



Interventions to improve
engagement with immunisation
programmes in selected
underserved populations

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Contents

About this briefing	2
Key points	2
Introduction	4
Evidence summary	5
Summary of evidence	23
Conclusions	25
Appendix 1: Search terms and strategy	27
References	33

About this briefing

This rapid review summarises recently published literature on strategies that aim to improve engagement with immunisation programmes in selected underserved populations.

Key points

- There is an underdeveloped evidence base on interventions aiming to improve vaccination rates among certain underserved populations.
- There is a lack of robust evidence for effective interventions in Gypsy/Traveller communities. Outreach programmes and dedicated services were reported in two studies but robust evaluation was lacking. One robust qualitative study suggested a number of ways to increase vaccination uptake, but formal evaluation to assess their effectiveness is needed.
- There is some evidence from three studies to support the use of health checks as an approach to improve vaccination uptake in people with learning disabilities.
- Tailored information, such as translated resources and/or bilingual support, featured in all six studies found for people whose first language is not English. Three studies which looked at multicomponent interventions suggested that education, as well as additional support (e.g. reminders, outreach or patient navigation) may improve completion rates of immunisation programmes involving multiple injections. Non-clinical, trusted community settings could be locations to implement the interventions for at-risk populations.
- A range of approaches were evaluated in eight studies for deprived populations, one of which was a systematic review of 41 studies. The studies largely came from the USA, and were mixed in terms of quality and study design. Deprived study populations were heterogeneous in terms of ethnic and cultural diversity, and predominantly urban. As such, the interventions tailored to these populations may have limited transferability to the UK.

- A large systematic review provided moderate-quality evidence that locally designed multicomponent interventions are effective in reducing inequalities in immunisation in urban ethnically diverse deprived children and adolescents. It also found that interventions that included home visits and increased in intensity could be effective, but there was mixed evidence for social marketing and limited evidence for text message reminders.
- In two studies, prenatal and postpartum periods were used as opportunities to improve vaccination uptake among deprived mothers and their infants. Evidence for interventions in deprived adult populations was limited to an evaluation of one pharmacist-driven initiative of limited effectiveness.

Introduction

Vaccination delivery is being modernised across Scotland. The three-year vaccination transformation programme (VTP) aims to empower local decision making, and will reconfigure vaccination services so that delivery of the Scottish Immunisation Programme (SIP) will move away from general practice to provision by NHS Boards. During the transition, NHS Boards will work alongside local partners to develop, test and implement safe and sustainable service delivery models to suit their local population, geography, workforce and resources.¹ It is critical that high vaccination coverage of the SIP (> 95% for some programmes) is maintained or improved, and the inequalities gap across programmes closes further.²

While vaccination programmes have been shown to reduce health inequalities worldwide, there are populations that vaccination services still find difficult to engage with and are therefore undervaccinated.³ These groups are known as underserved populations. They are defined as a group of individuals from any ethnic background who due to social circumstances or disability, language, culture or lifestyle find it difficult to access health care or healthcare services.⁴ Suboptimal vaccination means that underserved populations are at increased risk of morbidity and mortality from vaccine-preventable diseases.² The reasons for suboptimal vaccination among these groups are many, varied and complex. Examples of barriers to vaccination among underserved populations include: poor access to healthcare services; marginalisation; perception of low risk; fear and distrust; complacency; culturally derived attitudes; poor health literacy; language barriers; and cost.^{3,5}

Standard approaches to vaccination delivery may have limited effectiveness among underserved groups, which is shown by the difference in vaccination rates in these populations compared with the general population.⁶ The VTP is an opportunity to find better ways to design and deliver immunisation services, taking into consideration the needs of underserved groups. Therefore, this rapid review aimed to identify effective interventions to improve engagement with underserved populations in immunisation programmes.

Underserved groups can comprise a number of different populations including migrants and refugees, people who are socially disadvantaged, nomadic groups, homeless people, the elderly, people who are housebound due to mobility or cognitive impairment, and children who are home schooled or are hospitalised long term. Because of time constraints, it was not possible to cover all underserved groups; however, the review covers the following populations:

- people from deprived areas
- people whose first language is not English
- people with learning disabilities
- Gypsy/Traveller communities.

Evidence summary

Systematic methods were used to identify, critically appraise and synthesise published, peer-reviewed research on ways to improve engagement with immunisation programmes among selected underserved communities. The populations included in this review were selected by business change managers for the VTP within local Health Boards through a prioritisation process.

A literature search of seven electronic bibliographic databases found English-language studies that were published between January 2013 and August 2018. The databases, search terms and strategies can be found in **Appendix 1**. Studies were selected if they were conducted in high-income countries and assessed an intervention to improve immunisation uptake or change an intention to vaccinate in the defined underserved populations.

Of the 1,149 studies identified, 17 studies met the inclusion criteria and three additional studies were found from reference lists of relevant papers. A total of 20 studies were included in this review. Given the variety in study designs and quality, the evidence is presented for each underserved population.

People from deprived areas

Key points

- Evidence for interventions to increase vaccination uptake in deprived communities predominantly comes from US-based studies, in which populations were ethnically diverse, and interventions were population and context specific.
- Multicomponent interventions feature in studies across all age groups and were heterogeneous in composition. Evidence from a large systematic review of moderate quality indicated that locally designed multicomponent interventions may be effective in urban deprived child and adolescent populations from minority backgrounds.
- Prenatal and postpartum periods could provide opportunities to improve vaccination uptake among deprived mothers and their infants. Evidence for interventions in adult populations was limited to one pharmacist-driven initiative of uncertain effectiveness.

The effect of deprivation on immunisation is well documented in Scotland and appears to vary by age of the population and immunisation programme.

Uptake of routine childhood immunisations is generally high across all deprivation categories, but there is a slight deprivation effect for all vaccines, with rates increasing across deprivation quintiles from the most to the least deprived. Children in more deprived areas are more likely to be vaccinated later in their second year than children in less deprived areas.⁷ Among seasonal flu programmes for primary school children and adolescent immunisation programmes, the deprivation gradient is marked, with uptake lower for the most deprived areas compared with the least deprived areas. An inequality gap also exists for adults eligible for the shingles vaccine in both the routine and catch-up cohorts.⁸

A broad range of interventions to reduce inequalities in vaccine uptake or increase immunisation rates among deprived populations were identified in eight studies of variable design (two systematic reviews, two evaluations, one

randomised controlled trial, one intervention study, one modelling study and one quasi-experimental study) and quality. There is no universal tool to measure deprivation but, of the tools that exist, a number of indicators such as income, employment, health, education, access and housing are included. As a result, low income, postcode areas and public health insurance status were considered to be proxies for deprivation. The majority of the studies were based in the USA and many used enrolment in public insurance programmes, such as Medicaid and the Children's Health Insurance Program, as an inclusion criterion for low income.

Five studies focused on interventions in children and adolescents,^{9,10,11,12,13} two focused on pregnant or postpartum women and their infants^{14,15} and one on adult populations.¹⁶ The results are presented by age of population to highlight any commonalities in intervention type.

Children and young people

A large systematic review brings together evidence on effective interventions to reduce inequalities in predominantly urban, ethnically diverse, deprived children and adolescents.⁹ This review updates a 2009 systematic review which underpins the National Institute for Health and Care Excellence (NICE) public health guidance on reducing inequalities in immunisation in under-19-year-olds.¹⁷ The authors identified a total of 41 studies. These were from the USA (n = 31), the UK (n = 5), Canada (n = 3) and Australia (n = 2), and they looked at complex multicomponent interventions* (n = 16), reminder/recall systems (n = 18), outreach programmes (n = 3) and computer-based interventions (n = 2).

* There was variation in the composition of each complex multicomponent intervention but they typically contained two or more interacting components, which could comprise identification, promotional materials, education, patient reminder/recall, outreach (e.g. home visits), training of healthcare workers, prompts for healthcare workers, additional services (e.g. clinics), standing orders (i.e. non-prescribing healthcare professionals) and/or community involvement.

The review concluded that:

- interventions that included a home visit showed some evidence of effectiveness
- escalating intensity in an intervention was mostly effective (a finding consistent with the 2009 review) and may be a cost-effective approach to incorporating home visiting into a programme
- outreach interventions alone were not effective
- there was mixed evidence of effectiveness for social marketing interventions, but these might be promising among adolescents
- centralised reminder/recall systems worked better than practice-based ones
- there is limited evidence that text message reminders are effective in reducing inequalities.⁹

This study undertook an extensive literature search to 2015 and although the authors reported that they followed NICE methodology, the quality of the individual studies was not reported. In total, 24 of the 41 studies looked at inequalities from deprivation/low income in addition to ethnicity, urban environment or both. Only eight studies specifically targeted interventions to address low vaccination uptake in deprived or low-income populations. Three of these studies involved a multicomponent intervention [including two Scottish studies on school-based delivery of the human papillomavirus (HPV) vaccine], three studies evaluated a reminder/recall intervention (including one English study on incentives for HPV vaccine uptake) and two involved home visiting as an outreach intervention.

Given the variation in the populations and contexts, the interventions may not be transferable to other settings. However, the findings of this study offer an insight into the types of approaches used for children and adolescents with low vaccination uptake and suggest that multicomponent interventions which are designed to address the local needs of the population provide the best evidence for vaccination uptake.

School-based delivery aims to reduce inequalities in the uptake of vaccines among child and adolescent programmes, and many high-income countries use this method of delivery.^{18,19} The findings of a well-conducted systematic review also support this approach in advancing health equity among deprived communities from minority backgrounds. Median estimates from four fair- or good-quality US non-randomised studies with immunisation as a health outcome were combined. These programmes comprised onsite clinics serving predominantly low-income (determined by Medicaid or free lunch status) and ethnic minority high school students. The combined effect indicated that school-based health centres were associated with improvements in recommended vaccinations, with an increase of 15.5 percentage points (although the range for individual study effects was wide, ranging from –22 percentage points to 26.1 percentage points). Although there was some risk of bias and limited generalisability because of differences in the healthcare systems, health centres linked with schools may have a role in reducing inequalities in immunisation among deprived ethnic minority adolescents.¹⁰

A number of interventions targeted parents to increase awareness of vaccination in children and young people, or influence behavioural intent or vaccination status. The first of these was a social marketing immunisation campaign, which delivered messages in a variety of community settings using a phased approach.¹¹ The campaign used a community-based participatory research approach to create culturally appropriate messages, and targeted neighbourhoods where low-income urban communities lived. The campaign had a modest effect, with about half of survey respondents who reported seeing the immunisation campaign indicating that it motivated them to act, and 30% reported immunising their child after the billboard phase compared with 17% after the ‘enhanced’ billboard phase. Although the study had deficiencies in terms of quality, a community-based participatory research approach in designing culturally appropriate messages and identifying suitable locations for health messages on immunisation in the community may have been effective in reaching low-income urban minority communities.

The second study was a multilevel intervention targeting parents, adolescents and providers. In a four-arm factorial design, the effectiveness of a health system-level gender-specific postcard campaign and an in-clinic health information technology (HIT) system in increasing HPV vaccination initiation among non-vaccinated adolescents was assessed.¹² Public insurance status was used as a proxy for deprivation and adolescents enrolled in Medicaid or the Children's Health Insurance Program were recruited. The sample included 2,773 girls and 3,530 boys, and the participants were ethnically and racially diverse. The study showed that administering the postcard campaign at a health system level was feasible, with at least one postcard successfully reaching 95% of parents. They were generally well received and prompted many to seek additional information about the vaccine (91% of boys and 80% of girls among 162 parents who participated in the survey). HPV vaccination initiation rates increased variably across all intervention arms compared to control arms (with the adjusted odds of initiation increasing by 60% in girls and 10% in boys with the postcard campaign; 30% in girls and 40% in boys with the HIT system; and 100% in girls and 60% in boys with the postcard campaign and HIT system). However, the results should be considered with caution given that participants were not randomised to the HIT arm and there were issues with recruitment to the HIT arm.

An additional recall/reminder intervention study of moderate quality was identified which focused on children and adolescents, and targeted missed influenza vaccination opportunities. The intervention flagged unvaccinated individuals to healthcare providers via colour-coded alerts in a registry-linked electronic health record.¹³ Using a cluster randomised crossover design comparing the effects during 'on' and 'off' periods across four US clinics serving a predominantly publicly insured and Latin American population, the intervention modestly increased influenza vaccination among children who were not up to date during late winter months by 5.7%. Although acting on the reminder was not mandatory, 83% of providers engaged with it, so tailoring a reminder intervention to meet the healthcare provider's requirements could be beneficial.

Pregnant women and postpartum women with infants

Prenatal and postpartum periods were used as opportunities to improve vaccination uptake among low-income mothers and their infants. Two studies evaluated programmes with different components. The first study estimated the projected impact of an intensive pre- and postnatal home visiting programme by registered nurses offered to low-income first-time mothers.¹⁴ Based on effectiveness data from 1999 to 2013, the modelling results suggested a 13% increase in probability that children covered by public insurance will have complete immunisations at age two by 2031. Some issues with the immunisation trial data meant that these results should be interpreted with caution; however, participation in a home visiting-based intervention may improve compliance with early childhood immunisation programmes in low-income families.

The second study evaluated a multicomponent programme to improve uptake and completion of HPV vaccination among postpartum mothers who had delivered their baby at a public hospital and were unvaccinated or partially vaccinated.¹⁵ The programme involved: the distribution of factsheets on HPV in English and Spanish; face-to-face counselling; providing the vaccination free of charge; and patient navigators, who scheduled follow-up appointments to coincide with postpartum or infant checks and provided a reminder service. Offering the HPV vaccine postpartum markedly increased vaccination initiation rates among patients, from 25.4% before the intervention to 80.8% post-intervention, and increased completion rates from 15.5% to 65.1%. Patient navigation and text messages potentially ensured that a high percentage completed all three doses. Uptake of influenza vaccination during pregnancy was also associated with receipt and completion of HPV vaccination. Although the findings of this single-centre evaluation have limited generalisability, they do support the design of interventions to address multiple barriers such as cost, onsite access, convenience and language.

Adults

Evidence for interventions in deprived adult populations was limited to one pharmacist-driven immunisation programme evaluated in a retrospective intervention study.¹⁶ The pharmacist-driven initiative involved identification of low-income and uninsured individuals who were eligible for free vaccination through a proactive chart review of every clinic patient, offering them additional education in English or Spanish and (depending on their immunisation status) giving them multiple vaccinations in one visit to a pharmacy by a pharmacist or trainee. Telephone call reminders were made by volunteers for any follow-up doses. Although the initiative was associated with a large number of recommended vaccinations given to patients over the study period, it was difficult to assess the impact of this intervention due to a number of data collection issues and lack of baseline data. However, it is an example of an intervention driven by pharmacists, adopting an efficient approach to providing vaccination and using an innovative method to identify and serve a population in most need of immunisation updates.

People whose first language is not English

Key points

- Evidence for interventions to improve vaccination uptake in people whose first language is not English comes from six studies conducted in the USA and Canada.
- Tailored information, such as translated educational materials and/or bilingual support, featured in all studies and may help to engage people with limited English and positively influence their intention to vaccinate.
- Multicomponent interventions were examined in three studies and the findings suggested that education as well as additional support (e.g. reminders, outreach or patient navigation) may help completion of immunisation programmes that involve multiple injections.
- Non-clinical, trusted community settings could be locations to implement interventions to improve vaccination rates in at-risk populations. Engaging the support of trusted community leaders may be fundamental to this approach.

An individual whose first or native language is not English may have limited ability in oral and written communication. Scottish census data indicate that 1.4% of the population are not able to speak English well or at all and this percentage increases to 11% for those born outside the UK.²⁰

Communication difficulties can act as a barrier to accessing health care, and can lead to inequalities in health. Undervaccination is often seen among newly arrived migrants and refugees because they have not been vaccinated in their country of origin or completed the vaccination course.²¹ Suboptimal vaccination is also made worse by the lack of knowledge of the healthcare system, and cultural differences in health-seeking behaviour and attitudes to preventative care.²²

A variety of strategies were identified in one Canadian study²³ and five US studies^{24,25 26,27,28} among minority populations to improve levels of immunisations of HPV (four studies)^{24,25,26,27} and hepatitis B virus (HBV) (two studies).^{23,28} The studies were of low or moderate quality.

Three studies evaluated educational interventions to increase participant knowledge of a disease area and to change behaviour in terms of intention to vaccinate.^{23,24,25} In a study with a pre-/post-test design, Zibrik et al.²³ delivered workshops to Chinese, Filipino, Korean and Punjabi immigrants in their native languages using culturally sensitive and validated curricula and resources by trained bilingual staff. Data indicated variable success in engaging these at-risk ethnic communities in HBV prevention, with 48% talking to their healthcare professional about HBV testing/care and 19% reported being tested for HBV, but only 1% receiving the HBV vaccination.

Obulaney et al.²⁴ reported a 25% increase in the intent to vaccinate against HPV among uninsured and under-insured mothers and daughters who had participated in a nurse-led educational intervention using a quasi-experimental design in a faith-based clinic. The intervention used a pictorial brochure in English and Spanish, a presentation with Spanish subtitles followed by a question and answer session, and a Spanish-speaking volunteer who acted as a translator. The need for tailored information was evident; 67.4% of the participants were Hispanic and 54% of mothers spoke Spanish as their primary language. The clinic's aggregate HPV vaccine rate also increased during the cervical cancer prevention initiative, however, it was not possible to attribute this rise to the intervention.

The effect of a photographic short story (fotonovela) on participant knowledge and acceptability was evaluated in a before-and-after intervention study among a low-income Hispanic community.²⁵ The fotonovela was a culturally and linguistically tailored educational tool, which was generally well received and participants found it both educational and easy to read. A notable improvement in vaccination intention was seen, from 18% at baseline to 82% post intervention. The fotonovela may be useful for healthcare providers or

schools to engage non-native English speaking populations in dialogue about HPV vaccination.

These three studies used convenience samples with small participant numbers in which subjects acted as their own controls, and they did not randomise participants. Therefore, it is not possible to attribute the results solely to the intervention. The findings may also have limited generalisability to other ethnicities and settings. Although some improvement in intentions to vaccinate were seen, this outcome is not particularly reliable, as intentions are not always acted on and may not result in greater vaccination uptake.

Multicomponent interventions in community settings were evaluated in three studies with control groups,^{26,27,28} one of which used randomisation.²⁸ Two non-randomised studies^{26,27} evaluated linguistically tailored interventions to increase HPV vaccination uptake and reported significantly higher rates of completion of the three doses in the intervention groups compared with the control groups. Aragonés et al.²⁶ assessed the effect of parental education comprising a one-on-one session and printed materials, with or without weekly text message reminders in Spanish on Mexican parents of vaccine-eligible children attending a Mexican consulate in New York. The initiation rates were 98% and 87% in the education plus text messaging group, and in the education only group respectively. Of those who received a first dose, 88% of the text messaging and education group received all three doses compared with 40% in the educational only group ($p = 0.004$). The multicomponent intervention by Parra-Medina et al.²⁷ was part of a culturally relevant cervical cancer prevention programme. This involved group health education in their preferred language and outreach through referral and navigational support by a trained, culturally competent and trusted community healthcare worker (known as a *promotora*). The control group received a brochure in English or Spanish only. Although a similar percentage of individuals in both groups initiated vaccination (84%), the intervention participants were more likely to complete the three doses of the series compared with controls (72.2% versus 42.5%, $p < 0.001$). Both of these studies suggest that in addition to education, the additional support either

through promotora outreach or a text message reminder system may be important in encouraging completion of the HPV vaccine series.

Churches were shown to be a promising location for implementing multilevel interventions to change vaccination behaviour. Considerable improvements in HBV vaccination were seen in a large-scale, randomised, church-based trial of moderate quality. This study evaluated the effectiveness of a cultural and linguistically appropriate multicomponent intervention in a community of Korean Americans (59% did not speak English well or at all). The completion rate of the three-series vaccine was 84% in the intervention group compared with 17.6% in the control group at 12 months.²⁸ The intervention focused on addressing individual and provider barriers, and was informed by a community-based participatory research approach. It involved interactive group education delivered by bilingual community health educators, providing patient navigation assistance (such as language translation, appointment scheduling, transportation and low-cost health services) and engaging healthcare providers, church leaders and church members with a medical background. The control group received only group education, translated printed materials and encouragement to undergo routine checks. Although it was difficult to tell which components contributed to the overall intervention effect, its effectiveness may also be because of the combined efforts of adhering to community-based participatory research principles from study partners leading to community empowerment and targeting multilevel barriers. There were some issues related to the effectiveness of randomisation and the finding's generalisability to other ethnic populations in this setting.

People with learning disabilities

Key point

- There was some evidence to support the use of health checks as an approach to improve vaccination uptake in people with learning disabilities. This was based on three studies reported in two well-conducted systematic reviews and one randomised controlled trial of moderate quality.

People with learning disabilities have complex health needs. Communication difficulties and poor health literacy can reduce their ability to convey health needs. This population also experiences significant health inequalities, with evidence of difficulties in accessing health services.²⁹ Vaccination rates for this population are not well documented.

Three studies (two systematic reviews^{30,31} and one randomised controlled trial³²) evaluated variations of a screening tool, known as a health check, which helps to identify, prevent and manage health problems in people with learning disabilities. Immunisation status was checked as part of screening. Two well-conducted systematic reviews^{30,31} reported two Australian randomised controlled trials that evaluated the effectiveness of a health check in intervention groups compared with controls. Robertson et al.³⁰ also reported the outcomes of a screening programme in a Scottish matched cohort study. A pooled analysis of all three studies was reported in Robertson et al.³⁰ Study data from 795 individuals with mild-to-moderate learning disability showed increases in HBV, tetanus/diphtheria and influenza immunisation in the intervention group compared with the control group. Although the individual studies were small and there were some differences in terms of where participants lived (residence, private dwelling and with carers), the health professional doing the check and the intensity of the intervention, the results are likely to be reliable due to low bias in study methodology, and potentially generalisable to the wider learning disability population.

A Scottish randomised controlled trial of moderate quality using a cluster design of 38 GP practices to assess both the clinical and cost-effectiveness of a health check delivered by a practice nurse in adults with learning disabilities showed mixed results.³² After nine months, newly detected immunisation needs were not always acted on. With the exception of influenza where 61% of controls receiving standard care and 71% of the health check group were vaccinated, follow-up rates for tetanus, polio and HBV immunisations were less than 22% in the control group and 16% in the intervention group. The study also found that the health check offered cost savings compared with standard care.

Although available in other areas of the UK, health checks for people with learning disabilities are yet to be introduced in Scotland. A recent report called for the development of a national health screening programme for people with learning disabilities to be considered.²⁹

Gypsy/Traveller communities

Key points

- Only three studies were identified on interventions to engage Gypsy/Traveller communities in immunisation. Outreach and dedicated services have been reported in two studies but evidence of their effectiveness is lacking or not robust.
- One qualitative study identified a number of ways to potentially increase uptake in vaccination among Gypsy/Traveller communities through engagement with settled Travellers and healthcare providers. However, rigorous formal evaluation is needed to gather evidence on their effectiveness once they are implemented.

Traveller communities are a heterogeneous group, comprising Gypsy, Traveller and Roma populations who may be nomadic or settled in either an authorised or non-authorised location. They typically experience significantly poorer health, which is made worse by poor uptake of health services.^{3,33} We have included Showpeople in our search strategy, but we acknowledge that that there is a lack of evidence on health outcomes for this community.

There is a lack of immunisation data, particularly among adult populations, which may be due to issues with recording of ethnicity and an unwillingness to disclose this information. Undervaccination of Gypsy/Traveller children is highlighted in an English study.³⁴ Indeed, outbreaks of measles and whooping cough among Traveller communities are documented.³⁵

Evidence on interventions to engage Traveller communities in immunisation programmes was identified in three UK studies (one systematic review,³³ one scoping review³⁶ and one qualitative study³⁵). Although the methodology of the secondary evidence was considered to be high quality, this does not reflect the quality of the individual studies the reviews included.

A diverse range of strategies to facilitate access to and engagement with healthcare services was identified from 40 studies and these included specialist roles, dedicated services, raising health awareness, outreach, hand-held records, cultural awareness training and collaborative working.³³ Only one study provided details of an engagement strategy that may enhance access to immunisation. Dar et al.³⁴ highlighted the use of dedicated services in 37/135 primary care trusts across England to improve immunisation in the Gypsy/Traveller communities. Seven services (18.9%) delivered onsite immunisation by a dedicated healthcare worker, four (10.8%) reviewed immunisation as part of a health assessment and then referred to the GP or an immunisation nurse for follow-up vaccination and the remaining trusts commissioned a variety of healthcare workers to deliver the service. However, the effectiveness of the services was not reported.

Carr et al.³⁶ undertook a comprehensive scoping review on outreach programmes to improve Traveller health. The authors included 278 studies, many of which were anecdotal accounts. The research articles reporting outreach interventions were considered to be of poor methodological quality. Only one-quarter of the studies described implementing outreach programmes, which were classified as mobile clinics, professional outreach, lay outreach and office-based outreach. Some improvement in immunisation uptake was noted with mobile clinics, professional outreach and lay outreach from a small number of isolated programmes that mainly focused on children, and involved a health visitor or community healthcare worker.

The most convincing research on interventions to engage Traveller communities with immunisation programmes comes from a three-phase qualitative study.³⁵ The UNderstanding uptake of Immunisations in Travelling aNd Gypsy communities (UNITING) study engaged family members from six different Traveller communities who were settled in four UK cities as well as healthcare workers, who were interviewed either as a group or individually. A total of 12 interventions for increasing immunisation uptake were identified using a modified intervention mapping approach and discussed with a smaller

sample of Travellers and service providers in workshops, during which 10 were considered relevant and the five interventions were jointly agreed.

The following interventions in order of priority are:

- 1 cultural competence training for health professionals and frontline staff
- 2 identification of Travellers in health records to tailor support and monitor uptake
- 3 provision of a named frontline person in GP practices to provide a respectful and supportive service
- 4 flexible and diverse systems for booking appointments, recall and reminders
- 5 protected funding for health visitors specialising in Traveller health.

The first four interventions also had the agreement of service providers. Five of the 10 interventions focused on the provision of accessible, evidence-based information about immunisation from trusted, well-trained health professionals, as well as delivery from reliable social media and media sources. Improving access to bilingual support, and joined-up and multisector working were the focus of the remaining interventions.

Interventions to improve the uptake of immunisation among Travellers who live on the roadside and on unauthorised encampments were also considered (although this population was not represented in the sample):

- 1 offering flexible delivery of immunisation services
- 2 improving the system of temporary registration at GP practices.

Evidence from the well-conducted UNITING study points to a number of ways to increase uptake in settled Traveller communities. Although there were some gaps in the sample in terms of family roles, the views are representative of settled Traveller communities and are potentially generalisable to members of other Traveller communities. These interventions therefore may have a greater chance of success because they were informed by engaging the views and agreement of a wide range of individuals from Traveller communities across the UK as well as service providers. They may have the

potential to reduce health inequalities because the prioritised interventions target institutional and policy levels, and generate effects upstream rather than downstream. The complementary nature of the prioritised interventions may also mean they could be delivered as a multifaceted intervention, which has shown greater effectiveness in increasing vaccine uptake.³⁷

Implementation of the prioritised interventions in national guidance was recommended but there is a need for rigorous formal evaluation to gather evidence on their effectiveness.

Summary of evidence

The following conclusions were reached for each underserved population:

People from deprived areas

- Eight studies examined interventions for deprived populations, which were predominantly ethnically diverse.
- Multicomponent interventions featured across all age groups and there was heterogeneity in their components because the interventions were tailored to support specific populations and contexts.
- The findings of a large systematic review indicate that locally designed multicomponent interventions[†] provide the best evidence for vaccination uptake in urban, ethnically diverse, deprived children and adolescents. This study also concluded that interventions that include home visiting and increase in intensity could be effective but there was mixed evidence for social marketing and limited evidence for text message reminders.
- Evidence for school-based health centres in increasing immunisation rates in the US has limited application to the UK, as school-based delivery of childhood and adolescent immunisation programmes already happens.
- Several studies targeted parents to increase awareness of immunisation through the social marketing and postcard campaigns, and had modest effects.
- Prenatal and postpartum periods were used as opportunities to improve vaccination uptake among deprived mothers and their infants.
- One pharmacist-driven initiative of limited effectiveness was identified for an adult population.

[†] There was variation in the composition of each complex multicomponent intervention but they typically contained two or more interacting components, which could comprise identification, promotional materials, education, patient reminder/recall, outreach (e.g. home visits), training of healthcare workers, prompts for healthcare workers, additional services (e.g. clinics), standing orders (i.e. non-prescribing healthcare professionals) and/or community involvement.

People whose first language is not English

- Six studies examined interventions for people whose first language is not English. They varied in their composition but translation of educational resources and/or bilingual support was common to all and fundamental in engaging the participants in communication about immunisation.
- Culturally and linguistically tailored interventions are important in this population.
- Multicomponent interventions featured in three studies and education in addition to support services to change immunisation behaviour (e.g. reminders, outreach or patient navigation) may be necessary to improve completion rates for immunisation programmes involving multiple injections.
- Non-clinical, trusted community settings such as churches and consulates may be locations for implementing interventions to improve vaccination rates, and engaging the support of trusted community leaders may also be important.

People with learning disabilities

- Three studies examined variations of 'one off' health checks in people with learning disabilities and reported positive changes to immunisation status, in line with national programmes and seasonal immunisation. These findings suggest that health checks may have a role in reducing inequalities in immunisation rates in this population.

Gypsy/Traveller communities

- Three studies on strategies to increase engagement of Gypsy/Travellers in immunisation programmes were identified. Outreach programmes and dedicated services have been used to improve immunisation rates among Traveller communities but approaches lack robust evidence of effectiveness. A qualitative study proposed a number of promising interventions that are yet to be evaluated.

Conclusions

The findings of this evidence review give an insight into what is being done to improve vaccination uptake among certain underserved populations. The heterogeneity of the interventions likely reflects that there is limited evidence for a single approach in promoting immunisation in underserved populations. Instead, a range of approaches have been adopted to suit the local needs of the populations.

There is some evidence to suggest that effective interventions may be multifaceted. There is heterogeneity in the composition of multifaceted interventions but the approaches could be broadly categorised into:

- behavioural (changing participant behaviour by offering patient navigation, outreach programmes, reminder services for patients and healthcare providers or social media campaigns)
- educational (awareness and knowledge raising through group sessions, workshops, audiovisual presentations, written resources, a photographic story or bilingual translation)
- environmental (facilitating access through non-clinical or community settings).

The categories are not mutually exclusive, and many interventions combined more than one approach. It was not possible to identify which components influenced the outcome. Indeed, the variation in the components of the interventions reflects the need to overcome relevant and/or multiple barriers to the underserved population which may exist at patient, provider and/or organisational level. This might require different types of approaches, for example, convenience requires activities such as enhancing geographic access to services, and using community resources (staff and locations), whereas low health literacy may require engagement strategies such as improved dialogue and the involvement of trusted individuals. Identifying facilitators of immunisation are also important and will enhance vaccination. Any targeted interventions for underserved populations currently in place are funded and delivered by NHS Boards and/or Health and Social Care

Partnerships, and this will carry on after the VTP. Community-based participatory research featured in a small number of studies and, given NHS Health Board vaccination services will be designed and delivered locally under VTP, this approach might be worth considering when developing community-specific interventions.

There is an underdeveloped evidence base on interventions to improve vaccination rates among the selected underserved populations. The evidence base is most developed for deprived populations and, to a much lesser extent, for people whose first language is not English. For both of these populations, a range of approaches have been evaluated and interventions are tailored to the local population and context. However, this evidence largely came from the USA, where the study populations were ethnically and culturally diverse. As such, the interventions were so population and context specific, as well as being heterogeneous in composition, that they may have limited transferability to the UK. This contrasts with people with learning disabilities, for whom only one type of intervention has been evaluated, and for Gypsy/Traveller communities, for whom effective interventions have yet to be evaluated.

Appendix 1: Search terms and strategy

The following electronic databases were searched:

- Medline
- EMBASE
- Cochrane library
- CINAHL
- ASSIA
- Web of Science
- Proquest Public Health and Sociological Abstracts.

The search terms and strategies were as follows:

People from deprived areas

- Deprived areas, deprived neighbourhoods, deprived communities, areas of deprivation, areas of high deprivation, poverty areas, depriv*, socioeconomically deprived, psychosocial deprivation, maternal deprivation, paternal deprivation, regional deprivation, regional inequality, social group, disadvantaged areas, disadvantaged neighbourhoods, disadvantaged communities, areas of disadvantage, marginalised communities
- [socioeconomic inequalities, socioeconomic factors, social class, social conditions, economic factors, economic determinants, house-hold income, slum, slums]

People whose first language is not English

- English as a second language, English as an additional language, limited English proficiency, English language proficiency, ESL, language difficulties, minority language background, interpretation services, translation, foreign language training, English language skills, language barriers, non-native language, non-native speaker, inadequate language, non-English speaking, first language, native language, home language, nonprimary language, mother tongue
- immigrant*, refugee*, asylum seeker* AND language

People with learning disabilities

- Learning disab*, intellectual disab*, intellectually disab*, intellectual impair*, mental retardation, pml, learning difficult*, intellectual developmental disord*, intellectual development disord*, Down* Syndrome
- [Search note: journal title search field included to pick up learning disability specific journals]

People from Gypsy and Traveller communities

- See search strategy from www.ncbi.nlm.nih.gov/pubmed/29346666

Vaccination

- Vaccin*, immunisation, immunization
- [mmr, hpv vaccine*, influenza vaccine*] individual vaccine names not used as search terms as should be included in broader search for vaccin*

Search strategies

People from deprived areas

Ovid MEDLINE(R) ALL <1946 to August 01, 2018>

#	Searches
1	exp Vaccination/
2	exp Immunization Programs/
3	(vaccin* or immunisation* or immunization*).ti,ab,kf.
4	1 or 2 or 3
5	poverty areas/
6	((depriv* or poverty or poor or disadvantaged or marginalized or marginalised) adj3 (area* or region* or communit* or location* or city or cities or town or towns or village* or borough* or municipal* or council*1 or commune* or neighbourhood* or neighborhood*).ti,ab,kf.
7	index of multiple deprivation.ti,ab,kf.
8	poverty/
9	((((low or lower or reduced or poor or poverty or depriv* or disadvantaged) adj3 (socioeconomic* or socio-economic* or social conditions or household income* or house-hold income)) or social disadvantage or socially disadvantaged*).ti,ab,kf.
10	5 or 6 or 7 or 8 or 9
11	4 and 10
12	limit 11 to (english language and yr="2013 -Current")

English as a second language

Ovid MEDLINE(R) ALL <1946 to August 2, 2018>

#	Searches
1	exp Vaccination/
2	exp Immunization Programs/
3	(vaccin* or immunisation* or immunization*).ti,ab,kf.
4	1 or 2 or 3
5	(second language* or additional language*).ti,ab,kf.
6	(english adj3 proficien*).ti,ab,kf.
7	(language adj3 proficien*).ti,ab,kf.
8	language difficult*.ti,ab,kf.
9	(minority language* or non-native language* or foreign language* or non-English speak* or non-native speak* or first language* or native language*

#	Searches
	or home language* or nonprimary language* or non-primary language* or mother tongue*).ti,ab,kf.
10	(interpreter* or interpretation service*).ti,ab,kf.
11	((immigrant* or refugee* or asylum seeker*) and language*).ti,ab,kf.
12	"Emigrants and Immigrants"/
13	Language/
14	multilingualism/
15	language.ti,ab,kf.
16	13 or 14 or 15
17	12 and 16
18	5 or 6 or 7 or 8 or 9 or 10 or 11 or 17
19	4 and 18
20	limit 19 to (english language and yr="2013 -Current")

Learning disabilities

Ovid MEDLINE(R) ALL <1946 to August 2, 2018>

#	Searches
1	exp Vaccination/
2	exp Immunization Programs/
3	(vaccin* or immunisation* or immunization*).ti,ab,kf.
4	1 or 2 or 3
5	exp Intellectual Disability/
6	(learning disab* or intellectual disab* or intellectually disab* or intellectual impair* or mental retardation or pmlid or learning difficult* or intellectual development disord* or intellectual developmental disord* or down* syndrome).ti,ab,kf,jw.
7	5 or 6
8	4 and 7
9	limit 8 to (english language and yr="2013 -Current")

Gypsy and Traveller communities

Ovid MEDLINE(R) ALL <1946 to August 2, 2018>

#	Searches
1	exp Vaccination/
2	exp Immunization Programs/
3	(vaccin* or immunisation* or immunization*).ti,ab,kf.

#	Searches
4	1 or 2 or 3
5	Roma/
6	(gypsy*1 or gypsies or gipsy*1 or gipsies).ti,ab,kf.
7	(roma or romas or romany*1 or romani or romanis or romanies).ti,ab,kf.
8	(arli or arlis or ashkali or ashkalis or aurari or auraris or balkan egyptian or balkan egyptians or bashalde or bashaldes or boyash*1 or churari or churaris or cigano or ciganos or erlide or erlides or gitano or gitanos or gitans or horahane or horahanes or kalderash*1 or lalleri or lalleris or lingurari or linguraris or lovari or lovaris or ludar or ludars or ludari or ludaris or luri or luris or machvaya or machvayas or manouche or manouches or manush or manushs or manushes or modgar or modgars or modyar or modyars or romanichal or romanichals or romanichel or romanichels or romanis?l or romanis?ls or romungro or romungros or rudari or rudaris or tsigane or tsiganes or ungaritza or ungaritzas or ursari or ursaris or yerlii or yerliis or zl?tari or zl?taris).ti,ab,kf.
9	(sinti or sinta or sinte or sintis or sintas or sintes).ti,ab,kf.
10	ceardannan*.ti,ab,kf.
11	(yenish*1 or yeniche*1 or jenische*1).ti,ab,kf.
12	(quinqui*1 or mercheros*1).ti,ab,kf.
13	kale.ti,ab,kf.
14	(fairground*1 or fair-ground*1 or funfair*1 or fun-fair*1 or showmen*1 or show-men*1 or showwomen*1 or show-women*1 or showperson*1 or show-person*1 or showpeople*1 or show-people*1 or show communit* or show travel?er*1 or forains industriel).ti,ab,kf.
15	(circuses or circus men*1 or circus women*1 or circus person*1 or circus people*1 or circus communit* or circus travel?er*1).ti,ab,kf.
16	(bargee*1 or canal boat*1 or barge*1 or boat-dwell*).ti,ab,kf.
17	(pavee*1 or minceir* or lucht*1 or luchd*1 or itinerants).ti,ab,kf.
18	(travel?er*1 and (communit* or family or families or irish or ireland* or eire or wales or welsh or scottish or scotland*1 or highland*1 or norwegian*1 or norway*1 or newage or new-age or itinerant*1 or minorit* or ethnic* or halting site*1 or caravan*1)).ti,ab,kf.
19	(travel?er*1 adj1 (people* or person or persons or children*1 or child*1 or men or mens or male*1 or women*1 or female*1 or population*1 or group*1 or site or sites)).ti,ab,kf.
20	occupational travel?er*1.ti,ab,kf.
21	(travel?ing adj5 (communit* or family or families or irish or ireland* or eire or wales or welsh or scottish or scotland*1 or highland*1 or norwegian*1 or norway*1 or newage or new-age or itinerant*1 or minorit* or ethnic* or site*1 or caravan*1)).ti,ab,kf.
22	(travel?er*1 or travel?ing).ti,ab,kf.

#	Searches
23	"Transients and Migrants"/
24	"Emigrants and Immigrants"/
25	Vulnerable Populations/
26	Minority Groups/
27	Ethnic Groups/
28	Cultural Characteristics/
29	23 or 24 or 25 or 26 or 27 or 28
30	22 and 29
31	5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 30
32	4 and 31
33	limit 32 to (english language and yr="2013 -Current")

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