National Institute for Health and Care Excellence

Final

Vaccine uptake in the general population

[D] Evidence review for interventions to increase the uptake of routine vaccines by improving access

NICE guideline NG218

Evidence review underpinning recommendations 1.1.3, 1.1.6, 1.1.9 to 1.1.15, 1.2.9, 1.2.19, 1.3.19, 1.3.24 to 1.3.25 and 1.3.38 in the NICE guideline

May 2022

Final

This evidence review was developed by the Guideline Development Team

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1 Interventions to increase vaccine uptake by improving access

1.1 Review question

What are the most effective interventions for increasing the uptake of routine vaccines by improving access?

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. According to the UKSA (preciously known as Public Health England), the COVID-19 pandemic has also reduced childhood routine vaccination rates. This is likely to continue to disrupt routine vaccinations in the foreseeable future. In addition, certain population groups (such as Gypsy, Roma and Travellers, refugees and asylum seekers) 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. This review aims to identify effective interventions to increase the uptake of routine vaccines by improving access. It follows the protocol and overarching review question detailed in Appendix A, which has been divided across several review documents by intervention type and is summarised Table 1.

1.1.2 Summary of the protocol for interventions aimed at improving access.

Table 1 PICO table for interventions to increase routine vaccine uptake by improving access.

Population	• 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.
Intervention	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 reviews)
	• Opportunistic vaccinations:
	  ○ visits to GP, practice nurse or consultant for other medical/health 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.

Comparators	• 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)

Outcomes	• Changes in:
	  • Vaccine uptake (overall for a specific vaccine or vaccines and for each dose where a vaccine is administered in multiple doses)
	  • the proportion of people offered vaccinations
	  • the numbers of people who develop the disease the vaccination was aimed at preventing
	• Cost/resource use associated with the intervention

1.1.3 Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A and the methods document. Declarations of interest were recorded according to NICE's conflicts of interest policy.

This review is one of a series of reviews looking at interventions to increase uptake (see appendix A for the full protocol covering all of the intervention types). Some of the following text has been duplicated as it applies to all reviews, but other sections are specific to this review.

The following additional methods apply to this review across intervention types:

1. This review refers to the UK routine vaccination schedule. The November 2019 schedule was used when these reviews were carried out and is available with the current version of the complete routine immunisation schedule. Influenza vaccination is not covered by this guideline because there is a separate NICE guideline on Flu vaccination: increasing uptake.
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. A search for systematic reviews (SRs) of interventions to increase routine vaccine uptake was carried out. This was used to identify any SRs that could be used to answer the review questions directly with/ without additional searching being required to update them. However, all but 4 of them were subsequently excluded because they did not map sufficiently well to our review protocols. The most recent SRs were used to help design the search strategies to identify relevant primary intervention studies, and as a source of references.
5. Targeted searches were carried out to fill the gaps focusing on identifying primary studies that corresponded to each type of intervention as listed in the PICO in Table 1. These searches used RCT study type limits where it had been determined by reference to the SRs that there were many RCTs for this intervention type (for example, reminders). Where there was less certainty no study type limits were used during the search.
6. These primary searches were pooled with the SR search results in a single database for sifting and included studies were divided by intervention type for analysis. The search results were pooled to enable deduplication of results because the search results for particular types of interventions also frequently returned references for other types of interventions.
7. At the start of each intervention review, the included studies were examined in more detail and a decision was made whether to limit the included studies to RCTs and cluster RCTs, or whether additional study types were needed. Where insufficient RCT or cluster RCT evidence was identified then non-randomised controlled studies, cohort studies or interrupted time series studies were included. Where there was still a very limited evidence base then controlled before-and-after studies and finally uncontrolled before-and-after studies were included. Decisions were made in consultation with the committee. Where the study type limits were used then the remaining studies for that intervention type that did not met the additional inclusion criteria were excluded.
8. Where studies have more than 2 arms they may be included in more than one review if the intervention types differ, but a single comparison is only presented in a single review.
9. Where studies have multicomponent interventions they are included in the main intervention reviews if they have 2 components (for example, education and reminders),

but where they have more than 2 vaccine specific interventions they have been included in the multicomponent review. However, if the intervention has two types of the same group of interventions (for example, provider and patient education or provider audit with feedback) these have not been counted separately. Table 2 in the multicomponent review (evidence review H) summarises where these studies have been analysed.

10. 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.
11. Where no or limited direct evidence was found, indirect evidence was obtained by looking at the NICE guideline on Flu vaccination: increasing uptake. This evidence was limited that covering routine flu vaccination, not vaccination of high-risk groups (that are not covered by the routine schedule) or vaccinations that are purchased privately. Where the flu guideline did not address the review question directly, we referred to any relevant recommendations the flu committee made instead.
12. 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 in these countries are less likely to be relevant for the UK.
13. 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. 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 was identified online.
14. If a study presented data on multiple vaccines, that are not all on the UK routine schedule and we cannot extract data separately for the vaccines on the UK schedule then the study was excluded.
15. If study reports uptake of childhood vaccinations (e.g. up to date by 2 years old) and doesn't specify the vaccination, but we know that the schedule in that country (US normally) has some differences to UK schedule, we have included the study and not downgraded for applicability if the majority of the vaccinations on the schedule are the same as UK. This approach was agreed with the committee.
16. Studies using vaccine formulations that differ from those used in the UK have not been excluded if the vaccines included in the formulation target the same diseases as the UK versions and are used at the same time as on the UK routine schedule. The committee agreed 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.
17. Interventions may be generic or targeted (tailored to the needs of the individual/ group.) They may target individuals or groups of individuals (ie. a community). Interventions targeting individuals may be provided at the individually or as a group.
18. Where the comparator in an analysis is listed as the usual approach this defined as whatever is the standard approach to vaccination in at the time that an eligible study was carried out. If further details are available, then they are provided in the evidence tables.
19. Studies looking at catch-up campaigns were included if the campaigns were as follows:
    - opportunistic in those that missed a vaccination, and
    - catch-up campaigns in under-vaccinated groups.

Catch-up campaigns following a disease outbreak were not included.

20. Outcomes:
    - Vaccine uptake is defined as the proportion of people being vaccinated with individual vaccines or overall (for all eligible vaccines). It is a dichotomous outcome.
    - Occurrence of disease is defined however the study reports it at the end of the intervention.

- Any studies that only reported change in offers and not uptake were excluded from the review because the committee are only interested in how changes in the numbers of offers relate to changes in uptake. Increased uptake may be caused by increased offers or an increase in offers may not translate into increased uptake.

21. Network meta-analyses were not prioritised for the intervention reviews due to the expected variability between interventions, populations and types of vaccine. Instead, additional analysis time was used to try to triangulate the findings from the quantitative and qualitative reviews using a mixed methods approach. (See below in the review specific methods for more details about the approach used in this review.)
22. Since non-randomised trials and cohort studies are assessed for risk of bias using ROBINS-I they could be combined in a meta-analysis with RCTs in GRADE (starting at high quality). However, although the inclusion of these NRS could be used to provide more precise estimates in summary effects they were not combined in the intervention reviews because the NRS are expected to be much larger and may dominate such estimates.
23. Different risk of bias checklists may use different terminology to represent the overall risk of bias judgements and for domain summaries. Where they differ from those used in the methods chapter for this review the following applies:
    - Some concerns = moderate risk of bias
    - Serious = high risk of bias
24. No clinically meaningful differences were identified by the committee, and they were unwilling to define MIDs here because they thought the clinically meaningful change in uptake may differ between vaccinations. Therefore, the line of no effect was used to downgrade for imprecision.
25. The interpretations in the GRADE summary tables of evidence are as follows:
    - We state that the evidence showed that there is an effect (e.g., increase or decrease) if the 95% confidence interval (CI) does not cross the line of no effect.
    - The evidence could not differentiate between comparators if the 95% CI crosses the line of no effect.

Qualitative evidence

The qualitative evidence for this review was taken from evidence review B. Please see the methods detailed there for more information about how the findings were derived.

Access review specific methods

1. For this review the term ‘access’ covers different locations for where vaccines are administered, different times, extended hours and opportunistic vaccinations.
2. Studies of intervention versus control were included if the controls were the following:
    - No intervention
    - Usual practice. Studies did not need to specify what was usual practice was.
    - Part of the interventions cancelled each other out (such as 2 arms including education, or an active control such as information about another vaccination).
3. Where possible, cRCTs were adjusted for clustering using the following method: If the intra-cluster correlation coefficient (ICC) and number of clusters in each arm were provided, we used this information to adjust the vaccine uptake data for clustering. If one or more studies had an ICC but others did not, we used the most common ICC in this evidence review for the studies that did not have one. If no studies had an ICC, we used an ICC value of 0.05 because this was the most common ICC in the education and evidence review.
4. Although 9 RCTs and cluster RCTs with vaccine specific access interventions were identified (plus 7 non-vaccine specific RCTs) and 3 cohort studies, the committee decided to include before and after studies in this review to expand the evidence base.

5. A mixed methods summary was made which combined the main access-related findings from the qualitative barriers and facilitators review (evidence review B) with the relevant quantitative results from this review. Findings relating to access were identified from review B and the ones that were considered to be most important were presented in 1.1.6 Summary of the evidence. These findings spanned the age groups and life stages and were further summarised to produce a diagram with key barriers and facilitators to vaccine uptake that related to access. Where possible links were made between barriers and corresponding facilitators that had been raised in the findings themselves or that were logically linked. So, for example, if a barrier concerned issues with the opening hours of vaccine clinics and there was quantitative evidence from a study using out of hours vaccine services then the results of this study were summarised and placed in a box linked to the relevant barrier or facilitator. At this point the quantitative evidence was mapped onto the qualitative evidence. If a study could not be linked to a barrier or facilitator then it was shown in separate box at the side of the diagram.

1.1.4 Effectiveness evidence

A series of searches were carried out to identify evidence to answer the overall review question about effective interventions to increase uptake. Firstly, a search for systematic reviews (SRs) of interventions to increase routine vaccine uptake was carried out. This search returned 2190 references.

Additional searches were carried out to identify primary studies for all the intervention types listed in the full review protocol (see Appendix A). These searches were pooled with the SR search results in a single database for sifting to enable deduplication of results because the search results for particular intervention groups also frequently returned references for other intervention groups. As a result, it is harder to assign individual references to particular search results than would normally be the case. The numbers provided below refer to the pooled searches unless stated otherwise.

In total 19254 studies were screened at title and abstract level against the review protocol and 738 were included for screening at full text. Of these 215 matched the inclusion criteria and were divided into SRs or separate intervention types (education, infrastructure, access, reminders, acceptability) or multicomponent to match the evidence reviews.

Of the SRs that met the inclusion criteria all but 4 were subsequently excluded (see methods for more details of this process; the numbers above have taken this process into account and only include the 4 SRs). The 4 SRs were sufficiently well matched to a particular review question to be included as directly applicable evidence and were judged to be high-quality (following a ROBIS quality assessment). None were relevant for this review. 27 studies were identified that matched the review protocol for access interventions.

The systematic review search and the primary searches were rerun at the end of the guideline development process to identify any newly published references that were relevant for this and other reviews. Of the 1752 new references, 67 were ordered at full text to screen for inclusion in the intervention reviews. Of these, no SRs matched the inclusion criteria closely enough to be included in any of the reviews. 4 additional primary studies were included at this stage. One additional primary study was identified that was relevant for this review. Therefore, this review consisted of 28 studies.

For the evidence study selection, please see Appendix D.

1.4.1 Included studies

There were 28 articles, 2 of which reported the same study (Johnson 1993 and Johnson 2000). Therefore, there were 27 studies altogether that targeted individuals, parents, or carers (Table 2) and were a mix of RCTs, cRCTs, cohort studies, and before-and-after studies. They looked at access intervention versus controls (usual practice) or access

interventions (alone or in combination) compared to other interventions to increase vaccine uptake.

The studies were as follows:

- Nine studies (2 RCT, 2 cohort and 5 before-and-after studies) looked at access interventions versus control. (See note below)
- Five cohort studies looked at access interventions compared to other access interventions.
- Four studies (2 RCT, 1 cluster RCT and 1 cohort) looked at access interventions compared to reminder interventions. (See note below)
- Three studies (2 RCT, 1 cluster RCT) looked at access interventions plus another intervention compared to controls.
- One study (1 cluster RCT) looked at access plus financial incentive versus another intervention.
- Seven RCTs looked at multicomponent interventions that are non-vaccination specific but vaccination component involves improving access.

Note: The numbers of studies listed above is greater than the include study numbers because Rodewald 1996 is a 3-arm study that has reminder intervention, access intervention and control arms.

1.1.4.2 Excluded studies

The list of excluded studies with reasons for their exclusion are available in Appendix J.

1.1.5 Summary of studies included in the effectiveness evidence.

Table 2 Summary of the characteristics of the primary studies including access interventions.

Author (year)	Country	Sample size	Study design	Setting	Target population for vaccination	Access interventions	Comparators	Vaccine(s)	Relevant outcomes
Allison 2007	USA	1715	Cohort	Schools and community clinics	14-to-17-year olds	School-based health clinics	Community health centres	Tetanus booster, influenza, hepB (Hepatitis B)[8]	Vaccine uptake
Altinoluk-Davis 2020	UK	27527	Cohort	Schools	13-to-14-year olds	School nurses vaccinating at schools	School nurses signposting to general practices (reminder)	MMR (Measles, mumps and rubella) catch-up	Vaccine uptake
Aoki 2020	Japan	958	Cohort	Hospital and community primary care clinics	65 years of age or older	Hospital primary care clinics	Community primary care clinics	Pneumococcal, influenza[7]	Vaccine uptake
Beck 1997	USA	321	RCT	Primary care health centres	65 years of age or older with a chronic illness	Monthly group health check with primary care physician and nurse. They identified those not vaccinated and booked a vaccination if needed (inferred from what was written, non-vaccine specific)	Usual care	Pneumococcal	Vaccine uptake
Birkhead 1995	USA	836	Cluster RCT	Hospital paediatric clinic	Children aged 12 to 59 months	**Intervention1:** Escorted to vaccination section of a paediatric clinic with	I**ntervention 2**: Referral to vaccination clinic elsewhere (reminder).	Measles	Vaccine uptake

Author (year)	Country	Sample size	Study design	Setting	Target population for vaccination	Access interventions	Comparators	Vaccine(s)	Relevant outcomes
						vouchers provided afterwards. [Education provided in all arms.]	[Education provided too.] **Intervention 3**: Food vouchers provided monthly instead of every 2 months until the child was vaccinated. [Education provided too.]		
Bond 1998	Australia	169	RCT	Community (child's home)	Children 90 days late for 3rd DTP/OPV/Hib or 120 days late for MMR[1]	A nurse administered vaccination in the child's home at a time convenient to the parents.	Reminders to parents whose children were still not vaccinated 2 months after the intervention period.	DTaP (Diphtheria, tetanus pertussis)/ OPV (Polio)/ Hib (Haemophilus influenzae type b) or MMR[1]	Vaccine uptake
Bourdet 2003	USA	1050	Cohort	Hospital	65 years and over or a different indication for vaccination	Hospital pharmacists organised opportunistic vaccinations	Usual care: Hospital pharmacists did not organise opportunistic vaccinations	Pneumococcal, influenza[7]	Vaccine uptake
Conway 1999	UK	1000	Before and after	Hospital (paediatric ward)	Pre-school children	After: opportunistic vaccination on a hospital ward	Before: vaccination uptake on admission	Age-appropriate routine vaccinations [10]	Vaccine uptake
Dalby 2000	Canada	142	RCT	Community	70 years of age or older	Nurse visit for preventative care education (non-vaccine specific).	Usual care (no home visits for preventative care)	Pneumococcal, influenza[7]	Vaccine uptake

Author (year)	Country	Sample size	Study design	Setting	Target population for vaccination	Access interventions	Comparators	Vaccine(s)	Relevant outcomes
						Follow-up visits to vaccinate (vaccine specific)			
Daniels 2007	USA	186	Cluster RCT	Churches	People aged 65 years and over	Education and vaccinations at churches.	Education and reminders for church goers[4].	Pneumococcal, influenza[7]	Vaccine uptake
El-Mohandes 2003	USA	286	RCT	Community	Children up to 1 year of age	Home visits, developmental play groups, parent support groups and monthly support calls (entirely non-vaccination specific intervention)	Usual care	DTaP, polio, Hib B	Vaccine uptake
Federico 2010	USA	17349	Cohort	School-based health centres, community health centres	12-18-year-olds	Vaccination at school-based health centres. No further details are provided.	Vaccination at community health centres. No further details are provided.	HPV (Human papillomavirus), MCV4 (Meningococcal conjugate), Tdap (Tetanus, diphtheria, pertussis), varicella, HepA (Hepatitis A), and HepB (Hepatitis B)[5].	Vaccine uptake
Ginson 2000	Canada	102	Cluster RCT	Hospital	Age over 65 years and/or other	Vaccine education by pharmacist and vaccination.	No vaccine education or automatic offer of a vaccine	Pneumococcal and influenza[7]	Vaccine uptake

Author (year)	Country	Sample size	Study design	Setting	Target population for vaccination	Access interventions	Comparators	Vaccine(s)	Relevant outcomes
					indications for vaccination[6]				
Johnson 1993	Ireland	262	RCT	Community	Children aged up to 12 months	Community Mothers Programme – experienced mothers trained to visit first-time parents and provide education (entirely non-vaccination specific intervention)	Usual care (both arms received invitations to attend for immunisations)	Childhood vaccines[1]	Vaccine uptake
Johnson 2000	Ireland	77	RCT (follow-up of Johnson 1993)	Community	Children aged up to 7 years	Community Mothers Programme (see Johnson 1993)	Usual care	MMR	Vaccine uptake
Kaul 2019	USA	2307	Cohort	Schools	11-14-year-olds	Nurse vaccinations at school. Educational materials were available on vaccination day and there was a community-based educational programme.	Community based educational programme.	HPV[3]	Vaccine uptake
Kitzman 1997	USA	743	RCT	Community	Children aged up to 2 years	Nurse home visits during the pregnancy until the child was 2 years old (entirely non-vaccination specific intervention)	Usual care	MMR and DtaP	Vaccine uptake

Author (year)	Country	Sample size	Study design	Setting	Target population for vaccination	Access interventions	Comparators	Vaccine(s)	Relevant outcomes
Koniak-Griffin 2003	USA	101	RCT	Community	Children aged up to 2 years	Early Intervention Program – public health nurse home visits from pregnancy until 1 year postpartum (entirely non-vaccination specific intervention)	Usual care	DtaP, poliovirus, measles	Vaccine uptake
Li 1991	UK	3616	Cohort	General practices and child health clinics	Children 10-12 months old	Community child health clinics	General practices	"UK primary vaccination course"[9]	Vaccine uptake
Norr 2003	USA	588	RCT	Community	Children aged up to 12 months	REACH-Futures: home visits and phone calls with nurses and community advocates (entirely non-vaccination specific intervention)	Usual care	Childhood vaccines[11]	Vaccine uptake
Pearson 2005	Canada	460	Before and after	Emergency department	65 years of age or older or a chronic illness	**After:** Opportunistic vaccination at an emergency department	**Before:** No opportunistic vaccination at an emergency department	Pneumococcal and influenza[7]	Vaccine uptake
Rodewald 1996	USA	1835	RCT	Emergency department	Children 6-26 months old	Vaccinations at the emergency department.	**Comparator 1:** Control. No vaccinations at the emergency department or reminders. **Comparator 2:** reminder letter sent to GP[2]	General childhood vaccines	Vaccine uptake

Author (year)	Country	Sample size	Study design	Setting	Target population for vaccination	Access interventions	Comparators	Vaccine(s)	Relevant outcomes
Stubbs 2014	USA	7916	Cohort	Schools	Adolescent girls eligible for HPV vaccination	Schools with clinics that vaccinated (plus education)	Satellite schools with no clinics so adolescents and parents had to travel to a school that had a clinic (plus education)	HPV	Vaccine uptake
Szilagyi 1997	USA	1301	Before and after	Emergency departments	Children 0 to 6.9 years old	**After**: Nurses in emergency departments identifying children and offering opportunistic vaccinations	**Before**: Vaccine uptake at the start of the visit	Diphtheria, tetanus, pertussis, polio, MMR, Hib, HepB.	Vaccine uptake
Taylor 1997	USA	210	RCT	Home visits or group visits at a hospital clinic	Children aged 0 to 4 months old	Home health supervision (1-to-1) by a nurse that included vaccination and health screening (entirely non-vaccination specific because immunisations were provided in both arms)	Group education led by a nurse that included vaccination and health screening	DTP, polio, HepB, Hib	Vaccine uptake
Tarca 2021	Australia	563	Before and after	Hospital wards	Children aged 0 to 18 years	**After**: Immunisation nurse reviewed patients and administered vaccines	**Before**: Control (no immunisation service in the hospital)	Age-appropriate routine vaccinations [10]	Vaccine uptake
Wilcox 2001	USA	991	RCT	Community	Children 6-10 months old	Outreach by a social worker or nurse and up to 4 unspecified attempts to contact family if required	Control (no intervention)	DTP, polio, Hib, HepB	Vaccine uptake
Wood 1998	USA	367	RCT	Community	Children 0-42 days old	Case management home visit with phone call reminders.	Control (Both arms had a 'health passport', that	DTP, polio, Hib	Vaccine uptake

Author (year)	Country	Sample size	Study design	Setting	Target population for vaccination	Access interventions	Comparators	Vaccine(s)	Relevant outcomes
							included a schedule of recommended well child visits and immunisations)		

1. DTP/OPV/Hib = diphtheria-tetanus-pertussis/poliomyelitis/*Haemophilus influenzae* type b vaccination.
2. This intervention compared to comparator 1 (control) is included in the reminders evidence review C.
3. HPV vaccination was bundled with other vaccines that were already routinely delivered in the school setting, but the study only reported data on HPV vaccination.
4. The education intervention was not the same in both study arms.
5. Results were extracted for HPV only as the data for meningococcal vaccination (MCV4) was not provided in an extractable format and Tdap (Tetanus, Diphtheria, Pertussis), varicella (chickenpox), HepA (hepatitis A), and HepB (hepatitis B) vaccines are not routinely given to 11-18 year olds in the UK.
6. Known anaphylactic hypersensitivity to eggs (influenza vaccine only), acute febrile illness, terminal illness or palliative care, resident of nursing home or chronic care facility, previous receipt of both current influenza vaccine and a pneumococcal vaccine, inability to give informed consent.
7. Only the data for pneumococcal vaccination uptake was extracted because influenza vaccination is covered in a different guideline.
8. Only the data for tetanus booster uptake was extracted because influenza and HepB are not on the UK routine vaccination schedule for 11-18 year olds.
9. No further details of the vaccines was provided.
10. Downgraded for directness because relevant vaccines were general for age but were not provided in the methods section.
11. The specific vaccines were not mentioned in the study.

For the full evidence tables, please see Appendix D.

1.1.6 Summary of the evidence

Summary of the quantitative evidence

See 1.1.3 Methods and process for an explanation of the interpretation column.

Table 3 Summary of effectiveness findings for access interventions compared to control

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Home visit and vaccination by nurse versus control (RR >1 favours intervention)							
65 years and older							
1 (Dalby 2000)	RCT	142	RR 114.4 (7.22, 1815.67)	N/A[1]	N/A[1]	Increased with home visit and vaccination by nurse	Moderate
Opportunistic emergency department vaccination versus control (RR >1 favours intervention)							
0-5 year olds							
1 (Rodewald 1996)	RCT	1225	RR 1.11 (1.04, 1.19)	69 per 100	77 per 100 (72, 82)	Increased with opportunistic emergency department vaccination.	Moderate
NON-RCT summary by age groups: access intervention versus control (cohort studies) (RR >1 favours intervention)							
4 (Conway 1999, Tarca 2021, Kaul 2019, Bourdet 2003)	Cohort, before and after	5920	RR 1.33 (1.06, 1.67)	40 per 100	53 per 100 (42, 67)	Increased with access intervention.	Very low
0-5 year olds							
1 (Conway 1999)	Before and after	1000	RR 1.03 (0.99, 1.08)	80 per 100	82 per 100 (79, 86)	The study could not differentiate change in vaccine uptake between access intervention or control.	Very low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
0-18 year olds							
1 (Tarca 2021)	Before and after	563	RR 1.18 (1.11, 1.25)	82 per 100	97 per 100 (91, 103)	Increased with access intervention.	Very low
11-18 year olds							
1 (Kaul 2019)	Cohort	2307	RR 1.38 (1.19, 1.60)	21 per 100	28 per 100 (23, 33)	Increased with access intervention.	Moderate
65 years and older							
1 (Bourdet 2003)	Cohort	1050	RR 30.26 (9.58, 95.62)	0 per 100	15 per 100 (5, 47)	Increased with access intervention.	Very low
NON-RCT: School-based vaccination compared to control (community-based education in both arms) (RR >1 favours intervention)							
11-18 year olds							
1 (Kaul 2019)	Cohort	2307	RR 1.38 (1.19, 1.60)	21 per 100	28 per 100 (23, 33)	Increased with school-based vaccination.	Moderate
NON-RCT: Opportunistic hospital vaccination versus control (RR >1 favours intervention)							
3 (Conway 1999, Tarca 2021, Bourdet 2003)	Before and after, cohort	3613	RR 1.14 (1.10, 1.18)	55 per 100	62 per 100 (60, 64)	Increased with opportunistic hospital vaccination.	Very low
0-5 year olds							
1 (Conway 1999)	Before and after	1000	RR 1.03 (0.99, 1.08)	80 per 100	82 per 100 (79, 86)	The study could not differentiate change in vaccine uptake between opportunistic hospital vaccination or control.	Very low
0-18 year olds							
1 (Tarca 2021)	Before and after	563	RR 1.18 (1.11, 1.25)	82 per 100	97 per 100 (91, 103)	Increased with opportunistic hospital vaccination.	Very low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
65 years and older							
1 (Bourdet 2003)	Cohort	1050	RR 30.26 (9.58, 95.62)	0 per 100	15 per 100 (5, 47)	Increased with opportunistic hospital vaccination.	Very low
NON-RCT: Opportunistic emergency department vaccination versus control (RR >1 favours intervention)							
2 (Szilagyi 1997, Pearson 2005)	Before and after	1761	RR 1.54 (0.86, 2.75)	57 per 100	87 per 100 (49, 156)	The study could not differentiate change in vaccine uptake between opportunistic emergency department vaccination or control.	Very low
0-5 years old							
1 (Szilagyi 1997)	Before and after	1301	RR 1.15 (1.09, 1.21)	63 per 100	73 per 100 (69, 77)	Increased with opportunistic emergency department vaccination.	Low
65 years and older							
1 (Pearson 2005)	Before and after	920	RR 2.06 (1.82, 2.34)	38 per 100	78 per 100 (69, 89)	Increased with opportunistic emergency department vaccination.	Very low

1. It is not possible to calculate absolute risk because there are no events in the control arm.

Table 4 Summary of effectiveness findings for access interventions compared to other access interventions

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
NON-RCT: school-based health centres versus community health centres (RR >1 favours school-based health centres)							
11-18 years							
2 (Allison 2007, Federico 2010)	Cohort	19064	RR 1.51 (1.41, 1.61)	13 per 100	19 per 100 (18, 21)	Increased with school-based health centres.	Low
NON-RCT: Onsite school vaccination clinics versus not having onsite clinics (satellite schools without clinics so pupils had to travel to schools with clinics) (RR >1 favours schools with clinics)							
11-18 year olds							

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
1 (Stubbs 2014)	Cohort	7916	RR 6.21 (4.56, 8.46)	1 per 100	6 per 100 (5, 8)	Increased with schools that have clinics.	Low
NON-RCT: Hospital primary care clinics versus community primary care clinics (RR >1 favours hospital primary care clinics)							
65 years and older							
1 (Aoki 2020)	RCT	958	RR 0.79 (0.70, 0.90)	61 per 100	48 per 100 (42, 54)	Increased with community primary care clinics.	Low
NON-RCT: Community child health clinics versus general practices (RR >1 favours community child health clinics)							
0-5 years							
1 (Li 1991)	Cohort	3616	RR 0.85 (0.81, 0.89)	80 per 100	68 per 100 (65, 71)	Increased with general practices.	Moderate

Table 5 Summary of effectiveness findings for access interventions compared to reminders interventions

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Summary by age groups: access versus reminders interventions (pooled) (RR >1 favours access interventions)							
0-5 year olds							
2 (Bond 1998, Rodewald 1996)	RCT	1390	RR 1.45 (0.74, 2.84)	66 per 100	96 per 100 (49, 188)	The studies could not differentiate change in vaccine uptake between access interventions or reminder interventions.	Very low
Home vaccination by nurse compared to reminders to parents (RR >1 favours home vaccination by nurse)							
0-5 year olds							
1 (Bond 1998)	RCT	169	RR 2.08 (1.41, 3.08)	27 per 100	58 per 100 (38, 84)	Increased with home vaccination by nurse.	Moderate
Opportunistic emergency department vaccination compared to letter reminder to GP (RR >1 favours opportunistic emergency department vaccination)							
0-5 year olds							
1 (Rodewald 1996)	RCT	1221	RR 1.07 (1.0, 1.14)	72 per 100	77 per 100 (72, 82)	Increased with opportunistic emergency department vaccination.	Moderate

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
CLUSTER RCT: Vaccination at church versus reminders (RR >1 favours vaccination at church)							
65 years and older							
1 (Daniels 2007)	Cluster RCT	186	RR 1.87 (1.24, 2.84)	27 per 100	51 per 100 (34, 78)	Increased with vaccination at church.	Low
NON-RCT: School nurse catch-up vaccination versus school nurse reminder to have catch-up vaccination done at a general practice (MMR catch-up for adolescents) (RR >1 favours school nurse catch-up vaccination)							
11-18 years							
1 (Altinoluk-Davis 2020)	Cohort	27527	RR 8.89 (5.00, 15.8)	0 per 100	2 per 100 (1, 3)	Increased school nurse catch-up vaccination.	Low

Table 6 Summary of effectiveness findings for access interventions plus another intervention compared to control

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
CLUSTER RCT: education and offer of vaccination by hospital pharmacist versus control (RR >1 favours intervention)							
65 years and older							
1 (Ginson 2000)	Cluster RCT	102	RR 3.52 (1.89, 6.56)	19 per 100	66 per 100 (35, 123)	Increased with education and offer of vaccination by hospital pharmacist.	Low
Summary by age groups: access intervention plus reminders versus control (RR >1 favours intervention)							
0-5 years							
2 (Wilcox 2001, Wood 1998)	RCT	1358	RR 1.36 (1.23, 1.50)	45 per 100	61 per 100 (55, 68)	Increased with access intervention plus reminders.	Low
Outreach by a social worker or nurse plus up to 4 unspecified reminders if required versus control (RR >1 favours intervention)							
0-5 years							
1 (Wilcox 2001)	RCT	991	RR 1.40 (1.24, 1.58)	43 per 100	61 per 100 (54, 68)	Increased with outreach by a social worker or nurse plus up to 4 unspecified reminders if required.	Low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Outreach by a case manager plus reminders by outreach and telephone calls if required versus control (RR >1 favours intervention)							
0-5 years							
1 (Wood 1998)	RCT	367	RR 1.26 (1.05, 1.51)	51 per 100	64 per 100 (53, 77)	Increased with outreach by a case manager plus reminders by outreach and telephone calls if required.	Moderate

Table 7 Summary of effectiveness findings for access plus financial incentive versus another intervention

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
CLUSTER RCT: escorted to paediatric clinic by staff + vouchers versus referral for vaccination (RR >1 favours escorted to paediatric clinic)							
0-5 year olds							
1 (Birkhead 1995)	Cluster RCT	658	RR 1.56 (1.10, 2.20)	55 per 100	86 per 100 (60, 121)	Increased with escort to paediatric clinic by staff.	Low
CLUSTER RCT: escorted to paediatric clinic by staff (+ vouchers) versus vouchers given monthly instead of every 2 months until child is vaccinated (RR >1 favours intervention)							
0-5 years							
1 (Birkhead 1995)	Cluster RCT	555	RR 1.09 (0.85, 1.39)	78 per 100	85 per 100 (67, 109)	The studies could not differentiate change in vaccine uptake between being escorted to the paediatric clinic by staff (+ vouchers) or control (vouchers).	Very low

Table 8 Summary of effectiveness findings for multicomponent interventions that are non-vaccination specific but vaccination component involves improving access

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Access intervention (health check) versus control (RR >1 favours intervention)							
65 years and older							
1 (Beck 1997)	RCT	321	RR 1.84 (1.24, 2.73)	18 per 100	33 per 100 (22, 49)	Increased with intervention.	Low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Home visits plus education versus control (RR >1 favours intervention)							
0-5 years							
4 (El-Mohandes 2003, Johnson 1993, Kitzman 1997, Koniak-Griffin 2003)	RCT	1362	RR 1.09 (0.91, 1.31)	60 per 100	66 per 100 (55, 79)	The studies could not differentiate change in vaccine uptake between home visits plus education or control.	Very low
Home visits plus education versus control (RR >1 favours intervention)							
0-5 years							
1 (Johnson 2000)[a]	RCT	76	RR 0.95 (0.87, 1.04)	100 per 100	95 per 100 (87, 104)	The study could not differentiate change in vaccine uptake between home visits plus education or control.	Very low
Individual/parent/carer home visits, appointment booking and education versus control (RR >1 favours intervention)							
0-5 years							
1 (Norr 2003)	RCT	477	RR 1.45 (1.26, 1.67)	53 per 100	77 per 100 (67, 89)	Increased with intervention.	Moderate
Home visits plus education versus group education (RR >1 favours home visits plus education)							
0-5 years							
1 (Taylor 1997)	RCT	210	RR 1.09 (0.91, 1.30)	67 per 100	73 per 100 (61, 87)	The study could not differentiate change in vaccine uptake between home visits plus education or group education.	Low
a. This data is separate from Johnson 1993 to avoid double-counting. This is a 7-year follow-up with only 33% of original participants able to be contacted.							

Sensitivity analysis (removing studies at high risk of bias)

Table 9 Summary of effectiveness findings for the sensitivity analysis: Access interventions compared to control

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
NON-RCT summary by age groups: Access intervention versus control (RR >1 favours intervention)							
(Pooled total)							
1 (Kaul 2019)	Cohort	2307	RR 1.38 (1.19, 1.60)	21 per 100	28 per 100 (24, 33)	Increased with access intervention.	Moderate

Table 10 Summary of effectiveness findings for the sensitivity analysis: Access interventions plus reminders compared to control

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Summary by age groups: Access intervention plus reminders versus control (RR >1 favours intervention)							
0-5 years							
1 (Wood 1998)	RCT	367	RR 1.26 (1.05, 1.51)	51 per 100	64 per 100 (53, 77)	Increased with access intervention plus reminders.	Moderate

Table 11 Summary of effectiveness findings for the sensitivity analysis: Multicomponent interventions that are non-vaccination specific but vaccination component involves improving access

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Interpretation	Quality
Home visits plus education versus control (RR >1 favours intervention)							
0-5 years							
3 (Johnson 1993, Kitzman 1997, Koniak-Griffin 2003)	RCT	1076	RR 1.07 (0.87, 1.30)	69 per 100	74 per 100 (60, 89)	The study could not differentiate change in vaccine uptake between home visits and education or control.	Very low

See Appendix F for full GRADE tables

Summary of the qualitative evidence

Findings relevant to access taken from the barriers to and facilitators for vaccine uptake review in evidence review B. For more details and additional findings please refer to this review. In the following table Gypsy, Roma and Travellers have been abbreviated to GRT to make the findings less unwieldy, however these apply to all 3 groups unless otherwise specified.

Table 12 Summary of the key qualitative findings

Population to be vaccinated	Finding	Confidence
Pregnant women	Some pregnant women say that getting vaccinated at their GP's surgery is convenient because they attend for other reasons too. Other pregnant women say that having the vaccinations at antenatal appointments or at a community pharmacy would be more convenient than attending a GP surgery, but not all women believe that vaccines can be delivered at community pharmacies.	Moderate
Pregnant women	GPs and midwives not informing pregnant women about all the available locations to access maternal vaccinations (such as at a pharmacy) could reduce access to vaccinations	Low
65 years and over	People aged 65 years and over and pharmacists say that community pharmacies would be convenient places for people aged 65 years and over to get vaccinated. This is because they are sometimes nearer to home and open at convenient times. Pharmacists believe that giving people aged 65 years and over the choice between their community pharmacy and their GP to receive their vaccine should increase vaccine uptake.	Moderate
65 years and over	People aged 65 years and over who go to church say that being vaccinated after the Sunday service would be very convenient. However, vaccinations after the Sunday service would require coordination between the church and the health service.	Low
0-5 year olds	Some parents (including parents who are immigrants*, orthodox Jewish, travellers and gypsies) experienced difficulty in getting to the clinic to have their child vaccinated. Parents and health service providers said that if the child welfare centre or GP's surgery is a long distance away, they are less likely to travel there for vaccination, especially if they do not have access to a car. Parents viewed public transport as infrequent, unreliable, crowded, difficult to use with a pram and expensive. Walking was slow and time-consuming. This issue also applies to women living on caravan sites (such as travellers and gypsies). They may not have access to vehicles during the day and caravan sites are usually at remote locations with no public transport or other services. * Immigrants were people who had lived in the Netherlands for at least 1 year – mostly people from Morocco, and Turkey, as well as some from Afghanistan, Somalia, Poland and Belgium)	High
0-5 year olds	Inflexible and inconvenient clinic hours make it harder for parents, including Jewish ultra- orthodox parents) to bring children to be vaccinated. For women working in full time employment, attendance usually involved taking formal leave. Even women working part-time did not always find it easy to attend appointments. This may also be more of a problem for parents from lower socioeconomic groups who are less able to afford to take time off work or work unpredictable hours.	Moderate

Population to be vaccinated	Finding	Confidence
0-5 year olds	Many parents, including those from GRT communities), and health service providers said that home immunisation could increase vaccine uptake for people who have access issues.	Moderate
0-5 year olds	Parents who live on caravan sites and travel frequently have difficulty obtaining vaccination appointments. People on caravan sites said that appointment cards and information on vaccines does not reach them. This is a particular problem for people living on illegal camping sites who must change location every few weeks. Some have also been told by the surgery that they need a fixed address to secure an appointment.	Moderate
0-5 year olds	Parents living on caravan sites noted that their children were less likely to be vaccinated because the children did not spend as much time in schools [and nurseries etc] and frequently moved schools.	Moderate
0-5 year olds (specific to the COVID-19 pandemic)	Providers adapted their models to fit with the safety requirements for the pandemic. Some, used innovative methods such as outdoor or drive-through immunisation services, and these were reported to be generally well received by people attending vaccination appointments	Low
0-5 year olds (specific to the COVID-19 pandemic)	Participants identified a local transient population as a barrier to some people accessing vaccinations	Low
11-18 year olds	Nurses actively tried to ensure that adolescent girls did not miss their opportunity to be vaccinated. These actions included following up families that did not return consent forms and signposting adolescent girls who missed their vaccination to other services that could provide it. Nurses felt these actions improved uptake, but they did not always have time to do it. In some cases, the nurses also reported holding additional clinics for girls who were not in school or poor attenders off the school premises or outside of school hours.	High
1 (Rubens-Augustson 2019)	Nurses recognise that newly arrived migrant parents and young people in Canada face numerous barriers to vaccination. They often do not have records of their medical history and lack knowledge of what healthcare is available and how to access it. Language difficulties also exist, and some nurses had difficulty communicating information about vaccinations and therefore obtaining informed consent. The nurses felt they did not have time to dedicate to this issue amongst other priorities.	Moderate
11-18 year olds (finding presented in the studies spanning multiple age/ life stage categories section)	Poor levels of attendance or being homeschooled can make it harder for children to be vaccinated in some GRT communities. Girls from some Traveller communities (such as Romanian Roma) are withdrawn from school when they reach puberty to avoid them mixing with non-Traveller boys while a minority of adolescents may have reduced attendance due to racism and discrimination at school. This makes it harder to ensure that they receive the vaccinations that are normally provided at	Moderate

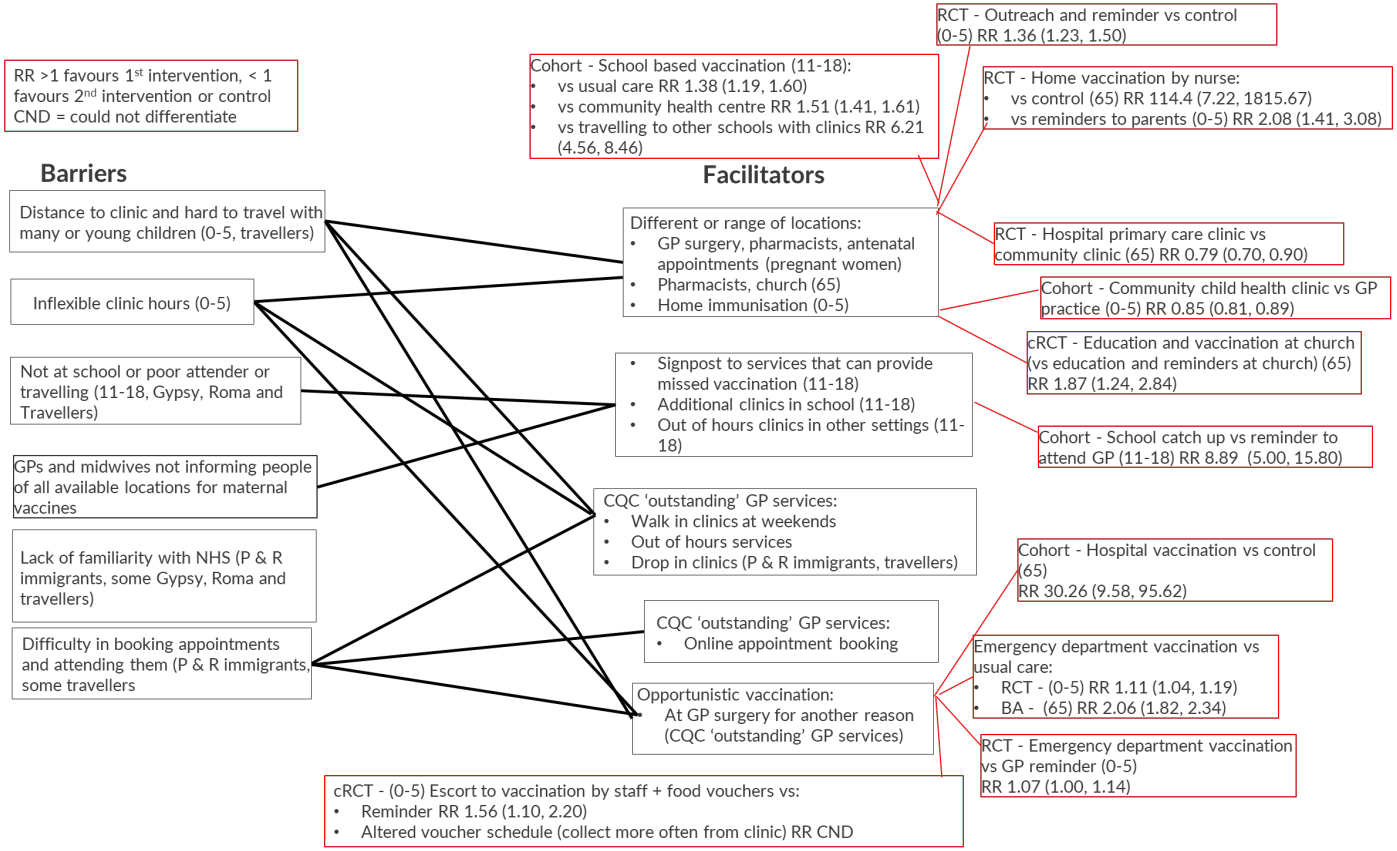
Population to be vaccinated	Finding	Confidence
	school such as HPV. Other GRT children miss vaccinations if the family is travelling when the vaccines are administered at school. In contrast, other groups of Travellers such as Scottish show people have good school attendance.	
All ages (finding presented in the studies spanning multiple age/ life stage categories section)	Some parents who are Polish or Romanian immigrants* and Roma Travellers are unfamiliar with the NHS and can find it difficult to navigate the UK health system to obtain healthcare. They reported difficulties in registering with GPs and this was linked to lack of appropriate documentation in some cases while Roma travellers were not necessarily aware that they needed to book appointments to be seen by a GP. In addition, pregnant Roma often arrive without having had any antenatal care and cannot access it in the UK until they are registered with a GP. These difficulties are overcome with the support of family members and friends and a growing understanding of how the system works. Once registered some Romanian and Polish parents report finding it easy to book appointments at GP practices. In contrast other Romanian and Romanian Roma parents still find it hard book GP appointments, and this may be due to language difficulties affecting communication or discrimination. Providers report that these parents are more likely to see help at A&E if they are unwell than to visit a GP, which may be linked to problems with booking appointments. However, providers also thought that these communities have a more reactive response to healthcare. This could negatively affect their uptake of vaccines. *Polish and Romanian immigrants living in the UK (average time living in the UK was 11 years for Polish people and 9 years for Romanians in one study, 3 years or less in another study)	High
All ages (finding presented in the studies spanning multiple age/ life stage categories section)	Providers thought that drop-in clinics would be more effective at increasing vaccine uptake in Romanian and Romanian Roma* communities than booked appointments. This might be due to difficulties in making and attending appointments if families are often travelling and/or do not speak English well (or at all). *Polish people living in the UK for 3 years or less	Moderate
All ages (finding presented in the studies spanning multiple age/ life stage categories section)	A minority of GRT described problems with accessing healthcare that included difficulties with registering with GPs, problems booking appointments and having to wait weeks for appointments, which could be a problem for those who are travelling. Some GRT prefer to use A&E and use out-of-hours services to avoid these waits	Moderate
All ages (finding presented in the studies spanning multiple age/ life	The travelling lifestyle can make it hard to build relationships with people in GRT communities and encourage vaccinations, but the amount of travelling varies across GRT communities. English Gypsy and Scottish Showpeople are more settled and travel for shorter times so they don't lose their spaces on site. This allows them to access GP services and book	Moderate

Population to be vaccinated	Finding	Confidence
stage categories section)	appointments around their travelling commitments. Travelling is seen as being more disruptive in other communities such as the Roma Travellers with staff commenting that they spend time build relationships and then the families move on.	
GRT (finding presented in the studies spanning multiple age/ life stage categories section)	Healthcare providers reported a lack of funding to carry out work with GRT communities to promote vaccine uptake. This lack of funding affects work with the Roma communities in particular in some areas and may be due to commissioners and senior managers failing to understand the complex nature of working with these communities. Rather than being proactive in trying to address inequalities and promote vaccine uptake routinely, vaccination services are now seen to be more reactive with catch up campaigns in the case of outbreaks. Service providers also raised concerns that there was a lack of fund for training staff carrying out immunisations and schools may be prevented from taking part in immunisation campaigns by the lack of money to provide consent forms in other languages.	Moderate
All ages (finding presented in the studies spanning multiple age/ life stage categories section)	CQC- 'outstanding practice': Flexibility in addressing the needs of patients was thought to be essential in facilitating vaccine uptake. This was manifested by increasing the opportunities for vaccination by offering opportunistic vaccination when people were attending the surgery for other reasons; increased out of hours clinics; 'walk-in' clinics at weekends for working parents; longer appointments for non-English speakers or those with complex needs. Online appointment booking also increased immunisation bookings.	Moderate
All ages (finding presented in the studies spanning multiple age/ life stage categories section)	Healthcare providers recognised the importance of being flexible and using a number of approaches to make vaccinations more accessible to GRT including holding drop-in clinics, using opportunistic vaccinations, improving the accessibility of appointments and delivering outreach services. Opportunistic vaccinations were suggested at A &E and other non-vaccination clinics plus during other appointments at GP practices while some providers reported having longer GP opening hours with increased numbers of vaccination clinics to improve uptake. However, most GRT reported being able to attend appointments and they agreed with service providers that outreach service should be limited to those who cannot attend mainstream services such as the elderly and those who travel regularly or do not ever attend GPs .	Moderate

Mixed methods summary of the quantitative and qualitative evidence

The barriers and facilitators in the diagram are summarised versions of the findings that were considered to be the most important from the qualitative evidence relating to access presented in Table 12. Possible links between barriers and corresponding facilitators are shown in the diagram, with the quantitative evidence mapped onto the related qualitative themes. See section 1.1.3 Methods and process for more details.

Figure 1 Diagrammatic summary of the barriers and facilitators to vaccine uptake with access interventions mapped onto them. RR= risk ratio.



1.1.7 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 initial inclusion criteria. 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. 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 published economic analysis from this search was included in the evidence synthesis.

1.1.7.1 Included studies

None of the 11 studies identified in the systematic review looked at access interventions.

1.1.7.2 Excluded studies

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

1.1.8 Summary of included economic evidence

No economic evidence was identified for access interventions.

1.1.9 Economic model

The committee discussed multiple access interventions which were anticipated to have some resource impact, so a costing analysis was undertaken for each intervention. This analysis used assumptions around staff time, costs and uptake numbers, and was conducted for only the populations considered in the identified studies. The interventions considered were community centre vaccination, hospital based opportunistic vaccination, nurse home visits, and extended or additional hours for vaccination services. Four scenarios were considered when calculating the cost per additional person vaccinated; 1) all unvaccinated people at baseline incur the full cost and cost savings from displaced GP appointments (costing £10.05 per vaccination) are included, 2) the full cost of the intervention is only applied to those people vaccinated, and an alternative cost assuming reduced intervention activities (such as staff time) is applied for those who did not receive the vaccine and cost savings from displaced GP appointments are included, or 3 and 4) as in scenarios 1 and 2 respectively, with cost savings from GP appointments excluded. It was felt that scenarios 1 and 2 were more representative of the true costs as it is likely that these access interventions will mean GP appointments are not required for the individuals vaccinated in these settings. Scenario 1 was selected as the base-case as this was felt to be the more conservative approach. The cost per additional person vaccinated (receiving all the relevant vaccination at a single vaccine appointment) with each intervention in this scenario is presented in Table 13.

The costing analysis indicates that nurse home visits are a more costly intervention than community centre and hospital-based vaccinations, largely due to the amount of time

required being much longer for home visits. The cost per additional person vaccinated under the nurse home visits intervention is also much higher for children than for older people because the clinical evidence indicated that nurse home visits were much more effective at increasing vaccine uptake in older people.

Table 13: Cost per additional person vaccinated

	Cost per additional person vaccinated	
	0-5 years	65+ years
Community centre vaccination	-	£17.78
Hospital-based opportunistic vaccination	£11.42	£14.23
Nurse home visits	£104.70	£40.93

The costing analysis for extended or additional hours for vaccination services focused on the total annual cost across the country, rather than cost per person vaccinated, and the results of this are presented in Table 30. Results of the other scenarios and further details of these analyses are provided in Appendix I.

1.1.10 Unit costs

The fees payable to GP providers for delivery each of the vaccines relevant to this guideline are given below.

Resource	Unit costs	Source
Vaccine fee for service (excluding pneumococcal PCV and MMR catch-up)	£10.06	British Medical Association: Vaccinations fees and arrangements
Vaccine fee for service (pneumococcal PCV)	£15.02	British Medical Association: Vaccinations fees and arrangements
Vaccine fee for service (MMR catch-up)	£5	British Medical Association: Vaccinations fees and arrangements

1.1.11 Economic evidence statements

- One original costing analysis found that for older adults eligible for the PPV vaccine, the cost per additional person vaccinated when community centre vaccinations are available was between £10.64 and £29.30 dependent on the assumptions made in the analysis.
- One original costing analysis found that for children aged 0-5 years the cost per additional child vaccinated when opportunistic emergency department vaccinations are offered was negative i.e. cost-saving in the most favourable scenario, and between £11.42 and £100.13 in other combinations of assumptions in the analysis.
- One original costing analysis found that for people aged 65 years and older the cost per additional person vaccinated when opportunistic emergency department vaccinations are offered was between £10.60 and £18.11 dependent on the assumptions made in the analysis.
- One original costing analysis found that for children aged 0-5 years the cost per additional child vaccinated when nurse home visits for vaccinations are offered was between £62.17 and £113.98 dependent on the assumptions made in the analysis.
- One original costing analysis found that for people aged 65 years and older the cost per additional person vaccinated when nurse home visits for vaccinations are offered was between £34.64 and £40.93 dependent on the assumptions made in the analysis.
- One original costing analysis found that providing additional hours for vaccination services, such as extended hours, weekend services and clinics alongside hospitals, were likely to be associated with a significant resource impact. The total annual cost varied between £345,744, and £73,805,472, in the combinations of assumptions for number of additional hours (2-6 per month), region served (per local authority or per GP surgery) and staff members available (GP, GP nurse or pharmacist).

1.1.12 The committee's discussion and interpretation of the evidence

This discussion includes consideration of the qualitative evidence that specifically covers access from evidence review B (summarised above) as well as the quantitative evidence presented in this review.

The outcomes that matter most

The protocol's 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, and in some cases, such as where letters are posted out to eligible people, a person may not actually receive the invite but it could still be counted as an offer.

The quality of the evidence

The committee noted that the quality of the quantitative evidence ranged from moderate to very low as assessed using GRADE. This was due to downgrading for risk of bias due to methodological issues in the ways the studies were designed or carried out, or poor reporting. Many of the studies did not provide information about how data was collected, or they lacked blinding of staff during data collection leading to a risk of bias.

The evidence was provided by a mixture of RCTs, cluster RCTs (cRCTs), cohort studies and before and after studies. Following the review protocol, the cohort and before and after studies were not analysed in the same meta-analysis as any RCTs or cRCTs with similar

interventions and comparators. However, these studies showed similar results to the RCTs and cRCTs in that the use of an access intervention was associated with an increase in vaccine uptake compared to control. This was also the case for access versus reminders interventions where the results across the different study types consistently showed that there was greater vaccine uptake with the access intervention compared to the use of a reminder.

The committee noted that the pooled results from the meta-analyses of access interventions compared to reminder interventions and opportunistic emergency department vaccination versus control were the only results (from vaccine specific studies). that did not favour access interventions over the comparator. In both cases the pooled result could not differentiate between the interventions and there was a lot of inconsistency (I^2 = 91% or more) due to heterogeneity between the studies. For example, for the access compared to reminders interventions summary plot the studies looked at 2 different types of access interventions (home vaccination and emergency department vaccination) compared to reminders for parents and GPs respectively. However, when the studies were analysed separately by intervention type both sets of results favoured the access intervention.

The committee noted that the identified studies only looked at using a different setting for vaccinations (at school, during home visits) or opportunistic vaccination (at the emergency department or during a hospital visit). None of the included studies looked at expanding existing clinic hours or using weekend walk in clinics, out of hours clinics, drop-in clinics or running vaccination clinics in parallel with regular appointments. Some of the identified studies compared two different locations for vaccination. Other studies compared the effect of a particular vaccination setting to the use of reminders for GPs or individuals or involved a combined intervention with vaccination in an alternative setting plus education or reminders compared to a control.

Although Daniels 2007 looked at education and vaccinations at Church compared to education and reminders at Church, the educational components of the 2 interventions were not identical. The committee therefore agreed that this study could not be analysed in the access versus reminder category as the presence of education in each arm could not be taken to be a shared background intervention. In contrast, both arms of Kaul 2019 involved the same community education programme and this study was classified as school-based vaccination versus usual practice.

Two of the studies looked at school-based vaccination of 11-18 years olds compared to control (Kaul 2019) or community-based vaccination (Federico 2010). The committee noted that the HPV vaccination rates in these studies were very low at 12% and 28% respectively and were not comparable to UK levels of uptake. In 2018/2019, 83.9% of year 9 girls completed their 2-dose HPV vaccination in the UK and the majority of these vaccinations would have been administered at school. In the case of Kaul 2019, this low level of vaccination could perhaps be linked to the target population as the study was carried out in an underserved area of Texas and involved the vaccination of uninsured as well as insured teenagers. The parents of uninsured teenagers may not have been aware that they could obtain free vaccination or that the vaccine administration charge would be covered by the researchers.

The committee noted that the study comparing GP vaccination of 0-5 year olds to vaccination at community child health clinics (Li 1991) was very old and that there had been significant changes in general practice in the UK since the study was carried out. Therefore, they agreed that this study could no longer be considered relevant.

The committee discussed the results for the non-vaccine specific multicomponent interventions that contained an access component. They noted that in some cases, the intervention was associated with an increase in vaccine uptake, but that this was not seen in all cases. Due to the variation between the interventions it was not possible to attribute any effects specifically to the access component so the committee agreed to focus on the

evidence from vaccine specific interventions when making recommendations. However, they agreed that although studies were not vaccine specific in their aims, they could represent situations where other contacts by healthcare practitioners are used to provide vaccinations and so it was reasonable to include them in the evidence base.

Advantages and disadvantages

Making vaccination services accessible and tailoring to local needs

The committee discussed the quantitative and qualitative evidence. They noted that many of the barriers relating to access raised in the qualitative evidence were linked to facilitators and that some of facilitators were reflected by the quantitative evidence (such as using different locations for vaccinations or offering opportunistic vaccinations). These links are summarised in Figure 1. However, the barrier of a lack of familiarity with the NHS raised by some Gypsy, Roma and Travellers and Polish and Romanian immigrants that reduced their ability to navigate the system to access healthcare lacked a corresponding facilitator. The committee were confident that this has been addressed by the recommendations made as part of the education and reminders review (see evidence review E) that people who come from outside the UK should be given details about the NHS vaccine schedule and help to access healthcare if needed. Therefore, they agreed that no additional recommendations were required to address this barrier to access. In addition, they noted that some barriers such as difficulty travelling to clinics with many children and problems with booking and attending appointments were reported by specific populations while others applied more generally (for example, inflexible clinic hours).

The committee agreed that in an ideal world, vaccinations would be available in a very wide range of places and at all times because when people have easy access to vaccinations and are offered them in person they are more likely to be vaccinated than if they are referred elsewhere. The evidence from the studies included in this review supported the view that improving access increased vaccine uptake. However, the committee agreed that improving access alone was insufficient to increase vaccine uptake in the absence of other necessary factors, such as being able to identify eligibility, the provision of information/ education to staff and patients and having the infrastructure in place to administer the vaccinations. In addition, the committee agreed that it was important to be aware that increasing the number of locations and available hours for vaccination might not increase uptake overall if this displaced vaccinations between settings for people who would be vaccinated in the usual settings and during normal hours otherwise. To prevent this from happening, the committee agreed that it was essential to tailor any additional services to local needs to target the minority of people who would not be vaccinated otherwise.

The committee discussed how different areas are likely to have different needs based on the characteristics of their local populations, such as whether they include Gypsy, Roma and Travellers, religious communities, or covered areas with high levels of socioeconomic deprivation. They agreed that vaccination services should be tailored to the needs of the local community and noted that there is guidance on how to do this from the WHO using the TIP approach (Tailoring Immunization Programmes (2019)). However, no quantitative evidence was identified as part of these reviews that looked at the effectiveness of using the TIP approach to design interventions for increasing vaccine uptake in the UK healthcare system and there was limited qualitative evidence that met the qualitative review inclusion criteria. This discussion supported the inclusion of the research recommendation related to the WHO TIP approach that was made as part of the mixed methods review (see Appendix K – evidence review J).

In the absence of evidence to support specifically recommending using the TIP approach, the committee made recommendations to support commissioners and providers in providing vaccination services that are tailored to their local communities. They agreed that commissioners and providers would initially have to identify local population needs and

barriers to vaccine uptake, including which areas or populations have low vaccine uptake before they could design the vaccination services in such a way to address these needs. This process would likely be guided by a Joint Strategic Needs Assessment and also take into account data from other sources, including input from the local communities involved.

The committee noted that from the qualitative review on the barriers to and facilitators for vaccine uptake (evidence review B) there were some barriers that were raised frequently across the different ages/ life stages or thought to have more impact on vaccine uptake. The committee included a box summarising these barriers to uptake in the guideline. They acknowledged that this list only covers a small number of barriers that apply across groups and that people should refer to review B for more details and a fuller list of barriers. However, they hoped that the list would raise awareness of some of the common issues that may prevent people accessing or consenting to vaccinations.

In addition, the committee recognised that it is particularly important to focus on areas of low vaccination uptake because low vaccination rates leave people in these areas more vulnerable to disease and they may already be disadvantaged in other ways. For example, these communities may be of lower socioeconomic status, which is associated with having a higher prevalence of chronic conditions compared to the general population. The committee agreed that targeted interventions should be considered for these areas to overcome local barriers to vaccination that have been identified during the assessments discussed above. However, they recognised that vaccination rates may vary within areas and there could be pockets of low uptake surrounded by other communities with high levels of uptake. The committee therefore recommended that targeted interventions could also be used to address inequalities between population groups. For example, by providing outreach workers to build relationships and trust with specific communities that often have low levels of vaccine uptake, such as Gypsies, Roma and Travellers and thereby facilitate vaccination. This is supported by the qualitative findings from healthcare workers who reported that, due to a lack of funding, their inability to carry out targeted work with Gypsy, Roma and Traveller communities to promote vaccine uptake had been reduced. This had affected the already disadvantaged Roma community particularly badly and meant that rather than being proactive in trying to address inequalities and promote vaccine uptake routinely, the services had become more reactive using catch up campaigns in the case of outbreaks instead.

The committee did not make separate recommendations for specific groups of people who are known to have low vaccine uptake or who are at increased risk of low uptake by name. This was because many of the barriers faced by these groups or communities are shared with each other and, in some cases, with the general population. In addition, there was very limited or no quantitative evidence for effective interventions to increase uptake in these groups of people. The committee therefore took the approach of making recommendations aimed at promoting the identification of local needs and barriers to uptake and then requiring commissioners and providers to design their services in a way that is tailored to address these needs and the inequalities in uptake between population groups. However, the committee agreed that it would be helpful to provide an information box that lists population groups which are known to have or be at risk of low vaccine uptake to highlight the importance of thinking about these groups when commissioners and providers assess local needs and design their services. These groups include people from some ethnic minority groups such as Black, Asian or Eastern European communities; people from some religious communities (for example, Orthodox Jewish communities) and people who live in an area of high deprivation amongst others. Although this list is not exhaustive, it should give providers an indication about which populations may need more consideration when developing vaccination programmes.

The committee agreed that they should not be too prescriptive about what commissioners and providers should do to increase vaccine uptake because that would depend on the individual characteristics of that community. The committee agreed that it is also essential to include input from the local community as part of this process to ensure that vaccination

services meet the needs of the communities and people who will be using them and to help with the identification of local barriers to uptake. They therefore included a cross-reference to the section on involving people in peer and lay roles to represent local needs and priorities in NICE's guideline on community engagement) to help facilitate this collaboration. In addition, they agreed that interventions targeted at areas or communities with low uptake should be developed using a systems wide approach to addressing uptake. This could include involving wider services in the community, such as nurseries, schools, colleges, and community and faith leaders to determine local needs and priorities The committee agreed that by understanding the needs of the local population, commissioners and providers should be able to set up clinics in suitable locations and with suitable hours so that more people can access vaccination services. They noted that providing multiple opportunities for people to be vaccinated is one of the key approaches to achieve higher vaccination rates. These could involve using different locations such as pharmacies or GP surgeries. For people with chronic conditions, which include many people aged 65 years and over, the opportunity to be vaccinated at a clinic that they attend regularly for a condition might be more convenient to them. For most adolescents (and their parents or carers), vaccination of the adolescents at school is likely to be convenient, while maternity services are likely to be convenient for most pregnant women. However, having additional locations may also be helpful, for example, to reach young people who are not attending school, and GPs can also offer vaccinations to pregnant women. In support of this recommendation, the quantitative evidence showed that using different locations for vaccinations were effective at increasing uptake and the qualitative evidence includes using a range of locations for vaccination services as a facilitator of vaccine uptake. The committee also agreed about the need to make booking systems accessible to everyone (see below in the section about other factors the committee took into account for further details). The committee discussed using additional settings for vaccinations further. They noted that in Ginson 2000 vaccination with education by a hospital pharmacist was effective at increasing uptake in the people aged 65 year and older compared to control. People aged 65 and over also agreed that providing vaccinations at community pharmacies would be convenient because they attend them regularly and they can be closer to home than their GP in the qualitative evidence. Using community pharmacies as vaccination venues could lead to increased uptake for this age group and possibly for other age groups/ life stages too. However, the committee acknowledged that funding many different locations for vaccinations could lead to a reduction of funding for immunisations by GPs, who currently play a significant role in coordinating invitations, reminders and administering vaccinations for many age groups/life stages. Providing vaccines in a number of different locations may also make it difficult to predict how many people will present at each location to be vaccinated. This could cause issues with stocking vaccines, with the risk of services either being left with unused stock or under-ordering to avoid this. This is something that providers and commissioners should consider if they decide to provide a wider range of vaccination settings, to ensure that each location can plan based on the number of people who are expected to attend their service. In addition, the committee noted that if vaccinations are carried out in multiple settings, then it is important to ensure that systems are in place to update records held by GPs and CHIS (where appropriate) (see review A on identification and recording of eligibility and status for more details).

In some areas with hard-to-reach communities, non-healthcare settings, such as community centres, places of worship (such as mosques or churches) or faith-based community centres could be appropriate venues for vaccination. The evidence highlighted how the use of Church-based vaccination with education increased the numbers of vaccinations for over 65 years olds compared to reminders and education (Daniels 2007). However, the Church-based intervention did not involve the Church leader in the vaccination process. The committee thought that, as a trusted individual, Church leaders could provide additional encouragement for vaccination in these settings if suitably engaged. Community vaccination clinics may also be suitable for groups of people who find it hard to attend GPs, such as some Gypsy, Roma and Travellers or people who live in remote locations and lack transport.

The committee also observed that some vaccination services have successfully used buses that visit carparks at schools and supermarkets as venues for vaccination. Due to the limited evidence in support of community vaccination and the potential costs of establishing and running these clinics, the committee agreed to make a weaker recommendation in favour of these and left the choice of which options might be suitable to the commissioners and providers.

An additional barrier to vaccination that was identified from the qualitative evidence was inflexible clinic hours. The corresponding facilitators to vaccination included out of hours clinics and drop-in clinics which also operated at weekends. The committee noted that most NHS services operate during working hours and agreed that it would be helpful to provide weekend, extended hours and out-of-hours vaccination services for people who may find it difficult to attend at other times. However, in the absence of quantitative evidence to support these changes and due to the cost implications of paying for staff to provide these clinics, the committee decided that this should also be a weaker recommendation.

Out-of-hours services are already provided by practice nurses in some areas, but funding for out-of-hours vaccinations may not be available everywhere. The committee agreed that it would not be necessary to provide these services at every GP surgery and that it might be more efficient to have a centralised service in each local area instead. In addition, they agreed that adding the option to be vaccinated to existing out of hours services was likely to be more cost effective than establishing new out of hours clinics because bundling out of hours services together could also facilitate opportunistic vaccination and reduce staffing costs compared to separate services.

The qualitative evidence highlighted an additional barrier to accessing vaccinations relating to the difficulties that some people faced in registering with a GP. This includes people who do not have a fixed address or those who do not have certain documentation to provide proof of identity. This finding was further supported by evidence from the COVID review (see the call for evidence document K) where some immigrants reported difficulties registering with a GP or concerns about not having the correct documentation or proof of immigration status. However, the committee noted that these issues should not be a barrier to vaccination as neither a fixed address nor proof of identity are required to register with a GP, as indicated by the British Medical Association guidance. The committee therefore decided to include a recommendation highlighting that primary care providers should follow contractual obligations and best practice in relation to patient registration. Using home visits for vaccination

The committee had already reviewed the evidence for invitations and reminders made recommendations to cover the use of these interventions (see evidence review C). As part of this process the committee had recommended that providers discuss the reasons why people have not been vaccinated and respond to any issues they raise. The committee noted that these issues may include difficulties in accessing services and that these difficulties may remain for some people, despite having multiple locations and out of hours sessions.

The committee recognised that in some cases people may not be able to attend primary care or other vaccination services. This could include people who are housebound or have caring responsibilities, people in care homes, looked after children, people with mental disabilities, and people who struggle with transportation costs. In these circumstances home visits might be necessary. The benefits of home visits to administer vaccines for certain people was supported by the quantitative evidence showing that vaccine uptake was increased with home vaccination in comparison to control in people aged 65 years and older and in comparison to reminders for parents of children aged 0-5 years. The qualitative evidence also supported the use of home visits in some cases where attendance in primary care was potentially problematic, such as for some Gypsy, Roma and Travellers. However, the committee acknowledged that providing home visits could take up considerable time and resources and so people who can attend GPs or other clinics should be encouraged to do

so. The committee therefore restricted the recommendation for home visits to people for whom travelling to services is the barrier to vaccination.

As well as discussing vaccinations during these home visits, the committee agreed that it would be most effective to offer the vaccinations there and then if possible rather than just providing a reminder and offering vaccination later. This inference is supported by the results of several studies that showed that offering vaccination was more effective at increasing uptake than using reminders. This is presumably because people are more likely to be vaccinated on the spot if offered rather than if they have to actively seek out vaccination. Bond 1998 specifically look at home visits and found that a nurse vaccinating young children at home was more effective at increasing vaccination rates than reminding the parents of unvaccinated children. However, they acknowledged that this may not always be possible and, in these cases, a convenient time for vaccination should be arranged instead to ensure that the person is vaccinated.

The committee noted that people who are housebound with a social care package would normally be identified by primary care providers and that this would facilitate home visits for vaccination. However, to ensure that all housebound people are identified the committee recommended nominating a named immunisation lead in each practice to be responsible for this process. This could involve the use of a housebound register.

The committee agreed that other groups of people who may not attend primary care, perhaps due to a lack of familiarity with how the NHS works or difficulties in making or attending appointments (as reported by some immigrants and Gypsy, Roma and Travellers in the qualitative work), may be more efficiently targeted using community vaccination clinics instead of individual home visits (as discussed above).

Opportunistic vaccination

The committee noted the importance of opportunistic identification of eligible people followed by vaccination of a method of increasing uptake. They discussed this extensively while reviewing the evidence for identification and recording of eligibility and status (see evidence review A for more details). As part of this review, they had already made a recommendation to opportunity to identify people eligible for vaccination and this included a number of settings and groups of particular interest (such as looked after children).

The committee discussed how the evidence from this review provide related to the existing recommendation. The evidence demonstrated that opportunistic vaccination in the emergency department (for 0-5 year olds and people aged 65 years and over) and hospital (for 0-18 year olds and people aged 65 years and over) was effective at increasing vaccine uptake. The committee noted that opportunistic vaccinations during hospital visits would be most likely to increase overall uptake for certain groups such as people aged 65 years and over who might not be vaccinated elsewhere, whereas most 0-5 year olds are likely to be vaccinated routinely in other settings. Therefore, for 0-5 year olds they thought that resources might be better targeted at children who missed their routine vaccinations or had them delayed rather than children who are due, but not overdue, to be vaccinated. As a result of this evidence the committee expanded the range of healthcare settings where eligible people could be identified for opportunistic vaccination to include hospitals, emergency departments, inpatient services, rehabilitation services as well as general practice.

Once eligible people are identified, the committee agreed that they should be offered vaccinations at that time. However, the committee noted that some hospitals may not currently have the storage facilities and vaccine supply needed for them to be able to carry out opportunistic vaccinations. It would also be important for them to ensure that the vaccination supply matched usage to reduce vaccine wastage. The committee also recommended that if vaccinations cannot be provided at that time, then the person should be

signposted to vaccination services instead (see evidence review A for more details about the discussion around about what to do following opportunistic indentation of eligible people).

As discussed above, the committee recommended home visits for people who were unable to travel to vaccination services. However, given the resource impact of separate visits for vaccination, they noted that it would be more efficient if vaccinations could be delivered to people at home during other visits for healthcare needs where possible. Taking this into account, the committee specified checking eligibility for vaccination when people are having home visits for healthcare or social care as part of the recommendation about the opportunistic identification of eligible people for vaccination.

The committee also discussed barriers to opportunistic vaccination that they were aware of. These included:

- Contractual barriers stating that GPs should only administer HPV vaccination on request from the patient if they have missed vaccination at school. The committee noted that this is not in the spirit of making every contact count and thought that it would be beneficial if permission could be obtained for HPV vaccinations to be offered at GPs more proactively.
- The committee noted that some community health clinics and other health clinics do not have refrigerators and therefore are not able to store or administer vaccinations currently. This could be addressed by the provision of fridges and vaccines, but trained staff would also be required to administer them, and there would need to be a named person at every clinic who is responsible for vaccine ordering and governance.
- The lack of an integrated record keeping system which makes it hard for eligible people to be identified. They noted that medical record systems in different locations do not generally communicate with each other electronically. The committee noted that the use of Summary Care Records with additional information about routine vaccination status could help overcome this problem. These records can be seen and used by authorised staff in other areas of the health and care system involved in people's direct care. In addition, in the future children should be covered by the Digital Child Health transformation programme. The committee noted that determining vaccination status currently often involves asking the person. If they do not know their vaccination status, the service will generally contact the GP.
- The shortage of staff who have been trained to administer vaccinations.
- The lack of a precedent for offering routine vaccination in settings such as emergency departments. However, tetanus vaccination is carried out in emergency departments currently, and other urgent vaccines are sometimes given such as Hepatitis B for high-risk inoculation injuries. The mechanisms in place to enable these vaccinations could be adapted to facilitate opportunistic routine vaccination as well.

School-based vaccinations and catch-up vaccinations

The committee noted that although vaccination in a school setting was an effective method of increasing HPV vaccination, HPV and other routine vaccinations are already provided in schools for adolescents in the UK. A recommendation about giving vaccinations to children and young people in schools was made to highlight this good practice. An additional recommendation was included to highlight that the organisation and delivery of these vaccinations should be achieved by school age immunisation providers working together with schools. However, some young people miss being vaccinated with their peers and this was reflected in the qualitative evidence. This could be because the young person is absent from school due to sickness, truancy, or on the road if they are part of a Gypsy, Roma or Traveller family. In other cases, the young person may be present but not vaccinated because they lack parental consent (due to a lack of response rather than refusal) despite attempts from the immunisation team to contact the parents. The committee therefore agreed that a system is needed to enable young people who missed being vaccinated to receive the vaccinations

later. They noted that immunisation services in schools already identify and run catch up session for these people and made a recommendation to reflect the importance of these services. This was supported by the results from Altinoluk – Davis 2020, which 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 qualitative evidence from vaccination providers in schools provided support for this approach with facilitators for vaccination of young people who missed their school vaccinations including signposting to services that can provide missed vaccinations, additional clinics in schools and out of hours clinics in other settings. These findings supported the recommendation made in the evidence review J that school age immunisation teams should offer catch-up sessions. This review also contains a research recommendation on this topic.

The committee also noted that children and young people who do not attend school could be targeted for opportunistic vaccination (see review A on identification and recording of eligibility and status for more details).

Cost effectiveness and resource use

The committee recommended that local public health teams should identify local population needs and tailor hours and locations of vaccination services to meet those needs. The committee noted that this is already expected in current practice and is unlikely to be associated with a significant resource burden, as the recommendation is aimed at making this identification and tailoring of services more consistent across the country.

The committee recommended that NHS commissioners and providers should consider introducing targeted interventions in areas with low vaccine uptake to tackle barriers and inequalities. Healthcare providers currently receive funding for delivering vaccines, for example the Item of Service fees paid per vaccination administered in a GP practice, and using this funding to introduce targeted interventions to address health inequalities and barriers to vaccine uptake is not expected to have a significant resource impact.

The committee recommended that multiple opportunities and locations should be provided for people to have their vaccinations at a time and location convenient to them, for example offering vaccination services at more convenient locations such as community pharmacies and GP surgeries. The committee also recommended that a diversity of sites outside of healthcare settings should be considered as settings for vaccination clinics, for example community or faith centres. These alternative settings would address specific local barriers to uptake and may be particularly beneficial in some areas, such as in rural areas. The committee were presented with a costing analysis estimating the cost per additional person vaccinated when vaccination was offered in a faith centre setting, with the resulting cost between £10.64 and £29.30 depending on whether or not the full cost of the intervention is only applied to those people vaccinated, and an alternative cost assuming reduced intervention activities is applied for those who did not receive the vaccine, or where the cost savings from displaced GP vaccinations were included. These costs were also similar to those when vaccination was offered opportunistically in other settings, such as hospitals. The committee felt that the costs associated with increasing uptake by providing these alternative vaccination settings would be offset by the significant savings made by avoiding the care costs associated with outbreaks. Outbreaks require significant staff time and resources to deal with which, as seen in the additional hours costing analysis, are very costly, and have negative health impacts for the population. Additionally, the committee noted that providing these more convenient times and locations for vaccination could save hours of staff time trying to chase up people who have missed vaccinations (e.g. school-aged individuals who have missed vaccination in school due to absence).

The committee discussed the need for providing out-of-hours or weekend vaccination services for people who may find it difficult to attend at other times. A costing analysis was conducted which indicated that if these out-of-hours services for vaccination were additional

services then this would be associated with a significant resource burden, but the committee agreed that the majority of areas have existing out of hours services that vaccinations could feasibly be included in. The committee therefore recommended that provision of vaccination services during weekend, extended hours and out-of-hours settings be considered, and where possible be provided as part of existing out-of-hours provision to contain costs.

The committee discussed home vaccination visits and recommended that home visits to discuss and offer vaccinations be considered for people who have not responded to reminders, recall invitations or appointments. Providing home visits was considered to have a substantial resource impact, so a costing analysis was conducted and presented to the committee to try and quantify these associated costs. Using effectiveness data identified in the systematic literature review, the cost per additional person vaccinated was calculated to be between £62 and £114 for 0-5 year olds and between £34 and £41 for people aged 65 and over Depending on whether or not the full cost of the intervention is only applied to those people vaccinated, and an alternative cost assuming reduced intervention activities is applied for those who did not receive the vaccine, or where the cost savings from displaced GP vaccinations were included. The committee felt that although the costs are high, the proportion of the population that would require home vaccination visits would be small as home visits would be offered only when all other routes to vaccination have been exhausted. The committee also noted that home visits would help to address equality issues by capturing hard to reach groups for vaccination, so this higher cost may be more justifiable.

The committee also recommended that there should be a named person in each practice to identify people that are housebound who need vaccination. This is unlikely to have a significant resource impact as this activity of identifying those people could be undertaken when people register at the practice, or when patients' circumstances change meaning they are housebound. Additionally, some practices already use a housebound register.

The committee recommended that children behind on their routine immunisations be offered vaccination at any opportunity in clinical interaction or, where immediate vaccination is not available, be signposted to vaccination services. Some of these venues for clinical interaction already have the capacity for this, with vaccine storage already present, however this is not the case for all potential clinical interactions. For those clinical interactions where the correct resources/storage are currently in place, there would be no resource implications, as the child is already present at the appointment, and the necessary staff and vaccines are available. In scenarios where this is not the case the individual would be signposted to vaccination services, which would have very low resource implications as it would simply require the practitioner to have knowledge of the appropriate vaccination services available.

The committee discussed school age vaccinations and recommended that these vaccinations should be administered in schools where possible. This is unlikely to have a substantial resource impact, as this is already current practice in most schools and setting up one-off vaccination days to vaccinate children at school is likely to be less resource intensive than contacting and booking appointments for children individually in other settings.

The committee recommended that school aged immunisation teams offer catch-up vaccination sessions to children or young people who are not up to date, and noted that this often happens in usual practice already, so is unlikely to have substantial implications on resource use.

The committee discussed a recommendation to consider having drop-in immunisation clinics within or alongside hospitals, however this is likely to be associated with substantial resource implications, especially if these clinics were to be set up in every hospital. Having a full-time immunisation clinic would require a significant amount of staff time to run. A costing exercise on extended or additional hours of provision estimating the costs associated with additional staff time was presented to the committee who agreed that this was unlikely to be feasible and did not recommend these additional immunisation clinics. The committee noted that the lower cost scenarios were less realistic as they assumed a single additional clinic run by a

single staff member per local authority and that the scenarios that would be useful had a significant resource impact. The committee considered that even if vaccinations were administered by a healthcare assistant to contain costs, a qualified person (e.g. nurse, GP) would still need to be present, thus making this approach more costly.

Other factors the committee took into account

The committee noted that one of the qualitative barriers highlighted in Figure 1 concerned difficulties with booking appointments. They were aware that people have different needs when booking appointments and noted that while many people may find online systems a convenient way to book their vaccination appointments, others may not have access to the necessary technology to use these systems or may not have the skills or ability to use them and may instead need access to a telephone booking system. They therefore recommended that a range of booking options are provided to make booking vaccination appointments as accessible as possible, and that support is available for people that need it to use these systems.

The committee were also aware that some school vaccination clinics now have an online appointment system that could make consenting to vaccinations easier for some people. However, similar difficulties to those discussed above also apply in this setting. To ensure that a range of options are available, the committee made a recommendation to promote the use of digital invitation, information and consent forms for school-aged vaccinations, but included a caveat about providing non-digital options where needed (see evidence review C for additional details).

In other cases, language or literacy issues may be a barrier to accessing vaccinations. This was raised in the qualitative barriers to and facilitators for vaccine uptake (evidence review B). To try to overcome these problems the committee made recommendations about providing information, invitation and any subsequent reminders are given in a format and language; making note of language and literacy needs on GP records. They also cross referred to NHS England's Accessible Information Standard. (See evidence review E for more information about the committee discussions on these points.)

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.

Recommendations supported by this evidence review

This evidence review supports recommendations 1.1.3,1.1.6,1.1.9 -1.1.15, 1.2.9, 1.2.19, 1.3.19, 1.3.24-1.3.25 and 1.3.38. Other evidence supporting these recommendations can be found in the evidence reviews on identification and recording of eligibility and status (evidence review A) and evidence review J on the acceptability and effectiveness of specific interventions.

1.1.13 References – included studies

1.1.13.1 Effectiveness

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1.1.13.2 Economic

None

Appendices

Appendix A – Review protocols

Review protocol to identify effective interventions to improve uptake of routine vaccines.

ID	Field	Content
0.	PROSPERO registration number	Not applicable
1.	Review title	Identifying effective interventions to improve uptake of routine vaccines.
2.	Review questions	What are the most effective interventions for increasing the uptake of routine vaccines?
3.	Objectives	To identify 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	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

		○ quality and outcomes framework ○ 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.
8.	Comparators	• 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)
9.	Types of study to be included	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) 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. 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)	Changes in: • Vaccine uptake (overall for a specific vaccine or vaccines and for each dose where a vaccine is administered in multiple doses)
13.	Secondary outcomes (important 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 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. 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. 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 (evidence review B) 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). 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>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 (in evidence review B), 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 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	Results will be separated into the following for analysis:
		
		• Age/time when vaccine is due:
		  o During pregnancy
		  o 0-5 years
		  o 11 to 18 years
		  o 65 years and older
		
		• Population groups with potential equality issues:
		  o Children excluded from mainstream education (including pupil referral units) and non-attenders.
		  o Care home residents or people in long-term care
		  o Looked after children
		  o Religious groups or groups with special beliefs (e.g. anthroposophical views)
		  o Travellers/ gypsies
		  o Migrants and asylum seekers
		
		• Settings:
		  o care homes (covered above for residents)
		  o hospitals
		  o community versus healthcare
		  o 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:
		
		  o health system level (for example clinical commissioning group [CCG], local authority, regional and national level)
		  o service provider level (for example GP practices, practitioners)
		  o individual level (for example patients or service users including carers)
		  o mixed levels

		• For interventions that use information/ education to increase uptake the results will also be presented for generic versus tailored interventions.		
18.	Type and method of review	☒ Intervention (multicomponent review) ☐ Diagnostic ☐ Prognostic ☐ Qualitative ☐ Epidemiologic ☐ Service Delivery ☒ Mixed method (all other quantitative reviews)		
19.	Language	English		
20.	Country	England		
21.	Anticipated or actual start date	January 2020		
22.	Anticipated completion date	October 2021		
23.	Stage of review at time of this submission	**Review stage**	**Started**	**Completed**
		Preliminary searches	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
		Piloting of the study selection process	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐

		Formal screening of search results against eligibility criteria	☑ ☑ ☑ ☑ ☑	☐ ☐ ☐ ☐ ☐
		Data extraction	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
		Risk of bias (quality) assessment	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
		Data analysis	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
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 Harrisingh • Toby Mercer • Stephen Sharp • Hannah Lomax • Joshua Pink		

		• 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

Systematic review search

An initial search to find systematic reviews identifying interventions to improve uptake of routine vaccinations was run on 23rd and 24th March 2020 and re run on 5th and 6th May 2021. The following databases were searched: Medline, Medline in Process, Medline epubs ahead of print, Embase, Emcare and Psycinfo (all via the Ovid platform), Cochrane Database of Systematic Reviews (via the Wiley platform), Database of Abstracts of Reviews of Effects (DARE, via the Centre for Reviews and Dissemination platform), Applied Social Sciences Index and Abstracts (ASSIA), British Nursing Index, Sociological Abstracts and Educational Resources Information Center (ERIC, all via the Proquest platform). The Medline strategy is shown below. Health-evidence.ca study design filters were applied where appropriate. The search was limited to studies published after 1990 in the English language.

1..12.2.1 exp Vaccination/
2 exp vaccines/
3 exp Immunization programs/
4 vaccin*.tw.
5 exp Immunization/
6 (immunis* or immuniz*).tw.
7 (immunologic* adj4 (sensitiz* or sensitis* or stimulation*)).tw.
8 (immunostimul* or variolation*).tw.
9 or/1-8
10 (uptake or ((64egional* or improv* or rais* or higher) adj8 (rate* or 64egion* or vaccin* or complian*))).tw.
11 9 and 10
12 (MEDLINE or pubmed).tw.
13 systematic review.tw.
14 systematic review.pt.
15 meta-analysis.pt.
16 intervention$.ti.
17 or/12-16
18 11 and 17
19 animals/ not humans/
20 18 not 19
21 limit 20 to 64egiona language
22 limit 21 to ed=19900101-20200323

Common terms for primary studies searches

Focussed searches were run to identify evidence on themed groups of interventions between June 2020 and February 2021 to supplement systematic reviews retrieved by the overarching systematic review search. These were rerun in April 2021.

The Medline version of the population terms used in all searches is shown below.

1..12.2.2 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 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/ (65237)
45 43 or 44

A NICE in house geographic filter to limit studies to OECD countries was applied where appropriate. The Medline version is shown below

1. 65egionals65d/ or exp 65egion/ or 65egiona/ or 65egiona/ or 65egionals regions/ or argentina/ or exp asia, central/ or exp asia, northern/ or exp asia, southeastern/ or exp 65egional islands/ or 65egiona/ or 65egionals65/ or Bhutan/ or 65egiona/ or borneo/ or “bosnia and 65egionals65d”/ or brazil/ or 65egional/ or exp central 65egiona/ or exp china/ or “commonwealth of independent states”/ or 65egiona/ or “democratic people’s republic of korea”/ or 65egiona/ or 65egionals/ or 65egion/ or exp india/ or 65egionals/ or iran/ or 65egi/

or 66egion/ or 66egion/ or 66egion/ or 66egiona/ or 66egionals66d66a/ or macau/ or "66egionals (republic)"/ or exp 66egionals/ or 66egiona/ or 66egion/ or 66egional/ or 66egionals66/ or 66egio/ or 66egionals66d 66egional/ or new guinea/ or oman/ or 66egional/ or 66egional/ or peru/ or 66egionals66d/ or 66egio/ or "republic of 66egiona"/ or 66egiona/ or exp 66egion/ or 66egio arabia/ or 66egion/ or sri lanka/ or suriname/ or 66egio/ or 66egion/ or exp 66egionals66d66a/ or 66egiona/ or 66egiona/ or united arab emirates/ or exp ussr/ or 66egionals/ or yemen/
2. "organisation for economic co-operation and development"/
3. 66egionals66d/ or exp 66egionals/ or 66egiona/ or exp 66egion states/ or 66egiona/ or exp 66egion/ or chile/ or 66egio republic/ or 66egional/ or 66egion/ or exp 66egion/ or exp 66egiona/ or 66egion/ or hungary/ or 66egiona/ or 66egion/ or exp 66egio/ or exp japan/ or korea/ or 66egionals66/ or 66egion/ or 66egionals66d/ or new 66egiona/ or north 66egiona/ or 66egion/ or 66egional/ or exp "republic of korea"/ or exp "66egionals66d66 and 66egion countries"/ or 66egional/ or 66egional/ or spain/ or 66egionals66d/ or turkey/ or exp united kingdom/ or exp united states/
4. 66egional union/
5. developed countries/
6. or/2-5
7. 1 not 6

The following study designs were applied where appropriate. Medline versions are shown below.

Randomised controlled trials

McMaster balanced filter

1. randomized controlled trial.pt.
2. randomi?ed.mp.
3. placebo.mp.
4. or/1-3

Systematic reviews

health-evidence.ca filter

1. (MEDLINE or pubmed).tw.
2. systematic review.tw.
3. systematic review.pt.
4. meta-analysis.pt.
5. intervention$.ti.
6. or/1-5

Observational studies

Adapted from the NICE in house filter

1. Observational Studies as Topic/
2. Observational Study/
3. Epidemiologic Studies/
4. exp Cohort Studies/
5. Controlled Before-After Studies/
6. Interrupted Time Series Analysis/
7. Comparative Study.pt.
8. (cohort adj (study or studies)).tw.

9. cohort analy$.tw.
10. (follow up adj (study or studies)).tw.
11. (observational adj (study or studies)).tw.
12. longitudinal.tw.
13. prospective.tw.
14. retrospective.tw.
15. or/1-14

Searches were limited to studies published after 1990 in the English language.

Reminder Interventions search

Searches were run on various dates between 26th June and 28th July 2020 and re run on 9th April 2021 in the following databases: Medline, Medline in Process, Medline epubs ahead of print, Embase, Emcare and Psycinfo (all via the Ovid platform), CENTRAL and the Cochrane Database of Systematic Reviews (via the Wiley platform), Database of Abstracts of Reviews of Effects (DARE, via the Centre for Reviews and Dissemination platform), Applied Social Sciences Index and Abstracts (ASSIA), British Nursing Index, and Sociological Abstracts (all via the Proquest platform). The Medline version of the intervention terms are shown below. Population terms, the OECD geographic filter, RCT, systematic review and observational study design filters as described above were used.

1. Reminder Systems/
2. (recall or remind* or prompt* or nudge).tw.
3. (electronic* adj4 invit*).tw.
4. Mobile Applications/
5. exp Internet/
6. exp Cell Phone/
7. exp Computers, Handheld/
8. (app or apps).ti,ab.
9. (online or web or internet or digital*).ti.
10. ((online or web or internet or digital*) adj3 (based or application* or intervention* or program* or therap*)).ab.
11. (phone* or telephone* or smartphone* or cellphone* or smartwatch*).ti.
12. ((phone* or telephone* or smartphone* or cellphone* or smartwatch*) adj3 (based or application* or intervention* or program* or therap*)).ab. (8053)
13. (mobile health or mhealth or m-health or ehealth or e-health or emental or e-mental).ti.
14. ((mobile health or mhealth or m-health or ehealth or e-health or emental or e-mental) adj3 (based or application* or intervention* or program* or therap*)).ab.
15. (mobile* adj3 (based or application* or intervention* or device* or technolog*)).ti,ab.
16. text messaging/
17. (text messag* or sms or short messag* service).tw.
18. electronic mail/
19. (email* or e-mail* or e mail* or electronic mail).tw.
20. Correspondence as Topic/
21. (letter* or correspondence or mail).tw.
22. (iphone* or mobile phone*).tw.
23. pamphlets/
24. (pamphlet* or leaflet* or brochure*).tw.
25. Posters as Topic/
26. poster*.tw.
27. (postcard* or post-card*).tw.
28. or/1-27

Access interventions search

Searches were run between 11 and 17th June 2020 and re run on 9th April 2021 in the following databases: Medline, Medline in Process, Medline epubs ahead of print, Embase, Emcare and Psycinfo (all via the Ovid platform), CENTRAL and the Cochrane Database of Systematic Reviews (via the Wiley platform), Database of Abstracts of Reviews of Effects (DARE, via the Centre for Reviews and Dissemination platform), Applied Social Sciences Index and Abstracts (ASSIA), British Nursing Index, and Sociological Abstracts (all via the Proquest platform). The Medline version of the intervention terms are shown below. Population terms, the OECD geographic filter, RCT, systematic review and observational study design filters as described above were used.

1. exp Health Services Accessibility/
2. (access* or available or availability or convenien* or opportuni*).tw.
3. ((out or extended) adj2 hour*).tw.
4. (drop adj2 in).tw.
5. Community health centers/
6. ((community or public or civic or communal or municipal) adj4 (setting* or venue* or locat* or building* or 68egional* or clinic* or hall* or centre* or center* or space*)).tw.
7. Pharmacies/
8. ((community or retail) adj4 pharmac*).tw.
9. Prenatal Care/ or Perinatal care/ or Maternal Child Health centers/
10. ((prenatal or antenatal or pregnan*) adj4 (care or service* or clinic*)).tw.
11. ((drug or alcohol or specialist or dedicated or “substance abuse”) adj4 (service* or clinic* or care)).tw.
12. exp Community Mental Health Services/ or Substance Abuse Treatment Centers/
13. Libraries/
14. (library or libraries).tw.
15. ((child or children* or leisure or resource or day) adj4 (centre* or center*)).tw.
16. schools/ or schools, nursery/
17. (school* or nursery or nurseries or kindergarten* or “pre school*” or “play group*”).tw.
18. (walk adj1 in adj4 (centre* or center* or clinic* or service*)).tw.
19. ((extend* or weekend or early or evening or commuter) adj4 (clinic* or service* or appointment* or session*)).tw.
20. (“24 hour* “ or “twenty four hour*” or “all day” or “seven day” or “7 day”).tw.
21. exp Home Care Services/
22. adult day care centers/ or exp child day care centers/ or Senior Centers/
23. ((home or domiciliary or day) adj4 (care or visit*)).tw.
24. Self-Help Groups/
25. ((support or self-help) adj4 (group* or meeting*)).tw.
26. Homes for the Aged/
27. exp Nursing Homes/
28. ((residential or nursing or care) adj4 home*).tw.
29. exp Education, Special/
30. (special adj4 (education or school*)).tw.
31. Inpatients/
32. inpatient*.tw.
33. Prisons/ or Prisoners/
34. (prison* or jail).tw.
35. (young adj4 (Offender* or detention)).tw.
36. (youth adj4 (detention or custody)).tw.
37. (juvenile adj4 (offender* or hall or detention)).tw.
38. (HMYOI* or YOI* or STC* or “secure training centre*”).tw.

39. ((secure or correction* or detention) adj4 (accommodation or care or home or centre* or center* or 69egional*)).tw.
40. exp “Emigrants and Immigrants”/
41. ((immigration or immigrant*) adj4 (removal or detention or detain* or accomodat* or hous* or home* or rent*)).tw.
42. 87 Mobile Health Units/
43. 88 ((mobile or outreach) adj4 (clinic* or unit* or service*)).tw.
44. 89 (“making every contact count” or MECC).tw.
45. 90 or/1-45

Education interventions search

Searches were run on 29th October 2020 and re run on 9th April 2021 in the following databases: Medline, Medline in Process, Medline epubs ahead of print, Embase, Emcare and Psycinfo (all via the Ovid platform), CENTRAL and the Cochrane Database of Systematic Reviews (via the Wiley platform), Database of Abstracts of Reviews of Effects (DARE, via the Centre for Reviews and Dissemination platform), Applied Social Sciences Index and Abstracts (ASSIA), British Nursing Index, Sociological Abstracts and ERIC (Educational Resources Information Center) (all via the Proquest platform). The Medline version of the intervention terms are shown below. Population terms, the OECD geographic filter and RCT study design filter as described above were used.

1. exp Communication/
2. ((Vaccin* or 69egion*) adj4 (Communic* or messag* or listen* or negotiat* or persua* or dialogu* or conversation* or question* or discuss*)).tw.
3. ((universal or population or national* or public health or nationwide* or statewide* or countrywide* or citywide* or national* or nation wide* or state wide* or country wide* or city wide* or government*) adj4 (promotion* or campaign* or intervention* or toolkit* or strateg*)).tw.
4. (rais* adj2 awareness adj4 (promotion* or campaign* or intervention* or toolkit* or strateg*)).tw.
5. exp Consumer Health Information/
6. Social Media/
7. electronic mail/
8. Mobile Applications/
9. exp Internet/
10. exp Cell Phone/
11. exp Computers, Handheld/
12. Medical Informatics Applications/
13. Therapy, Computer-Assisted/
14. (app or apps).ti,ab.
15. (online or web or internet or digital*).ti.
16. ((online or web or internet or digital*) adj3 (based or application* or intervention* or program* or therap*)).ab.
17. (phone* or telephone* or smartphone* or cellphone* or smartwatch* or tablet*).ti.
18. ((phone* or telephone* or smartphone* or cellphone* or smartwatch or tablet*) adj3 (based or application* or intervention* or program* or therap*)).ab.
19. (mobile health or mhealth or m-health or ehealth or e-health or emental or e-mental).ti.
20. ((mobile health or mhealth or m-health or ehealth or e-health or emental or e-mental) adj3 (based or application* or intervention* or program* or therap*)).ab.
21. (mobile* adj3 (based or application* or intervention* or device* or technolog*)).ti,ab.
22. (twitter or tweet* or blog* or pinterest or 69egionals or facebook or snapchat).tw.
23. ((text or multimedia) adj messag*).tw.

24. (sms or whatsapp* or email* or “e-mail*” or “electronic mail*” or “e mail*”).tw.
25. exp Mass Media/
26. (media or radio* or television* or tv* or broadcast* or podcast* or newspaper* or magazine* or display* or presentation*).tw.
27. Correspondence as Topic/
28. (correspond* or letter* or mail).tw.
29. Pamphlets/
30. (leaflet* or pamphlet* or booklet* or flyer* or brochure* or handout* or newsletter* or factsheet* or postcard* or banner* or bulletin*).tw.
31. ((print* or written*) adj4 (media or material*)).tw.
32. Health Promotion/
33. ((health or media) adj4 (campaign* or promot*)).tw.
34. Health Knowledge, Attitudes, Practice/
35. Advertising/
36. advert*.tw.
37. Posters as Topic/
38. poster*.tw.
39. Government Publications as Topic/
40. exp Education/
41. ((vaccin* or 70egion*) adj4 (educ* or teach* or instruct* or learn* or “e-learn*” or “ e learn*” or coach* or train* or aware* or inform*)).tw.
42. ((train* or development*) adj4 (inservice or staff or professional)).tw.
43. exp Interpersonal Relations/
44. Hospital Patient Relations/
45. Community Institutional Relations/
46. Community Networks/
47. ((communit* or social) adj4 network*).tw.
48. peer influence/
49. ((peer* or family or families or friend* or professional* or GP* or doctor* or physician* or nurse* or “health visitor*” or midwife or midwives or “social worker*” or leader* or community or communities or teacher* or faith) adj4 (influence* or pressure* or recommend* or advice or advise* or led or support* or educ* or advocat*)).tw.
50. Mentors/
51. (mentor* or “role model*”).tw.
52. hotlines/
53. (champion* or hotline*).tw.
54. House calls/
55. ((house or home) adj4 (call* or visit*)).tw.
56. Self-Help Groups/
57. (group* adj2 (support* or self-help*)).tw.
58. exp Treatment Refusal/
59. Choice Behavior/
60. (decision* adj4 (making or support or aid*)).tw.
61. exp Informed Consent/
62. (informed adj4 (consent or choice* or decision*)).tw.
63. ((vaccin* or 70egion*) adj4 (hesitan* or refus* or trust* or distrust* or accept* or confiden* or reject* or doubt* or decline*)).tw.

Infrastructure interventions search

Searches were run on 28th September 2020 and re run on 9th April 2021 in the following databases: Medline, Medline in Process, Medline epubs ahead of print, Embase, Emcare ,Psycinfo and HMIC (Health Management and Policy Database) (all via the Ovid platform), CENTRAL and the Cochrane Database of Systematic Reviews (via the Wiley platform), Database of Abstracts of Reviews of Effects (DARE, via the Centre for Reviews and

Dissemination platform), Applied Social Sciences Index and Abstracts (ASSIA), British Nursing Index, and Sociological Abstracts (all via the Proquest platform). The Medline version of the intervention terms are shown below. Population terms, the OECD geographic filter and RCT study design filter as described above were used.

1. “Appointments and Schedules”/
2. (appointment* or 71egional* or book* or rebook* or follow-up or follow up).tw.
3. “Organization and Administration”/
4. Health Planning/
5. “Delivery of Health Care”/og or “Delivery of Health Care”/st
6. Organizational Objectives/
7. Community Health Services/og or Community Health Services/st
8. ((service* or system* or team* or practice* or provider*) adj4 (administ* or organis* or organiz* or coordin* or co ordin* or co-ordin* or logistic* or plan* or 71egionals*)).tw.
9. Statistics as Topic/
10. Data Collection/ or Datasets as Topic/ or Data Analysis/ or Data interpretation, Statistical/ or Data Management/ or Electronic Data Processing/
11. exp Clinical Audit/
12. Feedback/
13. (data* or audit* or statistic* or feedback or intelligence or dashboard* or analytics or analysis).tw.
14. Quality Indicators, Health Care/
15. Quality Improvement/og or Quality Improvement/st
16. Quality Assurance, Healthcare/og or Quality Assurance, Healthcare/st
17. (qof* or (quality adj4 (indicator* or outcome* or framework*))).tw.
18. “Facility Design and Construction”/
19. Built Environment/
20. Architecture/
21. ((building* or 71egional* or premises or office* or room* or surger* or environment* or clinic or clinics or setting*) adj4 (design* or construct* or layout* or 71egionals*)).tw.
22. “Treatment Adherence and Compliance”/ or Patient Compliance/
23. Motivation/
24. (incentive* or disincentive* or 71egional*).tw.
25. Punishment/
26. (punish* or fine* or penal* or sanction* or deter* or discourage*).tw.
27. Reward/
28. (reward* or encourage* or attract* or reimburse* or pay or payment).tw.
29. Reimbursement, Incentive/ or Physician Incentive Plans/
30. Mandatory Programs/
31. (71egiona* or compulsory or obligat*).tw.
32. infrastructure*.tw.

Acceptability interventions search

Searches were run on 4th and 5th February 2021 and re run on 12th April 2021 in the following databases: Medline, Medline in Process, Medline epubs ahead of print, Embase, Emcare and Psycinfo (all via the Ovid platform), CENTRAL and the Cochrane Database of Systematic Reviews (via the Wiley platform), Database of Abstracts of Reviews of Effects (DARE, via the Centre for Reviews and Dissemination platform), Applied Social Sciences Index and Abstracts (ASSIA), British Nursing Index, and Sociological Abstracts (all via the Proquest platform). The Medline version of the intervention terms are shown below. Population terms, the OECD geographic filter, RCT, systematic review and observational study design filters as described above were used

1. acceptab*.kw.
2. exp “Patient Acceptance of Health Care”/
3. exp Patient Satisfaction/
4. Choice Behavior/
5. (accept* or prefer* or option* or choice* or choose* or chose* or 72egiona* or tolera*).tw.
6. or/1-5
7. exp Drug Administration Routes/
8. ((subcutaneous* or cutaneous* or intravenous* or inhal* or nasal* or intranasal* or intramuscular* or topical* or oral* or infus* or intradermal*) adj4 (administ* or route* or appli* or dispens* or deliver* or method*)).tw.
9. (inject* or shot* or jab* or patch* or liquid* or drop* or spray* or needle* or syringe*).tw.
10. (dose* or dosage or formulation*).tw.
11. or/7-10
12. exp Physicians/
13. (doctor* or gp* or “general practitioner*” or physician*).tw.
14. exp Nurses/
15. (nurse* or midwife or midwives).tw.
16. Nursing Assistants/
17. ((nurse or nursing) adj2 (aide* or assistant*)).tw.
18. ((healthcare or “health care”) adj2 assistant*).tw.
19. hca*.tw.
20. Pharmacists/ or Pharmacy Technicians/
21. (pharmacist* or (pharmacy adj2 technician*)).tw.
22. or/12-21
23. 11 or 22
24. (uptake or ((72egional* or improv* or rais* or higher) adj8 (rate* or 72egion* or vaccin* or complian*))).tw.
25. 23 and 24
26. 6 or 25

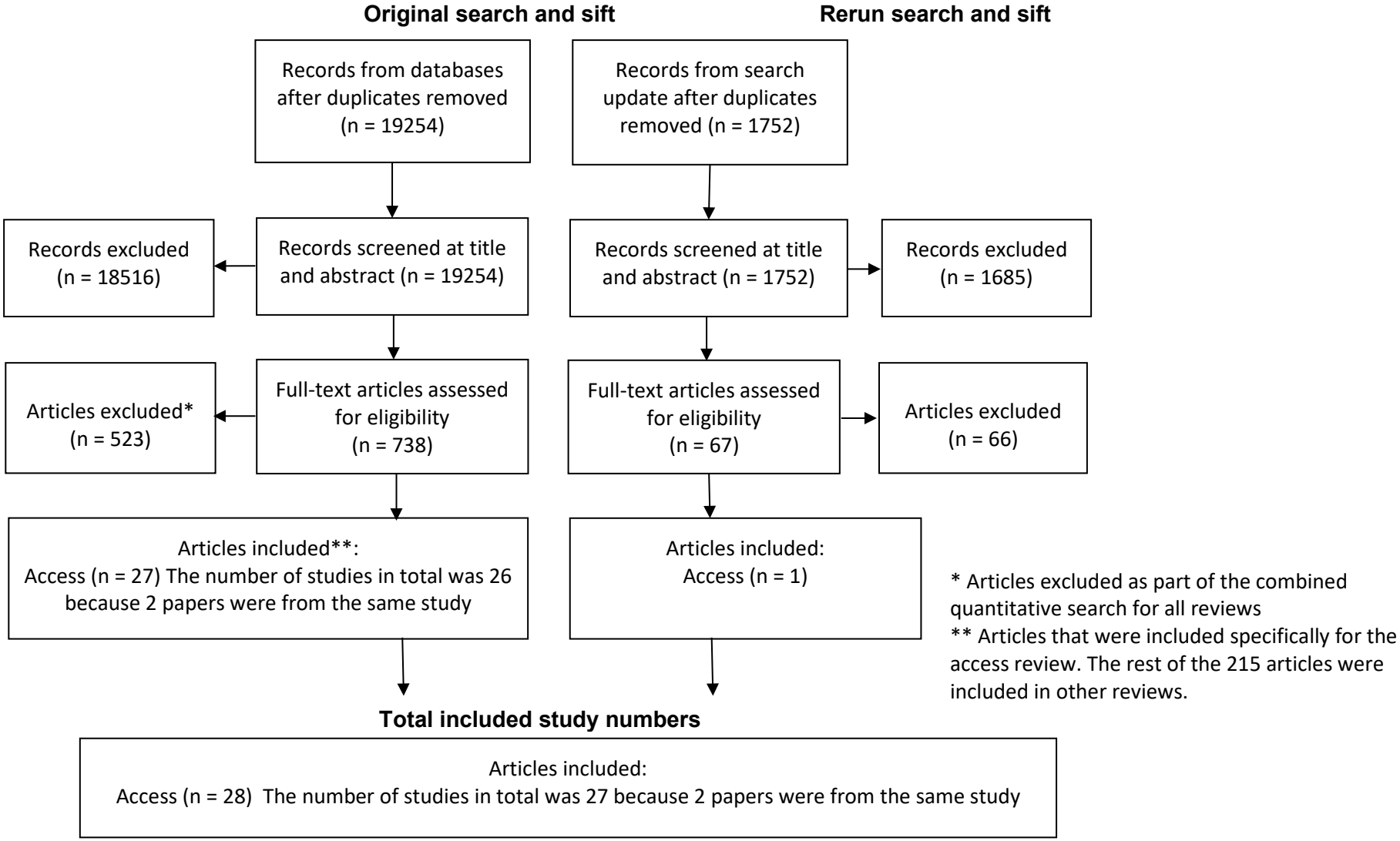
A single search to identify economic evidence for all review questions was run on 12th February 2020.The following databases were searched: Medline, Medline in Process, Embase, Econlit (all via the Ovid platform) NHS Economic Evaluation Database (NHS EED) and the Health Technology Assessment Database (HTA) (via the CRD platform). The searches were re run on 13th April 2021 with the HTA database replaced by the International Health Technology Database (INAHTA). The Medline strategy is presented below

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 animals/ not humans/
47 45 not 46
48 limit 47 to 73egiona language/
49 limit 48 to ed=19900101-20200212
50 afghanistan/ or exp 73egion/ or 73egiona/ or 73egiona/ or 73egionals regions/ or argentina/ or exp asia, central/ or exp asia, northern/ or exp asia, southeastern/ or exp 73egional islands/ or 73egiona/ or 73egionals73/ or Bhutan/ or 73egiona/ or borneo/ or “bosnia and Herzegovina”/ or brazil/ or 73egional/ or exp central 73egiona/ or exp china/ or 73egional/ or “Commonwealth of Independent States”/ or 73egiona/ or “Democratic People’s Republic of Korea”/ or 73egiona/ or 73egionals/ or 73egion/ or exp india/ or 73egionals/ or iran/ or 73egi/ or 73egion/ or 73egion/ or 73egion/ or 73egiona/ or 73egionals73d73a/ or macau/ or “73egionals (republic)”/ or exp 73egionals/ or 73egiona/ or 73egion/ or 73egional/ or 73egionals73/ or 73egio/ or Netherlands Antilles/ or New Guinea/ or oman/ or 73egional/ or 73egional/ or peru/ or 73egionals73d/ or 73egio/ or “republic of Belarus”/ or 73egiona/ or exp 73egion/ or 73egio arabia/ or 73egion/ or sri lanka/ or suriname/ or 73egio/ or 73egion/ or exp 73egionals73d73a/ or 73egiona/ or 73egiona/ or united arab emirates/ or exp ussr/ or 73egionals/ or yemen/ (1062747)

51 australasia/ or exp 74egionals/ or 74egiona/ or exp Baltic States/ or 74egiona/ or exp 74egion/ or chile/ or 74egio republic/ or 74egion/ or European Union/ or exp 74egion/ or exp 74egiona/ or 74egion/ or hungary/ or 74egiona/ or Israel/ or exp 74egio/ or exp japan/ or korea/ or 74egionals74/ or 74egion/ or 74egionals74d/ or new 74egiona/ or north 74egiona/ or 74egion/ or 74egional/ or exp “republic of korea”/ or exp “Scandinavian and Nordic Countries”/ or 74egional/ or 74egional/ or spain/ or 74egionals74d/ or turkey/ or exp united kingdom/ or exp united states/ or “Organisation for Economic Co-Operation and Development”/ or Developed Countries/
52 50 not (50 and 51)
53 49 not 52 (53810)
54 Cost-Benefit Analysis/
55 Quality-Adjusted Life Years/
56 Markov Chains/
57 exp Models, Economic/
58 cost*.ti.
59 (cost* adj2 utilit*).tw.
60 (cost* adj2 (effective* or assess* or evaluat* or analys* or model* or benefit* or threshold* or quality or expens* or saving* or reduc*)).tw.
61 (economic* adj2 (evaluat* or assess* or analys* or model* or outcome* or benefit* or threshold* or expens* or saving* or reduc*)).tw.
62 (74egiona* adj2 adjust* adj2 life*).tw.
63 QALY*.tw.
64 (incremental* adj2 cost*).tw.
65 ICER.tw.
66 utilities.tw.
67 markov*.tw.
68 (dollar* or USD or cents or pound or pounds or GBP or sterling* or pence or euro or euros or yen or JPY).tw.
69 ((utility or effective*) adj2 analys*).tw.
70 (willing* adj2 pay*).tw.
71 (EQ5D* or EQ-5D*).tw.
72 ((euroqol or euro-qol or euroquol or euro-quol or eurocol or euro-col) adj3 (“5” or five)).tw.
73 (74egional* adj2 quality adj3 (“5” or five)).tw.
74 or/54-73
75 53 and 74

Appendix C – Effectiveness evidence study selection



Appendix D – Effectiveness evidence tables

Allison, 2007

Bibliographic Reference	Allison, Mandy A; Crane, Lori A; Beaty, Brenda L; Davidson, Arthur J; Melinkovich, Paul; Kempe, Allison; School-based health centers: improving access and quality of care for low-income adolescents.; Pediatrics; 2007; vol. 120 (no. 4); e887-94

Study details

Study type	Retrospective cohort study
Study location	USA
Study setting	School-based clinics and community clinics
Study dates	2002 to 2003
Sources of funding	National Research Service Award, Health Resources and Services Administration
Inclusion criteria	A specific age group: 14- to 17-year-olds seen at any Department of Health outpatient facility (school-based health clinic, community clinic, urgent care center, emergency department, or specialty clinic). Participants had to be registered at a Denver public school. Specified insurance status: Uninsured or insured by Medicaid or the State Children's Health Insurance Program because these adolescents were "less likely to seek care outside of the Department of Health system".
Exclusion criteria	Specified insurance status: Private or military health insurance Not enrolled at a state school
Intervention(s)	School-based health clinics (SBHCs). SBHCs were designed to provide primary care services for uninsured, underinsured, low-income, and minority children whose access to care is otherwise limited. SBHCs are usually staffed by health care professionals, such as nurses, nurse practitioners, physician assistants, behavioural health specialists, and physicians, who provide physical and mental health services with an emphasis on prevention. All of the students are encouraged to use the SBHC; however, parents must provide consent for their children to enrol to use the SBHC. Although the SBHCs billed students' insurance if possible, they did not require a co-payment or out-of-pocket payment from the student or family. The SBHCs provided preventive and primary health care services including immunisations, mental health services, referrals to specialty services, and access to after-hours telephone advice, urgent care, and emergency services in the DH system. They are designed to provide primary care for those students who do not have a primary care provider and to augment care for those who do. The SBHCs do provide pregnancy testing, diagnosis and treatment of sexually transmitted infections, and family planning and birth control counselling, but students are referred to DH community clinics for prenatal care and contraception management. The SBHCs are open during hours of school operation and are closed during school holidays.
Comparator	Cohort members who used a Department of Health community clinic at least once during the study period but did not use a school-based health clinic. The 9 Department of Health community clinics were open weekdays from 8:30 AM to 5:30

	PM and provided primary health care and preventive services, including contraception management, obstetric services, and access to after-hours services. Some of the community clinics also provided specialty services, including mental health care. Insured patients were often required to provide a co-payment, depending on the type of insurance, whereas uninsured patients paid out of pocket based on a sliding scale system. The SBHCs and community clinics used the same immunization schedule and followed the same Department of Health immunisation protocol.
Number of participants	1715
Duration of follow-up	Not applicable – this was a retrospective study. Adolescents needing a tetanus booster were identified, and receipt of a tetanus booster during the study period was compared between SBHC users and other users.
Loss to follow-up	Not applicable – this was a retrospective study.
Additional comments	The study included participants who either did not attend a Department of Health institution or only attended urgent/emergency department services. However, no tetanus vaccine uptake data was collected for these participants. The study also had data on influenza and HepB vaccination but this was excluded because these are not on the UK routine vaccination schedule for 11-18 year olds.

Study arms

School-based health centre users (N = 790)
Other users (used a community clinic at least once during the study but did not use a school-based health centre) (N = 925)

Characteristics

Arm-level characteristics

	School-based health centre users (N = 790)	**Other users (used a community clinic at least once during the study but did not use a school-based health centre) (N = 925)**
Age *(years)*		
Mean/SD	15.6 (1.1)	15.5 (1.2)
% Female *(%)*		
Nominal	61.4	66.4

Section	**Question**	**Answer**
1. Bias due to confounding	Risk of bias judgement for confounding	Low
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low

Section	Question	Answer
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Serious *(Because SBHC users could use both SBHCs and community clinics, some of the SBHC users' immunisations occurred at community clinics rather than at an SBHC. Among SBHC users, 24.2% of tetanus immunisations occurred at a community clinic.)*
5. Bias due to missing data	Risk of bias judgement for missing data	Low
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Serious *(There was no explanation as to how data was collected. It is possible that effort was required to collect data. Therefore, the effort expended to collect data may have been different depending on which arm the participants were in.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	Serious *(Issues with deviations from intended interventions and data collection.)*
	Directness	Directly applicable

Altinoluk-Davis, 2020

Bibliographic Reference	Altinoluk-Davis F; Gray S; Bray I; Measuring the effectiveness of catch-up MMR delivered by school nurses compared to signposting to general practice on improving MMR coverage.; Journal of public health (Oxford, England); vol. 42 (no. 2)

Study details

Study type	Retrospective cohort study
Study location	UK
Study setting	Schools
Study dates	2000 to 2001
Sources of funding	The study was undertaken as part of a Masters course – no funding was provided.
Inclusion criteria	A specific age group: All adolescents in year 9 (age 13-14 years) A specified area: Bath and North East Somerset, Berkshire, Buckinghamshire, Gloucestershire, Oxfordshire, Swindon and Wiltshire.
Exclusion criteria	None
Intervention(s)	MMR catch-up campaign by school nurses administering the vaccine to adolescents. No further information was provided.

Comparator	MMR catch-up campaign by school nurses signposting adolescents to general practice. No further information was provided.
Outcome measures	Vaccine uptake
Number of participants	27527
Duration of follow-up	Not applicable – this was a retrospective cohort study.
Loss to follow-up	None
Additional comments	MMR uptake data was collected at 3 different time points. For the evidence review, the latest time point was used because these results are summative. Uptake data was collected for 0, 1, 2, and >2 doses. 2 doses was used for the evidence review because this signifies dose course completion.

Study arms

MMR catch-up campaign by school nurses administering the vaccine to adolescents (N = 20936)
MMR catch-up campaign by school nurses signposting adolescents to general practice (reminder) (N = 6591)

Characteristics

Arm-level characteristics

	MMR catch-up campaign by school nurses administering the vaccine to adolescents (N = 20936)	**MMR catch-up campaign by school nurses signposting adolescents to general practice (reminder) (N = 6591)**
% Female *(%)*		
Nominal	50.3	49.5

Section	**Question**	**Answer**
1. Bias due to confounding	Risk of bias judgement for confounding	Low
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Moderate *(MMR uptake at baseline was not quite equal for each arm. This is important given that participant numbers were high and the effect sizes between each arm were small. For example, the percentage of participants who had 0 doses of MMR at baseline was 11.6% for the vaccinations at school arm and 5.6% for the reminders arm. Given the large number of participants, this might suggest there were differences in uptake that were determined by where participants lived because the area where they lived determined which arm they would be in.)*
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low

Section	Question	Answer
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Low
5. Bias due to missing data	Risk of bias judgement for missing data	Low
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	No information
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	Serious *(There was no description as to how uptake data was collected, stored and retrieved. There were baseline differences in uptake between the arms. Serious risk of bias because this is a retrospective cohort study. Therefore, it is prone to bias compared to randomised controlled trials.)*
	Directness	Directly applicable

Aoki, 2020

Bibliographic Reference	Aoki, T.; Fukuhara, S.; Associations of Types of Primary Care Facilities with Adult Vaccination and Cancer Screening in Japan; International journal for quality in health care : journal of the International Society for Quality in Health Care; 2020

Study details

Trial registration number and/or trial name	They used data collected from the primary care organizations reciprocal evaluation survey study (PROGRESS) 2018, which was conducted in a primary care practice-based research network (PBRN)
Study type	Retrospective cohort study
Study location	Japan
Study setting	Hospital and community primary care clinics
Study dates	2018
Sources of funding	Institute for Health Economics and Policy, Japan
Inclusion criteria	A specific age group: Participants aged 20 years or older. Pneumococcal vaccine eligibility age was 65 years of age or older. Received care from a specific organisation: Outpatients who normally received care a primary care facility who participated in the PROGRESS survey Participant matched inclusion criteria for vaccination
Exclusion criteria	None

Intervention(s)	Hospital primary care clinics. Small- and medium-sized hospitals with beds were run by two or more full-time physicians and other healthcare professionals and provided inpatient care in addition to outpatient and possibly home care. No further information was provided.
Comparator	Community primary care clinics. Community clinics were generally run by one full-time physician, nurses and medical assistants, and they provided outpatient and possibly home care. No further information was provided.
Outcome measures	Vaccine uptake
Number of participants	958
Duration of follow-up	Not applicable – this was a retrospective cohort study.
Loss to follow-up	Not applicable – this was a retrospective cohort study.
Additional comments	Data on influenza vaccine was also included in the study but was not included because this is beyond the scope of the protocol of this evidence review.

Study arms

Hospital primary care clinics (N = 337)
Community primary care clinics (N = 621)

Characteristics

Arm-level characteristics

	Hospital primary care clinics (N = 337)	Community primary care clinics (N = 621)
% Female *(%)*		
Nominal	45.1	44
Participants aged 50 years and over *(%)*		
Nominal	75	76

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Low
5. Bias due to missing data	Risk of bias judgement for missing data	Low

Section	Question	Answer
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Serious *(Participants were asked by way of a survey if they had received a pneumococcal vaccination. Participants might not have remembered correctly or filled the form in correctly.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	Serious *(Uptake was self-reported by participants.)*
	Directness	Directly applicable

Beck, 1997

Bibliographic Reference	Beck A; Scott J; Williams P; Robertson B; Jackson D; Gade G; Cowan P; A randomized trial of group outpatient visits for chronically ill older HMO members: the Cooperative Health Care Clinic.; Journal of the American Geriatrics Society; 1997; vol. 45 (no. 5)

Study details

Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	Primary care health centres
Study dates	Not provided
Sources of funding	Garfield Memorial Fund and the Research and Development Fund of the Kaiser Foundation Health Plan of Colorado.
Inclusion criteria	65 years of age or older and had a chronic illness falling into one or more of four categories: heart disease, lung disease, joint disease, or diabetes. Patients were further selected based on relatively high health care utilization patterns within the preceding 12 months, defined as one or more outpatient visits per month and one or more calls to the nurse or physician every 2 months.
Exclusion criteria	None
Intervention(s)	Group visit patients were contacted by the study nurse and scheduled for their initial group visit. Physicians' schedules were modified to incorporate monthly group visits for the 12-month duration of the intervention. Scheduling for future group visits occurred at the first visit. At the first group visit, the health care team was introduced, and ground rules for the groups were established, including participants respecting each others' opinions, responsibility for asking questions, and the importance of keeping the group appointments. Patient concerns about specific health care issues were discussed at the initial visit in order to incorporate them into future discussion topics. A clinical psychologist from the mental health department attended the first three sessions of each group in order to facilitate the bonding of the groups. The general group visit format was as follows: A 15-minute warm up and socialization period, followed by a 30-minute presentation of a specific health-related topic as well as information on disease processes by the physician or one of the members of the interdisciplinary team that supported the Cooperative Health Care Clinic. Topics included medications and drug-related

	problems (presented by a clinical pharmacist), exercise (presented by a physical therapist), nutrition (presented by a dietician), alternate care (for example, skilled nursing facilities), home safety, advance directives, and use of emergency care services. Time was allowed for patient questions and interaction. A 15-minute break in which patients could socialize and refreshments were provided. During the break, the nurse took blood pressure readings, reviewed patients' medical records for immunization status, and determined any immediate care needs and other pertinent medical information. Where necessary, the nurse scheduled individual physician visits for the patient and also completed medical-related paper work requested by patients. The physician circulated, attending to individual concerns raised by the patients. Fifteen minutes were devoted to questions and answers, and another 15 minutes for planning for the next meeting. Thirty minutes were set aside at the end of the visits to allow for brief one-to-one visits with the physician, as necessary. In addition, all patients were given their own summarized medical record to keep and to bring to each visit for review and update by the nurse.
Comparator	No change in medical care occurred for usual care patients. Their healthcare utilization was assessed through data from administrative databases and chart review.
Outcome measures	Vaccine uptake
Number of participants	321
Duration of follow-up	4 months
Loss to follow-up	None
Additional comments	This study was downgraded because we had to infer the intervention from what was written: Monthly group health check with primary care physician and nurse. They reviewed the records, identified those who were not vaccinated and then booked them in for vaccination if needed.

Study arms

Monthly group health check with primary care physician and nurse. Vaccination records were reviewed and vaccination appointments were booked (inferred from what was written) (N = 160)
Usual care (N = 161)

Characteristics

Arm-level characteristics

	Monthly group health check with primary care physician and nurse. Vaccination records were reviewed and vaccination appointments were booked (inferred from what was written) (N = 160)	**Usual care (N = 161)**
Nominal	72	75

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(There was no blinding and the method of measurement was a mixture of database and chart review.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	High *(Issues with defining what the intervention was and measurement of outcome.)*
Overall bias and Directness	Overall Directness	Directly applicable

Birkhead, 1995

Bibliographic Reference Birkhead, G.S.; LeBaron, C.W.; Parsons, P.; Grabau, J.C.; Barr-Gale, L.; Fuhrman, J.; Brooks, S.; Rosenthal, J.; Hadler, S.C.; Morse, D.L.; The immunization of children enrolled in the special supplemental food program for women, infants, and children (WIC): The impact of different strategies; Journal of the American Medical Association; 1995; vol. 274 (no. 4); 312-316

Study details

Study type	Cluster randomised controlled trial
Study location	USA
Study setting	Community
Study dates	1991
Sources of funding	Centers for Disease Control and Prevention
Inclusion criteria	A specific age group: Aged 12 to 59 months A specified area: Families registered at 6 clinics in New York City Participant matched inclusion criteria for vaccination: Measles vaccination
Exclusion criteria	None
Intervention(s)	In accordance with policy, at all study sites the parents and guardians of children eligible for measles immunisation were taught about the complications of measles disease and the importance of measles immunisation. Educational materials were provided in English and Spanish on measles and on immunizations in general. Staff also stressed the importance of immunisations with parents in required group

	educational sessions. The names and telephone numbers of local health care providers where immunisations could be obtained were given to all eligible clients. **Intervention 1:** Escort: Children were accompanied by staff to the paediatric clinic in the same facility for express lane immunisation. Parents were told that vouchers would be available immediately on return from the escort. If there were a temporary contraindication to immunization (for example, high fever), parents were told to return when the child was well enough to be escorted. Staff continued to offer escort at subsequent visits to children who were not successfully escorted at study regionals. Food vouchers were dispersed according to the normal schedule whether families accepted or declined escort. **Intervention 2:** Voucher Incentive: The family returned on a monthly, rather than the normal every-2-months schedule, to pick up food vouchers until the child was immunised. No clients were ever denied at least a 1-month supply of food vouchers.
Comparator	Referral: The vaccination assessment, education, and referral services mandated by policy were provided, but no additional interventions were offered. No further information on reminders was provided. In accordance with policy, at all study sites the parents and guardians of children eligible for measles immunisation were taught about the complications of measles disease and the importance of measles immunisation. Educational materials were provided in English and Spanish on measles and on immunizations in general. Staff also stressed the importance of immunisations with parents in required group educational sessions. The names and telephone numbers of local health care providers where immunisations could be obtained were given to all eligible clients.
Outcome measures	Vaccine uptake
Number of participants	836
Duration of follow-up	8 months
Loss to follow-up	None
Additional comments	This study took place just after a large measles outbreak from 1990 to 1991 at New York City. There was no ICC provided in this study or in another similar study. Therefore, we adjusted the data for clustering using an ICC of 0.05, which was the most common ICC in the education and reminders evidence review. This study features in the access, reminders, and infrastructure evidence reviews.

Study arms

Child was escorted to a nearby paediatric clinic for immunisation + vouchers (N = 377)
Family was offered vouchers for monthly visits until child was immunised (N = 178)
Family was referred for immunisation (N = 281)

Characteristics

Arm-level characteristics

	Child was escorted to a nearby paediatric clinic for immunisation + vouchers (N = 377)	Family was offered vouchers for monthly visits until child was immunised (N = 178)	Family was referred for immunisation (N = 281)
Mother's median age *(years)*			
Nominal	26	26	29

Section	Question	Answer
1a. Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Although no details were provided about the randomisation process, the baseline characteristics were fairly equal for all 3 arms considering that it was a randomisation of 6 clinics.)*
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	Some concerns *(It is possible that lack of blinding and effort required to collect data could have biased the results in the arms in an uneven way.)*
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 *(Some concerns with data collection.)*
	Overall Directness	Partially applicable *(This study began within weeks or months of a major measles outbreak ending in New York City. This is not a normal situation for routine vaccines and it could have influenced uptake.)*

Bond, 1998

Bibliographic Reference	Bond, L M; Nolan, T M; Lester, R A; Home vaccination for children behind in their immunisation schedule: a randomised controlled trial.; The Medical journal of Australia; 1998; vol. 168 (no. 10); 487-90

Study details

Study type	Randomised controlled trial (RCT)
Study location	Australia

Study setting	Community
Study dates	1996
Sources of funding	National Health and Medical Research Council
Inclusion criteria	Overdue a vaccination 90 days late for their third diphtheria-tetanus-pertussis/poliomyelitis Haemophilus influenzae type B vaccination (DTP/OPV/Hib; 1st milestone), or 120 days late for their measles-mumps-rubella vaccination (MMR; 2nd milestone).
Exclusion criteria	None
Intervention(s)	A nurse administered vaccination in the child's home at a time convenient to the parents. Siblings were also vaccinated if they were due for vaccination. The nurse providing the vaccination had completed a standard Victorian Government Department of Human Services immunisation course. A resuscitation kit (including adrenalin) was taken on each home visit, and the cold chain was maintained by transporting vaccines in a temperature-monitored car refrigerator. Before vaccination, the nurse administered a pre-vaccination health checklist to confirm the child's medical history, as obtained during the initial telephone contact, and to assess the child's health on the day of vaccination. Vaccines that were due were verified from the parent-held Child Health Record. The child's temperature was taken if he or she was hot or appeared unwell (a temperature ~ 38.5°C preclude vaccination). Paracetamol was offered to all children before vaccination. The nurse remained with the family for more than 20 minutes after vaccination.
Comparator	Two months after the intervention period, and based on updated information from the Australian Childhood Immunisation Register, they sent letters to parents of control children for whom neither the Register nor local councils had recorded a third DTP/OPV/Hib or an MMR vaccination. They followed the letters with a telephone call to verify vaccination status and to offer, in this case, vaccination at the Royal Children's Hospital. Parents of control children were also informed of local vaccination services offered by the maternal and child health nurse or of the schedules of mobile vaccination vans provided by local councils.
Outcome measures	Vaccine uptake
Number of participants	169
Duration of follow-up	No follow-up period for the intervention group. There was a 2 month follow-up period for the control group after the intervention period.
Loss to follow-up	None
Additional comments	No baseline characteristics for the 2 separate arms were provided.

Study arms

Home vaccination by nurse (N = 81)
Reminder (N = 88)

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low
Domain 2a: Risk of bias due to deviations from the	Risk of bias for deviations from the intended	Low

Section	Question	Answer
intended interventions (effect of assignment to intervention)	interventions (effect of assignment to intervention)	
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	Low
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(There was no blinding and the method of collecting outcome data was not explained. It is possible that bias could have been introduced by the lack of blinding if data collection required effort.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	Some concerns
	Overall Directness	Directly applicable

Bourdet, 2003

Bibliographic Reference	Bourdet SV; Kelley M; Rublein J; Williams DM; Effect of a pharmacist-managed program of pneumococcal and influenza immunization on vaccination rates among adult inpatients.; American journal of health-system pharmacy: AJHP : official journal of the American Society of Health-System Pharmacists; 2003; vol. 60 (no. 17)

Study details

Study type	Prospective cohort study
Study location	USA
Study setting	Hospital
Study dates	2001
Sources of funding	Not provided
Inclusion criteria	A specific age group: People aged 65 years or over or had a different indication for pneumococcal vaccine, such as (aged over 18 years with): diabetes, pulmonary disease, cardiovascular disease, kidney failure or disease, alcoholism or liver disease, compromised immune system. People admitted into hospital
Exclusion criteria	None
Intervention(s)	All adults greater than 18 years of age who were admitted to the general medicine, pulmonary medicine, and infectious diseases services were included in the intervention group and were considered for immunization. A pharmacist assigned to the medical service identified new admissions from daily census reports and screened the patients for indications for influenza and pneumococcal immunization according to the guidelines of the Advisory Committee

	on Immunization Practices. Pharmacists' participation in the vaccination program was voluntary. Initial information was retrieved from the inpatient medical chart and online medical record. Interviews were conducted by the pharmacist for patients with indications for immunisation to determine possible contraindications, to determine vaccination status, and to provide education. During the interview, patients were provided with vaccine information sheets published by the CDC. Because of difficulty in obtaining documentation of prior immunisations, vaccination status was determined by patient recall alone. For patients unsure of their vaccination status, immunization with influenza or pneumococcal vaccine was recommended in accordance with ACIP guidelines. For patients at risk of complications from intramuscular injections (e.g., anticoagulation, thrombocytopenia), the decision to immunize was discussed with the physician, and subsequent vaccination occurred under a physician order rather than a standing order. Vaccination standing orders were completed by the pharmacist for patients who had indications for vaccination, who had no contraindications, and who were agreeable to vaccination. A short form noting the pharmacist's intervention, including the vaccine ordered or the reason for not ordering a vaccine, was completed and placed in the patient's chart. Patients receiving vaccines during hospitalisation were given a wallet card upon discharge with documentation of the vaccines administered and the dates of vaccination.
Comparator	All patients admitted to the renal and gastrointestinal medicine, cardiology, and family medicine services were included in the control group. Control patients were not actively targeted by pharmacists for immunisation but were immunised if this was ordered by the health care provider during usual care. This study involves opportunistic vaccination and therefore involves identification of individuals suitable for vaccination, like a study in evidence review A.
Outcome measures	Vaccine uptake
Number of participants	1050. In the intervention group, there were 442 participants. However, only 214 of these were aged 65 years and over. In the control group, there were 608 participants. However, only 310 of these were aged 65 years and over.
Duration of follow-up	Follow-up data was collected at discharge from hospital.
Loss to follow-up	None
Additional comments	No relevant baseline characteristics were provided for each arm. This study included data for influenza vaccinations that were not used because influenza vaccinations are not part of this evidence review.

Study arms

Opportunistic vaccinations at a hospital (N = 442)
No opportunistic vaccinations at a hospital (N = 608)

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Serious *(The recruitment locations were not equal for each arm: Participants in the intervention arm were on general medicine, pulmonary medicine, and infectious diseases wards. Participants in the control arm were on renal and gastrointestinal medicine, cardiology, and family medicine services. Indications for pneumococcal vaccination include the diseases listed in the inclusion criteria.)*
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Low
5. Bias due to missing data	Risk of bias judgement for missing data	Low
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Serious *(There was no blinding and details as to how data was collected was not provided. Therefore, data collection could have been biased if it required effort.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	Serious *(Issues with patient allocation and data collection.)*
	Directness	Partially Applicable *(Approximately 50% of participants in each arm were below the age of 65 years and were being vaccinated for indications other than age.)*

Conway, 1999

Bibliographic Reference	Conway SP; Opportunistic immunisation in hospital.; Archives of disease in childhood; 1999; vol. 81 (no. 5)

Study details

Study type	Uncontrolled before-and-after studies
Study location	UK
Study setting	Hospital
Study dates	Not provided
Sources of funding	Not provided

Inclusion criteria	A specific age group: 1000 consecutive pre-school children admitted onto a paediatric ward.
Exclusion criteria	None
Intervention(s)	The carers of preschool age children admitted to a paediatric ward were asked by the attending doctor about the immunisation status of their child. This was checked against the child health record book if available, or by telephone contact with the health authority computer database. The latter became routine work for the ward clerk. Where there was a conflict of information, the official record was taken as accurate unless cogent explanations were given for the discrepancy. The ward doctor was instructed to discuss immunisation with the family of any under immunised child and to offer appropriate immunisation on the ward before discharge. Consultants and middle grade staff were asked to emphasise the proactive nature of this policy on ward rounds. When available, reasons for carers refusing catch up immunisation were noted.
Comparator	Vaccination uptake on admission.
Outcome measures	Vaccine uptake
Number of participants	1000
Duration of follow-up	Not mentioned
Loss to follow-up	None
Additional comments	The vaccines that were assessed and offered were not mentioned. Baseline characteristics were not provided. This study involves opportunistic vaccination and therefore involves identification of individuals suitable for vaccination, like an evidence review A study.

Study arms

Pre-existing vaccination levels (before) (N = 1000)
Opportunistic parental education by a doctor and offer of a vaccination (after) (N = 1000)

Section	Question	Answer
Random sequence generation	Was the allocation sequence adequately generated?	NA
Allocation concealment	Was the allocation adequately concealed?	Unclear *(Blinding was not mentioned)*
Baseline outcome measurements	Were baseline outcome measurements similar?	NA
Baseline characteristics	Were baseline characteristics similar?	NA
Incomplete outcome data	Were incomplete outcome data adequately addressed?	NA

Section	Question	Answer
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?	Yes
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 *(There is no mention of how vaccine uptake was recorded. There was no mention of blinding.)*
Overall judgements of risk of bias and directness	Overall risk of bias	High *(Issues with measuring outcomes)*
Overall judgements of risk of bias and directness	Overall directness	Partially applicable *(Relevant vaccines were general for age but were not provided in the methods section.)*

Dalby, 2000

Bibliographic Reference	Dalby, Dawn M; Sellors, John W; Fraser, Fred D; Fraser, Catherine; et, al; Effect of preventive home visits by a nurse on the outcomes of frail elderly people in the community: A randomized controlled trial: CMAJ; Canadian Medical Association. Journal; 2000; vol. 162 (no. 4); 497-500

Study details

Study type	Randomised controlled trial (RCT)
Study location	Canada
Study setting	Community (home visits versus control)
Study dates	Not provided
Sources of funding	Ontario Ministry of Health
Inclusion criteria	A specific age group: People 70 years of age and over A specified area: On the roster of 2 physicians affiliated with a health service organisation in Stoney Creek, Ontario (primary care). Specified health condition(s): Functional impairment or admission to hospital or bereavement in the last 6 months.
Exclusion criteria	Living in a nursing home Involved in another research study Had previously been visited by the nurse in their home Other Had participated in the pre-test of the survey.

Intervention(s)	The visiting nurse used the “functional consequences theory” of gerontologic nursing. The goals are to minimise the negative effects of age-related changes and risk-factors and to promote positive functional consequences. The nurse reviewed each person’s medical record and completed a comprehensive assessment addressing physical, cognitive, emotional and social function, medication use, and the safety and suitability of the home environment. A care plan was developed together with the primary care physician, the patient, the family, caregivers and other health professionals. Follow-up visits and phone calls were conducted as needed over the course of the 14-month trial to provide vaccinations, monitor, promote health and provide psychological support. The nurse served as a case manager by integrating community services and agencies, such as Home Care, into the participants’ care plan.
Comparator	Usual care
Outcome measures	Vaccine uptake
Number of participants	142
Duration of follow-up	14 months
Loss to follow-up	14 participants withdrew from the study in the intervention arm (12 of these were lost to follow-up) and 15 participants withdrew from the study in the usual care arm (10 of these were lost to follow-up).
Additional comments	This study included data for influenza that was not relevant to this evidence review.

Study arms

Visiting nurse (N = 73)
Control (N = 69)

Characteristics

Arm-level characteristics

	Visiting nurse (N = 73)	**Control (N = 69)**
Age *(years)*		
Mean/SD	79.1 (5.8)	78.1 (5.3)
% Female *(%)*		
Nominal	71.2	62.3

Section	**Question**	**Answer**
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(There was no blinding of the people who did the data collection. The data collection required effort and therefore could have been prone to bias.)*
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns with data collection.)*
	Overall Directness	Directly applicable

Daniels, 2007

Bibliographic Reference	Daniels, Nicholas A; Juarbe, Teresa; Moreno-John, Gina; Perez-Stable, Eliseo J; Effectiveness of adult vaccination programs in faith-based organizations.; Ethnicity & disease; 2007; vol. 17 (no. 1suppl1); 15-22

Study details

Study type	Cluster randomised controlled trial
Study location	USA
Study setting	Churches
Study dates	Not provided
Sources of funding	Centre for Aging in Diverse Communities, National Institute on Aging, the National Institute of Nursing Research, and the National Center on Minority Health and Health Disparities.
Inclusion criteria	A specific age group Aged 65 years and over or having clinical indication for vaccination (diabetes, chronic lung disease, cardiovascular disease, chronic kidney disease) People who attend the churches included in the study
Exclusion criteria	None
Intervention(s)	The intervention happened in churches. During the adult vaccine education session component of the intervention, participants learned about influenza and pneumonia vaccines in group discussions that lasted <1 hour. Study participants at sites that were randomised for on-site vaccination were also offered the vaccines, which were administered by the investigators with medical training. All participants were assessed at baseline and during 3- to 6-month follow-up telephone interviews to assess receipt of vaccination.
Comparator	The comparator happened in churches. Those who become part of the comparison group received informational pamphlets, church-based education on adult vaccinations, and physician reminders that participants should see their physicians for vaccinations and watched a slide presentation on benefits and side effects of influenza and pneumococcal vaccinations. All participants were assessed at baseline and during 3- to 6-month follow-up telephone interviews to assess receipt of vaccination.

Outcome measures	Vaccine uptake
Number of participants	186
Duration of follow-up	6 months
Loss to follow-up	None
Additional comments	Only the data for pneumococcal vaccination uptake was extracted because influenza vaccination is covered in a different guideline. Adjusted odds ratio for clustering was not provided. The data was not adjusted for clustering because the number of churches in each arm was not provided. In the study, they provide per protocol analysis results (they did not include participants who had already had a pneumonia vaccine). In the data synthesis of this evidence review, intention to treat results have been calculated.

Study arms

Vaccination at church (N = 113)
Reminders (N = 73)

Arm-level characteristics

	Vaccination at church (N = 113)	**Reminders (N = 73)**
Age *(years)*		
Mean/SD	64 (14)	67 (13)
% Female *(%)*		
Nominal	78	70

Section	**Question**	**Answer**
1a. Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(The method of randomisation was not provided. However, the baseline characteristics of the participants is roughly equal for both arms.)*
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	High *(The methods of education were not the same for both arms.)*
3. Bias due to missing outcome data	Risk of bias judgement for missing outcome data	Low

Section	Question	Answer
4. Bias in measurement of the outcome	Risk of bias judgement for measurement of the outcome	High *(The investigators telephoned the participants to ask them about their vaccination status. This method is less reliable than documentation done at the time of vaccination or use of a vaccine registry. Furthermore, neither the participants nor the investigators were blinded, which could have introduced bias because they knew which arms they were in.)*
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	High
	Overall Directness	Directly applicable

El-Mohandes, 2003

Bibliographic Reference	El-Mohandes, Ayman A E; Katz, Kathy S; El-Khorazaty, M Nabil; McNeely-Johnson, Doris; Sharps, Phyllis W; Jarrett, Marian H; Rose, Allison; White, Davene M; Young, Michal; Grylack, Larry; Murray, Kennan D B; Katta, Pragathi S; Burroughs, Melissa; Atiyeh, Ghassan; Wingrove, Barbara K; Herman, Allen A; The effect of a parenting education program on the use of preventive pediatric health care services among low-income, minority mothers: a randomized, controlled study.; Pediatrics; 2003; vol. 111 (no. 6pt1); 1324-32

Study details

Trial registration number and/or trial name	Pride in Parenting
Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	
Study dates	April 1995 – April 1997
Sources of funding	NICHD, NIH Office of Research on Minority Health
Inclusion criteria	Women who had inadequate or no prenatal care Less than 5 prenatal visits or care initiated in 3rd trimester At least 18 years of age, English-speakers, no history of psychiatric illness, not incarcerated and not planning on placing the baby for adoption
Exclusion criteria	Baby delivered before 34-weeks' gestation, weighed less than 1500 g, or had congenital abnormalities

Intervention(s)	Yearlong intervention including home visits, parent-infant developmental play groups, parent support groups, and monthly support calls from the Pride in Parenting family resource specialist. Home visits, usually weekly, were from a lay home visitor who participated in a 9-week training programme. Home visitors followed a standard curriculum including health and child care topics relevant to the child's age as well as providing health and development information and facilitated use of community health and social services resources. At 5 months of age, home visits alternated with group sessions which included the play groups and parent support groups. Lesson plans for each play group and support group ensured consistency across sites.
Comparator	Standard social services support – Monthly phone calls from a Pride in Parenting family resource specialist who provided referrals to health care, social support services and other community resources
Relevant outcome measures	Vaccine uptake Completion of the immunisation schedule
Duration of follow-up	1 year
Loss to follow-up	4 months – 27.6% 8 months – 34.6% 12 months – 41.6% Numbers not reported for individual arms
Additional comments	Study also reports individual vaccine uptake at 2, 4, 6, 9 and 12 months. Only completion of immunisation schedule at 12 months is included in the analysis for this review because this is the latest time point and is therefore a more summative result.

Study arms

Home visits and parental support (N = 146) Home visits, developmental play groups, parent support groups and monthly support calls
Control (N = 140) Standard social services support

Risk of bias

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Limited information about the randomisation process)*
Domain 2: Risk of bias due to deviations from the intended interventions	Risk of bias for deviations from the intended interventions	Low

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Only 58.4% of participants remained in the trial at 12 months. No information about the proportions missing from each group)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	High *(Limited information about randomisation methods. High number of dropouts by 12 months – no information about how this differed between arms.)*
	Overall Directness	Directly applicable

Federico, 2010

Bibliographic Reference	Federico, Steven G; Abrams, Lisa; Everhart, Rachel M; Melinkovich, Paul; Hambidge, Simon J; Addressing adolescent immunization disparities: a retrospective analysis of school-based health center immunization delivery.; American journal of public health; 2010; vol. 100 (no. 9); 1630-4

Study details

Study type	Retrospective cohort study
Study location	USA
Study setting	School-based health centres and community health centres.
Study dates	2006 to 2008
Sources of funding	Not provided
Inclusion criteria	A specific age group Males and females aged 12 to 18 years A specified area Adolescents who had received care within the Denver Health system.
Exclusion criteria	None
Intervention(s)	Vaccination at school-based health centres. No further details are provided.
Comparator	Vaccination at community health centres. No further details are provided.
Outcome measures	Vaccine uptake
Number of participants	There were 17349 children and adolescents aged 12 to 18 years who received care in the Denver Health system during the study interval: 8144 (47%) at CHCs, 6668 (38%) at SBHCs, and 2537 (15%) at both. After those who used both sites were classified on the basis of which site they visited the most, there were 9132 (53%) CHC users and 8217 (47%) SBHC users.

Duration of follow-up	This was a snapshot of uptake of participants aged 12 to 18 years as they visited health centres from 1/8/2006 to 31/7/2008.
Loss to follow-up	None
Additional comments	Only the HPV and meningococcal results were relevant to the protocol but the data for meningococcal vaccine (MCV4) was not provided in an extractable format. The Tdap, varicella, HepA, and HepB vaccines are not routinely given to 11-18 year olds in the UK. Baseline characteristics were not provided.

Study arms

School-based health centre vaccination (N = 8217)
Community health centre (N = 9132)

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Serious *(No baseline characteristics were provided. Therefore, we do not know whether each arm is a like-for-like comparison. For example, similar ages and genders for both arms.)*
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Serious *(Descriptions of the interventions were not provided.)*
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Serious *(2537 (15%) of participants received both interventions. From study: 'For patients who used both clinical settings, we decided a priori to classify them into either the SBHC group or the CHC group, depending on which clinic they used the most.)*
5. Bias due to missing data	Risk of bias judgement for missing data	Low
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Serious *(The method of data collection was not provided.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	High
	Directness	Directly applicable

Ginson, 2000

Bibliographic Reference	Ginson, S.H.; Malmberg, C.; French, D.J.; Impact on vaccination rates of a pharmacist-initiated influenza and pneumococcal vaccination program; Canadian Journal of Hospital Pharmacy; 2000; vol. 53 (no. 4); 270-275

Study details

Study type	Cluster randomised controlled trial
Study location	Canada
Study setting	Hospital
Study dates	1997
Sources of funding	Not provided
Inclusion criteria	People admitted into hospital Participant matched inclusion criteria for vaccination For pneumonia and/or influenza vaccination: Age >65 years, chronic cardiac or pulmonary disorder, chronic condition, liver cirrhosis, alcohol misuse, immunosuppression due to disease.
Exclusion criteria	Participant had exclusion criteria for vaccine(s) Known anaphylactic hypersensitivity to eggs (influenza vaccine only), acute febrile illness, terminal illness or palliative care, resident of nursing home or chronic care facility, previous receipt of both current influenza vaccine and a pneumococcal vaccine, inability to give informed consent.
Intervention(s)	Patient-focused education and a standing order for vaccination (automatic vaccination). The pharmacist reviewed the benefits and potential side effects of vaccination with each patient, using a pamphlet to highlight relevant information about the vaccines. Material in the pamphlet was based on empirically derived determinants of vaccination behaviour, both cognitive (fear of contracting influenza from the vaccine) and behavioural (transportation and visit time). Patients were informed that both vaccines were available in the hospital and were asked to give written consent to be vaccinated. Eligibility and consent to be vaccinated in the patient's chart, and a conditional order for the appropriate vaccine or vaccines was written by the pharmacist. The order required a physician's signature before the vaccine could be administered. A record of in-hospital vaccination was forwarded to the patient and his or her family physician.
Comparator	No information was provided. Presumably no intervention and usual care.
Outcome measures	Vaccine uptake
Number of participants	102
Duration of follow-up	Vaccination status after the intervention phase of the study.
Loss to follow-up	None
Additional comments	This is a cluster RCT because it was the physicians who were randomised to the arms. The patients they were managing were allocated to arms depending on who their physician was. The data was adjusted for clustering: there were 16 clusters in the intervention arm and 25 clusters in the control arm. No ICC was provided by a cRCT in this evidence review so an ICC of 0.05 was used because this was the most common ICC in the education and reminders evidence review.

Study arms

Vaccine education and offer by hospital pharmacist (N = 50)
Control (N = 52)

Arm-level characteristics

	Vaccine education and offer by hospital pharmacist (N = 50)	Control (N = 52)
Age *(years)*		
Mean/SD	65.6 (17.5)	70.2 (14)
% Female *(%)*		
Nominal	66	67

Section	Question	Answer
1a. Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low
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	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	Some concerns *(There was no blinding of the clinical staff. This could have affected the staff's behaviour in the control arm.)*
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 *(Lack of staff blinding could have affected the advice and prescribing behaviour of clinicians in the control arm.)*
	Overall Directness	Partially applicable *(The intention to treat data included participants who were due to have a pneumonia vaccine or an influenza vaccine. The exclusion criteria included participants who were residents of a nursing home or chronic care facility.)*

Johnson, 1993

Bibliographic Reference	Johnson Z; Howell F; Molloy B; Community mothers' programme: randomised controlled trial of non-professional intervention in parenting.; BMJ (Clinical research ed.); 1993; vol. 306 (no. 6890)

Study details

Other publications associated with this study included in review	Johnson 2000
Trial registration number and/or trial name	Community Mothers Programme
Study type	Randomised controlled trial (RCT)
Study location	Ireland
Study setting	Communities in Dublin
Study dates	6 months in 1989 (exact dates not specified)
Sources of funding	Bernard van Leer Foundation, The Hague
Inclusion criteria	First time mothers who delivered over six months in 1989 and lived in a defined deprived area
Exclusion criteria	None reported
Intervention(s)	Community Mothers Programme – aimed at using experienced volunteer mothers in disadvantaged areas to give support to first time parents using the child development programme. Potential community mothers were identified by the local public health nurse and interviewed by a regional family development nurse to assess suitability. Community mothers were given 4 weeks of training and were given opportunities to meet other community mothers to explore ways of delivering the programme. After training, each community mother worked under the guidance of a family development nurse, who served as a resource person, confidante, and monitor. Each community mother aimed at supporting five to 15 first time parents.
Comparator	Control (usual care). Both groups also received the standard support from their own local public health nurse, which consisted of visits at birth and six weeks and at other times as required. Both groups received invitations to attend for primary immunisations and a development assessment.
Relevant outcome measures	Vaccine uptake Number of children who had received all three shots of their primary immunisations by their first birthday
Number of participants	262
Duration of follow-up	Until the child's first birthday

Loss to follow-up	Intervention: 12, Control: 16
Additional comments	Study also reports individual data on diphtheria-tetanus-pertussis, but this review only analyses number of children who had completed the immunisation schedule by their first birthday

Study arms

Community Mothers Programme (N = 127)
Experienced volunteer mothers trained by public health nurse and visit first-time parents once per month to provide education. Standard support from local public health nurse

Control (N = 105)
Standard support from local public health nurse

Characteristics

Arm-level characteristics

	Community Mothers Programme (N = 127)	**Control (N = 105)**
Mother's age *(years)*		
Mean/SD	24.1 (4.4)	23.1 (3.7)
% Female		
Nominal	51	51

Risk of bias

Section	**Question**	**Answer**
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Most baseline characteristics were similar, with the exception of parents employment. However, the authors controlled for this in the analysis, finding no significant effects on the results)*
Domain 2: Risk of bias due to deviations from the intended interventions	Risk of bias for deviations from the intended interventions	Some concerns *(No information about analysis methods to estimate the effects of assignment to intervention)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Vaccination rates were assessed by questionnaires completed by the parents which could be subjective if the parents were aware of the intervention received. The study states that this was cross-checked with other*

Section	Question	Answer
		sources of information but no further information on what this was)
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	Some concerns *(No information about analysis methods to estimate the effect of assignment to intervention. Vaccine uptake was based on parent reports which could be a subjective outcome)*
	Overall Directness	Directly applicable

Johnson, 2000

Bibliographic Reference	Johnson Z; Molloy B; Scallan E; Fitzpatrick P; Rooney B; Keegan T; Byrne P; Community Mothers Programme–seven year follow-up of a randomized controlled trial of non-professional intervention in parenting.; Journal of public health medicine; 2000; vol. 22 (no. 3)

Study details

Secondary publication of another included study- see primary study for details	Johnson 1993 – 7-year follow-up of the 1993 study
Study type	Randomised controlled trial (RCT)
Relevant outcome measures	Vaccine uptake MMR
Number of participants	Original study children: 721 7 years later, 38 intervention and 39 control parents were located (32.8% of the original sample). They all agreed to participate in a follow-up. At this point, vaccine uptake (Hib and polio) for subsequent children was measured.
Duration of follow-up	7 years after the 1993 study
Loss to follow-up	None

Additional comments	This data was presented separately to Johnson 1993 to prevent double-counting. This is a 7-year follow-up with fewer participants.

Study arms

Community mother (N = 127)

Inclusion criteria	First time mothers

Control (N = 105)

Relevant outcome measures	Vaccine uptake

Characteristics

Arm-level characteristics

	Community mother (N = 127)	Control (N = 105)
% Female *(%)* (infant)		
Nominal	51	51
Single parent family *(%)*		
Nominal	52	62
Percentage in local authority housing *(%)*		
Nominal	56	64

Risk of bias

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Participant characteristics similar for those traced for this study. However, there were some differences in parent employment rates in the 1993 study but this was controlled for and not found to affect the results.)*
Domain 2: Risk of bias due to deviations from the intended interventions	Risk of bias judgement for deviations from the intended interventions	Low

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(Only 32.8% of the original sample could be contacted to take part in the study)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Unclear how vaccine uptake information was obtained. If it was by parent reports then this outcome could be subjective)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Limited information on analysis methods)*
Overall bias and Directness	Risk of bias judgement	High *(A small proportion of the original sample (33%) could be contacted to take part in the follow-up study. Unclear how vaccine uptake data was obtained and limited information about analysis methods)*
	Overall Directness	Directly applicable

Kaul, 2019

Bibliographic Reference	Kaul, S.; Do, T.Q.N.; Hsu, E.; Schmeler, K.M.; Montealegre, J.R.; Rodriguez, A.M.; School-based human papillomavirus vaccination program for increasing vaccine uptake in an underserved area in Texas; Papillomavirus Research; 2019; vol. 8; 100189

Study details

Study type	Prospective cohort study
Study location	USA
Study setting	Schools
Study dates	2016 to 2018
Sources of funding	Cancer Prevention Research Institute of Texas.
Inclusion criteria	A specific age group 6th-, 7th-, and 8th-grade students (aged 11 to 14 years in the USA school system)
Exclusion criteria	None
Intervention(s)	They piloted their school-based HPV vaccination event at the intervention school. Vaccination events were held in the nurse's office or conference room. The events were scheduled for the HPV vaccine series to be initiated and completed during the school year (i.e., back-to-school events, progress report nights, and schedule preview events). Five HPV vaccination events were held between August 2017 and April 2018. Prior to these events, consent forms were sent home with students by school staff. At each vaccination event, 2 tables were set up – one with educational materials and another for the vendor that was contracted by the project to administer on-site vaccinations at the school (ProCare Health Services). The vendor had the parents sign in and complete the consent form for the vaccinations as well as register their child with ImmTrac, the Texas Immunization Registry, to track and document vaccinations. For educational purposes, parents were required to be

	present when the first dose of the vaccine was administered. It usually took less than 10 min for students to get vaccinated. The HPV vaccine was bundled with other recommended vaccines (e.g., flu, Meningococcal, Meningitis B, Tetanus, Diphtheria [TD], or Tetanus, Diphtheria, and Pertussis [TDAP] and Hepatitis A vaccines). The vendor's medical assistants administered the vaccines. Before vaccination, the vendor screened the children for their health insurance coverage (ie, private health insurance, Medicaid, Children's Health Insurance Program [CHIP], Texas Vaccination Program) to bill for vaccine administration. Although uninsured children receive vaccines free of charge through the VFC program, there is a vaccine administration charge. According to county estimates, ~20% of the parents cannot afford to pay the $10 admin fee. Their program covered the administrative fee if the child had no payer. If a child missed a dose, efforts were made to catch up through the supporting clinics and subsequent vaccination events. Their vaccine vendor also provided the student vaccination data, which supplemented the school immunisation records. The vendor collected student vaccination data (vaccine, dose number) during the vaccine administration. All records were refreshed quarterly by the vendor and school. There was also an educational component that was present in both arms of the study: Their educational program was uniformly delivered to stakeholders in the surrounding community. All 3 schools were exposed to the same community-based education program starting in 2016. The educational presentations occurred at school-based (e.g., health fairs, vaccination days, back-to-school nights, Parent-Teacher Association [PTA], school board, and monthly nurse meetings) and community events (e.g., health department events with Starr, Hidalgo, and Cameron; regional conferences; training sessions/workshops). The PowerPoint presentation included details on HPV (e.g., what is HPV, how does it spread, incidence and burden of HPV, HPV vaccine guidelines etc.) and their funded project (e.g., their program's focus on increasing HPV vaccination rates and its significance, importance, components, and goals). The 30-min educational presentations were delivered by the study investigators (1 gynaecologist and 1 oncologist) with time allotted for questions from the audience. A paediatrician was also present to answer questions. They emphasised the benefits of vaccination, the recommended age, and the importance of provider recommendations and distributed existing educational materials in English and Spanish from the Centres for Disease Control and Prevention (CDC). These educational materials were also delivered to paediatric and family health clinics located within a 15-mile radius. When requested at school-based events, parents/guardians received one-on-one education by their study personnel. For school-based events, the researchers posted educational flyers and fact sheets on the importance of getting students vaccinated against HPV. They also used social media (eg, Facebook), local radio stations, and newspapers to provide a description of their program and advertise events.
Comparator	Only the educational components were provided. The school-based HPV vaccination event was not part of the control.
Outcome measures	Vaccine uptake
Number of participants	2307
Duration of follow-up	The latest date at which data was collected (4/25/2018) has been used because this is the largest data set and is the summative data.
Loss to follow-up	None

Study arms

School-based vaccination (N = 885)

Control (N = 1422)

Arm-level characteristics

	School-based vaccination (N = 885)	Control (N = 1422)
Age *(years)*		
Mean/SD	12 (0.9)	12 (0.9)
% Female *(%)*		
Nominal	52	47

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Low
5. Bias due to missing data	Risk of bias judgement for missing data	Low
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Serious *(There was no blinding and the method of collecting outcome data was not explained. It is possible that bias could have been introduced by the lack of blinding if data collection required effort.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	Moderate
	Directness	Directly applicable

Kitzman, 1997

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

Study details

Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	Nurse visits in the community by nurses from an obstetric clinic.
Study dates	June 1990 – August 1991
Sources of funding	National Institute of Nursing Research, the Bureau of Maternal and Child Health, the Administration for Children and Families, the Office of the Assistant Secretary for Planning and Evaluation, the National Center for Child Abuse and Neglect, Robert Wood Johnson Foundation, the Carnegie Corporation of New York, the Pew Charitable Trusts, and the William T. Grant Foundation.
Inclusion criteria	Pregnant women These women were followed-up until their children were 2 years old. Women less than 29 weeks pregnant were recruited if they had no previous live births, no specific chronic illnesses thought to contribute to fetal growth retardation or preterm delivery (for example, chronic hypertensive disorders requiring medical treatment, severe cardiac disease, large uterine fibroids) Sociodemographic risk conditions At least 2 of the following sociodemographic risk conditions: unmarried, less than 12 years of education, and unemployed.
Exclusion criteria	None
Intervention(s)	Two arms of this study were not included in this review because vaccine uptake was not reported. Arms 2 (control for the nurse visit arm) and 4 (nurse visit arm) were relevant to this review. Women in the nurse visit arm were provided free transportation and developmental screening and referral services for the child at 6, 12 and 24 months of age. Women also had intensive nurse home-visitation services during pregnancy, 1 postpartum visit in the hospital before discharge, and 1 postpartum visit in the home. They continued to be visited by nurses until the child's 2nd birthday.
Comparator	Free transportation for scheduled prenatal care plus developmental screening and referral services for the child at 6,12, and 24 months of age.
Relevant outcome measures	Vaccine uptake MMR and DtaP – vaccines up to date at 2 years of age
Number of participants	743
Duration of follow-up	24 months from birth
Loss to follow-up	None
Additional comments	Four arm study but only 2 arms reported vaccine uptake

Study arms

Nurse visits (N = 228)
Free transport for prenatal care, developmental screening and referral services. Nurse home visits from during the pregnancy until the child was 2 years of age

Control (N = 515)
Free transport for prenatal care, developmental screening and referral services

Characteristics

Arm-level characteristics

	Nurse visits (N = 228)	Control (N = 515)
Women who were married *(%)*		
Nominal	1	2
Years of education *(years)*		
Mean/SD	10.1 (2)	10.3 (1.9)
Head of household employed *(%)*		
Nominal	50	57
Mother's age *(years)*		
Mean/SD	18.1 (3.2)	18.1 (3.3)

Risk of bias

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	High *(No information about the randomisation process or allocation concealment)*
Domain 2: Risk of bias due to deviations from the intended interventions	Risk of bias judgement for deviations from the intended interventions	Low
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(Unclear whether data was available for all participants)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(No information about the randomisation process or allocation concealment. No information about whether data was available for all participants)*
	Overall Directness	Directly applicable

Koniak-Griffin, 2003

Bibliographic Reference	Koniak-Griffin D; Verzemnieks IL; Anderson NL; Brecht ML; Lesser J; Kim S; Turner-Pluta C; Nurse visitation for adolescent mothers: two-year infant health and maternal outcomes.; Nursing research; 2003; vol. 52 (no. 2)

Study details

Trial registration number and/or trial name	Early Intervention Program
Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	Community Health Services Division of the County Health Department in San Bernardino, California
Study dates	Not reported
Sources of funding	National Institute of Nursing Research, the Office of Research on Women's Health, NINR
Inclusion criteria	First time mothers 14-19 years of age At 26 weeks gestation or less Planning to keep the baby
Exclusion criteria	Dependent on narcotic or injection drugs Had a documented serious medical or obstetric problem
Intervention(s)	One nurse providing continuous care to her assigned adolescent from pregnancy until 1 year postpartum. Four "preparation-for-motherhood" classes focused on behaviours to promote health during pregnancy, parent-child communication, and the transition to motherhood. Following childbirth, PHNs demonstrated selected components of the Neonatal Behavioural Assessment Scale and provided videotape instruction and feedback to improve parenting behaviours. Teaching and counselling

	were provided for health promotion, life planning, building problem-solving skills, and securing resources such as social support, child care, and health services). The programme was designed to include up to 17 home visits: 2 prenatal, and 15 postpartum (1.5 to 2 hours each).
Comparator	Traditional Public Health Nursing Care – services comparable to those often available in county health departments lacking special funding for adolescent programs. Included 1 prenatal home visit after the participant's entry into the study, and a 2nd visit during the 3rd trimester. Visits focused on (a) assessment and counselling related to prenatal healthcare, (b) self-care, (c) preparation for childbirth, (d) education planning, and € well-baby care, including immunizations. Within 6 weeks postpartum, the PHN made an additional home visit to provide the mother with general information about child care, postpartum recovery, maternal and infant nutrition, home safety, community resources, and family planning.
Relevant outcome measures	Vaccine uptake Infants adequately immunised (4 or more doses of diphtheria-tetanus-pertussis vaccine, 3 or more doses of poliovirus vaccine, and 1 or more doses of measles-containing vaccine were received by 24 months of age)
Number of participants	101
Duration of follow-up	2 years
Loss to follow-up	Not reported

Study arms

Early Intervention Program (N = 56) Public Health nurse home visits – providing care to the adolescent from pregnancy to 1 year postpartum
Traditional Public Health Nursing Care (N = 45) Standard public health care

Characteristics

Arm-level characteristics

	Early Intervention Program (N = 56)	**Traditional Public Health Nursing Care (N = 45)**
Mother's age *(years)*		
Mean/SD	16.75 (1.24)	16.84 (1)
Gestational age at enrolment *(Weeks)*		
Mean/SD	20.67 (5.92)	20.25 (5.12)

Risk of bias

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Limited information about randomisation methods and allocation concealment)*
Domain 2: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	Low
	Overall Directness	Directly applicable

Li, 1991

Bibliographic Reference	Li, J; Taylor, B; Comparison of immunisation rates in general practice and child health clinics.; BMJ (Clinical research ed.); 1991; vol. 303 (no. 6809); 1035-8

Study details

Study type	Retrospective cohort study
Study location	UK
Study setting	General practices and child health clinics
Study dates	1990 to 1991
Sources of funding	North East Thames Regional Health Authority
Inclusion criteria	A specific age group: Children aged 10 to 12 months
Exclusion criteria	Individuals who had incomplete data Children whose data on vaccination location were not available in the child health system.
Intervention(s)	Community child health clinics. No further details of the intervention were provided.
Comparator	General practices. No further details of the intervention were provided.
Outcome measures	Vaccine uptake
Number of participants	3616
Duration of follow-up	Not applicable – this was a retrospective cohort study.

Loss to follow-up	Not applicable – this was a retrospective cohort study.
Additional comments	Data for uptake of the third pertussis dose was used rather than data for uptake of the first pertussis dose because the former is a later and therefore more summative result. The only baseline characteristic provided was number of children registered by type of district, which is included below.

Study arms

Community child health clinics (N = 1114)
General practice (N = 2502)

Characteristics

Arm-level characteristics

	Community child health clinics (N = 1114)	General practice (N = 2502)
Rural/suburban *(%)*		
Nominal	10.2	89.8
Inner city *(%)*		
Nominal	61.6	38.4

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Low
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Low
5. Bias due to missing data	Risk of bias judgement for missing data	Low
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Low
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Low
Overall bias	Risk of bias judgement	Moderate *(Moderate risk of bias because it is a retrospective cohort study and therefore has more innate risk of bias compared to a randomised controlled trial.)*
	Directness	Directly applicable

Norr, 2003

Bibliographic Reference	Norr KF; Crittenden KS; Lehrer EL; Reyes O; Boyd CB; Nacion KW; Watanabe K; Maternal and infant outcomes at one year for a nurse-health advocate home visiting program serving African Americans and Mexican Americans.; Public health nursing (Boston, Mass.); 2003; vol. 20 (no. 3)

Study details

Trial registration number and/or trial name	REACH-Futures
Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	2 prenatal clinics of the University of Illinois at Chicago Medical Center
Study dates	Not reported
Sources of funding	The Agency for Health Care and Policy Research, the National Center for Nursing Research, the Dean's Fund, College of Nursing, University of Illinois at Chicago.
Inclusion criteria	Pregnant women Low-income, inner-city women who lived in community areas with high infant mortality Medicaid or state supplemental health insurance eligibility (income under 150% of poverty), address in a neighbourhood with high infant mortality, medically and obstetrically low risk, and no evidence of current drug use
Exclusion criteria	None reported
Intervention(s)	REACH-Futures. A community worker–nurse team combined the health knowledge of the nurse and the advocates' understanding of the community. All program educational materials were available in English and Spanish. Each team of 1 nurse and 2 health advocates followed 150 families. Families were contacted once a month and more often if necessary. The advocates conducted the first home visit within 2 weeks of discharge. At each visit, the advocate discussed the mother's concerns and problems as well as developmental changes, appropriate parenting, and positive discipline strategies. The advocate also assessed home safety and reviewed infant health. The nurse accompanied the advocate at 1, 6, and 12 months to conduct infant health and development screening. The advocate also helped the mother schedule visits at the health facility. Home visits did not replace regular well-child visits. After 2 months, a phone call could replace visits, with home follow-up if problems were identified.
Comparator	Routine well-child visits at the clinic or provider of the family's choice (standard care).
Relevant outcome measures	Vaccine uptake Immunisations complete at 12 months (based on medical record and mother's reports)
Number of participants	588

Duration of follow-up	12 months
Loss to follow-up	19% (figures not reported per arm)

Study arms

REACH-Futures (N = 258) Home visits and phone contact to discuss mother's questions with nurse and community advocate (182 African Americans, 76 Mexican Americans)
Control (N = 219) Routine well-child visits at the clinic or provider of their choice (standard care) (141 African Americans, 78 Mexican Americans)

Risk of bias

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Limited information about randomisation and allocation concealment)*
Domain 2: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(No information about analysis used to estimate the effect of assignment to intervention)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(No information about missing data)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Limited information about analysis methods)*
Overall bias and Directness	Risk of bias judgement	Some concerns *(Limited information about randomisation and analysis methods. No information about missing data)*
	Overall Directness	Directly applicable

Pearson, 2005

Bibliographic Reference	Pearson, E.; Lang, E.; Colacone, A.; Farooki, N.; Afilalo, M.; Successful implementation of a combined pneumococcal and influenza vaccination program in a Canadian emergency department; Canadian Journal of Emergency Medicine; 2005; vol. 7 (no. 6); 371-377

Study details

Study type	Uncontrolled before-and-after studies
Study location	Canada

Study setting	Emergency department
Study dates	2001
Sources of funding	Programme le Ministere de la Sante et des Services sociaux, Regies 117egionals et Fronds de recherche en sante du Quebec, Brownstein Emergency Department, Armand Afilo, Family Emergency Department.
Inclusion criteria	A specific age group: Aged 65 years and over Specified health condition(s): Chronic disease: cardiac disease, pulmonary disease, renal disease, diabetes, immunosuppression, active cancer, HIV, spleen dysfunction, liver disease/chronic alcoholism.
Exclusion criteria	Participant had exclusion criteria for vaccine(s): Contraindication. Other: Interviewed in the emergency department during a previous visit Unable to communicate (in French or English) Specific medical conditions: Dementia, delirium Unable to sign a consent form. Non-resident of the country where the study took place
Intervention(s)	Opportunistic vaccination at an emergency department. All patients who visited the emergency department between 8am and 4pm during weekdays were screened for pneumonia vaccination eligibility (based on age and chronic disease). A research assistant approached all patients determined to be vaccine eligible. Unvaccinated patients who did not have a clear plan for vaccination elsewhere were offered vaccination in the emergency department. If the patient agreed, a vaccination order sheet was presented to the emergency physician to sign. Once ordered, the study nurse administered the pneumococcal vaccination.
Comparator	Of the 174 (out of 460) who had already been vaccinated, 52% had been vaccinated by a family physician, 20% had been vaccinated at a community health clinic, 6% had been vaccinated during chronic care at a hospital, and 21% had been vaccinated at an ‘other’ location.
Outcome measures	Vaccine uptake
Number of participants	460
Duration of follow-up	Data was collected after the visit to the emergency department.
Loss to follow-up	None
Additional comments	The study collected data for influenza vaccination. However, this data was not used in this review because influenza vaccination is not included in this evidence review. No baseline characteristics were collected by the study authors. This study involves opportunistic vaccination and therefore involves identification of individuals suitable for vaccination like in evidence review A study.

Study arms

Opportunistic vaccination at the emergency department (N = 460)

Section	Question	Answer
Random sequence generation	Was the allocation sequence adequately generated?	NA *(The study included all relevant participants during the recruitment time window.)*
Allocation concealment	Was the allocation adequately concealed?	NA *(The study included all relevant participants during the recruitment time window.)*
Baseline outcome measurements	Were baseline outcome measurements similar?	Unclear *(Baseline characteristics of those already vaccinated and those who were vaccinated in the emergency department were not collected.)*
Baseline characteristics	Were baseline characteristics similar?	Unclear *(This data was not collected)*
Incomplete outcome data	Were incomplete outcome data adequately addressed?	NA *(There was no incomplete outcome data)*
Knowledge of the allocated interventions	Was knowledge of the allocated interventions adequately prevented during the study?	NA *(It is unlikely that knowledge of the intervention would have affected participant behavior before their visit to the emergency department.)*
Protection against contamination	Was the study adequately protected against contamination?	Yes
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 *(The method of data collection was not explained. This could have introduced bias because there was no blinding.)*
Overall judgements of risk of bias and directness	Overall risk of bias	High risk of bias *(Because baseline characteristics were not provided, it is difficult to say how comparable the before and after data are. No explanation of how data was collected and no blinding.)*
	Overall directness	Partially applicable *(The study included people aged 65 years and over as well as people with chronic medical conditions (attending an emergency department). The investigators do not say what proportion were aged 65 years and over.)*

Rodewald, 1996

Bibliographic Reference	Rodewald LE; Szilagyi PG; Humiston SG; Raubertas RF; Wassilak S; Roghmann KJ; Hall CB; Effect of emergency department immunizations on immunization rates and subsequent primary care visits.; Archives of pediatrics & adolescent medicine; 1996; vol. 150 (no. 12)

Study details

Study type	Randomised controlled trial (RCT)
Study location	USA

Study setting	An emergency department and 54 primary care practices in Monroe county, New York.
Study dates	1990 to 1991
Sources of funding	Centres for Disease Control and Prevention
Inclusion criteria	Children of a specific age Aged 6 to 36 months. Participants attended an emergency department
Exclusion criteria	None reported
Intervention(s)	When children attended an emergency department, they were randomised into a primary care reminder arm, emergency department vaccination arm or control groups. The emergency department vaccination arm: Parents of children who were not likely to be up to date with their vaccinations were offered vaccines that likely had not been previously administered and vaccination was not contraindicated. The reminder arm: No intervention in the emergency department. Less than a week later, the child's GP was sent a letter. If there was a chance that they might not be up to date with vaccinations, this was flagged up.
Comparator	No intervention with regards to vaccines.
Relevant outcome measures	Vaccine uptake The outcome was percentage / number of children up to date with their vaccinations. The study mentions diphtheria, tetanus, pertussis, polio, and Hib.
Number of participants	1835
Duration of follow-up	1 month
Loss to follow-up	none
Additional comments	The comparison of reminders vs control is included in the reminders evidence review C. This study involves opportunistic vaccination and therefore involves identification of individuals suitable for vaccination, like an evidence review A study.

Study arms

Primary care reminders (N = 610)
No reminders but offers of vaccinations in the emergency department (N = 611)
Control group: no reminders and no offers of vaccinations in the emergency department (N = 614)

Characteristics

Arm-level characteristics

	Primary care reminders (N = 610)	**No reminders but offers of vaccinations in the emergency department (N = 611)**	**Control group: no reminders and no offers of vaccinations in the emergency department (N = 614)**
Age *(Months)*			
Nominal	18.2	17.5	18

	Primary care reminders (N = 610)	No reminders but offers of vaccinations in the emergency department (N = 611)	Control group: no reminders and no offers of vaccinations in the emergency department (N = 614)
Sex: Female *(%)*			
Nominal	41	45	42

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Blinding was not mentioned. The investigators do not mention how the data for uptake was collected. Therefore, it is difficult to assess bias for data collection.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	Some concerns
	Overall Directness	Directly applicable

Stubbs, 2014

Bibliographic Reference	Stubbs, Brenda W; Panozzo, Catherine A; Moss, Jennifer L; Reiter, Paul L; Whitesell, Dianne H; Brewer, Noel T; Evaluation of an intervention providing HPV vaccine in schools.; American journal of health behavior; 2014; vol. 38 (no. 1); 92-102

Study details

Study type	Prospective cohort study This study involved clustering by way of schools
Study location	USA
Study setting	Schools
Study dates	2009 to 2010
Sources of funding	Guilford County Health Department
Inclusion criteria	A specific age group: Adolescent girls who were eligible for HPV vaccination and who were attending a participating school

Intervention(s)	The intervention was the same as the comparator arm except that adolescents in the intervention arm had a clinic at their school, but adolescents in the comparison arm did not – adolescents and parents had to travel to a school with a clinic. The core intervention team consisted of a project manager, clerical support staff, and a health educator, all of whom were employees of the Guilford County Department of Public Health. The core team assigned school health nurses to staff the clinics and held in-service training sessions for the nurses. The core team devised the information and consent packet for girls to take home to their parents. The packets contained a cover letter approved and signed by the Guilford County health director and Guilford County Schools' superintendent, the HPV and HPV vaccine fact sheet, the HPV vaccination consent form, the HPV vaccination waiver, clinic schedules, a statement that the vaccination clinics would incur no out-of-pocket expense, and an unstamped postcard survey (as described above) for parents declining vaccination. The packets were written at the eighth-grade reading level, and Spanish translations appeared on the back of all materials. The intervention plan was to send the packets home with every girl 2 weeks prior to the first vaccination clinics to allow enough time for the parents to read the packets and make a decision. Parents deciding to vaccinate their daughters at a school-located clinic brought signed consent forms from the packet to the first clinic; vaccinations provided during subsequent second and third dose clinics did not require additional consent. The core team also provided education and outreach. As described above, education was promoted largely by the earlier campaign, "Don't Wait… Educate!" In addition, during the vaccination intervention, a web campaign appeared on the Guilford County Department of Public Health website that provided continuing education and outreach to parents, and the health educator provided educational HPV presentations upon request. Parents also were reminded about the vaccination clinics through ConnectEd, an automated calling service, and the media relations manager promoted the school-located clinics through local media outlets. The clinics had to take place during non-instructional hours. Parents had to be present for all of their daughters' vaccinations, even if the parents signed a consent form. All principals of the host schools (6/6, or 100%) agreed to distribute HPV vaccine information and consent packets directly to the students. The information and consent packets took 2 months to create and receive approval from the local school system senior staff, local health director, and county attorney. Just prior to packet distribution, national media carried a negative story about the safety and potential side effects of the HPV vaccine. The officials who approved the packets asked the investigators to revise them to include a second, separate consent form that parents had to sign acknowledging the possibility of HPV vaccine side effects, including death. Due to concerns that the delayed packet distribution may have contributed to a low number of girls attending the first round of clinics offered in October, the investigators invited girls to receive their first dose of HPV vaccine at any of the clinics already planned in December 2009, and they added 3 second-dose clinics in February 2010 and 3 third-dose clinics in June 2010.
Comparator	The comparator was the same as the intervention except that the adolescents and parents had to travel to a school in the same USA county that had a clinic. Most principals of the satellite schools (15/16, or 94%) agreed to distribute HPV vaccine information and consent packets directly to the students.
Outcome measures	Vaccine uptake

Number of participants	7916
Duration of follow-up	The follow-up period was not provided.
Loss to follow-up	None
Additional comments	Baseline characteristics were not provided for both arms of the study.

Study arms

Schools with clinics (N = 1781) 6 schools had these clinics
Schools without clinics but were nearby a school that had a clinic (a "satellite school") (N = 6135) 14 schools were "satellite schools"

Section	Question	Answer
1. Bias due to confounding	Risk of bias judgement for confounding	Low
2. Bias in selection of participants into the study	Risk of bias judgement for selection of participants into the study	Moderate *(The investigators did not explain how they allocated schools to the clinic or satellite arms.)*
3. Bias in classification of interventions	Risk of bias judgement for classification of interventions	Low
4. Bias due to deviations from intended interventions	Risk of bias judgement for deviations from intended interventions	Low
5. Bias due to missing data	Risk of bias judgement for missing data	Low
6. Bias in measurement of outcomes	Risk of bias judgement for measurement of outcomes	Serious *(The method of data collection is not explained and the duration of follow-up is not provided. For example they did say whether data collection was blinded. The duration of follow-up could have varied depending on the school.)*
7. Bias in selection of the reported result	Risk of bias judgement for selection of the reported result	Moderate *(The investigators collected more data for each arm than just participants who received one dose of HPV or more. For example, they do not provide the data for completion of all 3 doses for each arm separately.)*
Overall bias	Risk of bias judgement	Serious *(There are issues with allocating schools to arms, data collection and selection of the reported result.)*

Section	Question	Answer
	Directness	Directly applicable

Szilagyi, 1997

Bibliographic Reference	Szilagyi PG; Rodewald LE; Humiston SG; Fierman AH; Cunningham S; Gracia D; Birkhead GS; Effect of 2 urban emergency department immunization programs on childhood immunization rates.; Archives of pediatrics & adolescent medicine; 1997; vol. 151 (no. 10)

Study details

Study type	Uncontrolled before-and-after studies
Study location	USA
Study setting	Emergency departments
Study dates	1992 to 1994
Sources of funding	New York State Department of Health, and Strong Children's Research Center.
Inclusion criteria	Pre-school age children (0 to 6.9 years) visiting emergency departments.
Exclusion criteria	None
Intervention(s)	Nurses were hired and trained to work in emergency departments to identify pre-school age children and offer immunizations. The vaccinations offered were: diphtheria, tetanus, pertussis, polio, MMR, Hib, HepB.
Comparator	Vaccine uptake at the start of the visit.
Outcome measures	Vaccine uptake
Number of participants	1301
Duration of follow-up	1 day
Loss to follow-up	None
Additional comments	We used the up-to-date vaccine uptake data at day 1 after the visit to the emergency department. This is because this result provides more accurate ED uptake data compared to the uptake data at 6 months, which would be contaminated by external factors. There were no relevant baseline characteristics. The before (control) data was calculated by us as follows: In the Manhattan group, 106 were vaccinated and 471 were not vaccinated. Of those vaccinated, 20% were already up to date with their vaccinations (20% of 106 = 21 participants). Of those not vaccinated, 74% were already up to date with their vaccinations (74% of 471 = 349). In the Bronx group, 129 were vaccinated and 595 were not vaccinated. Of those vaccinated, 20% were already up to date with their vaccinations (20% of 129 = 26 participants). Of those not vaccinated, 72% were already up to date with their vaccinations (72% of 595 = 428 participants). Therefore, altogether (21+349+26+428=) 824 were vaccinated prior to visiting the emergency departments.

	The number of participants who visited the emergency departments who were not up to date and left up to date was: For Manhattan: 76% vaccinated at day 1 – 20% already vaccinated of 106 participants who were vaccinated in the ED = 60. For Bronx: 70% vaccinated at day 1 – 20% of 129 who were vaccinated in the ED = 65. Therefore, altogether 125 participants were made newly up to date. 125+824 = 949 participants who were up to date in total after the emergency department visit. This study involves opportunistic vaccination and therefore involves identification of individuals suitable for vaccination, like an evidence review A study.

Study arms

After: opportunistic vaccination in emergency departments (N = 1301)
Before: control (N = 1301)

Section	Question	Answer
Random sequence generation	Was the allocation sequence adequately generated?	No
Allocation concealment	Was the allocation adequately concealed?	No
Baseline outcome measurements	Were baseline outcome measurements similar?	NA
Baseline characteristics	Were baseline characteristics similar?	NA
Incomplete outcome data	Were incomplete outcome data adequately addressed?	NA
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?	Yes
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 *(There was no blinding and there was little information on how data was collected.)*
Overall judgements of risk of bias and directness	Overall risk of bias	High risk of bias *(There were issues with data collection.)*
Overall judgements of risk of bias and directness	Overall directness	Directly applicable

Taylor, 1997

Bibliographic Reference	Taylor, J A; Davis, R L; Kemper, K J; Health care utilization and health status in high-risk children randomized to receive group or individual well child care.; Pediatrics; 1997; vol. 100 (no. 3); e1

Study details

Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	Community (home visits) and hospital clinic (group health visits)
Study dates	1993 to 1996
Sources of funding	Center for the Future of Children at the David and Lucile Packard Foundation, and the Stuart Foundation.
Inclusion criteria	Individuals with a specified age (range): 0-4 months old. High risk infants/children: Infants were eligible for the project if their mothers had at least one of the following risk factors: single marital status, education level less than completion of high school, participation in Medicaid (as a proxy for poverty), age less than 20 years at delivery, previous substance abuse, or history of abuse as a child.
Exclusion criteria	Individuals that did not speak English. The primary caregiver was not a biologic parent, or an older sibling received primary care from another provider. Child had a serious ongoing medical condition.
Intervention(s)	**Home visits with 1-to-1 education and vaccination:** Study health supervision visits were scheduled at 4, 5, 6, 8, 10, 12, and 15 months of age. At each visit, the study nurse practitioners followed a curriculum of topics to be discussed that was developed before beginning the project. Children randomized to the control arm received traditional one-to-one health supervision visits at home. Immunizations and health screening were provided to all study children regardless of arm.
Comparator	**Hospital clinic group education and vaccination:** Study health supervision visits were scheduled at 4, 5, 6, 8, 10, 12, and 15 months of age. At each visit, the study nurse practitioners followed a curriculum of topics to be discussed that was developed before beginning the project. Patients randomised to the intervention arm were assigned to a cohort of infants with birthdays within 2 months of each other. Group health supervision visits consisted of a discussion of age-appropriate child-rearing issues, led by a nurse practitioner. Each child received a brief physical examination before or after the group session. Immunizations and health screening were provided to all study children regardless of arm.
Outcome measures	Vaccine uptake

Number of participants	210
Duration of follow-up	Follow-up was at 12 months of age
Additional comments	Originally in this study's paper, the group intervention at the heath centre was the 'intervention' and home visiting was the comparator. We have reversed this in the forest plots and tables so there is greater continuity to the other studies in this review with regards to format and to make the data more comparable. A child was considered to be fully immunized if he or she had received three DTP/DT, two OPV/IPV, three hepatitis B, and three Hib vaccines.

Study arms

Group education, vaccination and health screening led by a nurse (N = 106)
Home health supervision, vaccination, and health screening visits by a nurse (N = 104)

Characteristics

Arm-level characteristics

	Hospital clinic group education and vaccination led by a nurse (N = 106)	**Home visits with 1-to-1 education and vaccination by a nurse (N = 104)**
% of mothers aged <20 years *(%)*		
Nominal	22.5	23
% of mothers aged 20 to 30 years *(%)*		
Nominal	60.7	55.4
% of mothers aged 30+ years *(%)*		
Nominal	16.9	19.6

Section	**Question**	**Answer**
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Although the method of randomisation was not provided, the baseline characteristics of the participants was equally balanced between the 2 arms.)*
Domain 2a: Risk of bias due to deviations from the intended	Risk of bias for deviations from the intended interventions	Low

Section	Question	Answer
interventions (effect of assignment to intervention)	(effect of assignment to intervention)	
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	Low
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(No information was provided as to whether data extraction from the medical records was blinded. Extracting the data would have required effort so there could have been a favourable bias towards the intervention (group) arm.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns with data collection)*
	Overall Directness	Directly applicable

Tarca, 2021

Bibliographic Reference	Tarca, Adrian J; Lau, Gloria TY; Mascaro, Filomena; Clifford, Patricia; Campbell, Anita J; Taylor, Ellen; Pre- and post-intervention study examining immunisation rates, documentation, catch-up delivery and the impact of a dedicated immunisation service at a tertiary paediatric hospital; Journal of Paediatrics and Child Health; 2021; vol. 57 (no. 2); 263-267

Study details

Study type	Uncontrolled before-and-after studies
Study location	Australia
Study setting	Hospital wards
Study dates	2017 to 2018
Sources of funding	Not mentioned
Inclusion criteria	Children aged 0 to 18 years
Exclusion criteria	None
Intervention(s)	After: An immunisation nurse reviewed the immunisation record of all inpatient admissions each weekday for a period of 3 months. An immunisation history was

	then obtained from the legal guardian of all children identified as not up-to-date to confirm immunisation status. Only patients identified as not up-to-date had their AIR status confirmed as AIR is unlikely to falsely report a child as up-to-date due to the requirement for manual recording of immunisations at time of administration. This included sighting the electronic school-based immunisation register and if available, a written immunisation record. Immunisations or a catch-up immunisation plan was provided where required.
Comparator	Before: Control (no hospital immunisation service)
Outcome measures	Vaccine uptake
Number of participants	563
Duration of follow-up	3 months
Loss to follow-up	None

Study arms

Immunisation nurse reviewed patients and administered vaccines (N = 291)
Control (no immunisation service in the hospital) (N = 272)

Characteristics

Arm-level characteristics

	Immunisation nurse reviewed patients and administered vaccines (N = 291)	**Control (no immunisation service in the hospital) (N = 272)**
median age (years)		
Nominal	3.2	2.75

Critical appraisal - ACCESS - GUT EPOC risk of bias tool

Section	**Question**	**Answer**
Random sequence generation	Was the allocation sequence adequately generated?	No *(No randomisation)*
Allocation concealment	Was the allocation adequately concealed?	No *(No blinding)*
Baseline outcome measurements	Were baseline outcome measurements similar?	No *(The intervention arm had 89% of participants vaccinated at baseline. The control had 75%.)*
Baseline characteristics	Were baseline characteristics similar?	Partly

Section	Question	Answer
Incomplete outcome data	Were incomplete outcome data adequately addressed?	Yes
Knowledge of the allocated interventions	Was knowledge of the allocated interventions adequately prevented during the study?	No *(No blinding)*
Protection against contamination	Was the study adequately protected against contamination?	Yes
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?	Yes
Overall judgements of risk of bias and directness	Overall risk of bias	High risk of bias *(No randomisation, no blinding, unequal vaccine uptake at baseline.)*
Overall judgements of risk of bias and directness	Overall directness	Partially applicable *(Vaccines were age-appropriate but the list of vaccines given was not provided.)*

Wilcox, 2001

Bibliographic Reference Wilcox, S A; Koepke, C P; Levenson, R; Thalheimer, J C; Registry-driven, community-based immunization outreach: a randomized controlled trial.; American journal of public health; 2001; vol. 91 (no. 9); 1507-11

Study details

Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	Community (outreach)
Study dates	1997
Sources of funding	Not provided
Inclusion criteria	A specific age group: Children aged 6 to 10 months old A specified area Children in the Philadelphia Department of Public Health KIDS Immunization Database/Tracking System
Exclusion criteria	None
Intervention(s)	Outreach: Two community-based organizations were contracted by the Department of Public Health to provide outreach to specific neighborhoods. Two thirds of the sample received outreach from a bilingual social services agency and one third from a university nursing center.

	Outreach workers used KIDS registry information to locate the family, obtain the immunisation history, and assess whether the child was up to date. If the child was not up to date, the outreach worker helped the family obtain care and updated the registry. In the case of children who were not up to date, outreach workers made an average of 4 attempts to contact the family or the provider. The 2 community-based organisations followed similar outreach procedures, except that the nursing center placed higher priority on the cases of older children and relied more heavily on home visits. The social services agency was more likely to contact providers directly to obtain immunisation histories. In comparison with the nursing centre, the social services agency had a larger and more experienced staff and had less personnel turnover during the study. Neither facility required outreach workers to hold advanced degrees, but the nursing center looked for outreach workers with previous experience in health care.
Comparator	Control: No intervention. No further information was provided.
Outcome measures	Vaccine uptake
Number of participants	991 (There was no information or data on the further 705 participants who were randomised to the reminders only arm)
Duration of follow-up	The duration of the study's "observation period" was not provided.
Loss to follow-up	None
Additional comments	There were no relevant baseline characteristics for each arm. The vaccines that were administered were: DTP, polio, Hib, HepB. There was randomisation to a third arm that were given reminders. However, no description or outcome data (including uptake) was provided for this arm in the study.

Study arms

Outreach by a social worker or nurse and up to 4 unspecified reminders if required (N = 379)
Control (no intervention) (N = 612)
Mailed reminder letter (N = 705)

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Although the randomisation method was not provided, the baseline characteristics are equal for both arms.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(This study had a third arm with 705 participants but there was no information and no data provided about them.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(Uptake data was provided from parents and providers in the outreach arm and from outreach in the control arm after the study period. Therefore, the method of data collection was different for both arms, there was no assessor blinding, and data collection required effort.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	High *(Issues with data collection and missing data from the reminders arm.)*
	Overall Directness	Directly applicable

Wood, 1998

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

Study details

Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	Community (home visits)
Study dates	1994
Sources of funding	Centers of Disease Control and Prevention
Inclusion criteria	A specific age group: Aged 0 to 42 days of life A specified area: Living in 1 of 10 ZIP codes in Los Angeles, which were low income A specified characteristic: African American
Exclusion criteria	Baby died, change of address
Intervention(s)	The case managers conducted in-depth assessments in the home of the child before the infant was 6 weeks of age, with subsequent home visits scheduled 2 weeks prior to when the next immunizations were due. In a family that received all well-child care visits and immunizations on time, home visits would occur when the infants were approximately 3.5 and 5.5 months of age, with a fourth visit being optional. Case managers also followed up by telephone or by home visit after scheduled well-child visits to determine if the family kept the appointment and if the child received the appropriate care. Case managers scheduled more follow-up visits with families that had difficulty in keeping appointments or whose children fell behind in their immunizations. Therefore, the families that were compliant received fewer home visits and had fewer telephone or mail contacts initiated by the case manager. The mean number of home visits was 4.0 (SD 2; range, 0-13), and the mean number of telephone contacts was 7.0 (SD 4.1; range, 0-23). Over the 1 year, the mean number of minutes spent by the case managers in face-to-face contact with a

	family member was 85 minutes (SD 75), and the mean number of minutes on the telephone with a family member was 29.8 (SD 39). The case management intervention included the following components: assessment of client health and other needs, development of a service plan and goals in collaboration with the client, brokering and coordination of services for the client, advocacy with larger institutions and public assistance programs (such as Medicaid), and monitoring and follow-up. At each visit the case manager documented that the client understood the immunization schedule and which immunizations were still remaining, had an appointment with a provider for the next immunization, and was planning on keeping the appointment. The case managers sought to reduce misconceptions regarding false contraindications to vaccination and encouraged clients to be proactive and request immunizations from their providers. Furthermore, the case managers sought to identify and help resolve problems or barriers in the receipt of well-child care, such as lapses in Medicaid insurance or problems with transportation.
Comparator	Control. The control and intervention arm (all participants in this study) were given health passports that were produced by the state of California and contained information on the recommended visits for well-child care and the childhood immunization schedule approved by the CDC. To track the control group the investigators made 1 contact when the infants were aged 4 to 5 months to update the mothers' addresses and telephone numbers.
Outcome measures	Vaccine uptake
Number of participants	367
Duration of follow-up	Approximately 10-12 months
Loss to follow-up	They interviewed 181 (86%) of the 210 control group participants and 186 (89%) of the 209 participants in the case management group, including 29 of 32 who had initially refused to participate in case management. Those that they did not interview were lost to follow-up (29 in the control group and 25 in the intervention group).
Additional information	Being up-to-date at 12 months of age was defined as having received 3 appropriately spaced diphtheria-tetanus-pertussis (DTP) vaccinations, 2 appropriately spaced oral poliovirus (OPV) vaccinations, and 3 appropriately spaced Haemophilus influenzae type B (HIB) vaccinations

Study arms

Outreach case management including reminders (N = 186)	
Control (no intervention) (N = 181)	
Number of participants	419
Duration of follow-up	10 months
Loss to follow-up	Intervention arm: 32 refused case management, 25 were lost to follow-up (N = 25). However, of those who refused case management, 29 were included in the analysis. Control arm: 29 were lost to follow-up.

Characteristics

Arm-level characteristics

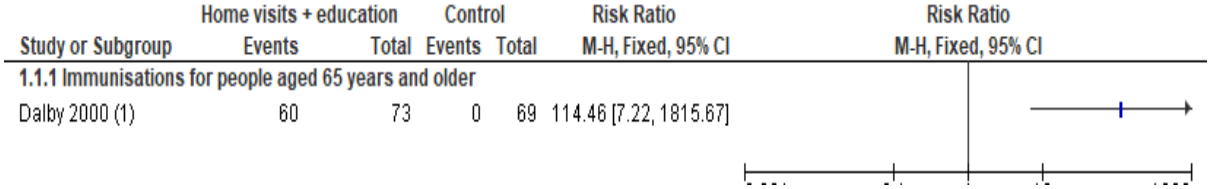
	Outreach case management including reminders (N = 186)	Control (no intervention) (N = 181)
Mother's age *(years)*		
Mean/SD	24.7 (6.2)	25.3 (6.2)

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Uptake was self-reported by the participants and data collection was not blinded. Therefore, bias could have favoured the intervention arm.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns with data collection.)*
	Overall Directness	Directly applicable

Appendix E – Forest plots

Access interventions compared to control

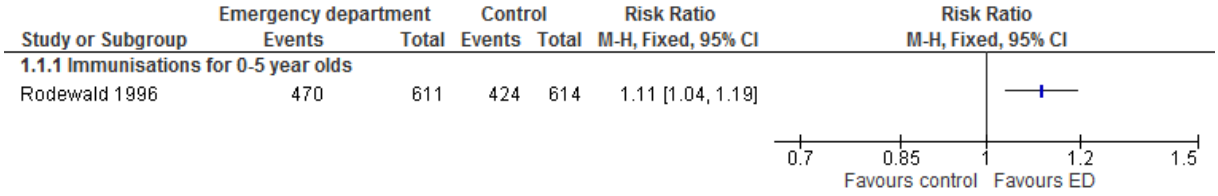
Home visit and vaccination by nurse versus control



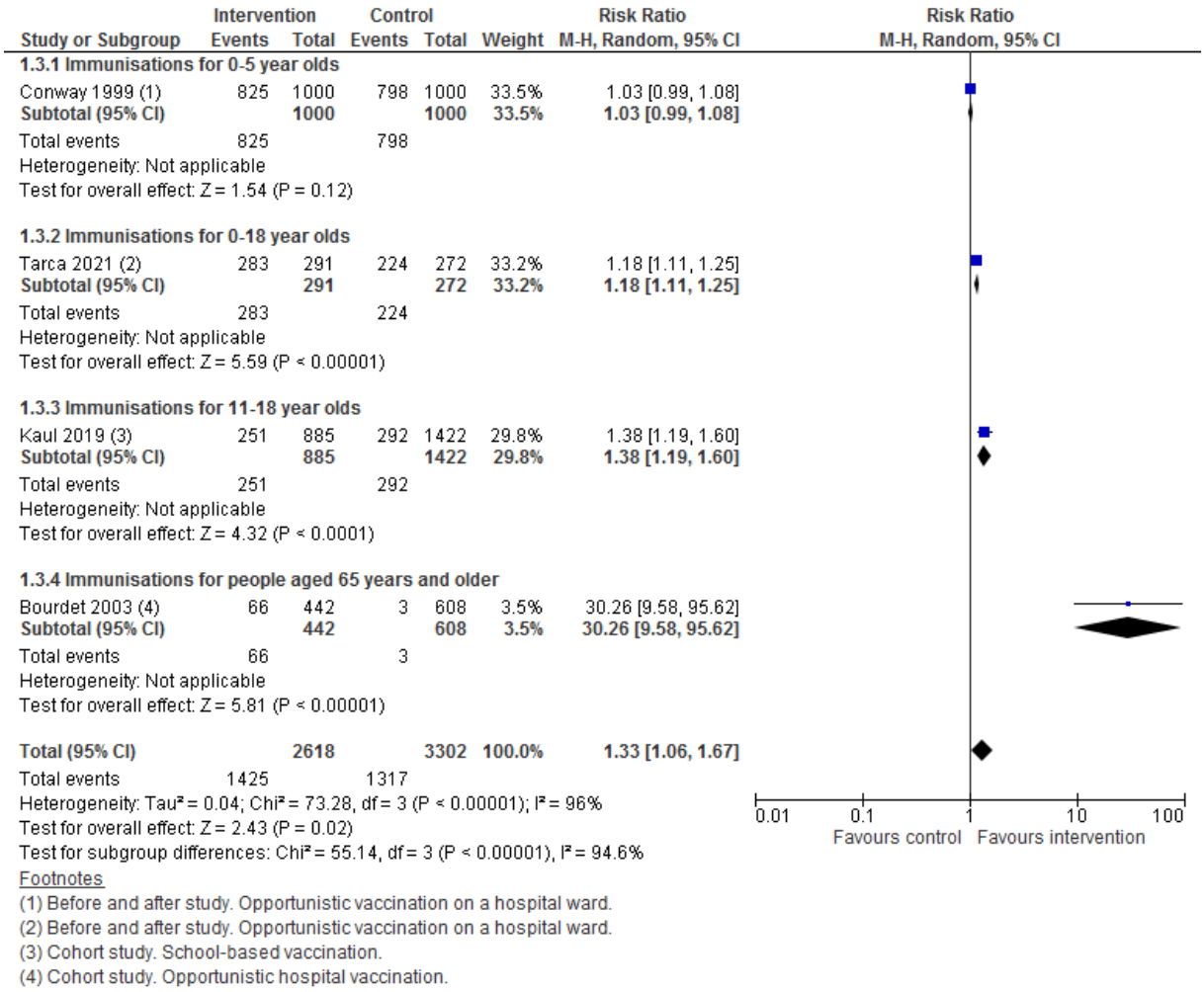
Footnotes

1) Nurse home visit for preventative care education (non-vaccine specific). Follow-up home visits to vaccinate (vaccine specific).

Opportunistic emergency department vaccination versus control



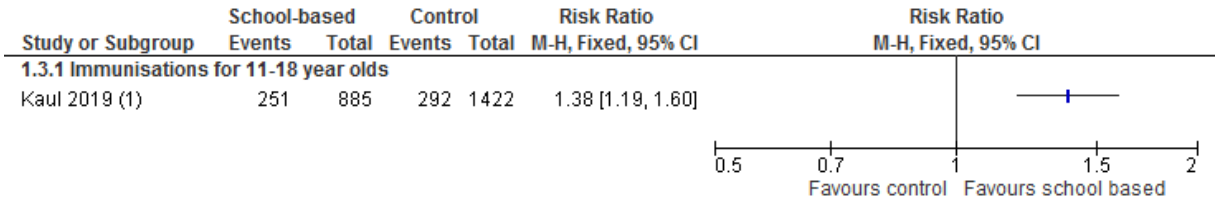
NON-RCT summary by age groups: access intervention versus control



Footnotes

(1) Before and after study. Opportunistic vaccination on a hospital ward.
(2) Before and after study. Opportunistic vaccination on a hospital ward.
(3) Cohort study. School-based vaccination.
(4) Cohort study. Opportunistic hospital vaccination.

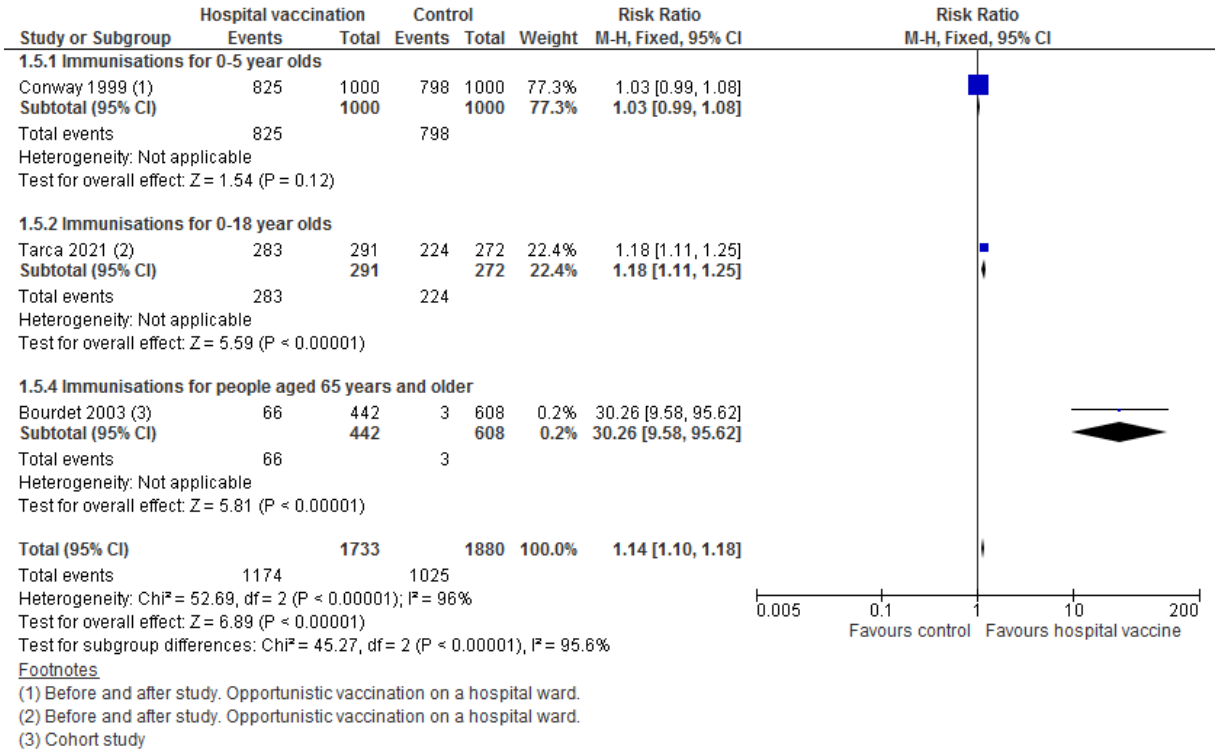
NON-RCT: School-based vaccination versus control



Footnotes

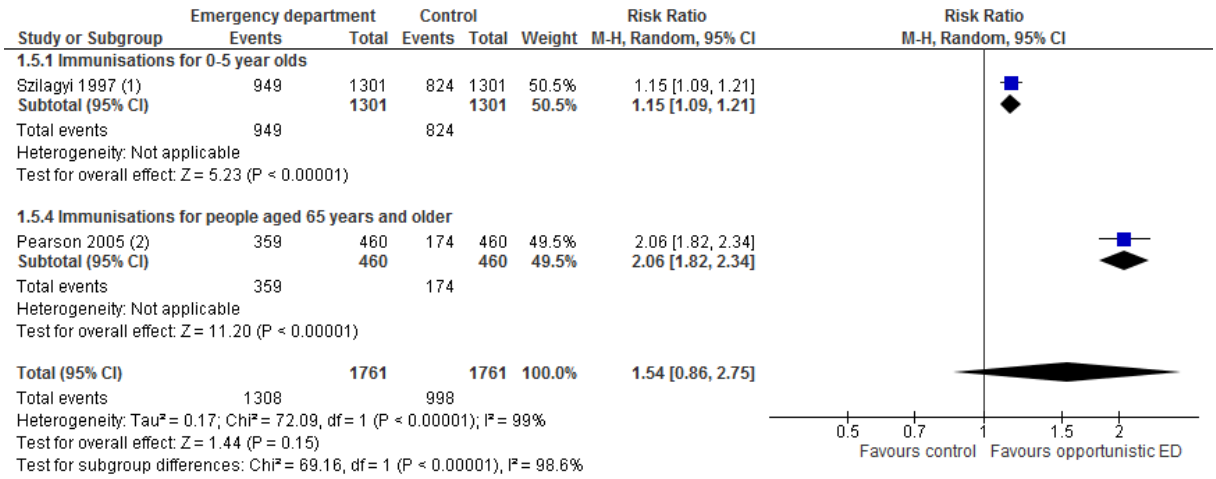
(1) Cohort study

NON-RCT: Opportunistic hospital vaccination versus control



Footnotes
(1) Before and after study. Opportunistic vaccination on a hospital ward.
(2) Before and after study. Opportunistic vaccination on a hospital ward.
(3) Cohort study

NON-RCT: Opportunistic emergency department vaccination versus control



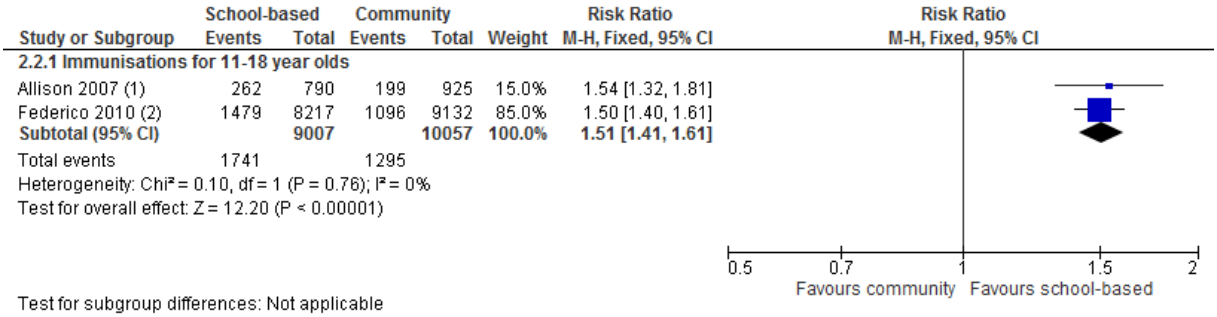
Footnotes

1) Before and after study. Opportunistic vaccination in an emergency department.
2) Before-and-after study. Before the offer of opportunistic vaccination to 460 patients at an emergency department, of the 174 who had already been vaccinated, 52% had been vaccinated by a family physician, 20% at a community health clinic, 6% during chronic care at a hospital, 21% at another (unspecified) location.

Access interventions compared to other access interventions

Different locations for vaccination

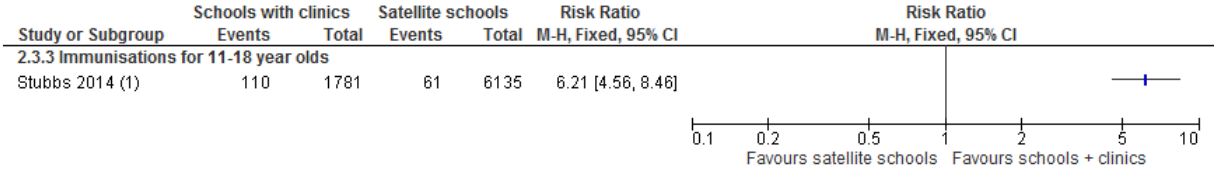
NON-RCT: School-based health centres versus community health centres



Test for subgroup differences: Not applicable

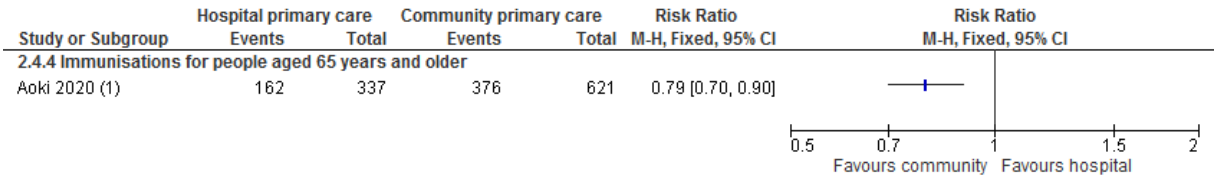
Footnotes
(1) Cohort study
(2) Cohort study

NON-RCT: onsite school vaccination clinics versus not having onsite clinics (the pupils in satellite schools without clinics had to travel to schools with clinics)



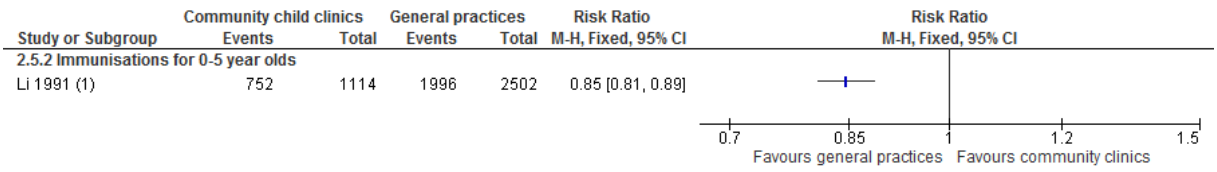
Footnotes
(1) Cohort study

NON-RCT: hospital primary care clinics versus community primary care clinics



Footnotes
(1) Cohort study

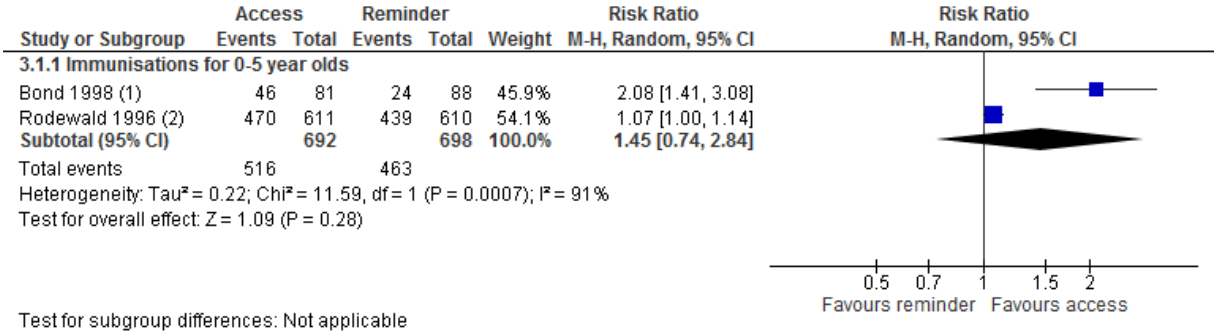
NON-RCT: community child health clinics versus general practices



Footnotes
(1) Cohort study

Access interventions compared to reminders interventions

Access versus reminders interventions (summary)



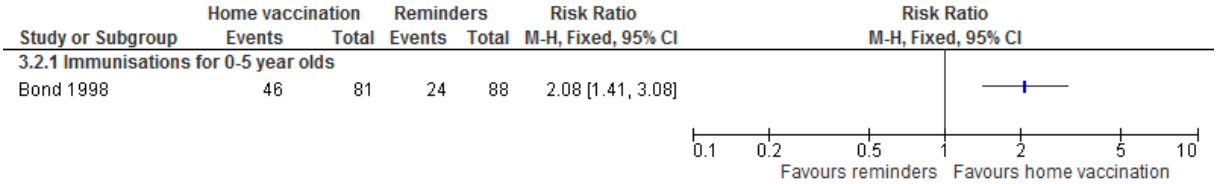
Test for subgroup differences: Not applicable

Footnotes

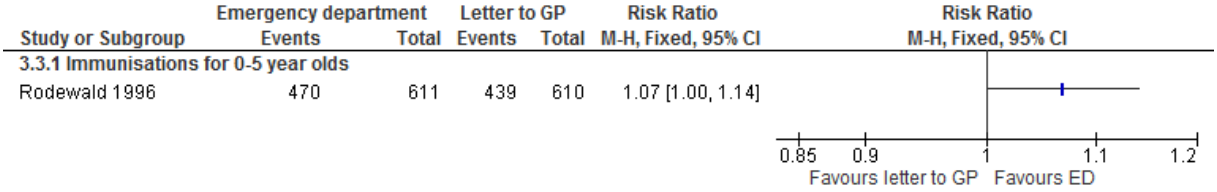
(1) Home vaccination by nurse compared to reminders to parents

(2) Emergency department vaccination compared to letter reminder to GP

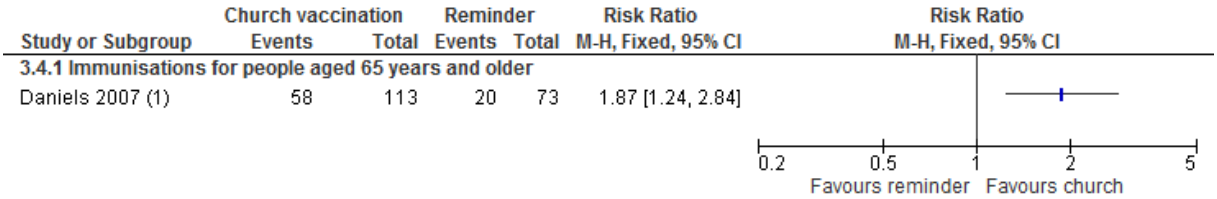
Home vaccination by nurse versus reminders to parents



Opportunistic emergency department vaccination versus letter reminder to GP



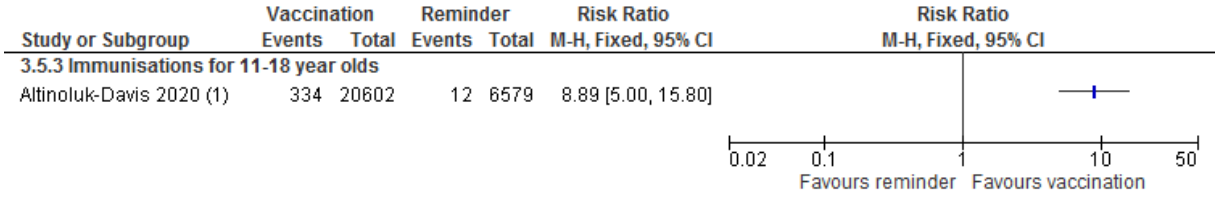
CLUSTER RCT: Vaccination at church versus reminders



Footnotes

(1) Cluster RCT. The data could not be adjusted for clustering because the number of churches in each arm was not provided.

NON-RCT: School nurse catch-up vaccination versus school nurse reminder to have catch-up vaccination at a general practice (MMR catch-up for adolescents)

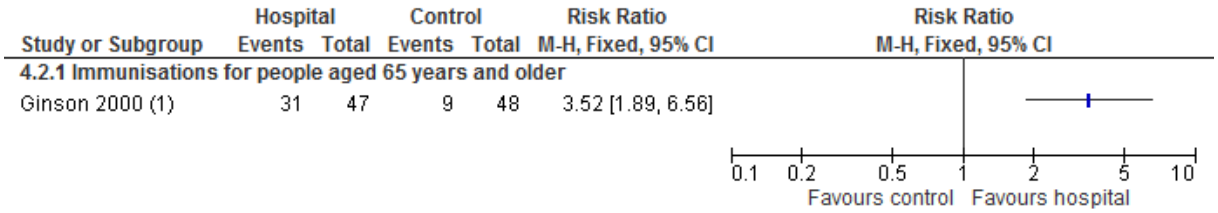


Footnotes
(1) Cohort study

Access plus another intervention compared to control

Access plus education compared to control

CLUSTER RCT: vaccine education and offer of vaccination by hospital pharmacist versus control

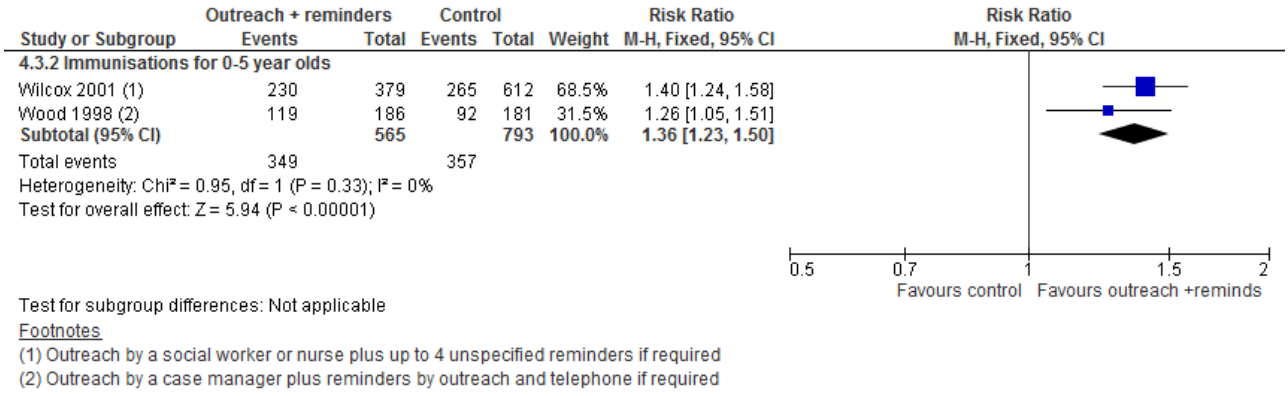


Footnotes

1) Cluster RCT. The data was adjusted by us for clustering.

Access plus reminders compared to control

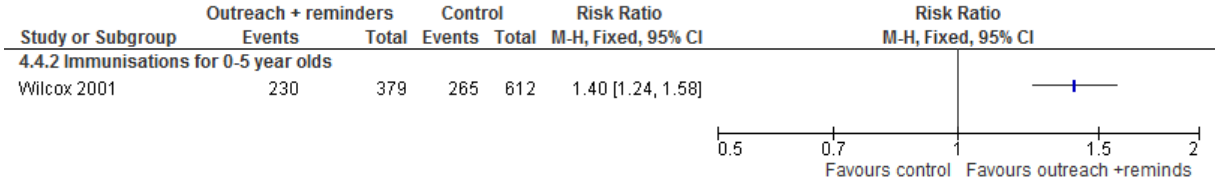
Summary by age groups: access intervention plus reminders versus control



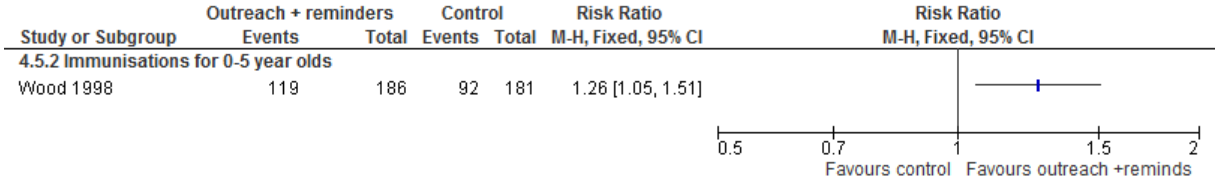
Test for subgroup differences: Not applicable

Footnotes
(1) Outreach by a social worker or nurse plus up to 4 unspecified reminders if required
(2) Outreach by a case manager plus reminders by outreach and telephone if required

Outreach by a social worker or nurse plus up to 4 unspecified reminders if required versus control



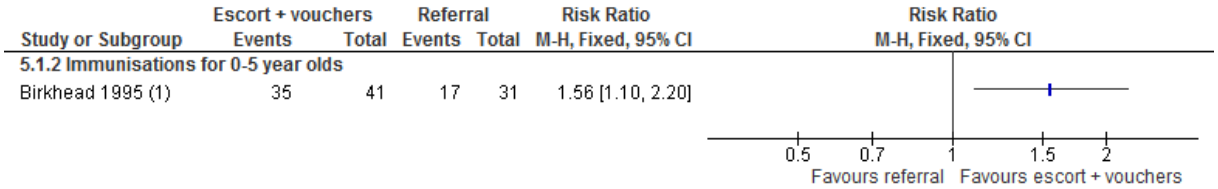
Outreach by a case manager plus reminders by outreach and telephone calls if required versus control



Access plus financial incentive versus another intervention

Access plus financial incentive (vouchers) versus reminder

CLUSTER RCT: escorted to paediatric clinic by staff plus food vouchers versus referral for vaccination.

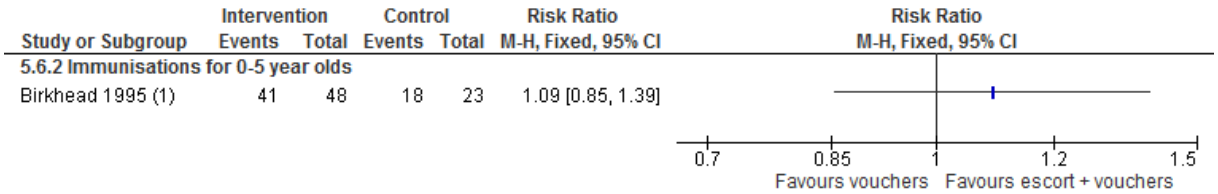


Footnotes

(1) Cluster RCT. We adjusted the data for clustering. Details of the referral method was not described.

Access plus financial incentive (vouchers) versus altered voucher schedule

CLUSTER RCT: escorted to paediatric clinic by staff (plus vouchers) versus vouchers given monthly instead of every 2 months until child is vaccinated)

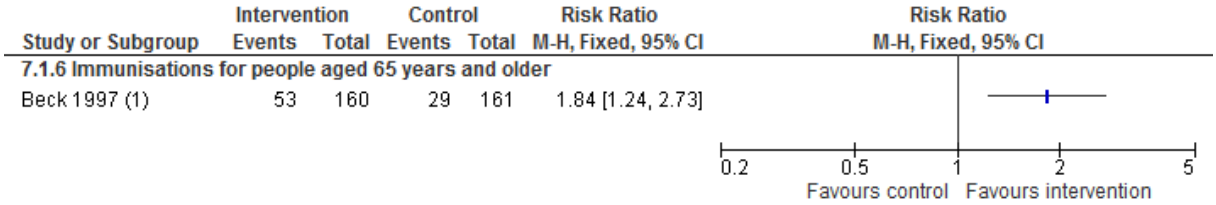


Footnotes

(1) Cluster RCT. The data was adjusted by us for clustering.

Multicomponent interventions that are non-vaccination specific but vaccination component involves improving access

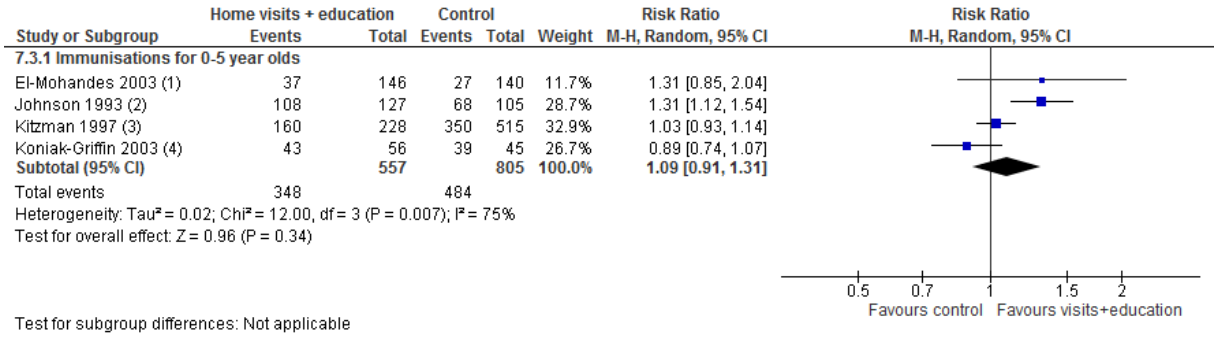
Access intervention (health check) versus control



Footnotes

1) Monthly group health check with primary care physician and nurse. They identified those not vaccinated and booked a vaccination if needed (inferred from what was written, non-vaccine specific)

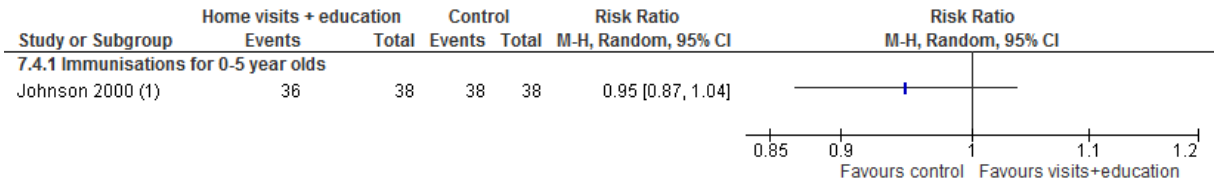
Home visits plus education versus control



Footnotes

1) Home visits, developmental play groups, parent support groups and monthly support calls (entirely non-vaccination specific intervention).
2) Experienced mothers trained to visit first-time parents and provide education (entirely non-vaccination specific intervention).
3) Nurse home visits during the pregnancy until the child was 2 years old (entirely non-vaccination specific intervention)
4) Public health nurse home visits from pregnancy until 1 year postpartum (entirely non-vaccination specific intervention).

Home visits plus education versus control

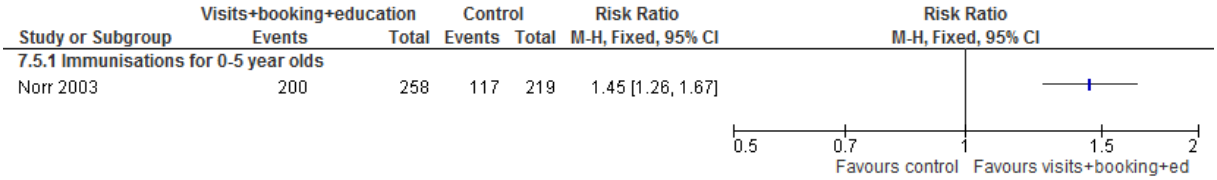


Footnotes

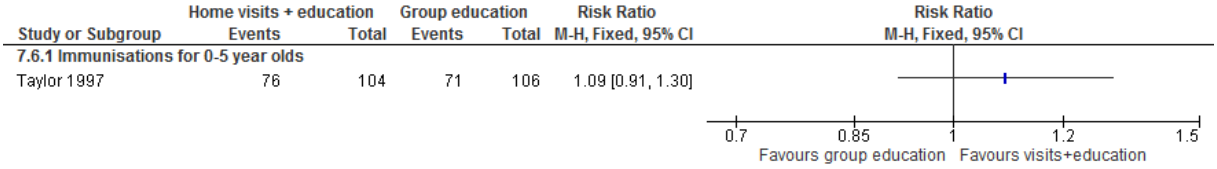
1) This data is separate from Johnson 1993 to avoid double-counting. This is a 7-year follow-up with only 33% of original participants able to be contacted. Experienced mothers trained to visit first-time parents and provide education (entirely non-vaccination specific intervention).

Individual/parent/carer home visits, appointment booking and education versus control

Home visits and phone calls with nurses and community advocates (non-vaccination specific intervention).



Home visits plus education versus group education

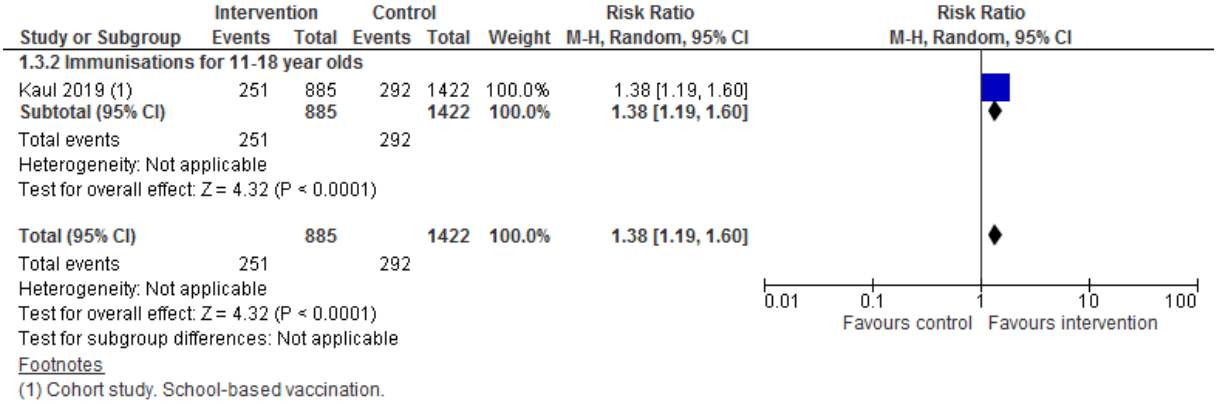


1) Home health supervision (1-to-1) by a nurse that included vaccination and health screening (entirely non-vaccination specific because immunisations were provided in both arms).

Sensitivity analysis (removing studies at high risk of bias)

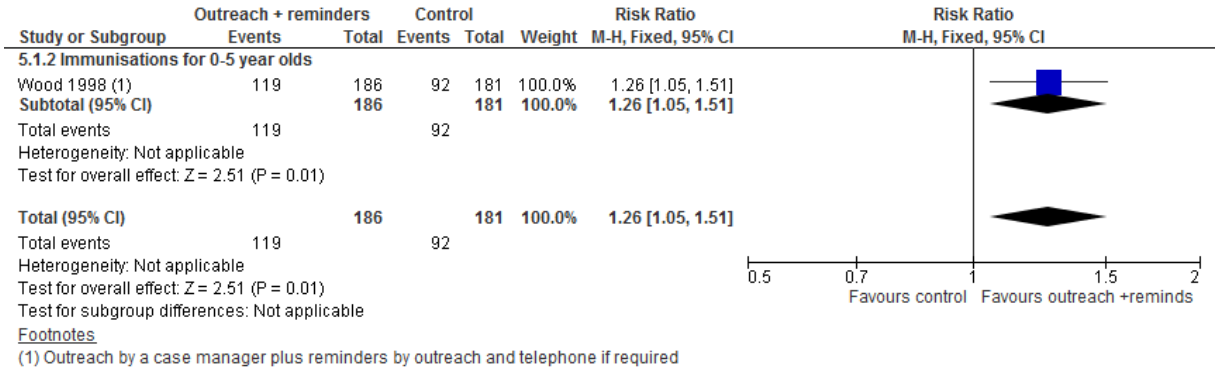
Access interventions compared to control

NON-RCT summary by age groups: access intervention versus control



Access interventions plus reminders compared to control

Summary by age groups: access intervention plus reminders versus control

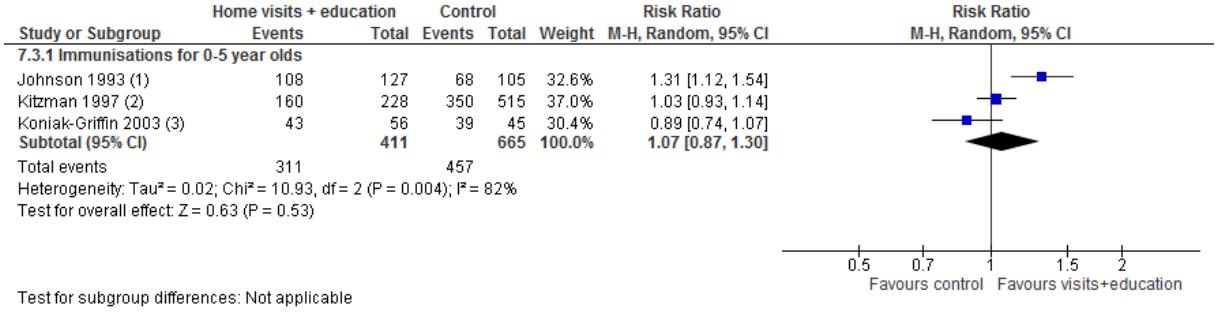


Footnotes

(1) Outreach by a case manager plus reminders by outreach and telephone if required

Multicomponent interventions that are non-vaccination specific but vaccination component involves improving access

Home visits plus education versus control



Footnotes

1) Experienced mothers trained to visit first-time parents and provide education (entirely non-vaccination specific intervention).
2) Nurse home visits during the pregnancy until the child was 2 years old (entirely non-vaccination specific intervention)
3) Public health nurse home visits from pregnancy until 1 year postpartum (entirely non-vaccination specific intervention).

Appendix F – GRADE tables

Access interventions compared to control

Table 14 GRADE table for access interventions compared to control

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Home visit and vaccination by nurse versus control (RR >1 favours intervention)										
65 years and older										
1 (Dalby 2000)	RCT	141	RR 114.4 (7.22, 1815.67)	N/A[4]	N/A[4]	Serious[1]	Not serious	N/A[5]	Not serious	Moderate
Opportunistic emergency department vaccination versus control (RR >1 favours intervention)										
0-5 year olds										
1 (Rodewald 1996)	RCT	1225	RR 1.11 (1.04, 1.19)	69 per 100	77 per 100 (72, 82)	Serious[1]	Not serious	N/A[5]	Not serious	Moderate
NON-RCT summary by age groups: Access intervention versus control (cohort studies) (RR >1 favours intervention)										
4 (Conway 1999, Tarca 2021, Kaul 2019, Bourdet 2003)	Cohort, before and after	5920	RR 1.33 (1.06, 1.67)	40 per 100	53 per 100 (42, 67)	Very serious[6]	Serious[3]	Very serious[2]	Not serious	Very low
0-5 year olds										
1 (Conway 1999)	Before and after	1000	RR 1.03 (0.99, 1.08)	80 per 100	82 per 100 (79, 86)	Very serious[6]	Serious[3]	N/A[5]	Serious[2]	Very low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
0-18 year olds										
1 (Tarca 2021)	Before and after	563	RR 1.18 (1.11, 1.25)	82 per 100	97 per 100 (91, 103)	Very serious[6]	Serious[3]	N/A[5]	Not serious	Very low
11-18 year olds										
1 (Kaul 2019)	Cohort	2307	RR 1.38 (1.19, 1.60)	21 per 100	28 per 100 (23, 33)	Serious[1]	Not serious	N/A[5]	Not serious	Moderate
65 years and older										
1 (Bourdet 2003)	Cohort	1050	RR 30.26 (9.58, 95.62)	0 per 100	15 per 100 (5, 47)	Very serious[6]	Serious[3]	N/A[5]	Not serious	Very low
NON-RCT: School-based vaccination compared to control (community-based education in both arms) (RR >1 favours intervention)										
11-18 year olds										
1 (Kaul 2019)	Cohort	2307	RR 1.38 (1.19, 1.60)	21 per 100	28 per 100 (23, 33)	Serious[1]	Not serious	N/A[5]	Not serious	Moderate
NON-RCT: Opportunistic hospital vaccination versus control (RR >1 favours intervention)										
3 (Conway 1999, Tarca 2021, Bourdet 2003)	Before and after, cohort	3613	RR 1.14 (1.10, 1.18)	55 per 100	62 per 100 (60, 64)	Very serious[6]	Serious[3]	Very serious[2]	Not serious	Very low
0-5 year olds										
1 (Conway 1999)	Before and after	1000	RR 1.03 (0.99, 1.08)	80 per 100	82 per 100 (79, 86)	Very serious[6]	Serious[3]	N/A[5]	Serious[2]	Very low
0-18 year olds										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
1 (Tarca 2021)	Before and after	563	RR 1.18 (1.11, 1.25)	82 per 100	97 per 100 (91, 103)	Very serious[6]	Serious[3]	N/A[5]	Not serious	Very low
65 years and older										
1 (Bourdet 2003)	Cohort	1050	RR 30.26 (9.58, 95.62)	0 per 100	15 per 100 (5, 47)	Very serious[6]	Serious[3]	N/A[5]	Not serious	Very low
NON-RCT: Opportunistic emergency department vaccination versus control (RR >1 favours intervention)										
2 (Szilagyi 1997, Pearson 2005)	Before and after	1761	RR 1.54 (0.86, 2.75)	57 per 100	87 per 100 (49, 156)	Very serious[6]	Serious[3]	Very serious[2]	Serious[2]	Very low
0-5 years old										
1 (Szilagyi 1997)	Before and after	1301	RR 1.15 (1.09, 1.21)	63 per 100	73 per 100 (69, 77)	Very serious[6]	Not serious	N/A[5]	Not serious	Low
65 years and older										
1 (Pearson 2005)	Before and after	920	RR 2.06 (1.82, 2.34)	38 per 100	78 per 100 (69, 89)	Very serious[6]	Serious[3]	N/A[5]	Not serious	Very low

1. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
2. Downgraded once for imprecision: the 95% confidence interval for the effect size crossed the line of no effect.
3. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies that were partially or indirectly applicable.
4. It is not possible to calculate absolute risk because there are no events in the control arm.
5. Single study. Inconsistency not applicable.
6. Downgraded twice: greater than 33.3% of the weight of the meta-analysis came from studies at high risk of bias.

Access interventions compared to other access interventions

Table 15 GRADE table for access interventions compared to other access interventions

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
NON-RCT: School-based health centres versus community health centres (RR >1 favours school-based health centres)										
11-18 years										
2 (Allison 2007, Federico 2010)	Cohort	19064	RR 1.51 (1.41, 1.61)	13 per 100	19 per 100 (18, 21)	Very serious[1]	Not serious	Not serious	Not serious	Low
NON-RCT: Onsite school vaccination clinics versus not having onsite clinics (satellite schools without clinics so pupils had to travel to schools with clinics) (RR >1 favours schools with clinics)										
11-18 year olds										
1 (Stubbs 2014)	Cohort	7916	RR 6.21 (4.56, 8.46)	1 per 100	6 per 100 (5, 8)	Very serious[1]	Not serious	N/A[3]	Not serious	Low
NON-RCT: Hospital primary care clinics versus community primary care clinics (RR >1 favours hospital primary care clinics)										
65 years and older										
1 (Aoki 2020)	RCT	958	RR 0.79 (0.70, 0.90)	61 per 100	48 per 100 (42, 54)	Very serious[1]	Not serious	N/A[3]	Not serious	Low
NON-RCT: Community child health clinics versus general practices (RR >1 favours community child health clinics)										
0-5 years										
1 (Li 1991)	Cohort	3616	RR 0.85 (0.81, 0.89)	80 per 100	68 per 100 (65, 71)	Serious[2]	Not serious	N/A[3]	Not serious	Moderate

1. Downgraded twice: greater than 33.3% of the weight of the meta-analysis came from studies at high risk of bias.
2. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
3. Single study. Inconsistency not applicable.

Access interventions compared to reminder interventions

Table 16 GRADE table for access interventions compared to reminders interventions

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Access versus reminders interventions (summary) (RR >1 favours access interventions)										
0-5 year olds										
2 (Bond 1998, Rodewald 1996)	RCT	1390	RR 1.45 (0.74, 2.84)	66 per 100	96 per 100 (49, 188)	Serious[1]	Not serious	Very serious[3]	Serious[4]	Very low
Home vaccination by nurse compared to reminders to parents (RR >1 favours home vaccination by nurse)										
0-5 year olds										
1 (Bond 1998)	RCT	169	RR 2.08 (1.41, 3.08)	27 per 100	58 per 100 (38, 84)	Serious[1]	Not serious	N/A[5]	Not serious	Moderate
Opportunistic emergency department vaccination compared to letter reminder to GP (RR >1 favours opportunistic emergency department vaccination)										
0-5 year olds										
1 (Rodewald 1996)	RCT	1221	RR 1.07 (1.0, 1.14)	72 per 100	77 per 100 (72, 82)	Serious[1]	Not serious	N/A[5]	Not serious	Moderate
CLUSTER RCT: Vaccination at church versus reminders (RR >1 favours vaccination at church)										
65 years and older										
1 (Daniels 2007)[6]	Cluster RCT	186	RR 1.87 (1.24, 2.84)	27 per 100	51 per 100 (34, 78)	Very serious[2]	Not serious	N/A[5]	Not serious	Low
NON-RCT: School nurse catch-up vaccination versus school nurse reminder to have catch-up vaccination done at a general practice (MMR catch-up for adolescents) (RR >1 favours school nurse catch-up vaccination)										
11-18 years										
1 (Altinoluk-	Cohort	27181	RR 8.89 (5.00, 15.8)	0 per 100	2 per 100 (1, 3)	Very serious[2]	Not serious	N/A[5]	Not serious	Low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Davis 2020)										

1. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
2. Downgraded twice: greater than 33.3% of the weight of the meta-analysis came from studies at high risk of bias.
3. Downgraded twice for inconsistency: the I^2 was greater than 66.7%.
4. Downgraded once for imprecision: the 95% confidence interval for the effect size crossed the line of no effect.
5. Single study. Inconsistency not applicable.
6. The data was not adjusted for clustering because the number of churches in each arm was not provided.

Access plus another intervention compared to controls

Table 17 GRADE table for access plus another intervention compared to controls

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
CLUSTER RCT: Education and offer of vaccination by hospital pharmacist versus control (RR >1 favours intervention)										
65 years and older										
1 (Ginson 2000)	Cluster RCT	102	RR 3.52 (1.89, 6.56)	19 per 100	66 per 100 (35, 123)	Serious[2]	Serious[4]	N/A[3]	Not serious	Low
Summary by age groups: Access intervention plus reminders versus control (RR >1 favours intervention)										
0-5 years										
2 (Wilcox 2001, Wood 1998)	RCT	1358	RR 1.36 (1.23, 1.50)	45 per 100	61 per 100 (55, 68)	Very serious[1]	Not serious	Not serious	Not serious	Low
Outreach by a social worker or nurse plus up to 4 unspecified reminders if required versus control (RR >1 favours intervention)										
0-5 years										
1 (Wilcox 2001)	RCT	991	RR 1.40 (1.24, 1.58)	43 per 100	61 per 100 (54, 68)	Very serious[1]	Not serious	N/A[3]	Not serious	Low
Outreach by a case manager plus reminders by outreach and telephone calls if required versus control (RR >1 favours intervention)										
0-5 years										
1 (Wood 1998)	RCT	367	RR 1.26 (1.05, 1.51)	51 per 100	64 per 100 (53, 77)	Serious[2]	Not serious	N/A[3]	Not serious	Moderate

1. Downgraded twice: greater than 33.3% of the weight of the meta-analysis came from studies at high risk of bias.
2. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
3. Single study. Inconsistency not applicable.
4. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies that were partially or indirectly applicable.

Access plus financial incentive versus another intervention

Table 18 GRADE table for financial incentive compared to another intervention

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Access plus financial incentive (vouchers) versus reminder										
CLUSTER RCT: escorted to paediatric clinic by staff + vouchers versus referral for vaccination (RR >1 favours escorted to paediatric clinic)										
0-5 year olds										
1 (Birkhead 1995)[4]	Cluster RCT	658	RR 1.56 (1.10, 2.20)	55 per 100	86 per 100 (60, 121)	Serious[1]	Serious[2]	N/A[5]	Not serious	Low
Access plus financial incentive (vouchers) versus altered voucher schedule										
CLUSTER RCT: escorted to paediatric clinic by staff (+ vouchers) versus vouchers given monthly instead of every 2 months until child is vaccinated (RR >1 favours intervention)										
0-5 years										
1 (Birkhead 1995)[4]	Cluster RCT	555	RR 1.09 (0.85, 1.39)	78 per 100	85 per 100 (67, 109)	Serious[1]	Serious[2]	N/A[5]	Serious[3]	Very low

1. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
2. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies that were partially or indirectly applicable.
3. Downgraded once for imprecision: the 95% confidence interval for the effect size crossed the line of no effect.
4. The data was adjusted for clustering using an ICC of 0.05, which was the most common ICC in the education and reminders evidence review.
5. Single study. Inconsistency not applicable

Multicomponent interventions that are non-vaccination specific but vaccination component involves improving access

Table 19 GRADE table for multicomponent interventions that are non-vaccination specific but vaccination component involves improving access

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Access intervention (health check) versus control (RR >1 favours intervention)										
65 years and older										
1 (Beck 1997)	RCT	321	RR 1.84 (1.24, 2.73)	18 per 100	33 per 100 (22, 49)	Very serious[1]	Not serious	N/A[5]	Not serious	Low
Home visits plus education versus control (RR >1 favours intervention)										
0-5 years										
4 (El-Mohandes 2003, Johnson 1993, Kitzman 1997, Koniak-Griffin 2003)	RCT	1362	RR 1.09 (0.91, 1.31)	60 per 100	66 per 100 (55, 79)	Serious[2]	Not serious	Very serious[3]	Serious[4]	Very low
Home visits plus education versus control (RR >1 favours intervention)										
0-5 years										
1 (Johnson 2000)[a]	RCT	76	RR 0.95 (0.87, 1.04)	100 per 100	95 per 100 (87, 104)	Very serious[1]	Not serious	N/A[5]	Very serious[6]	Very low
Individual/parent/carer home visits, appointment booking and education versus control (RR >1 favours intervention)										
0-5 years										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
1 (Norr 2003)	RCT	477	RR 1.45 (1.26, 1.67)	51 per 100	77 per 100 (67, 89)	Serious[2]	Not serious	N/A[5]	Not serious	Moderate
Home visits plus education versus group education (RR >1 favours home visits plus education)										
0-5 years										
1 (Taylor 1997)	RCT	210	RR 1.09 (0.91, 1.30)	67 per 100	73 per 100 (61, 87)	Serious[2]	Not serious	N/A[5]	Serious[4]	Low

1. Downgraded twice: greater than 33.3% of the weight of the meta-analysis came from studies at high risk of bias.
2. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
3. Downgraded twice for inconsistency: the I^2 was greater than 66.7%.
4. Downgraded once for imprecision: the 95% confidence interval for the effect size crossed the line of no effect.
5. Single study. Inconsistency not applicable.
6. Downgraded once for imprecision: the 95% confidence interval for the effect size crossed the line of no effect and the number of participants was <200.

a. This data is separate from Johnson 1993 to avoid double-counting. This is a 7-year follow-up with only 33% of original participants able to be contacted.

Sensitivity analysis (removing studies at high risk of bias)

Table 20 GRADE table for the sensitivity analysis: Access interventions compared to control

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
NON-RCT summary by age groups: Access intervention versus control (RR >1 favours intervention)										
Pooled total										
1 (Kaul 2019)	Cohort	2307	RR 1.38 (1.19, 1.60)	21 per 100	28 per 100 (24, 33)	Serious[1]	Not serious	N/A[2]	Not serious	Moderate

1. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
2. Single study. Inconsistency not applicable.

Table 21 GRADE table for the sensitivity analysis: Access interventions plus reminders compared to control

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Summary by age groups: Access intervention plus reminders versus control (RR >1 favours intervention)										
0-5 years										
1 (Wood 1998)	RCT	367	RR 1.26 (1.05, 1.51)	51 per 100	64 per 100 (53, 77)	Serious[1]	Not serious[2]	N/A	Not serious	Moderate

1. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
2. Single study. Inconsistency not applicable.

Table 22 GRADE table for the sensitivity analysis: Multicomponent interventions that are non-vaccination specific but vaccination component involves improving access

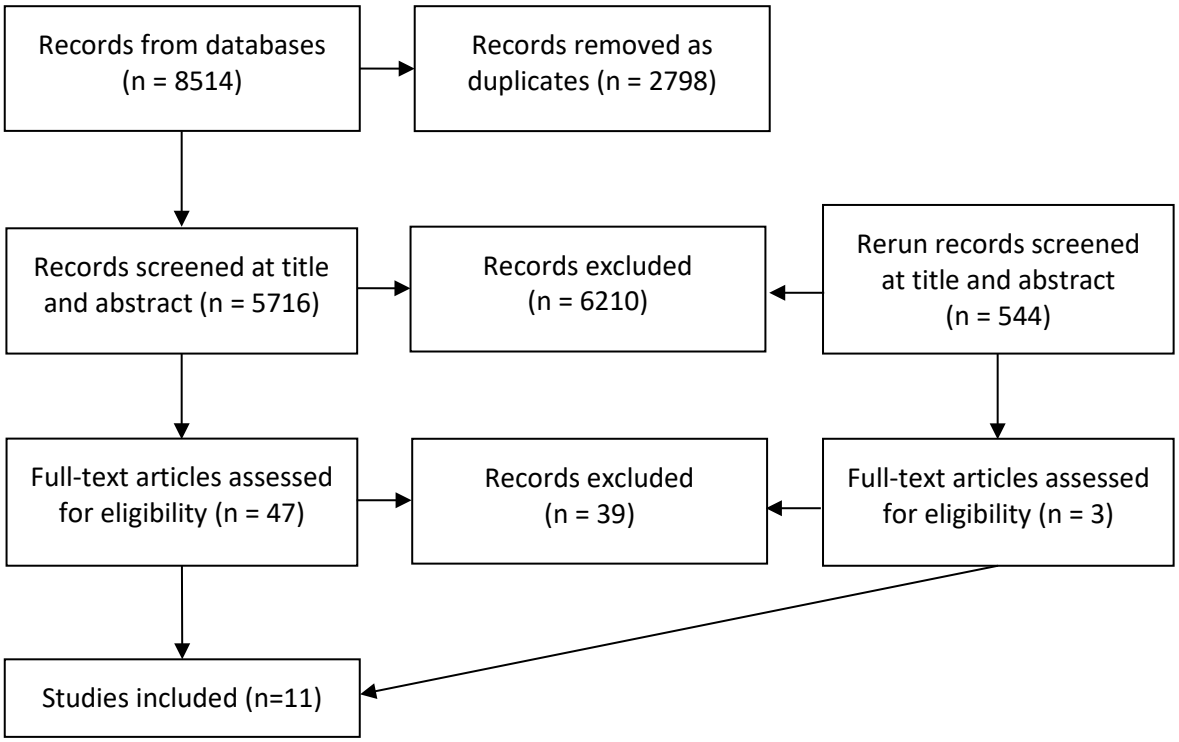
No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Home visits plus education versus control (RR >1 favours intervention)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
0-5 years										
3 (Johnson 1993, Kitzman 1997, Koniak-Griffin 2003)	RCT	1076	RR 1.07 (0.87, 1.30)	69 per 100	74 per 100 (60, 89)	Serious[1]	Not serious	Very serious[2]	Serious[3]	Very low

1. Downgraded once: greater than 33.3% of the weight of the meta-analysis came from studies at moderate or high risk of bias.
2. Downgraded twice for inconsistency: the I^2 was greater than 66.7%.
3. Downgraded once for imprecision: the 95% confidence interval for the effect size crossed the line of no effect.

Appendix G – Economic evidence study selection

None of the 11 studies identified in the full text review were relevant to access interventions.



Appendix H – Economic evidence tables

No economic evidence was identified for access interventions.

Appendix I – Health economic model

The committee discussed multiple access interventions which were anticipated to have some resource impact, so three simple cost-effectiveness analyses reporting cost per additional vaccinated person, and one simple costing analysis were undertaken. These analyses used assumptions around staff time, costs, and uptake numbers. The interventions considered were community centre vaccination, hospital based opportunistic vaccination, nurse home visits, and extended or additional hours for vaccination services.

The cost of each intervention was calculated using information from the relevant effectiveness studies, assumptions and committee input to estimate the time and resources associated with each intervention.

Data informing the effectiveness of the interventions are taken from the studies identified in the clinical evidence review, and pooled where there was more than one relevant study. The baseline vaccine uptake data was taken from publicly available sources and adjusted using control arm data from the studies to account for people who would have already been vaccinated at the time the intervention is offered (there are likely to be costs associated with many access interventions where some of the people vaccinated using the intervention are not additional vaccinations, but simply a situation where a vaccination has been moved from one setting to a different one). The effectiveness data from the relevant studies is applied to the baseline uptake to calculate vaccine uptake with the intervention.

The cost per additional person vaccinated is calculated by applying the cost of the intervention to those that would receive the intervention and sharing this total cost between those that would get vaccinated after receiving the intervention.

Three scenarios were considered when calculating the cost per additional person vaccinated; where the full cost of the intervention is only applied to those people vaccinated, and an alternative cost assuming reduced intervention activities (e.g., reduced staff time) is applied for those who did not receive the vaccine, where the cost savings from displaced GP vaccinations (costing £10.05 per vaccination) were included, and a combination of these two assumptions. Displaced GP vaccination costs were included in the analysis as it was thought that with more convenient or opportunistic vaccinations available, people may not need to make a GP appointment to be vaccinated and this cost would be saved.

Community centre vaccination

For the community centre vaccination costing the Daniels 2007 study was used, as the committee agreed the church-based setting was a reasonable proxy for other community centres. This community vaccination setting was assumed to be at a time when people are already present at the venue, rather than having people attend a clinic specifically to get vaccinated, which allows for the assumption that there would be a constant stream of individuals to be vaccinated.

It was assumed that each vaccination would be associated with 10 minutes of nurse time, at a cost of £42 per hour (PSSRU), and that there would be no costs associated with the venue. Therefore, the cost per vaccination was estimated to be £7.00.

To calculate the additional cost per person vaccinated, the outcomes data from the Daniels 2007 study comparing the effectiveness of vaccination at a faith centre with letter reminders was used. The odds ratio associated with vaccine uptake with the faith centre vaccination intervention compared with reminder was 2.79.

The vaccine uptake rate in the control arm of the trial was 27.40%, and the baseline probability of being vaccinated is equal to the pneumococcal polysaccharide vaccine (PPV)

uptake rate of the overall population (68.96%, PPV: vaccine coverage estimates, UKA, previously known as Public Health England), so we calculate the proportion of individuals in our population that would have been vaccinated by the time the intervention was offered to be 57.24% (i.e. some individuals would have got vaccination anyway at a later timepoint, regardless of whether the intervention was offered or not). This gives a baseline odds of being vaccinated of 0.38 and applying the OR of 2.79 (95% CI: 1.48-5.26), the odds of being vaccinated following the faith centre vaccination intervention are 1.05, giving a 51.29% probability of being vaccinated after receiving the faith centre vaccination intervention, and a 79.17% probability of being vaccinated with faith centre vaccination and usual practice.

Table 23: Calculation of uptake with community centre vaccination

Calculated parameter	Value	Source
Probability of vaccine uptake before community centre vaccination	57.24%	Adj uptake = (baseline uptake – trial uptake) / (1 - trial uptake)
Uptake before community centre vaccination (odds)	0.38	Odds = probability/(1-probability)
Additional uptake after community centre vaccination (odds)	1.05	Baseline odds*odds ratio
Additional uptake after community centre vaccination (probability)	51.29%	Probability = odds/(1+odds)
Total uptake with community centre vaccination and usual practice	79.17%	Total uptake = Adj uptake + (1 – adj uptake)*additional uptake

Using the cost of £7.00 per vaccination, the cost per additional person vaccinated when faith centre vaccinations are made available is calculated to be £29.30. The results for scenarios taking into account alternative costing for people who did not get vaccinated, and displaced GP visit costs (costing £10.05 per vaccination) are presented in Table 24. The alternative costing considered for this intervention is that people who were offered the faith centre vaccination but did not get vaccinated incurred 5 minutes of nurse time rather than the 10 minutes associated with vaccination.

Table 24: Cost per additional person vaccinated (community centre vaccination)

	Only include costs to the organisation providing the vaccine	Include cost savings of displaced GP vaccinations
All unvaccinated people at baseline incur the full cost	£29.30	£17.78
Only people who get vaccinated with the intervention incur the full cost	£22.16	£10.64

Hospital based opportunistic vaccination

The committee discussed providing multiple opportunities and routes for vaccination at convenient locations, including pharmacies, GP surgeries or clinics they already attend. Four studies were identified comparing opportunistic hospital or emergency department vaccinations with usual practice; three in people aged 65 years and older, and one in people aged 0-5 years. For the purposes of this costing analysis the costs will be estimated separately for the 65+ and the 0-5 populations. The hospital and emergency department opportunistic vaccination can be used as a proxy for other clinical settings where vaccines are available and staff members are able to administer them since the intervention would only require additional staff time.

It was assumed that each vaccination would be associated with 10 minutes of hospital pharmacist time, at a cost of £47 per hour (PSSRU). Therefore, the cost per vaccination was estimated to be £7.83.

Childhood vaccinations in people aged 0-5 years

To calculate the additional cost per person vaccinated, the outcomes data from the Rodewald 1996 study comparing the effectiveness of opportunistic vaccination at an emergency department with usual practice was used. The odds ratio associated with vaccine uptake with the emergency department vaccination intervention compared with usual practice was 1.49.

The vaccine uptake rate in the control arm of the trial was 69.06%, and the baseline probability of being vaccinated is equal to the average uptake rate for childhood vaccinations in the overall population (92.08%, NHS Digital Childhood Vaccination Coverage Statistics), so we calculate the proportion of individuals in our population that would have been vaccinated by the time the intervention was offered to be 74.40% (i.e. some individuals would have got vaccination anyway at a later timepoint, regardless of whether the intervention was offered or not). This gives a baseline odds of being vaccinated of 2.23 and applying the OR of 1.49 (95% CI: 1.16-1.93), the odds of being vaccinated following the opportunistic emergency department intervention are 3.33, giving a 76.88% probability of being vaccinated after receiving the emergency department intervention, and a 94.08% probability of being vaccinated with opportunistic emergency department vaccination and usual practice. Using the cost of £7.83 per vaccination, the cost per additional person aged 0-5 years vaccinated when opportunistic emergency department vaccinations are offered is calculated to be £100.13. The results for scenarios taking into account alternative costing for people who did not get vaccinated, and displaced GP visit costs (costing £10.05 per vaccination) are presented in Table 25. The alternative costing considered for this intervention is that people who were offered the emergency department vaccination but did not get vaccinated incurred 5 minutes of hospital pharmacist time rather than the 10 minutes associated with vaccination.

Table 25: Cost per additional person vaccinated (emergency department vaccination, aged 0-5 years)

	Only include costs to the organisation providing the vaccine	Include cost savings of displaced GP vaccinations
All unvaccinated people at baseline incur the full cost	£100.13	£11.42
Only people who get vaccinated with the intervention incur the full cost	£88.55	Dominant (-£0.16)

PPV vaccination in people aged 65 years and older

To calculate the additional cost per person vaccinated, the pooled outcomes data from three studies (Bourdet 2003, Ginson 2000, Pearson 2005) comparing the effectiveness of hospital and emergency department with usual practice was used. The odds ratio associated with vaccine uptake with the intervention compared with usual practice was 7.47.

The vaccine uptake rate in the control arm of the trial was 16.70%, and the baseline probability of being vaccinated is equal to the PPV uptake rate of the overall population (68.96%, PPV: vaccine coverage estimates, UKHSA, previously known as Public Health England), so we calculate the proportion of individuals in our population that would have been vaccinated by the time the intervention was offered to be 62.74%. This gives a baseline odds of being vaccinated of 0.20 and applying the OR of 7.47 (95% CI: 5.74-9.74), the odds of being vaccinated following the hospital vaccination intervention are 1.50, giving a 59.96% probability of being vaccinated after receiving the intervention, and a 85.08% probability of

being vaccinated with hospital/emergency department vaccination and usual practice. Using the cost of £7.83 per vaccination, the cost per additional person vaccinated when hospital or emergency department vaccinations are made available is calculated to be £18.11. The results for scenarios taking into account alternative costing for people who did not get vaccinated, and displaced GP visit costs (costing £10.05 per vaccination) are presented in Table 26. The alternative costing considered for this intervention is that people who were offered the hospital vaccination but did not get vaccinated incurred 5 minutes of hospital pharmacist time rather than the 10 minutes associated with vaccination.

Table 26: Cost per additional person vaccinated (emergency department vaccination, aged 65 years and older)

	Only include costs to the organisation providing the vaccine	Include cost savings of displaced GP vaccinations
All unvaccinated people at baseline incur the full cost	£18.11	£14.23
Only people who get vaccinated with the intervention incur the full cost	£14.48	£10.60

Nurse home visits

The committee recommended that home visits be considered for people who have not responded to immunisation reminders, recall or appointments. A costing analysis was conducted to calculate the expected cost per additional person vaccinated, as home visits are expected to be highly resource intensive. Two studies were identified comparing nurse home visits with usual practice; one in people aged 65 years and older (Dalby 2000), and one in people aged 0-5 years (Bond 1998). For the purposes of this costing analysis the costs will be estimated separately for the 65+ and the 0-5 populations. In this analysis (unlike the other analyses above) effectiveness of the intervention on vaccine uptake will be captured using absolute percentage increase, rather than odds ratios, as the control arm in the Dalby study had zero events (meaning none of the people not offered a home visit got vaccinated through other means), making the odds ratio difficult to interpret. Although it was possible to use the odds ratio approach for the Bond study, for consistency in the analysis of this intervention the absolute percentage increase approach was used.

Using the Bond 1998 study it was assumed that each vaccination would be associated with 41.5 minutes of nurse time during the home visit and 6.56 minutes of nurse time for a phone call with the individual prior to the visit, at a cost of £42 per hour (PSSRU). Therefore, the cost per vaccination was estimated to be £33.64.

Childhood vaccinations in people aged 0-5 years

To calculate the additional cost per person vaccinated, the outcomes data from the Bond 1998 study comparing the effectiveness of increasing vaccination uptake of nurse home visits with usual practice was used. The absolute increase in vaccine uptake with the home visit intervention compared with usual practice was 29.52%.

The vaccine uptake rate in the control arm of the trial was 27.27%, and the baseline probability of being vaccinated is equal to the average uptake rate for childhood vaccinations in the overall population (92.08%, NHS Digital Childhood Vaccination Coverage Statistics), so we calculate the proportion of individuals in our population that would have been vaccinated by the time the intervention was offered to be 89.11%. Applying the absolute increase of 29.52%, the probability of being vaccinated following the nurse home visit intervention is 95.29%. Using the cost of £30.48 per vaccination, the cost per additional person aged 0-5 years vaccinated when nurse home visits are offered is calculated to be

£113.98. The results for scenarios taking into account alternative costing for people who did not get vaccinated, and displaced GP visit costs are presented in Table 25. The alternative costing considered for this intervention is that people who were offered the nurse home visit for immunisation but did not get vaccinated only incurred the cost of the initial phone call, and did not actually receive the home visit.

Table 27: Cost per additional person vaccinated (nurse home visit, aged 0-5 years)

	Only include costs to the organisation providing the vaccine	Include cost savings of displaced GP vaccinations
All unvaccinated people at baseline incur the full cost	£113.98	£104.70
Only people who get vaccinated with the intervention incur the full cost	£71.45	£62.17

PPV vaccination in people aged 65 years and older

To calculate the additional cost per person vaccinated, the outcomes data from the Dalby 2000 study comparing the effectiveness of increasing vaccination uptake of nurse home visits with usual practice was used. The absolute increase in vaccine uptake with the home visit intervention compared with usual practice was 82.19%.

The vaccine uptake rate in the control arm of the trial was 0%, and the baseline probability of being vaccinated is equal to the PPV uptake rate of the overall population (68.96%, PPV: vaccine coverage estimates, UKHSA, previously known as Public Health England), so we calculate the proportion of individuals in our population that would have been vaccinated by the time the intervention was offered to be 68.96%. Applying the absolute increase of 82.19%, the probability of being vaccinated following the nurse home visit intervention is 94.47%. Using the cost of £30.48 per vaccination, the cost per additional person vaccinated when nurse home visits are offered is calculated to be £40.93. The results for scenarios taking into account alternative costing for people who did not get vaccinated, and displaced GP visit costs are presented in Table 28. The alternative costing considered for this intervention is that people who were offered the nurse home visit for immunisation but did not get vaccinated only incurred the cost of the initial phone call and did not actually receive the home visit. Note that the cost per additional person is the same regardless of whether the displaced GP visit cost is included or not as, in the trial, no one was vaccinated in the control arm, so no GP visits were displaced.

Table 28: Cost per additional person vaccinated (nurse home visit, aged 65 years and older)

	Only include costs to the organisation providing the vaccine	Include cost savings of displaced GP vaccinations
All unvaccinated people at baseline incur the full cost	£40.93	£40.93
Only people who get vaccinated with the intervention incur the full cost	£34.64	£34.64

Extended/additional hours for vaccination services

The committee discussed the idea of providing out of hours services, extended hours services, weekend services and setting up drop-in immunisation clinics alongside hospitals. These services were anticipated to have a large resource impact, so a simple costing exercise was conducted to estimate these costs.

Total annual costs for England were calculated based on number of additional hours per month, and by staff member providing those hours. The scenarios considered were one staff member per local authority, and one staff member per GP surgery. There are 343 local authorities and 6,571 GP surgeries in England (Gov.UK, NHS Digital). The cost per hour for staff time are £156, £42, and £48 for GPs, GP nurses and community pharmacists, respectively.

Table 29: Staff time costs

Staff member	Cost per hour	Source
GP	£156	PSSRU
GP nurse	£42	PSSRU
Community pharmacist	£48	PSSRU

Varying the number of additional hours per month between 2 and 6 hours, and calculating costs for a GP, a nurse and a pharmacist assuming one per LA and one per GP surgery, the total annual cost varies between £345,744, and £73,805,472, for the lowest and highest resource use assumptions, respectively. These costs are presented in Table 30.

Table 30: Total annual cost of providing additional hours vaccination services in England

	Number of additional hours	2	3	4	5	6
1 per LA	GP	£1,284,192	£1,926,288	£2,568,384	£3,210,480	£3,852,576
1 per LA	GP nurse	£345,744	£518,616	£691,488	£864,360	£1,037,232
1 per LA	Community pharmacist	£395,136	£592,704	£790,272	£987,840	£1,185,408
1 per GP surgery	GP	£24,601,824	£36,902,736	£49,203,648	£61,504,560	£73,805,472
1 per GP surgery	GP nurse	£6,623,568	£9,935,352	£13,247,136	£16,558,920	£19,870,704
1 per GP surgery	Community pharmacist	£7,569,792	£11,354,688	£15,139,584	£18,924,480	£22,709,376

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

Study	Reason for exclusion
	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*

Study	Reason for exclusion
	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

Study	Reason for exclusion
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

Study	Reason for exclusion
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. Journal of the American Pharmacists Association : JAPhA 57(3s): 293-s297e1	- Does not contain an outcome of relevance to this review

Study	Reason for exclusion
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

Study	Reason for exclusion
	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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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	- Duplicate reference

Study	Reason for exclusion
Preventive Services. American journal of preventive medicine 18(1suppl): 97-140	
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	- Conference abstract

Study	Reason for exclusion
TO ENGAGE ADOLESCENT AND YOUNG ADULT WOMEN IN PRIMARY CARE. Journal of Adolescent Health 66(2s)	
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

Study	Reason for exclusion
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

Study	Reason for exclusion
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	- Education non-RCT. Excluded because there

Study	Reason for exclusion
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	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,	- Conference abstract

Study	Reason for exclusion
January 30-February 2, 2016. American Journal of Obstetrics and Gynecology 214(6): 752	
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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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 Neonatal Intensive Care Unit. Applied clinical informatics 8(1): 206-213	- Reminders non-RCT. Excluded because there 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.*

Study	Reason for exclusion
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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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*

Study	Reason for exclusion
	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

Study	Reason for exclusion
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*

Study	Reason for exclusion
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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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

Study	Reason for exclusion
	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.*

Study	Reason for exclusion
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. Journal of the American Pharmacists Association : JAPhA 52(3): 367-71	- Study participants are the wrong age group *The participants for all 3 arms have a mean age of*

Study	Reason for exclusion
	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

Study	Reason for exclusion
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*

Study	Reason for exclusion
	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	- Systematic review used as source of primary studies

Study	Reason for exclusion
Community Guide Systematic Economic Review. American journal of preventive medicine 50(6): 797-808	
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

Study	Reason for exclusion
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	- Study includes data on a vaccine that is not on the

Study	Reason for exclusion
immunizations: a randomized controlled comparative effectiveness trial. American journal of public health 103(6): 1116-23	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 International: Section B: The Sciences and Engineering 79(4be): no-specified	- Not a peer-reviewed publication

Study	Reason for exclusion
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.*

Study	Reason for exclusion
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.*

Study	Reason for exclusion
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 cohort study. The European journal of health economics : HEPAC : health economics in prevention and care 17(3): 305-15	- The intervention is a free vaccine- not in scope *The financial encouragement is free vaccination. The non-financial encouragement is information, whichis in both arms of the study equally.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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

Study	Reason for exclusion
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 human papillomavirus vaccination. American journal of preventive medicine 47(6): 734-44	- The study did not report any of the outcomes specified in the protocol *Reports number of vaccinations given relative to number of visits, rather than number of people vaccinated*

Study	Reason for exclusion
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 collaborative human papillomavirus knowledge survey. Public health 128(12): 1099-105	- Not a relevant study design *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	- Does not contain an outcome of relevance to this review

Study	Reason for exclusion
Project. Journal of the American Psychiatric Nurses Association 26(2): 172-180	
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*

Study	Reason for exclusion
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	- Infrastructure study. Excluded because there

Study	Reason for exclusion
pneumococcal and influenza vaccination rates in immunosuppressed inflammatory arthritis patients. Clinical Rheumatology 39(3): 747-754	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

Study	Reason for exclusion
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	- More recent systematic review identified that covers the same topic

Study	Reason for exclusion
vaccine uptake and vaccine coverage. Human vaccines & immunotherapeutics 11(1): 72-82	
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

Study	Reason for exclusion
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

Study	Reason for exclusion
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 immunizations: a systematic review. BMC medical informatics and decision making 12: 145	- Qualitative systematic review
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

Study	Reason for exclusion
	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*

Study	Reason for exclusion
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*

Study	Reason for exclusion
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:*

Study	Reason for exclusion
	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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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

Study	Reason for exclusion
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

Study	Reason for exclusion
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

Study	Reason for exclusion
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	- Protocol for a future study

Study	Reason for exclusion
college students: study protocol for a randomized controlled trial. BMC public health 19(1): 1546	
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.*

Study	Reason for exclusion
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*

Study	Reason for exclusion
	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

Study	Reason for exclusion
	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*

Study	Reason for exclusion
	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	- Study includes data on a vaccine that is not on the

Study	Reason for exclusion
school: Results of a small-scale implementation project on program delivery. Paediatrics & Child Health 24: 54-s67	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	- Does not contain an outcome of relevance to this review

Study	Reason for exclusion
Technology to Increase HPV Vaccination Uptake. Journal for Nurse Practitioners 6(6): 464-470	
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 a community-based, interdisciplinary intervention. The journal of behavioral health services & research 41(1): 37-49	- Does not contain an outcome of relevance to this 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	- Education and reminders non-RCT. Excluded because there was sufficient RCT evidence for this review

Study	Reason for exclusion
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 campaign in the pharmacies in Switzerland. Swiss medical weekly 144: w13955	- Education non-RCT. Excluded because there 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*

Study	Reason for exclusion
	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

Study	Reason for exclusion
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*

Study	Reason for exclusion
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

Study	Reason for exclusion
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*

Study	Reason for exclusion
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*

Study	Reason for exclusion
	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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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	- Systematic review that did not include any additional relevant papers

Study	Reason for exclusion
Vaccination: Systematic Review. JMIR mHealth and uHealth 8(5): e17371	
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

Study	Reason for exclusion
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

Study	Reason for exclusion
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

Study	Reason for exclusion
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.*

Study	Reason for exclusion
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

Study	Reason for exclusion
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
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Study	Reason for exclusion
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