The effects and costs of expanding the coverage of immunisation services in developing countries: a systematic literature review

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CRD summary
This review assessed the effectiveness of ways to expand the coverage of existing immunisation services in developing countries. The authors concluded that all interventions bar one had a positive impact, but firm conclusions could not be drawn because of the paucity and limitations of the primary studies. These conclusions appear appropriate.

Authors' objectives
To assess the effectiveness of ways to expand the coverage of existing child immunisation services in developing countries. The review also assessed the costs and cost-effectiveness. This abstract refers only to effectiveness.

Searching
MEDLINE, POPLINE, databases on BIDS, CAB Abstracts, Web of Science, PubMed, EconLit, HEED, the Cochrane Library, and the World Health Organization (WHO) regional databases (LILACS, IMSEAR, IMEMR and AIM) were searched up to December 2001; the search terms were reported. In addition, the references of included studies were checked.

Study selection
Study designs of evaluations included in the review
Studies that involved at least two observations in time, or one observation over two different populations, were eligible for inclusion.

Specific interventions included in the review
Studies of strategies to improve the coverage of existing immunisation services were eligible for inclusion. The specific interventions assessed were those targeting the supply side and/or the demand side. The interventions targeting the supply side were training, monitoring or supervision, outreach teams, community health workers and changes in immunisation schedules. The interventions targeting the demand side were channelling, reminders, campaigns to increase awareness, and shortening waiting times and missed opportunities. Those targeting both the supply and demand side were mass campaigns and the overall re-organisation of the immunisation system.

Participants included in the review
Studies of children aged less than 5 years old from developing countries were eligible for inclusion. The included studies were conducted in Africa, Southeast Asia, and Central or South America.

Outcomes assessed in the review
Studies that reported the percentage increase in the coverage of bacillus Calmette Guerin, diphtheria-tetanus-pertussis (DTP), oral polio or measles vaccinations were eligible for inclusion. Studies that reported either the probability of a child being vaccinated or the drop-out rates were also included. Where necessary, the rates of DTP3 coverage were taken as a proxy for fully vaccinated children (FVC).

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The internal validity of the primary studies was assessed according to study design, length of follow-up, definition of the intervention and comparison populations, whether the study sample was representative of the study population, bias...
in measurement and selection, confounding, and the precision of the results. In addition, the external validity of the studies was assessed according to whether a clear and comprehensive description of the intervention context was given, and whether the authors were transparent in their assumptions and directly considered issues of generalisability. Each dimension of study quality was scored adequate, partial, inadequate or unknown. Only effectiveness studies with four or less limitations were included in the analysis. The authors did not state how many reviewers performed the validity assessment.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. The percentage of FVC was extracted.

Methods of synthesis
How were the studies combined?
The results from the studies were tabulated and combined in a narrative.

How were differences between studies investigated?
The correlation between the impact of the interventions and the rates of immunisation at baseline was assessed.

Results of the review
Fifty-two studies were included in the effectiveness evaluation; the results were based on the 21 studies with four or less methodological limitations. The study designs were not reported.

In terms of study quality, confounding was present in 37% of the studies and unknown in 51%. Only 16% of the papers reported confidence intervals. Follow-up was often partial or inadequate. Few studies defined the data sources.

The mean rate of immunisation at baseline was 34% (standard deviation, SD, 19%; minimum 3%, maximum 65%). Across the studies the mean increase in the proportion of FVC was 27% (SD 19%; minimum -1%, maximum 72%). With the exception of one study, which evaluated an immunisation campaign in Cameroon, all of the interventions had a positive impact. The interventions with the highest impact on full coverage were community health workers and channelling. There was no significant association between the rate of immunisation at baseline and the size of the improvement in the percentage of FVC across the studies. Neither was it observed that any one category of intervention (supply, demand, demand and supply) was associated with significantly better beneficial increases in rates across the studies.

Cost information
Yes. In three countries the average dose of vaccine delivered, per dose of DPT3 and per FVC was higher for campaigns than for routine services. There was a wide variation in cost, ranging from US$7 to US$222 (based on US$ exchange rates for 2001). Outreach teams had a higher average cost than mass campaigns and routine programmes, but were equally or less expensive than fixed centres in Brazil. In Kenya, it was found that the cost for mobile health teams were lower where the population density was higher, and vice versa. In the Amazon region of Ecuador, the cost of an outreach strategy conducted with the involvement of community health workers was less than that for an outreach strategy conducted by hospital staff alone. The strategies that showed the lowest average incremental cost per FVC were peer training and channelling.

Authors' conclusions
Although it was difficult for any firm conclusions to be drawn given the quality and paucity of the primary studies, the data seemed to suggest that all interventions had a positive impact on coverage, except for an immunisation campaign that was evaluated over a medium-term period. The strategies with the highest percentage increases in full coverage were community health workers and channelling. The least costly strategies were peer training and channelling.
The review question was reasonably broad, but had been defined in terms of the interventions, participants, outcomes and study designs. A number of sources were searched for relevant studies, but no efforts were made to locate unpublished studies and it was unclear if any language restrictions were applied. Since it was also unclear how many reviewers were involved in selecting the studies, assessing validity and extracting the data, it is not known whether any efforts were made to minimise reviewer bias and errors in the review process. The quality of the included studies was adequately assessed.

No details of the individual studies were given in either the tables or text of the review, thus it was not possible to assess whether the authors’ results and conclusions were consistent with the evidence reviewed. The use of a narrative synthesis was appropriate given the differences between the studies, and some differences were discussed in relation to the intervention and study location. Overall, the authors’ conclusions about there being limited evidence appear appropriate, but conclusions on the effectiveness of the interventions may not be very reliable because of the paucity of the evidence reviewed.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that future research needs to evaluate the quality of the delivery of interventions; acknowledge and discuss the issues of confounding; consider not only how many children are vaccinated, but also who they are in socio-economic terms; and use final and/or generic outcome measures such as life-years gained or disability-adjusted life-years. They also stated there is a need for studies with improved methodology and longer term follow-up to assess the sustainability of the interventions. They further stated that a cost-effectiveness analysis should be undertaken alongside the interventions.

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**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.