, Doris Y P, Leung, Angela Y M et al. (2015) A nurse-delivered brief health education intervention to improve pneumococcal vaccination rate among older patients with chronic diseases: a cluster randomized controlled trial. International journal of nursing studies 52(1): 317-24	- Study took place in a non-OECD country
Chau, Janita Pak Chun, Lo, Suzanne Hoi Shan, Choi, Kai Chow et al. (2020) Effects of a multidisciplinary team-led school-based human papillomavirus vaccination health-promotion programme on improving vaccine acceptance and uptake among female adolescents: A cluster randomized controlled trial. Medicine 99(37): e22072	- Study took place in a non-OECD country
Chien AT; Li Z; Rosenthal MB (2010) Improving timely childhood immunizations through pay for performance in Medicaid-managed care. Health services research 45(6 Pt 2): 1934-1947	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This study was an interrupted time series.*
Closser, Svea, Rosenthal, Anat, Maes, Kenneth et al. (2016) The Global Context of Vaccine Refusal: Insights from a Systematic	- Study took place in a non-OECD country

Comparative Ethnography of the Global Polio Eradication Initiative. Medical Anthropology Quarterly 30(3): 321	
Coley, K.C., Gessler, C., McGivney, M. et al. (2020) Increasing adult vaccinations at a regional supermarket chain pharmacy: A multi-site demonstration project. Vaccine 38(24): 4044-4049	- Data not reported in an extractable format *The number of participants considered for vaccination was not provided. They only reported the number of vaccinations given.*
Collins, Brian K, Morrow, Helen E, Ramirez, Jennifer M et al. (2006) Childhood immunization coverage in US states: the impact of state policy interventions and programmatic support. Journal of health & social policy 22(1): 77-92	- Not a review of published literature *Study uses a survey to review the impact of interventions.*
Connors, John T; Slotwinski, Kate L; Hodges, Eric A (2017) Provider-parent Communication When Discussing Vaccines: A Systematic Review. Journal of pediatric nursing 33: 10-15	- Systematic review that does not include the outcomes stated in the protocol
Cooper Robbins, Spring Chenoa; Ward, Kirsten; Skinner, S Rachel (2011) School-based vaccination: a systematic review of process evaluations. Vaccine 29(52): 9588-99	- Systematic review used as source of primary studies
Cooper, S.C., Davies, C., McBride, K. et al. (2016) Development of a human papillomavirus vaccination intervention for Australian adolescents. Health Education Journal 75(5): 610-620	- The study did not report any of the outcomes specified in the protocol
Cory, L., Cha, B., Ellenberg, S. et al. (2019) Effects of Educational Interventions on Human Papillomavirus Vaccine Acceptability: A Randomized Controlled Trial. Obstetrics and Gynecology 134(2): 376-384	- Study participants are the wrong age group *The mean age of the participants was 24 years (SD 4). For HPV vaccination, the protocol is for participants aged 11-18 years.*

Costantino, C., Restivo, V., Ventura, G. et al. (2018) Increased vaccination coverage among adolescents and young adults in the district of Palermo as a result of a public health strategy to counteract an 'epidemic panic'. International Journal of Environmental Research and Public Health 15(5): 1014	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review *This was a before-and-after information/education study.*
Costantino, Claudio, Caracci, Francesca, Brandi, Mariarosa et al. (2020) Determinants of vaccine hesitancy and effectiveness of vaccination counseling interventions among a sample of the general population in Palermo, Italy. Human vaccines & immunotherapeutics: 1-7	- Does not contain an outcome of relevance to this review
Cox, Dena S, Cox, Anthony D, Sturm, Lynne et al. (2010) Behavioral interventions to increase HPV vaccination acceptability among mothers of young girls. Health psychology : official journal of the Division of Health Psychology, American Psychological Association 29(1): 29-39	- Does not contain an outcome of relevance to this review *This study looks at vaccination intention, not uptake.*
Coyle, Christina M and Currie, Brian P (2004) Improving the rates of inpatient pneumococcal vaccination: impact of standing orders versus computerized reminders to physicians. Infection control and hospital epidemiology 25(11): 904-7	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Crawford, N.W., Barfield, C., Hunt, R.W. et al. (2014) Improving preterm infants' immunisation status: A follow-up audit. Journal of Paediatrics and Child Health 50(4): 314-318	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Crocker-Buque, Tim; Edelstein, Michael; Mounier-Jack, Sandra (2017) Interventions to reduce inequalities in vaccine uptake in children and adolescents aged <19 years: a systematic review. Journal of epidemiology and community health 71(1): 87-97	- Systematic review used as source of primary studies
Crocker-Buque, Tim and Mounier-Jack, Sandra (2018) Vaccination in England: a review of why business as usual is not enough to maintain coverage. BMC public health 18(1): 1351	- Systematic review used as source of primary studies

Cuff, R.D., Buchanan, T., Pelkofski, E. et al. (2016) Rates of human papillomavirus vaccine uptake amongst girls five years after introduction of statewide mandate in Virginia Presented as a podium presentation at the Annual Meeting of the South Atlantic Association of Obstetricians and Gynecologists, Charleston, South Carolina, January 30-February 2, 2016. American Journal of Obstetrics and Gynecology 214(6): 752	- Conference abstract
Cuff, Ryan D, Buchanan, Tommy, Pelkofski, Elizabeth et al. (2016) Rates of human papillomavirus vaccine uptake amongst girls five years after introduction of statewide mandate in Virginia. American journal of obstetrics and gynecology 214(6): 752e1-6	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Curran, Eileen A; Bednarczyk, Robert A; Omer, Saad B (2013) Evaluation of the frequency of immunization information system use for public health research. Human vaccines & immunotherapeutics 9(6): 1346-50	- Systematic review that does not include the outcomes stated in the protocol *Review evaluating the use of an information system in research*
Cutrona, S.L., Golden, J.G., Goff, S.L. et al. (2018) Improving Rates of Outpatient Influenza Vaccination Through EHR Portal Messages and Interactive Automated Calls: A Randomized Controlled Trial. Journal of General Internal Medicine 33(5): 659-667	- Study participants are the wrong age group *59% of the participants were younger than 50 years. This study has pneumococcal vaccine uptake data but this vaccine is routinely given to people aged 65 years and older in the UK.*
Czajka, H., Lauterbach, R., Pawlik, D. et al. (2017) Implementation of mandatory vaccinations against diphtheria, tetanus and pertussis in preterm infants as part of the Polish Immunization Programme. Pediatria Polska 92(5): 485-493	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study about mandatory vaccinations. The 2 subgroups of babies in the intervention arm all received the same intervention.*

Daku, Mark; Raub, Amy; Heymann, Jody (2012) Maternal leave policies and vaccination coverage: a global analysis. Social science & medicine (1982) 74(2): 120-4	- Not a relevant study design *This is a global survey that looks at correlations.*
Daley, Matthew F, MD, Narwaney, Komal J, MPH, PhD, Shoup, Jo Ann, PhD et al. (2018) Addressing Parents' Vaccine Concerns: A Randomized Trial of a Social Media Intervention. American Journal of Preventive Medicine 55(1): 44	- Does not contain an outcome of relevance to this review
Das, J.K., Salam, R.A., Arshad, A. et al. (2016) Systematic Review and Meta-Analysis of Interventions to Improve Access and Coverage of Adolescent Immunizations. Journal of Adolescent Health 59(2supplement): 40-s48	- Systematic review used as source of primary studies
Davies, C., Skinner, S.R., Stoney, T. et al. (2017) 'Is it like one of those infectious kind of things?' The importance of educating young people about HPV and HPV vaccination at school. Sex Education 17(3): 256-275	- Does not contain an outcome of relevance to this review
Davis TC, Fredrickson DD, Arnold C et al. (1998) A polio immunization pamphlet with increased appeal and simplified language does not improve comprehension to an acceptable level. Patient education and counseling 33(1): 25-37	- The study did not report any of the outcomes specified in the protocol
de Oliveira Bressane Lima, P., van Lier, A., de Melker, H. et al. (2020) MenACWY vaccination campaign for adolescents in the Netherlands: Uptake and its determinants. Vaccine 38(34): 5516-5524	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
deHart, M.P., Salinas, S.K., Barnette Jr., L.J. et al. (2005) Project Protect: Pneumococcal vaccination in Washington State nursing homes. Journal of the American Medical Directors Association 6(2): 91-96	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review
Dempsey AF, Maertens J, Beaty B et al. (2015) Characteristics of users of a tailored, interactive website for parents and its impact on adolescent vaccination attitudes and uptake. BMC research notes 8: 739	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review

Dempsey AF, Zimet GD, Davis RL et al. (2006) Factors that are associated with parental acceptance of human papillomavirus vaccines: a randomized intervention study of written information about HPV. Pediatrics 117(5): 1486-1493	- The study did not report any of the outcomes specified in the protocol
Dempsey Amanda, F, Pyrznawoski, Jennifer, Lockhart, Steven et al. (2018) Effect of a Health Care Professional Communication Training Intervention on Adolescent Human Papillomavirus Vaccination: a Cluster Randomized Clinical Trial. 172	- Duplicate reference *Dempsey 2015 was included in this evidence review.*
Dempsey, A.F., Pyrzanowski, J., Campbell, J. et al. (2020) Cost and reimbursement of providing routine vaccines in outpatient obstetrician/gynecologist settings. American Journal of Obstetrics and Gynecology 223(4): 562	- Duplicate reference *This is an economic analysis of O'Leary 2019: "Effectiveness of a multimodal intervention to increase vaccination in obstetrics/gynecology settings"*
Dempsey, A.F. and Zimet, G.D. (2015) Interventions to Improve Adolescent Vaccination: What May Work and What Still Needs to Be Tested. Vaccine 33(supplement4): d106-d113	- Review article but not a systematic review
Dempsey, Amanda F and Zimet, Gregory D (2015) Interventions to Improve Adolescent Vaccination: What May Work and What Still Needs to Be Tested. American journal of preventive medicine 49(6suppl4): 445-54	- Duplicate reference *Article published in a different journal concurrently with identical text.*
Desai, Sonali P, Lu, Bing, Szent-Gyorgyi, Lara E et al. (2013) Increasing pneumococcal vaccination for immunosuppressed patients: a cluster quality improvement trial. Arthritis and rheumatism 65(1): 39-47	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Deshmukh, Uma, Oliveira, Carlos R, Griggs, Susan et al. (2018) Impact of a clinical interventions bundle on uptake of HPV vaccine at an OB/GYN clinic. Vaccine 36(25): 3599-3605	- Vaccine on UK routine schedule but wrong context for administration *The mean age of the women receiving the HPV vaccine was 22 years.*

Dexheimer, Judith W, Jones, Ian, Waitman, Russ et al. (2006) Prospective evaluation of a closed-loop, computerized reminder system for pneumococcal vaccination in the emergency department. AMIA ... Annual Symposium proceedings. AMIA Symposium: 910	- Conference abstract
Dexheimer, Judith W, Talbot, Thomas R 3rd, Ye, Fei et al. (2011) A computerized pneumococcal vaccination reminder system in the adult emergency department. Vaccine 29(40): 7035-41	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Dexheimer, Judith W, Talbot, Thomas R, Ye, Fei et al. (2008) Implementing a computerized pneumococcal vaccination reminder system in an emergency department: a prospective study. AMIA ... Annual Symposium proceedings. AMIA Symposium: 867	- Conference abstract
Dexter LJ, Teare MD, Dexter M et al. (2012) Strategies to increase influenza vaccination rates: outcomes of a nationwide cross-sectional survey of UK general practice. BMJ open 2(3)	- Data not reported in an extractable format *The number of participants in each arm was not provided. The study mentions supplementary tables but they are not provided on the journal's website.*
Dexter, P R, Perkins, S, Overhage, J M et al. (2001) A computerized reminder system to increase the use of preventive care for hospitalized patients. The New England journal of medicine 345(13): 965-70	- Data not reported in an extractable format *Pneumonococcal vaccine uptake data reported per hospitalisation and not per person.*
Dini, E F, Chaney, M, Moolenaar, R L et al. (1996) Information as intervention: how Georgia used vaccination coverage data to double public sector vaccination coverage in seven years. Journal of public health management and practice : JPHMP 2(1): 45-9	- Review article but not a systematic review
Dini; Linkins; Sigafoos (2000) The impact of computer-generated messages on childhood immunization coverage(2)(2). American journal of preventive medicine 19(1): 68-70	- Duplicate reference
Dini; Linkins; Sigafoos (2000) The impact of computer-generated messages on childhood immunization coverage(2)(2). American journal of preventive medicine 19(1): 68-70	- Duplicate reference

Dixon, B, Downs, S, Zhang, Z et al. (2016) A mhealth intervention trial to improve HPV vaccination rates in urban primary care clinics. Sexually transmitted diseases 43(10): S199	- Conference abstract
Dixon, Brian E, Kasting, Monica L, Wilson, Shannon et al. (2017) Health care providers' perceptions of use and influence of clinical decision support reminders: qualitative study following a randomized trial to improve HPV vaccination rates. BMC medical informatics and decision making 17(1): 119	- Does not contain an outcome of relevance to this review *The quanitative study is Zimet 2018, which is detailed elsewhere. Dixon 2017 has qualitative findings.*
Djibuti, M., Gotsadze, G., Zoidze, A. et al. (2009) The role of supportive supervision on immunization program outcome - A randomized field trial from Georgia. BMC International Health and Human Rights 9(suppl1): 11	- Study took place in a non-OECD country
Dona, Daniele, Masiero, Susanna, Brisotto, Sara et al. (2018) Special Immunization Service: A 14-year experience in Italy. PloS one 13(4): e0195881	- Not a relevant study design
Donahue K, Hendrix K, Sturm L et al. (2018) Provider Communication and Mothers' Willingness to Vaccinate Against Human Papillomavirus and Influenza: A Randomized Health Messaging Trial. Academic pediatrics 18(2): 145-153	- The study did not report any of the outcomes specified in the protocol
Donnelly, Amber (2008) HPV vaccination: Parental perspectives in Omaha, Nebraska. Dissertation Abstracts International: Section B: The Sciences and Engineering 69(5b): 2941	- Full text paper or book article is unavailable *Dissertation abstract*
Dorell, Christina G, Yankey, David, Santibanez, Tammy A et al. (2011) Human papillomavirus vaccination series initiation and completion, 2008-2009. Pediatrics 128(5): 830-9	- Not a relevant study design *Survey that looks at correlations/risk factors.*
Dubowitz H., Feigelman S. LW&KJ (2009) Pediatric primary care to help prevent child maltreatment: the Safe Environment for Every Kid (SEEK) model. Pediatrics: 858-864	- Study does not contain an intervention aimed at increasing vaccine uptake *This study is about preventing child mistreatment via social work etc. There is no*

	mention of interventions to increase vaccination uptake in the methods section.
Dumo P, Dougherty J SM (2002) Impact of clinical pharmacists on vaccination rates in medicine, surgery, and infectious disease services: a randomized, controlled trial. Pharmacotherapy 10: 1347–8	- Conference abstract
Dylag, Andrew M and Shah, Shetal I (2008) Administration of tetanus, diphtheria, and acellular pertussis vaccine to parents of high-risk infants in the neonatal intensive care unit. Pediatrics 122(3): e550-5	- Does not contain an outcome of relevance to this review *This study does not have a comparator.*
Eason E, Naus M, Sciberras J et al. (2001) Evaluation of an institution-based protocol for postpartum rubella vaccination. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 165(10): 1321-1323	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Eckrode, Carl; Church, Nancy; English, Woodruff J 3rd (2007) Implementation and evaluation of a nursing assessment/standing orders-based inpatient pneumococcal vaccination program. American journal of infection control 35(8): 508-15	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Eid, Deeb D; Meagher, Rebecca C; Lengel, Aaron J (2015) The Impact of Pharmacist Interventions on Herpes Zoster Vaccination Rates. The Consultant pharmacist : the journal of the American Society of Consultant Pharmacists 30(8): 459-62	- Review article but not a systematic review
Ellerbeck, Edward F, Totten, Bonnie, Markello, Samuel et al. (2003) Quality improvement in critical access hospitals: addressing immunizations prior to discharge. The Journal of rural health : official journal of the American Rural Health Association and the National Rural Health Care Association 19(4): 433-8	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Ellis, Catherine; Roland, Damian; Blair, Mitch E (2013) Professional educational interventions designed to improve knowledge and uptake of immunisation. Community practitioner : the journal of the Community Practitioners' & Health Visitors' Association 86(6): 20-3	- More recent systematic review identified that covers the same topic
Ernst, Kimberly D (2017) Electronic Alerts Improve Immunization Rates in Two-month-old Premature Infants Hospitalized in the	- Reminders non-RCT. Excluded because there

Neonatal Intensive Care Unit. Applied clinical informatics 8(1): 206-213	was sufficient RCT evidence for this review
Fadda, Marta, Galimberti, Elisa, Fiordelli, Maddalena et al. (2018) Evaluation of a Mobile Phone-Based Intervention to Increase Parents' Knowledge About the Measles-Mumps-Rubella Vaccination and Their Psychological Empowerment: Mixed-Method Approach. JMIR mHealth and uHealth 6(3): e59	- Does not contain an outcome of relevance to this review
Fairbrother, G., Friedman, S., Hanson, K.L. et al. (1997) Effect of the vaccines for children program on inner-city neighborhood physicians. Archives of Pediatrics and Adolescent Medicine 151(12): 1229-1235	- The intervention is a free vaccine- not in scope
Fiks, AG; Luan, X; Mayne, SL (2016) Improving HPV Vaccination Rates Using Maintenance-of-Certification Requirements. Pediatrics 137(3): e20150675	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Findley, Sally E, Irigoyen, Matilde, Sanchez, Martha et al. (2008) Effectiveness of a community coalition for improving child vaccination rates in New York City. American journal of public health 98(11): 1959-62	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Fishbein, DB, Willis, BC, Cassidy, WM et al. (2006) A comprehensive patient assessment and physician reminder tool for adult immunization: effect on vaccine administration. Vaccine 24(18): 3971-3983	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Fisher-Borne, Marcie, Preiss, Alexander J, Black, Molly et al. (2018) Early Outcomes of a Multilevel Human Papillomavirus Vaccination Pilot Intervention in Federally Qualified Health Centers. Academic pediatrics 18(2s): 79-s84	- Data not reported in an extractable format *The number of participants was not provided.*
Flanagan, J R, Doebbeling, B N, Dawson, J et al. (1999) Randomized study of online vaccine reminders in adult primary care. Proceedings. AMIA Symposium: 755-9	- Does not contain an outcome of relevance to this review *Study reports ordering of vaccination by physician not if it was administered.*

Flood, T., Wilson, I.M., Prue, G. et al. (2020) Impact of school-based educational interventions in middle adolescent populations (15-17yrs) on human papillomavirus (HPV) vaccination uptake and perceptions/knowledge of HPV and its associated cancers: A systematic review. Preventive Medicine 139: 106168	- Systematic review used as source of primary studies *Some studies are non-OECD*
Fogarty, Kieran J, Massoudi, Mehran S, Gallo, William et al. (2004) Vaccine coverage levels after implementation of a middle school vaccination requirement, Florida, 1997-2000. Public health reports (Washington, D.C. : 1974) 119(2): 163-9	- Does not contain an outcome of relevance to this review *This study only reports data after the intervention is implemented - there is no 'before' comparison data.*
Forbes, Thomas A, McMinn, Alissa, Crawford, Nigel et al. (2015) Vaccination uptake by vaccine-hesitant parents attending a specialist immunization clinic in Australia. Human vaccines & immunotherapeutics 11(12): 2895-903	- Does not contain an outcome of relevance to this review *This study does not have a comparator.*
Ford, A.J. and Alwan, N.A. (2018) Use of social networking sites and women's decision to receive vaccinations during pregnancy: A cross-sectional study in the UK. Vaccine 36(35): 5294-5303	- Does not contain an outcome of relevance to this review
Forster, A, Cornelius, V, Rockliffe, L et al. (2018) A cluster randomised feasibility study of an adolescent incentive intervention to increase uptake of HPV vaccination. British journal of cancer. Conference: 2018 national cancer research institute cancer conference, NCRI 2018. United kingdom 119(1): 34	- Conference abstract
Forster, Alice S, Cornelius, Victoria, Rockliffe, Lauren et al. (2017) A protocol for a cluster randomised feasibility study of an adolescent incentive intervention to increase uptake of HPV vaccination among girls. Pilot and feasibility studies 3: 13	- Protocol for a future study *This is the protocol for Forester 2018, which is also considered in this review.*

Forster, Alice S, Cornelius, Victoria, Rockliffe, Lauren et al. (2017) A cluster randomised feasibility study of an adolescent incentive intervention to increase uptake of HPV vaccination. British journal of cancer 117(8): 1121-1127	- Does not contain an outcome of relevance to this review *Vaccine uptake may have been recorded during the study but the data was not included in the results section.*
Frame, P S, Zimmer, J G, Werth, P L et al. (1994) Computer-based vs manual health maintenance tracking. A controlled trial. Archives of family medicine 3(7): 581-8	- Vaccine on UK routine schedule but wrong context for administration *Study is about adult tetanus boosters in the USA.*
Francis, Diane B, Cates, Joan R, Wagner, Kyla P Garrett et al. (2017) Communication technologies to improve HPV vaccination initiation and completion: A systematic review. Patient education and counseling 100(7): 1280-1286	- More recent systematic review identified that covers the same topic
Franco, M., Mazzucca, S., Padek, M. et al. (2019) Going beyond the individual: how state-level characteristics relate to HPV vaccine rates in the United States. BMC public health 19(1): 246	- Not a relevant study design *This is a snap-shot of a national survey.*
Franzini, Luisa; Boom, Julie; Nelson, Cynthia (2007) Cost-effectiveness analysis of a practice-based immunization education intervention. Ambulatory pediatrics : the official journal of the Ambulatory Pediatric Association 7(2): 167-75	- Study includes data on a vaccine that is not on the UK routine vaccination schedule *This study does not separate out the data on varicella vaccine uptake, which is not on the UK routine vaccination schedule.*
Frascella, B., Oradini-Alacreu, A., Balzarini, F. et al. (2020) Effectiveness of email-based reminders to increase vaccine uptake: a systematic review. Vaccine 38(3): 433-443	- Systematic review used as source of primary studies

Free, Caroline, Phillips, Gemma, Felix, Lambert et al. (2010) The effectiveness of M-health technologies for improving health and health services: a systematic review protocol. BMC research notes 3: 250	- Review article but not a systematic review
Frew PM, Owens LE, Saint-Victor DS et al. (2014) Factors associated with maternal influenza immunization decision-making. Evidence of immunization history and message framing effects. Human vaccines & immunotherapeutics 10(9): 2576-2583	- Does not contain an outcome of relevance to this review *The outcome is intention to vaccinate, not vaccine uptake.*
Frew, Paula M and Lutz, Chelsea S (2017) Interventions to increase pediatric vaccine uptake: An overview of recent findings. Human vaccines & immunotherapeutics 13(11): 2503-2511	- Systematic review used as source of primary studies
Fried, Bruce J, Keyes-Elstein, Lynette, Lannon, Carole M et al. (2004) Practice based education to improve delivery systems for prevention in primary care: randomised trial. British Medical Journal 328(7436): 388-392	- Duplicate reference *This study is the same as Margolis 2004, which was excluded because the vaccine uptake data is only presented in a chart. This abstract entry has a different order of authors. It is otherwise identical.*
Frère J, De Wals P, Ovetchkine P et al. (2013) Evaluation of several approaches to immunize parents of neonates against B. pertussis. Vaccine 31(51): 6087-6091	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Fu, Linda Y, Bonhomme, Lize-Anne, Cooper, Spring Chenoa et al. (2014) Educational interventions to increase HPV vaccination acceptance: a systematic review. Vaccine 32(17): 1901-20	- More recent systematic review identified that covers the same topic
Fu, LY, Zook, K, Gingold, JA et al. (2016) Strategies for Improving Vaccine Delivery: a Cluster-Randomized Trial. Pediatrics 137(6)	- Study includes data on a vaccine that is not on the UK routine vaccination schedule *Varicella vaccine is not on the UK routine vaccination schedule and*

	it is not possible to separate this data out from other vaccines' uptake data.
Fujiwara, Hiroyuki, Takei, Yuji, Ishikawa, Yoshiki et al. (2013) Community-based interventions to improve HPV vaccination coverage among 13- to 15-year-old females: measures implemented by local governments in Japan. PloS one 8(12): e84126	- Not a relevant study design *This is a survey that analyses interventions as if they were 'risk factors' increasing uptake.*
Gaglani, M, Riggs, M, Kamenicky, C et al. (2001) A computerized reminder strategy is effective for annual influenza immunization of children with asthma or reactive airway disease. The Pediatric infectious disease journal 20(12): 1155-60	- The study did not report any of the outcomes specified in the protocol
Gagneur, Arnaud, Lemaitre, Thomas, Gosselin, Virginie et al. (2018) A postpartum vaccination promotion intervention using motivational interviewing techniques improves short-term vaccine coverage: PromoVac study. BMC public health 18(1): 811	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Gamble, George R; Goldstein, Adam O; Bearman, Rachel S (2008) Implementing a standing order immunization policy: a minimalist intervention. Journal of the American Board of Family Medicine : JABFM 21(1): 38-44	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Gannon M, Qaseem A, Snooks Q et al. (2012) Improving adult immunization practices using a team approach in the primary care setting. American journal of public health 102(7): e46	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Gargano, Lisa M, Herbert, Natasha L, Painter, Julia E et al. (2014) Development, theoretical framework, and evaluation of a parent and teacher-delivered intervention on adolescent vaccination. Health promotion practice 15(4): 556-67	- Does not contain an outcome of relevance to this review

Gates, A., Gates, M., Rahman, S. et al. (2021) A systematic review of factors that influence the acceptability of vaccines among Canadians. Vaccine 39(2): 222-236	- Not a relevant study design
Gazibara, T.; Jia, H.; Lubetkin, E.I. (2017) Trends in HPV vaccine initiation and completion among girls in Texas: Behavioral risk factor surveillance system data, 2008-2010. Puerto Rico Health Sciences Journal 36(3): 152-158	- Study does not contain an intervention aimed at increasing vaccine uptake
Gellert, Paul; Bethke, Norma; Seybold, Joachim (2019) School-based educational and on-site vaccination intervention among adolescents: study protocol of a cluster randomised controlled trial. BMJ open 9(1): e025113	- Protocol for a future study
Ghadieh, A.S., Hamadeh, G.N., Mahmassani, D.M. et al. (2015) The effect of various types of patients' reminders on the uptake of pneumococcal vaccine in adults: A randomized controlled trial. Vaccine 33(43): 5868-5872	- Study took place in a non-OECD country *Lebanon*
Gidengil, Courtney, Chen, Christine, Parker, Andrew M et al. (2019) Beliefs around childhood vaccines in the United States: A systematic review. Vaccine 37(45): 6793-6802	- Not a relevant study design *Qualitative study - considered for the qualitative review*
Giles EL, Robalino S, McColl E, Sniehotta FF, Adams J (2014) The effectiveness of financial incentives for health behaviour change: systematic review and meta-analysis. PLOS ONE 9(3): e90347	- Systematic review that does not include the outcomes stated in the protocol *Review focuses on financial incentives for behaviour change and covers changes in vaccination, but included references are not for routine vaccinations included in our protocol.*
Gilkey, Melissa B and McRee, Annie-Laurie (2016) Provider communication about HPV vaccination: A systematic review. Human vaccines & immunotherapeutics 12(6): 1454-68	- Systematic review that does not include relevant study types *Review of surveys and qualitative studies*

Gindler, J.S., Cutts, F.T., Barnett-Antinori, M.E. et al. (1993) Successes and failures in vaccine delivery: Evaluation of the immunization delivery system in Puerto Rico. Pediatrics 91(2): 315-320	- Not a relevant study design *Survey snapshot of Puerto Rico.*
Girard, Dorota Zdanowska (2012) Recommended or mandatory pertussis vaccination policy in developed countries: does the choice matter?. Public health 126(2): 117-22	- Review article but not a systematic review
Gleeson S; Kelleher K; Gardner W (2016) Evaluating a Pay-for-Performance Program for Medicaid Children in an Accountable Care Organization. JAMA pediatrics 170(3): 259-266	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before and after study.*
Glenton, Claire, Scheel, Inger B, Lewin, Simon et al. (2011) Can lay health workers increase the uptake of childhood immunisation? Systematic review and typology. Tropical medicine & international health : TM & IH 16(9): 1044-53	- Systematic review used as source of primary studies
Goebel, LJ (1997) A peer review feedback method of promoting compliance with preventive care guidelines in a resident ambulatory care clinic. Joint Commission journal on quality improvement 23(4): 196-202	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Golden, Shelley D, Moracco, Kathryn E, Feld, Ashley L et al. (2014) Process evaluation of an intervention to increase provision of adolescent vaccines at school health centers. Health education & behavior : the official publication of the Society for Public Health Education 41(6): 625-32	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Gordon, Louisa G, Holden, Libby, Ware, Robert S et al. (2012) Comprehensive health assessments for adults with intellectual disability living in the community: Weighing up the costs and benefits. Australian Family Physician 41(12): 969-72	- Vaccine on UK routine schedule but wrong context for administration *The mean age of participants was 36 years (SD 13). For the pneumonia vaccine. This is younger than the committee's cut-off mean age of 50 years.*

Gori, D., Costantino, C., Odone, A. et al. (2020) The impact of mandatory vaccination law in Italy on mmr coverage rates in two of the largest italian regions (Emilia-romagna and sicily): An effective strategy to contrast vaccine hesitancy. Vaccines 8(1): 57	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Gosselin Boucher, Vincent, Colmegna, Ines, Gemme, Claudia et al. (2019) Interventions to improve vaccine acceptance among rheumatoid arthritis patients: a systematic review. Clinical rheumatology 38(6): 1537-1544	- Systematic review used as source of primary studies
Gottlieb, N H, Huang, P P, Blozis, S A et al. (2001) The impact of Put Prevention into Practice on selected clinical preventive services in five Texas sites. American journal of preventive medicine 21(1): 35-40	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Grant, C.C., Turner, N.M., York, D.G. et al. (2010) Factors associated with immunisation coverage and timeliness in New Zealand. British Journal of General Practice 60(572): 180-186	- Not a relevant study design *Survey snapshot of New Zealand.*
Green, D., Labriola, G., Smeaton, L. et al. (2017) Prevention of neonatal whooping cough in England: The essential role of the midwife. British Journal of Midwifery 25(4): 224-228	- Review article but not a systematic review
Greyson, Devon; Vriesema-Magnuson, Chris; Bettinger, Julie A (2019) Impact of school vaccination mandates on pediatric vaccination coverage: a systematic review. CMAJ open 7(3): e524-e536	- Systematic review used as source of primary studies
Groom, Holly C, Irving, Stephanie A, Caldwell, Jessica et al. (2017) Implementing a Multipartner HPV Vaccination Assessment and Feedback Intervention in an Integrated Health System. Journal of public health management and practice : JPHMP 23(6): 589-592	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Groom, Holly, Hopkins, David P, Pabst, Laura J et al. (2015) Immunization information systems to increase vaccination rates: a	- Systematic review used as source of primary studies

community guide systematic review. Journal of public health management and practice : JPHMP 21(3): 227-48	
Gruber, T and Marada, R (2000) Improving pneumococcal vaccination rates for elderly patients. New Jersey medicine : the journal of the Medical Society of New Jersey 97(2): 35-9	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review *This was a before-and-after study.*
Guo, J.-L.; Gottlieb, N.H.; Huang, C.-M. (2002) Effects of office system and educational interventions in increasing the delivery of preventive health services: A meta-analysis. Taiwan Journal of Public Health 21(1): 36-51	- More recent systematic review identified that covers the same topic *SR is not specific to increasing vaccination and other more relevant and up to date SRs identified.*
Gust, Deborah A, Kennedy, Allison, Weber, Deanne et al. (2009) Parents questioning immunization: evaluation of an intervention. American journal of health behavior 33(3): 287-98	- Does not contain an outcome of relevance to this review
Haesebaert J, Lutringer-Magnin D, Kalecinski J et al. (2012) French women's knowledge of and attitudes towards cervical cancer prevention and the acceptability of HPV vaccination among those with 14 - 18 year old daughters: a quantitative-qualitative study. BMC public health 12: 1034	- The study did not report any of the outcomes specified in the protocol
Haji, Adam, Lowther, S, Ngan'ga, Z et al. (2016) Reducing routine vaccination dropout rates: evaluating two interventions in three Kenyan districts, 2014. BMC public health 16: 152	- Study took place in a non-OECD country
Hajizadeh, Mohammad, Heymann, Jody, Strumpf, Erin et al. (2015) Paid maternity leave and childhood vaccination uptake: Longitudinal evidence from 20 low-and-middle-income countries. Social science & medicine (1982) 140: 104-17	- Systematic review of non-OECD countries
Hakim, Hina, Provencher, Thierry, Chambers, Christine T et al. (2019) Interventions to help people understand community immunity: A systematic review. Vaccine 37(2): 235-247	- Systematic review used as source of primary studies

Hansen, P.R.; Schmidtblaicher, M.; Brewer, N.T. (2020) Resilience of HPV vaccine uptake in Denmark: Decline and recovery. Vaccine 38(7): 1842-1848	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Harper, P and Madlon-Kay, D J (1994) Adolescent measles vaccination. Response rates to mailings addressed to patients vs parents. Archives of family medicine 3(7): 619-22	- Study participants are the wrong age group *This study is a measles catch-up campaign for adolescents aged 12 to 18 years. MMR is on the routine schedule for children aged 0-5 years. Catch-up campaigns are out of scope.*
Harvey, Hannah; Reissland, Nadja; Mason, James (2015) Parental reminder, recall and educational interventions to improve early childhood immunisation uptake: A systematic review and meta-analysis. Vaccine 33(25): 2862-80	- Systematic review used as source of primary studies
Hastings, Tessa J, Hohmann, Lindsey A, Huston, Sally A et al. (2020) Enhancing pharmacy personnel immunization-related confidence, perceived barriers, and perceived influence: The We Immunize program. Journal of the American Pharmacists Association : JAPhA 60(2): 344-351e2	- Does not contain an outcome of relevance to this review
Hayles, Elizabeth Helen, Cooper, Spring Chenoa, Wood, Nicholas et al. (2015) What predicts postpartum pertussis booster vaccination? A controlled intervention trial. Vaccine 33(1): 228-36	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Healy CM, Ng N, Taylor RS et al. (2015) Tetanus and diphtheria toxoids and acellular pertussis vaccine uptake during pregnancy in a metropolitan tertiary care center. Vaccine 33(38): 4983-4987	- Data not reported in an extractable format *The number of participants in each cohort was not provided.*
Hechter, Rulin C, Qian, Lei, Luo, Yi et al. (2019) Impact of an electronic medical record reminder on hepatitis B vaccine initiation and completion rates among insured adults with diabetes mellitus. Vaccine 37(1): 195-201	- Vaccine on UK routine schedule but wrong context for administration *This study is about HepB vaccination for adults.*

Hempstead, K., Bresnitz, E., Howell-White, S. et al. (2004) Use of a state regulation for adult vaccination. American Journal of Preventive Medicine 26(4): 311-314	- Does not contain an outcome of relevance to this review
Henninger, Michelle L, Mcmullen, Carmit K, Firemark, Alison J et al. (2017) User-Centered Design for Developing Interventions to Improve Clinician Recommendation of Human Papillomavirus Vaccination. The Permanente journal 21: 16-191	- Not a relevant study design
Henrikson, N, Zhu, W, Nguyen, M et al. (2017) Health system-based HPV vaccine reminders: randomized trial results. Cancer epidemiology biomarkers and prevention 26(3): 435	- Conference abstract
Henry SL, Shen E, Ahuja A et al. (2016) The Online Personal Action Plan: A Tool to Transform Patient-Enabled Preventive and Chronic Care. American journal of preventive medicine 51(1): 71-77	- Not a relevant study design *Use of a website for education is treated as a risk factor for vaccine uptake. All participants had access to the same website.*
Herbert, N (2014) Parental attitudes and beliefs about human papillomavirus (HPV) vaccination and vaccine receipt among adolescents in richmond county, Georgia. Journal of adolescent health 54(2): S82	- Conference abstract
Herman, C.J.; Speroff, T.; Cebul, R.D. (1994) Improving compliance with immunization in the older adult: Results of a randomized cohort study. Journal of the American Geriatrics Society 42(11): 1154-1159	- Does not contain an outcome of relevance to this review *This study has data for vaccinations offered. This is not the same thing as uptake.*
Hicks, Paul; Tarr, Gillian A M; Hicks, Ximena Prieto (2007) Reminder cards and immunization rates among Latinos and the rural poor in Northeast Colorado. Journal of the American Board of Family Medicine : JABFM 20(6): 581-6	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Higginbotham, Suzanne; Stewart, Autumn; Pfalzgraf, Andrea (2012) Impact of a pharmacist immunizer on adult immunization rates.	- Study participants are the wrong age group

Journal of the American Pharmacists Association : JAPhA 52(3): 367-71	*The participants for all 3 arms have a mean age of 45 years (SD 12.1). This is the wrong age group for vaccines on the UK routine vaccination schedule.*
Ho, Hanley J, Chan, Yin Ying, Ibrahim, Muhamad Alif Bin et al. (2017) A formative research-guided educational intervention to improve the knowledge and attitudes of seniors towards influenza and pneumococcal vaccinations. Vaccine 35(47): 6367-6374	- Does not contain an outcome of relevance to this review
Hofstetter, Annika M, Vargas, Celibell Y, Camargo, Stewin et al. (2015) Impacting delayed pediatric influenza vaccination: a randomized controlled trial of text message reminders. American journal of preventive medicine 48(4): 392-401	- The study did not report any of the outcomes specified in the protocol
Hohmann, L.A., Hastings, T.J., Ha, D.R. et al. (2019) Impact of a multi-component immunization intervention on pneumococcal and herpes zoster vaccinations: A randomized controlled trial of community pharmacies in 2 states. Research in social & administrative pharmacy : RSAP 15(12): 1453-1463	- The study did not report any of the outcomes specified in the protocol *And unable to determine what proportion of individuals were over 65 years of age*
Hohmann, L, Hastings, T, Garza, K et al. (2018) Impact of a multicomponent immunization intervention on pneumococcal and herpes zoster vaccinations: a randomized controlled trial of community pharmacies in two states. Journal of the american pharmacists association 58(3): e71	- Conference abstract
Holloway, Ginger L (2019) Effective HPV Vaccination Strategies: What Does the Evidence Say? An Integrated Literature Review. Journal of pediatric nursing 44: 31-41	- Review article but not a systematic review
Holzman, GS, Harwell, TS, Johnson, EA et al. (2005) A media campaign to promote pneumococcal vaccinations: is a telephone survey an effective evaluation strategy?. Journal of public health management and practice 11(3): 228-234	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Hopfer S, Ray AE, Hecht ML et al. Taking an HPV vaccine research-tested intervention to scale in a clinical setting. Translational behavioral medicine 8(5): 745-752	- The study did not report any of the outcomes specified in the protocol

Houle, Sherilyn K D, McAlister, Finlay A, Jackevicius, Cynthia A et al. (2012) Does performance-based remuneration for individual health care practitioners affect patient care?: a systematic review. Annals of internal medicine 157(12): 889-99	- Systematic review used as source of primary studies
Hui, Charles, Dunn, Jessica, Morton, Rachael et al. (2018) Interventions to Improve Vaccination Uptake and Cost Effectiveness of Vaccination Strategies in Newly Arrived Migrants in the EU/EEA: A Systematic Review. International journal of environmental research and public health 15(10)	- Systematic review used as source of primary studies
Hull, Sally, Hagdrup, Nicola, Hart, Ben et al. (2002) Boosting uptake of influenza immunisation: a randomised controlled trial of telephone appointing in general practice. The British journal of general practice : the journal of the Royal College of General Practitioners 52(482): 712-6	- The study did not report any of the outcomes specified in the protocol
Hutchinson, A.F. and Smith, S.M. (2020) Effectiveness of strategies to increase uptake of pertussis vaccination by new parents and family caregivers: A systematic review. Midwifery 87: 102734	- Systematic review used as source of primary studies
Ibikunle-Salami, Tawa B (2016) Educational intervention to impact parental decisions to consent to Human Papillomavirus vaccine. Dissertation Abstracts International: Section B: The Sciences and Engineering 77(2be): no-specified	- Not a peer-reviewed publication
Ibáñez-Jiménez, A, Pairet-Jofre, G, Prat-González, I et al. (2007) Randomized clinical trial on the effectiveness of a postal reminder to increase tetanus-diphtheria vaccination coverage in the young adult population. Enfermeria clinica 17(4): 171-176	- Study not reported in English
Interaminense, I.N.C.S., de Oliveira, S.C., Leal, L.P. et al. (2016) Educational technologies to promote vaccination against human papillomavirus: Integrative literature review. Texto e Contexto Enfermagem 25(2): e2300015	- More recent systematic review identified that covers the same topic
Irigoyen, M M, Findley, S, Earle, B et al. (2000) Impact of appointment reminders on vaccination coverage at an urban clinic. Pediatrics 106(4suppl): 919-23	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Irigoyen, M., Findley, S.E., Chen, S. et al. (2004) Early continuity of care and immunization coverage. Ambulatory Pediatrics 4(3): 199-203	- Does not contain an outcome of relevance to this review

	This study does not compare one arm against another. Continuity of care is analysed like a risk factor for vaccination.
Irving, S.A.; Salmon, D.A.; Curbow, B.A. (2007) Vaccine risk communication interventions in the United States, 1996-2006: A review. Current Pediatric Reviews 3(3): 238-247	- More recent systematic review identified that covers the same topic
Isaac, Michael R, Chartier, Mariette, Brownell, Marni et al. (2015) Can opportunities be enhanced for vaccinating children in home visiting programs? A population-based cohort study. BMC Public Health 15(620)	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Isenor, J E, Edwards, N T, Alia, T A et al. (2016) Impact of pharmacists as immunizers on vaccination rates: A systematic review and meta-analysis. Vaccine 34(47): 5708-5723	- Systematic review used as source of primary studies
Isenor, J.E., Kervin, M.S., Halperin, D.M. et al. (2020) Pharmacists as immunizers to Improve coverage and provider/recipient satisfaction: A prospective, Controlled Community Embedded Study with vaccineS with low coverage rates (the Improve ACCESS Study): Study summary and anticipated significance. Canadian Pharmacists Journal 153(2): 88-94	- Protocol for a future study
ISRCTN20165116 (2003) Randomised trial of pre-pregnancy information and counselling in inner urban Melbourne. http://www.who.int/trialsearch/Trial2.aspx?TrialID=ISRCTN20165116	- Does not contain an outcome of relevance to this review *This is a study registration. They went on to look at birth weight but not vaccine uptake.*
Ito, Tomoko, Takenoshita, Remi, Narumoto, Keiichiro et al. (2014) A community-based intervention in middle schools to improve HPV vaccination and cervical cancer screening in Japan. Asia Pacific family medicine 13(1): 13	- Does not contain an outcome of relevance to this review
Jaca, Anelisa, Mathebula, Lindi, Iweze, Arthur et al. (2018) A systematic review of strategies for reducing missed opportunities for vaccination. Vaccine 36(21): 2921-2927	- Systematic review used as source of primary studies

Jacob, Verughese, Chattopadhyay, Sajal K, Hopkins, David P et al. (2016) Increasing Coverage of Appropriate Vaccinations: A Community Guide Systematic Economic Review. American journal of preventive medicine 50(6): 797-808	- Systematic review used as source of primary studies
Jacobs-Wingo, Jasmine L; Jim, Cheyenne C; Groom, Amy V (2017) Human Papillomavirus Vaccine Uptake: Increase for American Indian Adolescents, 2013-2015. American journal of preventive medicine 53(2): 162-168	- Not a relevant study design *This is a survey that looks for associations / risk factors that appear to increase or decrease vaccine uptake.*
Jarrett, Caitlin, Wilson, Rose, O'Leary, Maureen et al. (2015) Strategies for addressing vaccine hesitancy - A systematic review. Vaccine 33(34): 4180-90	- Systematic review used as source of primary studies
Jeannot, Emilien; Petignat, Patrick; Sudre, Philippe (2015) Successful Implementation and Results of an HPV Vaccination Program in Geneva Canton, Switzerland. Public Health Reports 130(3): 202-206	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Joffe, M.D. and Luberti, A. (1994) Effect of emergency department immunization on compliance with primary care. Pediatric Emergency Care 10(6): 317-319	- The intervention is a free vaccine- not in scope
Johnson, Elizabeth A, Harwell, Todd S, Donahue, Peg M et al. (2003) Promoting pneumococcal immunizations among rural Medicare beneficiaries using multiple strategies. The Journal of rural health : official journal of the American Rural Health Association and the National Rural Health Care Association 19(4): 506-10	- Does not contain an outcome of relevance to this review *Does not state number or % vaccinated*
Johnston, Jennifer Cyne, McNeil, Deborah, Lee, Germaeline et al. (2017) Piloting CenteringParenting in Two Alberta Public Health Well-Child Clinics. Public Health Nursing 34(3): 229-237	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review

Jordan, Elizabeth T, Bushar, Jessica A, Kendrick, Juliette S et al. (2015) Encouraging Influenza Vaccination Among Text4baby Pregnant Women and Mothers. American journal of preventive medicine 49(4): 563-72	- The study did not report any of the outcomes specified in the protocol
Jung, Jesse J, Elkin, Zachary P, Li, Xiaochun et al. (2013) Increasing use of the vaccine against zoster through recommendation and administration by ophthalmologists at a city hospital. American journal of ophthalmology 155(5): 787-95	- The study did not report any of the outcomes specified in the protocol
Juon, Hee-Soon, Strong, Carol, Kim, Frederic et al. (2016) Lay Health Worker Intervention Improved Compliance with Hepatitis B Vaccination in Asian Americans: Randomized Controlled Trial. PloS one 11(9): e0162683	- Study participants are the wrong age group *In the UK, HepB routine vaccination is for infants. Participants in this study are all adults.*
Kamath, Geetanjali (2018) Hepatitis-B vaccination, behavioral cognitions, and changing risk behaviors among a drug using population: Findings from a cluster randomized controlled trial. Dissertation Abstracts International: Section B: The Sciences and Engineering 78(10be): no-specified	- Conference abstract
Katz ML, Oldach BR, Goodwin J et al. (2014) Development and initial feedback about a human papillomavirus (HPV) vaccine comic book for adolescents. Journal of cancer education : the official journal of the American Association for Cancer Education 29(2): 318-324	- The study did not report any of the outcomes specified in the protocol
Kaufman, Jessica, Ryan, Rebecca, Walsh, Louisa et al. (2018) Face-to-face interventions for informing or educating parents about early childhood vaccination. The Cochrane database of systematic reviews 5: cd010038	- Duplicate reference
Kaufman, Jessica, Ryan, Rebecca, Walsh, Louisa et al. (2018) Face-to-face interventions for informing or educating parents about early childhood vaccination. The Cochrane database of systematic reviews 5: cd010038	- Duplicate reference
Kaufman, Jessica, Ryan, Rebecca, Walsh, Louisa et al. (2018) Face-to-face interventions for informing or educating parents about early childhood vaccination. The Cochrane database of systematic reviews 5: cd010038	- Duplicate reference
Kaufman, Jessica, Synnot, Anneliese, Ryan, Rebecca et al. (2013) Face to face interventions for informing or educating parents about early childhood vaccination. The Cochrane database of systematic reviews: cd010038	- More recent systematic review identified that covers the same topic

Kempe, Allison, Saville, Alison, Dickinson, L Miriam et al. (2013) Population-based versus practice-based recall for childhood immunizations: a randomized controlled comparative effectiveness trial. American journal of public health 103(6): 1116-23	- Study includes data on a vaccine that is not on the UK routine vaccination schedule *Varicella vaccine uptake was incorporated into the data and could not be separated.*
Kendrick, D, Hewitt, M, Dewey, M et al. (2002) The effect of home visiting programmes on uptake of childhood immunization: a systematic review and meta-analysis. British Journal of Clinical Governance 7(1): 51-52	- Duplicate reference *This is a reprint of Kendrick 2000, which has been considered in this evidence review.*
Kendrick, D, Hewitt, M, Dewey, M et al. (2000) The effect of home visiting programmes on uptake of childhood immunization: a systematic review and meta-analysis. Journal of public health medicine 22(1): 90-8	- Systematic review used as source of primary studies
Kim, C S, Kristopaitis, R J, Stone, E et al. (1999) Physician education and report cards: do they make the grade? results from a randomized controlled trial. The American journal of medicine 107(6): 556-60	- Does not contain an outcome of relevance to this review
Kim, J (2020) The impact of narrative strategy on promoting HPV vaccination among college students in korea: the role of anticipated regret. Vaccines 8(2)	- The study did not report any of the outcomes specified in the protocol - Vaccine on UK routine schedule but wrong context for administration *Vaccination of university students for HPV is not on the UK routine schedule.*
Kim, M, Lee, H, Aronowitz, T et al. (2018) An online-based storytelling video intervention on promoting Korean American female college students' HPV vaccine uptake. Cancer epidemiology biomarkers and prevention 27(7)	- Conference abstract
Kim, MinJin (2018) "I want to know more about the HPV vaccine": Stories by Korean American college women. Dissertation Abstracts	- Not a peer-reviewed publication

International: Section B: The Sciences and Engineering 79(4be): no-specified	
Kim, Sujin; Hughes, Christine A; Sadowski, Cheryl A (2014) A review of acute care interventions to improve inpatient pneumococcal vaccination. Preventive medicine 67: 119-27	- Systematic review used as source of primary studies
Klein, R S and Adachi, N (1983) Pneumococcal vaccine in the hospital. Improved use and implications for high-risk patients. Archives of internal medicine 143(10): 1878-81	- Study published before 1990 date limit set in review protocol
Klein, RS and Adachi, N (1986) An effective hospital-based pneumococcal immunization program. Archives of internal medicine 146(2): 327-329	- Study published before 1990 date limit set in review protocol
Kolasa, M S, Petersen, T J, Brink, E W et al. (2001) Impact of multiple injections on immunization rates among vulnerable children. American journal of preventive medicine 21(4): 261-6	- Study looks at intervention in the context of introducing a new vaccine
Kolasa, M.S., Chilkatowsky, A.P., Stevenson, J.M. et al. (2003) Do laws bring children in child care centers up to date for immunizations?. Ambulatory Pediatrics 3(3): 154-157	- The study did not report any of the outcomes specified in the protocol
Koniak-Griffin D, Anderson NL, Brecht ML et al. (2002) Public health nursing care for adolescent mothers: impact on infant health and selected maternal outcomes at 1 year postbirth. The Journal of adolescent health : official publication of the Society for Adolescent Medicine 30(1): 44-54	- Duplicate reference *These are the preliminary findings of Koniak-Griffin 2003, which has also been considered in this review.*
Korn, Lars, Betsch, Cornelia, Bohm, Robert et al. (2018) Social nudging: The effect of social feedback interventions on vaccine uptake. Health psychology : official journal of the Division of Health Psychology, American Psychological Association 37(11): 1045-1054	- Does not contain an outcome of relevance to this review
Krantz, Landon, Ollberding, Nicholas J, Beck, Andrew F et al. (2018) Increasing HPV Vaccination Coverage Through Provider-Based Interventions. Clinical pediatrics 57(3): 319-326	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review

	This is a before-and-after study.
Kreuter, Matthew W, Caburnay, Charlene A, Chen, John J et al. (2004) Effectiveness of individually tailored calendars in promoting childhood immunization in urban public health centers. American journal of public health 94(1): 122-7	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Krishnaswamy, S., Wallace, E.M., Buttery, J. et al. (2018) Strategies to implement maternal vaccination: A comparison between standing orders for midwife delivery, a hospital based maternal immunisation service and primary care. Vaccine 36(13): 1796-1800	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Kruspe, Rachel, Lillis, Rebecca, Daberkow, Dayton W 2nd et al. (2003) Education does pay off: pneumococcal vaccine screening and administration in hospitalized adult patients with pneumonia. The Journal of the Louisiana State Medical Society : official organ of the Louisiana State Medical Society 155(6): 325-31	- Vaccine on UK routine schedule but wrong context for administration *This study looks at hospital vaccination in the context of managing pneumonia rather than uptake in the general population of people 65+ years old.*
Kuehne, Flora, Sanftenberg, Linda, Dreischulte, Tobias et al. (2020) Shared Decision Making Enhances Pneumococcal Vaccination Rates in Adult Patients in Outpatient Care. International journal of environmental research and public health 17(23)	- Systematic review used as source of primary studies
Kumar, Rajesh (2014) Effective messages in vaccine promotion: a randomised trial: public health viewpoint. Indian pediatrics 51(6): 493	- Not a peer-reviewed publication *This is a letter about Nyhan 2014. Nyhan 2014 was excluded because it did not have an outcome of relevance to this review.*

Kuria, Patrick; Brook, Gary; McSorley, John (2016) The effect of electronic patient records on hepatitis B vaccination completion rates at a genitourinary medicine clinic. International journal of STD & AIDS 27(6): 486-9	- Vaccine on UK routine schedule but wrong context for administration *This is an adult study on HepB vaccination.*
Lam LP and McLaws ML (1998) Hepatitis B vaccination coverage of Vietnamese children in south-western Sydney. Australian and New Zealand journal of public health 22(4): 502-504	- Vaccine on UK routine schedule but wrong context for administration
Lam, Sum and Jodlowski, Tomas Z (2009) Vaccines for older adults. The Consultant pharmacist : the journal of the American Society of Consultant Pharmacists 24(5): 380-91	- Review article but not a systematic review
Lau, Darren, Hu, Jia, Majumdar, Sumit R et al. (2012) Interventions to improve influenza and pneumococcal vaccination rates among community-dwelling adults: a systematic review and meta-analysis. Annals of family medicine 10(6): 538-46	- Systematic review used as source of primary studies
Lawrence GL, MacIntyre CR, Hull BP et al. (2004) Effectiveness of the linkage of child care and maternity payments to childhood immunisation. Vaccine 22(17-18): 2345-2350	- Does not contain an outcome of relevance to this review
Lee, Cecilia and Robinson, Joan L (2016) Systematic review of the effect of immunization mandates on uptake of routine childhood immunizations. The Journal of infection 72(6): 659-666	- Systematic review used as source of primary studies
Lee, Haeok, Kim, Minjin, Allison, Jeroan et al. (2017) Development of a theory-guided storytelling narrative intervention to improve HPV vaccination behavior: Save our daughters from cervical cancer. Applied nursing research : ANR 34: 57-61	- Protocol linked to an included study or paper
Lee, Hee Yun, Koopmeiners, Joseph S, McHugh, Jennifer et al. (2016) mHealth Pilot Study: Text Messaging Intervention to Promote HPV Vaccination. American journal of health behavior 40(1): 67-76	- Does not contain an outcome of relevance to this review *This study does not have a comparator.*
Lefevere, Eva, Hens, Niel, De Smet, Frank et al. (2016) The impact of non-financial and financial encouragements on participation in non school-based human papillomavirus vaccination: a retrospective	- The intervention is a free vaccine- not in scope

cohort study. The European journal of health economics : HEPAC : health economics in prevention and care 17(3): 305-15	*The financial encouragement is free vaccination. The non-financial encouragement is information, whichis in both arms of the study equally.*
Lemaitre, Thomas, Carrier, Nathalie, Farrands, Anne et al. (2019) Impact of a vaccination promotion intervention using motivational interview techniques on long-term vaccine coverage: the PromoVac strategy. Human vaccines & immunotherapeutics 15(3): 732-739	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Lieu TA, Glauber JH, Fuentes-Afflick E et al. (1994) Effects of vaccine information pamphlets on parents' attitudes. Archives of pediatrics & adolescent medicine 148(9): 921-925	- The study did not report any of the outcomes specified in the protocol
Lim, W Ting, Sears, Kim, Smith, Leah M et al. (2014) Evidence of effective delivery of the human papillomavirus (HPV) vaccine through a publicly funded, school-based program: the Ontario Grade 8 HPV Vaccine Cohort Study. BMC public health 14: 1029	- The study did not report any of the outcomes specified in the protocol *This study does not have a comparator.*
Lin, James L, Bacci, Jennifer L, Reynolds, Marci J et al. (2018) Comparison of two training methods in community pharmacy: Project VACCINATE. Journal of the American Pharmacists Association : JAPhA 58(4s): 94-s100e3	- Data not reported in an extractable format *Uptake was reported as percentages - the number of participants was not provided.*
Lin, S.-C., Tam, K.-W., Yen, J.Y.-C. et al. (2020) The impact of shared decision making with patient decision aids on the rotavirus vaccination rate in children: A randomized controlled trial. Preventive medicine: 106244	- Study took place in a non-OECD country
Linton, Leslie S, Peddecord, K Michael, Seidman, Robert L et al. (2003) Implementing a seventh grade vaccination law: school factors associated with completion of required immunizations. Preventive medicine 36(4): 510-7	- Not a relevant study design *This is a survey and does not specifically look at an intervention.*

Lopez, N., Garces-Sanchez, M., Panizo, M.B. et al. (2020) HPV knowledge and vaccine acceptance among European adolescents and their parents: A systematic literature review. Public Health Reviews 41(1): 10	- Not a relevant study design
Lu, P.-J., Yankey, D., Jeyarajah, J. et al. (2017) Impact of Provider Recommendation on Tdap Vaccination of Adolescents Aged 13-17 Years. American Journal of Preventive Medicine 53(3): 373-384	- Study does not contain an intervention aimed at increasing vaccine uptake
Lukusa, Lungeni Auguy, Ndze, Valantine Ngum, Mbeye, Nyanyiwe Masingi et al. (2018) A systematic review and meta-analysis of the effects of educating parents on the benefits and schedules of childhood vaccinations in low and middle-income countries. Human vaccines & immunotherapeutics 14(8): 2058-2068	- Systematic review of non-OECD countries
Ma, Grace X, Lee, Minsun M, Tan, Yin et al. (2018) Efficacy of a community-based participatory and multilevel intervention to enhance hepatitis B virus screening and vaccination in underserved Korean Americans. Cancer 124(5): 973-982	- Vaccine on UK routine schedule but wrong context for administration
MacDougall DM, Halperin BA, Langley JM et al. (2016) Knowledge, attitudes, beliefs, and behaviors of parents and healthcare providers before and after implementation of a universal rotavirus vaccination program. Vaccine 34(5): 687-695	- Study does not contain an intervention aimed at increasing vaccine uptake *This study compares patient and healthcare provider attitudes towards a physician-delivered programme compared to a nurse-delivered programme. However, there are no details of an intervention to increase uptake.*
Mackey, Jessica K, Thompson, Katie, Abdulwahab, Adeem et al. (2019) A Simple Intervention to Increase Human Papillomavirus Vaccination in a Family Medicine Practice. South Dakota medicine : the journal of the South Dakota State Medical Association 72(10): 438-441	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Macknin, J.; Marks, M.; Macknin, M.L. (2000) Effect of telephone follow-up on frequency of health maintenance visits among children attending free immunization clinics: A randomized, controlled trial. Clinical Pediatrics 39(11): 679-681	- Does not contain an outcome of relevance to this review *This study does not have any vaccine uptake data.*

Madlon-Kay, Diane J (2011) Effect of revised nursery orders on newborn preventive services. Journal of the American Board of Family Medicine : JABFM 24(6): 656-64	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Maertens, Julie A, Jimenez-Zambrano, Andrea M, Albright, Karen et al. (2017) Using Community Engagement to Develop a Web-Based Intervention for Latinos about the HPV Vaccine. Journal of health communication 22(4): 285-293	- Duplicate reference
Malo, Teri L, Hall, Megan E, Brewer, Noel T et al. (2018) Why is announcement training more effective than conversation training for introducing HPV vaccination? A theory-based investigation. Implementation science : IS 13(1): 57	- Does not contain an outcome of relevance to this review
Malone, Kathryn, Clark, Stephanie, Palmer, Jo Ann et al. (2016) A quality improvement initiative to increase pneumococcal vaccination coverage among children after kidney transplant. Pediatric transplantation 20(6): 783-9	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Manthey, David E; Stopyra, Jason; Askew, Kim (2004) Referral of emergency department patients for pneumococcal vaccination. Academic emergency medicine : official journal of the Society for Academic Emergency Medicine 11(3): 271-5	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Mantzari, Eleni; Vogt, Florian; Marteau, Theresa M (2012) Using financial incentives to increase initial uptake and completion of HPV vaccinations: protocol for a randomised controlled trial. BMC health services research 12: 301	- Protocol for a future study *The RCT is Mantzari 2015 and it has been considered in this review*
Margolis PA, Lannon CM, Stuart JM et al. (2004) Practice based education to improve delivery systems for prevention in primary care: randomised trial. BMJ (Clinical research ed.) 328(7436): 388	- Data not reported in an extractable format *The vaccine uptake data is only presented in a chart.*
Mayne, Stephanie L, duRivage, Nathalie E, Feemster, Kristen A et al. (2014) Effect of decision support on missed opportunities for	- The study did not report any of the outcomes specified in the protocol

human papillomavirus vaccination. American journal of preventive medicine 47(6): 734-44	*Reports number of vaccinations given relative to number of visits, rather than number of people vaccinated*
McCaul, Kevin D; Johnson, Rebecca J; Rothman, Alexander J (2002) The effects of framing and action instructions on whether older adults obtain flu shots. Health psychology : official journal of the Division of Health Psychology, American Psychological Association 21(6): 624-8	- The study did not report any of the outcomes specified in the protocol
McRee, A-L; Shoben, AB; Reiter, PL (2018) Effects of a pilot randomized controlled trial of a web-based HPV vaccination intervention for young gay and bisexual men: the outsmart HPV project. Journal of adolescent health 62(2): S10	- Conference abstract
Meghea, C I, Li, B., Zhu, Q et al. (2013) Infant health effects of a nurse-community health worker home visitation programme: a randomized controlled trial. Child: Care, Health and Development 39(1): 27-35	- Study does not contain an intervention aimed at increasing vaccine uptake *This study has an intervention that includes parenting education. However, there is nothing specifically about increasing vaccine uptake.*
Melman, S T, Ehrlich, E S, Klugman, D et al. (2000) Compliance with initiation of a sequential schedule for polio immunization. Clinical pediatrics 39(1): 51-3	- Not a relevant study design
Mena Cantero, Alvin (2018) Educational Intervention for Engaging Adolescents and Their Parents in HPV Vaccination. Dissertation Abstracts International: Section B: The Sciences and Engineering 79(3be): no-specified	- Does not contain an outcome of relevance to this review
Meyer, Amanda F, Borkovskiy, Nicole L, Brickley, Jennifer L et al. (2018) Impact of Electronic Point-of-Care Prompts on Human Papillomavirus Vaccine Uptake in Retail Clinics. American journal of preventive medicine 55(6): 822-829	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Michail, G, Smaili, M, Vozikis, A et al. (2014) Female students receiving post-secondary education in Greece: the results of a	- Not a relevant study design

collaborative human papillomavirus knowledge survey. Public health 128(12): 1099-105	*This study is a survey - there is no comparator.*
Miles, L.W., Williams, N., Luthy, K.E. et al. (2020) Adult Vaccination Rates in the Mentally Ill Population: An Outpatient Improvement Project. Journal of the American Psychiatric Nurses Association 26(2): 172-180	- Does not contain an outcome of relevance to this review
Mills, Brittany, Fensterheim, Leonard, Taitel, Michael et al. (2014) Pharmacist-led Tdap vaccination of close contacts of neonates in a women's hospital. Vaccine 32(4): 521-5	- Study does not include a relevant population
Minkovitz, C S, Belote, A D, Higman, S M et al. (2001) Effectiveness of a practice-based intervention to increase vaccination rates and reduce missed opportunities. Archives of pediatrics & adolescent medicine 155(3): 382-6	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review *This was a before-and-after study.*
Mohan, Pavitra (2014) Effective messages in vaccine promotion: a randomised trial: public policy viewpoint. Indian pediatrics 51(6): 492	- Not a peer-reviewed publication *This is a letter about Nyhan 2014. Nyhan 2014 was excluded because it did not have an outcome of relevance to this review.*
Mohr, J.J., Randolph, G.D., Laughon, M.M. et al. (2003) Integrating improvement competencies into residency education: A pilot project from a pediatric continuity clinic. Ambulatory Pediatrics 3(3): 131-136	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Monreal Perez, M. and Beltran Viciano, M.A. (2019) Educational intervention for achieving improvements in the vaccination coverage of meningitis C in primary care. Vacunas 20(1): 25-33	- Study not reported in English
Moretti, Manuel, Grill, Eva, Weitkunat, Rolf et al. (2003) An individualized telephone intervention to increase the immunization rates of school beginners. Zeitschrift fur Gesundheitspsychologie 11(2): 39-48	- Not a peer-reviewed publication

Morgan JL, Baggari SR, Chung W et al. (2015) Association of a Best-Practice Alert and Prenatal Administration With Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccination Rates. Obstetrics and gynecology 126(2): 333-337	- Comparator in study does not match that specified in protocol *The control cohort was usual care vaccinations during the post-partum period*
Morris, J, Wang, W, Wang, L et al. (2015) Comparison of reminder methods in selected adolescents with records in an immunization registry. Journal of adolescent health 56(5): S27-S32	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Moss, J.L., Gilkey, M.B., Griffith, T. et al. (2013) Organizational correlates of adolescent immunization: Findings of a state-wide study of primary care clinics in North Carolina. Vaccine 31(40): 4436-4441	- Not a relevant study design *Survey with no specific intervention.*
Moss, Jennifer L (2016) Concomitant adolescent vaccination: The influence of seasonal variation, school requirements, and patient-provider communication. Dissertation Abstracts International: Section B: The Sciences and Engineering 76(9be): no-specified	- Conference abstract
Moss, Jennifer L, Reiter, Paul L, Dayton, Amanda et al. (2012) Increasing adolescent immunization by webinar: a brief provider intervention at federally qualified health centers. Vaccine 30(33): 4960-3	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Moss, Jennifer L, Reiter, Paul L, Truong, Young K et al. (2016) School Entry Requirements and Coverage of Nontargeted Adolescent Vaccines. Pediatrics 138(6)	- Data not reported in an extractable format *Number of participants within states not provided.*
Muehleisen, Beda, Baer, Gurli, Schaad, Urs B et al. (2007) Assessment of immunization status in hospitalized children followed by counseling of parents and primary care physicians improves vaccination coverage: an interventional study. The Journal of pediatrics 151(6): 704-2	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review

Murphy, A W, Harrington, M, Bury, G et al. (1996) Impact of a collaborative immunisation programme in an inner city practice. Irish medical journal 89(6): 220-1	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Murray, K., Low, C., O'Rourke, A. et al. (2020) A quality improvement intervention failed to significantly increase pneumococcal and influenza vaccination rates in immunosuppressed inflammatory arthritis patients. Clinical Rheumatology 39(3): 747-754	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Nace DA, Perera S, Handler SM et al. (2011) Increasing influenza and pneumococcal immunization rates in a nursing home network. Journal of the American Medical Directors Association 12(9): 678-684	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Nan X; Futerfas M; Ma Z (2017) Role of Narrative Perspective and Modality in the Persuasiveness of Public Service Advertisements Promoting HPV Vaccination. Health communication 32(3): 320-328	- The study did not report any of the outcomes specified in the protocol
NCT01719679 (2012) School Located Adolescent Vaccination Study. https://clinicaltrials.gov/show/NCT01719679	- Protocol for a future study *This is the protocol for Shlay 2015, which is considered in this evidence review.*
Ndiaye, Serigne M, Hopkins, David P, Shefer, Abigail M et al. (2005) Interventions to improve influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among high-risk adults: a systematic review. American journal of preventive medicine 28(5suppl): 248-79	- Systematic review that does not include a relevant population *Review looks at several high risk groups of adults*
Neubrand, Tara P L, Breitkopf, Carmen Radecki, Rupp, Richard et al. (2009) Factors associated with completion of the human papillomavirus vaccine series. Clinical pediatrics 48(9): 966-9	- Not a relevant study design *This is a survey of women who had an HPV vaccination.*

Niccolai, Linda M and Hansen, Caitlin E (2015) Practice- and Community-Based Interventions to Increase Human Papillomavirus Vaccine Coverage: A Systematic Review. JAMA pediatrics 169(7): 686-92	- Systematic review used as source of primary studies
Nichol, K.L. (1998) Ten-year durability and success of an organized program to increase influenza and pneumococcal vaccination rates among high-risk adults. American Journal of Medicine 105(5): 385-392	- Does not contain an outcome of relevance to this review *Vaccination numbers based on outcome of patient survey*
Nour, Rawan (2019) A Systematic Review of Methods to Improve Attitudes Towards Childhood Vaccinations. Cureus 11(7): e5067	- Systematic review used as source of primary studies
Nowalk MP, Nutini J, Raymund M et al. (2012) Evaluation of a toolkit to introduce standing orders for influenza and pneumococcal vaccination in adults: a multimodal pilot project. Vaccine 30(41): 5978-5982	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Nowalk, Mary Patricia, Moehling, Krissy K, Zhang, Song et al. (2017) Using the 4 Pillars to increase vaccination among high-risk adults: who benefits?. The American journal of managed care 23(11): 651-655	- Secondary publication of an included study that does not provide any additional relevant information
Nwanodi, Oroma; Salisbury, Helen; Bay, Curtis (2017) Multimodal Counseling Interventions: Effect on Human Papilloma Virus Vaccination Acceptance. Healthcare (Basel, Switzerland) 5(4)	- Does not contain an outcome of relevance to this review
Nyhan, Brendan, Reifler, Jason, Richey, Sean et al. (2014) Effective messages in vaccine promotion: a randomized trial. Pediatrics 133(4): e835-42	- Does not contain an outcome of relevance to this review
O'Leary, S, Pyrzanowski, J, Lockhart, S et al. (2017) Impact of a provider communication training intervention on adolescent human papillomavirus vaccination: a cluster randomized, clinical trial. Open forum infectious diseases 4: S61	- Conference abstract

O'Leary, S, Wagner, N, Narwaney, K et al. (2017) Effectiveness of a web-based intervention to increase uptake of maternal vaccines. Open forum infectious diseases 4: S457	- Conference abstract
Odone, Anna, Ferrari, Antonio, Spagnoli, Francesca et al. (2015) Effectiveness of interventions that apply new media to improve vaccine uptake and vaccine coverage. Human vaccines & immunotherapeutics 11(1): 72-82	- More recent systematic review identified that covers the same topic
Oeffinger, K C, Roaten, S P, Hitchcock, M A et al. (1992) The effect of patient education on pediatric immunization rates. The Journal of family practice 35(3): 288-93	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review *Participants were randomised by birth day of the week so not true randomisation.*
Ogilvie, G., Anderson, M., Marra, F. et al. (2010) A population-based evaluation of a publicly funded, school-based HPV vaccine program in British Columbia, Canada: Parental factors associated with HPV vaccine receipt. PLoS Medicine 7(5)	- Not a relevant study design *This study is a survey that looks at associations and risk factors for vaccine uptake.*
Okwo-Bele, J.M. (2012) Integrating immunization with other health interventions for greater impact: The right strategic choice. Journal of Infectious Diseases 205(suppl1): 4-s5	- Review article but not a systematic review
Oliver, Kristin; Frawley, Alean; Garland, Elizabeth (2016) HPV vaccination: Population approaches for improving rates. Human vaccines & immunotherapeutics 12(6): 1589-93	- Review article but not a systematic review *Article is assessing the evidence to support American vaccination recommendations.*
Opel, D.J., Henrikson, N., Lepere, K. et al. (2019) Previsit screening for parental vaccine hesitancy: A cluster randomized trial. Pediatrics 144(5): e20190802	- Study does not contain an intervention aimed at increasing vaccine uptake

Orefice, Roberto and Quinlivan, Julie A (2019) Small interface changes have dramatic impacts: how mandatory fields in electronic medical records increased pertussis vaccination rates in Australian obstetric patients. BMJ health & care informatics 26(1): 0	- Study does not contain an intervention aimed at increasing vaccine uptake
Ornstein, S M, Garr, D R, Jenkins, R G et al. (1991) Computer-generated physician and patient reminders. Tools to improve population adherence to selected preventive services. The Journal of family practice 32(1): 82-90	- Vaccine on UK routine schedule but wrong context for administration *This study is about tetanus immunisation that occurs every 10 years after the primary immunisation series.*
Ortega, A.N., Andrews, S.F., Katz, S.H. et al. (1997) Comparing a computer-based childhood vaccination registry with parental vaccination cards: A population-based study of Delaware children. Clinical Pediatrics 36(4): 217-221	- Study does not contain an intervention aimed at increasing vaccine uptake *This study compares the accuracy of 2 different record keeping systems.*
Ortiz, Rebecca R, Shafer, Autumn, Cates, Joan et al. (2018) Development and Evaluation of a Social Media Health Intervention to Improve Adolescents' Knowledge About and Vaccination Against the Human Papillomavirus. Global pediatric health 5: 2333794x18777918	- Does not contain an outcome of relevance to this review
Ortiz, Rebecca R; Smith, Andrea; Coyne-Beasley, Tamera (2019) A systematic literature review to examine the potential for social media to impact HPV vaccine uptake and awareness, knowledge, and attitudes about HPV and HPV vaccination. Human vaccines & immunotherapeutics 15(78): 1465-1475	- Systematic review used as source of primary studies
Pahud, B., Clark, S., Herigon, J.C. et al. (2015) A pilot program to improve vaccination status for hospitalized children. Hospital Pediatrics 5(1): 35-41	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Palmeri, S, Costantino, C, D'Angelo, C et al. (2017) HPV vaccine hesitancy among parents of female adolescents: a pre–post interventional study. Public Health 150: 84	- Does not contain an outcome of relevance to this review

Pandolfi, Elisabetta, Graziani, Maria C, Ieraci, Roberto et al. (2008) A comparison of populations vaccinated in a public service and in a private hospital setting in the same area. BMC public health 8: 278	- Study does not contain an intervention aimed at increasing vaccine uptake
Parker, Siddhartha, Chambers White, Laura, Spangler, Chad et al. (2013) A quality improvement project significantly increased the vaccination rate for immunosuppressed patients with IBD. Inflammatory bowel diseases 19(9): 1809-14	- Study does not include a relevant population *Furthermore, the age of the participants was not provided.*
Parra-Medina, Deborah, Morales-Campos, Daisy Y, Mojica, Cynthia et al. (2015) Promotora Outreach, Education and Navigation Support for HPV Vaccination to Hispanic Women with Unvaccinated Daughters. Journal of cancer education : the official journal of the American Association for Cancer Education 30(2): 353-9	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Parsons, Joanne E; Newby, Katie V; French, David P (2018) Do interventions containing risk messages increase risk appraisal and the subsequent vaccination intentions and uptake? - A systematic review and meta-analysis. British journal of health psychology 23(4): 1084-1106	- Systematic review used as source of primary studies
Patel, A., Stern, L., Unger, Z. et al. (2014) Staying on track: A cluster randomized controlled trial of automated reminders aimed at increasing human papillomavirus vaccine completion. Vaccine 32(21): 2428-2433	- Vaccine on UK routine schedule but wrong context for administration *The women in this study are aged 19 to 26 years (mean age 23 years).*
Patel, Anik R; Breck, Andrew B; Law, Michael R (2018) The impact of pharmacy-based immunization services on the likelihood of immunization in the United States. Journal of the American Pharmacists Association : JAPhA 58(5): 505-514e2	- Not a relevant study design
Paunio M, Virtanen M, Peltola H et al. (1991) Increase of vaccination coverage by mass media and individual approach: intensified measles, mumps, and rubella prevention program in Finland. American journal of epidemiology 133(11): 1152-1160	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Pereira, Jennifer A, Quach, Susan, Heidebrecht, Christine L et al. (2012) Barriers to the use of reminder/recall interventions for	- Qualitative systematic review

immunizations: a systematic review. BMC medical informatics and decision making 12: 145	
Perkins, Rebecca B, Legler, Aaron, Jansen, Emily et al. (2020) Improving HPV Vaccination Rates: A Stepped-Wedge Randomized Trial. Pediatrics 146(1)	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Perkins, Rebecca B, Lin, Mengyun, Silliman, Rebecca A et al. (2015) Why are U.S. girls getting meningococcal but not human papilloma virus vaccines? Comparison of factors associated with human papilloma virus and meningococcal vaccination among adolescent girls 2008 to 2012. Women's health issues : official publication of the Jacobs Institute of Women's Health 25(2): 97-104	- Not a relevant study design
Perman, Sarah, Turner, Simon, Ramsay, Angus I G et al. (2017) School-based vaccination programmes: a systematic review of the evidence on organisation and delivery in high income countries. BMC public health 17(1): 252	- Systematic review that does not include the outcomes stated in the protocol
Pich, Jacqueline (2019) Patient reminder and recall interventions to improve immunization rates: A Cochrane review summary. International Journal of Nursing Studies 91: 144	- Review article but not a systematic review *Summary of a Cochrane systematic review*
Piedimonte, S, Leung, A, Zakhari, A et al. (2018) Impact of an HPV Education and Vaccination Campaign among Canadian University Students. Journal of obstetrics and gynaecology canada 40(4): 440-446	- Study participants are the wrong age group *The subjects are university students, not teenagers.*
Pierre-Victor, Dudith, Page, Timothy F, Trepka, Mary Jo et al. (2017) Impact of Virginia's School-Entry Vaccine Mandate on Human Papillomavirus Vaccination Among 13-17-Year-Old Females. Journal of women's health (2002) 26(3): 266-275	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Poole, Tracey, Goodyear-Smith, Felicity, Petousis-Harris, Helen et al. (2012) Human papillomavirus vaccination in Auckland: reducing ethnic and socioeconomic inequities. Vaccine 31(1): 84-8	- Not a relevant study design *This study is a survey*

Porter RM, Amin AB, Bednarczyk RA et al. Cancer-salient messaging for Human Papillomavirus vaccine uptake: A randomized controlled trial. Vaccine 36(18): 2494-2500	- The study did not report any of the outcomes specified in the protocol
Porter, A.M. and Fulco, P.P. (2020) Impact of a pharmacist-driven recombinant zoster vaccine administration program. Journal of the American Pharmacists Association	- Study does not include a relevant population *Furthermore, the age of the participants was not provided.*
Poscia, Andrea, Pastorino, Roberta, Boccia, Stefania et al. (2019) The impact of a school-based multicomponent intervention for promoting vaccine uptake in Italian adolescents: a retrospective cohort study. Annali dell'Istituto superiore di sanita 55(2): 124-130	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Pot, M., Paulussen, T.G., Ruiter, R.A. et al. (2020) Dose-Response Relationship of a Web-Based Tailored Intervention Promoting Human Papillomavirus Vaccination: Process Evaluation of a Randomized Controlled Trial. Journal of medical Internet research 22(7): e14822	- Duplicate reference *This is a process evaluation of Pot 2017, which has been assessed in this evidence review.*
Pot, Mirjam, Ruiter, Robert A C, Paulussen, Theo W G M et al. (2018) Systematically Developing a Web-Based Tailored Intervention Promoting HPV-Vaccination Acceptability Among Mothers of Invited Girls Using Intervention Mapping. Frontiers in public health 6: 226	- Does not contain an outcome of relevance to this review
Quinley, John C and Shih, Anthony (2004) Improving physician coverage of pneumococcal vaccine: a randomized trial of a telephone intervention. Journal of community health 29(2): 103-15	- Data not reported in an extractable format *Participant numbers were not provided.*
Rabarison, Kristina M, Li, Rui, Bish, Connie L et al. (2015) A Cost Analysis of the 1-2-3 Pap Intervention. Frontiers in public health services & systems research 4(4): 45-50	- Not a relevant study design *Cost-effectiveness analysis only*

Ramón Esparza, T; Hernando Arizaleta, L; García Calvente, MM (1990) Vaccination every time when an occasion arises: evaluation of an intervention in the Murcia Autonomous Community. Atencion primaria / Sociedad Espanola de Medicina de Familia y Comunitaria 7(10): 616-621	- Study not reported in English
Rangrej, MI (2017) IMPACT OF CLINICAL PHARMACIST INTERVENTION ON THE KNOWLEDGE OF IMMUNIZATION IN PARENTS OF PEDIATRICS IN TERTIARY CARE HOSPITAL. Value in Health : The Journal of the International Society for Pharmacoeconomics and Outcomes Research 20(5)	- Conference abstract
Rani, U., Darabaner, E., Seserman, M. et al. (2020) Public Education Interventions and Uptake of Human Papillomavirus Vaccine: A Systematic Review. Journal of public health management and practice : JPHMP	- Systematic review used as source of primary studies
Raviotta, Jonathan Marc (2020) The development testing and implementation of the 4 pillarsTM practice transformation program for immunization: Achieving public health outcomes through primary care quality improvement. Dissertation Abstracts International: Section B: The Sciences and Engineering 81(8b): no-specified	- Review article but not a systematic review
Reading, Richard (2009) Pediatric primary care to help prevent child maltreatment: the Safe Environment for Every Kid (SEEK) model. Child Care, Health and Development 35(4): 588	- Not a peer-reviewed publication *This is an editorial about Dubowitz 2009, which has been considered in this review.*
Redfield, J.R. and Wang, T.W. (2000) Improving pneumococcal vaccination rates: A three-step approach. Family Medicine 32(5): 338-341	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Reiter, Paul L, Stubbs, Brenda, Panozzo, Catherine A et al. (2011) HPV and HPV vaccine education intervention: effects on parents, healthcare staff, and school staff. Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology 20(11): 2354-61	- Does not contain an outcome of relevance to this review
Reno, Jenna E, Thomas, Jacob, Pyrzanowski, Jennifer et al. (2019) Examining strategies for improving healthcare providers' communication about adolescent HPV vaccination: evaluation of secondary outcomes in a randomized controlled trial. Human vaccines & immunotherapeutics 15(78): 1592-1598	- Duplicate reference *This is a survey following a study that has already been included: Dempsey 2018: Effect of a Health*

	Care Professional Communication Training Intervention on Adolescent Human Papillomavirus Vaccination: A Cluster Randomized Clinical Trial
Ressler KA, Orr K, Bowdler S et al. (2008) Opportunistic immunisation of infants admitted to hospital: are we doing enough?. Journal of paediatrics and child health 44(6): 317-320	- Study describes a catch up campaign following the introduction of a vaccine- out of scope of the review
Reuben, D.B., Hirsch, S.H., Frank, J.C. et al. (1996) The prevention for elderly persons (PEP) program: A model of municipal and academic partnership to meet the needs of older persons for preventive services. Journal of the American Geriatrics Society 44(11): 1394-1398	- The study did not report any of the outcomes specified in the protocol
Richman, Alice R, Maddy, LaDonna, Torres, Essie et al. (2016) A randomized intervention study to evaluate whether electronic messaging can increase human papillomavirus vaccine completion and knowledge among college students. Journal of American college health : J of ACH 64(4): 269-78	- Study participants are the wrong age group *Adults aged 18-26 for HPV vaccination*
Rickert, Donna, Deladisma, Adeline, Yusuf, Hussain et al. (2004) Adolescent immunizations. are we ready for a new wave?. American journal of preventive medicine 26(1): 22-8	- Not a relevant study design *Survey that looks at associations and risk factors for uptake.*
Rickert, Vaughn I, Auslander, Beth A, Cox, Dena S et al. (2015) School-based HPV immunization of young adolescents: effects of two brief health interventions. Human vaccines & immunotherapeutics 11(2): 315-21	- Does not contain an outcome of relevance to this review *Vaccination intent is recorded for each of the 4 arms but not uptake. Percentage uptake is recorded for all 4 arms together but not for each arm separately.*

Ridda, Iman, MacIntyre, Raina C, Lindley, Richard I et al. (2007) Predictors of pneumococcal vaccination uptake in hospitalized patients aged 65 years and over shortly following the commencement of a publicly funded national pneumococcal vaccination program in Australia. Human vaccines 3(3): 83-6	- The intervention is a free vaccine- not in scope
Righolt, Christiaan H; Bozat-Emre, Songul; Mahmud, Salaheddin M (2019) Effectiveness of school-based and high-risk human papillomavirus vaccination programs against cervical dysplasia in Manitoba, Canada. International journal of cancer 145(3): 671-677	- Does not contain an outcome of relevance to this review
Rihtarchik, Lindsey, Murphy, Claire V, Porter, Kyle et al. (2018) Utilizing pharmacy intervention in asplenic patients to improve vaccination rates. Research in social & administrative pharmacy : RSAP 14(4): 367-371	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review
Riley R; Maher C; Kolbe A (1993) Hepatitis B vaccination of high-risk neonates in the South West Region of New South Wales: evaluation of program coverage. Australian journal of public health 17(2): 171-173	- Not a relevant study design *Study does not have a comparison group.*
Riley, D.J.; Mughal, M.Z.; Roland, J. (1991) Immunisation state of young children admitted to hospital and effectiveness of a ward based opportunistic immunisation policy. British Medical Journal 302(6767): 31-33	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Rimple, Diane, Weiss, Steven J, Brett, Meghan et al. (2006) An emergency department-based vaccination program: overcoming the barriers for adults at high risk for vaccine-preventable diseases. Academic emergency medicine : official journal of the Society for Academic Emergency Medicine 13(9): 922-30	- Study does not include a relevant population
Rizzo, C. (2006) Improving immunization rates in practice settings. Pediatric Annals 35(7): 493-497	- Review article but not a systematic review
Robare, Joseph F, Bayles, Constance M, Newman, Anne B et al. (2011) The "10 Keys" to Healthy Aging: 24-Month Follow-Up Results From an Innovative Community-Based Prevention Program. Health Education & Behavior 38(4): 379-388	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review

Robison, Steve G (2013) Sick-visit immunizations and delayed well-baby visits. Pediatrics 132(1): 44-8	- Data not reported in an extractable format *The data that we would like was written in a narrative rather than numerical format.*
Rockliffe L, Chorley AJ, McBride E et al. Assessing the acceptability of incentivising HPV vaccination consent form return as a means of increasing uptake. BMC public health 18(1): 382	- The study did not report any of the outcomes specified in the protocol
Rosberger Z, Krawczyk A, Stephenson E et al. (2014) HPV vaccine education: enhancing knowledge and attitudes of community counselors and educators. Journal of cancer education : the official journal of the American Association for Cancer Education 29(3): 473-477	- The study did not report any of the outcomes specified in the protocol
Rosen, Brittany L, Bishop, James M, McDonald, Skye L et al. (2018) Quality of Web-Based Educational Interventions for Clinicians on Human Papillomavirus Vaccine: Content and Usability Assessment. JMIR cancer 4(1): e3	- Systematic review that does not include the outcomes stated in the protocol
Rosenberg, Karen (2019) EDUCATIONAL INTERVENTION IMPROVES VACCINATION RATES IN OLDER PATIENTS. The American Journal of Nursing 119(7): 63	- Review article but not a systematic review
Rosenberg, Karen (2014) AFIX CONSULTATIONS MAY INCREASE VACCINATION COVERAGE IN YOUNGER ADOLESCENTS. The American Journal of Nursing 114(11): 65	- Not a peer-reviewed publication *Editorial about a study that has already been considered in this review: Gilkey 2014: Increasing provision of adolescent vaccines in primary care: a randomized controlled trial*
Rosenberg, Z, Findley, S, McPhillips, S et al. (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 11(3suppl): 14-20	- Study does not contain an intervention aimed at increasing vaccine uptake

Rosser, W W; McDowell, I; Newell, C (1991) Use of reminders for preventive procedures in family medicine. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 145(7): 807-14	- The study did not report any of the outcomes specified in the protocol *Tetanus vaccination is not on routine schedule after age 18 in UK and flu vaccination is not covered by this guideline*
Ruffin, Mack T 4th, Plegue, Melissa A, Rockwell, Pamela G et al. (2015) Impact of an Electronic Health Record (EHR) Reminder on Human Papillomavirus (HPV) Vaccine Initiation and Timely Completion. Journal of the American Board of Family Medicine : JABFM 28(3): 324-33	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Ruiz-López T, Sen S, Jakobsen E et al. (2019) FightHPV: Design and Evaluation of a Mobile Game to Raise Awareness About Human Papillomavirus and Nudge People to Take Action Against Cervical Cancer. JMIR serious games 7(2): e8540	- The study did not report any of the outcomes specified in the protocol
Russell, SL (2012) Effectiveness of text message reminders for improving vaccination appointment attendance and series completion among adolescents and adults. Value in health 15(4): A248	- Conference abstract
Sadaf A, Richards JL, Glanz J, Salmon DA, Omer SB (2013) A systematic review of interventions for reducing parental vaccine refusal and vaccine hesitancy. Vaccine 31(40): 4293-4304	- Systematic review used as source of primary studies
Saeterdal, Ingvil, Lewin, Simon, Austvoll-Dahlgren, Astrid et al. (2014) Interventions aimed at communities to inform and/or educate about early childhood vaccination. The Cochrane database of systematic reviews: cd010232	- Systematic review used as source of primary studies
Saffin K (1992) School nurses immunising without a doctor present. Health visitor 65(11): 394-396	- Does not contain an outcome of relevance to this review *This is a survey of nurses' opinions.*

Saito, A, Saitoh, A, Sato, I et al. (2016) Effectiveness of stepwise perinatal immunization education: a cluster randomized controlled trial. Open forum infectious diseases 3	- Conference abstract
Santa Maria, Diane (2020) EFFICACY OF A STUDENT-NURSE BRIEF PARENT-BASED SEXUAL HEALTH INTERVENTION TO INCREASE HPV VACCINATION AMONG ADOLESCENTS. Journal of Adolescent Health 66(2s)	- Conference abstract
Schempf, A.H.; Politzer, R.M.; Wulu, J. (2003) Immunization coverage of vulnerable children: A comparison of health center and national rates. Medical Care Research and Review 60(1): 85-100	- Study does not contain an intervention aimed at increasing vaccine uptake
Seib K, Underwood NL, Gargano LM et al. (2016) Preexisting Chronic Health Conditions and Health Insurance Status Associated With Vaccine Receipt Among Adolescents. The Journal of adolescent health : official publication of the Society for Adolescent Medicine 58(2): 148-153	- Does not contain an outcome of relevance to this review *This study does not measure uptake for each of the 3 arms.*
Seib, KG, Herbert, N, Gargano, L et al. (2014) Pre-existing chronic health conditions and health insurance status as determinants of vaccine receipt among adolescents in Richmond county, Georgia. Journal of adolescent health 54(2): S29	- Conference abstract
Sellors, J, Pickard, L, Mahony, J B et al. (1997) Understanding and enhancing compliance with the second dose of hepatitis B vaccine: a cohort analysis and a randomized controlled trial. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 157(2): 143-8	- Study participants are the wrong age group *This study looks at HepB vaccination for adults.*
Sewell, M.J., Riche, D.M., Fleming, J.W. et al. (2016) Comparison of pharmacist and physician managed annual medicare wellness services. Journal of Managed Care and Specialty Pharmacy 22(12): 1412-1416	- Study does not contain an intervention aimed at increasing vaccine uptake
Shah, M.D., Glenn, B.A., Chang, L.C. et al. (2020) Reducing Missed Opportunities for Human Papillomavirus Vaccination in School-Based Health Centers: Impact of an Intervention. Academic Pediatrics	- Does not contain an outcome of relevance to this review *This study looks at missed opportunities, not vaccine uptake*

Shah, MN, Clarkson, L, Lerner, EB et al. (2006) An emergency medical services program to promote the health of older adults. Journal of the american geriatrics society 54(6): 956-962	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Shaw, J., Mader, E.M., Bennett, B.E. et al. (2018) Immunization mandates, vaccination coverage, and exemption rates in the United States. Open Forum Infectious Diseases 5(6)	- Not a relevant study design *Survey that looks at associations and risk factors for vaccination*
Shaw, J.S., Samuels, R.C., Larusso, E.M. et al. (2000) Impact of an encounter-based prompting system on resident vaccine administration performance and immunization knowledge. Pediatrics 105(4ii): 978-983	- The study did not report any of the outcomes specified in the protocol *Study looks at missed opportunities and prescribing errors, not vaccine uptake*
Shay, L Aubree, Street, Richard L Jr, Baldwin, Austin S et al. (2016) Characterizing safety-net providers' HPV vaccine recommendations to undecided parents: A pilot study. Patient education and counseling 99(9): 1452-60	- The study did not report any of the outcomes specified in the protocol *There is no intervention - this is a conversation analysis of consultations*
Sheaves, Crystal (2016) Evaluating changes in knowledge, beliefs, and behaviors associated with HPV following an educational intervention among women. Dissertation Abstracts International: Section B: The Sciences and Engineering 76(12be): no-specified	- Not a peer-reviewed publication
Shenson, D., Adams, M., Bolen, J. et al. (2011) Routine checkups don't ensure that seniors get preventive services. The Journal of family practice 60(1): e1-e10	- Not a relevant study design *This is a survey that looks for associations and risk factors for vaccination*
Shlay JC, Rodgers S, Lyons J et al. (2015) Implementing a School-Located Vaccination Program in Denver Public Schools. The Journal of school health 85(8): 536-543	- The study did not report any of the outcomes specified in the protocol

Si, Mingyu, Su, Xiaoyou, Jiang, Yu et al. (2019) Interventions to improve human papillomavirus vaccination among Chinese female college students: study protocol for a randomized controlled trial. BMC public health 19(1): 1546	- Protocol for a future study
Siebers, M J and Hunt, V B (1985) Increasing the pneumococcal vaccination rate of elderly patients in a general internal medicine clinic. Journal of the American Geriatrics Society 33(3): 175-8	- Study published before 1990 date limit set in review protocol
Singh, S.; Mazor, K.M.; Fisher, K.A. (2019) Positive deviance approaches to improving vaccination coverage rates within healthcare systems: A systematic review. Journal of Comparative Effectiveness Research 8(13): 1055-1065	- Systematic review that does not include relevant study types
Sinn JS; Morrow AL; Finch AB (1999) Improving immunization rates in private pediatric practices through physician leadership. Archives of pediatrics & adolescent medicine 153(6): 597-603	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review *This was a before-and-after study.*
Siriwardena, A.N., Rashid, A., Johnson, M.R.D. et al. (2002) Cluster randomised controlled trial of an educational outreach visit to improve influenza and pneumococcal immunisation rates in primary care. British Journal of General Practice 52(482): 735-740	- Study does not include a relevant population *The intervention is provider education. The ≥65 years of age population for influenza vaccine (n=27,580) was different to the populations for pneumonia vaccine. The populations for pneumonia vaccine were people with: congestive heart disease (n=6207), diabetes (n=4327) and splenectomy (n=169).*
Skedgel C, Langley JM, MacDonald NE et al. (2011) An incremental economic evaluation of targeted and universal influenza vaccination in pregnant women. Canadian journal of public health = Revue canadienne de sante publique 102(6): 445-450	- Does not contain an outcome of relevance to this review *Study does not have vaccine uptake data, it looks at whether people should be vaccinated or not.*

Skinner, S R, Imberger, A, Nolan, T et al. (2000) Randomised controlled trial of an educational strategy to increase school-based adolescent hepatitis B vaccination. Australian and New Zealand journal of public health 24(3): 298-304	- Vaccine on UK routine schedule but wrong context for administration *HepB vaccine is given to infants in the UK, not teenagers.*
Skinner, SR, Davies, C, Cooper, S et al. (2015) Randomised controlled trial of a complex intervention to improve school-based HPV vaccination for adolescents: the HPV. EDU study. Sexually transmitted infections 91: A77	- Conference abstract
Skledar SJ, Hess MM, Ervin KA et al. (2003) Designing a hospital-based pneumococcal vaccination program. American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists 60(14): 1471-1476	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Smith, J.M. and Craig, T.J. (2006) Strategies for improving pneumococcal vaccination in eligible patients. Current Infectious Disease Reports 8(3): 231-237	- Review article but not a systematic review
Smith, Kenneth J, Zimmerman, Richard K, Nowalk, Mary Patricia et al. (2017) Cost-Effectiveness of the 4 Pillars Practice Transformation Program to Improve Vaccination of Adults Aged 65 and Older. Journal of the American Geriatrics Society 65(4): 763-768	- Duplicate reference *This is an economic analysis of a study already considered in this review: Zimmerman 2017: Using the 4 Pillars Practice Transformation Program to Increase Pneumococcal Immunizations for Older Adults: a Cluster-Randomized Trial*
Smulian, Elizabeth A; Mitchell, Krista R; Stokley, Shannon (2016) Interventions to increase HPV vaccination coverage: A systematic review. Human vaccines & immunotherapeutics 12(6): 1566-88	- Systematic review used as source of primary studies
Sohn, M.-W., Yoo, J., Oh, E.H. et al. (2011) Welfare, maternal work, and on-time childhood vaccination rates. Pediatrics 128(6): 1109-1116	- Not a relevant study design

	This study retrospectively selects factors that may increase vaccine uptake as if they were 'risk factors' for vaccine uptake.
Soljak, M A and Handford, S (1987) Early results from the Northland immunisation register. The New Zealand medical journal 100(822): 244-6	- Study published before 1990 date limit set in review protocol
Soon, Reni, Sung, Stephen, Cruz, May Rose Dela et al. (2017) Improving Human Papillomavirus (HPV) Vaccination in the Postpartum Setting. Journal of community health 42(1): 66-71	- Study participants are the wrong age group *Participants were of university age, not teenagers at school.*
Srivastava, T.; Emmer, K.; Feemster, K.A. (2020) Impact of school-entry vaccination requirement changes on clinical practice implementation and adolescent vaccination rates in metropolitan Philadelphia. Human Vaccines and Immunotherapeutics 16(5): 1155-1165	- The study did not report any of the outcomes specified in the protocol
Stanwyck, C.A.; Kolasa, M.S.; Shaw, K.M. (2004) Immunization requirements for childcare programs: Are they enough?. American Journal of Preventive Medicine 27(2): 161-163	- Not a relevant study design *This study is a survey that looks at factors associated with vaccination. There is no specific intervention to increase uptake.*
Staras, S.A.S., Richardson, E., Merlo, L.J. et al. (2021) A feasibility trial of parent HPV vaccine reminders and phone-based motivational interviewing. BMC public health 21(1): 109	- Does not contain an outcome of relevance to this review *The outcome was acceptability, not uptake.*
Staras, SA, Vadaparampil, S, Livingston, IM et al. (2014) A health information technology intervention increases HPV vaccine series initiation among Florida Medicaid and CHIP adolescents. Sexually transmitted diseases 41(suppl1): S9-10	- Conference abstract

Staras, SAS, Vadaparampil, ST, Thompson, LA et al. (2020) Postcard reminders for HPV vaccination mainly primed parents for providers' recommendations. Preventive medicine reports 20	- Does not contain an outcome of relevance to this review *This is a secondary analysis of a previous study (Staras 2015) and does not report vaccine uptake for each intervention. The previous study was quasi-experimental but this evidence review is at the RCT and cluster RCT level of evidence.*
Staras, Stephanie A S, Vadaparampil, Susan T, Livingston, Melvin D et al. (2015) Increasing human papillomavirus vaccine initiation among publicly insured Florida adolescents. The Journal of adolescent health : official publication of the Society for Adolescent Medicine 56(5suppl): 40-6	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Stevens, B. and Gibbins, S. (2002) Immunizations in adulthood. Primary Care - Clinics in Office Practice 29(3): 649-665	- Review article but not a systematic review
Stevenson, K B, McMahon, J W, Harris, J et al. (2000) Increasing pneumococcal vaccination rates among residents of long-term--care facilities: provider-based improvement strategies implemented by peer-review organizations in four western states. Infection control and hospital epidemiology 21(11): 705-10	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Stille, C J, Christison-Lagay, J, Bernstein, B A et al. (2001) A simple provider-based educational intervention to boost infant immunization rates: a controlled trial. Clinical pediatrics 40(7): 365-73	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Stockwell, Melissa S, Kharbanda, Elyse Olshen, Martinez, Raquel Andres et al. (2012) Text4Health: impact of text message reminder-recalls for pediatric and adolescent immunizations. American journal of public health 102(2): e15-21	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Stone, Erin G, Morton, Sally C, Hulscher, Marlies E et al. (2002) Interventions that increase use of adult immunization and cancer screening services: a meta-analysis. Annals of internal medicine 136(9): 641-51	- More recent systematic review identified that covers the same topic

	Interventions to increase adult immunisation covered by other SRs while cancer screening is not within the scope of this review.
Stroffolini T and Pasquini P (1990) Five years of vaccination campaign against hepatitis B in Italy in infants of hepatitis B surface antigen carrier mothers. The Italian journal of gastroenterology 22(4): 195-197	- Study does not contain an intervention aimed at increasing vaccine uptake *This study is mostly about screening pregnant women for HBsAg. Yearly changes in HepB uptake are looked at in a coincidental way.*
Sumner, W. (1991) Brief reports. An evaluation of readable preventive health messages. Family Medicine 23(6): 463-6	- Vaccine on UK routine schedule but wrong context for administration *Mean age of participants was 35 to 38 years with SD 10.7 to 13.2 for the 3 study groups. This age group is not on the routine vaccination schedule.*
Suppli, Camilla Hiul, Rasmussen, Mette, Valentiner-Branth, Palle et al. (2017) Written reminders increase vaccine coverage in Danish children - evaluation of a nationwide intervention using The Danish Vaccination Register, 2014 to 2015. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin 22(17)	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Suryadevara M, Bonville CA, Ferraioli F et al. (2013) Community-centered education improves vaccination rates in children from low-income households. Pediatrics 132(2): 319-325	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Szczerbinska, K., Topinkova, E., Brzyski, P. et al. (2016) Delivery of Care to Nursing Home Residents With Diabetes: Results From the SHELTER Study. Journal of the American Medical Directors Association 17(9): 807-813	- Study does not contain an intervention aimed at increasing vaccine uptake

	Study looks at factors associated with vaccination
Taddio, Anna, Alderman, Leslie, Freedman, Tamlyn et al. (2019) The CARD™ System for improving the vaccination experience at school: Results of a small-scale implementation project on program delivery. Paediatrics & Child Health 24: 54-s67	- Study includes data on a vaccine that is not on the UK routine vaccination schedule *Study includes HepB vaccine for adolescents and it is not possible to separate out the data for HPV vaccine.*
Taitel, M.S., Fensterheim, L.E., Cannon, A.E. et al. (2013) Improving pneumococcal and herpes zoster vaccination uptake: Expanding pharmacist privileges. American Journal of Managed Care 19(9): e309-e313	- Not a relevant study design *This study has selected characteristics of a population and has treated them as 'risk factors' for vaccine uptake.*
Takayama, J I; Iser, J P; Gandelman, A (1999) Regional differences in infant immunization against hepatitis B: did intervention work?. Preventive medicine 28(2): 160-6	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Tayfur, I.; Gunaydin, M.; Suner, S. (2019) Healthcare service access and utilization among syrian refugees in Turkey. Annals of Global Health 85(1): 42	- Not a relevant study design *This is a survey that looks at factors associated with vaccination.*
Taylor, J.A., Rietberg, K., Greenfield, L. et al. (2008) Effectiveness of a physician peer educator in improving the quality of immunization services for young children in primary care practices. Vaccine 26(33): 4256-4261	- Data not reported in an extractable format *Data was given as percentages without participant numbers*

Thomas, D R, King, J, Evans, M R et al. (1998) Uptake of measles containing vaccines in the measles, mumps, and rubella second dose catch-up programme in Wales. Communicable disease and public health 1(1): 44-7	- Study looks at intervention in the context of introducing a new vaccine
Thomas, T.L.; Stephens, D.P.; Blanchard, B. (2010) Hip Hop, Health, and Human Papilloma Virus (HPV): Using Wireless Technology to Increase HPV Vaccination Uptake. Journal for Nurse Practitioners 6(6): 464-470	- Does not contain an outcome of relevance to this review
Thompson, E.L., Livingston, M.D., Daley, E.M. et al. (2020) Rhode Island Human Papillomavirus Vaccine School Entry Requirement Using Provider-Verified Report. American Journal of Preventive Medicine 59(2): 274-277	- Data not reported in an extractable format *Only percentage uptake was provided. Numbers of participants were not provided for each arm.*
Trethewey, Samuel P; Patel, Neil; Turner, Alice M (2019) Interventions to Increase the Rate of Influenza and Pneumococcal Vaccination in Patients with Chronic Obstructive Pulmonary Disease: A Scoping Review. Medicina (Kaunas, Lithuania) 55(6)	- Systematic review that does not include a relevant population *People with COPD*
Trick, William E, Linn, Edward S, Jones, Zina et al. (2010) Using computer decision support to increase maternal postpartum tetanus, diphtheria, and acellular pertussis vaccination. Obstetrics and gynecology 116(1): 51-7	- Study does not include a relevant population
Tubeuf S, Edlin R, Shourie S et al. (2014) Cost effectiveness of a web-based decision aid for parents deciding about MMR vaccination: a three-arm cluster randomised controlled trial in primary care. The British journal of general practice : the journal of the Royal College of General Practitioners 64(625): e493	- Secondary publication of an included study that does not provide any additional relevant information *This is a mirror publication of Shourie 2013. We have included Shourie 2013 in the review because it is a cluster RCT and reports the Intracluster Correlation Coefficient.*
Tyler, Darlene, Nyamathi, Adeline, Stein, Judith A et al. (2014) Increasing hepatitis C knowledge among homeless adults: results of	- Does not contain an outcome of relevance to this review

a community-based, interdisciplinary intervention. The journal of behavioral health services & research 41(1): 37-49	
Tyler, R., Kile, S., Strain, O. et al. (2020) Impact of pharmacist intervention on completion of recombinant zoster vaccine series in a community pharmacy. Journal of the American Pharmacists Association	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Underwood, Natasha L, Gargano, Lisa M, Jacobs, Samantha et al. (2016) Influence of Sources of Information and Parental Attitudes on Human Papillomavirus Vaccine Uptake among Adolescents. Journal of pediatric and adolescent gynecology 29(6): 617-622	- Secondary publication of an included study that does not provide any additional relevant information *This is a secondary publication of Underwood 2015, which is already considered in this review. Underwood 2015 does not have any further outcomes of interest for each of the 3 arms.*
Uskun, Ersin, Uskun, Suha Basar, Uysalgenc, Meral et al. (2008) Effectiveness of a training intervention on immunization to increase knowledge of primary healthcare workers and vaccination coverage rates. Public health 122(9): 949-58	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Vacek JL (2004) Practical strategies for cardiac disease prevention. Basic steps to ensure better heart health. Postgrad Med 3	- Review article but not a systematic review
Vacek, J.L. (2004) Practice-based continuing education combined with process improvement methods improves delivery of preventive services to children. Evidence-Based Healthcare 8(4): 177-179	- Duplicate reference *This is an editorial about Vacek 2004, which is considered in this review.*
Valdez, Armando, Stewart, Susan L, Tanjasiri, Sora Park et al. (2015) Design and efficacy of a multilingual, multicultural HPV vaccine education intervention. Journal of communication in healthcare 8(2): 106-118	- Does not contain an outcome of relevance to this review
Valeri, Fabio, Hatz, Christoph, Jordan, Dominique et al. (2014) Immunisation coverage of adults: a vaccination counselling	- Education non-RCT. Excluded because there

campaign in the pharmacies in Switzerland. Swiss medical weekly 144: w13955	was sufficient RCT evidence for this review
Vanderpool, Robin C, Cohen, Elisia, Crosby, Richard A et al. (2013) "1-2-3 Pap" Intervention Improves HPV Vaccine Series Completion among Appalachian Women. The Journal of communication 63(1): 95-115	- Study participants are the wrong age group *Participants were aged 22 years (SD 2.4). The UK routine vaccination age range for HPV vaccine is 11 to 18 years.*
Varman, M, Sharlin, C, Fernandez, C et al. (2018) Human Papilloma Virus Vaccination Among Adolescents in a Community Clinic Before and After Intervention. Journal of community health 43(3): 455-458	- Review article but not a systematic review
Venkatesh, Ashwin, Chia, Daphne Theresa, Tang, Anthony et al. (2020) Efficacy of text message intervention for increasing MMR uptake in light of the recent loss of UK's measles-free status. The British Journal of General Practice : The Journal of the Royal College of General Practitioners 70(692): 110	- Review article but not a systematic review
Vondracek, T G; Pham, T P; Huycke, M M (1998) A hospital-based pharmacy intervention program for pneumococcal vaccination. Archives of internal medicine 158(14): 1543-7	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Wagner, Abram L, Shrivastwa, Nijika, Potter, Rachel C et al. (2018) Pneumococcal and Meningococcal Vaccination among Michigan Children with Sickle Cell Disease. The Journal of pediatrics 196: 223-229	- Study does not contain an intervention aimed at increasing vaccine uptake *This study compares vaccine uptake between children who have sickle cell disease and those who do not.*
Wagner, Nicole Marie (2019) Assessing the value of the vaccine social media intervention through the re-aim framework implementation dimension. Dissertation Abstracts International: Section B: The Sciences and Engineering 80(11be): no-specified	- Not a peer-reviewed publication
Wallace C; Leask J; Trevena LJ (2006) Effects of a web based decision aid on parental attitudes to MMR vaccination: a before and after study. BMJ (Clinical research ed.) 332(7534): 146-149	- The study did not report any of the outcomes specified in the protocol

Wallace, A.S.; Ryman, T.K.; Dietz, V. (2012) Experiences integrating delivery of maternal and child health services with childhood immunization programs: Systematic review update. Journal of Infectious Diseases 205(suppl1): 6-s19	- Systematic review used as source of primary studies
Wallgren, S.; Berry-Caban, C.S.; Bowers, L. (2012) Impact of Clinical Pharmacist Intervention on diabetes-Related outcomes in a military treatment Facility. Annals of Pharmacotherapy 46(3): 353-357	- Study does not contain an intervention aimed at increasing vaccine uptake *The intervention is aimed at managing diabetes and related conditions. There is no mention of an intervention specifically for vaccines.*
Walling, Emily B, Benzoni, Nicole, Dornfeld, Jarrod et al. (2016) Interventions to Improve HPV Vaccine Uptake: A Systematic Review. Pediatrics 138(1)	- Systematic review used as source of primary studies
Wang, Jiangrong, Ploner, Alexander, Sparen, Par et al. (2019) Mode of HPV vaccination delivery and equity in vaccine uptake: A nationwide cohort study. Preventive medicine 120: 26-33	- Not a relevant study design *Survey looking at factors that affect vaccine uptake.*
Wang, Junling, Ford, Lindsay J, Wingate, La'Marcus et al. (2013) Effect of pharmacist intervention on herpes zoster vaccination in community pharmacies. Journal of the American Pharmacists Association : JAPhA 53(1): 46-53	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Ward, K., Chow, M.Y.K., King, C. et al. (2012) Strategies to improve vaccination uptake in Australia, a systematic review of types and effectiveness. Australian and New Zealand Journal of Public Health 36(4): 369-377	- Systematic review used as source of primary studies
Weaver, M, Krieger, J, Castorina, J et al. (2001) Cost-effectiveness of combined outreach for the pneumococcal and influenza vaccines. Archives of internal medicine 161(1): 111-20	- Duplicate reference *This is an economic analysis of a study already considered in this review: Krieger*

	2000: Increasing influenza and pneumococcal immunization rates: a randomized controlled study of a senior center-based intervention
Weir, Rosy Chang, Toyoji, Mariko, McKee, Michael et al. (2018) Assessing the Impact of Electronic Health Record Interventions on Hepatitis B Screening and Vaccination. Journal of health care for the poor and underserved 29(4): 1587-1605	- Study does not include a relevant population *Study look at HBV vaccination in Asian American adults who are at higher risk of HBV. Also vaccination not provided to adults routinely in UK.*
Wells, C., Monte, S.V., Prescott, W.A. et al. (2019) A pharmacy resident-driven pneumococcal vaccination protocol increases vaccination rates in hospitalized patients over 65 years. JACCP Journal of the American College of Clinical Pharmacy 2(5): 488-493	- Infrastructure study. Excluded because there was sufficient RCT and cohort evidence for this review
Westrick, Salisa C, Owen, James, Hagel, Harry et al. (2016) Impact of the RxVaccinate program for pharmacy-based pneumococcal immunization: A cluster-randomized controlled trial. Journal of the American Pharmacists Association : JAPhA 56(1): 29-36e1	- Data not reported in an extractable format *Data was given as percentages without participant numbers*
Whelan, Noella W, Steenbeek, Audrey, Martin-Misener, Ruth et al. (2014) Engaging parents and schools improves uptake of the human papillomavirus (HPV) vaccine: examining the role of the public health nurse. Vaccine 32(36): 4665-71	- Not a relevant study design *This is a survey that looks at factors affecting vaccine uptrake*
Whitaker JA, Poland CM, Beckman TJ et al. Immunization education for internal medicine residents: A cluster-randomized controlled trial. Vaccine 36(14): 1823-1829	- The study did not report any of the outcomes specified in the protocol

White, C M and Lines, D R (1995) Compliance with neonatal hepatitis B vaccination. The Medical journal of Australia 162(11): 613	- Not a peer-reviewed publication
Whittaker, Karen (2002) Lay workers for improving the uptake of childhood immunization. British journal of community nursing 7(9): 474-9	- Systematic review used as source of primary studies
Wigham, Sarah, Ternent, Laura, Bryant, Andrew et al. (2014) Parental financial incentives for increasing preschool vaccination uptake: systematic review. Pediatrics 134(4): e1117-28	- Systematic review used as source of primary studies
Williams, Nia, Woodward, Helen, Majeed, Azeem et al. (2011) Primary care strategies to improve childhood immunisation uptake in developed countries: systematic review. JRSM short reports 2(10): 81	- Systematic review used as source of primary studies
Willis, Natalie, Hill, Sophie, Kaufman, Jessica et al. (2013) "Communicate to vaccinate": the development of a taxonomy of communication interventions to improve routine childhood vaccination. BMC international health and human rights 13: 23	- Does not contain an outcome of relevance to this review *Study aims to develop a taxonomy of communication interventions but does not look at whether the identified studies increase uptake*
Wilson, Matthew W; Brown, Blair J; Miles, Matthew C (2016) A Multicomponent Intervention to Improve Pneumococcal Vaccination Knowledge Among Internal Medicine Residents. MedEdPORTAL : the journal of teaching and learning resources 12: 10414	- Does not contain an outcome of relevance to this review
Wilson, Thad R, Fishbein, Daniel B, Ellis, Peggy A et al. (2005) The impact of a school entry law on adolescent immunization rates. The Journal of adolescent health : official publication of the Society for Adolescent Medicine 37(6): 511-6	- Not a relevant study design *Survey that looks at factors affecting uptake*
Witt, CE, Ulm, M, Redfern, T et al. (2020) Video-assisted counseling for human papillomavirus vaccination: a quality improvement study. Journal of investigative medicine 68(2): 683	- Conference abstract

Wong VWY, Fong DYT, Lok KYW et al. Brief education to promote maternal influenza vaccine uptake: A randomized controlled trial. Vaccine 34(44): 5243-5250	- Study took place in a non-OECD country
Wood, Heidi M; McDonough, Randal P; Doucette, William R (2009) Retrospective financial analysis of a herpes zoster vaccination program from an independent community pharmacy perspective. Journal of the American Pharmacists Association : JAPhA 49(1): 12-7	- Does not contain an outcome of relevance to this review *This study does not have a comparator*
Wright A, Poon EG, Wald J et al. (2012) Randomized controlled trial of health maintenance reminders provided directly to patients through an electronic PHR. Journal of general internal medicine 27(1): 85-92	- Study participants are the wrong age group *This study looked at pneumococcal vaccine but ~50% of participants were under the age of 50 years and only ~15% were over ~63 years old.*
Wright, P.J., Fortinsky, R.H., Covinsky, K.E. et al. (2000) Delivery of preventive services to older black patients using neighborhood health centers. Journal of the American Geriatrics Society 48(2): 124-130	- Does not contain an outcome of relevance to this review *This study does not have a comparator*
Yanagihara, Dolores M, Taira, Deborah A, Davis, James et al. (2005) A health plan intervention to improve pneumococcal vaccination in the elderly. Managed care interface 18(9): 25-30	- The study did not report any of the outcomes specified in the protocol *This study does not focus on the effect of specific interventions.*
Yang TU, Kim E, Park YJ et al. (2016) Successful introduction of an underutilized elderly pneumococcal vaccine in a national immunization program by integrating the pre-existing public health infrastructure. Vaccine 34(13): 1623-1629	- The intervention is a free vaccine- not in scope
Yee, Lynn M, Martinez, Noelle G, Nguyen, Antoinette T et al. (2017) Using a Patient Navigator to Improve Postpartum Care in an Urban Women's Health Clinic. Obstetrics and gynecology 129(5): 925-933	- Vaccine on UK routine schedule but wrong context for administration *Study includes data for HPV vaccination for new*

	mothers. Our age range of interest for HPV vaccine is 11-18 years of age.
Yeh, Sylvia, Mink, ChrisAnna, Kim, Matthew et al. (2014) Effectiveness of hospital-based postpartum procedures on pertussis vaccination among postpartum women. American journal of obstetrics and gynecology 210(3): 237e1-6	- Vaccine on UK routine schedule but wrong context for administration *Pertussis vaccination given to women post-partum in USA, during pregnancy in UK.*
Yokley, J M and Glenwick, D S (1984) Increasing the immunization of preschool children; an evaluation of applied community interventions. Journal of applied behavior analysis 17(3): 313-25	- Study published before 1990 date limit set in review protocol
Yoo GJ, Fang T, Zola J et al. (2012) Destigmatizing hepatitis B in the Asian American community: lessons learned from the San Francisco Hep B Free Campaign. Journal of cancer education : the official journal of the American Association for Cancer Education 27(1): 138-144	- The study did not report any of the outcomes specified in the protocol
Yoost, Jennie Lee, Starcher, Rachael Whitley, King-Mallory, Rebecca Ann et al. (2017) The Use of Telehealth to Teach Reproductive Health to Female Rural High School Students. Journal of pediatric and adolescent gynecology 30(2): 193-198	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Young, S A, Halpin, T J, Johnson, D A et al. (1980) Effectiveness of a mailed reminder on the immunization levels of infants at high risk of failure to complete immunizations. American journal of public health 70(4): 422-4	- Study published before 1990 date limit set in review protocol
Yudin MH; Salaripour M; Sgro MD (2010) Acceptability and feasibility of seasonal influenza vaccine administration in an antenatal clinic setting. Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC 32(8): 745-748	- Not a relevant study design
Yun, Katherine, Urban, Kailey, Mamo, Blain et al. (2016) Increasing Hepatitis B Vaccine Prevalence Among Refugee Children Arriving in the United States, 2006-2012. American journal of public health 106(8): 1460-2	- Study does not contain an intervention aimed at increasing vaccine uptake

Zajicek-Farber, Michaela L (2010) Building Practice Evidence for Parent Mentoring Home Visiting in Early Childhood. Research on Social Work Practice 20(1): 46-64	- The study did not report any of the outcomes specified in the protocol *This study involves general education for parents. However, they do not mention any compotent that should increase vaccine uptake.*
Zimet, G, Dixon, B, Xiao, S et al. (2016) Can automated physician reminders increase 2nd and 3rd dose administration of HPV vaccine?. Sexually transmitted diseases 43(10): S158	- Conference abstract
Zucker, Rachel A, Reiter, Paul L, Mayer, Melissa K et al. (2015) Effects of a Presidential Candidate's Comments on HPV Vaccine. Journal of health communication 20(7): 783-9	- Study does not contain an intervention aimed at increasing vaccine uptake

Excluded from the re-runs search

Study	Reason for exclusion
(2019) Impact of shingrix (recombinant zoster vaccine) second dose reminder member calls by a commercial health plan. Journal of managed care and specialty pharmacy 25: S95-S96	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Abdullahi, Leila H, Kagina, Benjamin M, Ndze, Valantine Ngum et al. (2020) Improving vaccination uptake among adolescents. The Cochrane database of systematic reviews 1: cd011895	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Acampora, Anna, Grossi, Adriano, Barbara, Andrea et al. (2020) Increasing HPV Vaccination Uptake among Adolescents: A Systematic Review. International journal of environmental research and public health 17(21)	- Multicomponent non-RCT. Excluded because there was sufficient RCT evidence for this review
Akojie, Halimat (2021) Strategies for teaching new mothers the importance of vaccination. Dissertation Abstracts International: Section B: The Sciences and Engineering 82(3b): no-specified	- Not a peer-reviewed publication *This is a thesis and was not published in a peer-reviewed journal*

Arendt, F. and Scherr, S. (2020) News-stimulated public-attention dynamics and vaccination coverage during a measles outbreak: An observational study. Social Science and Medicine 265: 113495	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Austin, S., Wooten, K., Dunkle, W. et al. (2021) Increasing HPV Vaccination Support Through a Pilot Film-Based Community Engagement. Journal of community health 46(2): 343-348	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Balzarini, F., Frascella, B., Oradini-Alacreu, A. et al. (2020) Does the use of personal electronic health records increase vaccine uptake? A systematic review. Vaccine 38(38): 5966-5978	- Duplicate reference
Barchitta, M., Maugeri, A., Lio, R.M.S. et al. (2021) Vaccination status of mothers and children from the 'mamma & bambino' cohort. Vaccines 9(2): 1-11	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Blanchi, S., Vaux, J., Toque, J.M. et al. (2020) Impact of a catch-up strategy of DT-IPV vaccination during hospitalization on vaccination coverage among people over 65 years of age in france: The HOSPIVAC study (Vaccination during hospitalization). Vaccines 8(2): 1-13	- The vaccine(s) were not on the UK routine vaccine schedule for this age group *Diphtheria, tetanus and polio vaccine are not on the UK vaccination schedule for people aged 65+ years.*
Bond, Amelia M, Volpp, Kevin G, Emanuel, Ezekiel J et al. (2019) Real-time Feedback in Pay-for-Performance: Does More Information Lead to Improvement?. Journal of general internal medicine 34(9): 1737-1743	- Infrastructure before-and-after study. Excluded because there was sufficient RCT and cohort evidence for this review
Bouchez, M., Ward, J.K., Bocquier, A. et al. (2021) Physicians' decision processes about the HPV vaccine: A qualitative study. Vaccine 39(3): 521-528	- Qualitative study
Chantler, Tracey, Pringle, Ellen, Bell, Sadie et al. (2020) Does electronic consent improve the logistics and uptake of HPV vaccination in adolescent girls? A mixed-methods theory informed evaluation of a pilot intervention. BMJ open 10(11): e038963	- Study already identified in the intital search and sift *Already included as a mixed methods study in the qualitative review*

Cunningham, Andrew K, Rourke, Meaghan M, Moeller, James L et al. (2021) HPV Immunization in High School Student-Athletes Receiving Preparticipation Physical Evaluations at Mass Event Versus Other Venues. Sports health 13(1): 91-94	- Not a relevant study design *All participants had access to the same interventions. This study looks at 'risk factors' for getting vaccinated.*
de Cock, Caroline, van Velthoven, Michelle, Milne-Ives, Madison et al. (2020) Use of Apps to Promote Childhood Vaccination: Systematic Review. JMIR mHealth and uHealth 8(5): e17371	- Systematic review that did not include any additional relevant papers
Dempsey, Amanda F, Pyrzanowski, Jennifer, Campbell, Jonathan et al. (2020) Cost and reimbursement of providing routine vaccines in outpatient obstetrician/gynecologist settings. American journal of obstetrics and gynecology 223(4): 562e1-562e8	- Duplicate reference *This is an economic analysis of O'Leary 2019: "Effectiveness of a multimodal intervention to increase vaccination in obstetrics/gynecology settings"*
Duong, H.T. and Hopfer, S. (2021) Let's Chat: Development of a Family Group Chat Cancer Prevention Intervention for Vietnamese Families. Health education & behavior : the official publication of the Society for Public Health Education 48(2): 208-219	- Qualitative study
Duong, H.T. and Hopfer, S. (2020) "Let's Chat": process evaluation of an intergenerational group chat intervention to increase cancer prevention screening among Vietnamese American families. Translational behavioral medicine	- Qualitative study
Eisenhauer, L.; Hansen, B.R.; Pandian, V. (2021) Strategies to improve human papillomavirus vaccination rates among adolescents in family practice settings in the United States: A systematic review. Journal of clinical nursing 30(34): 341-356	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Elliott, T.E., O'Connor, P.J., Asche, S.E. et al. (2021) Design and rationale of an intervention to improve cancer prevention using clinical decision support and shared decision making: A clinic-randomized trial. Contemporary Clinical Trials 102: 106271	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Falkenberg-Olson, A.C., Hayter, K.L., Holzer, R.A. et al. (2020) Infant Vaccinations among Mothers with Substance-Use Disorders: A Comparative Study. Clinical medicine & research	- Multicomponent non-RCT. Excluded because there was sufficient RCT evidence for this review

Flood, T., Wilson, I.M., Prue, G. et al. (2020) Impact of school-based educational interventions in middle adolescent populations (15-17yrs) on human papillomavirus (HPV) vaccination uptake and perceptions/knowledge of HPV and its associated cancers: A systematic review. Preventive Medicine 139: 106168	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Foss, Hakan Safaralilo, Oldervoll, Ann, Fretheim, Atle et al. (2019) Communication around HPV vaccination for adolescents in low- and middle-income countries: a systematic scoping overview of systematic reviews. Systematic reviews 8(1): 190	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Glanz, J.M., Wagner, N.M., Narwaney, K.J. et al. (2020) Web-Based Tailored Messaging to Increase Vaccination: A Randomized Clinical Trial. Pediatrics 146(5): e20200669	- Study already identified in the intital search and sift
Gleeson, S; Kelleher, K; Gardner, W (2016) Evaluating a Pay-for-Performance Program for Medicaid Children in an Accountable Care Organization. JAMA pediatrics 170(3): 259-266	- Infrastructure before-and-after study. Excluded because there was sufficient RCT and cohort evidence for this review
Gori, D., Costantino, C., Odone, A. et al. (2020) The impact of mandatory vaccination law in Italy on mmr coverage rates in two of the largest italian regions (Emilia-romagna and sicily): An effective strategy to contrast vaccine hesitancy. Vaccines 8(1): 57	- Infrastructure before-and-after study. Excluded because there was sufficient RCT and cohort evidence for this review
Hansen, Peter R; Schmidtblaicher, Matthias; Brewer, Noel T (2020) Resilience of HPV vaccine uptake in Denmark: Decline and recovery. Vaccine 38(7): 1842-1848	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Hohmann, Lindsey A, Hastings, Tessa J, Ha, David R et al. (2019) Impact of a multi-component immunization intervention on pneumococcal and herpes zoster vaccinations: A randomized controlled trial of community pharmacies in 2 states. Research in social & administrative pharmacy : RSAP 15(12): 1453-1463	- The study did not report any of the outcomes specified in the protocol *And unable to determine what proportion of individuals were over 65 years of age*
Ilozumba, O., Schmidt, P., Ket, J.C.F. et al. (2021) Can mHealth interventions contribute to increased HPV vaccination uptake? A systematic review. Preventive Medicine Reports 21: 101289	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review

JPRN-UMIN000039273 (2020) A blinded RCT to verify the effect of changing the awareness and behavior of HPV vaccination by video viewing intervention for parents who have daughters of targeted generation. http://www.who.int/trialsearch/Trial2.aspx?TrialID=JPRN-UMIN000039273	- This is a study protocol without a published study
Kaufman, J., Attwell, K., Hauck, Y. et al. (2020) Designing a multi-component intervention (P3-MumBubVax) to promote vaccination in antenatal care in Australia. Health promotion journal of Australia : official journal of Australian Association of Health Promotion Professionals	- The study did not report any of the outcomes specified in the protocol *This study is about how an intervention was developed. There is no qualitative data published in this study.*
Kuehne, F., Sanftenberg, L., Dreischulte, T. et al. (2020) Shared decision making enhances pneumococcal vaccination rates in adult patients in outpatient care. International Journal of Environmental Research and Public Health 17(23): 1-15	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Lin, S.-C., Tam, K.-W., Yen, J.Y.-C. et al. (2020) The impact of shared decision making with patient decision aids on the rotavirus vaccination rate in children: A randomized controlled trial. Preventive Medicine 141: 106244	- Study not carried out in an OECD country *Study took place in Taiwan.*
Loskutova, Natalia Y, Smail, Craig, Callen, Elisabeth et al. (2020) Effects of multicomponent primary care-based intervention on immunization rates and missed opportunities to vaccinate adults. BMC family practice 21(1): 46	- Multicomponent non-RCT. Excluded because there was sufficient RCT evidence for this review
Lott, B.E., Okusanya, B.O., Anderson, E.J. et al. (2020) Interventions to increase uptake of Human Papillomavirus (HPV) vaccination in minority populations: A systematic review. Preventive Medicine Reports 19: 101163	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Maggio, L.A.; Krakow, M.; Moorhead, L.L. (2020) There were some clues': A qualitative study of heuristics used by parents of adolescents to make credibility judgements of online health news articles citing research. BMJ Open 10(8): e039692	- Qualitative study
Maria, DS (2020) 8. Efficacy of a Student-Nurse Brief Parent-Based Sexual Health Intervention to Increase HPV Vaccination Among Adolescents. Journal of adolescent health 66(2): S4-S5	- Conference abstract

McAdam-Marx, C., Tak, C., Petigara, T. et al. (2019) Impact of a guideline-based best practice alert on pneumococcal vaccination rates in adults in a primary care setting. BMC health services research 19(1): 474	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Nagykaldi, Z., Scheid, D., Zhao, Y.D. et al. (2020) A sustainable model for preventive services in rural counties: The healthier together study. Journal of the American Board of Family Medicine 33(5): 698-706	- Multicomponent non-RCT. Excluded because there was sufficient RCT evidence for this review
NCT04638010 (2020) Increasing Breast, Cervical, and Colorectal Cancer Screening and HPV Vaccination Among Underserved Texans. https://clinicaltrials.gov/show/NCT04638010	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
O'Leary, Sean T, Narwaney, Komal J, Wagner, Nicole M et al. (2019) Efficacy of a Web-Based Intervention to Increase Uptake of Maternal Vaccines: An RCT. American journal of preventive medicine 57(4): e125-e133	- Study already identified in the intital search and sift
O'Leary, Sean T, Pyrzanowski, Jennifer, Brewer, Sarah E et al. (2019) Effectiveness of a multimodal intervention to increase vaccination in obstetrics/gynecology settings. Vaccine 37(26): 3409-3418	- Duplicate reference
Orefice, R. and Quinlivan, J.A. (2019) Small interface changes have dramatic impacts: how mandatory fields in electronic medical records increased pertussis vaccination rates in Australian obstetric patients. BMJ health & care informatics 26(1): 0	- This study has already been included in RQ1
Perkins, RB, Legler, A, Jansen, E et al. (2020) Improving HPV Vaccination Rates: a Stepped-Wedge Randomized Trial. Pediatrics 146(1)	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Peterson, Caryn E, Silva, Abigail, Holt, Hunter K et al. (2020) Barriers and facilitators to HPV vaccine uptake among US rural populations: a scoping review. Cancer causes & control : CCC 31(9): 801-814	- Qualitative study
Pot, Mirjam, Paulussen, Theo Gwm, Ruiter, Robert Ac et al. (2020) Dose-Response Relationship of a Web-Based Tailored Intervention Promoting Human Papillomavirus Vaccination: Process Evaluation of a Randomized Controlled Trial. Journal of medical Internet research 22(7): e14822	- Duplicate reference *This is a process evaluation of Pot 2017, which has been assessed in the education evidence review.*

Rani, Uzma, Darabaner, Ellen, Seserman, Michael et al. (2020) Public Education Interventions and Uptake of Human Papillomavirus Vaccine: A Systematic Review. Journal of public health management and practice : JPHMP	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Saitoh, A., Katsuta, T., Mine, M. et al. (2020) Effect of a vaccine information statement (VIS) on immunization status and parental knowledge, attitudes, and beliefs regarding infant immunization in Japan. Vaccine 38(50): 8049-8054	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Scarinci, Isabel C; Hansen, Barbara; Kim, Young-Il (2020) HPV vaccine uptake among daughters of Latinx immigrant mothers: Findings from a cluster randomized controlled trial of a community-based, culturally relevant intervention. Vaccine 38(25): 4125-4134	- Study already identified in the intital search and sift *It was already included in the education evidence review*
Schellenberg, Naomi and Crizzle, Alexander M. (2020) Vaccine hesitancy among parents of preschoolers in Canada: a systematic literature review. Canadian journal of public health = Revue canadienne de sante publique 111(4): 562-584	- Systematic review that did not include any additional relevant papers
Spina, C.I., Brewer, S.E., Ellingson, M.K. et al. (2020) Adapting Center for Disease Control and Prevention's immunization quality improvement program to improve maternal vaccination uptake in obstetrics. Vaccine 38(50): 7963-7969	- Infrastructure before-and-after study. Excluded because there was sufficient RCT and cohort evidence for this review
Staras, S.A.S., Richardson, E., Merlo, L.J. et al. (2021) A feasibility trial of parent HPV vaccine reminders and phone-based motivational interviewing. BMC public health 21(1): 109	- The study did not report any of the outcomes specified in the protocol
Staras, SAS, Vadaparampil, ST, Thompson, LA et al. (2020) Postcard reminders for HPV vaccination mainly primed parents for providers' recommendations. Preventive medicine reports 20	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Szilagyi, Peter, Albertin, Christina, Gurfinkel, Dennis et al. (2020) Effect of State Immunization Information System Centralized Reminder and Recall on HPV Vaccination Rates. Pediatrics 145(5)	- Duplicate reference
Thompson, E.L., Livingston, M.D., Daley, E.M. et al. (2020) Rhode Island Human Papillomavirus Vaccine School Entry	- Study already identified in the intital search and sift

Requirement Using Provider-Verified Report. American Journal of Preventive Medicine 59(2): 274-277	*It was included in the accessibility evidence review.*
Tull, Fraser, Borg, Kim, Knott, Cameron et al. (2019) Short Message Service Reminders to Parents for Increasing Adolescent Human Papillomavirus Vaccination Rates in a Secondary School Vaccine Program: A Randomized Control Trial. The Journal of adolescent health : official publication of the Society for Adolescent Medicine 65(1): 116-123	- Study already identified in the intital search and sift *This study had already been included in the reminders evidence review.*
Tyler, R., Kile, S., Strain, O. et al. (2020) Impact of pharmacist intervention on completion of recombinant zoster vaccine series in a community pharmacy. Journal of the American Pharmacists Association	- Reminders non-RCT. Excluded because there was sufficient RCT evidence for this review
Ulm, MA, Redfern, T, Pierce, V WF et al. (2020) Video-assisted counseling for human papillomavirus vaccination: a quality improvement study. Gynecologic oncology 159: 288-289	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Wallace-Brodeur, R., Li, R., Davis, W. et al. (2020) A quality improvement collaborative to increase human papillomavirus vaccination rates in local health department clinics. Preventive Medicine 139: 106235	- Education non-RCT. Excluded because there was sufficient RCT evidence for this review
Wilder-Smith, Annika B and Qureshi, Kaveri (2020) Resurgence of Measles in Europe: A Systematic Review on Parental Attitudes and Beliefs of Measles Vaccine. Journal of epidemiology and global health 10(1): 46-58	- Qualitative study
Wilkinson, Tracey A, Dixon, Brian E, Xiao, Shan et al. (2019) Physician clinical decision support system prompts and administration of subsequent doses of HPV vaccine: A randomized clinical trial. Vaccine 37(31): 4414-4418	- Study already identified in the intital search and sift *This study has already been included in the reminders evidence review.*
Yunusa, Umar, Garba, Saleh Ngaski, Umar, Addakano Bello et al. (2021) Mobile phone reminders for enhancing uptake, completeness and timeliness of routine childhood immunization in low and middle income countries: A systematic review and meta-analysis. Vaccine 39(2): 209-221	- Systematic review that did not include any additional relevant papers

Economic studies

Study	Reason for exclusion
Ameel, B.M.; Beigi, R.H.; Caughey, A.B. (2018) Cost-effectiveness of the Tdap vaccine during pregnancy. American Journal of Obstetrics and Gynecology 218(1supplement1): 516-s517	- Study did not consider increasing uptake
Atkins, Katherine E, Fitzpatrick, Meagan C, Galvani, Alison P et al. (2016) Cost-Effectiveness of Pertussis Vaccination During Pregnancy in the United States. American journal of epidemiology 183(12): 1159-70	- Study did not consider increasing uptake
Bae, Geun-Ryang, Choe, Young June, Go, Un Yeong et al. (2013) Economic analysis of measles elimination program in the Republic of Korea, 2001: a cost benefit analysis study. Vaccine 31(24): 2661-6	- Study did not consider increasing uptake
Bettampadi, D., Boulton, M.L., Power, L.E. et al. (2019) Are community health workers cost-effective for childhood vaccination in India?. Vaccine 37(22): 2942-2951	- Non-OECD country
Beutels, Ph and Gay, N J (2003) Economic evaluation of options for measles vaccination strategy in a hypothetical Western European country. Epidemiology and infection 130(2): 273-83	- Study did not consider increasing uptake
Burmeister, J., Schroeder, M., Veach, S. et al. (2013) The cost effectiveness of various marketing techniques on Tdap vaccination rates within two community pharmacies. Journal of the American Pharmacists Association 53(2): e45	- No results reported - Did not include QALYs as an outcome - adult studies
Chesson, Harrell W and Markowitz, Lauri E (2015) The cost-effectiveness of human papillomavirus vaccine catch-up programs for women. The Journal of infectious diseases 211(2): 172-4	- No results reported
Chiappini, Elena, Stival, Alessia, Galli, Luisa et al. (2013) Pertussis re-emergence in the post-vaccination era. BMC infectious diseases 13: 151	- Study did not consider increasing uptake
Derrah, K., Ameel, B.M., Hersh, A.R. et al. (2020) 1053: Cost-effectiveness of Tdap vaccination during pregnancy. American Journal of Obstetrics and Gynecology 222(1supplement): 652	- Study did not consider increasing uptake
Ding, Y., Hay, J., Yeh, S.H. et al. (2012) Cost-benefit analysis of hospital based postpartum vaccination with combined tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (TDAP). Value in Health 15(4): a241	- Study did not consider increasing uptake
Ding, Yao, Yeh, Sylvia H, Mink, Chris Anna M et al. (2013) Cost-benefit analysis of hospital based postpartum vaccination with combined tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap). Vaccine 31(22): 2558-64	- Study did not consider increasing uptake

Study	Reason for exclusion
Fernandes, E.G., Rodrigues, C.C.M., Sartori, A.M.C. et al. (2019) Economic evaluation of adolescents and adults' pertussis vaccination: A systematic review of current strategies. Human Vaccines and Immunotherapeutics 15(1): 14-27	- Study did not consider increasing uptake
Fernandes, Eder Gatti, Sartori, Ana Marli Christovam, de Soarez, Patricia Coelho et al. (2020) Cost-effectiveness analysis of universal adult immunization with tetanus-diphtheria-acellular pertussis vaccine (Tdap) versus current practice in Brazil. Vaccine 38(1): 46-53	- Non-OECD country
Fernandez-Cano, Maria Isabel; Armadans Gil, Lluis; Campins Marti, Magda (2015) Cost-benefit of the introduction of new strategies for vaccination against pertussis in Spain: cocooning and pregnant vaccination strategies. Vaccine 33(19): 2213-2220	- Study did not consider increasing uptake
Getsios D, Caro J J, Caro G, De Wals P, Law B J, Robert Y, Lance J M R (2002) Instituting a routine varicella vaccination program in Canada: an economic evaluation. Pediatric Infectious Disease Journal 21(6): 542-547	- Vaccine not routine in the UK
Greengold, Barbara, Nyamathi, Adeline, Kominski, Gerald et al. (2009) Cost-effectiveness analysis of behavioral interventions to improve vaccination compliance in homeless adults. Vaccine 27(5): 718-25	- Vaccine not routine in the UK
Hayman, D T S, Marshall, J C, French, N P et al. (2017) Cost-benefit analyses of supplementary measles immunisation in the highly immunized population of New Zealand. Vaccine 35(37): 4913-4922	- Study did not consider increasing uptake
Hoshi, Shu-Ling, Seposo, Xerxes, Okubo, Ichiro et al. (2018) Cost-effectiveness analysis of pertussis vaccination during pregnancy in Japan. Vaccine 36(34): 5133-5140	- Study did not consider increasing uptake
Hui, Charles, Dunn, Jessica, Morton, Rachael et al. (2018) Interventions to Improve Vaccination Uptake and Cost Effectiveness of Vaccination Strategies in Newly Arrived Migrants in the EU/EEA: A Systematic Review. International journal of environmental research and public health 15(10)	- Systematic review - the only CE study did not consider increasing uptake - Not a cost-effectiveness study
Hurley, L.P., Beaty, B., Lockhart, S. et al. (2017) Centralized vaccine reminder/recall to improve adult vaccination rates at an urban safety net health system. Journal of General Internal Medicine 32(2supplement1): 135-s136	- Did not include QALYs as an outcome - adult studies
Kempe, Allison, Barrow, Jennifer, Stokley, Shannon et al. (2012) Effectiveness and cost of immunization recall at school-based health centers. Pediatrics 129(6): e1446-52	- Not a cost-effectiveness study
Lugner, Anna K, van der Maas, Nicoline, van Boven, Michiel et al. (2013) Cost-effectiveness of targeted vaccination to protect new-borns against pertussis: comparing neonatal, maternal,	- Study did not consider increasing uptake

Study	Reason for exclusion
and cocooning vaccination strategies. Vaccine 31(46): 5392-7	
Major, J.; Wingate, L.T.; Oishi, T.S. (2016) A cost-effectiveness evaluation of a multifaceted community pharmacy intervention to increae rates of herpes zoster vaccination. Value in Health 19(3): a217	- Vaccine not routine in the UK
Ouwens, M., Littlewood, K., Sauboin, C. et al. (2010) Impact of mmrv mass vaccination with or without a catch up program on the incidence of varicella complications in France. Value in Health 13(7): a430	- Vaccine not routine in the UK
Poirrier, J.E., Mungall, B., Lee, I.H. et al. (2014) Cost-effectiveness of maternal immunisation for pertussis in new zealand. Value in Health 17(7): a806	- Study did not consider increasing uptake
Portnoy, A., Campos, N.G., Sy, S. et al. (2020) Impact and cost-effectiveness of human papillomavirus vaccination campaigns. Cancer Epidemiology Biomarkers and Prevention 29: 22-30	- Study did not consider increasing uptake - Non-OECD country
Rivero-Santana, Amado, Cuellar-Pompa, Leticia, Sanchez-Gomez, Luis M et al. (2014) Effectiveness and cost-effectiveness of different immunization strategies against whooping cough to reduce child morbidity and mortality. Health policy (Amsterdam, Netherlands) 115(1): 82-91	- Study did not consider increasing uptake
Russell, Louise B, Pentakota, Sri Ram, Toscano, Cristiana Maria et al. (2016) What Pertussis Mortality Rates Make Maternal Acellular Pertussis Immunization Cost-Effective in Low- and Middle-Income Countries? A Decision Analysis. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 63(suppl4): 227-s235	- Non-OECD country - Study did not consider increasing uptake
Smith, Kenneth J, Nowalk, Mary Patricia, Lin, Chyongchiou J et al. (2017) Cost effectiveness of a practice-based intervention to improve vaccination rates in adults less than 65-years-old. Human vaccines & immunotherapeutics 13(10): 2207-2212	- Vaccine not routine in this age group in the UK
Suh, Christina A, Saville, Alison, Daley, Matthew F et al. (2012) Effectiveness and net cost of reminder/recall for adolescent immunizations. Pediatrics 129(6): e1437-45	- Cost perspective was inappropriate (private practice, net additional revenue)
Terranella, A., Beeler Asay, G.R., Messonnier, M.L. et al. (2013) Pregnancy dose Tdap and postpartum cocooning to prevent infant pertussis: A decision analysis. Obstetrical and Gynecological Survey 68(9): 615-616	- Study did not consider increasing uptake
Terranella, Andrew, Asay, Garrett R Beeler, Messonnier, Mark L et al. (2013) Pregnancy dose Tdap and postpartum cocooning to prevent infant pertussis: a decision analysis. Pediatrics 131(6): e1748-56	- Study did not consider increasing uptake
Van Bellinghen, Laure-Anne, Dimitroff, Alex, Haberl, Michael et al. (2018) Is adding maternal	- Study did not consider increasing uptake

Study	Reason for exclusion
vaccination to prevent whooping cough cost-effective in Australia?. Human vaccines & immunotherapeutics 14(9): 2263-2273	
van Hoek, Albert Jan, Campbell, Helen, Amirthalingam, Gayatri et al. (2016) Cost-effectiveness and programmatic benefits of maternal vaccination against pertussis in England. The Journal of infection 73(1): 28-37	- Study did not consider increasing uptake
Wateska, A.R., Nowalk, M.P., Lin, C.J. et al. (2019) An intervention to improve pneumococcal vaccination uptake in high risk 50-64 year olds vs. expanded age-based recommendations: an exploratory cost-effectiveness analysis. Human Vaccines and Immunotherapeutics 15(4): 863-872	- Vaccine not routine in this age group in the UK
Westra, T.A., De Vries, R., Tamminga, H.J. et al. (2009) Cost-effectiveness of a cocooning immunization strategy against pertussis for The Netherlands. Value in Health 12(7): a425-a426	- Study did not consider increasing uptake
Westra, Tjalke A, de Vries, Robin, Tamminga, Johannes J et al. (2010) Cost-effectiveness analysis of various pertussis vaccination strategies primarily aimed at protecting infants in the Netherlands. Clinical therapeutics 32(8): 1479-95	- Study did not consider increasing uptake
Dempsey, Amanda F, Pyrzanowski, Jennifer, Campbell, Jonathan et al. (2020) Cost and reimbursement of providing routine vaccines in outpatient obstetrician/gynecologist settings. American journal of obstetrics and gynecology 223(4): 562e1-562e8	- Exclude - not a cost-effectiveness analysis
Spencer, Jennifer C, Brewer, Noel T, Trogdon, Justin G et al. (2020) Cost-effectiveness of Interventions to Increase HPV Vaccine Uptake. Pediatrics 146(6)	- Exclude - system was too different to the UK context

Appendix K – Research recommendations – full details

K.1.1 Research recommendation 1

What levels and types of incentives are effective and acceptable for increasing vaccination uptake in a school-based population in the UK?

K.1.2 Why this is important

One of the barriers to vaccine uptake for school-based populations is the non-return of consent forms. There is evidence from a UK study (Forster 2017) to indicate that offering financial incentives to young people for the return of consent forms can increase the number of consent forms that are returned, and that the majority of these returned forms contained consent for the vaccination, although there was no direct data on uptake. It is unclear whether other types of incentives (either financial or non-financial) would be effective in a school-based population; what levels of incentives are required to be effective and whether incentivising uptake directly is an effective approach.

K.1.3 Rationale for research recommendation

Importance to 'patients' or the population	It is unclear whether financial and non-financial incentives are effective at increasing the uptake of routine school-based vaccinations in the UK in and whether they are acceptable to the population. Increasing vaccination uptake will provide benefits to young people by reducing vaccine preventable diseases as well as helping to develop herd immunity in the wider population.
Relevance to NICE guidance	Medium: the research is relevant to the recommendations in the guidance, but the research recommendations are not essential to future updates. Additional evidence about the effectiveness of incentives to increase uptake could help improve the existing recommendations or lead to new recommendations aimed at school-based populations.
Relevance to the NHS	A reduced incidence of vaccine preventable diseases would be expected if vaccination rates increase and would lead to reduced numbers of hospitalisations and other medical interventions to treat the diseases thereby freeing up resources that could be deployed to address other priorities.
National priorities	There is a new DHSC vaccination strategy due in late 2021 and it is expected that this work would fall under the goal of increasing the uptake of routine vaccinations
Current evidence base	One UK quantitative study with low quality evidence that did not look directly at uptake. Two qualitative studies with very low to moderate qualitative evidence that accompanied the quantitative study. No evidence comparing different types of incentives was identified as part of this review or the infrastructure review.
Equality considerations	Some young people attend alternative educational settings. The applicability of any incentives to these young people should be considered.

K.1.4 Modified PICO table

Population	• Children and young people eligible for school-based vaccinations or their parents or carers (as appropriate) • Healthcare staff organising the vaccination programmes or administering vaccinations (for the qualitative research only)
Intervention	Different types and levels of incentives to increase uptake of routine UK school-based vaccinations. Incentives can be: • financial (e.g. raffles, payment for accepting vaccinations) • non-financial (such as school lunch passes) • aimed at increasing vaccination directly or indirectly (see additional information below) The interventions should not be aimed at younger children, but rather their parents or carers (as appropriate). However, the interventions could be aimed at young people and/ or their families or carers (as appropriate).
Comparator	• Other levels of the same incentive: - the intervention should be compared with similar incentives of a different value (e.g. one financial reward per school or different odds of winning, such as a 1-in-10 or 1-in-50 chance) • Other types of incentive
Outcome	Quantitative outcomes including: • uptake of relevant routine vaccinations for the school-aged children and young people • offers of vaccination • responses to invitations or consent form return (if this behaviour is being incentivised) Qualitative outcomes including: • acceptability of the incentives • views about implementation • other views about the intervention or general barriers or facilitators to uptake that relate to incentives. The qualitative work should look at the views of young people, their parents and careers (as appropriate) and relevant healthcare staff.
Study design	• Quantitative study: RCT or cluster RCT • Qualitative study: Interviews, focus groups only (not surveys or open - ended questions on surveys)
Timeframe	There is no specified time frame in which the study needs to be completed.
Additional information	• Vaccinations to be incentivised must be on the UK routine schedule and exclude flu vaccination (out of scope for this guideline). The incentive must be aimed at increasing uptake in the relevant population for this schedule. • Incentives do not necessarily need to be directly related to receipt of a vaccine. Could also be for other behaviours (for example, consent form return) that ultimately result in increased vaccine uptake.

K.1.5 Research recommendation 2

Is the use of the World Health Organisation 'Tailoring Immunisation Programmes' (TIP) approach an effective way of designing interventions to increase vaccine uptake in a UK context?

K.1.6 Why this is important

The WHO TIP approach aims to understand the barriers to vaccination among population groups with suboptimal coverage and then facilitate the design of interventions to overcome these barriers thereby increasing vaccine uptake. In the reviews for this guideline limited evidence was identified that used this approach and it is unclear whether this is an effective method of developing tailored vaccination programmes aimed at increasing vaccination uptake. However, this approach has been used in the UK (for example, PHE has a document on Tailoring Immunisation Programmes in the Charedi community in North London and this is published as Letley 2018). It may therefore be the case that this evidence exists but was not identified as part of the current work because:

- of the format used to report it (if it is not a peer-reviewed publication)
- the published qualitative work does not match the format of the included studies for the qualitative review (i.e., focus groups, interviews or open-ended questionnaire questions) and present the barriers and enablers in a more summarised format than could be incorporated in our synthesis of the qualitative findings.
- the studies do not report the effect on vaccine uptake (the key outcome for the quantitative reviews).
- we did not record whether studies that used the TIP approach to design their interventions because this was not part of the review protocol.

If the TIP approach is effective at increasing uptake of routine vaccinations in the UK then it could be a used by providers of routine vaccination programmes to develop strategies tailored their local communities. Research is therefore needed to identify whether literature already exists to facilitate examination of the effectiveness of this approach at increasing vaccine uptake. If no such literature exists, then research aimed at using the TIP approach to design an intervention (or a multi-component intervention) and determine the effects on routine vaccine uptake would be needed to address this research recommendation.

K.1.7 Rationale for research recommendation

Importance to 'patients' or the population	It is unclear whether use of the TIP approach would be an effective way of increasing uptake of routine vaccinations in the UK. If it is effective this could help reduce the chances of disease and increase herd immunity.
Relevance to NICE guidance	Medium: the research is relevant to the recommendations in the guidance, but the research recommendations are not essential to future updates. Increased understanding of effective ways to develop local vaccination programmes could help improve the existing recommendations or lead to new recommendations aimed at specific populations.
Relevance to the NHS	Identifying ways to develop effective vaccination programmes will help providers to develop vaccination services tailored to their local communities. A reduced incidence of vaccine preventable diseases would be expected if vaccination rates increase and would lead to reduced numbers of hospitalisations thereby free up resources that could be deployed to address other priorities.

National priorities	There is a new DHSC vaccination strategy due in late 2021 and it is expected that this work would fall under the goal of increasing the uptake of routine vaccinations
Current evidence base	One qualitative study (which used the TIP programme to explore vaccination decisions in undocumented migrants in Sweden) was included as part of the current review work. No UK-based qualitative or quantitative studies were identified (see caveats above).
Equality considerations	The most effective and acceptable intervention may differ between populations and communities.

K.1.8 Modified PICO table

Population	• Individuals eligible for routine schedule vaccination(s) or their parents or carers (as appropriate) • Healthcare staff organising relevant vaccination programmes or administering vaccinations.
Intervention	The World Health Organisation Tailoring Immunisation Programmes approach used to design and test an intervention to increase vaccine uptake. This may be a multicomponent intervention and may target individuals eligible for routine schedule vaccination(s), their parents or carers (as appropriate) and/or healthcare staff
Comparator	Usual processes
Outcome	Quantitative outcomes including: • uptake of routine vaccinations by eligible people • offers of relevant vaccinations
Study design	• Systematic review to identify and available evidence • Quantitative study: RCT or cluster RCT, cohort studies
Timeframe	There is no specified time frame in which the study needs to be completed.
Additional information	• The vaccinations must be available as detailed on the UK routine schedule. • Flu vaccination is excluded as this is out of scope of this guideline.

K.1.9 Research recommendation 3

What is the effectiveness and acceptability of school-based catch-up vaccination sessions compared with GP-based catch-up campaigns in the UK?

K.1.10 Why this is important

The reviews for this guideline identified limited evidence about the effectiveness of different types of catch-up campaigns for routine vaccinations, and only one study (Altinoluk-Davis 2020) considered the effectiveness of catch-up campaigns delivered in schools compared to GP surgeries for MMR vaccination. An effective catch-up campaign can help to increase the number of people who are up to date with their routine vaccinations by giving people who have missed vaccinations another opportunity to be vaccinated. (Catch-up campaigns in response to disease outbreaks were out of scope and not included in the evidence reviews.) For children and young people in the UK these catch-up sessions routinely occur within schools, but vaccinations may also be offered at GPs. It is unclear whether school-based or GP-based catch-up campaigns are more effective for these age groups for vaccinations other than MMR and information about what makes an effective and acceptable campaign could be used to improve their design and implementation.

K.1.11 Rationale for research recommendation

Importance to 'patients' or the population	Catch-up campaigns or sessions are needed to ensure that people who miss routine vaccinations have another opportunity to be vaccinated. It is unclear whether a school based of GP based campaign is the most effective and acceptable. Information about what makes an effective and acceptable catch-up campaign can be used to design these campaigns and ultimately should help increase vaccine uptake.
Relevance to NICE guidance	Medium: the research is relevant to the recommendations in the guidance, but the research recommendations are not essential to future updates. The guideline currently recommends school-based catch-up campaigns, but these recommendations could be improved by information about what makes an effective campaign and recommendations on the use of other settings for catch-up vaccinations could be added if supported by the evidence.
Relevance to the NHS	Identifying the most effective setting and designs for a catch-up campaign will help providers to plan effective services for vaccination catch-up campaigns and thereby reduce the number of unvaccinated or under-vaccinated children and young people. This should in turn reduce the number of people with vaccine preventable diseases and resources that would be used to treat these people could be redeployed to the benefit of other patients.
National priorities	There is a new DHSC vaccination strategy due in late 2021 and it is expected that this work would fall under the goal of increasing the uptake of routine vaccinations
Current evidence base	One qualitative study (Seok 2018) was identified which specifically examined nurses' views of a GP-based catch-up campaign in the UK. A single quantitative study was found which compared school-based with GP-based catch-up campaigns but that was a cohort study and only looked at MMR vaccination. No evidence was identified that that examined different types of school-based or GP-based catch-up campaigns compared other school or GP based campaigns respectively.

Equality considerations	Some young people attend alternative educational settings or are home schooled. The accessibility of catch-up campaigns for these groups of young people should be considered.

K.1.12 Modified PICO table

Population	• Children and young people who have missed the routine schedule vaccinations that they are eligible for or their parents or carers (as appropriate) • Healthcare staff organising the catch-up campaigns or administering vaccinations as part of these campaigns.
Intervention	• School based catch-up **or** • GP-based catch-up The different components of these interventions could be aimed at the child or young person, their parents or carers (as appropriate) or healthcare staff or combination of these groups.
Comparator	• The other type of catch-up campaign (from above) **or** • Different designs of the same type of catch-up campaign (i.e., school-based versus another design of school-based catch-up)
Outcome	Quantitative outcomes including: • uptake of vaccines that are routinely available as part of catch–up campaigns for school-aged children and young people (see below) • offers of vaccination Qualitative outcomes including: • acceptability of the intervention • views about implementation • other views about the intervention or general barriers or facilitators to uptake during catch-up campaigns. The qualitative work should look at the views of young people, their parents and careers (as appropriate) and relevant healthcare staff.
Study design	• Quantitative study: RCT or cluster RCT, cohort studies • Qualitative study: interviews, focus groups only (not surveys or open -ended questions on surveys)
Timeframe	There is no specified time frame in which the study needs to be completed.
Additional information	• The vaccinations must be available on the UK routine schedule and the timing of the catch-up campaign should be relevant for the UK. • The catch-up campaign of interest is limited to providing vaccinations to children and young people who have missed vaccinations at the time they would normally have received them on the routine schedule. It does not include catch-up campaigns in response to disease outbreaks or those targeting groups/ communities with low vaccine uptake. • Flu vaccination is excluded as this is out of scope of this guideline.