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EVIDENCE FOR PRIVATE SECTOR ROLES IN REACHING ZERO-DOSE CHILDREN

Final Literature Review Report

USAID FROM THE AMERICAN PEOPLE

MOMENTUM A Global Partnership for Health and Resilience

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ABBREVIATIONS

CSO	Civil society organization
CSR	Corporate Social Responsibility
DRC	Democratic Republic of the Congo
DTP	Diphtheria-Tetanus-Pertussis vaccine
EPI	Expanded Programme on Immunization
IA2030	Immunization Agenda 2030
LMIC	Low- and Middle-Income Country
MOH	Ministry of Health
MOU	Memorandum of Understanding
NGO	Non-Governmental Organizations

BACKGROUND

Both the Immunization Agenda 2030 (IA2030) and Gavi's Phase 5 strategy 2021-2025 have made it an objective to improve immunization equity by ensuring immunization services reach zero-dose children and communities as part of the goal of ensuring everyone is protected by full immunization.[1,2] The term "zero-dose" is used to describe children who are unvaccinated or those who have not received any routine vaccine and is most commonly measured by those who have not received their first dose of a diphtheria-tetanus-pertussis (DTP) containing vaccine.[3] To ensure that all people benefit from recommended immunizations effectively integrated with other essential health services and that immunization programs can prepare for, respond to, and deliver immunization services during outbreaks and emergencies, IA2030 has also prioritized cross-sector collaboration, coordination and integration, and public-private partnerships with the private sector. Forming private partnerships with partners beyond the health sector, with the private sector, and with civil society organizations (CSOs) to strengthen immunization programs is also one of the four core principles of IA2030 that cuts across all seven of its strategic priorities.[1] Considering that zero-dose children are more likely to live in poor and already disadvantaged communities and are less likely to receive other primary health care services, engaging the private sector in immunization efforts could offer new or additional opportunities to reach these children.[4,5,6,7] However, the role of the private sector in reaching zero-dose children has not been well-documented and potential models for engagement are poorly understood.

While there has been significant progress in increasing global immunization coverage since the 1980's following the implementation of the Expanded Programme on Immunization (EPI), coverage rates have stagnated or even dropped in some places in recent years. From 2010-2019, estimates of the global coverage of DPT-3 reached 86% with wide regional variation, such as in West and Central Africa, where coverage has hovered around 66%. Over the same time period, at least 18 countries saw decreases of more than 10% in DPT-3 coverage, with 8 of these countries in Latin America and the Caribbean, including Brazil, where DPT-3 coverage decreased by 26%.[8,9] Most recently however, the COVID-19 pandemic has contributed to major disruptions in the delivery of immunization services and the largest decrease in global coverage in the past three decades, dropping to 81% in 2021.[10]

This drop in global vaccine coverage means that in 2021, approximately 25 million children did not receive vaccines in their first year of life, the highest number reported since 2009.[10] As of 2019, almost two-thirds of zero-dose children were living in just 10 countries: Nigeria, India, Democratic Republic of the Congo (DRC), Pakistan, Philippines, Ethiopia, Brazil, Indonesia, Angola, and Mexico.[8,9] Studies estimating the zero-dose prevalence in low- and middle-income countries (LMICs) have found rates to be between 7.5-8%, while a study looking at 33 countries just in sub-Saharan Africa found the prevalence to be 17% .[4,6,11]

TABLE 1. NUMBER AND GLOBAL SHARE OF ZERO-DOSE (DPT-1) CHILDREN BY REGION, 2020

	No. of Zero-Dose Children (millions)	Global % of Zero-Dose Children
African Region	7.7 million	45%
Region of the Americas	1.7 million	10%
Eastern Mediterranean Region	2.3 million	13%
European Region	0.3 million	2%

South-East Asia Region	4.1 million	24%
Western Pacific Region	1.0 million	6%

Source: *Routine Vaccination Coverage — Worldwide, 2020, Morbidity and Mortality Weekly Report 2021*

Nearly half of zero-dose children live in conflict-affected settings, remote and rural communities, and poor urban areas.[12] The literature suggests several factors are associated with zero-dose status, including living in rural areas and having a mother with a low level of education attainment and who received incomplete antenatal care and delivered outside a health facility.[4,5,6,7] Furthermore, several studies have identified being in the poorest household wealth quintile as one of the main determinants of a child receiving no vaccinations.[4,5,6] Reasons for non-vaccination that have been identified include parental attitudes and knowledge about vaccination (which includes cultural and religious beliefs against vaccines), systems issues such as lack of access to vaccination services because of long travel distances, family characteristics such as caregiver education level and family composition, and poor immunization-related communication and information.[13,14]

While it is understood that governments are mainly responsible for ensuring immunization services, previous papers have described the role of the private sector in delivering immunization services in LMICs.[15,16,17] The private health sector includes the delivery of health services, specifically immunization in this case, by any formal entity outside of the government, which can consist of various cadres of full- or part-time private providers (doctors, nurses, community health workers, etc.), non-profit organizations, for-profit entities, CSOs, non-governmental organizations (NGOs), faith-based institutions, and humanitarian agencies.[16,18] Although there is limited evidence on what share of immunization services are provided by the private sector, it is known to be delivering a significant portion of vaccinations in some countries, particularly in Asia and in fragile settings, where NGOs have been reported to provide the majority of vaccinations, either through formal agreements with the government or by filling gaps through ad hoc service delivery.[15,16] Within countries, the private sector's contribution may also vary by region, location, antigen, and type of provider; the access, affordability, and quality of immunization services found in the private sector also depends on the scope of the government's involvement.[16,17] Immunization services delivered by NGOs and other non-profit organizations have also been found to be more common in rural areas and within poor communities. NGOs appear to play a bigger role than for-profit providers, especially in Africa, and are more likely to be engaged by the government and international organizations.[15,16] Faith-based organizations have also been found to be an important provider of routine immunization services, particularly in hard-to-reach and humanitarian settings.[19]

There is even less evidence about the regulation and quality of immunization services in the private sector. Even when regulations are in place, they have been found to be inferior or inadequately enforced, although the literature suggests NGOs are more likely to follow guidelines on quality of care than the for-profit sector.[15,16,17] A study of private sector involvement in immunization services in the Western Pacific found that even though most countries report having regulations in place, almost half of private providers were unaware of them.[17] Furthermore, private health workers tend to lack knowledge and training on vaccine provision and management. Immunization coverage has also been found to be lower in private sector facilities compared to public facilities.[15,16] Reasons for limited private sector involvement could be lack of financial support or prioritization of private sector delivery from the government, limited technical capacity, weak linkages between the private and public sectors, and restriction of EPI service provision to the public sector. Additionally, there is limited monitoring and supervision of private sector providers by the government and limited reporting of data from private sector facilities to governments.[16]

Although evidence on the private sector's role in immunization is limited, private sector participation has been found to increase access to immunization services, particularly in urban slums, remote regions, and fragile settings, and decrease disparities in access to services.[15,16] Successful strategies for engaging the private sector have included contracting, training, financing, and coordinating and several public-private partnerships have been found to be effective in increasing immunization coverage.[15,16,17] Other models of engagement have included governments providing vaccines, supplies, and equipment, and supporting logistics, planning, and monitoring while requiring private facilities to comply with regulation requirements, such as for reporting and performance monitoring.[16]

Given the IA2030 target of reducing the number of zero-dose children by 50% by 2030 and the overall global focus on equity, engaging the private sector in programming targeting unvaccinated children could present a unique opportunity for governments and international actors to leverage the sector's strengths to deliver immunization services, particularly in areas where there is limited access to government services.[20] While the evidence on private sector engagement in immunization services generally has been documented and there is an emerging understanding on who zero-dose children are and where they live, there has been no documentation to date on how the private sector has been included in initiatives to reach zero-dose children. This review aims to fill this evidence gap, while also providing recommendations for future programming.

This activity emerges from the work done by USAID's MOMENTUM Private Healthcare Delivery project to understand how non-governmental providers are being engaged to reach zero-dose children. It builds upon learnings from webinars and consultations with immunization partners across the USAID MOMENTUM suite of awards over the past two years.[*] MOMENTUM Knowledge Accelerator has provided specialist technical expertise to conduct this evidence synthesis, hold consultations with key technical experts across the MOMENTUM suite, and produce this summary report.

METHODOLOGY

RESEARCH OBJECTIVES AND QUESTIONS

The main objective of this literature review is to provide a synthesis of information on how private sector service providers are engaged in reaching zero-dose children based on published and grey literature and fill the evidence gap by summarizing how the private sector has been involved thus far in delivering immunization services to zero-dose children and the communities where they live. The review is guided by four main questions: 1) What role does the private sector play in delivering immunization services in LMICs to zero-dose children and the communities where they are most concentrated: fragile settings, rural and remote areas, and poor urban areas? 2) What barriers or enablers do private sector providers face in providing services and what motivations do they have to reach zero-dose children? 3) What models for public-private engagement exist for reaching zero-dose children and what factors have enabled them to be successful? and 4) What promising practices exist (and at what levels) to engage private sector providers in immunization services for zero-dose children?

While this review uses a broad definition of the private sector, it is limited to the private sector's role in delivering immunization services to and assisting in service delivery programs targeting zero-dose children.

[*] USAID's MOMENTUM suite of awards includes MOMENTUM Integrated Health Resilience, MOMENTUM Country and Global Leadership, MOMENTUM Knowledge Accelerator, MOMENTUM Private Healthcare Delivery, MOMENTUM Safe Surgery in Family Planning and Obstetrics, and MOMENTUM Routine Immunization Transformation and Equity.

This includes vaccine administration at fixed service delivery points and through outreach sessions and campaigns, as well as activities related to demand generation, social mobilization, and community engagement. It does not consider the private sector's role in funding immunization programming for zero-dose children or involvement in other aspects of immunization, such as supply chain.

The findings of this review will provide guidance to the MOMENTUM awards on innovative or promising approaches to integrating private sector providers in strategies to reach zero-dose children and inform potential program design and policy. This work will help to inform the development of potential models of engagement with the private sector that will be useful in designing context-specific programmatic interventions to reach zero-dose children. The review also contributes to broader efforts to document existing evidence on how the private sector can bolster existing national immunization programs to reach remaining unvaccinated populations.

SEARCH STRATEGY

Electronic databases and websites were used to look for literature published as far back as 2000. First, a search for peer-reviewed journal articles was conducted through PubMed and Embase. This search was supplemented by a search for peer-reviewed articles, grey literature, conference proceedings, and project reports through Google Scholar. Second, the websites of international organizations, donors, implementing partners, and USAID-funded projects were searched for additional grey literature and project reports. Websites included those of the World Health Organization, Pan American Health Organization, Gavi, John Snow, Inc., PATH, the Maternal and Child Survival Program, the Center for Strategic and International Studies, and the American Academy of Pediatrics. Third, articles were solicited from technical experts from across the MOMENTUM awards. Lastly, the references of articles identified through the search were reviewed, as well as the references cited in six key papers discussing private sector engagement in immunization services and reasons for non-vacciantion.[13,14,15,16,17,21]

The search terms used consisted of four key words: "vaccination," "private sector," "zero-dose," and "children." These words, along with associated words and synonyms, were used in a variety of combinations and included:

- Vaccination OR Vaccin* OR Immunization OR Immunisation OR Immuniz* OR Immunis*
- Private sector OR Private OR Private Provider OR Non-government* OR NGO OR Civil Society OR CSO OR Faith-based OR Mission OR Humanitarian OR Non-profit OR Nonprofit OR Not-for-profit OR For-profit
- Zero-dose OR Unvaccinated OR Un-vaccinated OR Not Vaccinated OR Not Immunized OR Unimmunized OR Un-immunized OR Unreached OR Not Reached OR Hard to Reach OR Never Vaccinated OR Never Immunized OR low vaccination coverage
- Children OR Childhood OR Infant OR Newborn

When searching through the electronic databases, a string was added to the search terms to exclude articles with the terms "COVID," "HPV," and "Influenza" in the titles or abstracts because of the large amount of search results addressing non-vaccination for these diseases.

INCLUSION AND EXCLUSION CRITERIA

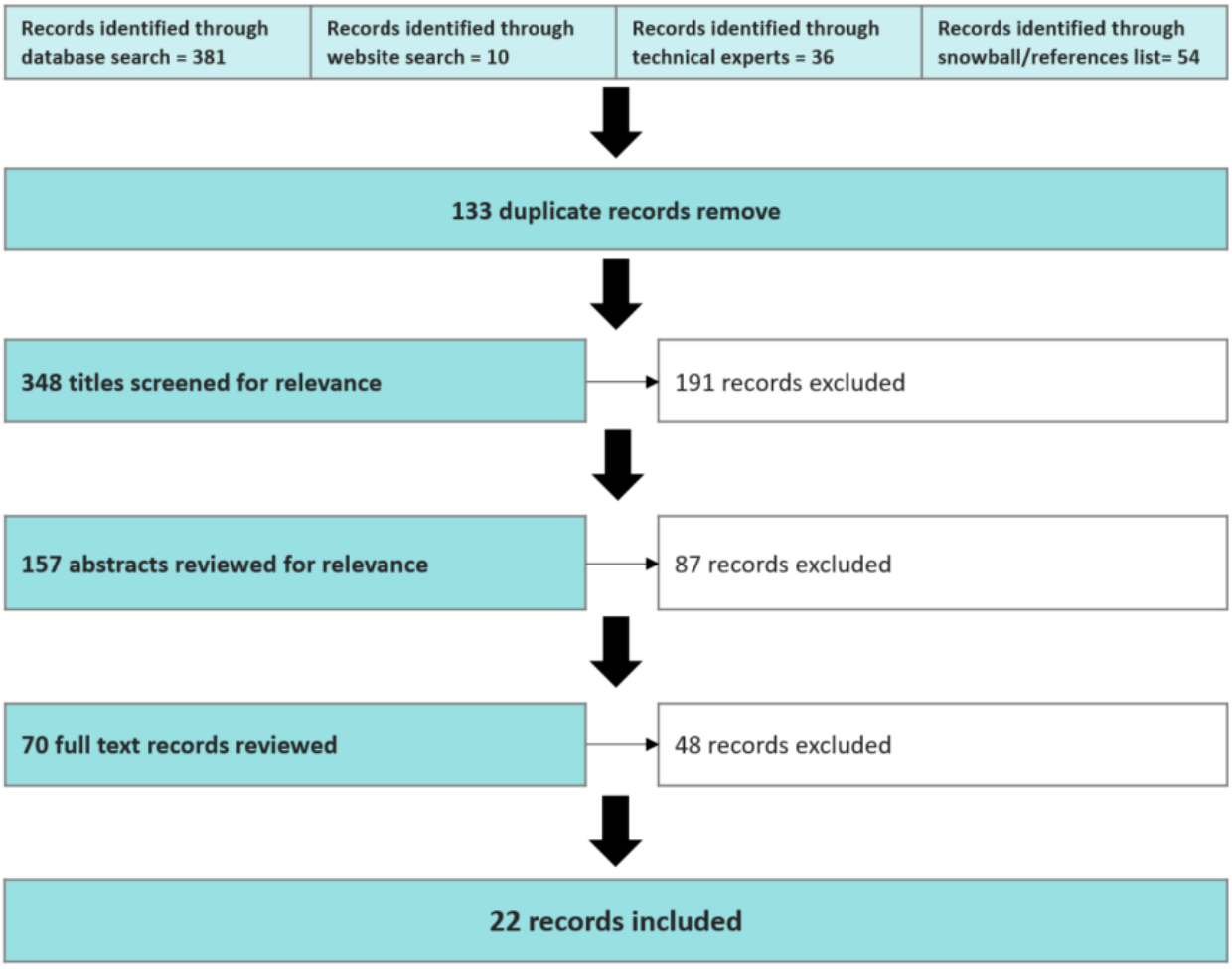
Based on the screening of titles and abstracts, articles were initially included if they met the following criteria: 1) included any of the search terms in the title or abstract, 2) published in or after 2000, 3) had a

geographic focus in LMICs, and 4) were either English, Spanish, or French language documents with abstracts in English. Articles were excluded if they were within the context of high-income countries and if they focused on non-childhood vaccines, such as vaccines for COVID-19, HPV, and influenza. An additional set of inclusion and exclusion criteria, described below, were used for articles that were fully reviewed.

ARTICLE REVIEW

The literature review found an initial 481 articles through the database and online search, solicitations from technical experts, and reviews of article references. Of these, 133 were duplicate references and were manually removed. The titles and then abstracts of 348 articles were screened for relevance and to assess if they met the predetermined inclusion criteria. A total of 70 articles underwent a full text review and were included in the report if they addressed at least one of the following themes: 1) private sector provision of immunization services to unvaccinated children or in communities with either low vaccination coverage among children or high percentages of zero-dose children; 2) private sector support of immunization-related activities targeting zero-dose children or in communities with either low vaccination coverage among children or high percentages of zero-dose children; and 3) involvement of the private sector in public sector-managed programs or initiatives targeting zero-dose children. Articles were excluded if they 1) did not provide private sector-specific data (either quantitative or qualitative), 2) did not include a focus on unvaccinated children, 3) did not provide enough detailed information on mechanisms for engaging the private sector, or 4) did not discuss the private sector in relation to either delivering services or reaching zero-dose children. Figure 1 describes the results of the search and selection of articles for this review.

FIGURE 1. LITERATURE REVIEW SCREENING PROCESS



DATA EXTRACTION AND ANALYSIS

Information was extracted from 22 relevant articles into an Excel matrix that organized data into the following categories: 1) citation information; 2) purpose or objectives; 3) methods and design; 4) geographic focus; 5) population focus; 6) types of private sector engagement discussed; 7) vaccines covered; 8) key results, findings, and observations; and 9) limitations. The matrix then had four separate categories to collect and record information related to the four key research questions (private sector role; enablers, barriers, and motivations; models for engagement and success factors; and promising practices). The report is organized by the findings to each of these key four questions.

FINDINGS

Although there is some literature on private sector providers' role in immunization, there is still limited published evidence detailing how private sector providers have been involved in reaching zero-dose children specifically. Most articles did not directly address or exclusively focus on efforts to specifically reach zero-dose children, and instead described mechanisms aiming to increase immunization coverage or strengthen immunization services, including in areas that were hard-to-reach or also had under-vaccinated children, as

well as zero-dose children. While many articles acknowledged the opportunity and the need to appropriately engage the private sector to expand immunization service delivery, few articles provided concrete evidence or examples on how best to do so. Furthermore, most articles did not focus on private providers, but on the private sector in general.

The literature review found 22 relevant articles, of which 19 were peer-reviewed journal articles and three were grey literature. The peer-reviewed literature consisted of cross-sectional surveys, qualitative studies, program and health information management data analysis, mixed methods, and discussion papers. The three grey literature resources were all reports. Geographically, all of the articles covered countries in either sub-Saharan Africa or Asia. There were four articles based in India, three in Nigeria, two each in Afghanistan and Pakistan, and then one each in Uganda, Kenya, Sudan, Angola, Bangladesh, DRC, Malawi, and Papua New Guinea. There were also three articles that covered multiple countries, either in Asia or sub-Saharan Africa. Most of the articles also covered multiple vaccines, usually those in their respective countries' childhood vaccine schedules. Three articles did not specify the type of antigen and discussed childhood immunization in general. Lastly, every article except for three discussed engagement with either NGOs or civil society organizations.

TABLE 2. SUMMARY OF LITERATURE

Resource Type	• 19 peer-reviewed and 3 grey literature articles • Descriptive studies, cross-sectional surveys, qualitative research, program and health information management data analysis, mixed-methods, and evaluations • Discussion papers, such as program reviews and case studies
Geographical Coverage	• Countries covered: India (4), Nigeria (3), Afghanistan (2), Pakistan (2), Angola (1), Bangladesh (1), DRC (1), Kenya (1), Malawi (1), Papua New Guinea (1), Sudan (1), Uganda (1) • 3 articles covering multiple countries in Asia or sub-Saharan Africa
Vaccines Covered	• DPT • Polio • Measles • BCG • Pentavalent • Hepatitis B • Yellow Fever • Measles, mumps, and rubella • Rotavirus • Pneumococcal conjugate • Tetanus • Haemophilus influenzae type b
Private Sector Actors Discussed	• NGOs • CSOs • Faith-based institutions • Non-profit organizations, including humanitarian • For-profit providers or facilities

QUESTION 1: WHAT ROLE DOES THE PRIVATE SECTOR PLAY IN DELIVERING IMMUNIZATION SERVICES IN LMICS TO ZERO-DOSE CHILDREN AND THE COMMUNITIES WHERE THEY ARE MOST CONCENTRATED: FRAGILE SETTINGS, RURAL AND REMOTE AREAS, AND POOR URBAN AREAS?

The review of the literature demonstrated that the private sector is contributing to reaching zero-dose children with immunization services by either directly delivering immunization services to communities or by supporting activities to identify and reach zero-dose children. The literature suggests that NGOs and non-profit facilities play a very important role in both administering vaccines to zero-dose children and supporting activities to increase vaccine uptake in communities with large populations of zero-dose children. There was limited evidence on the contribution of for-profit providers; however, there was some documentation of them delivering immunization services, particularly in countries with existing private sector engagement in health care delivery. The role of the private sector is particularly important in the three contexts where zero-dose children are most commonly found and has been found to increase immunization coverage in these areas. While there is documentation of the role the private sector has played in reaching the unvaccinated, there is no evidence estimating or quantifying the potential number of zero-dose children reached by the private sector. Furthermore, the evidence did not always exclusively focus on reaching zero-dose children, but instead often described efforts to increase vaccination coverage or address coverage and delivery gaps in areas with a high percentage of unvaccinated children.

TABLE 3. SUMMARY OF PRIVATE SECTOR ROLES IN REACHING ZERO-DOSE CHILDREN

Vaccine Administration
• Examples of the private sector delivering immunization services to zero-dose children or in areas with a high number of zero-dose children in Angola, Bangladesh, DRC, Nigeria, Papua New Guinea, Sudan, and Uganda. • Private providers work in conflict-affected settings, remote and rural communities, and poor urban areas, typically in coordination with the government, to supplement public sector services and address immunization service coverage gaps. • The private sector provides immunizations through the establishment of routine immunization services in their facilities, vaccination sessions held on certain days of the week, outreach sites and sessions, and immunization campaigns. • Immunization services may be provided through clinicians working through international, national, or local NGOs, faith-based institutions, and non-profit organizations, as well as for-profit providers in clinics, hospitals, or other private health centers.
Other Interventions to Increase Vaccine Uptake
• The private sector also conducts non-clinical activities to support immunization services and increase the uptake of childhood vaccines. This includes: - Social mobilization - Community engagement - Identifying, registering, and tracking, and follow-up with zero-dose children - Conducting micro-censuses - Educating caregivers on immunization - Referring zero-dose children to vaccination centers - Promoting vaccine-related communication and information - Organizing immunization campaigns - Refurbishing health facilities • These activities are mainly carried out by NGOs and CSOs.

PRIVATE SECTOR ROLE IN ADMINISTERING VACCINES TO ZERO-DOSE CHILDREN

Most of the literature describing the role of the private sector in delivering immunization services to zero-dose children did so in the context of conflict-affected settings, remote and rural communities, or poor urban areas. Two articles highlighted the role of private providers in delivering immunization services to children in conflict settings. In Sudan, a paper reviewed the formalized collaboration between the government and the private sector to deliver immunization services, where the government has utilized public-private partnerships with private providers to fill coverage gaps, such as by asking private providers to establish immunization services in their facilities or set up outreach sites. While this arrangement has typically been done with NGOs, for-profit facilities and private hospitals have also been involved. Public-private partnerships have been particularly important in ensuring immunization services for inaccessible and difficult-to-reach populations and in areas within the country that are conflict-affected, such as the Darfur region, where it was estimated that NGOs provided immunization services to more than 57,000 children, although it was not known how many were unvaccinated.[22]

In the Uruzgan province of Afghanistan, a remote and conflict-affected area of the country, an evaluation of a public-private partnership found that the delivery of immunization services by private providers contributed to increases in childhood immunization coverage in the villages that they served compared to villages that did not have private providers deployed by the partnership. Furthermore, the percentage of unvaccinated children in villages with a private provider was significantly less than in villages without one (5.3% vs. 34.6%). The findings also showed that children in intervention areas accessed immunization either entirely by private providers or a combination of private providers and mass campaigns, while non-intervention areas relied largely (92.5%) on mass campaigns alone.[23]

There were additional examples of the private sector's reach in remote areas, such as a corporate social responsibility (CSR) initiative that provided routine immunization services in a rural community in Edo state of Nigeria where government services were limited and unreliable. Eight years after the initiative began, more than 80% of children had received their full series of vaccines on time, a significant increase from 43% at baseline.[24] The evaluation of a public-private partnership to improve health service delivery in remote Papua New Guinea found that vaccination coverage for children under one year of age increased significantly, including a 25% increase in the measles vaccine, a 58% increase for the first dose of the pentavalent vaccine, and a 75% increase for the oral polio vaccine.[25]

In Angola, an Italian NGO implemented an intervention to strengthen the organization and delivery of immunization services at a non-profit mission hospital in a hard-to-reach area of the country with the aim of reducing the burden of unvaccinated children. The intervention consisted of training, staff reorganization, performance reviews, vaccine stockpile monitoring, involving community health workers, and improving collaboration with the district health department. Vaccination sessions were conducted at both the hospital outpatient clinic and through outreach sessions in communities that were difficult to reach since the non-profit mission hospital was the only facility able to conduct outreach sessions because it had a vehicle and an adequate number of staff. The number of overall doses administered during the intervention period increased by 26%. This was mainly driven by doses administered during outreach sessions, which were 62% higher than before the intervention was implemented.[26]

In Uganda, health care workers from both for-profit and not-for-profit facilities participated in Family Health Days implemented by the Ministry of Health (MOH) and managed by district health officers. Most of the Family Health Day campaigns were conducted in rural areas with the exception of Kampala. The Family Health Days were an additional outreach program implemented in districts in Uganda with low vaccination

coverage to strengthen routine EPI services and target children under 5 who were unimmunized by using places of worship as service delivery points using both public and private sector providers.[27]

The private sector has also contributed to reaching zero-dose children found in urban contexts. In the DRC, a donor-funded project aiming to reach unvaccinated children in Kinshasa worked with the MH to strengthen routine immunization services by adapting the Reaching Every District approach and identifying steps to improve quality of care and reduce dropouts. This included integrating private sector health facilities into the national EPI system, which were almost all of the health facilities in the health zones in the project area and most of which were not providing routine immunization services. Immunization services improved after the integration of private facilities including in one area where the addition of the private sector resulted in a 9.5% increase in the total number of vaccinations and accounted for 8.6% of all vaccinations.[28]

A study in Bangladesh assessed the impact of an EPI intervention package in improving child immunization coverage in urban slums within the existing service delivery system. All immunization services in Dhaka are provided through a public-private partnership where national NGOs deliver more than 95% of immunizations, mainly through outreach sites, generally once a month. Additionally, some providers offer vaccines in static NGO clinics. A collaborative effort between an international health research organization, the MOH, the Dhaka municipal government, and four NGOs implemented a package of interventions, which included an extended EPI service schedule, training providers, implementing an immunization screening tool, and setting up an EPI support group for social mobilization. The evaluation found that the percentage of children 12-23 months old who had received all valid doses of recommended antigens by 12 months increased from 43% to 99%.[29]

PRIVATE SECTOR ROLE IN SUPPORTING ACTIVITIES TO REACH ZERO-DOSE CHILDREN

The private sector, particularly NGOs and CSOs, play an important role in supporting additional immunization activities outside of service delivery that target zero-dose children and communities with low rates of vaccination. This includes social and community mobilization, identifying zero-dose children in communities, helping to address non-vaccination, and promoting vaccine-related communication and information.[22,30,31,32,33,34,35,36,37,38,39] One study in Nigeria identified and documented the role of CSOs in an area with low immunization rates and many hard-to-reach communities due to difficult terrain and communal clashes. While the CSOs did not administer vaccinations, they were an important actor in immunization advocacy, communication, and social mobilization.[30] NGOs also helped to refurbish or build facilities and provide basic health services and education in the communities where they were providing immunization services.[22,24]

In the urban slums of Indore, India, where 60% of children were reported to be missing all their immunizations, a donor-funded project facilitated the partnership between five NGOs and a network of local community-based organizations to lead demand generation activities that linked communities in the slums to maternal and child health services, including immunization. Formative research found that most people received immunization services through outreach camps hosted by public providers in the slums and almost never went to fixed facilities. Therefore, the network of local organizations worked with the public providers to implement the outreach camps by helping to organize them, informing targeted families, and registering and tracking children.[39]

A series of papers described and examined the role of the CORE Group Polio Project in 11 countries towards eradicating polio.[33-38] The CORE Group was an international network of international, national, and local NGOs and CSOs that supported polio eradication activities at the country level. It worked originally in Angola, India, Nepal, Bangladesh, and Ethiopia, and then expanded to Nigeria, Kenya, Somalia, South Sudan, and

Afghanistan. The CORE Group helped to coordinate national and local NGOs to stop polio transmission in places where it was still endemic and to reach unvaccinated children, particularly in hard-to-reach communities. While the activities implemented by NGOs supported by the CORE Group varied based on the local context, most activities focused on 1) community-based social mobilization, 2) surveillance and independent campaign monitoring, and 3) capacity development for local health systems. For example, the CORE Group trained thousands of mobilizers who would disseminate information about polio to caregivers, track unimmunized children, motivate caregivers to vaccinate their children, and support immunization campaigns. Mobilizers would also create registers of pregnant women and newborns to track vaccination status and would then ensure the children received vaccinations, such as by conducting house visits, referring children to vaccination centers, and even accompanying caregivers to receive routine immunization services.[33-38] Identifying and tracking newborns and unimmunized children, educating their caregivers, and referring them was crucial to ensuring all children received polio vaccination.[33,35,37] The mobilizers also played an important role in conducting outreach sessions, particularly in hard-to-reach areas, such as internally displaced people's camps, nomadic communities, security-compromised areas, and transit and cross-border points.[33-38]

In Pakistan, the government in Sindh contracted an NGO network to conduct a community micro-census and register all pregnant women and children that was then used to calculate immunization coverage and inform micro-planning. These activities were part of a larger program to develop an electronic census-based immunization information system to strengthen routine immunization services, including by identifying the unvaccinated. The percentage of fully immunized children increased from 18% to 52%.[40] Table 5 in the annex provides a comprehensive summary of the private sector roles, as well as the models for engagement described later, that were identified through a review of the literature.

QUESTION 2: WHAT BARRIERS OR ENABLERS DO PRIVATE SECTOR PROVIDERS FACE IN PROVIDING SERVICES AND WHAT MOTIVATIONS DO THEY HAVE TO REACH ZERO-DOSE CHILDREN?

The literature review found limited evidence on private providers' barriers and enablers to reaching zero-dose children. There was also very limited information on what motivations the private sector has to reach or deliver immunizations services to communities with unvaccinated children. Additionally, when the literature did address barriers and enablers, it was often in the context of delivering immunization services in hard-to-reach areas with high rates of unvaccinated children, and not specific to zero-dose children. A study assessing barriers and facilitators of CSO engagement in Nigeria identified geographic inaccessibility, lack of transportation, health worker shortage, communal clashes, preference for traditional medicines, misinformation and vaccine hesitancy, cultural beliefs and norms such as protecting the firstborn child and preferring male children, and distrust of vaccinators as barriers.[30] Maintaining a cold chain for vaccine storage and an interrupted supply chain were challenges to implementing a CSR initiative in rural Nigeria.[24] In the evaluation of a public-private partnership in remote Papua New Guinea, health workers cited a range of barriers to providing effective health services, including immunization. In addition to a lack of supervision, lack of community support, and cultural barriers, the workers noted that the lack of basic supplies, such as fuel for transportation and medical supplies, made it difficult to conduct outreach sessions.[25]

A study on the knowledge, attitudes, and practices of private immunization service providers in two urban settings in Gujarat State, India found that even though the providers offered a wide range of vaccines, there was a high prevalence of practices that lead to missed opportunities for vaccination, including being unwilling to administer multiple vaccines in the same visit and not adhering to the vaccination schedule. Providers' reasoning for not administering multiple vaccines was because of their judgment on risks and benefits. They

also reported varying from the vaccination schedule because of concerns about the caregiver's ability to pay for the provision of multiple vaccines at the same time. Recordkeeping and reporting practices were also found to be suboptimal, mainly because providers were not aware of reporting requirements, did not know how, or were concerned about tax implications.[41]

The same study on barriers to and facilitators of CSO engagement found that CSOs having community advocates and support from leaders, leveraging traditional dissemination channels, and using alternative immunization points helped to reach communities. Furthermore, CSOs used their existing relationships and experience in community mobilization and communication to build trust in vaccines among community members.[30] Another review of volunteer community mobilizers supported by NGOs in Nigeria to support the polio eradication initiative demonstrated how the community mobilizers were successful in reducing the number of missed children because they resided in the communities they were serving, spoke the language and understood the culture, established relationships with families, participated in micro-planning, and provided useful information on the communities.[35]

In Sudan, government support and regulation were enablers to deliver immunization services to hard-to-reach and conflict-ridden areas, including free vaccines and cold chain equipment, as well as the placement of government vaccinators in private facilities. It was also reported that private facilities leveraged their partnership with the EPI program to promote their health services and subsequently increase their client base.[21] A similar motivator was reported in the DRC, where the project worked to integrate some of the private facilities into the EPI as a routine immunization provider by highlighting to them how families visiting their private facility for child routine immunization services could also bring in business for other health services they needed.[28]

QUESTION 3: WHAT MODELS FOR PUBLIC-PRIVATE ENGAGEMENT EXIST FOR REACHING ZERO-DOSE CHILDREN AND WHAT FACTORS HAVE ENABLED THEM TO BE SUCCESSFUL?

The literature review identified existing public-private engagement models that aim to reach zero-dose children with immunization services in Angola, Bangladesh, the DRC, Kenya, Nigeria, Papua New Guinea, and Sudan. There were a variety of mechanisms used for engagement, with some more formal than others. Many of the models involved multiple stakeholders, including international, national, and local actors; and some of them focused on partnerships between two private entities that then collaborated with the public sector. There was limited evidence that assessed the mechanisms for engagement and rather described them in relation to activities implemented through a partnership.

In Kenya, an international non-profit humanitarian organization and its national chapter partnered with local community health workers and a local NGO to implement a strategy to identify zero-dose children and promote vaccination through social mobilization. They then engaged with government officials from local, state, and national levels to align goals and objectives and exchange information.[31] A similar partnership was seen in Angola, where an Italian NGO supported a non-profit mission hospital to implement a multifaceted intervention to strengthen immunization services and reduce the number of unvaccinated children in hard-to-reach communities. The hospital was already co-managed by the local catholic diocese and the national government and the district health department was responsible for providing vaccines, cold chain equipment, and other supplies to all vaccination points. A facet of the intervention focused on improving coordination and collaboration with the district health department, including for the planning of targeted outreach sessions and the sharing of immunization data and health information.[26] An urban health program in India also used a private-to-private partnership model between NGOs and community-based organizations

that collaborated closely with providers from the public health system to deliver immunization services and conduct outreach sessions in urban slums.[39]

The CORE Group supported national and local NGOs by facilitating collaboration and coordination from the community-level to the national-level and then to the global-level as well. To do this, the CORE Group used a secretariat model that consisted of a global secretariat that oversaw country secretariats and represented NGOs at regional and global planning meetings. The global secretariat had contracts with international NGOs who were members of the CORE Group and worked in-country. These international NGOs would then have contracts with national and local NGOs who carried out the activities. Each country where the CORE Group worked had their own secretariat office that was hosted by a NGO and was responsible for overseeing the implementation of activities in-country and supporting all national and local NGOs in the country that received grants through the CORE Group. The director of the country-level secretariat acted as a spokesperson for the national NGOs and participated in national and global policy and decision-making.[33]

In Afghanistan, an international NGO working in the country initiated a public-private partnership where it trained private providers to deliver immunization services in remote and conflict-affected areas of the country. In addition to training, the NGO helped to renovate facilities, provided supplies, scheduled vaccination days, coordinated the transport and storage of vaccines, covered the costs of the services, provided the providers a monthly stipend, established a private medical association, and conducted community engagement activities. The NGO implemented the program in close collaboration with Afghanistan's Basic Package of Health Services program in the province, including for vaccine distribution, referral systems, and immunization campaigns.[23]

There was one example of a CSR initiative implemented in a rural part of Nigeria where government services were limited and only 43% of children at baseline had received all their age-appropriate vaccines. A private multinational pharmaceutical company funded a public-private partnership that provided capacity development and local support to establish routine immunization services. The CSR initiative covered all program costs, including clinic staff, as well as costs for refurbishing the clinic, and for equipment and supplies. Throughout the initiative, the project team collaborated closely with the local government and the state MOH, including in the design of the project and the sharing of information and data. The initiative also focused on developing capacity within the government so that by the end of the project, services were transitioned to a newly built government-supported primary health care center.[24] Another example of a donor-funded project facilitating private sector engagement was seen in the DRC, where a project supporting the MOH to reach unvaccinated children and strengthen routine immunization services worked to integrate private health facilities into the EPI system. Once facilities started providing EPI services, they were required to comply with EPI norms (e.g., reporting) and they in turn received training and supervision.[28]

One study evaluated a service delivery program in a remote area of Papua New Guinea that was implemented through a partnership between a private contractor, an NGO, and the government. Instead of using a traditional public-private partnership model, the NGO contracted out a private organization that then delivered services to the public in collaboration with providers from the government and faith-based organizations. The private organization worked within existing government systems when possible and ensured service delivery was aligned with national policies, plans, and strategies.[25]

There were only two cases identified through the literature review where private sector engagement to reach unvaccinated communities was driven by the government. A review of public-private partnerships for immunization services in Sudan reported that the government has been engaging private providers to fill gaps in immunization coverage and service delivery since 1995, when the Khartoum State MOH established a regulatory framework for immunization services by non-governmental providers and integrated them into

the state immunization program. Other states then followed using a similar mechanism, which requires NGOs and for-profit providers providing immunizations to be registered and meet quality standards to receive a license for their facility. Outside of Khartoum, NGOs are regulated by the Humanitarian Aid Commission and any provider delivering immunization services has to have a memorandum of understanding (MOU) with the State MOH. Through these agreements, the government provides private facilities with free vaccines, data collection forms, and regular trainings while private facilities are required to comply with the MOUs, which involves administering vaccines for free, following national immunization policy and the vaccination schedule, reporting requirements, and supervisory visits. Furthermore, private facilities are included in micro-planning and mapping of immunization services and are represented on technical immunization committees and health coordination tasks forces at both the state and national levels.[22] Similarly, in Dhaka, the government has a formal public-private partnership with several national NGOs who deliver most immunizations with oversight from the municipal government. The MOH's national EPI program supports the partnership by ensuring the supply of vaccines, supplies, and equipment, while the municipal government assists the NGOs in planning, monitoring, and evaluation.[29]

Although most of the literature focused on evaluating programs implemented through public-private partnerships, several success factors related to private sector engagement were highlighted. Aligning the partnership's objectives with those of the government was found to be an important factor in ensuring that programs were effective in increasing immunization services and reaching unvaccinated populations.[23-25,32-35] Working within existing EPI systems was also crucial to the success of these models, especially because it strengthened the accountability of private sector actors to the government.[22,25,28,29,33,34,37] All of the private sector engagement models identified involved collaboration among multiple levels of stakeholders in order to reach zero-dose children.[22,24-26,28,29,31,33,36,37] This required creating a shared mission and vision among all involved, sharing information, and reviewing progress. Using a community-based approach that both engaged community members and tailored programs to local needs and contexts was considered a cornerstone of most of the private sector engagement models. This was particularly relevant when reaching unvaccinated children in hard-to-reach areas because programs needed to be adapted to the complexities of the communities they were serving.[24,26,28,29,31-33] The integration of additional health services beyond immunization has also facilitated the success of programs as it allowed immunization programs to respond to other community needs.[25,26,33,34]

Several additional factors were identified as contributing to the success of the CORE Group's secretariat model, some of which were directly related to the use of NGOs to implement activities. The CORE Group leveraged the strengths of NGOs, such as their existing visible presence in communities, innovation, and willingness to be accountable to both donors and communities.[33] Furthermore, the secretariat model was able to establish partnerships among NGOs, therefore allowing them to coordinate their activities and expand their scope and impact.[34] The secretariat model also improved coordination with various levels of government as well as international agencies, and created a mechanism to monitor NGO implementation. In addition to helping set a common mission among many partners, the CORE Group secretariat helped to develop NGO capacity, defined partner roles to avoid duplication of efforts, prioritized frequent engagement, allowed for operational freedom, and created a transparent partnership structure.[37]

QUESTION 4: WHAT PROMISING PRACTICES EXIST (AND AT WHAT LEVELS) TO ENGAGE PRIVATE SECTOR PROVIDERS IN IMMUNIZATION SERVICES FOR ZERO-DOSE CHILDREN?

The review of the literature found promising practices for engaging the private sector in immunization services for zero-dose children.

TABLE 4. PROMISING PRACTICES FOR THE PRIVATE SECTOR TO REACH ZERO-DOSE CHILDREN

Vaccine Administration
• Outreach sessions • Screening child's vaccination status during any health contact • Improved recordkeeping and use of child vaccination registers • Increased training and supervision • Government accreditation and oversight
Other Interventions to Increase Vaccine Uptake and Private Sector Involvement
• Social mobilization • Community engagement, including support groups • Identifying and registering unvaccinated children and tracking vaccinations status • Micro-planning • Linkages and coordination with government decision-making mechanisms

Multiple studies demonstrated how private providers conducted or were engaged by the public sector to participate in outreach sessions where immunizations services were delivered, particularly to children in hard-to-reach and remote areas. Outreach sessions have been shown to increase childhood vaccine coverage.[25-27,42] In Angola, the public health staff at a non-profit mission hospital who administered vaccines were rotated between fixed delivery points and outreach sessions to reduce and fairly distribute workload; this was found to be particularly helpful in ensuring human resources. Although not directly related to administering vaccines, social mobilization and community engagement are important in addressing barriers to immunization services.[26] The private sector, particularly NGOs, have been shown to be key actors in conducting social mobilization activities and engaging communities in immunization services. As part of social mobilization, NGOs have helped in identifying, registering, and tracking unvaccinated children. For example, in Bangladesh, NGOs delivering immunization services also worked with the municipal government to set up an EPI support group that were helpful in reducing the number of unvaccinated children as the support group members who lived in the slums helped to keep track of which children had yet to be vaccinated and also motivated the mothers to go to the EPI vaccination centers.[29] Social mobilization and the use of community mobilizers was a key pillar in the activities implemented by NGOs under the CORE Group and one of the key mechanisms used to reach unvaccinated children.[33-38]

The literature also showed that strengthening the quality of immunization services delivered by private sector providers could help to reach zero-dose children.[22,28,29,40] The findings of a study of the knowledge, attitudes, and practices of private immunization service providers in two urban settings in Gujarat State, India suggested that missed opportunities for vaccination could be reduced by simple changes, such as performing opportunistic screening for vaccination status and through improved and increased use of facility-based records and child vaccination registers. Other activities could include working through professional societies to adopt standards of practice on vaccination and recordkeeping and supervision to improve service quality. Training, supervision, and government oversight and accreditation were also identified by other papers as mechanisms for improving quality.[41] In Bangladesh, the implementation of a screening tool was found to be particularly important in identifying children with an unmet need for immunization and either vaccinating them at the same clinic where they were identified or referring them to nearby centers for vaccination.[29]

Including the private sector in decision-making on and planning for immunization services also helps to strengthen engagement, ownership, and accountability for private providers of immunization services.

Including them in micro-planning helps not only to identify facilities that have the potential to reach lots of children, but also to engage them in planning and resourcing discussions around service delivery.[22,28,33] One paper in particular highlighted the process the Sindh Government in Pakistan undertook in collaboration with stakeholders and partners, including the private sector, to develop strategies and interventions for addressing inequity in urban immunization services in Karachi and the root causes of zero-dose. The strategies and interventions were developed with multiple layers of input and feedback from stakeholders and focused primarily to address gaps in governance, leadership and accountability; immunization service delivery; and building demand and trust among the people. Interventions identified included strengthen functional linkages and coordination between the stakeholders, such as the Sindh EPI program, municipal authorities, and the private sector, as well as developing a private sector engagement strategy to provide immunization services in areas where there was no public health facility or health workers available, such as through MOUs for public-private partnerships.[43]

DISCUSSION

The review of the literature has shown that the private sector does contribute to reaching zero-dose children with immunization services, both through service delivery and activities to increase vaccine uptake. However, the extent of this contribution is still not well-understood. While the literature review did identify mechanisms used to reach zero-dose children with immunization services, the literature did not clearly distinguish between efforts to immunize zero-dose children versus under-vaccinated children. Reaching zero-dose children was mostly discussed within the context of strengthening routine immunization services or delivering services to hard-to-reach areas, without necessarily making the discernment between different levels of vaccination status. Therefore, while best practices and recommendations can be made on how the private sector can contribute to strengthening immunization services in areas with low coverage, there is still limited understanding and documentation of what role the private sector can play to specifically reach the children who have received no basic routine immunization.

The findings demonstrate that NGOs play an important role within the private sector in reaching zero-dose children, including vaccine administration and carrying out activities to promote vaccination. While there was some indication that for-profit providers also contribute to reaching communities with zero-dose children, with specific examples from Sudan and an urban area of India, the evidence was much more limited. This could be because non-profit facilities tend to be better coordinated with the government and are likely to be found in the areas where zero-dose children are concentrated.[15,16] The literature has also shown that private providers are already delivering immunizations in conflict-affected settings, remote and rural communities, and poor urban areas and are helping to fill coverage gaps where government services are limited or even non-existent. In settings where this is happening, the government should focus on establishing or strengthening regulatory frameworks and guidelines to ensure that the private sector is integrated into existing national immunization programs and that strategies to reach zero-dose children are coordinated.

The literature also highlighted the very important role that the private sector, particularly NGOs and CSOs, have in supporting activities to identify zero-dose children and increase vaccine uptake through social mobilization, community engagement, education and communication, and tracking vaccination status. Given that NGOs and CSOs bolster immunization programs because of their localized knowledge of and relationships within communities, any efforts aiming to reach zero-dose children should include local NGOs and CSOs as key stakeholders in designing, planning, and implementing strategies to deliver immunization services to communities with zero-dose children.[33,44] This specific role also emphasizes how approaches to ensure that zero-dose children receive appropriate vaccinations will require a differential and equitable focus to address the specific community needs and barriers to vaccination that factor into a zero-dose status. Any

efforts aiming to reach zero-dose children need to include community engagement and should consider using community-based approaches, such as social mobilization. Approaches using civil society and community engagement to reach zero-dose children are also key priorities for Gavi, and further work should explore and document CSO's contributions.[45]

Various models for public-private engagement have been used to reach zero-dose children, with many models using mechanisms already common in private sector engagement, such as contracting-out of services and MOUs. However, the literature did not always detail the exact partnership mechanisms and instead focused on the overall collaboration between partners and sectors. Furthermore, none of the models identified exclusively targeted zero-dose children and were more focused on broader efforts to strengthen immunization services, which included reaching those missed by routine services. While there were some examples of government-led partnership models, many of the models described partnerships initiated by international NGOs and other private sector actors. Although governments were always involved in these models, typically by contributing to planning or vaccine and supplies distribution, the lack of evidence on government-led initiatives suggests the need to develop government capacity to facilitate partnerships with the private sector. Furthermore, this highlights the role that donors and funders have in programming that prioritizes zero-dose children and in working with country counterparts to design and implement coordinated strategies on delivering immunization services to unreached communities. Donor support for efforts aiming to reach zero-dose children should also be better documented and assessed, particularly as countries transition and graduate from external funding, such as in the case of Angola, which has seen some decreases in immunization coverage after transitioning out of Gavi support.[46]

The literature has demonstrated that in order to leverage the full potential of the private sector to deliver immunization services to unreached areas and target zero-dose children, overall engagement with the private sector needs to be strengthened. Although there was limited evidence on private providers' barriers to reaching zero-dose children, supply chain issues and a lack of supplies were identified as challenges to delivering immunization services. Meanwhile, access to free vaccines was considered an enabling factor to high private sector engagement in Sudan and several public-private engagement models consisted of the government supplying vaccines, equipment, and supplies to private providers. Governments wanting to include private providers in efforts to reach zero-dose children should consider replicating this model of engagement, which could further be strengthened by agreements requiring private sector reporting in exchange for government-provided supplies. Poor or non-existent reporting is a known challenge among private sector facilities and using free vaccine supply as an incentive could improve reporting and data sharing.[47] Additionally, improved reporting from private sector providers delivering services in communities with high percentages of zero-dose children could help to improve coverage estimates and decision-making and planning on how to target the unvaccinated.

Improving the quality of private sector immunization services could also help zero-dose children receive appropriate and timely vaccinations. Several of the engagement models identified through the literature review focused on developing the capacity of private providers to provide routine immunizations in hard-to-reach areas or those with low immunization coverage through training and supervision. Other activities included implementing a checklist to screen a child's vaccination status and then refer for immunizations as needed. Evaluations of these programs found that immunization coverage increased in the areas being served by the private providers, suggesting that efforts to engage the private sector in reaching zero-dose children should explore implementing and scaling-up similar activities. While these examples highlighted through the literature review were primarily led by NGOs in collaboration with government counterparts, governments also have a role to play in ensuring that private providers receive training and supervision on issues such as immunization schedules, proper vaccine storage and handling, and messaging around routine

immunization, which could be enforced through regulations, quality standards and systems, and licensing requirements.[18,48] Other opportunities to improve service quality among private providers include using provider associations and societies, which can help develop and adopt standards of practice, provide training, and increase cross-sectoral coordination.[18,49]

Collaboration between the public and private sectors was a key success factor identified across all public-private engagement models. Even in partnerships where the public sector did not lead the implementation of efforts to reach zero-dose children, the government, ranging from the sub-national to national level, was engaged as a key stakeholder, particularly in planning for activities. Cross-sectoral coordination will be key to increasing the coverage of immunization services in the hardest to reach communities. Furthermore, governments should prioritize the inclusion of the private sector in immunization-related decision-making, policy-making, and micro-planning to expand the reach of national immunization programs and develop and implement strategies that specifically target zero-dose children. This will also facilitate government oversight and improve accountability of private sector facilities delivering immunization services. Governments should also leverage NGOs and CSOs to help identify and track zero-dose children, while also working to identify new private sector partners that have the potential to support the delivering of immunization services to zero-dose communities. In addition to their potential role in capacity development, provider societies can also advocate on behalf of private providers in policy-making and decision-making processes on reaching zero-dose children.[49]

Although the literature identified promising practices, approaches, and mechanisms that could be implemented through the private sector to reach zero-dose children with immunization services, it is less clear which practices would be most effective to specifically target zero-dose children, as opposed to children who are under-vaccinated. Outreach sessions were found to be an effective method for reaching children with vaccination services in hard-to-reach areas, particularly in the specific geographical settings where zero-dose children are most likely to be found. Other practices that should be scaled-up to help zero-dose children receive their immunizations include vaccination screening checklists, registers and other information tools to track vaccination status, and community support groups. The importance of information systems and data tools in identifying, reaching, and monitoring zero-dose children was also highlighted in a landscape analysis.[50] Further work should explore how these practices can be strengthened and implemented in the private sector. Future efforts should also look at how private sector engagement mechanisms and public-private partnerships can be optimized to reach zero-dose children, particularly in the settings where they are most likely to live. This could include contracting private sector facilities to provide immunization services in communities with high percentages of zero-dose children or establishing formal partnerships with NGOs and CSOs whose primary purpose is to identify, track, and register zero-dose children. In areas with a high prevalence of zero-dose children, collaborations between the government, private providers, and NGOs should be strengthened to implement multi-faceted programs that incorporate elements related to social mobilization, identifying and tracking zero-dose children, and vaccine administration.

Future research should examine the barriers and enablers to private sector engagement in reaching zero-dose children, as well as what may motivate private providers to participate in immunization service delivery for zero-dose children. This information could help to optimize both service delivery and engagement mechanisms, which were not adequately captured in this literature review as barriers, enablers, or motivators to private sector engagement to reach zero-dose children have not been well-documented. Additionally, the literature included had a limited geographic focus, with no evidence captured outside of Asia or sub-Saharan Africa, even with non-English documents being reviewed. This is an important gap in the literature and indicates a lack of documentation of private sector engagement roles and models. Another limitation of this literature review is that no article used the same definition to measure zero-dose or lack of

immunization, which may limit the ability to compare public-private engagement models and strategies. Additionally, although this literature review did not formally assess the quality of the literature, the scope, rigor, and generalizability of the articles included did vary significantly.

CONCLUSION

The findings of the literature review demonstrated that all formal private sector actors (for-profit clinicians, non-profit facilities, NGOs, CSOs, humanitarian organizations, and faith-based institutions) are currently engaged to varying degrees in efforts to reach zero-dose children, playing a notable role in either reaching these children through social mobilization and community-based approaches or administering vaccines directly to the communities where they live, particularly in the three settings where they are most concentrated: conflict-affected settings, remote and rural communities, and poor urban areas. Overall, there has been very little research or documentation on private sector engagement in reaching zero-dose children, limiting the scope and depth of this review. Additionally, many studies did not exclusively focus on zero-dose children and discussed reaching the unvaccinated within the context of increasing immunization coverage overall, highlighting the need to improve the documentation on how zero-dose children have been reached.

The concept of zero-dose children has only recently been positioned as a key measure within the global immunization agenda and is still being developed as a central tenant of equitable access to quality immunization service.[20,51] Donors and governments must embrace a cross-sectoral approach as they continue to focus on reaching zero-dose children to address declines and inequities in immunization coverage. Integrating the private sector into efforts and strategies targeting zero-dose children will strengthen routine immunization services while also helping to address the factors and vulnerabilities associated with zero-dose children. To maximize the role of the private sector in reaching zero-dose children with immunization services, future actions and research need to focus on the following: 1) understanding the barriers, enablers, and motivations of private sector engagement in delivering immunization services to zero-dose children; 2) clearly defining the roles of the various private sector providers and organizations (both for- and non-profit) and the levels of government involvement; 3) tailoring private sector mechanisms and approaches to specifically target zero-dose children and address the causes of non-vaccination; 4) assessing and documenting the private sector engagement mechanisms used to reach zero-dose children, and 5) realizing the potential of NGOs and CSOs to support identifying and tracking zero-dose children.

ANNEX 1. PRIVATE SECTOR PARTNERSHIP SUMMARY TABLE

The tale below summarizes the private sector roles and engagement models identified through the literature review. It is organized by the type of partnership and then details the private sector actors, their role in the partnership, and how they were engaged. It also describes what role the government played and the country where the partnership was implemented.

Model Types	Examples from the Literature				
	Country	**Private Sector Role**	**Private Sector Actors**	**Private Sector Engagement**	**Government Role**
Private-to-private Partnerships	Western Kenya	Identify missed children through house-to-house surveys and promote vaccination through social mobilization	• International non-profit humanitarian organization and national chapter • Local NGO	International non-profit organization and national chapter of organization worked with local NGO to implement activities; partnership mechanisms not specified	Officials from multiple levels involved in meetings to align goals and objectives, and exchange information for future planning
	Ombadja District, Angola	Routine delivery of immunization services via a fixed delivery site and outreach sessions	• International NGO • Non-profit mission hospital co-operated by Catholic diocese and national government	International NGO supported hospital to implement intervention to improve immunization services (training, vaccine stockpile monitoring, performance reviews)	District health department provided vaccines, cold chain equipment, and supplies; exchanged immunization data and health information; and participated in outreach session planning
	Uruzgan Province, Afghanistan	Private sector delivery of childhood	• International NGO • Private providers	International NGO trained and equipped private providers to	Provincial Basic Package of Health Services program provided vaccines and

Model Types	Examples from the Literature				
	Country	**Private Sector Role**	**Private Sector Actors**	**Private Sector Engagement**	**Government Role**
		vaccination services		deliver services through capacity development interventions	systems for referral, and assisted in mass vaccination campaigns
	Western Province, Papua New Guinea	Implemented health program, including immunization services	• NGO • Private organization • Private providers	NGO contracted private organization to deliver services; included existing private providers in partnership committee and program implementation	Government officials included in program design planning, in partnership committee; provided medical supplies; public providers included in implementation
	Multi-country/CORE Group Polio Project	Social mobilization, support immunization campaigns, track and follow-up with zero-dose children	• International, national and local NGOs	Network of NGOs that implemented activities at country level; based on secretariat model with international NGOs contracting national and local NGOs	Collaboration in implementation, alignment of goals and objectives
Donor-supported Partnerships	Edo State, Nigeria	Provided immunization services in rural area with no government-services	• GlaxoSmithKline Biologicals	CSR initiative completely funded by multinational pharmaceutical company	Initiative worked with government to transition services; sometimes provided supplies and commodities

Model Types	Examples from the Literature				
	Country	**Private Sector Role**	**Private Sector Actors**	**Private Sector Engagement**	**Government Role**
	Kinshasa, DRC	Strengthening of routine immunization services using Reaching Every District approach	• Private facilities • Implementing partner	Implementing partner worked with the MOH to integrate private facilities into EPI so they could offer immunization services	Project implemented in collaboration with the MOH
Government-led Partnerships	Sudan	Provision of immunization services, social mobilization	• For-profit providers • NGOs	Private sector facilities integrated into national immunization program through MOU and regulatory frameworks	Provide oversight to private sector facilities providing immunization services; provide vaccines, equipment, and supplies, and data collection forms and trainings
	Dhaka, Bangladesh	Provision of immunization services	• National NGOs	NGOs provide almost all immunization services through formal partnerships	Provide vaccines, supplies, equipment, planning, monitoring, and evaluation

ANNEX 2. SUMMARY OF LITERATURE REVIEW ARTICLES

The following tables summarizes the citations identified and reviewed from the literature review search, including citation information, the type of literature, the purpose of the article, and the countries and vaccines covered.

Source	Type of Literature	Purpose	Countries Covered	Vaccines Covered
Ahmed, Nada, Denise DeRoeck, and Nahad Sadr-Azodi. "Private Sector Engagement and Contributions to Immunisation Service Delivery and Coverage in Sudan." 2019.	Journal article (case study)	Review formal collaboration between the government in Sudan and the private sector in the planning and delivery of immunization services	Sudan	Pentavalent (3rd dose)
Martijn Vink et al. Ahmed, Nada, Denise DeRoeck, and Nahad Sadr-Azodi. "Does Support to Private Health Practitioners Increase Childhood Vaccination Coverage? Findings from a Comparative Study in Afghanistan." 2021.	Journal article (quantitative evaluation)	Assess public-private partnership program training and equipping private providers on childhood vaccination coverage	Afghanistan	Polio (3rd dose), DTP (3rd dose), measles (1st dose)
Aima A. Ahonkhai et al. "Lessons for Strengthening Childhood Immunization in Low- and Middle-Income Countries from a Successful Public-Private Partnership in Rural Nigeria." 2022.	Journal article (case study)	Describ public-private partnership supported by a CSR initiative to administer a childhood immunization program	Nigeria	BCG, polio (0–3rd doses), hepatitis B (1st–3rd doses), DPT (1st–3rd doses), measles, yellow fever
Emma Field et al. "A Partnership Model for Improving Service Delivery in Remote Papua New Guinea: A Mixed Methods Evaluation." 2018.	Journal article (mixed-methods evaluation)	Report on a health service delivery program and results of midline evaluation of program	Papua New Guinea	Pentavalent (3rd dose) and measles

Source	Type of Literature	Purpose	Countries Covered	Vaccines Covered
Mattia Fattorini et al. "Strengthening Routine Immunization Services in an Angolan Comuna: The Fight against the Burden of Unvaccinated Children in the Sustainable Development Goals Era." 2019.	Journal article (quantitative evaluation)	Evaluate interventions aiming to strengthen routine immunization services	Angola	Polio (0–3rd doses), BCG, hepatitis B (birth dose), pentavalent (1st–3rd doses), pneumococcal conjugate (1st–3rd doses), rotavirus (1st–2nd doses), measles, yellow fever
Ezekiel Mupere et al. "Family Health Days Program Contributions in Vaccination of Unreached and Under-Immunized Children during Routine Vaccinations in Uganda." 2020.	Journal article (quantitative evaluation)	Evaluate contribution of Family Health Days in improving access to routine expanded program for immunization for unimmunized and under-immunized children	Uganda	DPT (3rd dose) and measles
JSI. "Reaching Unvaccinated Children: Lessons Learned from JSI's Technical Assistance to the Government of the DRC for Improving Access and Utilization of Routine Immunization Services." n.d.	Grey literature (case study report)	Report on lessons learned from a project working with the MOH and urban municipalities in Kinshasa to strengthen routine immunization service delivery	DRC	Pentavalent (1st–3rd doses), BCG, polio (birth dose)
Md Jasmin Uddin et al. "Child Immunization Coverage in Urban Slums of Bangladesh: Impact of an Intervention Package." 2010.	Journal article (mixed-method evaluation)	Evaluate package of interventions to improve child immunization coverage in urban slums of Dhaka	Bangladesh	BCG, measles, DPT (1st–3rd doses), polio, hepatitis B (1st–3rd dose)

Source	Type of Literature	Purpose	Countries Covered	Vaccines Covered
Aniekan Etokidem et al. "Potential Barriers to and Facilitators of Civil Society Organization Engagement in Increasing Immunization Coverage in Odukpani Local Government Area of Cross River State, Nigeria: An Implementation Research." 2021.	Journal article (qualitative)	Assess barriers to and facilitators of CSO engagement in increasing immunization coverage, and also mapped active CSOs	Nigeria	Not specified
Mary Agócs et al. "Reasons Why Children Miss Vaccinations in Western Kenya; A Step in a Five-Point Plan to Improve Routine Immunization." 2021.	Journal article (qualitative)	Describe experience of engaging with caregivers and health workers to understand reasons for why children missed vaccinations and reasons identified	Kenya	Measles, pentavalent (1st or 3rd dose), BCG
Catholic Relief Services. "Civil Society Organization Platforms Contribute to National Immunization Programs." 2019.	Grey literature (report)	Describe best practices and lessons learned from civil society platforms contributing to efforts to increase immunization coverage in 24 countries	Ethiopia, Sierra Leone, South Sudan, Burkina Faso, Kenya, Zambia, Uganda, Pakistan, Cameroon, Chad, Nigeria, Togo, India, Madagascar, Guinea, Somalia, Mali, Malawi, Liberia	Measles, BCG, polio, DPT, hepatitis B, yellow fever, whooping cough, haemophilus influenzae type b, mumps, rubella
Lee Losey et al. "The CORE Group Polio Project: An Overview of Its History and Its	Journal article (case study)	Describe overall work of the CORE Group Polio Project	Uganda, Angola, India, Nepal, Bangladesh, Ethiopia, Nigeria,	Polio

Source	Type of Literature	Purpose	Countries Covered	Vaccines Covered
Contributions to the Global Polio Eradication Initiative." 2019.			Kenya, Somalia, South Sudan, Afghanistan	
Henry B. Perry et al. "Lessons Learned from the CORE Group Polio Project and Their Relevance for Other Global Health Priorities." 2019.	Journal article (case study)	Describe strategies implemented by CORE Group Polio project to reach missed children	India, Ethiopia, South Sudan, Kenya, Somalia, Uganda, DRC, Angola, Nigeria, Sierra Leone, Guinea Liberia	Polio
Janefrancis Ijeoma Duru et al. "Contributions of Volunteer Community Mobilizers to Polio Eradication in Nigeria: The Experiences of Non-Governmental and Civil Society Organizations." 2019.	Journal article (mixed-methods)	Review the polio eradication initiative in Nigeria and use of NGOs, CSOs, and volunteer community mobilizers	Nigeria	Polio
Chimpololo, Andrew, and Vanessa Burrowes. "Use of Social Mobilization and Community Mobilizers by Non-Governmental Health Organizations in Malawi to Support the Eradication of Polio, Improve Routine Immunization Coverage, and Control Measles and Neonatal Tetanus." 2019.	Journal article (mixed-methods)	Assess contribution of NGOs in promoting use of social mobilization and community mobilizers to share information related to polio, measles, and neonatal tetanus	Malawi	Polio, measles, neonatal tetanus
Solomon, Roma. "Involvement of Civil Society in India's Polio Eradication Program: Lessons Learned." 2019.	Journal article (case study)	Describe role of civil society in India's polio eradication program supported by the CORE Group Polio	India	Polio

Source	Type of Literature	Purpose	Countries Covered	Vaccines Covered
		Project and how the program overcame barriers		
Jitendra Awale et al. "Effective Partnership Mechanisms: A Legacy of the Polio Eradication Initiative in India and Their Potential for Addressing Other Public Health Priorities." 2019.	Journal article (literature review and quantitative analysis)	Report on lessons learned from building and coordinating partnerships for the polio eradication initiative in India supported by the CORE Group Polio Project	India	Polio
Bhanot, Arti, Siddharth Agarwal and Karishma Srivastava. "Improving Age Appropriate Immunization among Urban Poor Infants: Possible Options and Approaches." 2005.	Grey literature (mixed-methods)	Report on formative research to understand age-appropriate receipt of DPT vaccines and drop-out rates	India	DPT (1st and 3rd doses)
Erin Sullivan et al. "Electronic Immunization Information Systems: A Case Report of Lessons Learned from Implementation in Pakistan." 2020.	Journal article (case study)	Describe technical assistance provided to the Sindh Department of Health/Expanded Program on Immunization to strengthen routine immunization by developing and deploying an immunization information system	Pakistan	Tetanus, pentavalent (3rd dose)
José E. Hagan et al. "Knowledge, Attitudes, and Practices of Private Sector Immunization Service Providers in Gujarat, India." 2018.	Journal article (mixed-methods)	Assess the knowledge, attitudes, and practices of urban private immunization service providers	India	BCG, hepatitis B, polio, DTP, measles

Source	Type of Literature	Purpose	Countries Covered	Vaccines Covered
Raveesha R. Mugali. "Improving Immunization in Afghanistan: Results from a Cross-Sectional Community-Based Survey to Assess Routine Immunization Coverage." 2017.	Journal article (quantitative)	Estimate national and provincial levels of immunization coverage and identify reasons for why children were not immunized	Afghanistan	BCG, pentavalent, polio, measles (1st dose)
Iqbal Hossain et al. "Rethinking Strategies to Address Inequity in Immunization Services towards Achieving Universal Immunization Coverage (UIC) in Karachi, Pakistan." 2021.	Journal article (case study)	Describe process Sindh government used to collaborate with stakeholders to develop strategies and interventions address inequity in urban immunization services	Pakistan	Not specified

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