Interventions to Increase Community Demands for Vaccinations:

Client Reminder/Recall Systems

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Abramson et al. 1995) **Citation:** Development of a vaccine tracking system to improve the rate of age appropriate primary immunisation in children of lower socio economic status **Aim of study**: To increase the number of children of lower socio-economic status receiving their primary vaccinations on schedule using a newly developed vaccine tracking system **Study design:** RCT **Internal validity score:** - **Applicability:**	**Source population/s**: USA **Eligible population:** Infants born at Forsyth Memorial Hospital where the infant's mother indicated that the infant's primary care would be at the Reynolds Health Centre or Brenner Children's Hospital clinics. More than 98% of 5600 infants born in Forsyth County, each year are delivered at Forsyth Memorial Hospital. **Selected population:** Babies born at Forsyth Memorial Hospital and whose mother's indicated that primary care of the baby would be at the Reynolds Health Centre or Brenner Children's Hospital clinics and who were discharged on weekdays. **Excluded population/s:** 1. Infants not born in Forsyth Memorial Hospital. 2. Infants born in Forsyth Memorial Hospital and discharged on weekends **Setting:** Public hospital in Forsyth County in the US serving a lower socio economic population.	**Method of allocation:** NR **Intervention/s description:** 1. Reminder postcards sent 1 week before target vaccination dates. Parents of infants who did not receive a scheduled vaccination were reminded again with a post card. 2. Phone calls made to the family once a week until either the infant received the vaccination, a family member indicated that the primary health care provider had changed or the infant was more than 1 month behind on scheduled vaccinations. **Control/comparison/s description:** Control group did not receive any intervention except the public health department's routine policy of sending a single postcard to families of infants who did not keep their scheduled appointments. Infants in this group who did not make an initial appointment received no reminders.	**Primary Outcomes** Proportion of infants in each group who received their primary series of immunisations at age-appropriate times. **Secondary outcomes** NR **Follow-up periods:** 2 months, 4 months and 7 months**.** All infants were followed until they completed their primary series of immunisations or they reached 7 months of age. (Schedule for primary series of immunisations: DPT: 2, 4 and 6 months OPV: 2 and 4 months Hib: 2, 4 and 6 months Hepatitis B: 1, 2 and 6 months). **Method of analysis:** Chi-squared test was used to determine differences in proportions. Intention-to-treat analysis conducted. (Four infants	**Primary outcomes:** At 7 months of age 91% (274/301) of infants in intervention group versus 72% (214/296) of control infants were up-to date on vaccinations, a 19% difference in the risk of being delayed at 7 months of age (95% CI, 13% to 25%; chi-square**,** 35.1; p=3x 10-9. Risk difference at 2 months: 25% (95% CI, 18% to 31%) Risk difference at 4 months: 17% (95% CI, 11% to 23%) **Secondary outcomes:** NR **Attrition details:** One infant in the intervention group and three in the control group moved out of state and were lost to follow-up. (These infants not included in the analysis)	**Limitations identified by author:** NR **Limitations identified by review team**: Method of randomisation not described. Allocation concealment not reported. Blinding of participants, health care providers or assessors not reported. **Evidence gaps and/or recommendations for future research:** Further studies to evaluate the relative contributions of each component of the reminder system to its overall success and also the effectiveness of

B	**Vaccine:** Hib, DPT, OPV, Hep B	**Sample sizes:** **Total n=** 601 **Intervention n=** 302 **Control n=** 299 **Baseline comparisons**: The two groups were similar for race, number of siblings, maternal age and marital status. **Study sufficiently powered?** Formal power calculation not used for determination of sample size	in the intervention and seven in the control group changed health care providers within the state; vaccination status was determined for all these 11 children and included in analysis).		the tracking system in other settings (e.g. large inner city populations) **Source of funding:** Merck Sharpe & Dohme
(Alemi et al. 1996) **Citation:** Computer reminders improve on-time immunisation rates **Aim of study:** This study examines the effectiveness of computer-generated telephone reminders in improving infants receiving on-time immunisations. **Study design:** NRCT **Internal validity**	**Source population/s:** USA **Eligible population:** Infants enrolled at the outpatient clinic of Rainbow Babies and Children Hospital of Cleveland from April 1993. **Selected population:** Infants younger than 6 months enrolled at the outpatient clinic of Rainbow Babies and Children Hospital of Cleveland from April 1993 who had not visited the clinic before, and who were patients of one of the participating three attending physicians and three nurse practitioners and who consented to take part in the study. **Excluded population/s:** Control and intervention group participants who received regular care elsewhere, had moved out of the area, or whose immunisation	**Method of allocation:** NR **Intervention/s description:** The intervention comprised a computer generated telephone reminder. A computer called parents at home, reminded them of their child's visit, and asked if they could keep the appointment. If parents either cancelled or failed to honour the appointment, the computer called back a few days later and asked them to reschedule. **Control/comparison/s description:** **The control group did not receive any intervention.** **Sample sizes:** **Total** n= 213 **Intervention** n=124	**Primary Outcomes:** On-time immunisation rate of the infants. Immunisations were considered to be late if the child was more than 30 days past on any immunisation schedule of the American Academy of Paediatrics, except for Hepatitis B vaccine. Secondary outcomes: NR **Follow-up periods:** 1 year **Method of analysis:** Descriptive statistics.	**Primary outcomes:** The on-time immunisation rate for the intervention group were significantly higher than that for the control group 67.8% versus 43.4% (P = 0.0005). The on-time immunisation rates for individual vaccines were: **DTP** 82.6% (100) compared to 57.8% (48) in the control group (p=0.0001). **OPV** 71.9% (87) in the intervention group compared to 53% (44) in the control group (p=0.0057). **MMR** 76.6% (59) in the intervention group compared to 55.9%	**Limitations identified by author:** NR **Limitations identified by review team:** Not reported how the sample size was determined. Intention to treat analysis not used. Participants where those who consented to participate in the study, i.e. those who wanted to be remaindered. **Evidence gaps and/or recommendations**

score: + **Applicability:** B	data were requested by another clinic, were excluded from the analysis after the completion of data collection. A total of one participant from intervention group and four from the comparison group were excluded because of the above reasons. **Setting:** Outpatient clinic of Rainbow Babies and Children Hospital of Cleveland, USA. **Vaccines:** DTP, Oral polio vaccine, MMR, Hib	**Control** n=89 **Baseline comparisons:** There were no statistically significant differences in race and insurance status of infants between the comparison and experimental groups at alpha levels lower than 0.05. There was a significant difference in age of mothers. The mean age of the mothers in the intervention group was 21.6 years (standard deviation=5.9 years) where as the mean age of the mothers in the control group was 24.1 years (standard deviation=6.0 years). There were statistically significant differences in the age of infants between the intervention l and control groups. The mean age of the infants, at the time of chart review, in both the intervention group and control was 15.5 months, with standard deviations of 3.1 and 4.0 respectively. **Study sufficiently powered?** NR		(33) in the control group (p=0.0075). **Hib** 84.3% (102) for the intervention group compared to 62.7% (52) in the control group (p=0.0004). **Secondary outcomes:** NR **Attrition details:** Number analysed Intervention group n= 121 Control group n=83 Total analysed n=204 Total number lost-to-follow-up n= 9	**for future research:** Well designed, RCT should be conducted to determine the effectiveness of computer generated telephone reminders. **Source of funding:** NR
(Alto et al. 1994) **Citation:** Improving The Immunization Coverage Of Children Less Than 7 Years Old	**Source population/s:** USA **Eligible population:** 519 infants (aged 2 months or more on 1 January 1991) and children aged less than 7 years on June 30, 1991) and their parents enrolled in a	**Method of allocation:** NR **Intervention/s description:** The intervention comprised contacting parents of infants/ children in the intervention group. Firstly of postcard was	**Primary Outcomes** The number of infants/children receiving any of DTP, OPV, MMR or Hib. The percent fully immunised of up-to-date	**Primary outcomes:** The number of infants/children receiving DTP, OPV or Hib was not significant between the intervention and control group (P value NS).	**Limitations identified by author:** Contamination of the control group may have occurred due to the study design as such the

In A Family Practice Residency **Aim of study:** To evaluate the effectiveness of mail and telephone contact with parent a s a means to improve the immunisation coverage of children less than 7 years old in a family practice residency clinic**.** **Study design:** RCT **Internal validity score:** + **Applicability:** C	family practice. **Selected population:** 464 infants (aged 2 months or more on 1 January 1991) and children aged less than 7 years on June 30, 1991) and their parents enrolled in a family practice that were not up to date for immunisations. **Excluded population/s:** Infants (aged 2 months or more on 1 January 1991) and children aged less than 7 years on June 30, 1991) and their parents enrolled in a family practice who were fully immunised or up to date for immunisations. **Setting:** Family practice residency clinic in the USA. No further details provided. **Vaccines:** DTP, OPV, MMR and Hib	sent listing the types of immunisations required for that infant/child. The postcards were in English. After 6/52 attempts were made to contact the families by telephone of the remaining children, three attempts to contact by telephone were made. Telephone calls were made over an 8-week period between 8am and 10pm on weekdays, conducted in English. **Control/comparison/s description:** The control group received no special contact. **Sample sizes:** **Total** n= 464 **Intervention** n= 231 **Control** n= 233 **Baseline comparisons:** The intervention and control groups were compared in terms of age, % male, Hispanic surname, immunisations received only at the residency, number of immunisations on entry, having a telephone, age at entry. The only statistically significant difference was that there were more children aged 13-24 months in the control group (P 0.048).	for age. The number of children immunised. Secondary outcomes The number of clinic visits per child. The number of immunisations received per child. **Follow-up periods:** 6/12 after the initial mailing and 2/12 after the telephone contact. **Method of analysis:** Chi-square and two tailed t tests.	The number of infants/ children receiving the MMR was greater in the intervention (n= 23) compared to control (n= 8) P< 0.0049. The percent of infants /children fully immunised or up-to-date for age was greater in the intervention group 14.7% versus 7.3% in the control group (P <0.011). The number of infants /children immunised was greater in the intervention group (P< 0.047). **Secondary outcomes:** The number of clinic visits per child and the number of immunisations received per child was not significant between interventions and control groups (P value not significant). **Attrition details:** 1 child died and another 40% of the intervention group were unable to be contacted, all were analysed on an intention-to-treat basis.	intervention may have reminded entire families (those with more than 1 child or close-knit families) and neighbours of the intervention group. The clinic population was highly mobile and postcards may not have been received by the intervention group or may not have been understood if the family did not speak English. **Limitations identified by review team:** Method of randomisation not reported. Families with > 1 infant/child may have been randomised into both groups. Population in which the study was set is not reported. There was no power calculation reported.

		Study sufficiently powered? NR			**Evidence gaps and/or recommendations for future research:** Studies looking at interventions targeting under immunised babies/infants/ children, with provision for minority groups. **Source of funding:** NR
(Campbell et al. 1994) **Citation:** Patient -Specific Reminder Letter And Paediatric Well-Child-Care Show Rates **Aim of study:** To determine whether patient-specific letters, which describe the content of an upcoming well-child appointment, improve the show rate of well-child appointments	**Source population/s:** USA **Eligible population:** Newborns (and their parents) in Rochester, New York. **Selected population:** All newborns (and their parents) enrolled in the Paediatric Continuity Clinic, no further details provided. **Excluded population/s:** Infants receiving care from the chief investigator. **Setting:** Paediatric Continuity Clinic at Strong Memorial Hospital in Rochester, New York providing care to predominately poor urban children. 71% of visits are made by	**Method of allocation:** NR **Intervention/s description:** Newborns (and their parents) were randomised to a letter, postcard, or control group. For every well-child appointment, families were sent either a letter pertaining to the particular well-child appointment or a postcard one week before each scheduled appointment. The letters were one page in length and specified the date and time of the appointment and described interventions that the infant would receive. Postcards specified only the date and time of the appointment.	**Primary Outcomes:** Proportion of children who received 3 DTP immunisations by 7 months of age. **Secondary outcomes** Not relevant to this review**.** **Follow-up periods:** All infants followed for the first 13 months of life. **Method of analysis:** Chi-square test	**Primary outcomes:** The proportion if infants who received 3 DTP immunisations by 7 months in the letter, postcard and control groups were 62.5%, 59.12% and 56.6% respectively (P= 0.72). **Secondary outcomes:** Not relevant to this review. **Attrition details:** 17 (6%) of infants were no longer enrolled in the clinic at age 7 months. Three, nine and five infants from the letter, postcard and control groups respectively (P>0.10). It is not clear whether they were included on an intention-to-treat basis or not.	**Limitations identified by author:** The intervention may be limited by other barriers to using the clinic. **Limitations identified by review team:** There were no numbers for the infants in the intervention and control groups for the outcome. The randomisation was not clear. The study

better than postcard reminders. **Study design:** RCT **Internal validity score:** - **Applicability:** C	Medicaid recipients. **Vaccines:** DTP	**Control/comparison/s description:** The control group received no reminders. **Sample sizes:** **Total** n= 288 **Intervention** Letter n= 87 Postcard n= 96 Control n= 105 **Baseline comparisons:** There were no differences in demographics among the groups (not significant at P >0.05). **Study sufficiently powered?** NR			population characteristics are no clear. There is no power calculation reported and sample size may have been too small to detect a difference. No mention is made as to whether assessors were blinded. **Evidence gaps and/or recommendations for future research:** Well designed studies should be conducted in this topic area **Source of funding:** NR
(Dini, Linkins, & Sigafoos 2000) **Citation:** The Impact Of Computer-Generated Messages On Childhood Immunization Coverage	**Source population/s:** Denver, USA **Eligible population:** Children listed in the county health department database aged 60-90 days and their parents. **Selected population:** Children listed in the county health department database (n = 1227) 60 to 90 days of age who had received the first dose of diphtheria-tetanus-	**Method of allocation:** Random, although not specified how. **Intervention/s description:** The intervention comprised the children and their parents randomised to one of four groups, telephone messages followed by letters (Group A); telephone messages alone (Group B); letters only (Group	**Primary Outcomes** Series completion by 24 months of age. **Secondary outcomes:** Series completion by 24 months of age in those documented as receiving the intervention. Up-to-date status a t 6, 9, 12 15 and 18 months.	**Primary outcomes:** Children receiving any intervention compared to control were 21% more likely to have completed the series by 24 months of age compared to control (49.2% vs. 40.9%; RR =1.21; 95%CI 1.01 to 1.44). Each of the intervention groups had higher rate of	**Limitations identified by author:** Only one source of immunisation histories. Shift of healthcare delivery from public to private sector. Secondary analysis

Aim of study: To assess the sustained impact of computer-generated messages on immunization coverage during the first two years of life. **Study design:** RCT **Internal validity score:** + **Applicability:** C	pertussis (DTP) and/or poliovirus vaccines and who had telephone numbers in the pre-existing computerised health department database, enrolled over 15 moth s until the sample of 1200 was reached. **Excluded population/s:** Children not listed in the county health department database who were 60 to 90 days of age, those who had not received the first dose of diphtheria-tetanus-pertussis (DTP) and/or poliovirus vaccines and those who did not have telephone numbers in the pre-existing computerised health department database. **Setting:** County health department in the Denver Metropolitan area comprising three counties with four public health clinics, each with similar demographic characteristics and size. All four had computerised databases that were linked to the main office. **Vaccines:** DTP, OPV, MMR	C); or no notification (Group D). Group A received telephone messages followed by letters. In this intervention parents received one telephone message prior to the scheduled immunisation and up to four recall messages (1 per week) over the 4 week period following the due date. The messages were delivered by computer. The message reminder parents that their child was due for an immunisation and that immunisations were very important because they prevented children from contracted diseases and asked parents to keep their appointment or make one if they had not already done so. The content did not change for subsequent messages. As many as nine attempts were made until the message was delivered. Calls were made during weekday evening hours, between 6 and 9pm and Saturdays from 12 to 8pm. If the child did not report for immunisation after all designated contacts, the child was inactivated form further contact unless a new due date was established. Participants in group A who did not respond to any of the	Impact of confounding variables on up-to-date status (gender, ethnicity, language, number of children in household, Medicaid coverage) **Follow-up periods:** 22 months (2 months of age to 24 months of age) **Method of analysis:** Data abstracted from computerised databases. Rate ratios for each intervention group compared to control.	series completion compared to control at 24 months although this was not statistically significant. **Secondary outcomes:** Children receiving any intervention compared to control were 24% more likely to have completed the series by 24 months of age compared to control (58.1% vs. 46.8%; RR =1.24; 95%CI 1.05 to 1.47). Each of the intervention groups had higher rate of series completion compared to control at 24 months and this was significant compared to control for group A (61.0% vs. 46.8%; RR =1.30; 95%CI 1.08 to 1.58). There was higher age specific series completion at each selected age (6, 9, 12, 15, 18 months) in groups A, B and C compared to control. This was not significant at 15 and 18 months for group A compared to control, no values reported. At each time point intervention groups had higher up-to-date rates compared to control, similar within each ethnicity and language category (results not reported).	excluded children who had moved or gone elsewhere. **Limitations identified by review team:** No detail on setting demographic characteristics and size. Possible selection bias, as those not listed, or behind on initial immunisations or those without telephones were excluded. No power calculation Number of participants in each group not reported. **Evidence gaps and/or recommendations for future research:** Larger study to explore the impact of ethnicity with this type of intervention. **Source of funding:** National

		five telephone contact were mailed a computer generated written reminder 1 week after the due date of the fifth contact and a second was sent a week later if the children remained unimmunised. Group B received telephone messages alone, the same as group A. Group C received up to four computer generated letters. One 2 two days after their child's firth scheduled appointment was missed and a second, third and forth sent 1 week after each earlier reminder. Households in the intervention groups (A, B, and C) received up to five computer-generated telephone messages and/or up to four letters each time their children became due for immunisation(s). The telephone and letters were delivered in Spanish and English according to the immunisation record details. **Control/comparison/s description:** No intervention **Sample sizes:** Total n= 1227 **Intervention** n= NR		**Attrition details:** Only 861 children reached 24 months at the study end-point. At 24 months, 136/861 had moved form the study area or had changed provider. It is not reported but these children have been analysis on an intention-to-teat basis.	Immunisation Programme, CDC.

		Group A = NR Group B = NR Group C = NR Control n= NR **Baseline comparisons:** Between groups there was no significant differences terms of gender (p= 0.12), number of children per household (p = 0.69), insured by Medicaid (p= 0.72) Between groups there was no significant differences terms of gender (p= 0.12), number of children per household (p = 0.69), insured by Medicaid (p= 0.72). There were significant differences in terms of ethnicity between groups (p <0.05) with 35% of African American children in group B and 16% in group C, 19% of group C was Hispanic compared to only 3% in groups A. **Study sufficiently powered?** NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Gore et al. 1998) **Citation:** Development Of Persuasive Messages May Help Increase	**Source population/s:** USA **Eligible population:** Eligible participants were mothers of children aged less than four years,	**Method of allocation:** NR **Intervention/s description:** The intervention comprised of mailing of persuasive	**Primary Outcomes:** The primary outcomes was obtaining immunisations.	**Primary outcomes:** No group obtained late immunisations. **Secondary outcomes:** Not related to this review.	**Limitations identified by author:** Few assumptions were made in the study: the first

Mothers' Compliance Of Their Children's Immunization Schedule **Aim of study:** To assess the impact of three persuasion strategies: fear arousal, motherhood-arousal, and rational messages, on mothers of preschoolers who were late for their immunisations. **Study design:** RCT **Internal validity score:** - **Applicability:** C	whose children were late by more than a month for any of the immunisation schedule identified from medical records of the Monongalia county health department in Morgantown, US. **Selected population:** 243 mothers identified from medical records Monongalia county health department in Morgantown, W V. The specific selection criteria were: mothers who had children under the age of four, mothers of children whose immunisation records were available, mailing address or telephone numbers of the mothers available on the medical record and the child was flagged by the clinic as being late. For a mother to be selected in the study, all four selection criteria had to be met. The mothers were randomly assigned to either one of the three intervention groups or the control group. **Excluded population/s:** Children aged more than 4 years. **Setting:** Monongalia county health department in Morgantown, USA. **Vaccines:** Not specified	messages. There were 3 intervention groups: one group received fear-arousal message, another received the mother-hood arousal message, and the third received the rational message. All the messages were sent by first class mails. The fear arousal message contained colour illustrations of children suffering from certain infectious diseases. The intent of this message was to convey that the child may face the same health consequences if they contract the infectious disease. The message suggested that the mother, to protect her child, should ensure the child receive all the recommended immunisations in a timely manner. The motherhood arousal message was designed to generate a feeling of motherhood in the message recipient, create a sense of identification with the message and recommend an action plan to comply with the message recommendation. The message contained pictures of happy and healthy infants and toddlers with an intent to create a feeling of identification or association between the children in the message and the mothers own child; thereby arousing a	**Secondary outcomes:** Not related to this review. **Follow-up periods:** 3 weeks **Method of analysis:** Descriptive Statistics.	**Attrition details:** Messages mailed with bad addresses were returned by the post office. A total of 12 messages were returned from the fear message group, 10 from the motherhood-arousal message group, 10 from the rational message group .Thus the final total of subjects in each of the three intervention groups who received the messages was fear group=48, motherhood group=50 , and rational group=50. A total of 14 were lost to follow-up from the control group (final n=49 in control group). Total number lost to follow n= 46 Total analysed n = 197	assumption was that messages will evoke the emotive/cognitive responses in mothers in the way they were designed; another major assumption of the study was that the message would be comprehended by the recipient mothers or fathers. Thus the assumption was made that all study subjects will be exposed to the messages if they are delivered to them. **Limitations identified by review team**: No sample size was calculation. Method of randomisation and allocation concealment not reported. Baseline characteristics of participants in the intervention and control group not

		feeling of motherhood in the mother. The message suggested that the child should be immunised in a timely manner. The rational message contained a text only graphic depicting the benefits of immunisation, their easy availability and the negative consequences of not immunising children in a timely manner. **Control/comparison/s description:** The control group did not receive any message. **Sample sizes:** **Total** n= 243 I**ntervention:** **Fear message** n= 60 **Motherhood arousal message** n= 60 **Rational message** n= 60 **Control** n=63 **Baseline comparisons:** NR **Study sufficiently powered?** NR			reported. Confidence Intervals and p-values not reported. **Evidence gaps and/or recommendations for future research:** Further research should be conducted into the efficacy of persuasive messages **Source of funding:** NR

(Hambidge et al. 2004) **Citation:** Strategies to Improve Immunisation Rates and Well-Child Care in a Disadvantaged Population **Aim of study:** To measure the effect of a multimodal intervention on well-child care visit (WCV) and immunisation rates in an inner-city population**.** **Study design:** RCT **Internal validity score:** + **Applicability:** C	**Source population/s:** USA **Eligible population:** Babies born at Denver Health (DH) Medical Centre. **Selected population:** All patients born at Denver Health (DH) Medical Centre between July 1, 1998, and June 30, 1999 and intending to receive at a DH Study clinic. **Excluded population/s:** 178 infants were excluded (38 intending to receive care outside of DH Study clinics, 97 with no care at DH after new born discharge including 7 deaths, 43 attending a separately funded clinic). **Setting:** Community health centre system in Denver, USA. **Vaccines:** DPT, Polio, HIB, Hepatitis B	**Method of allocation:** Randomisation was conducted at the clinic level rather than at the patient level. Randomisation was achieved using a standard random-number table to assign each of the 11 clinics a number between 1 and 11 (1-4, 5-8, and 9-11 having been previously assigned to a study arm). The identity of individual clinics was concealed until study arms were assigned. **Intervention/s description:** There were two intervention groups an immunisation arm and a well-child-visit (WCV) arm. Both comprised a multimodal intervention (patient-based, clinic-based and system based interventions). Key elements of the intervention included intensive reminder/recall and the process of AFIX at the level of the clinic (AFIX is an intervention promoted by the Centres for Disease and Control and Prevention that was found to improve immunisation rates at public health immunisation sites). In the immunisation arm, children in need of immunisations were listed for recall with telephone calls, postcards, home visitations	**Primary Outcomes** Immunisation uptake at 12 months **Secondary outcomes** Not relevant to the review. **Follow-up periods:** 6 months and 12 months **Method of analysis:** All analyses were conducted using an intent-to-treat model.	**Primary outcomes:** 76% of those in the immunisation arm versus 77% of those in the WCV arm versus 71% of those in the control arm were up-to-date with immunisations by 12 months of age. **Secondary outcomes:** Not relevant to the review. **Attrition details:** Approximately 20% of the cohort was lost to follow-up	**Limitations identified by author:** NR **Limitations identified by review team**: Confidence interval and p values not reported in the results. **Evidence gaps and/or recommendations for future research:** NA **Source of funding:** Cooperative agreement TS 252-13/15 from the Association of Teachers of Preventive Medicine and the Centers for Disease Control and Prevention.

		and transportation for those enrolled in Medicaid. In the WVC monthly recall visits were generated for children in need of a WCV who did not have an appointment for a future visit. **Control/comparison/s description:** No intervention. **Sample sizes:** **Total** n= 2665 **Intervention** n= 1505 **Control** n=1160 **Baseline comparisons:** Not conducted **Study sufficiently powered?** NR			
(Hicks, Tarr, & Hicks 2007) **Citation:** Reminder Cards and Immunisation Rates Among Latinos and The Rural Poor In Northwest Colorado **Aim of study:** To determine the effect of reminder cards on up-to-date immunisation in low-income, rural and Latinos.	**Source population/s:** USA **Eligible population:** Children aged 35 months or younger seen the Salud Family Health Centre. **Selected population:** Children seen the Salud Family Health Centre aged 35 months or younger in one of the time periods. **Excluded population/s:** Children who had moved and left no forwarding address or transferred to other providers outside of the Saud system, children who had received	**Method of allocation:** Historical **Intervention/s description:** The intervention comprised language-appropriate reminder cards being sent to active children not up-to-date (UTD) listing the vaccines missing; the card served as the physician order for the vaccine. Posters were also placed in examination rooms remaindering children and their parents and physicians to vaccinate while they attended the clinic for other reasons. Up to 3 reminder	**Primary Outcomes** Proportion of children UTD. Children UTD at 13-18 months. Children UTD at 19 to 35 months. Secondary outcomes Children UTD for individual vaccines Children UTD based for confounding variables. **Follow-up periods:**	**Primary outcomes:** 73.4% of all children were UTD post intervention compared to 61.3% at baseline ($P < 0.05$). Children UTD aged 13-18 months was 55.9% at baseline compared to 77.5% post intervention ($p< 0.05$). Children UTD aged 19 to 35 months was 63.4% at baseline compared to 71.9% post intervention (not significant, no p value reported).	**Limitations identified by author:** Individual vaccines were high at baseline. The study design was not blinded. Excluding those how had moved and not left forwarding addresses (10%). **Limitations identified by**

Study design: Before and after study **Internal validity score:** + **Applicability:** C	3 reminders but not responded and children who has not visited the clinic for more than 1 year. **Setting:** Salud Family Health Centre a non-profit community health centre serving Latinos, and the poor in North-eastern Colorado. The centre in Fort Morgan serves a population which is 75% Latino who do not speak English and 35% of patients are at or below federal limits for poverty. **Vaccines:** DTP, OPV, MMR, Hib, Hep B	cards were sent by first class mail in English or Spanish to all children not UTD listing the vaccine that they were missing. Staff were instructed that the card served as a physician order for nursing staff to give the vaccine. **Control/comparison/s description:** Before and after study **Sample sizes:** **Total** n= 503 **Intervention** n= 263 **Control** (baseline) n= 240 **Baseline comparisons:** The groups did not differ in terms of age, distance from the clinic, primary language, ethnicity, insurance and place of birth, no data reported. **Study sufficiently powered?** NR	Not specified. Chart review of children at 35 months for both groups. **Method of analysis:** Fishers exact test.	**Secondary outcomes:** The only individual vaccine that was significantly different was Hib (79.5% post intervention vs. 70.4% baseline (P <0.05). The intervention significantly impacted on those who were Hispanic, listed Spanish as a preferred language, were near to the clinic9 0-10 miles), were born in Morgan County, were part of the Medicaid Program or had private insurance (P< 0.05). **Attrition details:** 3 charts were lost.	**review team:** Those excluded may have been different to those who participated fully in the clinics activities. The length of the intervention is not clear, the precise time between intervention and assessment is not clear. **Evidence gaps and/or recommendations for future research:** Further research is required to test the efficacy of reminder cards **Source of funding:** NR

(Hoekstra, LeBaron, & Johnson-Partlow 1999) **Citation:** The Impact of Reminder-Recall Interventions on Low Vaccination Coverage in an Inner-City Population. **Aim of study:** To evaluate the impact of large-scale, registry based reminder-recall interventions on low immunization rates in an inner-city population. **Study design:** RCT **Internal validity score:** + **Applicability:** B	**Source population/s:** USA **Eligible population:** The eligible participants were children who had birth dates between December 15, 1995, and April 30, 1996, and who were enrolled in the WIC (Special supplemental programme for Women, Infants, and Children), Chicago, on May 11996. **Selected population:** A total of 565 children were selected for the study with 324 in the intervention group (voucher-incentive plus reminder call) and 241 in the control group (voucher incentive only). 95% of the selected population was Hispanic, which is not representative of the larger WIC programme population. **Excluded population/s:** Children enrolled in WIC not born between December 15, 1995, and April 30, 1996. **Setting:** WIC (Special supplemental programme for Women, Infants, and Children), Chicago, USA. **Vaccines:** Not specified	**Method of allocation:** The participants were allocated to an intervention based on a random selection of dates when the infant was brought for the WIC certification visit at 6 months of age. Not reported method of randomisation and allocation concealment. **Intervention/s description:** The intervention comprised of voucher-incentive plus reminder call. At the visit to WIC the study clerk entered vaccination dates from parent-provided documentation in to a software programme, which determined whether the child needed a vaccination according to the standards of the Advisory Committee on Immunisation practices, allowing a 30-day grace period. The family of a child whose immunisations could not be documented as up-to-date was referred to its healthcare provider and, instead of given the usual 3-month supply of food vouchers, was given monthly vouchers until the child was appropriately vaccinated for age.	**Primary Outcomes:** Immunisation coverage at 12 months of age. **Secondary outcomes:** NR **Follow-up periods:** 12 months of age **Method of analysis:**	**Primary outcomes:** At 12 months of age the immunisation coverage did not differ significantly: intervention group (voucher incentive plus reminder recall), 80%± 4%; control group (voucher incentive), 79%± 5% (p=0.749) (CI not reported). **Secondary outcomes:** NR **Attrition details:** 560 of the 565 participants completed the study.	**Limitations identified by author:** NR **Limitations identified by review team:** Not reported on method used for calculation of sample size. Not reported method of randomisation and allocation concealment. Not reported on baseline characteristics of the participants. **Evidence gaps and/or recommendations for future research:** Studies exploring reminder/recall systems in broader populations and settings **Source of funding:** NR

		In addition, a telephone call was made by the bilingual study clerk to remind parents of all upcoming and missed immunisations. If 9 calls were unsuccessful in a month, 2 bilingual mailings were sent out, and the process was repeated each study month. **Control/comparison/s description:** The control group only received voucher incentive but no reminder –recall. **Sample sizes:** **Total** n= 565 **Intervention** n=324 **Control** n= 241 **Baseline comparisons:** Yes. The intervention groups did not differ significantly in age, racial/ethnic composition, or baseline immunisation rates. **Study sufficiently powered?** NR			

(Irigoyen et al. 2000) **Citation:** Impact Of Appointment Reminders On Vaccination Coverage At An Urban Clinic **Aim of study:** To test if appointment reminders blinded to immunisation status improve kept-appointment and vaccination coverage rates. **Study design:** NRCT **Internal validity score:** + **Applicability:** C	**Source population/s:** USA **Eligible population:** Children and their parents attending at paediatric clinic serving a low-income community in New York City. **Selected population:** Children and their parents (aged 4 through 18 months (n = 1273)) attending at paediatric clinic serving a low-income community in New York City. **Excluded population/s:** NR **Setting:** Paediatric clinic serving a low-income community in New York City where 85% of the patient visits were fee-for-service Medicaid; <5% were managed care. **Vaccines:** DTP, OPV, MMR	**Method of allocation:** Assigned by order in the appointment book at the clinic. **Intervention/s description:** Each patient, sequentially listed in the appointment book, was systematically assigned to 1 of 4 study groups: control (no reminder), postcard (P), telephone call (T), or postcard and telephone call (PT). On day 1, the first patient listed was assigned to the control group and successive patients were assigned to the P group, then the T group, and then the PT group. Assignment was advanced by 1 group for each successive day, restarting with the assignment of the first patient on day 5 to the control group. Assignments were made regardless of whether telephone numbers were available. Through this systematic rotation, each study group was exposed to every weekday. On subsequent visits, children were reassigned without regard to the previous assignment. Children in the same family who had appointments for the same provider on the same morning or afternoon were assigned to the same study group (n = 26). The providers were blind to the group assignment.	**Primary Outcomes** Proportion of infants up-to-date for DTP/OPV/MMR. Proportion of infants up-to-date for DTP/OPV/MMR of those who received them. **Secondary outcomes** Proportion of infants UTD, who were up-to-date before the appointment versus those who were not. **Follow-up periods:** Study conducted April to August 1997. Precise follow-up not reported. **Method of analysis:** The outcomes were analyzed by study group using intent-to-treat analysis as well as by receipt analysis. Differences were tested with χ^2 and odds ratios (OR) with 95% confidence intervals (CI).	**Primary outcomes:** Vaccination coverage rates averaged 84.1% and did not differ significantly among the control and reminder groups (x^2= 2.66; P = 0.45). Vaccination coverage by reminder group also did not differ significantly for children who actually received the reminders (x^2 = 2.12; P = 0.55). **Secondary outcomes:** For the subset of children who were not up-to-date at baseline, the postcard and the telephone reminders increased their vaccination coverage threefold compared with controls (OR = 2.9; 95% CI = 1.1 to 8.0). **Attrition details:** NR	**Limitations identified by author:** Assumed that postcards not retuned were received. Vaccination coverage may have been underreported for infants who were taken elsewhere for immunisations. The study do not measure the impact of repeat reminders on the same family. **Limitations identified by review team:** Large proportions of parents in the telephone and postcard group were not reached. No power calculation. Limited information on population characteristics reported and difficult to determine applicability to the UK

		The assignment of patients to a study group was made daily, 1 week before the scheduled appointment date. Postcards were mailed 1 week before the appointment date. A bilingual clerk telephoned families in the PT and T groups the weekday evening before the appointment date. Up to 3 calls were attempted to reach each family. **Control/comparison/s description:** No intervention. **Sample sizes:** **Total** n= 1273 **Intervention** **Postcard** n= 314 **Telephone** n=307 **Postcard and telephone call** n=306 **Control** n= 346 **Baseline comparisons:** The age of the children (mean = 10.3 months; standard deviation = 4.3) did not differ significantly among study groups (F = .32; P = .81). Likewise, gender did not vary significantly by group (56.3% male, x^2 = 3.44; P = .33). Medicaid coverage was greater among the T and PT groups compared with the other study groups, but there was no significant difference in Medicaid coverage across			No attrition details reported. **Evidence gaps and/or recommendations for future research:** Studies exploring reminder/recall systems in broader populations or settings **Source of funding:** Northern Manhattan Partnership, CDC

		all reminder groups compared with the controls (92.5% in the reminder groups vs. 89.8% in the control group, x^2 = 2.75; P = 0.25). The proportion of children who were up-to-date before the appointment did not differ significantly by study group (x^2 = 4.0; P = 0.27). **Study sufficiently powered?** NR			
(Irigoyen et al. 2006) **Citation:** Challenges and Successes of immunization Registry Reminders at Inner-City Practices **Aim of study:** To assess the effectiveness of two serial registry reminder protocols and the interactive effects of reminders with child characteristics on immunisation rates. **Study design:** RCT **Internal validity score:** + **Applicability:** C	**Source population/s:** USA **Eligible population:** 13 886 infants aged 6 weeks to 15 months who had made at least one visit to the network and were due or late for a DTaP dose. **Selected population:** 1662 infants aged 6 weeks to 15 months who had made at least one visit to the network and were due or late for a DTaP dose who were recruited weekly (12% per week) until the desired sample number of 1662 was reached. Infants were randomised weekly to 3 groups. **Excluded population/s:** 345 infants enrolled in the two week prior to September 11, 2001 **Setting:** A network of five community-based paediatric practices affiliated with an academic heath centre in New York City.	**Method of allocation:** Not specified **Intervention/s description:** The interventions groups received reminders comprising registry generated postcards with the photograph of a baby and a standard bilingual English/Spanish message, “Dear parent, Out records indicate that…now needs 1 or more immunisations. If you haven’t already please call out clinic at …to make an appointment”. Infants in the intervention groups were assessed every week to determine whether they needed a repeat reminder for a previous dose or a new dose. The continuous reminder group received unlimited reminders. The limited reminder group received up to 3 reminders.	**Primary Outcomes** Any subsequent immunisations Age appropriate up-to-date (UTD) status **Secondary outcomes** Not relevant to review **Follow-up periods:** 3 and 6 months **Method of analysis:** Intention to treat analysis. Students t test use to evaluate differences between groups	**Primary outcomes:** Reminders had no effect on receiving any subsequent immunisations (no p value or CI reported). Reminders significantly increased immunisation coverage for both DTaP and the 4:3:1:3 series, but only for those in the continuous reminder group at 3 months (51.2% continuous reminders versus 44% control, P<0.01); at 6 months (44.1% continuous reminders versus 39.2% controls , P<0.05). There was no difference between those sent limited reminders and controls (no p value or CI reported). **Secondary outcomes:** Not relevant to review **Attrition details:**	**Limitations identified by author:** NR **Limitations identified by review team:** The exclusion period around September 11, 2001 although perhaps obvious is not explained. There is limited information regarding parent’s characteristics between groups. The method of randomisation is not reported. The number lost to follow-up is not reported.

	Vaccines: DTP, polio, MMR, Hib	**Control/comparison/s description:** No intervention **Sample sizes:** **Total** n= **Intervention** **Continuous reminders** n= 549 **Limited reminders** n= 552 **Control** n=561 **Baseline comparisons:** At randomisation there were no significant differences with regard to age, gender, ethnicity, Medicaid, up-to-date rate. No p-values or CI reported. Study sufficiently powered? 1662 participants needed to achieve a power of 80% with a type 1 error of 5%.		NR	**Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** National Immunisation Program, Centres for Disease Control
(Kempe et al. 2001) **Citation:** Immunisation recall: Effectiveness and barriers to success in an urban teaching clinic **Aim of study:** To examine effectiveness of immunisation recall in an urban paediatric teaching clinic.	**Source population/s:** USA **Eligible population:** Children (aged 5 months to 17 months) attending the Children's Hospital, Denver, Colorado. **Selected population:** Children (aged 5 months to 17 months) who were not up-to-date with their immunisations, and attending the Children's Hospital, Denver, Colorado who had been seen for acute illness or well-child	**Method of allocation:** NR **Intervention/s description:** The intervention was a postcard recall intervention. A postcard was sent to the last known address for each child in the intervention group. The card stated that the child needed immunisations and requested the parents to schedule a visit as soon as possible. Cards that were returned with a forwarding	**Primary Outcomes:** The primary outcome was immunisation up-to-date status of the children. A child was considered up-to-date at 7 months if he or she had received at least 3 DTP, 2 polio, 2 Hep B and 2 HIb immunisations. For 12 months the requirement was 3 DTP,	**Primary outcomes:** <u>At two month follow-up</u> In infants aged 7 months 24% of the intervention group compared with 28% of the control group were up-to-date rates for immunisations (p=0.49). In infants aged 12 months The intervention group compared with the control group, had higher up-to-date rates of immunisation (51% versus 39%, p=0.07).	**Limitations identified by author:** The authors have reported that the success of the recall effort was limited by inability to contact a large portion of the population, by incomplete immunisation records, by the failure of families to

Study design: RCT **Internal validity score:** - **Applicability:** B	visit and identified from the computerised immunisation database of the hospital **Excluded population/s:** Children were excluded from the study if the medical record indicated they had moved to another provider (n=29) or if the child was seen solely in consultation (n=17) **Setting:** The Children's Hospital, Denver, Colorado, USA. **Vaccines:** DTP, Polio, Hepatitis B, Haemophilus Influenzae type B, measles-mumps-rubella.	address were re-mailed. Two weeks after the cards were mailed; up to 4 attempts to contact the child's guardian by telephone were made to recall the child for immunisations. The intervention stopped before 4 attempts, if the family was reached or the phone number was confirmed to be disconnected or incorrect. The clinic did not routinely send out any reminders, so the intervention was novel to the patients who received it. **Control/comparison/s description:** No recall intervention. **Sample sizes:** **Total** n= 603 **Intervention** n=294 **Control** n=309 **Baseline comparisons:** The intervention and the control groups were similar with respect to demographic characteristics (Race/ethnic group, sex, age). **Study sufficiently powered?** NR	2 polio, 2 Hep B and 3 Hib At 19 months, up-to-dat was defined as 4 DTP, 3 polio, 1 MMR, 3 Hep B, and 3 Hib immunisations. **Secondary outcomes:** Not relevant to the review. **Follow-up periods:** 2 months **Method of analysis:** Descriptive statistics.	In infants aged 19 months 16% of the intervention group compared with 16% of the control group were up-to-date rates for immunisations (p=0.95). **Secondary outcomes:** Not relevant to the review. **Attrition details:** Number randomised n=603 Number analysed n=596 The charts for 2 children in the intervention group and 5 in the control group were not available for outcome review. Data for 596 children (292 children in the intervention group and 304 children in the control group) were analysed.	make or keep appointments once contacted, and by the failure of providers to vaccinate at all available opportunities. **Limitations identified by review team:** Not reported method of randomisation and allocation concealment. Not reported method used for determination of sample size. Not reported of blind assessment of primary outcome. Although providers were blinded toe the intervention group of infants, they may have encouraged more vaccinations generally over both groups. The length of follow-up may not have been long enough.

					External factors may also have impacted on the outcomes. Such as access to the clinic etc. Both nurses and physicians were promoted to review immunisation status, through the receptionist placing a copy of a child's immunisation record and placing it ion the front of each child's chart at each visit. **Evidence gaps and/or recommendations for future research:** Well designed studies should be conducted **Source of funding:** NR

(LeBaron, Starnes, & Rask 2004) **Citation:** The impact of reminder-recall interventions on low vaccination coverage in an inner-city population **Aim of study:** To evaluate the impact of large-scale, registry-based reminder-recall interventions on low immunisation rates in an inner-city population. **Study design:** RCT **Internal validity score:** ++ **Applicability:** C	**Source population/s:** USA **Eligible population:** 246, 000 children in the Metro Atlanta Team for Child Health registry (MATCH). **Selected population:** Infants, who resided in Fulton County, had received care through the Fulton County health department clinics or public hospital health system and were born between July 1, 1995 and August 6, 1996. **Excluded population/s:** NR **Setting:** Fulton County, US **Vaccines:** DTP, OPV, MMR, Hib	**Method of allocation:** **Computer generated random numbers were used to allocate infants to groups.** **Intervention/s description:** Each child was randomly assigned to 1 of 4 groups: control (usual care), autodialer (automated telephone or mail reminder recall), outreach (in-person telephone, mail, or home visit recall), and combination (autodialer with outreach backup). In the autodialer intervention, seven days before a dose was due, a computer connected to a telephone delivered a recorded message to the family from the Fulton County health department staff, indicating that the child should was due for immunisations. If there was no answer or a busy signal, the call was repeated every 30 to 60 minutes. If these efforts failed to reach a person or an answering machine or if the telephone number was nonworking or not present in the database, an automated postcard with the same message was mailed to the family no later than 5 days before the due date. If 6 days after the due date the needed dose was not present in the	**Primary Outcomes** 4-3-1-3 series completion by 24 months of age **Secondary outcomes** Dose-specific coverage rates. **Follow-up periods:** The duration of intervention varied from 10 to 23 months, depending on the age of the child at the start of the study, with a median of 15 months and no significant difference among groups. Interventions began for all participants on September 9, 1996, and continued until each child reached 24 months of age, ending for the last participant on August 6, 1998. Follow-up contact with study subjects ended August 6, 1999, and electronic acquisition of vaccination information ended February 1, 2001. **Method of analysis:** Descriptive statistics, Fisher's exact test, Wilcoxon rank sum test.	**Primary outcomes:** The 3 intervention groups had series completion rates 3% to 6% higher than the control group (34%), but this was significant only for the autodialer group (40%) (P = .02). Individual intervention groups did not differ significantly from each other **Secondary outcomes:** Dose-specific coverage in the intervention groups was not significantly different from the control group for any of the 11 doses in the 4-3-1-3 series (difference, ≤3%), except the fourth DTP dose for one group (42% for the autodialer group vs 36% for the control group, P = .02). **Attrition details:** Intention-to-treat analysis was used.	**Limitations identified by author:** Possible that no real change was detected due to the registry used or the interventions. Data about vaccinations by providers not participating in the registry is lacking. The study was limited to the birth cohort vaccinated in Fulton County clinics, and it may not be representative of the public sector birth cohort of the whole Atlanta metropolitan area at large. Families may have responded to the interventions but were denied immunisations by their providers and this was not evaluated. Some vaccination providers had recall systems, and, from time to time, public officials, community

		registry, a computerised telephone message (or postcard in the absence of a working telephone) was sent to the family indicating that the child was behind in his or her immunisations. Unless the registry recorded the immunisation, the telephone message was repeated on days 11, 17, and 23. If these efforts failed, a computerised postcard was sent on day 28. All telephone calls were made between 5:30 and 9:00 PM. At the start of each message, an option for a Spanish-language version was presented, and postcards contained the message in both Spanish and English. The outreached component comprised that within 7 days of a child failing to receive a dose by the due date, an outreach worker contacting the family by telephone or postcard in the absence of a working telephone. If 7 days later the dose was still not in the registry, a postcard was sent. If 30 days later the dose was still missing, a home visit was attempted, with continued monthly efforts until contact was made. At the home visit, the outreach worker attempted to determine what was needed to assist the family in obtaining immunisation for the child.			leaders, and the media urged families to get their children vaccinated and the extent to which children in the control group were exposed to such efforts and an effect occurred, may have reduced the study's ability to detect an intervention effect. **Limitations identified by review team:** Demographic information on the study setting is lacking. **Evidence gaps and/or recommendations for future research:** Retesting to determine if a larger difference can be found. **Source of funding: National** Immunisation Program, Centres for Disease Control and Prevention,

		The principal outreach worker was a college-educated, African American woman who had been raised in inner-city Atlanta. For Hispanic families, outreach was provided by a bilingual, college-educated, Hispanic worker. The outreach workers and other study functions were supervised. **Control/comparison/s description:** see above **Sample sizes:** **Total** n= 3050 **Intervention** **Autodialer group** n= 763 **Outreach group** n= 763 **Combination group** n= 763 **Control** n= 763 **Baseline comparisons:** Groups were compared in terms of race, sex, median age at entry to the study, % age appropriately vaccinated at the start of the study and no significant differences between the intervention and control groups for any demographic or vaccination characteristic. **Study sufficiently powered?** The study population of 3050 provided 80% power for detection of 5% differences in immunisation rates among groups.			and the Georgia Department of Human Resources

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Lieu et al. 1997) **Citation:** Computer-generated recall letters for under immunised children: how cost-effective? **Aim of study:** To evaluate the effectiveness of computer-generated recall letters to children who were overdue for immunisations before their second birthday. **Study design:** RCT **Internal validity score:** + **Applicability:** B	**Source population/s:** USA **Eligible population:** Children (20 months old) who had not received MMR at Kaiser Permanente's Santa Clara and Santa Teresa medical centre, North California. **Selected population:** Children who reached 20 months of age Between January and November 1994, and who had not received the MMR were identified by the regional computerised immunisation tracking system developed with support from the Vaccine Safety Data Link Project of the Centres for Disease Control. Under immunised children were assigned by means of a random number generator to the intervention or control group. During the study period 3843 children became 20 months old. Of these 645 (17%) were excluded for gaps in health plan membership between 12 and 19 months of age. Of the remaining 3198 children 321 (10%) had not received the MMR by 20 months and were randomized to receive recall letters (n = 172) or no letters (n = 149). **Excluded population/s:**	**Method of allocation:** A random number generator was used for allocation of participants to intervention and control group. The authors have not reported of concealment of allocation. **Intervention/s description:** The intervention comprised of mailing of computer generated recall letters for under immunised children. A personalised letter in English and Spanish, on the stationery of the local medical centre, was generated and mailed by the regional Division of Research to parents in the intervention group. The letter said that Kaiser's computerized record showed that the child was overdue for an immunisation and instructed the parent to call the clinic to make an appointment for a preventive visit. The mailing included a brochure in English and Spanish listing recommended immunisations. The mailing did not include a slip that a parent could take to the injection clinic to obtain immunisations without an appointment. This was	**Primary Outcomes:** Receipt of MMR at 24 months of age was the primary outcome measure and this was evaluated with the computerised tracking system. **Secondary outcomes:** Not relevant to the review. **Follow-up periods:** At 24 months of age **Method of analysis:** Descriptive statistics	**Primary outcomes:** At 24 months of age a significantly higher proportion in the intervention group 54% (82) compared to 35% (47) in the control group received the MMR (P=0.001) . **Secondary outcomes:** Not relevant to the review. **Attrition details:** After randomisation of the 321 children, 27 children were excluded for gaps in health plan membership between 20 and 24 months of age; 5 children were excluded because parent history and chart review showed that they had actually received the MMR before randomization. Thus the analysis included 153 children in the letters group and 136 in the control group.	**Limitations identified by author:** NR **Limitations identified by review team**: Not reported method used for calculation of sample size. Not reported baseline characteristics of participants in the intervention and the control group. Not reported method of concealment of allocation. Not reported blind assessment of primary outcome. Not reported Confidence Interval not reported for the results. Intention to treat analysis was not used. **Evidence gaps and/or**

	Patients with a gap in health plan membership between 12 and 19 months of age were excluded from the study, because they could have received immunisations outside the health plan. Of the 3843 children 645 (17%) were excluded for gaps in health plan membership between 12 and 19 months of age **Setting:** Kaiser Permanente, Santa Clara and Santa Teresa medical centre, North California, USA. **Vaccines:** MMR	because the clinic staff wished to double-check each patient's vaccination status after the parent telephoned. The advice nurses recommended a preventive clinic appointment along with immunisation(s) if the child had missed a clinic visit; but if there was a long wait for appointments, the nurses helped patients obtain immunisations without appointments. **Control/comparison/s description:** The control group received usual care, which did not include a routine recall letter. **Sample sizes:** **Total** n= 321 **Intervention** n=172 **Control** n=149 **Baseline comparisons:** NR **Study sufficiently powered?** NR			**recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** Vaccine Safety Data link Project of the National Immunisation Program, Centres for Disease Control, and the Northern California Kaiser Innovation Program

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Lieu et al. 1998) **Year:** 1998 **Citation:**	**Source population/s:** US **Eligible population:** Underimmunised 20-month-olds, who lived in the residence area of	**Method of allocation:** Method of randomisation not reported, however only those in intervention groups were randomised. The control group were an historical	**Primary Outcomes** % of children who received any new vaccinations by 24 months of age	**Primary outcomes:** % who received any new vaccinations by 24 months of age Phone alone: 44.2% (95% CI	**Limitations identified by author:** Only targeted at families to those families whose 20-

Effectiveness and Cost-effectiveness of Letters, Automated Telephone Messages, or Both for Underimmunized Children in a Health Maintenance Organization **Aim of study:** To evaluate the effectiveness and cost-effectiveness of sending letters, automated telephone messages, or both to families of underimmunized 20-month-olds in a health maintenance organization (HMO) setting **Study design:** RCT **Internal validity score:** (-) **Applicability:** C	ten northern California Medical Centers of the Kaiser Permanente Medical Care Program, a nonprofit group-model HMO. **Selected population:** Underimmunised 20-month-olds identified using the regional Immunization Tracking System, based on the children's ages when they enrolled in the health plan. **Excluded population/s:** NR **Setting:** Ten northern California Medical Centers **Vaccines:** DTP, OPV, MMR, Hib, Hep B	group of infants of the same age before the study began (January 1996). **Intervention/s description:** Infants were assigned to one of four intervention groups: 1) an automated telephone message alone 2) a letter alone 3) an automated telephone message followed by a letter 1 week later 4) a letter followed by an automated telephone message 1 week later Telephone messages were sent on Tuesdays between 5 PM and 9 PM by an automated telephone message system. A pre recorded message approximately 1 minute long was sent to each family. It stated that the child was overdue for immunisations, and provided the telephone numbers of the advice/appointment lines at the nearest Kaiser Permanente clinics. The message was personalised to the extent that the child's first name was spoken by software that generated the name from text. The system prompted the listener to choose the language in which the message was to be delivered (English, Spanish, or	% of children fully immunised by 24 months of age **Secondary outcomes** NR **Follow-up periods:** until 24 months of age **Method of analysis:** Chi-squared test	36.6% to 51.9%) Letter alone: 43.8% (95% CI 36.1% to 51.5%) Phone-letter: 53.3% (95% CI 45.7% to 60.9%) Letter-phone: 57.8% (95% CI 49.9% to 65.7%) Phone alone vs Letter alone : (44.2% vs 43.8%, NS) Letter-phone vs Letter alone (47.8% vs 43.8%, p=0.01) Letter-phone vs Phone alone (47.8% vs 44.2%, p=0.02) Phone-letter vs Letter alone (53.3% vs 43.8%, p=0.09) Phone-letter vs Phone alone: (53.3% vs 44.2% p=0.10) Compared to 35.6% of the control group who received a needed immunisation by their 24-month birthday By 24 months of age the proportion of children fully immunised was not significant across the four intervention groups (P= 0.11). However, the proportion of infants receiving letter and the phone contact was 47.4% compared to the phone and letter (45.5%) then letter alone (37.7%) and lastly phone contact alone (36.4%).	month-olds that had already missed immunisations **Limitations identified by review team**: As above Comparisons between four interventions, randomised. The control group were not randomised. No information on demographics of population **Evidence gaps and/or recommendations for future research:** **Source of funding:** The Innovation Program of Northern California Kaiser Permanente and by the Vaccine Safety Data-link Project of the Centers for Disease Control

		Cantonese), asked him or her to confirm that the correct family had been reached, and also enabled them to replay the message if desired. The system kept records of the results of each call. Telephone numbers that could not be reached because there was no answer either by a person or an answering machine were called again the following evening. Up to six calls were made each evening. Letters were sent from the HMO's regional offices during the month after the child's 20-month birthday. The letters were personalized; printed in English, Spanish, and Cantonese; and included a list of which immunisations were needed by 24 months of age. To enable a clean evaluation of the study interventions, when the current study was initiated in September 1996, the participating clinics were asked to temporarily suspend any local efforts to telephone or send letters regarding immunisations to those families scheduled to receive messages as part of the study. **Control group description:** Received no systematic regional intervention for immunisations (not		**Secondary outcomes:** NR **Attrition details:** 67 (9%) were excluded because they had a gap in health plan enrolment between 20 and 24 months of age.	and Prevention

		randomised). **Sample sizes:** **Total n=** 867 **Intervention** Phone alone (n= 165) Letter alone (n=162) Phone-letter (n=167) Letter-phone (n=154) **Control n=** 219 (historical comparison group) **Baseline comparisons:** NR **Study sufficiently powered?:** Sample size calculation performed			
Study details	**Population and setting**	**Method of allocation to intervention/control**	**Outcomes and methods of analysis**	**Results**	**Notes**
(Morgan & Evans 1998) **Citation:** Initiatives to improve childhood immunisation uptake: a randomised controlled trial **Aim of study:** To test the effectiveness of two interventions (calling a child's health visitor and mailed reminders to a child's parents) on immunisation uptake. **Study design:** RCT	**Source population/s:** UK **Eligible population:** Children who were on the Child health system, (a computerised system that record the immunisation status of all children). **Selected population:** Children resident in the former county of South Glamorgan who were (*a*) born between 1 April and 30 September 1995 and scheduled to complete the primary course of diphtheria, pertussis, tetanus, polio, and *Haemophilus influenzae* type b immunisation or (*b*) born between 1 April and 30 September 1994 and scheduled to receive measles,	**Method of allocation:** Computer generated randomisation **Intervention/s description:** The intervention comprised two intervention groups and one control group. Intervention A comprised a non-directive telephone call to the child's health visitor to confirm the child's personal details and immunisation status. The health visitor was not informed of the trial and, although follow up of the child was anticipated, it was not specifically requested. Intervention B comprised a single mailed reminder to the	**Primary Outcomes** Completion of (*a*) primary immunisation by the first birthday or (*b*) measles, mumps, and rubella immunisation by the second birthday. **Secondary outcomes** Completion of either the primary vaccines or MMR compared to control. Subgroup analysis by maternal age and parity **Follow-up periods:** Not clear. **Method of analysis:**	**Primary outcomes:** There was no significant difference between either intervention group and the control group in the proportion completing the primary course or measles, mumps, and rubella immunisation. Primary course Intervention A 33% (compared to control difference in proportions 2.23 (95% CI -12.9 to 17.3)) Intervention B 29% (compared to control difference in proportions -1.5 (95% CI -15.9 to 12.9))	**Limitations identified by author:** NR **Limitations identified by review team**: Follow-up periods not clear. Limited information of the study setting. Baseline characteristics not decried, although reported to be

Internal validity score: - **Applicability:** B	mumps, and rubella immunisation. Children were included in the trial if they had not completed their primary course by 9 months of age or their measles, mumps, and rubella immunisation by 21 months of age. **Excluded population/s:** NR **Setting:** South Glamorgan, no further information reported. **Vaccines:** Primary vaccines (DTP, polio, Hib) and MMR	child's parents together with a questionnaire about details of immunisation status and reasons for non-immunisation, and a reply paid envelope. Parents were not informed of the trial. **Control/comparison/s description:** No intervention, although this is not specified **Sample sizes:** **Total n=** 451 **Intervention A n=** 153 **Intervention B n=** 159 **Control n=** 139 **Baseline comparisons:** The authors report that the distribution of baseline characteristics in the three groups was similar, however these are not reported. **Study sufficiently powered?** The study had a power of 80% to show a 15% difference between each intervention and the control group at 5% two sided significance.	Statistical analysis performed on an intention to treat basis, using the χ^2 test with Yates's correction for baseline comparisons, and 95% confidence intervals for the difference in proportions.	Control 32% MMR Intervention A 27% (compared to control difference in proportions -6.5 (95% CI –21.7 to 8.7)) Intervention B 23% (compared to control difference in proportions -9.8 (95% CI -24.7 to 5.1)) Control 34% Secondary outcomes: There was no significant difference in study end point, when both immunisations combined were compared with the control group. Intervention A 30% (compared to control difference in proportions -2.3 (95% CI -13.0 to 8.4)). Intervention B 26% (compared to control difference in proportions -6.0 (95% CI -16.4 to 4.4)) Control 32% Subgroup analysis by maternal age and parity showed a substantial but non-significant effect of intervention in promoting completion of primary immunisation in	similar between groups. It is not reported whether any participants were lost to follow-up and how this was dealt with. Small sample size. **Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** NR

				firstborn children (56%, 10/18) compared with firstborn controls (25%, 3/12), and in children of young mothers aged ≤30 years (31%, 27/86) compared with controls (13%, 5/38). There was no effect on uptake of measles, mumps, and rubella immunisation. **Attrition details:** NR	

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Stehr-Green et al. 1993) **Citation:** Evaluation Of Telephone Computer-Generated Reminders To Improve Immunisation Coverage At Inner-City Clinics **Aim of study:** To evaluate the effectiveness of computer-generated reminders used to raise the rates of on-time immunisation among preschool-age children in two public clinics in Atlanta, GA **Study design:** RCT	**Source population/s:** USA **Eligible population:** Parents with infants younger than 2 years of age who had previously been vaccinated at either of two public health clinics in southwest Fulton County and were listed in the clinic's file of current patients. **Selected population:** Parents with infants younger than 2 years of age who had previously been vaccinated at either of two public health clinics in southwest Fulton County, were listed in the clinic's file of current patients and were die to receive DTP, OPV or MMR during the study's 6 week enrolment period (in February – March 1990). **Excluded population/s:** NR	**Method of allocation:** Reported as random, but not described in detail. **Intervention/s description:** The intervention comprised parents of infants in the intervention group, and for whom telephone numbers were available, being telephoned using a Telecorp System 606 Telecomputer (A) that had been programmed by staff members of the Fulton County Health Department. The text of the standard message, which was delivered in a normal human voice, was: "This is the Fulton County Health Department calling to remind you that your child is due for an immunisation or 'shot' this month. Please call the health centre for an appointment or	**Primary Outcomes** Proportion vaccinated within 1 month of being due. **Secondary outcomes** Vaccinated on time for DTP and OPV-1,2 or DTP-3, and DTP-4 and OPV-3 or MMR Proportion of those reached successfully vaccinated on time. **Follow-up periods:** It is not clearly how long the intervention lasted or the precise follow-up period. **Method of analysis:** Not clearly reported, descriptive statistics	**Primary outcomes:** A higher proportion of the intervention group was vaccinated within 1 month after they were due (45.5%), compared with the control group (42.7%) (95% CI 0.78 to 1.46). **Secondary outcomes:** Among those due for DTP and OPV-1,2 or DTP-3, the intervention group were slightly more likely to have been vaccinated on time (51.3%) than the control group(45.6%)(95% CI 0.81 to 1.56). Among those due for DTP-4 and OPV-3 or MMR, the control group were slightly more likely to have been vaccinated on time (29.4%) than the intervention group (26.1%%)(95% CI 0.32 to	**Limitations identified by author:** Small sample size **Limitations identified by review team**: Method of randomisation not clear Small sample No sample size calculation Not clear if attrition analysis was performed Approximately 33% of the intervention group did not receive it because

Internal validity score: **-** **Applicability:** **C**	**Setting:** Two public health clinics in southwest Fulton County, which were principal sources of primary health care for members of poor, minority populations. **Vaccines:** DTP, OPV, MMR	bring your child in to the health centre any day this week, Monday through Friday, between 8:30 a.m. and 4 p.m. Immunisations are important to protect your child from certain diseases, such as whooping cough, measles, and polio. They are also required for day care or school attendance." Calls were made during 5 days, beginning the day before the child became due for his or her immunisation. A maximum of nine attempts (not counting wrong numbers, nonworking numbers, or misdials) were made to each child's home, until an answer was obtained; at least five of the calls were to be made between 6 and 9 p.m. Calls not answered, responses by an answering machine (for which no reminder message was left), hang-ups within 10 seconds, and busy signals were classified as missed attempts. Children were followed for a 1-month period beginning on the date that they became due to receive their immunisation; children who came for immunisation before the due date were excluded from the analysis. At the end of the study, information on immunisations given was		2.43). When sex, race, ethnicity, clinic attended, and type of vaccine due were controlled in a logistic regression model, the intervention group were more likely to have been vaccinated on time (adjusted odds ratio [aOR] = 1.13, 95% CI = 0.61 to 2.08). Of the 68 children in the intervention group whose homes were reached successfully, 36 (52.9%) were vaccinated on time, compared to 31 (41.3%) of the 75 in the control group with recorded telephone numbers for whom no reminder was given (crude relative risk = 1.28,95% CI = 0.90 to 1.82). When the potentially confounding factors were controlled using logistic regression, the homes reached were significantly more likely to have been vaccinated on time (aOR = 2.12, 95% CI = 1.01 to 4.46). **Attrition details:** 25 children were excluded as they returned for vaccination before their due date (14 of the intervention group and 11 of the control group). After randomisation 6 infants were lost to follow-up and 1 was deferred from receiving	they did not have a telephone. Limited demographic details of the study setting **Evidence gaps and/or recommendations for future research:** Larger studies to evaluate the impact of this intervention. **Source of funding:** NR

		abstracted from clinic records. **Control/comparison/s description:** Received no reminder of any kind. **Sample sizes:** **Total** n= 222 **Intervention** n= 112 **Control** n= 110 **Baseline comparisons:** Average ages of infants were similar, 9.2 ± 4.8 months for the intervention group versus 8.7 ± 4.9 months for the control group. There were equivalent proportions in the two groups who were black or Hispanic and children whose household telephone numbers were recorded in their charts. Compared to the intervention group, the control group were slightly younger, more likely to be female, more likely to attend clinic A (the larger of the two study sites), more likely to be due for DTP and OPV-1,2 or DTP-3, and were less likely to participate in other services offered by the two clinics. None of these differences were statistically significant. **Study sufficiently powered?** NR		further vaccinations, pending medical evaluation. These infants were not included in the 222 described as the intervention and control group. It is not reported if they were included in the analysis or not.	

Study details	Population and setting	Method of allocation to	Outcomes and	Results	Notes

		intervention/control	methods of analysis		
(Szilagyi et al. 2006) **Citation:** Effect of telephone reminder/recall on adolescent immunization and preventive visits **Aim of study:** To measure the effect of telephone –based reminder/recall on immunisation and well child care visit rates among young people in urban practices **Study design:** RCT **Internal validity score:** ++ **Applicability:** C	**Source population/s:** Urban primary care practices in Rochester, USA **Eligible population:** Young people aged 11-14 years in Rochester, USA. **Selected population:** Young people aged 11-14 years registered at four urban primary care practices in Rochester, USA. **Excluded population/s:** Siblings of the young people (aged 11-14), those with no practice visits within 24 months, those residing out of the county and those with no telephone number in the database **Setting:** Four urban primary care practices in Rochester, USA (two paediatric group practices, a hospital based paediatric clinic and a family medicine-based neighbourhood health clinic) **Vaccines:** Tetanus-diphtheria booster and hepatitis B	**Method of allocation:** Stratified into two age groups (11-12 years and 13-14 years) and then randomised into two groups usual and telephone intervention using a random number generator by research personnel **Intervention/s description:** The intervention comprised: 1. Health professional (no details) reviewing medical records for telephone numbers. 2. A database (no details) tracking for young people missing immunisations 3. A research assistant (no details) checking upcoming appointments and changes in telephone numbers 4. Placing a variable number of calls by auto dialer (recorded voice in English) day or early evening depending on the need for immunisations and prior response to reminder calls Between the dates of August 8 1998 and February 29 2000 **Control/comparison/s description:** Usual care (no details)	**Primary Outcomes** Improving immunisation rates **Secondary outcomes** NA **Follow-up periods:** 18 months **Method of analysis:** Intention to treat Data was analysed using chi square and t-tests	**Primary outcomes:** Intervention versus control group Hepatitis B vaccination 62% vs. 57.8% p=0.02 Tetanus- diphtheria booster 52% vs. 49.9% p=0.27 **Secondary outcomes:** NA **Attrition details:** n=132 of the intervention group and n=168 of the control group were inactive i.e. had moved or had no medical records thus intention to treat analyses was on n=1495 of the intervention group and n=1510 of the control group.	**Limitations identified by author:** The study setting was urban practices and therefore the results may not be generalisable. e.g. patient & practice characteristics Young people were probably included whom were not current patients of the practices thus they may have had immunisations else where The lack of an up to date telephone list was a major limitation. Autodialer telephone calls may not be as successful as a real person making contact Any potential immunisations outside the practice were not ascertained **Limitations**

		Sample sizes: **Total** n= 3006 **Intervention** n= 1496 **Control** n= 1510 **Baseline comparisons:** Baseline demographics and immunisation and well child clinic visits were similar for both intervention and control group **Study sufficiently powered?** Yes			**identified by review team**: There was little detail on the research personnel and health professional involved in the RCT. **Evidence gaps and/or recommendations for future research:** The authors cite the major limitation of this RCT was inaccurate telephone numbers therefore further research could investigate into methods of maintaining accurate contact details of primary care patients **Source of funding:** Centers for Disease Control and prevention. Atlanta, USA

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes

(Szilagyi et al. 2002) **Citation:** Reducing Geographic, Racial, and Ethnic Disparities in Childhood Immunisation Rates by Using Reminder/Recall Interventions in Urban Primary Care Practices **Aim of study:** To assess the effect of a community-wide reminder, recall, and outreach (RRO) system for childhood immunisations on known disparities in immunisation rates between inner-city, rest of the city and suburban populations. **Study design:** ITS **Internal validity score:** - **Applicability:** C	**Source population/s:** United States. **Eligible population:** Children aged 0-2 years residing in Monroe county, New York from three separate cohorts of children 1993, 1996 and 1999. **Selected population:** Children aged 0-2 years residing in Monroe county, New York from three separate cohorts of children 1993, 1996 and 1999 from the 10 largest practices out of 63 practices in the county were included in the study. A total of 3184 infants identified from these practices received intervention and were included in the study (1653 from inner-city, 938 from rest of the city, and 598 from suburbs). **Excluded population/s:** Children living in outlying counties who were served by Monroe County practices were excluded. **Setting:** Monroe County, New York (birth cohort: 10 000, total population: 750 000), which includes the city of Rochester. Three geographic regions within the county were compared: the inner city of Rochester, which contains the greatest concentration of poverty (among 2-year-old children, 64% had Medicaid); the rest of the city of	**Method of allocation:** Stratified, clustered sampling design was used, with primary sampling unit being the practice, then sampling from practices stratified by city versus suburban location. Patient records were assigned to a random number; a10% random sample was selected from practices located in the suburbs, and a 25% random sample was selected from practices located in the city. **Intervention/s description:** The intervention comprised of a community wide reminder, recall and outreach (RRO) system. The RRO interventions recruited lay outreach workers from the neighbourhoods around the practices and were assigned to one or more city practices. Outreach workers were trained to follow a strict reminder/recall protocol, were provided with a list of age-eligible children for whom they were responsible, set up a tickler-file system to track immunisations within their primary care practice and used medical charts to assess and monitor the immunisation status of their caseload, and applied the intervention protocol when children were behind in immunisations. The	**Primary Outcomes** Immunisation rates at 12 and 24 months for recommended vaccines (4 diphtheria-tetanus-pertussis: 3 polio: 1 measles-mumps-rubella: 1 Haemophilus influenzae type b on or after 12 months of age). Immunisation rates were assessed for the entire county and separately for the 3 geographic regions in 1993 (before any intervention), 1996 (when 46% of inner-city plus rest-of-city children received the intervention), and 1999 (when 68% of inner-city plus rest-of-city children received the intervention). **Secondary outcomes** Not relevant to the review. **Follow-up periods:** Follow up at baseline (1993), 1996 and 1999. **Method of analysis:** Descriptive statistics.	**Primary outcomes:** Baseline immunisation rates (1993) for 24-month-olds were as follows: inner city (55%), rest of city (64%), and suburbs (73%) (P<0.001). By 1996, immunisation rates rose significantly with inner city (76%), rest of the city (82%) and suburbs (84%) (p<0.001). In 1999, the results were not significant with immunisation rates being similar across geographic regions: inner city (84%), rest of city (81%), and suburbs (88%) (p<0.2) **Secondary outcomes:** Not relevant to the review. **Attrition details:** NR	**Limitations identified by author:** The intervention was implemented at primary care sites and not centrally, hence it is possible that study findings would not be applicable to a centrally operated tracking and outreach programme such as a centralised immunisation registry. The study does not provide evidence in either direction of the effectiveness of reminder/recall in suburban settings. Immunisation rates were assessed using medical chart reviews at participating practices, and it is possible that the 11% to 15% of children who were not included had immunisation rates different from those included in the assessments.

	Rochester (38% had Medicaid); and the suburbs of the county (8% had Medicaid). **Vaccines:** DTP, Polio, MMR, Haemophilus influenzae.	intervention was staged, with increasing intensity for children who were further behind in immunisations—all children were tracked; three-quarters received some type of reminder (telephone, postcard, or letter); many received multiple reminders; and a small number of children for whom all previous strategies failed (5%) received home visits to address barriers to care. The average caseload for outreach worker was 400 children. **Control/comparison/s description:** NA **Sample sizes:** **Total** n= 3184 **Intervention** n= NA **Control** n= NA **Baseline comparisons:** Yes. The inner city of Rochester had the highest concentration of black and Hispanic children and Medicaid recipients, with the majority of children served by hospital clinics or neighbourhood health centres. The suburbs had predominantly white children covered by commercial insurance and served by private paediatric practices. The "rest of the city" was in an intermediate zone in terms of			Children who were never seen in a primary care practice would have been missed by the immunisation assessments and also by the intervention. The assessments were conducted by medical chart review, with no contact of patients, and some immunisations received at non participating practices might have been missed by the chart reviews. **Limitations identified by review team**: Attrition not provided Not reported CI in the results. **Evidence gaps and/or recommendations for future research:** Well designed studies should be

		these characteristics. **Study sufficiently powered?** Power size calculation for determination of sample size.			conducted **Source of funding:** Centers for Disease Control and Prevention.

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Vivier et al. 2000) **Citation:** The Impact of Outreach Efforts in Reaching Under immunised Children in a Medicaid Managed Care Practice. **Aim of study:** To assess the impact of telephone, mail, and a combined mail/telephone intervention improve to immunisation rates among under immunised children enrolled in a hospital-based Medicaid managed care practice. **Study design:** RCT **Internal validity score:** +	**Source population/s:** USA **Eligible population:** All children enrolled in Medicaid in Hasbro Children's Hospital/Rhode Island Hospital, USA. Children were eligible for the study if they were under immunised, younger than 6 years as of September 30, 1998 and continuously enrolled in the primary care clinics at Hasbro Children's Hospital/Rhode Island Hospital during July, August, and September 1998. **Selected population:** A total 2117 children met the eligibility criteria at Hasbro Children's Hospital/Rhode Island Hospital. Of the 2117 children eligible for the study, 333 were under immunised. Fourteen of these children had received a recent immunisation, rendering them ineligible to receive needed vaccines in the coming weeks, and were therefore excluded from the study. 55 children who already had	**Method of allocation:** NR **Intervention/s description:** The intervention comprised either, telephone reminder, mail reminder or sequential mail/telephone reminder. English- and Spanish-speaking clinic receptionists attempted to call families in the telephone reminder group, informing them that their child was behind on his or her immunisations and requested that they make an appointment with their primary care provider. If the family agreed, the receptionist would schedule the appointment during the telephone call and ask them to bring their immunisation record with them to the appointment. Telephone numbers were obtained from the hospital registration system. Only 1 child had no telephone number from either source. At least 3 telephone call attempts	**Primary Outcomes:** Number of receiving an immunisation. The percentage of children immunised during follow-up. The percentage of children up-to-date. **Secondary outcomes:** Not relevant to the review. **Follow-up periods:** 10 weeks **Method of analysis:** Descriptive statistics. Intention to treat analysis used.	**Primary outcomes:** Children in the intervention groups were more likely to receive an immunisation compared with the control group (P<.05). The percentage of children immunised during follow-up was 4.2% (3/71) for the control group, 16.7% (10/60) for the telephone reminder group, 19.0% (12/63) for the mail reminder group, and 25.7% (18/70) for the sequential mail/telephone group. Differences between the 3 intervention groups were not statistically significant (P = .41). The percentage of children up-to-date for DPT, polio, Haemophilus influenzae type b, and MMR was 2.8% (2/71) for the control group, 13.3% (8/60) for the telephone group, 14.3% (9/63) for the mail group, and 17.1% (12/70) for the sequential mail/telephone group of	**Limitations identified by author:** NR **Limitations identified by review team**: Not reported method used for calculation of sample size. Not reported method of randomisation and concealment of allocation. Not reported blind assessment of primary outcome. Not reported attrition details. **Evidence gaps and/or**

Applicability: B	an appointment scheduled in the primary care clinics within 10 weeks were also excluded from the study. The remaining 264 children were included in the study (71in the control group, 60 in the telephone reminder group, 63 in the mail reminder group, and 70 in the sequential mail/telephone reminder group). **Excluded population/s:** Children enrolled in Medicaid in Rhode Island, who were in foster care. **Setting:** Hasbro Children's Hospital/Rhode Island Hospital, USA. **Vaccines:** DPT, polio, Haemophilus influenzae type b, MMR, or hepatitis B vaccines	were made, one each in the morning, afternoon, and early evening, before concluding that the family could not be contacted. For the mail reminder group, a letter was sent to the family; informing them the child was behind on his or her immunisations and requested that the family call the clinic to schedule an appointment with their primary care provider. A letter was also sent to the families of children in the sequential mail/telephone reminder group. If the family had not scheduled an appointment the receptionist then telephoned the family, using the same basic procedures as for the telephone reminder group. **Control/comparison/s description:** No intervention **Sample sizes:** **Total n=**264 **Intervention** Telephone n= 60 Mail reminder n= 63 Sequential mail/telephone reminder n= 70		under immunised children. Differences between the 3 intervention groups were not statistically significant (P = .82). **Secondary outcomes:** Not relevant to the review. **Attrition details:** NR	**recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** Hallet Trust

		Control n=71 **Baseline comparisons:** The groups were similar before the intervention in sex, age, and vaccine-specific immunisation rates. **Study sufficiently powered?** NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Franzini, Rosennthal, & Spears 2000) **Year:** 2000 **Citation:** Cost-Effectiveness of Childhood Immunization Reminder/Recall Systems in Urban Private Practices **Aim of study:** To assess cost and cost-effectiveness of immunization reminder/recall systems in the private sector**.** **Study design:** RCT **Internal validity score:**	**Source population/s:** **US** **Eligible population:** Children aged <12 months old presenting to 1 of the 6 participating private pediatric practices in Houston/Harris County, Texas, between May 1997 and April 1998. **Selected population:** 1138 children aged <12 months old presenting to 1 of the 6 participating private pediatric practices in Houston/Harris County, Texas, between May 1997 and April 1998. Patients were offered study participation if they were eligible for their first, second, or third diphtheria, tetanus, and pertussis vaccine/diphtheria, tetanus, and acellular pertussis vaccine (DTP/DTaP) at their next visit. **Excluded population/s:** NR	**Method of allocation:** NR **Intervention/s description:** The mail group of parents received a postcard delivered through the US mail reminding them of the date of their return appointments. In the autodialer group, parents were reminded of their return appointment date for immunisations by a computer automated telephone message system. Enrollment: Included a chart review to identify eligibility, signing of the consent form, recording demographic data, and providing a point of service **reminder**. The same enrollment procedures were used in all 3 arms of the study. **Reminder**: In the mail group, a postcard was sent 7 days before the target date for the return visit. The autodialer group received a computerized	**Primary Outcomes:** Number of children immunised Number of children immunised per 1000 children Additional number of children immunised relative to control per 1000 **Secondary outcomes** NR **Follow-up periods:** NR **Method of analysis:** Descriptive statistics	**Primary outcomes:** Number of children immunised was 315 for the mail group, 270 for the automated message group and 273 for the control group. Number of children immunised per 1000 children was 797 for the mail group, 860 for the automated message group and 636 for the control group. Additional number of children immunised relative to control per 1000 was 161 for the mail group and 224 for the automated message group **Secondary outcomes:** NR **Attrition details:**	**Limitations identified by author:** That the children were in an age group known o be high health care users limiting generalisbilty to other vaccines and age groups. **Limitations identified by review team**: No baseline demographics reported or compared between groups, however characteristics between clinics were not uniform. The study only considers one vaccine in very young children.

- **Applicability:** C	**Setting:** Six sites chosen on the basis of 1) absence of an existing immunization reminder/recall system at the practice site, 2) on-site delivery of childhood immunizations, and 3) participation in Clinic Assessment Software Application (CASA) evaluation. **Vaccines:** DTP	telephone message in the same time range. The control group received no **reminder** intervention. Follow-up and recall: After the target immunization date, the study staff reviewed the chart and recorded return visit status. Patient record reviews were conducted in a standardized fashion at 5, 17 and 30 days after the target appointment date. For children with no response to the study **reminder**, up to 2 recall messages (postcard or computer-generated telephone messages) were delivered 1 to 2 days after the previously defined record review intervals. Off-study: Children were considered off-study if there was a well-child return visit during the study window (target immunization date plus 30 days) or if they were nonrespondents at the end of the study window. Children were only enrolled for 1 target immunization (DTaP) and then were taken off-study. In addition, children were not eligible for reenrollment. **Control/comparison/s description:** No intervention. **Sample sizes:** **Total n=** 1138		NR	The method of randomisation is not reported. There is no sample size calculation. Data collection is not reported. Some clinics may have been more encouraging than others in addition to the interventions. The length of time between the intervention and data collection is not clear. (no p values or CI reported) **Evidence gaps and/or recommendations for future research:** **Source of funding:**

		Intervention letter = 315 **Intervention telephone 314=** **Control n=** 429 **Baseline comparisons:** Except for age, demographic characteristics of the practice sites were not uniform 9no further details). **Study sufficiently** powered?: NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Ashton-Key & Jorge 2003)d} **Year:** 2003 **Citation:** Does providing social services with information and advice on immunisation status of 'looked after children' improve uptake? **Aim of study:** Assess the value of providing social services with information on the status **Study design:** Before and after study **Internal validity score:** (-)	**Source population/s:** UK **Eligible population:** Community child health immunisation records of looked after children aged (0 to 18 years) in an urban unitary authority in England **Selected population:** 136 'looked after children' aged (age 16 months to 17 years 2 months) who were looked after continually during the study period in an urban unitary authority in England **Excluded population/s:** Only 90.1% of the names of looked after children supplied for 1999 (227 of 252) were matched to child health records despite searching both electronically and manually using known aliases, previous addresses, and previous	**Method of allocation:** NA **Intervention/s description:** A detailed immunisation history was prepared and provided to social services for every looked after child where the immunisation status was assessed. This included a record of all immunisations that had been recorded as received and detailed those immunisations that needed to be given to ensure that each child had received all their age appropriate immunisations. This information was provided to the senior social services manager in the unitary authority who had managerial responsibility for looked after children. **Control/comparison/s description:**	**Primary Outcomes** Up-to date immunisation status for age. **Secondary outcomes** NA **Follow-up periods:** 1 year **Method of analysis:** Descriptive statistics	**Primary outcomes:** Compared to 1999 there was a decreased in the proportion of children up-to-date with 82/136 (60.3%) (1999) versus 76/136 (55.9%) (2000), although this difference of 4.4% was not significant (95% CI 7.6% to 16.4%). **Secondary outcomes:** NA **Attrition details:** NA	**Limitations identified by author:** Missing names and record of 'looked after children' from original community health record: Data available for analysis:136 children **Limitations identified by review team**: See above Exact no of 'looked after' children not known from records. Children and young people in the study may not be representative of

Applicability: B	names. **Setting:** One urban unitary authority in England **Immunisations:** Primary DTP Primary polio Primary Hib Primary MMR Preschool booster MMR2 (booster) BCG School leavers booster	Immunisation record up-to-date vs not up-to-date in 2000 **Sample sizes:** Data available for analysis:136 children identified as 'looked after' **Total n=** 136 **Intervention n=** NA **Control n=** NA **Baseline comparisons:** NA **Study sufficiently powered?:** NA			'looked after' children. It is not reported how frequently information was provided to social services or if any follow-up was made. **Evidence gaps and/or recommendations for future research:** **Source of funding:** NR

Multi-component interventions that include education

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Barnes et al. 1999) **Citation:** Impact of Community Volunteers on Immunisation Rates of Children Younger Than 2 Years **Aim of study:** To assess the effectiveness of a volunteer-driven outreach programme on immunisation rates in children younger than 2 years. **Study design:** RCT **Internal validity score:** + **Applicability:** B	**Source population/s:** United States. **Eligible population:** Children younger than 2 years enrolled at one of the two ambulatory paediatric clinics of a major medical centre in New York from December 1995 to July 1996. **Selected population:** Infants less than 24 months and residing in north-western Manhattan; immunisation deficient by clinic chart review; and a no-show for a scheduled appointment at either of two ambulatory paediatric clinics of a major medical centre in New York and enrolled from December 1995 to July 1996. **Excluded population/s:** Not residents of north-western Manhattan and not attending one of the ambulatory clinics. **Setting:** Two Paediatric ambulatory clinics in North-western Manhattan, New York, USA. **Vaccines:** DTP, HIB, Polio,MMR and Hepatitis B	**Method of allocation:** NR **Intervention/s description:** Immunisation outreach, tracking, and follow-up were provided by community volunteers. The intervention group received basic immunisation education and referral from the community volunteers. During subsequent contacts (home visits or telephone calls) throughout the remainder of follow-up (a maximum of 6 months), families were reminded of upcoming vaccinations and were recontacted to ensure that requisite vaccines were received. **Control/comparison/s description:** No volunteer driven out reach programme. Control children were notified of immunisation status at enrollment but received no further contact until the conclusion of follow-up (mean, 6.4 months).	**Primary Outcomes** Immunisation status 6 months after enrollment. **Secondary outcomes** NR **Follow-up periods:** Baseline and 6 months. **Method of analysis:** Descriptive statistics.	**Primary outcomes:** Significantly more children in the intervention group were up-to-date with their vaccination series than children in the control group (75% vs. 54%; P=.03). Children in the control group were 2.8 times more likely to be late for a vaccine than intervention children (odds ratio=2.8; P=.02). **Secondary outcomes:** NR **Attrition details:** 21% lost to follow-up in the intervention group and 9.5% in the control group.	**Limitations identified by author:** The study population was not representative of under immunised preschool children in New York City as a whole; hence generalizability of the findings is warranted. Selection bias in the study. **Limitations identified by review team**: Not reported method of randomisation and allocation concealment. Not reported blind assessment of primary outcome. Not reported confidence interval for the results. Intention to treat

		Sample sizes: **Total n=** 434 **Intervention n=: 218** **Control n=216** **Baseline comparisons:** There were no significant differences between the intervention and control groups. **Study sufficiently powered?** Yes. Sample size was calculated on the assumption that 40% of children would be up-to-date with their immunisations at enrollment and that 60% of intervention children would be up-to-date at the final visit.			analysis not used. **Evidence gaps and/or recommendations for future research:** Testing the model in other populations and on a larger scale. **Source of funding:** New York City Department of Health.

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Browngoehl et al. 1997) **Citation:** Increasing Immunization: A Medicaid Managed Care Model **Aim of study:** To evaluate the impact of an immunisation	**Source population/s:** US **Eligible population:** Children aged 30-35 months at October 1992 and those 18-24 months at October 1992 identified from the enrolment database and remained enrolled through until October 1993. **Selected population:** Children aged 30-35 months at October 1992 and those 18-24	**Method of allocation:** Childs age **Intervention/s description:** The intervention comprised: Computerised tracking and reporting which included data management, tracking and member notification and reminders. Provider education and incentives, fee-for-service for	**Primary Outcomes** Up-to-date immunisation status determined for completeness (being immunised for each combination and each individual vaccine by 35 months) and age appropriate (being immunised for each combination and each individual vaccine by 24 months of age) Age appropriate was only	**Primary outcomes:** Those who received the intervention had higher completeness rates for all combined series and individual vaccines. All differences were significant at P< 0.05 except for Hib and series of which Hib was a part (4:3:1:3). When compared completeness rates for those in the intervention group were	**Limitations identified by author:** The intervention targeted a wider population; however it was evaluated using a smaller subgroup. This was a multi component intervention, however only the

outreach program on immunisation rates. **Study design:** Retrospective cohort study **Internal validity score:** **-** **Applicability:** **C**	months at October 1992 identified from the enrolment database and remained enrolled through until October 1993. Those aged 30-35 months at October 1992 were the control group. Those aged 18-24 months at October 1992 were the intervention group. **Excluded population/s:** Those who were part of the selected population but did not remain enrolled through the study period. **Setting:** Mercy Health Plan (MHP), an independent practice association that was at the time of the study the largest Pennsylvania Medicaid Managed Care Organisation. **Vaccines:** DTP, OPV, MMR, Hib	each immunisation in addition to monthly capitation payments. Provider also received taped educational material when they joined MHP and printed material semi-annually thereafter. Parent education and incentives, reminder cards sent at birth and 1 month before immunisations are due or when they missed a schedule immunisation. A $10 gift certificate was offered for diapers or shoes when immunisations were obtained. Transportation assistance was provide, ongoing education through a newsletter and prenatal classes. Home-visiting outreach using registered nurses were sent to households with children 2 years or younger who are identified as not being up-to-date from immunisation data in the tracking system. The nurses reviewed records, educate parents on the importance of immunising their children, assist with appointments, follow up to see if appointments were made. **Control/comparison/s description:** The control group received no intervention	considered for those who met the criteria for completeness. **Secondary outcomes** NR **Follow-up periods:** 12 months although not clearly reported. **Method of analysis:** Comparisons were made using the Students t test.	significantly higher in those who received a home visit versus those who didn't ($P<0.05$). **Secondary outcomes:** NR **Attrition details:** NR	impact of home visiting was individually measured. Incomplete data for some members is likely for some members as such this group are likely to represent the under immunised. **Limitations identified by review team**: Unclear outcome measures, poorly defined. Limited demographic information of the population in which the study is set. The study design is difficult to follow. The follow-up period is not entirely clear, although the intervention spanned 1 year. **Evidence gaps and/or recommendations for future research:**

		Sample sizes: **Total n=** 2511 **Intervention n=** 1254 **Control n=** 1257 **Baseline comparisons:** The two groups were compared and no significant differences were found. **Study sufficiently powered?** NR			Studies exploring broader populations and settings **Source of funding:** NR

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Crittenden & Rao 1994) **Citation:** The immunisation coordinator: improving uptake of childhood immunisation **Aim of study:** The aim was to discover whether local interventions by the immunisation coordinator in a district health authority improved uptake of immunisations. **Study design:** Before and after study	**Source population/s:** UK **Eligible population:** Unimmunised infants and children due for either primary vaccinations, or the preschool booster, or both in North east Essex. **Selected population:** Unimmunised infants and children due for either primary vaccinations, or the preschool booster, or both in North east Essex referred to the public health department from 1 April 1992 until 31 March 1993. 93 unimmunised infants and children were identified, of these 49 were due to receive primary DPT, Polio, or MMR vaccines and 44 were due for a DT/polio booster. **Excluded population/s:**	**Method of allocation:** NR **Intervention/s description:** The intervention was provided by a team comprising the immunisation coordinator, general practitioners, health visitors, and paediatricians. All interventions were intended to encourage parents to consent to immunisation (such as telephone calls, letters, and home visits. A team meeting was used (including the immunisation coordinator, general practitioners and health visitors) as a first step to discuss a child's family circumstances and reason for on attendance. Parents were then contacted with a letter giving reassurance or specific information, such as the side effects of immunisation. In	**Primary Outcomes** Overall immunisation uptake. Immunisation uptake for primary vaccines (DPT, Polio, MMR). Immunisation uptake for pre-school booster (DT/polio). **Secondary outcomes** NR **Follow-up periods:** 1 year. **Method of analysis:** Descriptive statistics	**Primary outcomes:** 58 of the 82 (71%) eligible children were vaccinated as a result of the intervention. 28/49 infants were immunised for primary vaccines (DPT, Polio, MMR) 30/33 eligible children were immunised for pre-school booster (DT/polio). Uptake of the primary booster increased form 87% to 90%. **Secondary outcomes:** NR **Attrition details:** 11 participants lost to follow-up. Of the 44 children due for a	**Limitations identified by author:** NR **Limitations identified by review team**: Baseline characteristics neither of the children nor of the study setting are not reported. Intention to treat analysis not used. Confidence intervals or p values not reported **Evidence gaps and/or**

Internal validity score: - **Applicability:** A	Children up-to-date with immunisations. **Setting:** GP clinics, hospitals and homes in North-east Essex, UK. No further details reported. **Vaccine**: Primary vaccines (DPT, Polio, MMR) and Pre-school booster (DT/polio).	some cases, this information was given to the general practitioner or health visitor who then visited the family. If necessary, another member of the team took part in a multidisciplinary home visit. Occasionally vaccinations were carried out under hospital supervision. The public health nurse recorded the progress and outcome of all interventions. **Control/comparison/s description:** NA **Sample sizes:** **Total n=** 93 **Intervention n=** NA **Control n=** NA **Baseline comparisons:** NR **Study sufficiently powered?** NR		DT/polio booster, the families of 10 children had moved out of the area and one child had child had died.	**recommendations for future research:** High quality studies need to be conducted to overcome any bias in the study. **Source of funding:** NR

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Ferson et al. 1995) **Citation:** School health nurse	**Source population/s:** Eastern Sydney, Australia **Eligible population:** School health nurses in Eastern	**Method of allocation:** Randomisation (no details) **Intervention/s description:** The intervention comprised: School nurses screening	**Primary Outcomes** Improvement in immunisation rates before and after interventions	**Primary outcomes:** Excluding children lost to follow up and those fully immunised (all age appropriate immunisations) at start of study	**Limitations identified by author:** NR Although author's report that although

Interventions to increase immunisation uptake in school entrants **Aim of study:** To compare two nurse led interventions to increase immunisation uptake in school entrants who report missing immunisations **Study design:** Randomised comparative study **Internal validity score:** + **Applicability:** C	Sydney, Australia School entrants in Eastern Sydney, Australia **Selected population:** School health nurses in 28 primary schools in which child health screening was routinely carried out Eastern Sydney, Australia. School entrants (no more details) in 28 primary schools in Eastern Sydney, Australia **Excluded population/s:** NR **Setting:** 28 primary schools in Eastern Sydney, Australia **Vaccines:** diphtheria, tetanus and polio and MMR	kindergarten children for their age appropriate immunisation status with a screening card using yes, no, not sure and blank over a one year period (1991). The children that answered no, not sure or blank were then randomised (no details) into passive or active intervention Passive intervention involved carers of the children being sent a letter from the school encouraging immunisation plus a Department of Health leaflet in the appropriate language Active intervention involved the above plus 1-2 months later the school health nurse contacted the parents by phone to ask the carers if they had received the letter and leaflet and as to whether the child had been immunised or if not, why not. If they had not been immunised, the nurse provided further information and encouragement to get the immunisation done Two- three months later both passive and active groups were surveyed by telephone by a research officer from the public health unit and asked if their child had had any immunisations recently and	**Secondary outcomes** Costs **Follow-up periods:** ~18 months **Method of analysis:** Chi square tests were used to compare between groups and at-test was used to compare mean ages of the two groups of children	20(37%) of 54 were immunised after the passive intervention 35 (71%) out of 49 were fully immunised after the active intervention P=0.001 **Secondary outcomes:** NA **Attrition details:** Lost to follow up was n=41 in the active group and n=31 in the active group Already immunised was n= 24 in the passive group and n=40 in the active group	the active intervention was effective it was probably not cost effective **Limitations identified by review team**: No detail on the children screened other than kindergarten children assumably starting school. Small numbers once the dropouts/with drawls were described Source of immunisation status on screening was not described as it whether it was parents or medical records **Evidence gaps and/or recommendations for future research:** As the active intervention was effective but not probably cost effective according to the authors,

		was it a result of the study 's interventions **Control/comparison/s description:** Passive versus active intervention **Sample sizes:** **Total n=** 239 at randomisation (817 screened) **Intervention n=** 119 for passive intervention and n=120 for active intervention **Control n=** **Baseline comparisons:** NR **Study sufficiently powered?** NA			further studies should concentre ion adaptation of this intervention to make it more cost effective **Source of funding:** One of the researchers was supported by a grant from the Prince Henry Hospital Centenary Research Fund

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Findley et al. 2004) **Citation:** Community empowerment to reduce childhood immunization disparities in New York City. **Aim of study:** To evaluate the effectiveness of the Start Right Programme in improving immunisation coverage rates among children aged less than 5 years. **Study design:** Cohort study. **Internal validity score:** - **Applicability:** C	**Source population/s:** United States. **Eligible population:** Eligible participants were children aged less than 5, from Northern Manhattan which included the communities of Harlem and Washington Heights, New York City, USA. These participants were enrolled in the Start Right Programme. **Selected population:** From January 2002 through September 2003, 2,433 children (1574 in 2002 and 859 in 2003) were enrolled in to Start Right Programme. Recruitment for the programme was completely community-based. Parents participating in a variety of programmes at coalition organisations were invited to participate in the Start Right programme if they had a child under 5. One-third of the children enrolled were under age 12 months at enrolment, another 15% were 12 to 18 months of age, 26% were 19 to 35 months of age, and 24% were 36 months or older. Of the children older than 18 months, 44.6% were current with 4:3:1:3:3 immunisation series (4 DTP/DTaP, 3 Polio, 1 MMR, 3 Hib and 3 Hepatitis B) at	**Method of allocation:** NA **Intervention/s description:** The intervention included the Start Right Programme, which is a Community-based, immunisation Programme of outreach and tracking for children under age 5 in Northern Manhattan. The Start Right programme included series of educational and counselling sessions, reminders and feedback with enrolled parents. All parents received a bilingual information package. In addition to the written materials the Start Right Outreach workers provided educational sessions for parents, either one-to-one or in groups. At the time the child was enrolled, the child's immunisation card was explained to the parent and he/she was given a Start Right reminder 'when the next shots are due'. The Start Right worker wrote, called or spoke with the parent within 10 days of the due date for the next immunisation. The reminder cycle was repeated until all immunisations were complete. Parents received a	**Primary Outcomes:** The primary outcome measure for the Start Right Intervention was up-to-date status for the 4:3:1:3:3 immunisation series (4 DTP/DTaP, 3 Polio, 1 MMR, 3 Hib and 3 Hepatitis B). **Secondary outcomes:** NR **Follow-up periods:** Follow up- was at September 30, 2003. **Method of analysis:** Descriptive Statistics.	**Primary outcomes:** At the follow-up date of September 30, 2003, 71.3% of the cohorts enrolled in 2002 were up-to-date compared to 87.8% of the cohort enrolled in 2003. Among children older than 18 months at follow-up, 76.6% were up-to-date, a 32% increase in the rates for these children at enrollment. Children older than 18 months at follow-up, who were enrolled in 2002, had the largest absolute gains in their immunisation rates, from 32% at enrollment to 74% at follow-up. At 24 months of age, 65.3% ± 3.4% were up-to-date (4:3:1 Series, not including Hib or Hepatitis B). The comparable 4:3:1 immunisation coverage rate for 19 to 23 month-old Start Right children was 85.9% ± 4.0%, significantly surpassing the rate observed for northern Manhattan children (t=-18.7, p<0.001). (CI not reported) **Secondary outcomes:** NR **Attrition details:**	**Limitations identified by author:** NR **Limitations identified by review team**: Not reported how the sample size was calculated. Not reported on attrition details. Not reported Confidence Intervals for the results. Intention to treat analysis not used. **Evidence gaps and/or recommendations for future research:** Well designed studies should be conducted **Source of funding:** Centres for Disease Control and Prevention.

	enrollment. **Excluded population/s:** Not being a resident of Northern Manhattan (Harlem and Washington Heights), New York City, USA. **Setting:** Communities in Northern Manhattan (Harlem and Washington Heights), New York City, USA. **Vaccines:** DTP/DTaP, Polio, MMR, Hib and Hepatitis B.	congratulations and 'milestone gift' when their child completed the entire set of immunisations. **Control/comparison/s description:** NA **Sample sizes:** **Total n=** 2433 **Intervention n=**NA **Control n=**NA **Baseline comparisons:** The participants were among the most disadvantaged communities in the city and nation, Almost two-thirds of the community's families had income s below 200% of the federal poverty line 82% of them received some form of income supplement. In 2000, the population was 121,820, comprising Latinos (52%) and African American (38%). Harlem was predominantly African American (77%) and Washington Heights was predominantly Latino (74%). Two out of 5 residents (40%) were born outside the United States, with the largest group coming from the Dominican Republic, but also from West Africa and other LATIN American countries.		NR	

		Study sufficiently powered? NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Freed et al. 1999) **Citation:** Age-appropriate immunization laws: a randomised trial of information dissemination **Aim of study:** To determine if parental knowledge of civil laws requiring immunisation for school and day care entry would impact on age-appropriate immunisation rates **Study design:** RCT **Internal validity score:** - **Applicability:** C	**Source population/s:** USA **Eligible population:** All babies born the state of North Carolina to North Carolina residents. **Selected population:** All babies born the state of North Carolina to North Carolina residents during the firth two weeks in January 1996 who were alive, not adopted or would not have immunisations delayed due to medical reasons. **Excluded population/s:** Those who did not have a county of residence listed, had an out of date address or had no birth-weight recorded. **Setting:** North Carolina, nor further details reported. **Vaccines:** DTP, OPV, Hib, Hep B	**Method of allocation:** Not clear. Ordered by county and then randomised, no further details provided. **Intervention/s description:** The infants were randomised to one of two interventions groups. Both groups received a mailing on the birth of their baby and included the 2 month schedule immunisations highlighted. A toll free number was provided for further information if needed. In addition to this, A health message group also received the slogan, 'Health is the prize when you immunise'. A law message group included a statement describing the existence of state laws not only requiring immunisations for all ages as well a slogan, ' If your kids don't get their shots on time – it's a crime'. Letters were mailed in February 1996 prior to the two month immunisation being due and again 2 weeks in	**Primary Outcomes** Up-to-date at 6 months for 4DTP: 2OPV:0MMR: 2Hib: 2HepB on or before their 7 month birthday. Calculated for the series including and excluding Hep B. **Secondary outcomes** Proportion of infants immunised for the 3:2:0:2:2 over time by intervention group at 7,8,9,10,11 months of age. **Follow-up periods:** At 7 months mothers in all groups were sent a questionnaire. The study required the mother/ parent to return the survey for the child immunisation history to be included, this is not clear. **Method of analysis:** Descriptive statistics	**Primary outcomes:** Complete immunisation histories were available for 629 infants, 91% of controls, 93% of the health message group, and 91% of the law message group of those who retuned surveys. There were no significant differences in immunisations at 7 months whether or not hepatitis B was included (no CI or p value reported). **Secondary outcomes:** There were no significant differences the proportion of infants immunised for the 3:2:0:2:2 over time by intervention group at 7,8,9,10,11 months of age (no p values or CIs reported). **Attrition details:** Of 1351 infants enrolled data were only available for 629. 3 participants were removed due to death or adoption during the study it is not reported if intention-to-treat analysis was carried out.	**Limitations identified by author:** High immunisation rates may mean that it is difficult to determine significant difference between groups. Information may not have been in a format that parents could understand. Subjects were from one state only, limiting generalisability. **Limitations identified by review team**: Small time frame limited entry to the study sample although this enabled all participants to be compared at the same age.

		advance of the 4 and 6 month well child visits. **Control/comparison/s description:** Received no informational mailings **Sample sizes:** **Total** n= 1351 **Intervention:** 'health message' n= 450 'law message' n= 450 Control n= 451 **Baseline comparisons:** Not reported for intervention groups **Study sufficiently powered?** NR			The method of randomisation is not clear. Limited information is reported on the study setting. Baseline data is compared between groups of parents who returned a survey at follow-up, it is not clear whether this group of 688 who returned surveys are the parents of the 629 infants who had data include in the study. No power calculation **Evidence gaps and/or recommendations for future research:** Well designed studies should be conducted in this topic area **Source of funding:** Immunisation Division of the North Carolina Department of

					Environment, Heath and Natural Resources

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Goldstein et al. 1999) **Citation:** Immunisation Outreach in an Inner-City Housing Development: Reminder–Recall on Foot **Aim of study:** To determine rates of immunisation coverage among children 3 to 72 months of age in a large public housing development. **Study design:** Before and after **Internal validity score:** + **Applicability:** C	**Source population/s:** United States. **Eligible population:** **Families with ch**ildren 3 to 72 months of age enrolled in PIP (Paediatric Immunisation Programme). **Selected population:** Families enrolled 1075 children, <6 years of age in PIP from October 1993 through April 1996. Of the children, 11% were, <7 months of age at the time of enrollment, 21% were between 7 and 18 months of age, 26% were between 19 and 35 months of age, and 43% were 36 to 71 months of age. Of the children in the programme, 54% were enrolled for ≥1year during the study period**.** Overall, immunisation records were obtained for 791 (73.6%) of the 1075 children. Of the children, 549 (51%) had immunisation records in the home. Caregivers of 319 of the remaining 526 children (61%) signed a release of information form for the outreach workers to obtain immunisation records from health	**Method of allocation:** NR **Intervention/s description:** The intervention comprised a community-based outreach programme. The services were provided by the community outreach-workers. The PIP hired and trained outreach workers. Workers received extensive training in components and scheduling of American Academy of Paediatrics (AAP) and Advisory Committee for Immunisation Practices ACIP) recommendations for well-child care visits. The PIP workers knocked on every door in programme buildings to identify children, 6 years of age and pregnant women. When a child was identified through the door-to-door canvass, the PIP worker recorded the parent or legal guardian's name, address, phone number if available, and the child's date of birth. The PIP worker asked for the parental opinion of the child's immunisation status at the	**Primary Outcomes:** The primary outcome was up-to-date immunisation status of the children. **Secondary outcomes:** Not relevant to the review. **Follow-up periods:** 3 years **Method of analysis:** Descriptive statistics.	**Primary outcomes:** After 3 years more children were up-to-date at their final assessment, than at their initial assessment: 50% versus 37% (P<0.001). **Secondary outcomes:** Not relevant to the review. **Attrition details:** NR	**Limitations identified by author:** NR **Limitations identified by review team**: sample size calculation not reported Number of participants lost to follow-up not reported. Intention to treat analysis not used. **Evidence gaps and/or recommendations for future research:** Well conducted RCT to determine the effectiveness of the programme**.** **Source of funding:** University of

	care providers. Records from clinics were received for 242 children (75.8% of the 319 for whom records were requested). **Excluded population/s:** Disenrollment of the children occurred for several reasons: 72 enrollees (7%) aged-out at 72 months; 256 (24%) moved from the 16 buildings; 12 (1%) changed custody/guardianship; 11 (1%) were voluntarily withdrawn by the parent/legal guardian; 2(<1%) died. **Setting:** The Robert Taylor Housing Development (RTH), a Chicago public housing development, USA. **Vaccines:** DTP, PCV (Polio containing vaccine), MMR, Hib.	time of enrollment and whether there were immunisation records in the home. If available these were used to assess the child's immunisation status on the spot. If there were no records in the home and the caretaker believed that the child had received any immunisations, the PIP worker obtained a signed release form to request the immunisation record(s) from the designated clinic(s). As soon as PIP was able to assess the child's immunisation status, the date of each immunisation was recorded on a form. Parents were also given copies of records received from clinics and urged to have them updated at clinic visits. Further, attempts were made to revisit families before due dates for future immunisations and well-child care and to revisit families to verify that immunisations were received. **Control/comparison/s description:** NA **Sample sizes:** **Total n=** 1075 **Intervention n=**NA **Control n=** NA **Baseline comparisons:**			Chicago Hospitals, the Joyce Foundation, the R.R. McCormick Chicago Tribune Foundation (Cubs Care), People's Gas, Light and Coke Company, the Lloyd A. Fry Foundation, Chicago Community Trust (Major League Baseball Player's Association), the W.P. and H.B. White Foundation, City of Chicago Public Health Department, the Wyler Children's Hospital Annual Golf Classic, Polk Brothers Foundation, University of Chicago Women's Board, Pasteur Merieux Connaught, and the Grant Health Care Foundation.

		NR **Study sufficiently powered?** NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Hellerstedt et al. 1999) **Citation:** Evaluation of a community-based programme to improve infant immunisation rates in rural Minnesota **Aim of study:** To evaluate the effects of enrollment in a community-based public health nursing programme, Communities Caring for Children (CCC), on infant immunisation rates in rural Minnesota. **Study design:** Cohort study **Internal validity score:**	**Source population/s:** United States. The average age of the participants was 8 months**.** **Eligible population:** Women (and their babies) enrolled in Communities Caring for Children (CCC). **Selected population:** Women (and their babies) enrolled in Communities Caring for Children (CCC) who gave birth between May 1 and December 31, 1995. **Excluded population/s:** Not residents of 13 CCC counties. **Setting:** 13 Communities Caring for Children (CCC) in rural Minnesota, USA. **Vaccines:** DTP, Polio, HIB, hepatitis B, MMR.	**Method of allocation:** NA **Intervention/s description:** The intervention was a community-based public health nursing programme, Communities Caring for Children (CCC) which included health education, a registry, and a reminder system developed throughout the 13 county regions to encourage well-child care and timely immunisations of the infants and children of enrolled in the programme. Newsletters were sent to new mothers immediately after delivery until the infant was five years old. The newsletter contained information specific to the age of the infant/child and focussed on well-child and immunisation needs, the seriousness of infectious diseases, infant/child safety, and infant/child health concerns. Each newsletter included a 'refrigerator memo' with child and family-care telephone numbers including	**Primary Outcomes** Immunisation status of the participants. The evaluation data for the programme came from the Minnesota and North Dakota birth certificates, the CCC immunisation registry, and a telephone survey of residents of the 13 CCC counties who delivered them between May 1 and December 31 1995. Approximately 20 professional interviewers administered the final survey; they were not aware of the study's intent, to compare CCC enrolles and non-enrollees, nor did they know which study participants were enrolled in CCC. **Secondary outcomes:** Not applicable to the review.	**Primary outcomes:** 100% of the infants of CCC enrollees and 98.5% of the infants of non-enrollees, received at least one immunisation (p-value=0.074). Immunisations for polio and DTP were higher in the CCC enrollees in comparison with the non enrollees (100% vs. 98.5%, p-value= 0.284 and 99.5% vs. 98.5%, p-value= 0.071 respectively); Immunisations for MMR was lower , for infants of CCC enrollees compared with non-enrollees , but not significant (22.5% vs. 29%, p-value= 0.133) **Secondary outcomes:** Not applicable to the review. **Attrition details:** Of the 484 women eligible for the survey, 421 completed the study.	**Limitations identified by author:** NR **Limitations identified by review team**: CI not reported Method used to select survey participants not clear; may not be representative of programme participants. **Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** Allina Foundation, Minneapolis, Minnesota.

+ **Applicability:** B		those of local immunisation providers and local public health nurses name , address, and telephone number.Enrollees received a newsletter two weeks before every well-child exam and immunisation was due. Four weeks after the 2-, 9- and 18-month newsletters, the public health nurse (PHN) telephoned the enrollees, or contacted them through home or Women, Infants, Children (WIC) visits, to encourage infant/child health care, answer questions, and identify barriers to timely health care. **Control/comparison/s description:** The comparison group included non-enrollees who were not enrolled in the CCC programme. **Sample sizes:** **Total n=** 514 **Intervention n=** 259 **Control n=** 255 **Baseline comparisons: Yes** The age of the Infants at the time of the survey ranged from 4 to 16 months (mean 8 months); 12% of the infants were younger than 6 months, 44% were 6-8 months old, 43% were 9-11 months old,	**Follow-up periods:** NR **Method of analysis:** Descriptive statistics.		

		and 1% were 12 months or older. A total of 95.4% of the enrollees and 89.8% of non-enrollees were white; 4.2% of the enrollees and 7.3% of the non-enrollees were American Indians. The CCC enrollees were significantly younger, less educated, more likely to be white and of lower-parity than non-enrollees. Compared with CCC enrollees, non enrollees had significantly higher annual incomes and 14% had children (other than the study infant) who were younger than 18 years old at home. **Study sufficiently powered?** NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Henning, Pollack, & Friedman 1992) **Citation:** A neonatal Hepatitis B	**Source population/s:** United States. **Eligible population:** The eligible participants were Hepatitis B positive pregnant women and their infants.	**Method of allocation:** NA **Intervention/s description:** The surveillance system for HBsAg positive pregnant	**Primary Outcomes** The proportion of babies completing the series of hepatitis B vaccinations. in program compared to non program hospitals.	**Primary outcomes:** The combined hepatitis B vaccine dose 1, 2, and 3 coverage rates were 97%, 89%, and 67%, respectively (no CI and p-value reported).	**Limitations identified by author:** NR **Limitations identified by**

Surveillance and Vaccination Programme: New York City, 1987 to 1988. **Aim of study:** To evaluate the impact of a neonatal Hepatitis B Surveillance and Vaccination Programme. **Study design:** Cohort study **Internal validity score:** - **Applicability:** C	**Selected population:** In the 1-year period from July 1, 1987, through June 30, 1988, 1030 HBsAg-positive pregnant women were identified. The study population consisted of 830 (81%) of the 1030 positive women. Reasons for exclusion from the study were as follows: 89 women did not respond to health department calls or letters, 50 provided insufficient locating information, 30 moved before delivery, 26 seroconverted to antigen-negative status before delivery, and 3 aborted or miscarried. The 830 women delivered 832 infants. **Excluded population/s:** Babies whose mothers did not respond to health department calls or letters, provided insufficient locating information, moved before delivery, seroconverted to antigen-negative status before delivery, or aborted or miscarried. **Setting:** 13 Hospitals in New York City, USA. (8 municipal and 5 voluntary) **Vaccine:** Hep B	women comprised: contacting HBsAg-positive women by telephone, letter, or home visit. Women were counselled (in English, Spanish, Chinese, French, or Creole) regarding HBV transmission, the importance of screening household contacts, and the need for neonatal hepatitis B vaccination. **Control/comparison/s description:** NR **Sample sizes:** **Total n=** 832 **Intervention n**=NR **Control n=**NR **Baseline comparisons:** NR **Study sufficiently powered?** NR	**Secondary outcomes** Vaccine completion rates by material characteristics **Follow-up periods:** When infants were aged 18 months. **Method of analysis:** Descriptive statistics	The proportion of babies completing the series of hepatitis B vaccinations who received their first dose in one of the 13 program hospitals was 73% compared to non program hospitals (59%): relative risk 1.24, (95%CI 1.05 to 1.46). **Secondary outcomes:** Compared to mothers of Asian origin, Black and Hispanic mothers were less likely to complete the series (P <0.005) there was no difference for White mothers (P = 0.17). Compared to women born in Asia, infants born to women born in the US, Dominican Republic or Other were ess likely to compared the series (P <0.005). There was no difference for Women born in Haiti or the Pacific Island. Those on Medicaid were less likely to complete the series compared to those with private insurance (P<0.005). **Attrition details:** NR	**review team**: No formal power size calculation for determination of sample size. Number of drop-outs not reported No use of intention-to-treat analysis. **Evidence gaps and/or recommendations for future research:** Well-designed and reported RCT according to the CONSORT guidelines to be conducted to determine the effectiveness of Hepatitis B Surveillance and Vaccination Programme. **Source of funding:** NR

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(LeBaron et al.	**Source population/s:**	**Method of allocation:**	**Primary Outcomes**	**Primary outcomes:**	**Limitations**

1998) **Citation:** The impact of interventions by a community-based organization on inner-city vaccination coverage **Aim of study:** To evaluate the impact of interventions by a community-based organisation on immunisation rates **Study design:** Controlled before and after study **Internal validity score:** + **Applicability:** C	Fulton county, Georgia, USA **Eligible population:** Community based organisation (of 28 paid staff and 300 volunteers) in Fulton county, Georgia, USA Child patients in public clinics in Fulton county, Georgia, USA **Selected population:** 'workers' of community based organisation (no details) Children aged 3-59 months of age attending one of four public clinics in Fulton county, Georgia, USA who predominantly served African American and Hispanic families **Excluded population/s:** NR **Setting:** One of four public clinics in Fulton county, Georgia, USA and within the community **Vaccines:** Age-appropriate vaccination at 3 months: 1st diphtheria and tetanus and pertussis vaccine (DTP), and oral poliovirus (OPV) at 5 months: 2nd DTP and OPV at 7 months: 3rd DTP at 16 months: MMR at 19 months: 4th DTP and 3rd OPV overall '4-3-1 series' complete	NR **Intervention/s description:** The intervention comprised: A clinic- based intervention in which there was a monthly review of clinical vaccination records by community organisation staff (no details) followed by contact with family (reminder-recall strategy) Plus, a residence-based intervention including a door to door assessment and education campaigns followed by mobile van vaccinations, temporary on-site vaccination stations, free child care and transportation to providers, incentives of food and baby products , focus groups and collation with local organisations (community saturation with vaccination messages and opportunities) For a duration of one year September the 1st 1992 to August 31st 1993 **Control/comparison/s description:** For the reminder-recall strategy : 1 intervention and one control clinic for each ethnic minority For the community saturation strategy	Changes in vaccination series completion rates (reminder-recall strategy) and the rate of age appropriate vaccination rates (community saturation study) after one year **Secondary outcomes** NA **Follow-up periods:** One year **Method of analysis:** Before and after analyses using chi square test	*For clinic based study*: **intervention** Series completion rates were 43% (87/2040 before and 58% (99/170) after p=0.003 **control** Series completion rates were 52% (81/157) and 52% (78/150) p=0.046 between intervention and control *For community saturation study* **intervention** Age appropriate vaccination rates 44% (154/347) before and 61% (260/429) after p<0.001 **Control** Age appropriate vaccination rates 44% (78/178) before and after 58% (129/221) p=0.004 p=0.78 between intervention and control **Secondary outcomes:** NA **Attrition details:** NA	**identified by author:** In the community survey, the number of children had to be estimated based on survey findings and the vaccination ascertainment rate was 65% therefore there were no data concerning the children not surveyed or ascertained. The study population was not characterised, risk factors for under vaccination was not identified, the age range of the clinic and community based populations were not identical. The vaccine series has now been replaced by a larger battery of antigens. The way the study was conducted, it was not possible to draw conclusions as the efficacy of the individual interventions in the community based study. **Limitations**

		6 public housing communities(predominantly African-American) (3 intervention and 3 control and 3 private housing communities (predominantly Hispanic) (2 intervention, 1 control) **Sample sizes:** For reminder-recall strategy **Total n=** 361 before (**Intervention n=** 204, **Control n=** 157) and n= 320 after (**Intervention n=** 170, **Control** n=150**)** For the community saturation strategy n=600 houses were occupied by families, 755 children who made up the study population of which 674 had their vaccination status determined **Baseline comparisons:** NA **Study sufficiently powered?** NA			**identified by review team**: No details on who was carrying out interventions and how they were carrying out interventions. **Evidence gaps and/or recommendations for future research:** The authors state that this study is rare in that it contains control groups and they urge future researchers to use the same study design **Source of funding:** National Immunization Program, Centers for disease control and prevention

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Mason & Donnelly 2000)	**Source population/s:** Children in Wales	**Method of allocation:** Computer generated random numbers	**Primary Outcomes** The proportions and % difference immunised in	**Primary outcomes:** In children aged 21-24 months when MMR was	**Limitations identified by author:**

Citation: Targeted mailing of information to improve uptake of measles, mumps and rubella vaccine: a randomised controlled trial **Aim of study:** To investigate the effect on vaccine uptake of posting a leaflet to parents of children who had not received the MMR vaccine by 21 months of age. **Study design:** RCT **Internal validity score:** + **Applicability:** B	**Eligible population:** Children and their parents' resident in Iechyd Morgannwg Health born between 1 November 1996 and 31 April 1997. **Selected population:** Children and their parents resident in Iechyd Morgannwg Health born between 1 November 1996 and 31 April 1997 who were unvaccinated against MMR by 21 months of age according to the computerised child health record system. **Excluded population/s:** NR **Setting:** Iechyd Morgannwg, Wales **Vaccines:** MMR	**Intervention/s description:** The intervention comprised a personnel reminder letter and a carefully developed leaflet , 'MMR the facts' sent to all parents in the intervention group with a copy sent to the child's GP and health visitor. **Control/comparison/s description:** No action which was the standard practice. **Sample sizes:** **Total n=** 511 **Intervention n=** 255 **Control n=** 256 **Baseline comparisons:** NR **Study sufficiently powered?** The study had a power of 80% to detect a difference of 10% in the proportions immunised in the two groups at a 5% significance level.	the intervention and control groups at the study end in children aged 21-24 months and children aged > 24 months. **Secondary outcomes** NR **Follow-up periods:** September 1998 to April 1999. **Method of analysis:** Descriptive statistics	<u>received</u> There was a 1.1% difference in uptake between the intervention and control groups (95% CI -3.3 to 5.5). 7.2% (Intervention) immunised versus 6.1% (control) <u>In children aged >24 months when MMR was received</u> There was a 1% difference in uptake between the intervention and control groups (95% CI -3.6 to 5.7). 8.4% (intervention) immunised versus 7.4% (control) In both groups, the findings are reported as being non statistically significant. **Secondary outcomes:** NR **Attrition details:** 18 children moved from the study area (6 in the control and 12 in the intervention group). 12 children (4.8%) were incorrectly identified as being unimmunised.	Parents who have not taken up immunisations by 21 months may have ideological objections to immunisation. An adverse media event during the trial may have impacted on the trial. **Limitations identified by review team**: No baseline data provided on population groups. No data provided on study setting **Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** Welsh Office of research and Development for Health and social

					Care.

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(McPhee et al. 2003) **Citation:** Successful Promotion of Hepatitis B Vaccinations Among Vietnamese-American Children Ages 3 to 18: Results of a Controlled Trial **Aim of study:** To assess the effectiveness of media education campaign strategy and community mobilisation strategy in increasing the receipt of 'catch-up' vaccinations among children of Vietnamese-American population in Houston and Dallas, Texas, USA. . **Study design:**	**Source population/s:** United States. **Eligible population:** Vietnamese-American residents of Houston and Dallas, Texas and Washington DC. **Selected population:** Computer assisted telephone survey was conducted for recruitment of participants in the study. At preintervention, 1624 parents were surveyed in the intervention and control areas, and 1508 (93%) responded. At post intervention, call attempts were made to 12,937 potential survey respondents. Of these, 3411 (26.4%) reached nonworking numbers. An additional 4359 calls (33.7%) reached families who were not eligible for interview for reasons such as not having age-eligible children in the household (28.4%), not being of Vietnamese or Chinese-Vietnamese ethnicity (5.2%), or not having anyone at least 18 years old in the household (0.1%). It was not possible to determine eligibility for 3494 (27%) call attempts because calls reached busy signals (2%), answering machines (6.8%) or unanswered phones (17%), or because those	**Method of allocation:** NR **Intervention/s description:** The intervention comprised: media education campaign strategy and community mobilisation strategy. The media-based education and outreach campaign was conducted to encourage Vietnamese-American parents to get their children aged 3 to 18 years vaccinated with the Hepatitis B. The campaign occurred over a 2-year period (from April 1998 through March 2000) in the Houston area. The intervention activities included Vietnamese-language print, electronic (mass), and outdoor media education, emphasizing the need for hepatitis B catch-up vaccinations. The print media included educational booklets about hepatitis B, calendars with incorporated hepatitis B messages, print advertisements, and news articles published in local Vietnamese newspapers; electronic media included radio advertisements, interviews with community	**Primary Outcomes:** The primary outcome proportion of children who had received 3 doses of hepatitis B. The vaccine receipt was measured using parent reported data from shot records, provider reported data from medical records and parent or provider reported data. **Secondary outcomes:** Not relevant to the review. **Follow-up periods:** 2 years. **Method of analysis:** Descriptive statistics.	**Primary outcomes:** Parent- reported or provider-reported data found receipt of 3 hepatitis B vaccinations increased significantly in the community mobilisation area from 26.6% **(**95% CI, 21.7 to 31.6) at pre-intervention versus 38.8%(95% CI, 32.4 to 45.2) at post intervention) ($p<0.01$); and in the media intervention area 28.5%(95% CI 22.7 to 34.3) at pre-intervention versus 39.4%(95% CI, 34 to 44.8) at post intervention) ($p<0.05$); and declined slightly in the control community from 37.8%(95% CI, 31.7 to 43.9) at pre- versus 33.5% (95% CI, to 27.6 to 39.4) at post intervention. Compared to control the community mobilisation strategy significantly increased immunisations ($p=0.01$). Compared to control the media based education and outreach campaign significantly increased immunisations ($p=0.01$). Parent reported data	**Limitations identified by author:** **Limitations identified by review team**: Not reported eligibility criteria of participants. Not reported exact number of participants in the intervention and the control group. Not reported the method used for determination of sample size. Intention to treat analysis not used. **Evidence gaps and/or recommendations for future research:** Well conducted RCT's to assess the effectiveness of the intervention. **Source of**

Non-randomised controlled trial **Internal validity score:** + **Applicability:** C	answering the telephone refused interview before eligibility could be ascertained (0.5%). The remaining call attempts reached 1673 eligible respondents, of which 1547 agreed to complete the interview for a post intervention response rate of 92.5%. Vaccination reports were obtained from providers for 694 of the 1508 children in the preintervention survey. At post intervention, parents gave the names of 1944 providers to contact regarding the vaccination status of 1547 children. Responses were received from 1101 providers, resulting in a provider response rate of 56.6%. It was not possible to obtain information from the remaining 844 (43.4%) providers because parents had provided insufficient contact information or because providers never responded despite multiple telephone, fax, or in-per-son follow-ups. Thus, vaccination reports were obtained from providers for 660 children in the post intervention survey. **Excluded population/s:** Non-Vietnamese population in Houston and Dallas. **Setting:** Intervention sites- Houston, Dallas Control site - Washington, DC area (the District of Columbia; Fairfax County and the City of Arlington, Virginia; and Prince Georges County and Montgomery County, Maryland) USA.	health leaders, and telephone "warm line". Outdoor media included billboards. The community mobilisation strategy was undertaken by the East Dallas Counselling Centre (EDCC), a Vietnamese-American community-based organisation, under a subcontract. EDCC convened a coalition in the Dallas/Fort Worth Metroplex to develop an action plan of activities and timeline with the goal of improving vaccination rates. The Intervention activities included efforts to promote physicians' registration as vaccines for children (VFC) providers, distribution of referral lists of VFC providers, distribution of health education brochures, conduct of health fairs, targeted mailings, educational presentations, and use of free local media. **Control/comparison/s description:** No intervention **Sample sizes:** **Total n=** 1508 **Intervention n=**NR **Control n=** NR **Baseline comparisons:** Fewer parents in the control		suggested that receipt of 3 hepatitis B vaccinations increased in the community mobilisation area from 40.5%, (95% CI 31 to 50) at pre-intervention to 51.6% (95% CI, 41.4 to 61.8) at post intervention) (p value not reported) ; increased significantly in the media intervention area from 43.1% (95% CI, 33 to 53.3) at pre-intervention to 77.1% (95% CI, 68.5 to 85.6)at post intervention (p<0.01); and in the control community from 49.9% (95% CI, 32 to 67.7) at pre- to 51.6% (95% CI, 38.1 to 65) at post intervention (p value not reported). <u>Provider reported data</u> suggested that receipt of 3 hepatitis B vaccinations increased in the community mobilisation area from 21.7%, (95% CI 16.8 to 26.6) at pre-intervention to 28.7 (95% CI, 22 to 35.5) at post intervention; in the media intervention area from 21.3% (95% CI, 15.5 to 27.1) at pre-intervention to 23.8 (95% CI, 18.7 to 28.9) at post intervention); and decreased in the control community from 36.2% (95% CI, 30.1 to 42.4) at pre- to 29.2% (95% CI, 23.1 to 35.2) at post intervention (p values not reported).	**funding:** Centres for Disease Control.

	Vaccines: Hepatitis B vaccine	group spoke English poorly, had less than 12th grade education, or reported having household incomes below the poverty line, compared with parents in the intervention group. More parents in the control group had health insurance. More children the control area had a Vietnamese-American provider than children in the intervention groups. **Study sufficiently powered?** NR		**Secondary outcomes:** Not relevant to the review. **Attrition details:** Vaccination reports were available for only 660 of the 1508 children in the pre intervention survey.	

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Mohr et al. 2003) **Citation:** Integrating Improvement Competencies Into Residency Education: A Pilot Project From a Paediatric Continuity Clinic **Aim of study:** To determine if integrating two competencies (practice-based learning and improvement and systems-based practice) resulted in increased immunisation rates for 2-year-olds. **Study design:** Before and after study **Internal validity score:** + **Applicability:** B	**Source population/s:** US **Eligible population:** University of North Carolina residents working at the Continuity Clinic. **Selected population:** University of North Carolina senior paediatric residents working at the Continuity Clinic. **Excluded population/s:** NR **Setting:** University of North Carolina (UNC) paediatric resident continuity clinic served approximately 5,000 children, of which 1000 were less than 2 years of age. The population is ethnically diverse with 505 African American, 10% Hispanic, 40% white. 54% are enrolled in the Medicaid program and 11% are uninsured. **Vaccines:** DTP, polio, MMR, HIB, and hepatitis B	**Method of allocation:** NR **Intervention/s description:** The intervention comprised: 1. A mapping exercise outlining the clinic's existing process for assessing a child immunisation status and ordering immunisations. 2. Moving the nursing review of immunisation records to precede the resident-patient interaction. 3. A promotion system by nurses after their review. 4. Standardising immunisation record location in all of the charts 5. Collaborating with medical records to improve timeliness of records 6. Provide educational materials to parents of young children at all visits. **Control/comparison/s description:** Before and after study The intervention was evaluated using data collected	**Primary Outcomes** Proportion of consecutive children (aged 24-36 months) who were up-to-date on DTP, polio, MMR, Hib and Hepatitis B. **Secondary outcomes** NR **Follow-up periods:** Baseline July 2000 Intervention August – February 2001) Follow-up Nov 2000 February 2001 July 2001 **Method of analysis:** 2 tailed chi-square analysis.	**Primary outcomes:** At baseline the immunisation rate was 60%, which increased to 73% (February 2001) and 86% (July 2001). The change from baseline was statistically significant (P = 0.04) **Secondary outcomes:** NR **Attrition details:** NR	**Limitations identified by author:** There was no comparison group. The intervention was lead by volunteers, who may have been more motivated for results. The results may only be short term, as the study covered only a 1 year period. **Limitations identified by review team**: Baseline comparison between children in the study is not reported. Small sample size and follow-up period. It is unclear how all the residents participated in the intervention.

		at set time point from children aged 24-26 months attending the clinic. Sample sizes ranged from 16-37 at each tie point. Three trained research assistants all with clinical backgrounds extracted immunisation data on the children. **Sample sizes:** **Total n=** NR **Intervention n=** NR **Control n=** NR **Baseline comparisons:** NR **Study sufficiently powered?** NR			**Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** UNC Program on Health Outcomes

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Niederhauser, Walters, & Ganeko 2007) **Citation:** Simple Solutions to Complex Issues: Minimizing Disparities in Childhood Immunization Rates by Providing Walk-in Shot Clinic Access	**Source population/s:** Hawaii **Eligible population:** Eligible participants were children and adults from birth to 21 years who accessed the Kalihi Palama Health Centre (KPHC), Honolulu for health care. **Selected population:** Prior to the start of the WISC("walk-in" shot clinic), a random sample of 400 clients was selected from the population of children, aged birth to 21 years, who accessed the KPHC	**Method of allocation:** NA **Intervention/s description:** The intervention consisted of opening a "walk-in" shot clinic (WISC), run by a nurse practitioner (NP), 2 evenings per week and Saturdays. The nurse practitioner (NP) conducted an assessment of health status prior to giving immunisations. Once a child had received the immunizations, parents were	**Primary Outcomes:** Immunisation rates for children, birth to 21 years Up-to-date status immunization was determined by completion of the recommended immunizations (DTP, polio, MMR, HIB, hepatitis B, varicella, Td), based on the child's age, as defined by the Recommendations for Childhood Immunizations.	**Primary outcomes:** The overall up-to-date immunization status for all clients aged 6 months to 21 years at the KPHC improved significantly between the preintervention and post intervention chart review ([chi]2 = 31.395, P = 0.000). Forty-one percent (n = 152) of the children aged birth to 21 years were up to date with their immunizations in the preintervention assessment, while 65% (n = 146) were up to date in the post intervention assessment	**Limitations identified by author:** No control or comparison group. Although there was no change in the immunisation policies or procedures during the 7 month intervention period, it is possible that some other unknown event or activity may have

Aim of study: To evaluate the effectiveness of WISC ("walk-in" shot clinic) in increasing immunizations rates for children aged 6 months to 21 years in a multiethnic community health centre in Honolulu. **Study design:** Before and after study **Internal validity score:** + **Applicability:** C	for healthcare between October 2003 and September 2004. Of these randomly selected clients, a total of 369 charts were available for review. For the post intervention data, a random sample of 250 clients, aged birth to 21 years, seen at the KPHC between January and July 2005 was selected for review. Of this 250, there were 225 charts available for review. **Excluded population/s:** Participants who did not access KPHC for healthcare. **Setting:** Kalihi Palama Health Centre (KPHC), Honolulu, Hawaii. **Vaccines:** DTP, Td (tetanus, diphtheria), IPV (inactivated polio vaccine), HBV (Hepatitis B vaccine), HIB (Heamophilus Infuenzae), MMR, VAR (varicella), PCV7 (pneumococcal).	given a unique reminder calendar, with a digital photo of their child, to post at home. At the end of the visit, the next date for follow-up shots was noted on the calendar; this notation served as a reminder to bring the child back for additional immunisations. The calendar also included the child's height, weight, information about why shots were important, and the WISC hours. By personalizing the calendars with the child's photograph, the hope was that parents would hang it up in a visual place, where they would be reminded of the need for follow-up shots. If the child, adolescent, or young adult did not want a calendar, they received a Hawaii Department of Health Immunization Card with the due date for the next shots. **Control/comparison/s description:** NA **Sample sizes:** **Total n= 369(preintervention)** **n=225 (post intervention)** **Intervention n=**NA **Control n=** NA **Baseline comparisons:** Yes.	**Secondary outcomes:** Not relevant to the review. **Follow-up periods:** 7 months **Method of analysis:** Descriptive statistics.	(p=0.000). **Secondary outcomes:** Not relevant to the review. **Attrition details:** NR	influenced the immunisation rates at the KPHC. The study was conducted in one community health centre serving a mostly immigrant population; therefore, the findings cannot be generalised to other settings or populations. The length of the study was only seven months; it would be possible that the findings may have been different if the intervention was longer. **Limitations identified by review team**: Not reported method used for calculation of sample size. Not reported intention to treat analysis. **Evidence gaps and/or recommendations**

		There were no significant differences in total family income between the pre intervention and post intervention groups. However, the preintervention group was older (mean = 10.95 years, SD = 6.61 vs. mean = 9.86 years, SD = 6.6) and had more females than males (62% and 51%, respectively). **Study sufficiently powered?** NR			**for future research:** Well conducted and reported RCT to evaluate the effectiveness of WISC. **Source of funding:** Hawaii Department of Health.

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(LeBaron et al. 1999) **Citation:** The effect of patient education on paediatric immunization rates. **Aim of study:** To evaluate the effect of a brief patient education encounter with new mothers on paediatric immunisation rates. **Study design:**	**Source population/s:** United States. **Eligible population:** The eligible participants were mothers and their new born infants delivered by family practice residents at the McLennan County family practice residency. **Selected population:** A total of 238 post partum mothers were included and assigned to either the intervention or the control group according to delivery date. **Excluded population/s:** Any child with a neonatal illness (e.g. extreme prematurity) that would necessitate a different	**Method of allocation:** The participants were assigned to either the intervention or the control group according to delivery date. Two schedules were used: one schedule (Sunday, Tuesday, and Thursday) was randomly assigned to the intervention group, while the other schedule (Saturday, Monday, Wednesday) was assigned to the control group. Not reported method of allocation concealment. **Intervention/s description:** The intervention comprised of patient education of new mothers: in the hospital immediately post partum, at	**Primary Outcomes:** Immunisation rates of the children at 2, 4, 12 months of age. **Secondary outcomes:** Not relevant to the review **Follow-up periods:** 2,4, 12 months of age **Method of analysis:** Descriptive statistics.	**Primary outcomes:** There was no statistically significant difference, by chi-square analysis, in the immunisation rates of the control and intervention groups at 2, 4 or 12 months of age. At 2 months 31% (36) of the children in the intervention group and 33 %(40) of the control group received their immunisation (p=0.772). At 4 months 27% of the intervention group received their immunisation compared to 20% of the control group (p=0.197). At 12 months of age 28%	**Limitations identified by author:** NR **Limitations identified by review team**: Not reported method used for calculation of sample size. Not reported of allocation concealment. Not reported of blinding of outcome assessors. Not reported

RCT **Internal validity score:** + **Applicability:** B	immunisation schedule or follow-up was excluded from the study. Any child who lived outside the country was also excluded. **Setting:** McLennan County family practice residency and homes, USA. **Vaccines:** DPT/OPV	the scheduled 2 week follow-up visit, or by home visitation. On the first day of the postpartum, the mothers in the intervention group participated in a 10-15 minute discussion on the importance of immunisations. Two-thirds of the teaching sessions were done by a nurse with experience in patient education, while the remainder of the sessions were conducted by a physician. A translator was used when the preferred language of the mother was Spanish. After the discussion the mothers were given a patient education handout, which summarised the points covered in the session. The hand-out was written on a sixth-or seventh grade reading level and was available in English and Spanish. A reminder letter was mailed to the intervention group at 2 months postpartum. **Control/comparison/s description:** No special intervention **Sample sizes:** **Total n=** 238		(33) of the children in the intervention group and 24% (29) in the control group received all three DPT/OPV immunisation (p=0.411) (CI not reported). **Secondary outcomes:** Not relevant to the review. **Attrition details:** NR	attrition details. Not reported baseline characteristics of the participants. **Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** American Academy of Family Physicians for family practice research.

		Intervention n=116 Control n= 122 **Baseline comparisons:** Yes No significant difference in the two groups with respect to age, race, previous number of children and prenatal care. **Study sufficiently powered?** NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Paunio et al. 1991) **Citation:** Increase in vaccination coverage by mass media and individual approach: Intensified measles, mumps and rubella prevention program in Finland **Aim of study:** To present result s of an intensified nationwide vaccination program against measles, mumps	**Source population/s:** People in Finland. **Eligible population:** Children born between November 1975 and June 1984. Health professionals of health care centres and child health clinics. Public health nurses. **Selected population:** Children born between November 1975 and June 1984 and their parents. The children were broken into two groups, those who entered primary school during the study period (born before January 1979) (n = 204,813) and those born after December 1978 (n= 358,118). Health professionals of health care centres and child health clinics. Public health nurses.	**Method of allocation:** NR **Intervention/s description:** The national MMR vaccination programme commenced in November 1982. It was based on a computerized recording of vaccinated children and the national population registry. MMR was given twice, first at 14-18 months of age and again at 6 years, non vaccinated children those aged 19 months to 5 years 11 months were also vaccinated for the first time. This was supported by 3 other interventions. 1. A mass media campaign started in the 3rd year of the program and	**Primary Outcomes** Number and % of children vaccinated. **Secondary outcomes** Time series model of the number of 'hard-to-reach' children, vaccinated before and after the mass-media and notification interventions according to ordinary least squares (OLS) model. **Follow-up periods:** The study period was 192 weeks, from November 1982 to the end of June 1986. **Method of analysis:** Descriptive statistics, time series models of the	**Primary outcomes:** 562,932 children were eligible. The total number of children vaccinated rose from 87.4% to 96.4%. In the younger cohort the 96.5% were vaccinated and in the older cohort and 96.1% in those children who had entered school. **Secondary outcomes:** Of those children defined as hard-to-reach, (6 year old children who received the vaccination for the first time), the mass media campaign, the letter to HCP and the letter (to parents and PH nurses) campaign all increased the number of hard to reach children vaccinated (p< 0.05, p < 0.001 and p	**Limitations identified by author:** The authors report a polio outbreak that meant polio injections were prioritised ahead of MMR campaign. The time series graphs show the effect of the nationwide polio campaign on the MMR vaccinations. **Limitations identified by review team**: **Evidence gaps**

and rubella (MMR) in Finland. **Study design:** Before and after study, time series modelling for different aspects of the campaign provided. **Internal validity score:** ++ **Applicability:** B	**Excluded population/s:** Children not aged in the cohort range. **Setting:** Finland **Vaccines:** MMR	comprised television and radio programs lasting 1 week, information was also sent to newspapers about MMR coverage in each health centre in the newspapers circulation coverage area. Country wide, data and active and non active areas was also sent to the press. 2. Letters with the names, addresses, and social security numbers of non vaccinated children were sent to healthcare professionals of health care centres, accompanied by a motivating letter. 3. A letter stressing the potential hazards measles, mumps and rubella and safety of MMR was sent to parents of non vaccinated children not yet attending primary school. For those non vaccinated children attending primary school the names and address' were sent to public health nurses at primary schools and a letter asking them to seek permission to vaccinate from the parents of these children. **Control/comparison/s**	different component of the campaign.	<0.0001 respectively) according to the OLS model. Of the unvaccinated children 1.18% (n= 6683) were unvaccinated because their parents refused, 820 (0.1%) of children were deceased of had an absolute contraindication and 5,031 (0.9%) could not be reached by the health nurse. **Attrition details:** No information was available on 1.4% of the children.	**and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** NR

		description: Before and after **Sample sizes:** **Total n=** 562,931 **Intervention n=** 562,931 **Control n=** no control **Baseline comparisons:** NR **Study sufficiently powered?** NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Rodewald et al. 1999) **Citation:** A Randomized Study of Tracking With Outreach And Provider Prompting To Improve Immunisation Coverage And Primary Care **Aim of study:** To measure the impact of immunisation coverage using a practice-based tracking and	**Source population/s:** United States. **Eligible population:** All infants born between March 1, 1993 and February 28, 1994 in Rochester, New York, USA. **Selected population:** Infants born between March 1, 1993 and February 28, 1994 in one of nine primary care sites serving impoverished and middle-class children in Rochester, New York and infants who transferred to the practices during the study period. and who were in the date-of-birth age range. **Excluded population/s:** Subjects, who changed to a non	**Method of allocation:** Computer program was used to randomise participants; siblings were not split between study groups. **Intervention/s description:** There were four study groups. 1. Tracking/outreach and prompting 2. Tracking outreach only 3. Prompting only 4. Control <u>Tracking/outreach:</u> comprised of tracking with outreach lay workers who were assigned to one or more study sites and were provided with a list of subjects for whom they were responsible. The outreach	**Primary Outcomes:** The primary outcomes were measures of immunisation status, which was either 'up-to-date' or 'not-up-to-date' for age appropriate, series-complete coverage (DTP, OPV, MMR, Hib). **Secondary outcomes** Not relevant to the review. **Follow-up periods:** Not clear, presumably at the end of the intervention period. **Method of analysis:**	**Primary outcomes:** The vaccination coverage levels at the end of the study were: 95% tracking/outreach-prompting group 95% for the tracking/outreach group 76% for the prompting group 74% for the control group The tracking/outreach-prompting group and the tracking/outreach group were significantly different to control (P< 0.001). The prompting group was not significantly different to the control group.	**Limitations identified by author:** Study group allocation within primary care provider sites, rather than by primary care provider site. **Limitations identified by review team**: Not reported the method used for calculation of sample size. Not reported blind assessment of

outreach programme and a policy change to reduce missed opportunities by prompting physicians when a vaccination is needed for a patient. **Study design:** RCT **Internal validity score:** - **Applicability:** C	participating provider or moved from Monroe County, were excluded from the analyses. **Setting:** Nine primary care sites serving impoverished and middle-class children in Rochester, New York, (Two paediatric urban group practices, two family medicine neighbourhood health centres, one paediatric neighbourhood health centre, one hospital-based clinic, and three rural health centres). **Vaccines:** DTP, OPV, MMR, Hib	workers were recruited from the neighbourhoods in which the practices were located; all had some college education, but none had an advanced degree. The outreach workers determined the immunisation status of their assigned subjects using medical charts. The outreach workers worked with parents of the under immunised children to bring them to the primary care office. The use of postcards and telephone calls was the primary means of recalling under immunised children to the primary care provider offices. The caseload averaged 300 subjects per full-time equivalent outreach worker. <u>Prompting:</u> This programme was aimed to reduce missed immunisation opportunities (prompting) in the primary care offices. The programme involved: conducting discussions with the practice-site physicians on missed immunisation opportunities and their contribution to under immunisation; having the practices agree to immunise prompting group participants that were not up-to-date at a visit; placing a distinct marker on the charts of the children in the prompting group; having the triage nurse assess the	Descriptive statistics, Chi squared and one way analysis of variance. A total of 272 participants who transferred out of the study practices were not included in the analysis.	**Secondary outcomes:** Not relevant to the review. **Attrition details:** 272 among the 3015 enrolled, transferred out of the study practices.	primary outcome. Not reported Intention to treat analysis not used. **Evidence gaps and/or recommendations for future research:** Studies are needed to determine methods of reducing illness visit missed immunisation opportunities. A different study design than a within-site randomisation is warranted-perhaps either a by-site randomisation. Studies are needed to investigate further the impact of immunisation status-driven interventions on primary care utilisation and child health status. **Source of funding:** Centres for Disease Control

		immunisation status of children in the prompting group on presentation to the practice; and providing bimonthly feedback on provider-specific rates of missed opportunities. The intervention was from March 1, 1994 to August 31, 1995, an 18 month period. **Control/comparison/s description:** No intervention. **Sample sizes:** **Total n=** 3015 **Intervention** **Tracking/outreach-Prompting n=** 732 **Tracking /Outreach n=** 715 **Prompting n=** 801 **Control n=** 767 **Baseline comparisons:** There were no significant differences in terms of age, sex, race ethnicity or insurance type. **Study sufficiently powered?** NR			and Prevention.

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Rosenberg et al. 1995) **Citation:** Community-based strategies for immunising the 'hard-to-reach' child: The New York state immunisation and primary health care initiative **Aim of study:** To test the effectiveness of alternative community-based strategies for increasing immunisation coverage among populations who have been hardest to completely immunise. **Study design:** Before and after study **Internal validity score:** +	**Source population/s:** United States. **Eligible population:** Community-Based Organisations (CBOs) from areas with a high measles incidence during the 1989-1991 measles epidemic. Defined as at least 20 confirmed cases of measles in 1990. **Selected population:** 11 Community-Based Organisations (CBOs) from areas with a high measles incidence during the 1989-1991 measles epidemic who had previous success in community based health and social services programming and had the ability to work effectively in community outreach. A total of 7615 families with 8784 children were contacted. Among these children 3928 were not up-to date in their immunisations. From this group of children 2676 were enrolled in the study. 53.7% of children below two years of age, 69.2% born in United States, 40.2% were Hispanic, 40.2% African-American, 9.7% white and 9.5% others.	**Method of allocation:** NA **Intervention/s description:** The programme was based on the following assumptions: 1. The need to locate families with under immunised children: 2. obtain the cooperation of parents of children behind in their immunisations; 3. link children to paediatric care services; 4. mobilise parents to bring in their children for immunisations and 5.rRetain contract until children were completely immunised. A variety of outreach strategies were used to identify and enrol under immunised children in primary care. Recruitment strategies used comprised: postpartum visits, door-to-door visits, group presentations, street outreach (such as women gathered to at self service laundries, day care centres, street fairs etc), filer campaigns, the media, and networking between local organisations. Follow-up of no show included telephone calls to the family and home visits. Tracking for subsequent visits	**Primary Outcomes** Proportion of children up-to-date with DTP, OPV, MMR immunisations. Proportion of children up-to-date with DTP, OPV, MMR immunisations aged 0-11 months, 12-23 months, 24-35 months, 36-47 months and greater than 48 months. Proportion of children up-to-date with DTP, OPV, MMR vaccines according age 2, 4, 6, 12, 15, 24, 36, 48 months of age **Secondary outcomes** Not relevant to the review. **Follow-up periods:** 9 months **Method of analysis:** Descriptive statistics, students t test	**Primary outcomes:** The percentage of children who were up-to-date with their immunisations (DTP/ OPV/ MMR) rose from 24% pre intervention to 73% post intervention ($p < 0.05$). The proportion of children up-to-date with DTP, OPV, MMR immunisations aged 0-11 months, 12-23 months, 24-35 months, 36-47 months and greater than 48 months was significantly different for all age groups of children pre and post intervention ($P<0.05$). Proportion of children up-to-date with DTP, OPV, MMR vaccines according to 2, 4, 6, 12, 15, 24, 36, 48 months of age were significant for all three vaccines except for OPV in infants aged 12 months at enrolment, and MMR I those aged 15 month or older at enrolment. **Secondary outcomes:** Not relevant to the review. **Attrition details:** Not provided exact number. A few children who were lost-to-follow-up were lost due to	**Limitations identified by author:** Less attention was given to subsequent primary health care visits compared to the initial visit and hence parents inevitably faced delays in making subsequent visits. Shorter follow-periods were used, which could not demonstrate greater improvement in immunisation impact among older children. **Limitations identified by review team**: Proportions only and not exact numbers were provided. Limited details were provide on the number of children lost-to-follow-up.

Applicability: B	**Excluded population/s:** Neighbourhoods with low incidence of measles during the 1989-1991 measles epidemic. **Setting:** 11 CBOs operating in neighbourhoods with a high measles incidence during the 1989-1991 measles epidemic in New York City, USA, four in Bronx, four in Brooklyn, and three in Manhattan. **Vaccine**: DPT, Polio, MMR.	included calls to families, calls to individual providers. No further specific details are provided. **Control/comparison/s description:** Before and after study **Sample sizes:** **Total n=** 2676 **Intervention n=** NA **Control n=** NA **Baseline comparisons:** NR **Study sufficiently powered?** NR		residential mobility, either of the entire family or by the children themselves when they were placed in shelters or foster care.	**Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** Columbia University School of Public Health's Maternal and Child Health Programme from the New York State Department of Health, Division of Family Health.

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Stille et al. 2001) **Citation:** A Simple Provider-Based Educational Intervention To Boost Infant Immunization Rates **Aim of study:** To determine if a simple	**Source population/s:** US **Eligible population:** Infants born at any hospital in Hartford, US, between October 1997 and May 1998. **Selected population:** Infants born at any hospital in Hartford, US, between October 1997 and May 1998 who presented for their first well child visits at one of three sites before they were aged 28 days, with their mother or care	**Method of allocation:** Week in which they attended the clinic. **Intervention/s description:** The intervention comprised two components. The first was an interactive graphic card given to parents. It had a graphic of a teddy bear holding balloons corresponding to immunisations in the infant primary series, with a space for each balloon where	**Primary Outcomes** Age-appropriate immunisation rates at 7 months **Secondary outcomes** Dose of DTP by 3 months of age **Follow-up periods:** When the infant were aged 7 months. **Method of analysis:** Pearson's X^2 and	**Primary outcomes:** There was no difference between groups for the rate of infant receiving age-appropriate immunisations at 7 months (58.3% intervention vs 57.9% control (p = 0.93). Secondary outcomes: There was no difference between groups for the proportion of infants receiving 1 dose of DTP by 3 months of age (85.3% intervention vs 88.1% control (p = 0.47).	**Limitations identified by author:** NR **Limitations identified by review team**: Restricted to those that spoke English or Spanish, who were on time for well child visits. The intervention

educational intervention initiated at the first wellchild care visit, with reinforcement at subsequent visits, can improve inner-city infant immunisation rates. **Study design:** NRCT **Internal validity score:** + **Applicability:** C	giver (who spoke English or Spanish) and gave consent to participate. **Excluded population/s:** Infants born at any hospital in Hartford, US, between October 1997 and May 1998 who did not present for well child visits at one of the three sties before less than 28 days of age or had a mother or care giver who did not speak English or Spanish. **Setting:** 3 inner city paediatric primary care sites in Hartford, Connecticut that were staffed by paediatric faculty and residents from the University of Connecticut school of Medicine. The sites provide care to more than 90% of uninsured and Medicaid eligible infants in Hartford **Vaccines:** DTP, OPV, Hib, HBV	stickers could be place for each immunisation and a space for parents to add their child's picture. The reverse had information in Spanish and English about timing, safety and contraindications written at fourth grade reading level. The second of the intervention comprised a explanation of the card form the infants provider answering any questions and took 2-3 minutes. When immunisations were given stickers were provided that could be added to the card. Staff were given training at each site, lasting approximately half an hour. **Control/comparison/s description:** Routine information **Sample sizes:** **Total n=** 315 **Intervention n=** 156 **Control n=** 159 **Baseline comparisons:** No significant differences were found except for maternal education which was higher in the intervention group (p = 0.04). **Study sufficiently powered?** The sample size provided 80% power to detect a difference of 15% between groups.	student's t test.	**Attrition details:** 8 infants were dropped form the study after they were found to be ineligible or they failed to have been given the handout. They were not included in the analysis.	and control groups attended the same clinic and may have been contaminated by staff, talking to others in the waiting area, or knowing other families at the clinic **Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** NR

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Tseng, Nesbitt, & O'Sullivan 1997) **Aim of study**: To assess effectiveness of the implementation of Lambeth, Southwark and Lewisham's selective neonatal BCG policy **Study design:** Before and after study **Internal validity score:** (-) **Applicability:** A	**Source population/s:** Health professionals and parents in the UK. **Eligible population:** Health professionals and parents in South East London, UK. **Selected population:** Health visitors and parents of infants born in four local hospitals in Lambeth, Southwark, and Lewisham. **Excluded population/s:** NR **Setting:** Lambeth, Southwark, and Lewisham, UK. At the time of this study (1993), 26% of this population were non-white. In children aged 0-4 years, 42% were non-white (comprising black Caribbean 11%, black African 10.1%, black others 6.4%, Indian subcontinent 8.3%, Chinese and other Asians 2.1% and others 3.9%)	**Method of allocation:** NR **Intervention/s description:** In addition to a pre-existing local neonatal BCG policy in December 1992 the intervention comprised: •1 Encouragement from hospital clinical directors to increase availability of BCG to neonates at risk •2 Training (not further described?) of health visitors to identify and refer eligible infants to designated local clinics •3 Leaflets about BCG for parents and health professionals distributed It is not reported how long after the first survey the intervention was delivered or how long after the intervention until the second survey. There was 18/12 between the first and second surveys. **Control/comparison/s description:** The results of the second survey (post intervention) were compared to the first (pre intervention) survey. **Sample sizes:** **Total n=** NR	**Primary Outcomes** Proportion of eligible infants immunised with BCG. **Secondary outcomes** NA **Follow-up periods:** Before and after surveys of eligibility and immunisation rates(?) were conducted on all infants seen by health visitors 10 days after birth between June 1 and August 31, 1994 and then between 20 November and December 20 1995. The time lapse between the intervention and the after survey is not reported. **Method of analysis:** Descriptive statistics	**Primary outcomes:** The BCG immunisation rate across the four participating hospitals increased from 9% to 15%, although this change was non-significant, (OR 0.6; 95%C.I 0.34 to 1.07). The rate of immunisation varied from 0% to 37% across the four participating hospitals. The number of infants eligible to receive the BCG immunisation remained the same between surveys. **Secondary outcomes:** NA **Attrition details:** NA	**Limitations identified by author:** A change in practice meant that where and who performed the 6 week infant check up changed during this study. **Limitations identified by review team**: Uncertainty as to whether the difference in immunisation rates was caused by to the intervention or the previous policy change(ie the possibility of a temporal trend is not discussed). Lambeth was not included in the second survey. The two surveys were carried out in different ways necessitated by a change in clinical practice. At the time of the first

		Intervention n= NR **Control n=** NR **Baseline comparisons:** NR **Study sufficiently powered?:** NR			survey clinical medical officers carried out most of the 6/52 checks, however by the time of the second survey care had moved out of the hospital and GPs were carrying out most of these checks, health visitors in contact with infants from the 10th day of life were selected to carryout the second survey. **Evidence gaps and/or recommendations for future research:** Well designed studies should be conducted **Source of funding:** NR

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Waterman et al. 1996) **Citation:** A model immunisation demonstration for preschoolers in an inner-city Barrio, San Diego, California, 1992-1994 **Aim of study:** To reduce barriers to immunisation and raise immunisation rates. **Study design:** Cohort study **Internal validity score:** - **Applicability:** B	**Source population/s:** United States. **Eligible population:** Children aged 2 to 4 years from areas of high measles incidence in San Diego County during 1989-1990. **Selected population:** The intervention community selected was from ZIP 92113, Barrio Logan; and the comparison community selected was from ZIP 92713, San Ysidro. Door-to door household surveys were conducted to assess baseline and post intervention immunisation coverage. In the pre-assessment phase 777 households were interviewed, resulting in information on 433 2-4 year olds. In the post-assessment, 731 households were interviewed, yielding information on 409 children 2-4 years of age. **Excluded population/s:** Communities not from areas of high measles incidence in San Diego County during 1989-1990. **Setting:** Community Health Centres in San Diego County, USA. **Vaccines:** DPT, OPV, MMR.	**Method of allocation:** NR **Intervention/s description:** The intervention comprised of free walk-in immunisation clinics that incorporated computerised reminder/recall system; educational series offered to community health centre (CHC) providers; and extensive community-based outreach and education in schools, churches. Free walk-in clinics were established once weekly in March 1992 at each of the intervention area Community Health Clinics (CHC's). A new modular trailer unit was placed adjacent one of the CHC's and the services provided were free walk-in immunisation 5 days a week, with bilingual nursing and community worker staff. Initially a manual recall system was implemented in the clinics with telephone or postcard recalls generated for any patient who failed to return within one month of the next immunisation due date. In March 1993 a computerised reminder-recall system was implemented and parents	**Primary Outcomes** Immunisation uptake **Secondary outcomes** Not relevant to the review. **Follow-up periods:** The immunisation rates were assessed at 12 -18 months. **Method of analysis:** NR	**Primary outcomes:** Overall coverage for 4 DPT, 3 OPV and 1 MMR vaccines at 2 years increased from 37.3% to 50.2% in the intervention community compared to from 50.2% to 51.3% in the control community. This difference is not compared statistically and no CI or p-values are reported. The number of publicly provided DPT4 vaccinations provided to children 12-23 months of age in the intervention ZIP code increased by more than 300% between 1991 and 1993 (293 in 1991, 609 in 1992, and 1264 in 1993), and increased by a modest 6% over the same time period (842, 842, 897) in the control community. **Secondary outcomes:** Not relevant to the review. **Attrition details:** NA	**Limitations identified by author:** NR **Limitations identified by review team**: Not reported method used for calculation of sample size. The authors have not reported the exact number of participants allocated in the intervention and control group. Not reported blind assessment of primary outcome. Not reported Confidence Interval and p-values for the results. Intention to treat analysis not reported. **Evidence gaps and/or recommendations**

		were reminded by telephone or postcard a week before their scheduled return date. Patients who failed to return two weeks after that date were sent a recall letter. **Control/comparison/s description:** No intervention **Sample sizes:** **Total n=** 433 **Intervention n=** NR **Control n=** NR **Baseline comparisons:** The participants were predominantly Latino and from low socio-economic status. More than 87% of the respondents to the survey were Hispanic, 80% responded in Spanish, 80% reported having a telephone and 17% had lived in the ZIP code area less than a year. Only 22% of children had received their most recent immunisation from a private physician. **Study sufficiently powered?** NR			**for future research:** Well designed studies should be conducted **Source of funding:** Centers for Disease Control and Prevention.

Study details	Population and setting	Method of allocation to	Outcomes and	Results	Notes

		intervention/control	methods of analysis		
(Wilcox et al. 2001) **Citation:** Registry-driven, community-based immunisation outreach: A Randomised controlled trial **Aim of study:** To evaluate whether community based, registry driven outreach is effective and whether predictors of under immunisation can be used to target at-risk children **Study design:** Randomised controlled trial (RCT). **Internal validity score:** - **Applicability:** C	**Source population/s:** United States. **Eligible population:** Children from lower socio-economic status drawn from the Philadelphia Department of Public Health KIDS Immunisation Database/Tracking System (Public Health care system). **Selected population:** Children aged 6-10 months drawn from the Philadelphia Department of Public Health KIDS Immunisation Database/Tracking System (Public Health care system). **Excluded population/s:** NR **Setting:** Two Community-based organisations – a bilingual social services agency and a university nursing centre, in Philadelphia, USA. **Vaccines:** DTP, OPV,	**Method of allocation:** NR **Intervention/s description:** The intervention delivered by outreach workers used KIDS (Philadelphia Department of Public Health Immunisation Database /Tracking System) 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 4 attempts to contact the family or the provider. No details on length of outreach provided **Control/comparison/s description:** No intervention. No details provided **Sample sizes:** **Total n=1856 randomised** **Intervention n=612 (analysed)** **Control n=379 (analysed)** **Baseline comparisons:** The outreach group was more likely to have been directed by the nursing centre (p<0.01), to have mothers who were high school graduates (p<0.05) and to	**Primary Outcomes** Receipt of any immunisation during the study observation period. **Secondary outcomes** NR **Follow-up periods:** Not reported **Method of analysis:** Descriptive statistics	**Primary outcomes:** Children in the outreach group were more likely to receive an immunisation during the study period than children in the control group (61% vs. 43%, p<0.001) In a multivariate model involving start time (when children joined the programme, site, and prenatal care (adequate versus inadequate) of children not up-to-date at 7 months (DTP, OPV, Hib, Hep B) Children receiving outreach were more likely 2.5 times more likely to have received a vaccination than children in the control group (85% CI: 1.5-3.9) Children whose cases were handled by social services agencies (OR=2.3, 95% CI: 1.4-3.7), whose mothers had received adequate prenatal care (OR=1.7, 95% CI=1.4-3.7), who had started the immunisation schedule on time (OR=1.6, 95% CI: 1.0-2.5) were also more likely to receive a vaccination Outreach was ineffective among children who needed only the third DPT, but it increased the percentage of children receiving vaccinations from 34% to 58% (p=0.001) among those missing one of the first or second vaccination. Outreach was more successful among children who had started the immunisation schedule late (increasing the percentage of children	**Limitations identified by author:** The authors have collected Immunisation history from only 57% of the population. **Limitations identified by review team**: Eligibility criteria not reported adequately. Randomisation process not described. Allocation concealment not reported. Blinding of participants, healthcare providers or outcome assessors not reported. Sample size was calculation not reported. Confidence Interval not reported for the results of primary outcome. No use of intention-to-treat analysis. **Evidence gaps and/or recommendations for future research:** Well-designed and reported RCT's to be conducted to evaluate the effectiveness of

	Hib, Hep B	be African-American (p<0.05). **Study sufficiently powered?** NR		receiving vaccinations from 35% to 58%; p=0.006), compared to children who had started the immunisation schedule on time (increase of 49% to 63%, p=0.026) **Secondary outcomes:** N/A **Attrition details:** Immunisation histories not obtained for 761 of the sample population	registry-driven, community based immunisation outreach. **Source of funding:** NR

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Wood et al. 1998) **Citation:** Increasing immunisation rates among inner-city, African American children **Aim of study:** To assess the effectiveness of case management in raising immunisation levels among infants of inner-city, African American families.	**Source population/s:** United States. **Eligible population:** African American women and their babies residing in inner city Los Angeles. **Selected population:** African American women and their babies residing in inner city Los Angeles (one of ten ZIP codes) obtained from the Los Angeles county Vital Statistics Branch. A total of 522 eligible participants were selected; and 419 participants were randomised (177 in the intervention group and 210 in the control group). A total of 41 participants refused to participate and 62 unable to contact.	**Method of allocation:** Block randomisation **Intervention/s description:** The intervention comprised of a case management delivered by the case managers. The case management intervention included health and needs assessment, developing a service plan and goals in collaboration with parents, coordinating services for parents, advocacy with larger institutions and public assistance programmes (such as Medicaid), and monitoring and follow-up. Case managers conducted in-depth assessment before infants were 6 weeks of age, with home visits 2 weeks prior	**Primary Outcomes** Percentage of children with up-to-date immunisations at age of 1 year. **Secondary outcomes** Not relevant to the review **Follow-up periods:** Baseline and 12 months. **Method of analysis:** Descriptive statistics. Intention to treat analysis used.	**Primary outcomes:** 63.8% of the intervention group versus 50.6% of control group were up-to-date with the immunisations (3 DTP, 2 OPV, 3 HIb) at the age of one year (p=0.01). **Secondary outcomes:** Not relevant to the review **Attrition details:** Analysed= 365 (155 in the intervention group and 181 in the control group) 32 participants refused case management intervention. A total of 25 participants in the intervention group and 29 in the control group were loss to follow- up.	**Limitations identified by author:** The study was conducted in inner city , African American population served by a particular health service system, hence results of this may not be generalizable to all inner-city ,high risk populations. A small portion of the immunisation records were reconstructed from parental recall; parental recall of events may be faulty. **Limitations identified by review team**:

Study design: RCT **Internal validity score:** + **Applicability:** C	**Excluded population/s:** Participants not based in 10 ZIP codes. **Setting:** Homes in Inner city Los Angeles, USA. **Vaccines:** DTP,OPV,HIB	to scheduled immunisation and additional follow-up as needed. The case managers at each home visit documented that the client understood the immunisation schedule; and also sought to reduce misconceptions to vaccination and encouraged clients to be proactive and request immunisations from their providers. In a family that received all well-child care visits and immunisations on time, home visits would occur when the infants were approximately 3.5 - 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 up with the appointment. Case managers scheduled more follow-up visits with families that had difficulty in keeping appointments or whose children fell behind in their immunisations. The mean number of home visits by the case managers was 4 (SD, 2; range, 0-13), and the mean number of telephone contacts was 7(SD, 4.1; range, 0-23). Over the one year, the mean number of minutes spent by the case			Sample size calculation not reported. Allocation concealment not reported. Not reported blind assessment of primary outcome. **Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** Centres for disease control and Prevention,Atlanta,Ga

		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). **Control/comparison/s description:** Health passport only **Sample sizes:** **Total n=** 419 **Intervention n=** 209 **Control n=**210 **Baseline comparisons:** Yes. The participants were low income African American mother-infant pairs. The mean age of the children was 17.8 days (0-42 days) Both intervention and control group found to be similar on almost all characteristics, except whether the mother reported she was currently 'living with a partner'. **Study sufficiently powered?** NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Wroe et al. 2007) **Aim of study:** To evaluate selective neonatal BCG program **Study design:** Before and after study **Internal validity score:** (-) **Applicability score:** (A)	**Source population/s:** Midwives, health visitors and practice nurses working in the UK. **Eligible population:** Midwives, health visitors, practice nurses working in London. **Selected population:** Midwives, health visitors, practice nurses, BCG clinic staff, as well as parents of infants offered the BCG vaccination in Bromley. More specific details not provided. **Excluded population/s:** NR **Setting:** Bromley, South East London. Ethnic population of 14%. Between 2,000-3,000 refugees and asylum seekers and 50 homeless families per quarter.	**Method of allocation:** NA **Intervention/s description:** Neonatal BCG Program comprised: •1 Universal risk assessment of all neonates completed by midwives and referral of all eligible expectant mothers to BCG clinic. •2 Screening of all infants (aged 0-2 years) who moved to the area completed by health visitors. •3 BCG clinic set up for a day each fortnight in an area accessible to majority of clients for immunising infants. •4 Information leaflets (only in English) distributed to all eligible parents, information on BCG from other organisations was also available in alternative languages •5 Training offered to all midwives, health visitors, and practice nurses on TB and BCG. It is not reported who delivered the intervention nor over what time span. The study does state that this is	**Primary Outcomes** Number of infants offered neonatal BCG and those who were vaccinated. **Secondary outcomes** NR **Follow-up periods:** Not clear. Comparison with previous year. **Method of analysis:** Proportion of eligible infants vaccinated.	**Primary outcomes:** 384 infants of a total of 480 offered BCG vaccination received it. This is compared with previous year in which only 20% of eligible infants received BCG. It is not reported if this increase is significant. **Secondary outcomes:** NR **Attrition details:** NR	**Limitations identified by author:** NR **Limitations identified by review team:** Comparison is only made to data from a 'personal communication'. No pre-intervention data were available. **Evidence gaps and/or recommendations for future research:** Well designed studies should be conducted **Source of funding:** NR

		the first year of the neonatal BCG program. **Control/comparison/s description:** No intervention **Sample sizes:** **Total n=** NR **Intervention n=** NR **Control n=** NR **Baseline comparisons:** NR **Study sufficiently powered?** NR			

Client or Family Incentives

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Hoekstra et al. 1998) **Citation**: Impact of a Large-Scale Immunization Initative in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) **Aim of study:** To evaluate the impact of an initiative linking immunisation with distribution of food vouchers in the inner city. **Study design:** Cohort study **Internal validity score:** + **Applicability:** C	**Source population/s:** US **Eligible population:** Infants (aged 24 months or younger and their parents of Chicago WIC a special supplemental Nutrition Program for Women, Infants, and Children administered through 47 sites, about 37000 infants. **Selected population:** Infants (aged 24 months or younger) and their parents of WIC at 22 sites, under the direct administration of the Chicago Department of Public Health. **Excluded population/s:** NR **Setting:** Nineteen Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) sites serving 30% of the Chicago, Ill, birth cohort **Vaccines:** Not specified, vaccines recommended by the Advisory Committee on Immunization Practices (including hepatitis B and *Haemophilus influenzae* type b)	**Method of allocation:** NR **Intervention/s description:** The intervention began in May 1996 with the implementation of voucher incentives for immunisation. At each WIC certification and recertification visit (every 6 months), a clerk reviewed the vaccination status of each child 24 months of age or younger. Where documentation of vaccination was provided (eg, vaccination card), the vaccination dates were entered into a software program. The program determined if the child was age-appropriately vaccinated. If the child was not age-appropriately vaccinated, the family was referred to a provider for vaccination. A 3-month supply of food vouchers is usually issued by WIC to enrolled families. When a child was designated as being at high risk only a 1-month supply of vouchers was issued at a time, to ensure frequent contact with the family. Children who were not age-appropriately vaccinated were treated as high-risk clients. A 1-month supply of	**Primary Outcomes** Age appropriate immunisation rates **Secondary outcomes** NR **Follow-up periods:** May 1996 to June 1997 **Method of analysis:** Descriptive statistics	**Primary outcomes:** Group A (4 sites) (+ incentives; + monitoring) immunisation rates rose from 56% to 89% during the 15 months of evaluation. Group B (10 sites) (+ incentives; - monitoring) data are absent for the early phases of incentive implementation, but the final immunization rate was identical to that of the group A sites (89%). Group C (3 sites) (- incentives; + monitoring) showed no improvement, despite the monitored implementation of assessment and referral; their final vaccination rate was almost identical to the starting rate of the group A sites (57% vs 58%). Group D (2 sites) (- incentives; - monitoring) performing unmonitored assessment and referral, had a coverage rate at the end of the evaluation period of 42% (42/99).	**Limitations identified by author:** Using existing data with the potential for confounders that may be present when subject populations have not been highly characterised. The immunisation rates in this study (based on age-appropriate receipt of all recommended antigens) are lower than would be produced by a provider-verified survey of the same population based on 4:3:1 series completion by 24 months of age. The annual labor cost of providing voucher incentives. Need for dedicated and cooperative staff with supervision

		vouchers was issued until the child was age-appropriately vaccinated, at which time the issuance of a 3-month supply was resumed. Only voucher frequency was varied; no voucher was ever withheld from a child because of immunisation status. There were four groups of sites with different immunisation activities that included either the incentives or monitoring or a combination of the two. Monitoring indicated that immunisation process data was collected from the WIC site each month (documentation rates, voucher eligibility rates, voucher incentives delivery rates). Group A (+ Incentives; + Monitoring). Four sites (4000 infants) (8% of the Chicago birth cohort) Selection was based on inner-city location and on the program staff's perception of the population's risk for low vaccination coverage. Group B (+ Incentives; - Monitoring). Ten sites serving (9000 infants) (18% of the Chicago birth cohort) began voucher incentives at the same time as group A (May		No p-values or CI are presented for comparisons. **Secondary outcomes:** NR **Attrition details:** NR	**Limitations identified by review team**: Variation in number of infants at each site subjected to the intervention. Not clear how the study sites were selected **Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** NR

		1996) but were not intensively monitored. Monthly immunisation rates were not collected until September 1996. Group C (- Incentives; + Monitoring). Three sites (2000 infants) (4% of the Chicago birth cohort) did not begin providing voucher incentives during the evaluation period but collected immunisation rate data, starting in February 1996, in preparation for the subsequent implementation of voucher incentives. Implementation did not take place at these sites during the study period. Group D (- Incentives; - Monitoring). Two sites (1000 infants) (2% of the Chicago birth cohort) did not implement voucher incentives and were not monitored during the evaluation period, although they reported having performed assessment and referral. **Control/comparison/s description:** see above **Sample sizes:**			

		Total n= 16,000 **Intervention n=** **Group A = 4000** **Group B = 9000** **Group C = 2000** **Group D = 1000** **Control n=** **Baseline comparisons:** Groups were compared for the sites that had immunisation services, % of children aged <12 months and race/ethnicity. The services immunisation services available were different for each group. In those indicated as RN, a nurse regularly visited two times a week, clinic meant that a public health clinic was on the same site as the WIC clinics and none indicated that no immunisation services were available at the WIC site. Group A was 25% RN: 75% clinic; Group B was 50% clinic: 50% none; Group C was 100% clinic and Group D was 100% RN. Group D had the highest proportion of infants aged <12 months with 18%, followed by 8%, 4% and 2% for groups A, C and D respectively. In terms of ethnicity, group C had a higher proportion of			

		black infants (72%) compared to 50%, 52%, and 48% for groups A, B, and D respectively. Group C also had a smaller proportion of Hispanics compared to Group A (31%) and group B (32%) while group D was comprised 44% Hispanics. **Study sufficiently powered?** NR			

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Hutchins et al. 1999) **Citation:** Effectiveness and cost-effectiveness of linking the special supplemental program for women, infants and children (WIC) and immunization activities **Aim of study:** To examine the feasibility, effectiveness and cost effectiveness of different strategies to	**Source population/s:** Chicago, USA **Eligible population:** Immunisation assistants and on –site nurses (no further details) in Chicago USA **Selected population:** Immunisation assistants and on-site nurses in seven of 48 WIC sites (community based scheme, no further details) located in neighbourhood at highest risk of measles, at least 400 children enrolled of 13-35 months of age and with deprived characteristics (financially poor, ethic minorities) in Chicago USA Infants and children (13-35 months) and their carers attending seven of 48 WIC sites located in	**Method of allocation:** Randomisation (no description) of WIC sites to either intervention (n=5) or control (n=2) **Intervention/s description:** The interventions comprised of: Immunisation assistants at each of the intervention WIC sites screening all children under the age of five for their immunisation status (from written records from health care providers), referring eligible children for free vaccination and using a food voucher scheme (available on a monthly basis) to try to encourage child vaccination as soon as possible. Between May 16th 1991 and July the 31st 1993	**Primary Outcomes** Change in baseline of up to date, WIC –enrolled children for age appropriate vaccination at 1st and 2nd birthday , one and two year after intervention began **Secondary outcomes** Percentage implementation at a site per day Cost effectiveness estimates **Follow-up periods:** Two years after intervention introduced. **Method of analysis:** Changes in baseline measures (percentages) 95% CI calculated	**Primary outcomes:** Mean response rate of enrolled children surveyed per site was 70% (range 51%-83% per site) <u>Intervention group</u> After 1st year measured on 1st birthdays): Enrolled children increased 10% from baseline (59% to 69%) After 2nd year measured on 2nd birthday): Enrolled children increased 23% above baseline (37% to 60%) <u>Control group</u> Coverage decreased -4% at firs birthday and -9% at	**Limitations identified by author:** The participants were not randomised although adjustments were made at analysis for income, active participation, racial/ethnic status **Limitations identified by review team**: No description of the WIC sites in terms of who they are, what other services are provided.

improve immunisation rates in areas of Chicago **Study design:** Before and after study **Internal validity score:** **-** **Applicability:** **C**	neighbourhood at highest risk of measles, at least 400 children enrolled of 13-35 months of age and with deprived characteristics (financially poor, ethic minorities) in Chicago, USA **Excluded population/s:** NR **Setting:** 48 WIC sites in Chicago USA **Vaccines:** Diphtheria, tetanus, polio, MMR, *Haemophilus influenzae* type B and hepatitis B	**Control/comparison/s description:** No intervention was introduced in control sites, children received standard care for WIC and health care services **Sample sizes:** **Total n=** 27,596 **Intervention n=** 21,179 **Control n=** 6,417 **Baseline comparisons:** Children enrolled varied on active participation, receipt of federal assistance and race /ethnicity. This was controlled for in the analysis. **Study sufficiently powered?** NA	adjustments were made at analysis for income, active participation, racial/ethnic status	second birthday ($p<0.05$) After second year when all interventions were fully implemented , coverage continued to increase to 21% at first birthday and 38% at second birthday whilst the control group was 0% and 4% respectively **Secondary outcomes:** NA **Attrition details:** Mean dropout rate in intervention group and control group was 40% and 34% respectively Dropout was defined as missing primary certification visit or reaching fifth birthday, missing two consecutive visits for food vouchers, transferring to another WIC site, voluntarily withdrawing or not specified.	No details on how participants were attracted to the scheme, it implies they were participants of the WIC scheme. It is possible participants received immunisation else where that may not have been in their health records e.g. if they had come from a different area **Evidence gaps and/or recommendations for future research:** The authors suggest that future research should continue to focus on integration between community schemes such as WIC and immunisation programs **Source of funding:** WIC programs

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Kerpelman, Connell, & Gunn 2000) **Citation:** Effect Of A Monetary Sanction Of Immunization Rates Of Recipients Of Aid To Families With Dependent Children **Aim of study:** To evaluate the effect of an initiative aimed at improving immunization rates among low-income preschool children by imposing a sanction on families who failed to provide proof of up-to-date immunization status. **Study design:** RCT **Internal validity score:** + **Applicability:** C	**Source population/s:** Georgia, US **Eligible population:** 3600 families with children 6 years or younger who received Aid to Families with Dependent Children (AFDC) living in Muscogee County, Georgia identified in November 1992 form the state's Public Assistance Reporting and Information Systems files. **Selected population:** 2500 families with children 6 years or younger who received Aid to Families with Dependent Children (AFDC) living in Muscogee County, Georgia selected randomly and assigned to control and interventions groups in Novemeber 1992 and babies born to these families between January 1, 1993 and December 31, 1993. **Excluded population/s:** NR **Setting:** Muscogee County, Georgia. **Vaccines:** MMR, polio, DTP, Hib, Hep B	**Method of allocation:** Method not randomisation not clearly described. Every third family was assigned to the control group until 1000 were selected and then every third was assigned to the intervention group until 1500 were selected. **Intervention/s description:** Proof of up-to-date immunizations for preschool-aged children (≤6 years) was required for families that applied or reapplied for AFDC benefits in Georgia. Families were reminded of their obligation both when they applied and when they were recertified for welfare eligibility, which was required semiannually until 1996, when it became an annual requirement. If the family did not present such proof without good cause, such as having religious objections or known allergic reactions, a sanction could be applied after oral or written warnings were issued. The sanction was losing AFDC benefits normally provided for the nonimmunised child. Medicaid benefits and those for Early Periodic Screening, Diagnosis, and Treatment were not affected.	**Primary Outcomes** Age appropriate immunisation rates. A 1 month grace period was provided before a child was considered not up-to-date. **Secondary outcomes** NR **Follow-up periods:** 5 points Baseline January 1 1993 Year 1 December 31 1993 Year 2 December 31 1994 Year 3 December 31 1995 Year 4December 31 1996 **Method of analysis:** Rates of participation were compared using X^2 analysis.	**Primary outcomes:** There were no differences between the immunisation rates of intervention and control groups at baseline. After baseline, immunisation rates were higher for intervention group children for all immunisations in each year. DTP (intervention vs control) Baseline 61.2% vs 60.1% 1993 70.2% vs 65.3% 1994 72.2% vs 65.6% 1995 72.3% vs 65.5% 1996 70.5% vs 64.3% Polio (intervention vs control) Baseline 68.1% vs 68.1% 1993 79.2% vs 74.4% 1994 86.6% vs 79.7% 1995 87.2% vs 80.4% 1996 87.5% vs 80.5% MMR (intervention vs control) Baseline 79.3% vs 77.6% 1993 88.2% vs 82.1% 1994 89.9% vs 83.3% 1995 85.5% vs 83.3% 1996 88.0% vs 81.95% Hib (intervention vs control) Baseline 16.5% vs 13.0% 1993 22.1% vs 17.5% 1994 23.5% vs 17.6% 1995 23.7% vs 17.1% 1996 23.9% vs 17.1%	**Limitations identified by author:** As the difference in the number of families participating in AFDC is at times statistically significant between the intervention and control groups indicating that families may have left the AFDC. Process evaluation revealing that some case workers did not stick to agency procedures all of the time and that they received very little training. **Limitations identified by review team**: Method of randomisation was not truly random. Attrition analysis not undertaken. Very little demographic information is provided about the

		Control/comparison/s description: Families in the control group were encouraged to immunise their preschool children, they were neither told about the sanction nor penalised for failure to immunise them. **Sample sizes:** **Total n=** 4150 **Intervention n=** 2488 **Control n=** 1662 **Baseline comparisons:** The average age of the preschool-aged children was 3.22 years for the intervention group and 3.34 years for the control group. In both groups 85% were black and 14% were white. The intervention group had the same proportion of males and females, but the control group had slightly fewer males proportionally. During the study, 278 infants were born in the control group families and 483 in the intervention group families and were included in this study. Similar proportions of children were in each age group for the 2 groups. **Study sufficiently powered?** NR		Hepatitis B (intervention vs control) Baseline 1.9% vs 1.7% 1993 11.6% vs 8.1% 1994 20.0% vs 12.7% 1995 22.4% vs 15.7% 1996 23.6% vs 16.2% Differences after the project's first year are statistically significant for all immunisations (P<.05), with the lone exception of Hib in the second year. **Secondary outcomes:** NR **Attrition details:** Families that left the Muscogee County AFDC program, either by income ineligibility or by moving out of the county, at final follow-up in 1996, 65.5% of the control group vs 61.7% in the intervention group remained active (χ^2=3.8, *P*<.05). Children whose parents did not give permission for their child's immunisation records to be obtained and children whose immunisation records were not available were not included in the analysis**.**	study population. **Evidence gaps and/or recommendations for future research:** Studies exploring broader populations and settings **Source of funding:** Georgia Department of Human Resources
(Kreuter et al. 2004)	**Source population/s:** US	**Method of allocation:** Day of visit to health centre	**Primary Outcomes:** Up-to-date status (within	**Primary outcomes:** Complete immunisation	**Limitations identified by**

Citation: Effectiveness Of Individually Tailored Calendars In Promoting Childhood Immunization In Urban Public Health Centers **Aim of study:** To determine the effectiveness of tailored calendars in increasing childhood immunisation rates. **Study design:** NRCT **Internal validity score:** - **Applicability:** C	**Eligible population:** Babies (aged birth to 1 year) and their parents in St Louis. **Selected population:** Babies aged birth to 1 year who visited the paediatrics department at 2 public health centres in St Louis during the project period. Intervention group Babies and their parents were recruited the intervention group at each centre on 2 particular days of the week. Control group For every baby in the intervention group, a matched control baby from a list of all other babies who had been seen at the same health centre was selected. Control babies were matched to participants by sex (100% match) and date of birth (95% match within 7 days). When more than 1 potential control baby matched a given participant, the control baby was selected at random. **Excluded population/s:** NR **Setting:** St Louis, Missouri has a high concentration of poor and minority families. In the 2 study neighbourhoods, the population is predominately African American (97%) and	**Intervention/s description:** The intervention comprised the parents of eligible babies completing a brief interview with project staff after which they received personalised calendars for the months leading up to their baby's next scheduled immunisation. They could receive subsequent months of the calendar only upon returning to the health centre during the enrollment period for their baby's next scheduled immunisation and updating their baby's picture, height, weight, and other information. **Control/comparison/s description:** No intervention **Sample sizes:** **Total n=** 337 pairs **Intervention n=**337 **Control n=** 337 **Baseline comparisons:** Not between the intervention and control pairs. **Study sufficiently powered?** NR	1 month) to a 4-3-1-3-3 age-specific immunisation schedule. Immunisation rates for participants and controls also were compared in each of 6 cohorts defined by babies' age at enrolment in the programme (<1 mo, 1 to < 2 mo, 2 to < 4 mo, 4 to < 6 mo, 6 to < 12 mo, ≥12 mo). For babies enrolled at less than 1 month of age, these analyses examined immunization status at ages 2, 4, 6, and 12 months (for babies enrolled at ages 4–6 months, immunization status was examined at ages 6 and 12 months, etc.). **Secondary outcomes:** NR **Follow-up periods:** Participants and matched controls for immunisation status were compared at ages 1, 2, 4, 6, 12, and 24 months and at the end of the study's enrolment period (September 30, 1998). **Method of analysis:**	records were obtained for 95% of the pairs (n = 321 matched pairs). 82% of intervention babies were up to date at the end of the enrollment period compared with 65% of matched controls ($\chi 2=25.5$, $P<.001$). At 24 months of age, 66% of intervention babies were up to date compared with 47% of matched controls ($\chi 2=21.5$, $P<.001$). Across the first 4 age cohorts (i.e., babies enrolled at ages <1 mo; 1 mo to <2 mo; 2 mo to <4 mo; 4 mo to <6 mo), we found that the intervention group had higher rates of immunisation than did the matched controls at each remaining immunisation interval (results reported graphically). **Secondary outcomes:** NR **Attrition details:** Study reports that data were not available on 26 babies, but they may mean 26 pairs, as this is the number	**author:** Small sample size **Limitations identified by review team:** Study numbers are not clear. Baseline characteristics were compared between health centres and not control and intervention groups. No power calculation The method of allocation may have resulted in selection bias. Attrition details not clear. **Evidence gaps and/or recommendations for future research:** Well designed studies should be conducted **Source of funding:** US Centers for Disease Control

	disproportionately female (56%).More than one-third (37%) of the African American population in St Louis is below the poverty level, and 27% of adults do not graduate from high school. Almost half of all preschool-aged children in the city have not been fully immunised in recent years. **Vaccines:** 4:3:1:3:3 DTP/OPV/MMR/Hib/ Hep B		Descriptive statistics, the McNemar test	included the analysis.	and Prevention

Study details	Population and setting	Method of allocation to intervention/control	Outcomes and methods of analysis	Results	Notes
(Minkovitz et al. 1999) **Citation:** The Effect Of Parental Monetary Sanctions On The Vaccination Status Of Young Children **Aim of study:** To determine whether financial sanctions to Aid to Families With Dependent Children (AFDC) recipients can be used to improve vaccination coverage of	**Source population/s:** US **Eligible population:** Infants (aged 3 to 24 months) and their parents from families receiving AFDC in Maryland. **Selected population:** Infants (aged 3 to 24 months) and their parents from families receiving AFDC from evaluation offices in June 1992 and all families applying for AFDC from January 1993 through August 1995 at any of 6 Maryland Department of Social Services offices. **Excluded population/s:** Children whose parents refused consent for data collection, for whom medical records were not available because each of their	**Method of allocation:** Precise method not reported. Participants were randomised in 2 stages. First, in June 1992, all families receiving AFDC from the 6 evaluation offices were assigned randomly to the experimental or the control group. Second, from January 1993 through August 1995, all families applying for AFDC at the 6 offices were assigned randomly to the experimental or the control group. The was one baseline group, and an intervention and control group at one year and an intervention and control group at two years. **Intervention/s description:** In 1992, Maryland obtained an	**Primary Outcomes** Proportion of infants up-to-date to age on vaccinations. **Secondary outcomes:** NR **Follow-up periods:** 1 and 2 years after implementation **Method of analysis:** The proportions of children up-to-date for age in the experimental and control groups were compared for each of the 2 post intervention years.	**Primary outcomes:** There was little variation in the percentage of children aged 3 to 24 months up-to-date for age for DTP at baseline 53.5%, intervention (year 1) 54.6%, control (year 1) 55.4%, intervention (year 2) 55.6% or control (year 2) 59.4%. There was little variation in the percentage of children aged 3 to 24 months up-to-date for age for polio at baseline 64.3%, intervention (year 1) 64.0%, control (year 1) 65.8%, intervention (year 2) 66.7% or control (year 2) 67.2%. There was little variation in the percentage of children aged 3 to 24 months up-to-date for age for MMR at	**Limitations identified by author:** Outside compensatory increases in other vouchers may have reduced the penalty felt by the families. Potential barriers to health care were not considered in the design. Once children were becoming up-to-date the penalty was discontinued and there was no incentive to adhere to the immunisation

young children. **Study design:** RCT **Internal validity score:** - **Applicability:** C	providers met 1 of the following criteria: was a non–primary care provider, refused to participate, had closed the practice, could not be located, had no record of the child's enrolment, could not locate the child's medical record, or was a health maintenance organization from which the child was disenrolled. Children for whom medical records at 1 or more primary care sites were not abstracted because of time constraints also were excluded **Setting:** Six Aid to Families With Dependent Children (AFDC) jurisdictions in Maryland, 4 in metropolitan areas and 2 in rural areas. **Vaccines:** DTP, polio, and MMR	agreement from the US Department of Health and Human Services to undertake a welfare reform demonstration project, the Primary Prevention Initiative (PPI). The PPI was a behavior-based strategy designed to promote parental responsibility, accountability, and self-sufficiency. Under the health component welfare recipients were subject to a $25 monthly penalty for failure to verify that their preschool-aged children received preventive health care services, including vaccinations. When a family applied for AFDC, a case worker reviewed the PPI requirements. Agreements with Medical Assistance (MA) providers specified that children be seen within a specified time and that sanctioned clients be given priority. At each 6-month redetermination, the case worker ascertained whether the client met the requirements. If clients did not provide verification, they might elect to delay the disallowance for good cause. Good-cause exemptions could last up to 3 months, with a total limit of 2. Noncompliant families were sent an official notice before penalties were imposed.The disallowance		baseline 66.4%, intervention (year 1) 66.0%, control (year 1) 67.4%, intervention (year 2) 69.2% or control (year 2) 69.9%. Proportions up-to-date for any of the vaccines did not reach statistical significance for year 1 intervention versus control; year 2 intervention versus control or baseline versus year 2 intervention group. **Secondary outcomes:** NR **Attrition details:** NR	schedule. **Limitations identified by review team:** Method of randomisation not reported Baseline demographics not reported. Sample selection not clearly reported and difficult to follow. Study design not clearly reported. **Evidence gaps and/or recommendations for future research:** Well designed studies should be conducted **Source of funding:** US Department of Health and Human Services and the Centers for Disease Control and Prevention

		was not necessarily for the study child, since disallowances were tracked by family, not by individual child. **Control/comparison/s description:** Welfare recipients in the control group were not subject to the penalty **Sample sizes:** **Total n=**2246 **Intervention year 1 n=**469 **Intervention year 2 n=** 442 **Control year 1 n=** 453 **Control year 2 n=** 411 **Baseline group** n= 471 **Baseline comparisons:** The mean numbers of well-child and sick visits per person-year were compared among the baseline and both experimental and control groups. Of the comparisons reported controls compared to the intervention group had more total visits to primary care providers (6.1 vs 5.6, P< 0.001) controls in this year were also more likely to have sick visits 2.5 versus 2.2 (P = 0.001). **Study sufficiently powered?** NR			

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