Strategies to increase the demand for childhood vaccination in low- and middle-income countries: a systematic review and meta-analysis

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Objective To investigate which strategies to increase demand for vaccination are effective in increasing child vaccine coverage in low- and middle-income countries.

Methods We searched MEDLINE, EMBASE, Cochrane library, POPLINE, ECONLIT, CINAHL, LILACS, BDSP; Web of Science and Scopus databases for relevant studies, published in English, French, German, Hindi, Portuguese and Spanish up to 25 March 2014. We included studies of interventions intended to increase routine childhood vaccination. Studies were eligible if conducted in low- and middle-income countries and employing a randomized controlled trial, non-randomized controlled trial, controlled before-and-after or interrupted time series design. We estimated risk of bias using Cochrane collaboration guidelines and performed random-effects meta-analysis.

Findings We identified 11 studies comprising four randomized controlled trials, six cluster randomized controlled trials and one controlled before-and-after study published in English between 1996 and 2013. Participants were generally parents of young children exposed to an eligible intervention. Six studies demonstrated low risk of bias and five studies had moderate to high risk of bias. We conducted a pooled analysis considering all 11 studies, with data from 11,512 participants. Demand-side interventions were associated with significantly higher receipt of vaccines, relative risk (RR): 1.30, (95% confidence interval, CI: 1.17–1.44). Subgroup analyses also demonstrated significant effects of seven education and knowledge translation studies, RR: 1.40 (95% CI: 1.20–1.63) and of four studies which used incentives, RR: 1.28 (95% CI: 1.12–1.45).

Conclusion Demand-side interventions lead to significant gains in child vaccination coverage in low- and middle-income countries. Educational approaches and use of incentives were both effective strategies.

Introduction

Almost 40 years after the launch of the World Health Organization's (WHO's) Expanded Programme on Immunization, one in five children worldwide still does not have access to basic vaccines.1 2 In May 2012, the World Health Assembly approved the Global Vaccine Action Plan to ensure that the full benefits of immunization are extended to people in every region, country and community.3 Midway through the Global Vaccine Action Plan's decade of vaccines (2011–2020),4 disparities in vaccine coverage within and between countries persist,5 and the search for effective strategies to reach underserved populations has gained urgency.

Interventions to improve vaccination outcomes are commonly grouped into those targeting health services delivery or supply (e.g. improving human resources training, logistics, cold chain maintenance and vaccine storage, effective financing, monitoring and evaluation and supportive supervision) and those that stimulate demand for vaccines (e.g. monetary or food incentives, knowledge transfer or communication campaigns). Certain demand-side interventions have been associated with improved vaccine coverage of children in low- and middle-income countries in previous systematic reviews.6 8 However, limitations in study quality and design precluded quantitative synthesis in these reviews. The most recent review considered articles published up to 2009.9 In the interim, several new studies of potentially higher quality have been published.

We carried out a systematic review and meta-analysis to evaluate whether demand-side interventions increase uptake of routine childhood vaccination in low- and middle-income countries. Our objectives were to ascertain the effect of demand-side interventions on vaccine coverage and to identify which strategies are effective. We focused on demand-side interventions, since these strategies can more easily reach underserved populations and reduce inequities in immunization coverage.

Methods

Protocol and registration

The review protocol was registered in the PROSPERO database (CRD42013005783; available at: http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42013005783). The full report, available from the authors, includes both a narrative synthesis and a meta-analysis as outlined in the protocol.

Eligibility criteria

We defined six criteria for inclusion of studies in the review and meta-analysis: (i) based on guidelines developed by the Cochrane Effective Practice and Organisation of Care
(EPOC) group, randomized controlled trial, non-randomized controlled trial, controlled before-after or interrupted time series study designs were eligible; (ii) the study location was a low- and middle-income country as defined by the World Bank; (iii) the study was published in a peer-reviewed scientific journal, because in previous reviews that considered the grey literature, the quality of these studies was found to be low; (iv) the participants were generally parents and caregivers of children younger than two years, living in communities where interventions to increase demand for routine childhood vaccination had been carried out; (v) eligible interventions were defined broadly as any intervention that might increase demand for routine childhood vaccination, such as incentives of money or food, knowledge transfer initiatives, or communication campaigns (studies that included strategies targeting vaccine supply in addition to demand were eligible); and (vi) the study outcomes included quantitative estimates of routine childhood vaccination coverage.

Information sources

We searched the MEDLINE (via Pubmed), EMBASE, Cochrane library, POPLINE, ECONLIT, CINAHL, LILACS (Latin America and the Caribbean Center on Health Sciences Information), BDSP (French public health database), Web of Science and Scopus databases using appropriate terms and descriptors. Searches were limited to articles concerning human data that were written in English, French, German, Hindi, Portuguese or Spanish. The search began on 1 September 2008 and was last updated on 25 March 2014. All published studies included in previous systematic reviews4–9 were also considered. We consulted experts and reviewed article reference lists for additional articles.

Search and selection

One of the authors and an academic librarian defined the MEDLINE search strategy (available from corresponding author). Search terms were combinations of “interventions”, “programs”, “approaches”, “subsidies”, “knowledge translation”, “vouchers”, “vaccination”, “immunization”, “vaccines”, “child”, “infant”, “newborn”, “kid”, and “low- and middle-income countries”. The author translated the strategy and terms for the databases in other languages. Identified records were uploaded into EndNote (Thomson Reuters, Philadelphia, United States of America) and duplicates eliminated. Two authors screened titles and abstracts independently and eliminated studies that failed to meet eligibility criteria. Full texts of remaining studies were retrieved. Two authors independently screened full text articles against study inclusion criteria and compared results; another author validated all decisions.

Data extraction

From each study, two authors independently extracted data on study design, aims, location, population, intervention, follow-up period and outcomes, using a pre-defined template (available from corresponding author). We adopted the original study definitions of comparator or control groups. We pilot tested the template on a subset of studies. In addition to vaccine outcomes, information on equity and economic outcomes were extracted. Together, three authors cross-checked and verified these data. Study authors were contacted for clarification if data were missing or unclear.

Risk of bias

We used Cochrane collaboration criteria to assess risk of bias.12 As these criteria were developed to assess randomized controlled trials, we supplemented them to accommodate additional study designs. To address issues specific to cluster randomized controlled trials, we systematically considered recruitment bias, unit of analysis bias and sample size as part of the “other” category.12 To accommodate non-randomized designs, we used the Cochrane EPOC group’s additional criteria and scoring for non-randomized controlled trials, controlled before-and-after and interrupted time-series studies.19 For each included study, two authors independently assessed risk of bias and compared results, and another author validated all decisions.

Statistical analysis

The principal measure was the relative risk (RR) of vaccination among children in intervention versus control groups. We performed a meta-analysis by estimating random effect models with inverse variance weighting. This method gives greater weight to studies with more precise estimates. Study-specific estimates of variance were obtained by deriving standard errors from the confidence intervals reported by the studies. For cluster randomized controlled trials, we used the standard errors with adjustment for clustering, which allowed us to use both clustered and non-clustered randomized controls trials in the same meta-analyses. In addition to conducting meta-analysis on all included studies, we performed meta-analysis on five pre-specified sub-groups: (i) studies including the third dose of diphtheria-tetanus-pertussis (DTP3); (ii) studies using knowledge transfer interventions; (iii) studies using incentives, (iv) studies whose risk of bias was assessed to be moderate-to-high; and (v) studies whose risk of bias was assessed to be low. We also estimated three meta-regression models adjusting separately for: (i) baseline vaccination coverage (the proportion of children aged 12–23 months receiving DTP3 in the study area or country); (ii) intervention type; and (iii) study quality. Heterogeneity was assessed using Cochrane’s Q-test and I² statistics.12

Potential publication bias was assessed using funnel plots. Analyses were performed using the metafor package13 for meta-analyses in R (R Foundation for Statistical Computing, Vienna, Austria) and the heterogi package14 for Stata (version 13.1, StataCorp LP, College Station, USA).

Results

Study selection

Search of the databases yielded 1705 citations. We also identified 59 records through previous systematic reviews, article bibliographies and subject-matter experts. After removal of 643 duplicate records, there were 1121 records for title and abstract screening. Of these, 1073 did not meet eligibility criteria and were excluded. The full text of the remaining 48 articles was retrieved for detailed review (available from corresponding author). It lists the 37 articles excluded after full-text evaluation and the principal reasons for their exclusion. A total of 11 studies10–21 comprising four randomized controlled trials, six cluster randomized controlled trials and one controlled before-and-after study were included in the review (Fig. 1 and Table 1).
Study characteristics

Study inclusion

The 11 studies were published in English between 1996 and 2013; eight were from lower-middle income countries, and three were from low-income countries. Study locations included south Asia (n = 7), sub-Saharan Africa (n = 3), and central America (n = 1).

Participants

Data were collected from 11,512 participants yielding outcomes for 11,512 children. As many interventions were directed to communities or populations rather than to individuals, the number of individuals reached by the interventions was considerably larger. Participants were mothers, caregivers, households of children who were within the target age-group for immunization (n = 9), or the general populations of target communities (n = 2).

Interventions

Of the 11 studies, seven described education or knowledge translation interventions, while four described interventions using incentives. One of the latter, two considered monetary incentives, and two non-monetary incentives. One study compared two types of monetary incentives; thus, the 11 studies yielded data on 12 interventions. Four studies considered both demand and supply interventions to improve vaccine coverage. For these studies, meta-analyses were based on the estimated demand-side effect.

Outcomes

Nine studies undertook coverage surveys to assess outcomes, while two used administrative data. For six studies, the main aim of the intervention was to increase immunization coverage, while for five studies, improving immunization coverage was a secondary aim and data on immunization outcomes were included.

Vaccination outcomes

Four studies described full immunization as defined by the country’s immunization schedule, all of which contain DTP3 as a subset. Six studies presented information on DTP3 vaccination. Three studies presented information on receipt of one or more vaccine doses and one considered age-appropriate vaccination. The timing of outcome measures was variable. While some studies addressed on-time delivery, a majority focused on the simpler assessment of presence or absence of vaccinations within a specified period. This period was based on the age of the child at the time outcomes were assessed and varied between studies: less than one year, less than two years, less than three years, or less than five years.

One study recorded changes in immunization knowledge, attitudes and beliefs and two estimated intervention costs and cost-effectiveness as additional vaccination-related outcomes. All studies considered equity in the choice of target populations by directing interventions to areas of greater need, but only two provided stratified analyses related to subgroups of interest.

Risk of bias

We assessed risk of bias for nine criteria. Our assessments ranged from low risk of bias on all criteria in one study to high risk of bias on five criteria in one study. For the purpose of subgroup analyses, we classified five studies with high risk of bias on one or more criteria as moderate-to-high risk of bias. The remaining six studies were categorised as low risk of bias. Fig. 2 presents a summary of our assessment of the risk of bias (a detailed assessment for each study and criterion, and figure summarizing risk of bias assessments by criterion is available from corresponding author).

Fig. 1. Interventions to increase the demand for childhood vaccination: selection of studies

1705 records identified through database searching:
- 368 in Medline (56 with keywords)
- 95 in CINAHL
- 390 in PUBMED
- 99 in LILACS
- 202 in ECONLIT
- 304 in POPLINE
- 111 EMBASE
- 53 in BDSP
- 83 in Cochrane Library

59 additional records identified through other sources:
- 18 from experts
- 20 from previous reviews
- 21 from reference lists

1073 excluded after screening titles and abstracts:
- not an intervention study
- not a primary study
- not in a low- or middle-income country
- not about routine childhood immunization
- not a demand-side intervention
- not an intervention to increase vaccination uptake

17 full-text articles excluded:
- 10 supply-side interventions
- 8 no control group
- 5 not about routine childhood immunization
- 5 immunization campaigns
- 3 not an intervention study
- 2 study design does not satisfy EPOC criteria for admissibility
- 2 duplicate
- 1 no quantitative evidence on coverage
- 1 outcome data unavailable

Fig. 2. Risk of bias assessment of interventions to increase childhood vaccination

Fig. 2 presents a summary of our assessment of the risk of bias (a detailed assessment for each study and criterion, and figure summarizing risk of bias assessments by criterion is available from corresponding author).
High risk of bias occurred most frequently for the category “other bias” (five studies), while unclear risk of bias was most frequent for the category “selective reporting” (nine studies). Risk of bias was related to intervention type: three of the four studies that used incentives had moderate-to-high risk of bias.

**Receipt of vaccine**

RR estimates, 95% confidence intervals (CI) and weights for each individual study are shown in Fig. 3. For each study, the crude proportion of participants with and without vaccination is shown separately for intervention and control groups. For one study, Morris et al., data necessary for meta-analysis were not available in the text or from the study author and were taken from a published article.

In the pooled analysis considering all 12 interventions assessed in the 11 studies (Fig. 3), interventions were associated with significantly higher receipt of vaccines (RR: 1.30; 95% CI: 1.17–1.44), but there was considerable heterogeneity ($I^2 = 88.96$; 95% CI: 82.94–92.16). Unweighted results were similar to weighted results (RR: 1.34; 95% CI: 1.21–1.50). To reduce diversity associated with outcomes measured, we considered only the nine studies reporting data for DTP3 or full vaccination (information available from corresponding authors). These results were similar to those for all studies (RR: 1.32; 95% CI: 1.15–1.51; $F = 86.31$; 95% CI: 75.31–91.11).

**Bias across studies**

To explore potential sources of heterogeneity, we plotted the observed outcome against the standard error for all meta-analyses and meta-regressions. Visual inspection of funnel plots revealed no evidence of asymmetry (available from corresponding author); however, due to the small number of studies the test has low power and we cannot exclude the possibility of publication bias.

### Subgroup analyses

The overall effect of educational or knowledge translation interventions was greater than for incentives (RR: 1.40 [95% CI: 1.20–1.63] versus RR: 1.28 [95% CI: 1.12–1.45], respectively (available from corresponding author). The pooled analysis considering studies with a low risk of bias yielded a higher estimate of overall effect than that for studies with moderate-to-high risk of bias, RR: 1.53 (95% CI: 1.28–1.82) and RR: 1.15 (95% CI: 1.02–1.30), respectively (available from corresponding author). Heterogeneity was lower for educational or knowledge translation interventions: $I^2 = 80.48$, (95% CI: 53.90–88.88) than for incentives $I^2 = 89.40$, (95% CI: 76.83–93.73). Heterogeneity was also lower for studies with low risk of bias: $I^2 = 79.16$, (95% CI: 42.92–88.82) versus studies with moderate-to-high risk of bias: $I^2 = 90.26$, (95% CI: 81.40–93.86). Meta-regression revealed no important differences in results by baseline cover-
Interventions to increase the demand for childhood vaccination: meta-analysis of 11 studies

<table>
<thead>
<tr>
<th>Author(s) and year</th>
<th>Intervention</th>
<th>Control</th>
<th>Weights %</th>
<th>RR (95% CI)</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brugha and Keating, 1996</td>
<td>171/200</td>
<td>137/219</td>
<td>9.21</td>
<td>1.40 (1.23–1.59)</td>
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<tr>
<td>Morris et al., 2004</td>
<td>-</td>
<td>-</td>
<td>10.88</td>
<td>1.07 (1.01–1.13)</td>
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</tr>
<tr>
<td>Pandey et al., 2007</td>
<td>107/149</td>
<td>36/79</td>
<td>9.57</td>
<td>1.57 (1.41–1.75)</td>
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<tr>
<td>Roy et al., 2008</td>
<td>64/126</td>
<td>60/104</td>
<td>6.78</td>
<td>0.88 (0.69–1.12)</td>
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<tr>
<td>Anderson et al., 2009</td>
<td>283/555</td>
<td>353/575</td>
<td>9.36</td>
<td>1.18 (1.05–1.33)</td>
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</tr>
<tr>
<td>Usman et al., 2009 – received education only</td>
<td>242/375</td>
<td>285/575</td>
<td>6.55</td>
<td>2.16 (1.66–2.78)</td>
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<tr>
<td>Banerjee et al., 2010 – intervention B vs A</td>
<td>148/382</td>
<td>68/379</td>
<td>6.22</td>
<td>1.39 (1.06–1.82)</td>
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<tr>
<td>Owais et al., 2011</td>
<td>129/179</td>
<td>92/378</td>
<td>6.04</td>
<td>1.08 (0.99–1.18)</td>
<td></td>
</tr>
<tr>
<td>Usman et al., 2011</td>
<td>226/376</td>
<td>149/378</td>
<td>5.92</td>
<td>1.04 (0.96–1.12)</td>
<td></td>
</tr>
<tr>
<td>Briner et al., 2012</td>
<td>1062/1607</td>
<td>382/723</td>
<td>10.10</td>
<td>1.65 (1.16–2.35)</td>
<td></td>
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<tr>
<td>Robertson et al., 2013 – unconditional cash transfer</td>
<td>139/517</td>
<td>253/569</td>
<td>9.92</td>
<td>1.08 (0.99–1.18)</td>
<td></td>
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<tr>
<td>Robertson et al., 2013 – conditional cash transfer</td>
<td>117/417</td>
<td>253/360</td>
<td>9.92</td>
<td>1.08 (0.99–1.18)</td>
<td></td>
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<tr>
<td>Total</td>
<td>100.00</td>
<td>1.30 (1.17–1.44)</td>
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</tbody>
</table>

CI: confidence interval; RR: relative risk.
Note: Weights are from random-effects analysis.

Discussion

This meta-analysis demonstrates that demand-side interventions lead to an increase in child vaccination coverage in diverse low- and middle-income settings and among communities with lagging health and social indicators. Immunization programmes have often focused on strengthening vaccine supply. Our results show that policymakers who seek to increase access to vaccines through the routine immunization system should also consider demand-side strategies.

Educational or knowledge translation interventions were more effective on average than interventions based on incentives; however, both strategies were effective. The highest estimates of effect and lowest heterogeneity were found among studies with low risk of bias. Risk of bias was related to intervention type, with three of the four incentives studies having moderate-to-high risk of bias.

Our analysis has six important limitations. First, vaccination coverage is shaped by interrelated supply and demand factors. Many studies, particularly those tackling vaccine and non-vaccine outcomes, did not give due consideration to the role of the health system in delivering vaccines during the study design phase leading to increased risk of bias. Three supply-side challenges confronted the studies reviewed: (i) increases in demand cannot be effective if supply-side constraints limit provision of vaccines; (ii) if coverage rates are already very high, there is limited scope to demonstrate improvement; and (iii) vaccination rates can be affected by changes in service delivery occurring independently of the study. Among the studies reviewed, only one study did not show a gain associated with the intervention: in this study, all experimental groups experienced substantial but similar gains in vaccination coverage. Another study noted a likely background trend with a differential impact on experimental groups. Unfortunately, neither of these studies collected data on health system trends that might affect immunization delivery. Studies addressing vaccine and non-vaccine outcomes, including three of the four incentive based studies, may have faced challenges related to broad study scope or a lack of vaccine-specific expertise in study planning. In addition, two studies of financial incentives were large-scale interventions and faced substantial implementation challenges.

Second, the systematic review and meta-analysis included only 11 studies. This limited our ability to explore potential sources of heterogeneity quantitatively and to exclude possible biases related to publication and study size.

Third, studies measured different vaccines over different time periods. Receipt of DTP3 is the measure preferred by international agencies to assess immunization coverage and was included in nine of the 11 papers reviewed. All analyses consistently showed that demand-side interventions are beneficial in improving coverage. However, due to diversity in outcomes and the small number of studies, we cannot evaluate the effect of interventions for specific vaccines.

Fourth, health gains depend not only on increased vaccine coverage but also on appropriate timing of vaccination. With one exception, studies offered little information on when doses were delivered.

Fifth, despite contacting the authors, we were not able to retrieve data for all studies and had to use approximate values for one study based on another publication.

Sixth, our analysis excluded interventions that focused exclusively on improving vaccine supply. However, from a policy point of view, how demand-side interventions interact with supply side constraints is also important. With one exception, immunization system performance was not explicitly assessed by these studies.

Our results indicate that future research on demand-side interventions to increase vaccine coverage should (i) standardize measurement of outcomes; (ii) include vaccination experts during the study design phase; and (iii) collect data on health system characteristics that may affect vaccine delivery.
Conclusion
Demand-side interventions are effective in improving the uptake of childhood vaccines delivered through routine immunization services in low- and middle-income countries. Our results are more definitive than those of previous systematic reviews which employed narrative synthesis techniques.

Demand-side strategies to improve vaccination coverage are important because they are inherently equity-oriented and address specific barriers to coverage related to financial constraints, opportunity costs, knowledge and prioritization. Future research should seek to refine our understanding of which approaches are most effective in specific contexts. Studies investigating the value of knowledge translation and incentives-based interventions offered in combination are also required. Studies that simultaneously consider supply- and demand-side interventions — and enable us to evaluate their relative effectiveness — are of particular interest. Finally, studies should consider whether interventions can be delivered effectively at scale and in the long term.

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Systematic reviews
Childhood vaccination in low- and middle-income countries
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Malnutrition

Summary

Demand-side strategies to improve vaccination coverage are important because they are inherently equity-oriented and address specific barriers to coverage related to financial constraints, opportunity costs, knowledge and prioritization. Future research should seek to refine our understanding of which approaches are most effective in specific contexts. Studies investigating the value of knowledge translation and incentives-based interventions offered in combination are also required. Studies that simultaneously consider supply- and demand-side interventions — and enable us to evaluate their relative effectiveness — are of particular interest. Finally, studies should consider whether interventions can be delivered effectively at scale and in the long term.

Abstract

The purpose of this systematic review and meta-analysis was to synthesize evidence from low- and middle-income countries on the effectiveness of demand-side interventions for improving the uptake of childhood immunization services in low- and middle-income countries, and the value of knowledge translation and incentives-based interventions offered in combination. Studies were included if they evaluated demand-side interventions designed to increase routine vaccination coverage; those that considered both demand- and supply-side interventions were also included. We searched four databases (MEDLINE, EMBASE, LILACS, and Cochrane Collaboration) for studies published in English, French, Spanish, Portuguese, German, and Dutch up to December 2013. Sixty studies met selection criteria, and 62 were included in the analysis. Our results suggest that demand-side interventions are effective in increasing routine vaccination coverage in low- and middle-income countries, and that knowledge translation and incentives-based interventions can be used to enhance the impact of demand-side interventions. Future research should consider whether interventions can be delivered effectively at scale and in the long term.

Methods

We searched MEDLINE, EMBASE, LILACS, and Cochrane Collaboration databases up to December 2013. We included studies evaluating demand-side interventions designed to increase routine vaccination coverage in low- and middle-income countries. We excluded studies that did not consider demand-side interventions, those that were non-comparative, or those that did not report outcomes on routine vaccination coverage. We included studies that measured the impact of demand-side interventions on routine vaccination coverage, either alone or in combination with supply-side interventions. We included studies that considered both demand- and supply-side interventions, provided they were evaluated as a single intervention.

Results

We identified 62 studies that met our selection criteria. Of these, 45 studies were included in the analysis. Our results suggest that demand-side interventions are effective in increasing routine vaccination coverage in low- and middle-income countries, and that knowledge translation and incentives-based interventions can be used to enhance the impact of demand-side interventions. Future research should consider whether interventions can be delivered effectively at scale and in the long term.

Conclusions

Demand-side strategies are effective in improving the uptake of childhood vaccines delivered through routine immunization services in low- and middle-income countries. Future research should seek to refine our understanding of which approaches are most effective in specific contexts. Studies investigating the value of knowledge translation and incentives-based interventions offered in combination are also required. Studies that simultaneously consider supply- and demand-side interventions — and enable us to evaluate their relative effectiveness — are of particular interest. Finally, studies should consider whether interventions can be delivered effectively at scale and in the long term.

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Резюме

Стратегии повышения спроса на вакцинацию детей в странах с низким и средним уровнем доходов: систематический обзор и метаанализ

Цель Определить, какие стратегии для увеличения спроса на вакцинацию оказваются эффективными и позволяют расширить охват вакцинацией детей в странах с низким и средним уровнем доходов.

Методы Был выполнен поиск исследований, опубликованных на английском, французском, испанском, португальском, немецком языках и хинди до 25 марта 2014 года в базах данных MEDLINE, EMBASE, Cochrane Library, POPLINE, ECONLIT, CINAHL, LILACS, BDSP, Web of Science и Scopus, десяти эпидемиологических исследований, рандомизированных контролируемых исследований и одно контролируемое перед началом и после окончания, участники этих исследований — это в основном родители маленьких детей в отношении которых применялись оправданные интервенции. Шесть исследований показали низкий риск системной ошибки. Другие пять — умеренный и высокий риск системной ошибки. Был проведен объединенный анализ с учетом всех 11 исследований, включающий данные 512 участников. Интервенции, направленные на повышение спроса, были связаны со значительно более активным согласием на вакцинацию. Описательный риск (OR) составил 1,30 (95 % доверительный интервал, ДИ: 1,17–1,44). Анализ в подгруппах также продемонстрировал значительный эффект в семи исследованиях, связанных с информированием и передачей знаний, OR: 1,40 (95 % ДИ: 1,20–1,63), и в четырех исследованиях, в которых использовались льготы, OR: 1,28 (95 % ДИ: 1,12–1,45).

Вывод Интервенции, направленные на повышение спроса на вакцинацию, приводят к значительному расширению охвата вакцинацией детей в странах с низким и средним уровнем доходов. Свою эффективность показали как стратегии информирования, так и использование льгот.

Resumen

Estrategias para incrementar la demanda de vacunación infantil en países de ingresos bajos y medios: una revisión sistemática y un metanálisis

Objetivo Investigar qué estrategias para incrementar la demanda de vacunación son efectivas en el incremento de la cobertura de vacunación infantil en países de ingresos bajos y medios.

Métodos Se realizaron búsquedas en las bases de datos de MEDLINE, EMBASE, Cochrane Library, POPLINE, ECONLIT, CINAHL, LILACS, BDSP, Web of Science y Scopus para encontrar estudios pertinentes, publicados en alemán, español, francés, hindi, inglés y portugués hasta el 25 de marzo de 2014. Se incluyeron estudios de intervenciones con el objetivo de incrementar la demanda de vacunación infantil sistemática. Los estudios fueron elegibles si se realizaron en países de ingresos bajos y medios y utilizaron un diseño de ensayo controlado aleatorizado, ensayo controlado no aleatorizado, controlado antes y después o de series temporales interrumpidas. Se estimó un riesgo de sesgo mediante las directrices de colaboración de Cochrane y se realizaron metanálisis de
efectos aleatorios. **Resultados**: Se identificaron 11 estudios que abarcan cuatro ensayos controlados aleatorizados, seis ensayos controlados aleatorizados por conglomerados y un estudio controlado antes y después, publicados en inglés entre 1996 y 2013. En general, los participantes fueron padres de niños pequeños expuestos a una intervención elegible. Seis estudios demostraron un bajo riesgo de sesgo y cinco estudios presentaron un riesgo de sesgo entre moderado y elevado. Se realizó un análisis agrupado teniendo en cuenta los 11 estudios, con datos de 11,512 participantes. Las intervenciones que afectan a la demanda se relacionaron con una recepción de las vacunas significativamente superior, riesgo relativo (RR): 1,30, (intervalo de confianza, IC, del 95%: 1,17–1,44). Los análisis de los subgrupos también demostraron efectos importantes de siete estudios de educación y traslación de conocimientos, RR: 1,40 (IC del 95%: 1,20–1,63) y de cuatro estudios que utilizaron incentivos, RR: 1,28 (IC del 95%: 1,12–1,45). **Conclusión**: Las intervenciones que afectan a la demanda llevan a mejoras significativas en la cobertura de vacunación infantil en países de ingresos bajos y medios. Los enfoques educativos y el uso de incentivos fueron estrategias efectivas.

**Referencias**

10. Effective Practice and Organisation of Care (EPOC). What study designs should be included in an EPOC review and what should they be called? EPOC Resources for review authors. Oslo: Norwegian Knowledge Centre for the Health Services; 2015. Available from: http://epoc.cochrane.org/epoc-specific-resources-review-authors [cited 2015 Mar 23].
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<tr>
<td>Robertson et al., 2013</td>
<td>Zimbabwe, rural areas</td>
<td>Cluster randomized controlled trial</td>
<td>30 areas were matched on socioeconomic characteristics and randomized to three groups (10 UCT: 10 CCT: 10 control). Households were eligible to participate if they lived in a study area and met need-based criteria. Vaccination outcomes consider children aged 0–4 years in participating households (934 in the intervention arms (517 UCT; 417 CCT) and 360 controls).</td>
<td>Unconditional cash transfer: every household collected US$18 plus US$4 per child (up to a maximum of three children) from designated pay points every 2 months. Conditional cash transfer: households received the same amount, but were monitored for compliance with several conditions. Among others, children less than 5 years had to be vaccinated on time.</td>
<td>No incentives</td>
<td>Proportion of children less than 5 years with up-to-date vaccinations (measles; BCG; polio; and diphtheria–pertussis)</td>
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<td>Briere et al., 2012</td>
<td>Kenya, largely rural</td>
<td>Controlled before-and-after study</td>
<td>Comparison between two adjacent districts. Children aged 2–13 months were eligible; 1607 children in the intervention arm and 723 children in the control arm. During routine immunization visits, caregivers with a child aged &lt;12 months were offered free hygiene kits (sodium hypochlorite solution for household water treatment, soap, pictorial educational materials) and education about water treatment and hand hygiene.</td>
<td>Routine immunization only</td>
<td>Children 2–13 months with up-to-date immunization coverage (3 doses of pentavalent vaccine at 6, 10 and 14 weeks and 1 dose of measles vaccine at 9 months)</td>
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<td>Owais et al., 2011</td>
<td>Pakistan, urban and peri-urban communities near Karachi</td>
<td>Randomized controlled trial</td>
<td>All mothers in five selected communities with a child ≤6 weeks old were eligible to participate; 179 children in the intervention arm and 178 in the control arm.</td>
<td>Short, home-based information sessions on importance of vaccines for low-literacy communities delivered by CHWs in 5 minutes. Pictorial cards conveyed three messages: vaccines save children’s lives; location of vaccination centres; and importance of retaining cards.</td>
<td>General health promotion messages (including information on vaccines) delivered by CHWs in 10–15 minutes</td>
<td>At four months after enrolment, children were defined as fully immunized if they completed all three doses of DTP3/Hepatitis B; otherwise non-immunized</td>
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<tr>
<td>Usman et al., 2011</td>
<td>Pakistan, rural area near Karachi</td>
<td>Randomized controlled trial</td>
<td>All children visiting six selected EPI centres for DTP1 were eligible, if mothers had lived in the area for at least 6 months. Mother–child pairs were randomly allocated to 1 of 4 study groups; 1128 participants in the intervention arms (Group 1: 378; 2: 376; 3: 374) and 378 in the control arm.</td>
<td>Group 1: A redesigned immunization card in a plastic jacket, with a hanging string. Group 2: 2–3 minutes conversation with mother during DPT1 visit to motivate and convey the potential adverse impact of incomplete immunization on the child’s health. Group 3: Received both interventions.</td>
<td>Mothers underwent routine EPI centre visits and received neither intervention</td>
<td>DTP3 completed (received both DTP2 and DTP3) versus DTP3 not completed</td>
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<td>Banerjee et al., 2010</td>
<td>India</td>
<td>Cluster randomized controlled trial</td>
<td>Within each of 134 randomly selected villages, 30 households with a child 0–5 years of age were randomly selected. Children were included if they belonged to a selected household and would be aged 1–3 years at the end of study (main sample) or were aged 0–6 months at baseline (baseline cohort). 761 children received interventions (A: 379; B: 382); 860 children served as controls.</td>
<td>Intervention A: A mobile team conducted monthly immunization camps in villages at fixed dates and times to improve services. In each village, a social worker performed outreach, linkage and educated mothers about immunization. Intervention B: Intervention A plus 1 kg of raw lentils per immunization and a set of metal plates for a child’s full immunization.</td>
<td>No intervention; had access to standard services</td>
<td>Children under 3 years who received ≥1 vaccine dose or were fully immunized; presence of BCG scar; number of immunizations; costs and cost-effectiveness</td>
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<td>Andersson et al., 2009</td>
<td>Pakistan, Lasbela district</td>
<td>Cluster randomized controlled trial</td>
<td>32 EAs were randomly selected. 18 EAs (3166 children &lt; 5 years) in intervention group; 14 EAs (2475 children &lt; 5 years) in control group. Vaccination outcomes reflect a random sample of children aged 12–23 months in each cluster (intervention: 535 children; control: 422 children).</td>
<td>The intervention involved three structured discussions separately with male and female groups in each village. Discussions shared findings about local vaccine uptake; focused on the costs and benefits of childhood vaccination; and focused on local action plans. Participants spread the dialogue in their communities.</td>
<td>Access to standard immunization services; both groups received a district-wide health promotion programme on household hygiene and costs and cost-effectiveness</td>
<td>Proportions of children 12–23 months receiving DTP3 and measles vaccine; knowledge, attitudes and norms about vaccination; costs and cost-effectiveness</td>
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<tr>
<td>Usman et al., 2009</td>
<td>Pakistan, urban area in Karachi</td>
<td>Randomized controlled trial</td>
<td>All children visiting five selected EPI centres for DTP1 were eligible to participate, if mothers had lived in the area for at least 6 months. Mother–child pairs were randomly allocated to 1 of 4 study groups; 1125 participants in the intervention arms (Group 1: 375; 2: 375; 3: 375) and 375 in the control arm.</td>
<td>Group 1: A redesigned immunization card in a plastic jacket, with a hanging string. Group 2: 2–3 minutes conversation with mother during DPT1 visit to motivate and convey the potential adverse impact of incomplete immunization on the child's health. Group 3: Repeated both interventions.</td>
<td>Mothers underwent routine EPI centre visits and received neither intervention</td>
<td>DTP3 completed (received both DTP2 and DTP3) versus DTP3 not completed</td>
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<td>Roy et al., 2008</td>
<td>Bangladesh, rural</td>
<td>Randomized controlled trial</td>
<td>1275 poor women in 17 districts eligible for the rural maintenance programme were divided into three groups. Vaccination outcomes concerned 340 children 0–60 months (intervention: 126, control: 104, comparison group 110).</td>
<td>The standard programme provided income support, employment and skill training. The intervention group received basic nutrition and health education (including child immunization).</td>
<td>Comparison group received only standard programme; control group received neither programme nor education</td>
<td>Percentages of children 0–60 months receiving DTP3 (by dose) DTP3 measles, BCG, OPV that were partially vaccinated or fully vaccinated</td>
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<tr>
<td>Pandey et al., 2007</td>
<td>India, Uttar Pradesh</td>
<td>Cluster randomized controlled trial</td>
<td>From 21 districts, 105 villages were randomly selected. 10 households per village (5 low caste, 5 middle-to-high caste) with at least one child going to public primary school were invited to join the baseline survey. Vaccine outcomes relate to 337 households (intervention 149; control 79) with a child less than 1 year</td>
<td>Campaigns to inform poor rural populations about entitled health and education services were conducted in two rounds in each village. Each round comprised two to three 1 hour meetings consisting of an audiotaped presentation, question period and leaflet distribution. Participants were re-interviewed after 12 months.</td>
<td>Access to standard services</td>
<td>Children less than 1 year old receiving ≥ 1 vaccine dose</td>
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<td>Morris et al., 2004</td>
<td>Honduras</td>
<td>Cluster randomized controlled trial</td>
<td>70 municipalities with the highest rates of malnutrition were selected and randomly assigned to one of four study groups in the ratio 2:1:2:2. Approximately 470,000 people received one or both interventions. Vaccine analyses for DTP1 compared 810 children in Group 1 to 878 controls.</td>
<td>Group 1 received vouchers worth £2.53 per month for each pregnant woman or child younger than 3 years, up to a maximum of two. Payments required compliance with child preventive health care. Group 2 improved health services via better planning, training and small repairs and purchases. Group 3 received both packages.</td>
<td>Access to standard services</td>
<td>Proportion of children 93 days to 3 years who received DTP1; proportion of children 1 year old who received measles vaccine</td>
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<td>Brugha and Kevany,</td>
<td>Eastern Ghana</td>
<td>Cluster randomized controlled trial</td>
<td>A town with regular immunization services was subdivided into 30 matched pairs of clusters. One of each pair was randomly allocated to the intervention group. All 12–18 month old children living in intervention clusters joined the intervention arm (200 children), all 12–18 month old children residing in control clusters (219 children) joined the control arm.</td>
<td>Trained, non-health workers made home visits advising parents to bring their child to the next under-fives’ clinic. This advice was given to all respondents but targeted to parents of incompletely immunized children. Children who failed to complete the schedule following the referral were identified from a register and a nurse made up to three home visits over 6 months to each child.</td>
<td>Access to standard services</td>
<td>Proportions of children in each cluster who received polio 1, polio 3, measles, or were fully immunized (BCG, polio 3, DTP3 and measles)</td>
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