
**Effective interventions for improving routine
childhood immunisation in L&MICs: A
systematic review of reviews**

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Executive summary

Background

Immunisation remains one of the most cost-effective interventions to prevent and control life-threatening infectious diseases. However, rates of routine immunisation of children remain below targets. In 2019, close to 20 million children did not receive the three recommended doses of diphtheria, pertussis and tetanus (DPT) vaccine with ten countries, including Nigeria, India, the Democratic Republic of Congo and Pakistan accounting for two out of five unvaccinated children globally. In the last few decades, interventions have emerged specifically aimed at strengthening national-level immunisation programmes but even with strengthened routine immunisation programmes, marginalised and vulnerable communities are at risk of being overlooked. Hence, numerous international and national policy frameworks are now increasingly focusing on multipronged approaches that provide contextualised solutions to address constraints in delivery of immunisation services as well as behavioural, social and practical barriers faced by caregivers. Many impact evaluations and systematic reviews have been conducted to assess the effectiveness of these approaches, but evidence synthesis gaps remain, which we are aiming to fulfil with this review to a certain extent.

Objectives

The primary goal of this systematic review of reviews is to provide more clarity on the types of interventions that are effective to improve routine immunisation for children in low- and middle-income countries (L&MICs). This is the first review of reviews focusing on interventions targeting immunisation of young children within L&MICs, with a view to better understand what type of interventions work best, for whom and how.

Search methods

The search strategy used in this review was initially designed for a 3ie evidence gap map (EGM) (Engelbert et al., 2022) that identified and described the evidence base for routine child immunisation in L&MICs. We updated this search strategy and included electronic searches of academic databases as well as sources of “grey literature” i.e., institutional websites. The search was conducted in October 2021 to identify any additional systematic reviews that were published in 2020-21.

Selection criteria

All search results were screened on title/abstract by a team of trained reviewers, independently and in duplicate, with full-text screening where necessary. Two reviewers independently screened each study applying pre-defined inclusion and exclusion criteria. The inclusion criteria were broad, e.g., in terms of **study design**, studies self-identifying as systematic reviews and or meta-analyses were included. The **population** of interest included children below the age of five, but we occasionally included other populations especially when these were relevant to better understand the impact of programmes on intermediate immunisation outcomes. Studies examining the impact of any **intervention** on at least one outcome in relation to routine child immunisation were included. Included studies had to address at least one of the following **outcomes**: Coverage rates or timeliness of full immunisation, third dose of DPT or pentavalent, or measles; additional antigen-specific immunisation coverage outcomes; and intermediate outcomes such as attitudes about vaccination, and access to immunisation services.

Data collection and analysis

Data were extracted by two researchers independently. Data at the systematic review level were extracted for the following areas:

1. Context
2. Type of intervention
3. Type of review, design and methods used
4. Outcome measures
5. Quality assessment
6. Study results and findings

Given the variety of synthesis approaches adopted by the reviews (e.g., narrative syntheses approaches, but also meta-analyses or a mixture of the two), we have adopted a mixed-methods synthesis approach centred on meta-analytical and narrative elements to best accommodate both the quantitative and qualitative information available in the included systematic reviews.

Results

We identified 62 systematic reviews, of which 18 were of high confidence, six of medium and 38 of low confidence. Our in-depth mixed methods synthesis focuses on the high and medium confidence reviews. We are guided by the intervention-outcome framework used in the 3ie evidence gap map (Engelbert et al., 2022) and start with the 1st tier analysis examining the six main intervention categories:

- A. Caregiver-oriented interventions,
- B. Health systems-oriented interventions,
- C. Other community-member oriented interventions,
- D. Community-level interventions,
- E. Non-health related policies and institutions,
- F. Multicomponent interventions.

We proceed with 2nd and 3rd tier analyses to pin down the intervention subcategories that are most effective in relation to specific outcomes. The majority of the evidence we uncovered is centred on caregiver-oriented interventions (A)¹ that have positive and statistically significant effects at the 1st and 2nd tier analysis level. At the 3rd tier level, our analysis confirms the favourable trends emerging from the 1st and 2nd tier analysis, one-time sensitisation and education campaigns (AA2) and written or pictorial messages (SMS, stickers, flyers etc.) to caregivers (AB4) present the largest evidence base within the 3rd tier category reporting positive effects. Another intervention category at the 3rd tier for which there is a large evidence base is monetary incentives (AB1), but the reviews have been published in 2016 or before and the evidence is mixed.

For the health systems-oriented interventions (B) we had no quantitative evidence, thus we could only rely on narrative synthesis and the results are mixed. Depending on the exact nature of the intervention, the contextual background and the specific outcome, the findings range from favourable to inconclusive effects. Among these interventions, the only intervention category at the 3rd tier for which we find positive effects are home visits (BB7), We find mixed results for pay for performance schemes (BD5) which have a relatively larger evidence base both at the primary study and review levels. For a 3rd tier category like health system strategic planning (BF1), though the evidence base is large when it occurs in combination with other interventions, i.e., as multicomponent interventions, the evidence base for single interventions is rather limited and inconclusive.

As for community-oriented interventions (C and D), the evidence base is very limited, focused on narrative synthesis and inconclusive. However, a recent review (Jain et al., 2022) on single and multicomponent community engagement interventions (F) uses a nuanced framework to classify them based on the process of engaging communities and find them to be effective using

¹ The lettering in brackets relates to the structure of the intervention-outcome framework in Appendix 1.

meta-analytical methods. We found no evidence on interventions related to non-health related policies and institutions (E).

The synthesis is rounded up with a focus on three dominant intervention-outcome pairs to tease out whether some of the caregiver-oriented interventions (A) are more effective in relation to specific outcomes. We examined the following pairs in more depth and found that positive and statistically significant effects dominate across all pairs:

1. Caregiver-oriented interventions: Written or pictorial messages (SMS, stickers, flyers etc.) to caregivers – vaccination coverage - positive and statistically significant effects with RRs ranging from 1.15 to 1.19,
2. Caregiver-oriented interventions: One-time sensitisation and education campaigns – vaccination coverage - positive and statistically significant effects with an average RR of 1.38,
3. Caregiver-oriented interventions: Written or pictorial messages (SMS, stickers, flyers etc.) to caregivers – vaccination timeliness - positive and statistically significant effects with an average RR of 1.21.

The review also assessed the interventions aiming to improve zero dose outcomes through DPT1 and BCG vaccine uptake. We find limited and inconclusive evidence for interventions improving DPT1 outcomes. However, for BCG vaccine uptake we find pay for performance schemes (BD5) and community engagement interventions (C and D) to be effective.

Overall, the evidence base discussed in this review is highly heterogeneous in terms of scope, intervention types and outcomes. The findings are largely positive and statistically significant. The inconclusive evidence, however, should not be ignored. We have shared our concerns in relation to the quality of the reviews we included but also regarding the quality of the primary studies they have included in their synthesis. In addition, we highlight the role of small sample bias in the context of interpreting our findings.

Authors' conclusions

Through this review we have demonstrated that a wealth of systematic reviews on interventions impacting routine child immunisation outcomes exist, but many are very broad in their scope and hence, may not provide a clear answer on all the different types of interventions that may or may not work best for improving immunisation outcomes of children in L&MICs.

For caregiver-oriented interventions (A) the evidence base is of reasonable quality and sufficiently large compared to the evidence on health-systems (B) and community-oriented (C and D) interventions. We also find that caregiver-oriented interventions, like those focusing on one-time sensitisation and education campaigns (AA2) as well as written messages to caregivers (AB4), are effective with most findings suggesting positive and statistically

significant results. On the other hand, for health-systems oriented interventions the evidence base is thin with narrative synthesis approaches dominating suggesting inconclusive results. For community-oriented interventions the evidence base is limited, but a recent review (Jain et al., 2022) provides high quality evidence on the effectiveness of community engagement interventions with mostly positive and statistically significant results. Overall, the evidence base provides clearer answers on the effectiveness of caregiver-oriented interventions and to a certain degree of community-oriented interventions than of health-systems oriented interventions.

However, even among caregiver-oriented interventions, there are critical evidence gaps which need to be filled. For example, monetary incentives interventions (AB1), which have received a lot of attention over the last decade, would benefit from an updated review with a broader search. Among the health-systems oriented interventions, some examples of the 3rd tier interventions which are of particular policy relevance and which would benefit from a stronger evidence base are: a) Interventions focusing on building skills, capacity and motivation of formal health workers (BA1, BA2, BD1, BD2) and b) new HMIS/dashboards systems (BG1), i.e. interventions leveraging digital technologies, which are increasingly being adopted and expanded across L&MICs. For both these intervention categories, the 3^{ie} EGM (Engelbert et al., 2022) has found a substantial number of primary studies, though most were not single but multicomponent interventions.

The multicomponent interventions are present not only among health-systems oriented interventions but also among caregiver-oriented interventions, and there is a need to better understand complementarity of interventions. Some reviews analysed combinations of caregiver-oriented and health-systems oriented intervention types finding favourable but also inconclusive effects. We do not yet know the intervention combinations that work best in terms of improving immunisation outcomes. Further, most of our included reviews did not pay sufficient attention to theoretical considerations. Theory development may be a starting point contributing to a better understanding of the enablers and barriers of interventions as well as unpacking underlying causal mechanisms and thus improving the selection and targeting of immunisation interventions. In addition to theory development, future research needs to engage more with cost effectiveness of interventions as we need to not only learn about what works but also at what cost to be able to select not only the most impactful but also most cost-effective interventions to improve routine child immunisation outcomes.

We also make recommendations for future research in relation to methods at the review and primary study level. In addition to the concerns on the quality of included systematic reviews, there are also concerns regarding the primary studies included in these reviews informing their findings. This implies that future research needs to pay more attention to overall study quality, at not only the review level but also at the primary study level. At the review level future research should attempt more subgroup analyses, e.g., by levels of confidence, to instil more trust in the results. At the primary study level, the researchers should use more robust evaluation designs, e.g., randomised controlled trials, to minimise potential biases in the

measurement of effects. Finally, given the dominance of positive effects, future synthesis research should also pay attention to the role of publication bias.

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