

A photograph of a woman with a white headwrap and a white shirt, holding a baby in a red and white striped outfit. The woman is looking towards the camera with a serious expression. The background is a plain wall with some papers pinned to it. A dark blue rectangular box with white text is overlaid on the left side of the image.

Synthesis of Immunization Service
Experience Interventions and
Monitoring and Measurement
Approaches for Zero-dose and
Under-immunized Children

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Photo credit: Kate Holt/MCSP

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Executive Summary



Background

Immunization Service Experience (SE) is a new concept that the Vaccination Demand Hub defines as *factors within and beyond the interactions between a health worker and an immunization client, which influence the experience and delivery of the immunization service* (Figure 1, page 8). Ensuring positive SE is important for improving local vaccine demand and shoring up quality, equitable immunization services in low-and-middle-income countries (LMIC), particularly for missed communities with zero-dose and under-immunized children. To advance current understanding of SE, a review and synthesis of SE-relevant literature was carried out to answer two questions: (1) What SE-focused interventions exist that are focused on reaching zero-dose children and under-immunized children and have been used? (2) What mechanisms or data collection tools exist to measure and monitor immunization SE for zero-dose and under-immunized children at country level (i.e. facility level up to national level)?



Approach

A search of scientific, peer-reviewed and gray literature for selected organizations that work on global immunization was carried out using defined

search terms pertaining to SE and related themes for routine immunization and for zero-dose and under-immunized children in LMIC settings. Retrieval and screening of literature resulted in 46 documents being retained, and 43 ultimately included in the review, with 35 LMIC reflected. Retrieved sources were grouped according to the review questions (i.e., Interventions to improve SE = 32, and Measurement approaches and tools for SE = 10; one source overlapped both categories).



Findings

Thematic categories emerged from the full review of sources. These categories were used to group the sources for synthesis as described below:

Key characteristics of the Intervention Literature

- Most of the studies employ multiple, bundled interventions that focus on community engagement and health service delivery improvements in rural areas.
- Studies employ mostly quasi-experimental pre-post evaluation designs. Measurement approaches for interventions are not consistently described in this literature.
- Immunization coverage features as the main outcome of emphasis across most of the studies, demonstrating marked improvements for most interventions. Outcomes around client knowledge/awareness of and satisfaction with immunization as well as service access, utilization, and quality outcomes are also prominent. However, the articles mostly



IMPROVES SERVICE EXPERIENCE (INTERVENTIONS)

- Communication campaigns with social media
- Multifaceted community engagement
- Digital information systems
- Energy infrastructure/electrification
- Health service delivery and management
- Supplementary immunization activities
- Pro-equity Strategies



MEASURES SERVICE EXPERIENCE (TOOLS/INDICATORS)

- Behavioural and Social Drivers
- Strengthening Immunization Service Experience Guide
- Immunization Campaign Tool
- Health Facility Assessment Tools
- Participatory, Community-based Assessments
- Global Immunization Metrics
- Social Media Studies

do not report relative effects of intervention components on coverage or other behavioral or service-related factors.

- Studies typically do not systematically disaggregate and describe specific effects on zero-dose and under-immunized children, though some studies do explicitly describe outcomes around the first and third doses of diphtheria, tetanus toxoid, and pertussis-containing vaccine (DPT 1 and DPT 3).
- The SE framework components with the most frequent representation in this literature are *community voice, input, & demand; community actors & stakeholders; integration of immunization within services packages, and health worker empowerment. Interventions for health worker empowerment*, including training on interpersonal communication are prominent in this literature. Measures showing specific improvements in interpersonal communication are not evident and hard to parse from general reporting on client satisfaction.
- There is a gap in attention to measuring important SE factors beyond health worker skills training, such as health worker attitudes, interpersonal dynamics, workplace culture, and work stress.
- Studies reviewed are mainly pilot interventions and do not report on efforts to scale or adapt interventions. Interventions using digital information systems appeared to be adaptations from previous experiences in other country settings with a technology provider.

Key Characteristics of the Measurement

Literature

- A broad set of options (tools, indicators, methods) for evidence gathering on SE are available, with evidence of use in pilot studies in countries at subnational levels. Their regular and systematic use for routine country monitoring and planning is not evident in this literature.
- Descriptions of tools and approaches emphasize monitoring activities, but also indicate that they would be suitable for quasi-experimental evaluations (e.g., pre-post or midline evaluations and for implementation research designs).
- The SE framework components with the most frequent representation in this literature are *community voice, input, & demand; community actors & stakeholders; expectation & perception of SE; and quality of the interaction and services provided.*
- Newly developed toolkits (e.g., Behavioural and Social Drivers Toolkit and Strengthening Immunization Service Experience: Insight Gathering Tool) bundle together a range of SE relevant methods and metrics in a comprehensive way, which can be useful for SE-focused intervention studies. However, based on this review, it is apparent that they have not gained wide application in application in country studies to date.
- Toolkits that compile methods and metrics that are relevant to SE are available. However, standardized and validated SE indicators have yet to be formalized.



RECOMMENDATIONS

Interventions should employ more diverse approaches to measuring and reporting results for SE, beyond coverage. Having greater diversity of evidence, including measurement of SE or quality of services, can help to better assess what works for reaching missed communities beyond typical or conventional approaches.

Investments are needed in adaptively scaling interventions for broader impact around improving SE among missed communities.

Measure service experience more broadly across health areas and in integrated services, beyond immunization services to obtain a more holistic view of the factors that influence positive and negative immunization SE.

Use participatory engagement and research to understand local meanings of SE, which could be instrumental for designing interventions and developing sets of SE indicators that are locally valued and validated.

Beyond health worker IPC skills training, increase focus on measuring interpersonal/behavioral aspects of SE at the facility, particularly as it pertains to health worker dynamics, attitudes, and clinic culture.

Balance the use of digital and analog engagement channels for reaching zero-dose populations, based on local context.

Measurement of SE requires additional formalization (e.g., a compendium of validated, standardized but adaptable indicators) drawing on existing service quality metrics and adaptive learning from participatory research and design activities in local settings and case studies.

Advocacy with decision makers at country level is needed to incorporate measures of SE into routine immunization monitoring and continuous quality improvement methods.

Introduction

Immunization programs in LMIC countries have historically focused on vaccine supply and delivery functions, with limited attention and investment given to demand generation. With stagnating immunization coverage rates over the last decade and in the wake of the COVID-19 pandemic, concerted efforts are underway to understand and address the social-behavioral, operational, and contextual factors that promote or inhibit vaccine demand. Immunization Service Experience (henceforth referred to as “SE”) is a critical element of improving vaccine demand. SE prioritizes people-centered models

of immunization that bring immunization services closer to communities and enhance service quality and accountability, based on the needs and experiences of service clients and health workers. The Vaccination Demand Hub defines 13 interrelated dimensions of SE (Figure 1).^a

Improving immunization SE is crucial for reaching *zero-dose and under-immunized children*, who are now the focus of Gavi 5.0 and Immunisation Agenda (IA2030) strategies to *leave no-one behind with immunization*. Zero-dose and under-immunized

children come from the most socially and geographically marginalized communities who miss out on immunization due to pronounced socio-economic disparity, lack of access to health services in their settings, unsatisfactory healthcare experiences, and gender- and other cultural-barriers.^b Empowering countries to invest in improving service experience for zero-dose and under-immunized children requires consolidating knowledge around what approaches are being used and to what effect, and what gaps and opportunities exist.

GAVI, THE VACCINE ALLIANCE DEFINES



ZERO-DOSE CHILDREN as those that have not received any routine vaccine. For operational purposes, Gavi defines zero-dose children as those who lack the first dose of diphtheria-tetanus-pertussis containing vaccine (DTP1).



UNDER-IMMUNIZED CHILDREN as those missing the third dose of diphtheria, tetanus and pertussis (DTP)-containing vaccine (DTP3).

a <https://demandhub.org/service-experience/>

b <https://www.gavi.org/our-alliance/strategy/phase-5-2021-2025/equity-goal/zero-dose-children-missed-communities>

Objectives and Rationale

To address this broad objective, this narrative literature review was carried out through the Vaccination Demand Hub Service Experience Workstream. Its aim is to identify existing interventions and tools for improving and measuring immunization SE, to determine to what extent they have been or are being used at the country level, and to identify barriers and enablers of their use. Two overarching questions that frame this synthesis were developed through a consultative process between Vaccination Demand Hub members.

1. What SE-focused interventions exist that are focused on reaching zero-dose children and under-immunized children and have been used – what brings them in, what promotes continued use of service once in the system?
2. What mechanisms or data collection tools exist to measure and monitor immunization SE for zero-dose and under-immunized children at country level (i.e. facility level up to national level)?

The primary intended audience for this synthesis is the Center for Disease Control and Prevention (CDC) and the members of the Vaccination Demand Hub. The secondary audience are global health research, practitioners, implementers, and donors who are interested in or working on vaccine demand challenges and on SE specifically.

Figure 1

What is immunization service experience?

Immunization service experience (SE) includes the factors within and beyond the interactions between a health worker and an immunization client which influence the delivery and experience of the immunization services.

- Inter-related and cross-cutting issues at the individual, facility, community, and system levels
- Issues affect either client or health worker



Search Methods

For this non-systematic narrative review, we organized the literature search into two streams, one for *peer-reviewed scientific articles* and the second for *gray literature*. We employed different approaches for screening and reviewing peer-reviewed literature and gray literature sources. Two reviewers initially screened and reviewed the peer-reviewed literature, with a third reviewing as a tiebreaker. We divided screening of gray literature among different reviewers for efficiency. One reviewer coded and grouped the sources into thematic categories.

Inclusion criteria were studies published in 2018 or later and focusing on routine immunization in low-and-middle income countries (LMICs). Although there is literature from years prior to this cut-off that focuses on immunization service quality and interpersonal interactions, we chose 2018 to reflect the most up-to-date literature, and for project scope and time consideration. The decision was reinforced by the recognition of a significant increase in literature in this period on immunization quality and quality of care, which are areas that are relevant to SE. Exclusion criteria were studies not related to zero-dose or under-immunized populations, not conducted in an LMIC, not involving immunization or routine immunization, not impacting zero-dose populations and non-English studies, and free full text not available. Studies and measurement approaches or tools

that focused on other immunization activities other than routine immunization (e.g., COVID-19 vaccines) were also not included.



Peer-reviewed literature

For peer-reviewed literature we used the PubMed/Medline database. Given that the core concepts “zero-dose” and “service experience” are relatively new and less formalized in the published literature, we broadened our search terminology to include associated terms and variations that we considered to be more commonly used (e.g., *service quality, service delivery, quality of, unvaccinated, under-immunized, under-vaccinated*). We compiled a list of 35 search terms and grouped them in three categories: (1) Interventions (which includes measurement, monitoring, and evaluation), (2) Service Experience, and (3) Immunization (zero dose/ unimmunized/ under-immunized), as described in ANNEX 1. Then we performed searches using a combination of Boolean operations. The same search strategy included search terms related to intervention and measurement.



Gray literature review

This search strategy was more semi-structured compared to the search of peer-reviewed litera-

ture. It entailed collectively agreeing on relevant multilateral, bilateral, and non-governmental and academic organizations and networks working on immunization and searching their websites for available reference documents (viz., reports, briefs, presentations, tools, and other knowledge resources). A more limited grouping of search terms was used and included: *zero-dose, zero-dose children, unvaccinated children, under-immunized, under-vaccinated children, routine immunization, immunization service experience, and immunization service quality*.

Organizations included in the search were: Gavi the Vaccine Alliance, the World Health Organization, UNICEF, the Global Polio Eradication Initiative, Bill & Melinda Gates Foundation, USAID Development Experience Clearinghouse, USAID Momentum Project, PATH, John Snow Inc., Vaccination Demand Hub, International Vaccine Access Center/Johns Hopkins University, Emory University Vaccine Center, Clinton Health Access Initiative, Zero-dose Immunization Programme, World Vision, Save the Children, International Federation of Red Cross and Red Crescent Societies, International Rescue Committee (IRC), International Organization of Migration (IOM), UN Office for Project Services (UNOPS), UN High Commission for Refugees, and Technet-21.

Search Results and Management

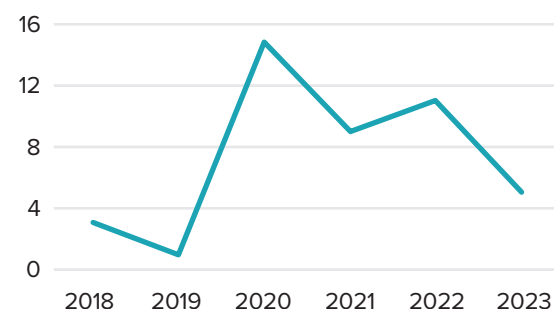
- **Peer-reviewed literature search:** From 1,377 studies retrieved, we filtered the number to 22 that met our inclusion criteria using the COVIDENCE software (See ANNEX 1 for the PRISMA Flow Diagram of the search filtering). The first level of filtering screened titles and abstracts for search terms; the second level of filtering screened the full text of article. Here, we parsed each article to ensure that it met our inclusion criteria for retention.
- **Gray literature search:** Of the sources screened, we retained 24 sources. From the two groups, three sources were subsequently removed on further review for not meeting inclusion criteria, leaving 43 sources in total (TABLE 1).
- The retained literature covered 35 countries from 5 geographic regions (TABLE 2), with the highest number of sources published in 2020 (FIGURE 2).
- For peer-reviewed literature, we prepared an extraction form on Covidence, which was then exported as an MS Excel file. The gray lit extraction was added into this database. Based on initial screening, we grouped the retrieved sources into two categories corresponding to the two framing questions of this synthesis: (1) *Improves Service Experience (Interventions)*, (2) *Measures Service Experience (Tool/Indicators)*. One source was included in both groups

Table 1. Enumeration of retained and grouped sources	
Peer-reviewed literature	22
Gray literature	24
Total	46

Grouping by framing question	
Improves Service Experience (Interventions)	32+1*
Measures Service Experience (Tool/Indicators)	10+1*
Total	43**

Table 2. Regions/Countries represented in retained sources
• Sub-Saharan Africa: Angola, Burkina Faso, Côte d'Ivoire, Ethiopia, Gambia, Ghana, Kenya, Malawi, Mozambique, Nigeria, South Africa, South Sudan, Uganda, Zimbabwe • North Africa and Middle East: Chad, Jordan, Mali, Mauritania, Yemen • Asia-Pacific: Bangladesh, Fiji, India, Indonesia, Nepal, Pakistan, Papua New Guinea, The Philippines • Latin America: Brazil, Guatemala, Haiti, Honduras, Mexico, Nicaragua • Eastern Europe: Georgia

Figure 2. Retained Publications by Year



(TABLE 1). We also summarized information drawn from each source that was relevant to the synthesis, including studies' or tools' summary information, scale and population, implementation enablers and barriers, and features of the studies or tools associated with the framework of 13 Service Experience components (see Figure 1). As sources were reviewed, they were coded into thematic categories that formed the basic organization of the synthesis under the two questions (TABLE 3).

Table 3. Number of sources for each thematic area or tool by framing questions

Q1. Improves Service Experience (Interventions)

- Communication campaigns with social media (3 sources)
- Multifaceted community engagement (8 sources)
- Digital information systems (4 sources)
- Energy infrastructure/electrification (2 sources)
- Health service delivery and management (13)
- Supplementary immunization activities (1)
- Pro-equity Strategies (2)

Q2. Measures Service Experience (Tools/Indicators)

- Behavioural and Social Drivers (BeSD) Toolkit (1 source)
- Strengthening Immunization Service Experience Guide) (2 sources)
- Immunization Campaign Tool (1 source)
- Health Facility Assessment Tools (3 sources)
- Participatory , Community-based Assessments (2 sources)
- Global Immunization Metrics (1 source)
- Social Media Studies (1 source)

Summary of Intervention Literature

Table 4 provides groups the interventions reviewed by thematic areas and provides summaries of the implementation. Each thematic category heading contains a link to the corresponding detailed synthesis in Annex 2.

Table 4: Intervention literature summary		
Thematic area and summary	Outcomes studied	Level of implementation and whether adapted or scaled
Communication campaigns with social media¹⁻³ Immunization messaging campaigns using social media are effective ways of reaching a wide public audience, that includes under-immunized and zero-dose populations. A partnership between the social media giant META, UNICEF, Yale University, Public Good Project, and the Vaccine Demand Observatory implemented and tested nation-wide social media campaigns in the Philippines, India, and Indonesia that captured lower to higher immunization coverage areas, including zero-dose communities. Studies analyzed public social media post from the general population on vaccines and immunization to capture awareness and attitudes (including myths/rumors, trust and mistrust, and positive sentiments) around vaccines and immunizations, which are relevant factors in SE. Based on those data, messaging campaigns were designed with different types of pro-social and pro-vaccine messaging that drew on voices and representations of diverse community influencers. • Three countries carried out social media campaigns to compare engagement of audiences (click-throughs and impressions) with different types of messaging and effects. • Campaigns targeted and compared high and low immunization coverage, including zero-dose populations and demonstrated the importance of targeting different coverage areas with tailored messages for stronger audience engagement and increasing pro-vaccine attitudes in those settings. Campaign reports do not describe how messaging was or should be tailored for zero-dose communities, per se.	• Reach of campaigns • Visits to landing pages and click-throughs • Changes in target population attitudes toward immunization	• Implemented sub-nationally (multiple regions) and nationally • No information provided on scaling or adaptation to different settings

Table 4: Intervention literature summary

Thematic area and summary	Outcomes studied	Level of implementation and whether adapted or scaled
Multifaceted community engagement, including outreach vaccination⁴⁻¹¹ Community engagement interventions were among the most numerous in the sources reviewed. These included eight studies in total, with one of them being a Cochrane Review of 14 community-focused interventions across 10 countries. Countries in Africa had the highest representation (viz., Ethiopia, Ghana, Mali, Nigeria, South Africa, Uganda, and Zimbabwe) followed by South Asia (India, Nepal and Pakistan), and Central America (Honduras, Mexico, and Nicaragua) and one study from Georgia. All the interventions were multi-faceted in nature; that is, combined different activities into a package of interventions targeting communities, and in some studies, health facilities and health workers and aimed to reduce immunization access barriers including attitudes and awareness, resourcing, planning and organization, and immunization tracking. Frequently used interventions included participatory activities relevant to SE such as <i>community dialogues and advocacy, community- and facility-based health education, used of mass-mass media, local financing, community-involved micro-planning, outreach and home visits, home-based incentives, community-based health/immunization committees, mothers' groups, community-based immunization tracking</i>. The general pattern of intervention effects showed marked increases in immunization coverage for target groups, with fewer studies describing improvements in vaccine awareness and satisfaction with services. • 8 intervention studies, including a Cochrane review of 14 studies in 10 countries. All interventions were packages of diverse, largely community-focused activities. • Studies captured zero-dose and under-immunized populations. However few reported on the specific impact of interventions on zero-dose population. • Interventions increased in immunization coverage for target groups, with fewer studies describing improvements in vaccine awareness and satisfaction with services	• Odds of using primary healthcare centers for antenatal care, delivery, postnatal care, and childhood immunization • Health facility visitation for routine immunization • Changes in immunization coverage • Changes in caregiver knowledge of and satisfaction with immunization services • Healthcare worker commitment to service quality improvements • Changes in funding for immunization program • Establishment of new outreach sites and immunization sessions provided	• Implemented in communities and health facilities, primarily in low-coverage districts, rural-remote settings, and urban slum • Mostly no information provided on adapting or scaling intervention; two settings had spontaneous or progressive scaling during the implementation.

Table 4: Intervention literature summary

Thematic area and summary	Outcomes studied	Level of implementation and whether adapted or scaled
Digital information systems¹²⁻¹⁵ This category of studies reflects community- and facility-based interventions that centered on the use of information technology to improve reach and tracking around immunization in target populations, noting zero-dose and under-immunized groups. These include mobile phone messaging, GIS spatial mapping, digital identity card, and “social listening” through social media. Intervention countries spanned countries in Anglophone and Francophone Africa, Pakistan, Jordan, Brazil, and Asia-Pacific region. The diverse types of information systems helped district managers identify and focus limited resources on high-risk and underserved populations; reminded families and health providers when vaccinations were due or missed; assisted managers in monitoring vaccination coverage, vaccinator performance, and vaccine stocks; and encouraged local problem solving to improve routine immunization performance. Two studies reported improvements in immunization utilization results; however a group of interventions, described in the Gavi Innovation Catalog, did not systematically report results, as evaluations had not been completed at the time of publishing. • Reviews 4 sources that cover single or multifaceted interventions that use information technology to improve reach and monitoring of immunization among target populations, and to increase utilization of immunization services and local problem solving. • Studies described the priority for missed communities and under-immunized children, with one explicitly noting zero-dose children. However, no study described the specific impacts on zero-dose and under-immunized children.	• Change in immunization coverage • Mother-baby recruitment and one week follow up/lost to follow-up for immunization • Resolution of spatial accuracy for GIS-informed microplanning • Community attitudes toward immunization access barriers • Reduction of zero-dose vaccination • Reduction in vaccine refusals	• Implemented at district, facility, and community levels, including refugee camp • Most interventions based on globally available technology and adapted from previous country experiences in partnership with industry technology providers; specifics of partnerships not described

Table 4: Intervention literature summary

Thematic area and summary	Outcomes studied	Level of implementation and whether adapted or scaled
Energy infrastructure/electrification¹⁶⁻¹⁷ Interventions for providing consistent electrification at healthcare facilities can improve multiple health system indicators. A systematic review of electrification in LMICs concluded that electrification of healthcare facilities is associated with enhanced service availability, readiness, and quality of care, which are important factors that shape SE. The other study from Kenya described the effects of donating a solar-power freezer to a rural facility on service accessibility and immunization coverage. • Includes a systematic review of 12 studies of health facility electrification and one of donated a solar-powered freezer that show associations of with enhanced immunization service availability, accessibility, quality of care, and coverage. • Studies carried out rural settings and noted missed populations, but do not report on specific intervention effects on zero-dose children.	• Odds of receiving first dose of different vaccines • Change in attending ANC in first trimester • Community satisfaction with and approval of facility services • Changes in immunization coverage	• Facility-based implementation, including in area off the energy grid • No information given on scaling or adapting interventions

Table 4: Intervention literature summary

Thematic area and summary	Outcomes studied	Level of implementation and whether adapted or scaled
Health service delivery and management¹⁸⁻²⁹ Most of the intervention studies reviewed fall under this category. Thirteen studies described interventions focused on health service delivery and management at, or originating from, the health-facility level. The majority of these were multifaceted in nature (i.e., combining different activities into an intervention package). Common activities included some type of facility staff training/capacity development, supportive supervision, continuous quality improvement, integration of immunization with other services (e.g., MNCH, nutrition, and pediatric outpatient services), community outreach, community health management committees, or used broader “health systems approach” that incorporated financing and governance arrangements over and above service delivery and staff capacity building. These interventions were implemented mainly in rural health facilities in Pakistan, India, Chad, Ghana, and South Sudan. One included study was a large systematic review of studies on adapted routine immunization systems and services at the subnational for conflict-affected and displaced populations in sub-Saharan Africa. Two targeted interventions focused on capacity building for health workers on Continuous Quality Improvement activities (CQI) for immunization, interpersonal communication (both in Ethiopia) and one on experiential learning (training and coaching) for health workers in Kenya. Several studies emphasized the role of partnership models as the main underpinning of the interventions carried out in rural Nigeria, Angola, Papua New Guinea, and urban slums in Bangladesh. They were broken out into a separate grouping, but constituted packaged health service delivery interventions, and thus, can be considered a subset of multifaceted interventions. They included health worker training on monitoring and tracking and social mobilization and outreach activities. These studies did not internally compare the different types of partnership models or to a counterfactual, so it was not possible to discern the contribution of the model type to observed outcomes. Assessments, where conducted, generally showed positive effects of interventions on immunization uptake, coverage, and other service-related measures. Most studies were carried out settings that include zero-dose and under immunized groups but do not report on respective impact specifically for these groups. Assessments, where conducted, generally showed positive effects of interventions on immunization uptake, coverage, and other service-related measures.	• Changes in immunization coverage • Drop-out rates • Reduction in access barriers • Uptake of routine vaccination • Reduction in locations with zero-dose populations • Reduction in polio case loads • Health worker quality of care • Community engagement • Vaccine doses provided	• Implementation primarily at health facilities or originating there, including in rural areas, • Generally, no information provided on scaling or adapting interventions; Experiential Learning model in Kenya was adapted from an MSH model.

Table 4: Intervention literature summary

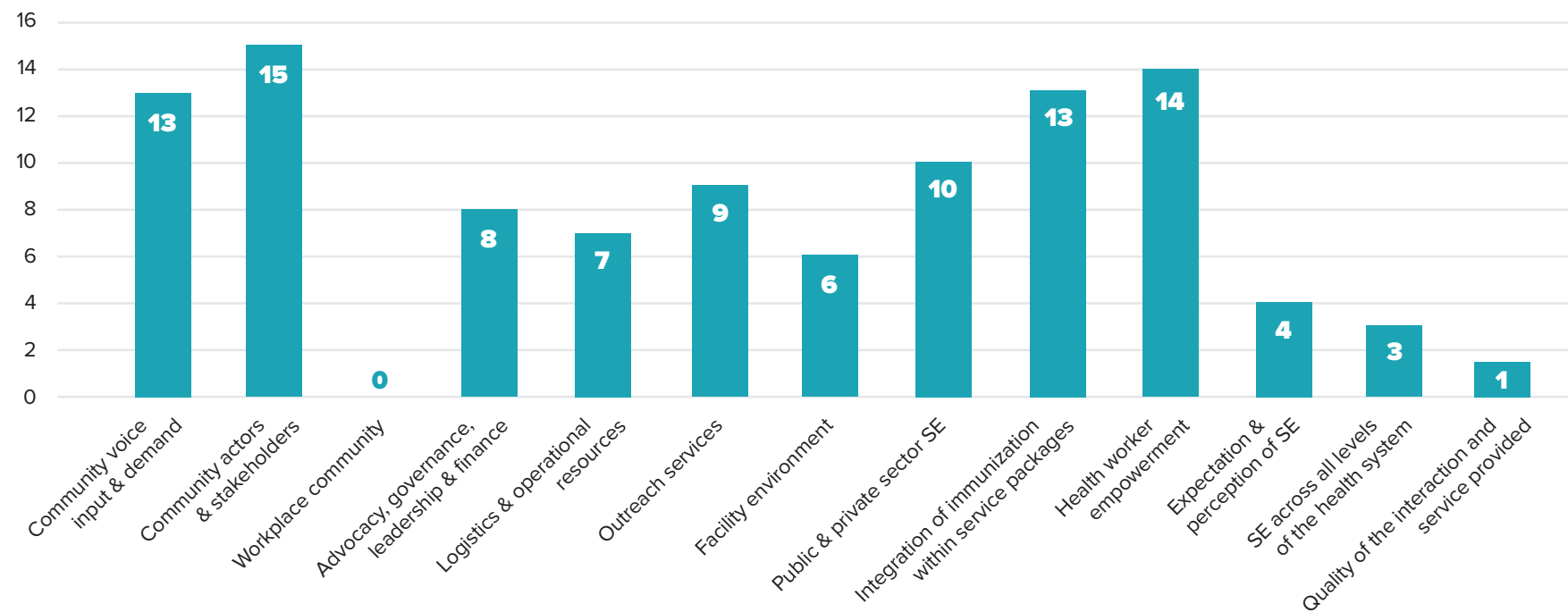
Thematic area and summary	Outcomes studied	Level of implementation and whether adapted or scaled
Supplementary Immunization Activities (SIAs)³⁰ SIAs are mass vaccination campaigns that are conducted in addition to routine vaccination. Three studies were originally included in the review, but only one was included that had a clear link between SIAs and routine immunization. It investigated the effects of SIAs with several antigens on routine immunization coverage in Nigeria. It also described activities to enhance community voice, input and demand around immunization and strengthen outreach services, which are important facets of SE. • A single study reviewed demonstrated the positive effect of SIAs for polio and other antigens on routine immunization coverage in Nigeria. • The study did not specify a focus on zero-dose children, though it reported the effect of polio SIAs on Penta 1 coverage. • Evidence lacks on whether and how SIAs per se drive zero-dose groups' retention in routine immunization services. These gaps represent future opportunities for more targeted measurement and reporting.	• Changes in immunization coverage • Immunization drop-out rate	• Implemented at community settings and health facilities and managed up to national level. • No information on adaptation or scaling provided
Pro-equity strategies³¹⁻³³ Pro-equity strategies, for the purposes of this review, are those interventions that pertain to Gavi 5.0 programmatic guidance on reaching zero-dose children and missed communities and that have been identified in studies that systematically reviewed Health Systems Strengthening proposals to Gavi, Joint Appraisal Reports, and Multi-stakeholder dialogue reports. The meaning of "pro-equity" is varied, having no formal definition. The two reviews identified refer to pro-equity intervention "as any tailored or targeted approach designed to reach underserved/vulnerable populations or communities with immunization" and "tailored or targeted approaches towards un- or under-immunized children and missed communities," both which encompass zero-dose populations. The reviews did not provide details of intervention implementation or measurement. Thus, the ANNEX tables only describe the general intervention and relevance to SE. • Two broad reviews of pro-equity strategies that align with Gavi 5.0 programmatic guidance on reaching zero-dose children and missed communities; these include Gavi Health System Strengthening proposals, and reports from Joint Appraisals and Multi-stakeholder Dialogues. • The reviews did not provide details of intervention implementation or measurement, nor effects on zero-dose children.	<i>The reviews did not provide details of intervention implementation or measurement. Thus, the corresponding tables in ANNEX 2 only describe the general intervention and relevance to SE.</i>	• Implemented at community settings and health facilities and managed up to national level. • No information on adaptation or scaling provided • Implemented at district, facility, and community levels, including rural-remote settings • No information provided on adapting or scaling interventions

Representation of SE Components across sources on Improvement/Interventions. Figure 3 summarizes the number of instances in the review where details from studies were found to reflect the

given SE theme from the framework in Figure 1 and the “Relevance to SE Components” tables in Annex 2 under each thematic category. Notably, *workplace community and quality of the interac-*

tion of services provided were the least identified, in contrast to a high number of instances of the health work empowerment category, which focuses more on skills training and capacity building.

Figure 3. Representation of SE components across sources on improvement/interventions



Summary of Measurement Tools & Approaches

The tables and summary information below provide snapshots of the types of tools and approaches for monitoring and measurement described in the reviewed sources—both from the

measurement literature (Table 5 and Annex 3) and, where relevant, from the intervention literature (Table 6 and Annex 2). Additional information provided below the tables includes the level of health

system at which they've been used, and how they reflect components of SE Framework. Each tool or approach listed in the table below contains a link to the corresponding detailed synthesis in Annex 3.

Table 5. Types of tools and approaches described in the measurement sources

Tool or approach	Type of data
Behavioural and social drivers toolkit ³⁴	Client-focused indicators for subjective, social, and service access and quality factors. Intended for use with stakeholders at community and facility levels. Survey and semi-structured interview data can be used for routine tracking and continuous quality improvement and can supplement other immunization program data.
Strengthening immunization service experience: insight gathering tool ^{35,37}	This guide from the Vaccination Demand Hub describes a wide range of tools and approaches for capturing immunization client and community attitudes, perceptions, and experiences. These client-focused score cards, interviews, surveys, mystery-client activities, and community-led health committees, which have been implemented at community and facility levels (Mozambique example) but are also intended for insight gathering at higher levels in the health system.
Immunization campaign tool ³⁸	UNICEF's 24-item semi-structured survey and interview guide, implemented in six countries to help stabilize routine immunization during the COVID-19 pandemic. Covers 15 thematic areas including community engagement and social mobilization, which are most relevant to SE. Questions/indicators are largely operational (i.e., focusing on identifying and mitigating access barriers and enhancing community engagement) rather than subjective in nature.
Health facility assessment tools ^{25,39,40}	Three sources describing health facility assessment tools. • One provides indicators for monitoring availability and functioning of material and human resources. • A second, the Context Assessment Toolkit (USAID MOMENTUM) contains surveys and interview modules for assessing the implementation of facility-based practice improvements, including aspects motivational, cultural, and interpersonal/teamwork factors among facility staff. • A third focuses on health workers capacity building for interpersonal communication for immunization and motivational interviewing (IPC/I & MI).

Table 5. Types of tools and approaches described in the measurement sources

Tool or Approach	Type of data
Participatory, community-based assessments ^{41,42}	• One source describes a broad suite of community-focused participatory methods ranging from different types of interviews and holistic narrative-based data gathering and analysis, to collective feedback and action reviews, scorecards and checklists, and interactive digital and video methods • Another source describes a study from Ethiopia that used qualitative situational and assessments and service access barrier and barrier/enabler analyses, and a community survey tool. The mixed method tools were implemented from the national to woreda levels and among underserved populations in rural, urban, and mobile contexts.
Global immunization Metrics ⁴³	The Immunization Agenda 2030 Monitoring Evaluation Framework that outlines global and regional/country strategic indicators to address under-vaccination. These indicators are intended to assess progress and guide performance improvements for immunization programming at global, regional, and country levels. They include indicators for behavioral, social, and demand generation strategies, which are relevant to SE, and can be self-reported by countries in the UNICEF/WHO Joint Reporting Form
Social media studies ⁴⁴	UNICEF source describing four mixed-method approaches to assessing the effectiveness of communication strategies for immunization campaigns: organic social media posts, brand lift studies (BLS), A/B testing, and off-platform studies/participatory research. It described their use in national/sub-national social media campaigns in four countries.

Table 6. Types of measurement approaches described in the Improvement/Intervention sources (Annex 3)

Majority of studies reviewed used

- Quasi-experimental pre-post evaluations of immunization coverage
 - 2 studies used interrupted time-series analyses
 - Some of these include qualitative methods (key informant interviews and focus groups)

Fewer number of studies described other approaches

- RCT (one study)
- Interrupted time-series analysis (two studies)
- Cross sectional descriptive surveys
- Mixed method observational studies
- Participatory research and engagement methods
- Sourcing local administrative data (census, DHIS2)



Where and how are measurement approaches being used (measurement literature)?

The general impression from this review is that service experience related measurement is happening in project pilots in countries, but far from being used regularly and systematically in routine country monitoring and planning.

- Five of the sources reviewed describe a globally relevant tool set or measurement approaches that can be adapted and implemented in country contexts; some cursory

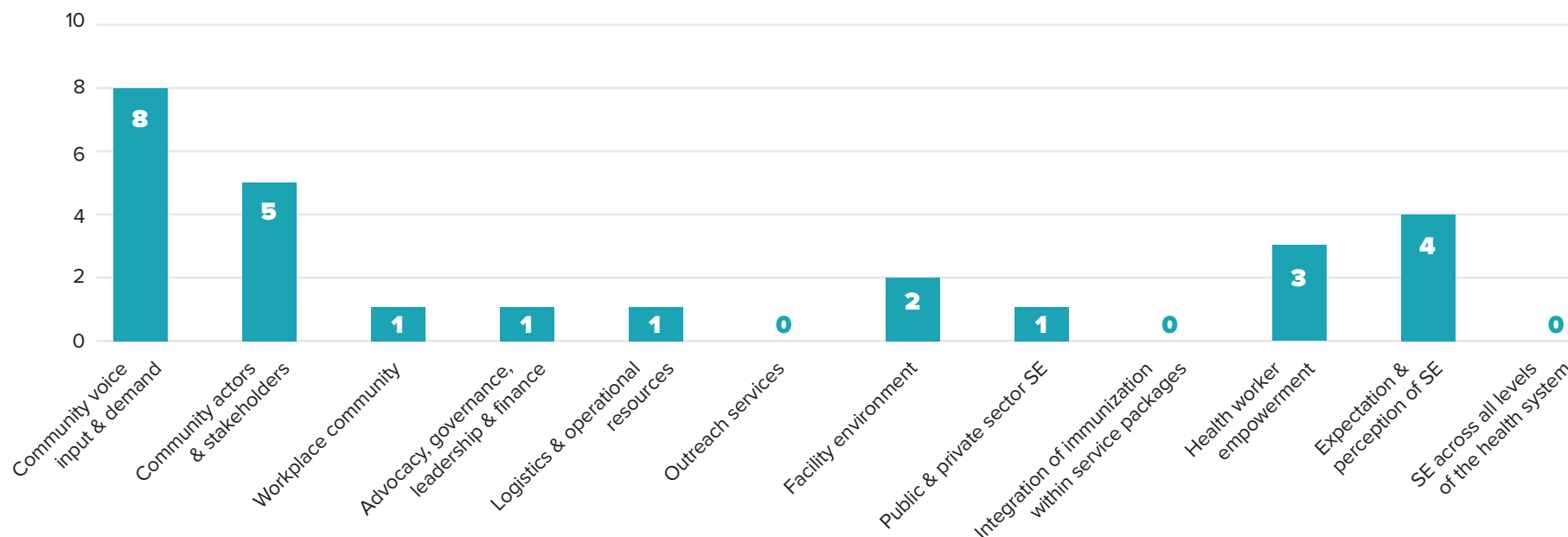
examples of their country application are provided.

- Four sources reviewed describe the actual implementation of a tools/set of tools/measurement approach in a country-based study or grouping of country-based studies.
- Two sources compile indicators for service experience-relevant measurement. Recommendations are given for using them for routine monitoring at regional and country levels or in specific project scenarios; however, specific examples of whether or how they have been implemented or routinized are not provided.

Representation of SE Components across sources on Measurement.

Figure 4 summarizes the number of instances in the review where details from studies reflected the given SE component theme from the framework in Figure 1 and the “Relevance to SE Components” tables in Annex 3 under each thematic category. Most of the tools focus on Community voice, inputs, & demand; Community actors & stakeholders; Expectation & perception of SE, and Quality of the interaction and services provided categories.

Figure 4. Representation of SE components across sources on measurement



Key Takeaways

What have we learned; what gaps exist?



General considerations:

“SE” and “zero-dose children” are relatively new terms in the immunization space and only recently becoming mainstreamed in terminology. As such they are not widely reflected in the sources reviewed, particularly older sources. Although some sources explicitly emphasize zero-dose children or under-immunized children, others do not, which, for this narrative review, required some a degree of inference based on sampling and characteristics of study populations and immunization measures (viz., DTP 1 and DTP 3 coverage), and reliance on SE-adjacent constructs in lieu of “SE” per se.



Intervention Literature

1. Interventions in the reviewed studies are broad ranging, with the majority focused on bundled intervention activities around community engagement and health service delivery improvements in rural settings.
2. Immunization coverage is the key outcome measure for most of the studies, with a smaller proportion also reporting positive effects on community/client knowledge of and satisfaction; reduction in vaccine refusal; and improved service access, utilization, and quality. The general trend across interventions showed marked improvements in immunization coverage for first dose of diphtheria-tetanus-pertussis containing vaccine (DTP1). However, studies largely do not parse and compare the effects of specific intervention components on coverage (exception is a Cochrane Review). Approaches to measurement in intervention studies are not consistently described, but mostly reflect quasi-experimental pre-post evaluations.
3. The reviewed intervention literature addresses the priority of zero-dose children, under-immunized children, or missed communities. Beyond emphasis on basic coverage (e.g., DPT1) for general study population, studies do not disaggregate specific effects of interventions (e.g., comparing changes in coverage among zero-dose vs. non-zero-dose populations). Also, studies, in general, do not address retention of zero-dose children in routine immunization apart from some reporting aggregated coverage of DPT3.
4. A smaller proportion of studies report on changes in community and caregiver awareness and satisfaction around immunization. However, these are not systematically measured as process or outcome variables.
5. The SE framework components with the most frequent representation in this literature are *community voice, input, & demand; community actors & stakeholders; integration of immunization within services packages, and health worker empowerment*. Health worker empowerment, including training for improving interpersonal communication between health service providers and clients. However, results specifically on improvements in interpersonal communication are not evident and difficult to parse from the more general reporting on improvements in client satisfaction with immunization services.
6. Workplace community, one of components of the SE framework, is underrepresented among the interventions and measurement literature. This suggests a gap in attention to and evidence-generation around important proximate

SE factors, beyond health worker skills training, like individual attitudes and interpersonal relations between health workers (e.g., team dynamics, collaboration, work stress, motivation, job satisfaction).

7. No study reviewed described actual efforts to scale or adapt interventions, other than making suggestions and recommendations. This gap is understandable in that it is typical that literature on pilot studies would not be able to provide information on how a pilot was further adapted or scaled. Other types of sources, such as Country Health Ministry reports may provide details of interventions that were scaled and their results.
8. Descriptions of interventions using digital information systems appeared to be adaptations from previous experiences in other settings with a technology provider.



Measurement Literature

9. The review of measurement approaches and tools shows that there is already a broad set of options (tools, indicators, methods) for gathering evidence on SE, with examples of country use provided. The general impression, however, is that SE related monitoring is happening in project pilots in countries, but far from being used regularly and systematically in routine country monitoring, planning, or continuous quality improvement approaches.
10. The description of tools and approaches in this literature appears to be aimed at monitoring activities. However, they are also suitable for use in quasi evaluation studies such as pre-post or midline evaluations and implementation research study designs.
11. The SE framework components with the most frequent representation in this literature are *community voice, input, & demand; community*

actors & stakeholders; expectation & perception of SE; and quality of the interaction and services provided.

12. Tools that explicitly foreground SE and relevant metrics (e.g. Behavioural and Social Drivers Toolkit (BeSD), and the Strengthening Immunization Service Experience: Insight Gathering Tool) are recently published and have not gained wide use in intervention studies. However, various methods and approaches that these tools encompass (e.g., surveys, stakeholder interviews, community engagement activities, CQI) are evident in intervention studies reviewed. Moving forward, studies can benefit from using these toolkits given that the compilation of various methods and approaches in them is quite comprehensive.
13. Toolkits that compile methods and metrics that are relevant to SE are available. However, standardized and validated SE indicators have yet to be formalized.

Recommendations

Directions for the future

The general considerations and specific recommendations below are purposefully presented as overall recommendations that combine issues relevant to both implementation and measurement, given their interlinked nature in practice.

General considerations:

Given SE's broad definition and components which encompasses health worker-client interactions and a range of social, behavioral, situational, and operational factors, and important step forward will be to develop standardized, adaptable, and validated SE metrics (both process and outcomes) that that can be systematically and definitively captured and reported in monitoring and evaluation of interventions. In this way, stronger links for measurement and analysis can be made between the effects of interventions and immunization coverage and equity, with SE metrics as intermediate, moderating or mediating variables.

Relatedly, as work around SE develops, it will also be important for greater attention to be given, beyond immunization coverage, to measuring and reporting on SE in a way that conveys the authentic voices

and insights of immunization clients/caregivers with zero-dose and under-immunized children and health workers that serve them. Taking a people-centered approach to SE evidence-gathering can help to differentiate their experiences, behaviors, perspectives from these general population in socially vulnerable settings. This in turn can help to further refine and mainstream the SE concept for pilot interventions and for routine monitoring and measurement at sub-national and national levels for countries.

Specific recommendations:

Employ different approaches to measuring and reporting results for zero-dose and under-immunized children, beyond coverage: Intervention studies that prioritize zero-dose children should explicitly measure and report the effects on reducing numbers of zero-dose children as well as report on continued use of immunization services through complete vaccination, beyond general coverage results for the study populations. Having greater diversity of evidence, including measurement of experience or quality of services, can help to better assess what works for reaching missed communities beyond typical or conventional approaches.

- General reporting of DPT1 coverage is an acknowledged indicator of reaching zero-dose children. However, information on DTP1 improvements from areas that have been chronically missed, as well as issues related to the timeliness of immunization, can provide further insight into where and how zero-dose children are being reached through certain interventions. Disaggregating coverage data in this way could offer more specificity in terms of understanding the effects of interventions for zero-dose children.
- Similarly, continued use of immunization services is an important indicator of positive SE. Studies and routine monitoring can use data on DTP3 doses and full immunization as metrics of continued use of routine immunization by zero-dose children and caregivers. However, more specificity would be helpful to understand improvements in DTP3 and FIC (fully immunized children) within “missed communities.” This could help health workers and other stakeholders better understand if efforts in reaching zero-dose communities are paying off in terms of them continually seeking immunization beyond initial uptake.

- Follow-up clients exit interviews and satisfaction surveys (paper or mobile phone) administered to a sample of caregivers during subsequent visits for immunization along the routine schedule can provide longitudinal data around retention and for assessing SE cross-sectionally and SE changes over time.
- Trusted actors like community health workers can also carry out information gathering activities in community and household settings. These can be designed to elicit caregiver narratives about service experience, outside of the sphere and power dynamics of the facility, which can be triangulated with exit interviews and satisfaction surveys.
- Training and involving community members in mapping immunization gaps in their communities, with participatory GIS methods can also encourage local ownership over data and its use, and would also require community buy-in.

Investing in adaptively scaling interventions:

Although intervention studies generally showed marked improvements in immunization coverage for target populations, the absence of documented evidence around scaling interventions beyond pilots is a notable gap in terms of building toward their sustainability. Project funders, governments, and partners should invest in adaptively scaling pilot interventions.

Capturing service experience beyond immunization in measurement: Negative experiences with other health services or with the health system in general can reduce demand for vaccination, as they are

interrelated from the clients' point-of-view (e.g., if bad ANC experience --> then bad immunization experience). SE measurement tools focused on immunization can be adapted or expanded upon at a localized level to capture zero-dose client SE across different health areas beyond immunization, especially in the context of MCH continuum of care (e.g. ANC, labor and delivery) and for integrating other health services into immunization services and outreach. This expansion may give a more holistic and people-centered view of what factors shape caregivers' SE and decision around immunization.

Understanding local meanings of SE: On-going work to define and measure SE could greatly benefit from understanding local meanings of immunization service experience through participatory engagement and research. Local meanings have not been investigated in this literature. Insights about local meanings could help in designing interventions and developing sets of SE indicators that are locally valued and validated.

Increase focus on interpersonal aspects of SE: Workplace community (a component of SE framework) is a topic that requires more attention as a focus of interventions and measurement. It's a theme that reflects important proximate interpersonal dimensions of SE (e.g., mutual support, collaborative learning and problem solving, motivated and satisfied staff, respectful communication and trust between health workers and clients). These characteristics are not consistently reflected in interventions that focus on the more technical side of health

worker training/capacity building, which is reflected in the health worker empowerment theme, which was more prominent in our assessment.

- The Context Assessment Toolkit (Momentum Project) is a useful instrument for evidence-gathering in that it identifies and helps address workplace factors that may influence the success of implementing a practice improvement. These factors include staff commitment and motivation, internal team culture, teamwork and communications, leadership, staff support and accountability.

Balance the use of digital and analog engagement channels for reaching zero-dose populations, based on local context: Social media, phone-based platforms, and other digital information systems are now common for reaching and tracking communities for immunization. However, interventions with zero-dose communities in rural, remote, and humanitarian settings must still consider limited internet connectivity and electricity that can limit feasibility of implementation and effectiveness. Alongside digital platforms, interventions should continue to use and test analog approaches to engaging audiences and motivating behavior change, such as community radio and theater, user-appropriate IEC and registration cards, and health education meetings. Mobile apps or other digital identity trackers should be introduced to zero-dose caregivers at birth rather than waiting until they have already started the routine immunization schedule.

- Demand creation campaigns using digital social media platforms have very broad reach and help to build trust in immunization services with pro-vaccine and pro-social themes. Campaigns must contain diverse messaging tailored to the populations in high- and low-immunization coverage areas. Campaigns should also be designed specifically with zero-dose/missing communities in mind and include tailored messaging for male engagement and for vaccine hesitant sub-groups. Participatory market research, human-centered design processes, and platform-based studies (Brand-life studies, A/B testing) can all be leveraged to gather evidence and insights among zero-dose/missing communities.

More work is needed to advance and formalize the measurement of SE and to situate SE-specific indicators and relevant methods within existing tools and resources.

- This review shows that there are diverse measurement tools and indicators to draw on that include existing service quality indicators on process and outcome that are reported by clients, communities and health workers (see for example SE Insight Gathering Brief, the WHO Quality Immunization Services Planning Guide, BeSD toolkit, and IPC/I & IM indicators, among others)
- Participatory research and engagement are also essential for capturing experiential and contextual insights to further refine concepts and indicators, and to foster commitments around SE data gathering and use.

Build country advocacy for routine monitoring and adaptive learning around SE: From this review, SE-related measurement is happening in project pilots in countries, but far from being used regularly and systematically in routine country monitoring and planning. Knowledge sharing and advocacy with country decision makers is needed on how to adapt and incorporate SE indicators into routine immunization monitoring and facility based CQI approaches, and policy guidelines. This also requires sensitizing decision-makers to the SE construct, their local meanings, and different approaches to measurement.

Limitations

- Given time constraints, only PubMed/Medline was used for the peer-reviewed literature search. Searching a social science database (e.g., JSTOR) could have yielded a broader set of relevant sources. Also, the gray literature search used a more limited number of search terms than the peer-reviewed literature search for efficiency and manageability.
- Considering the time range for the search that starts with the year 2018, we acknowledge that there may be key literature sources from previous years that have perhaps validated other measures, which could have been missed.
- We only screened English-language articles, due to the composition of our review team. This omits available non-English LMIC studies.
- We employed different approaches for screening and reviewing peer-reviewed literature and gray literature sources, considering the project scope and time constraints. Notably, we used a more limited range of relevant search terms for the latter. Reviewer decisions on which retrieved sources to include and group were subject to some subjective bias; however, using up to three reviewers allowed for collective deliberation and agreement.
- Many interventions described in single sources were multifaceted and incorporated elements from different levels of the health system. Thus, it was not feasible to parse each component of an intervention into separate categories. As a result, the interventions grouped under different thematic categories are not mutually exclusive. Some studies in one category encompass interventions that are relevant to other categories (e.g., outreach activities or health worker training that was part of a community engagement intervention package).
- The screening excluded many articles that did not meet inclusion criteria of interventions “impacting zero-dose and under-immunized populations,” even if they discussed SE-relevant interventions.
- Zero-dose is a newer term, with a specific definition, but not widely reflected in the literature. It is possible that studies were not included in the search that addressed zero-dose communities, but did not explicitly use the label.
- The objectives of this narrative review were to synthesize information on what interventions and measurement tools exist and how they are being used. Given the diversity of approaches, systematic comparisons of their relative effectiveness, as in a meta-analysis, was not possible.

References Cited

- Meta Workshop 2 (July 2022) – The Vaccination Demand Hub. Accessed March 7, 2023. <https://demandhub.org/meta-workshop-2-july-2022/>
- India-case-study-Building-confidence-in-routine-childhood-vaccines-2023.pdf. Accessed March 7, 2023. <https://www.unicef.org/media/135666/file/India-case-study-Building-confidence-in-routine-childhood-vaccines-2023.pdf>
- Indonesia-case-study-Building-confidence-in-routine-childhood-vaccines-2023.pdf. Accessed March 7, 2023. <https://www.unicef.org/media/133691/file/Indonesia-case-study-Building-confidence-in-routine-childhood-vaccines-2023.pdf>
- Okonofua F, Ntoimo LF, Yaya S, et al. Effect of a multifaceted intervention on the utilisation of primary health for maternal and child health care in rural Nigeria: a quasi-experimental study. *BMJ Open*. 2022;12(2):e049499. doi:10.1136/bmjopen-2021-049499
- Akwataghibe NN, Ogunsola EA, Popoola OA, Agbo AI, Dieleman MA. Using participatory action research to improve immunization utilization in areas with pockets of unimmunized children in Nigeria. *Health Res Policy Syst*. 2021;19(Suppl 2):88. doi:10.1186/s12961-021-00719-9
- Timothy A, Coetzee D, Morgan C, Kelaher M, Bailie RS, Danchin M. Using an adaptive, codesign approach to strengthen clinic-level immunisation services in Khayelitsha, Western Cape Province, South Africa. *BMJ Glob Health*. 2021;6(3). doi:10.1136/bmjgh-2020-004004
- Service experience: interlinking supply and demand for immunization (16th TechNet Conference). Accessed March 7, 2023. [https://www.technet-21.org/en/knowledge-hub/main/6692-service-experience:-interlinking-supply-and-demand-for-immunization-\(16th-technet-conference\)?Itemid=1758](https://www.technet-21.org/en/knowledge-hub/main/6692-service-experience:-interlinking-supply-and-demand-for-immunization-(16th-technet-conference)?Itemid=1758)
- Oyo-Ita A, Wiysonge CS, Oringanje C, Nwachukwu CE, Oduwole O, Meremikwu MM. Interventions for improving coverage of childhood immunisation in low- and middle-income countries. *Cochrane Database Syst Rev*. 2016;7(7):CD008145. doi:10.1002/14651858.CD008145.pub3
- Mupere E, Babikako HM, Okaba-Kayom V, et al. Family Health Days program contributions in vaccination of unreached and under-immunized children during routine vaccinations in Uganda. *PLoS One*. 2020;15(1):e0218239. doi:10.1371/journal.pone.0218239
- Nepal Immunization Service Experience – The Vaccination Demand Hub. Accessed March 7, 2023. <https://demandhub.org/nepal-immunization-service-experience-2/>
- Mogojwe H. Case study : Improving vaccination equity in rural Uganda. Clinton Health Access Initiative. Published March 28, 2022. Accessed March 7, 2023. <https://www.clintonhealthaccess.org/case-study/case-study-improving-vaccination-equity-in-rural-uganda/>
- Sullivan E, Masood T, Javed W, et al. Electronic immunization information systems: a case report of lessons learned from implementation in Pakistan. *Mhealth*. 2020;6:31. doi:10.21037/mhealth.2020.0107
- El-Halabi S, Khader YS, Khdeir MA, Hanson C, Alfvén T, El-Khatib Z. Children Immunization App (CIMA): A Non-randomized Controlled Trial Among Syrian Refugees in Zaatar Camp, Jordan. *J Prev* (2022). Published online 2023. doi:10.1007/s10935-023-00721-7
- Oteri J, Idi Hussaini M, Bawa S, et al. Application of the Geographic Information System (GIS) in immunisation service delivery; its use in the 2017/2018 measles vaccination campaign in Nigeria. *Vaccine*. 2021;39 Suppl 3:C29-C37. doi:10.1016/j.vaccine.2021.01.021
- Gavi_Innovation-catalogue.pdf. Accessed March 7, 2023. https://www.gavi.org/sites/default/files/2020-09/Gavi_Innovation-catalogue.pdf
- Khogali A, Ahmed A, Ibrahim M, et al. Building powerful health systems: the impacts of electrification on health outcomes in LMICs. *Psychol Health Med*. 2022;27(sup1):124-137. doi:10.1080/13548506.2022.2109049
- Reaching zero-dose children with solar power in Kenya | Gavi, the Vaccine Alliance. Accessed March 7, 2023. <https://www.gavi.org/vaccineswork/reaching-zero-dose-children-solar-power-kenya>
- Only H, Bingley H, Lowe N, Mehdi R, Haq ZU, Zaman M. Developing health service delivery in a poor and marginalised community in North West Pakistan. *Pak J Med Sci*. 2018;34(3):757-760. doi:10.12669/pjms.343.15168
- Erismann S, Gami JP, Ouedraogo B, Revault D, Prytherch H, Lechthaler F. Effects of a four-year health systems intervention on the use of maternal and infant health services: results from a programme evaluation in two districts of rural Chad. *BMC Public Health*. 2021;21(1):2304. doi:10.1186/s12889-021-12330-2
- Ghana Immunization Service Experience – The Vaccination Demand Hub. Accessed March 7, 2023. <https://demandhub.org/ghana-immunization-service-experience-2/>
- Idris IO, Obwoya JG, Tapkigen J, Lamidi SA, Ochagu VA, Abbas K. Impact evaluation of immunisation service integration to nutrition programmes and paediatric outpatient departments of primary healthcare centres in Rumbek East and Rumbek Centre counties of South Sudan. *Fam Med Community Health*. 2021;9(3). doi:10.1136/fmch-2021-001034
- Gera R, Kapoor N, Halder P, et al. Implementation of “health systems approach” to improve vaccination at birth in institutional deliveries at public health facilities; experience from six states of India. *J Family Med Prim Care*. 2019;8(5):1630-1636. doi:10.4103/jfmpc.jfmpc_70_19
- Ismail SA, Lam ST, Bell S, Fouad FM, Blanchet K, Borghi J. Strengthening vaccination delivery system resilience in the context of protracted humanitarian crisis: a realist-informed systematic review. *BMC Health Serv Res*. 2022;22(1):1277. doi:10.1186/s12913-022-08653-4

24. Manyazewal T, Mekonnen A, Demelew T, et al. Improving immunization capacity in Ethiopia through continuous quality improvement interventions: a prospective quasi-experimental study. *Infect Dis Poverty*. 2018;7(1):119. doi:10.1186/s40249-018-0502-8
25. Individual and interpersonal-level interventions and strategies – The Vaccination Demand Hub. Accessed March 7, 2023. <https://demandhub.org/individual-and-interpersonal-level-interventions-and-strategies/>
26. Chelagat T, Kokwaro G, Onyango J, Rice J. Effect of project-based experiential learning on the health service delivery indicators: a quasi-experiment study. *BMC Health Serv Res*. 2020;20(1):144. doi:10.1186/s12913-020-4949-5
27. Reaching Zero-dose Children: Evidence for Engaging the Private Sector. USAID MOMENTUM. Accessed March 7, 2023. <https://usaidmomentum.org/resource/reaching-zero-dose-children-evidence-for-engaging-the-private-sector/>
28. Field E, Abo D, Samiak L, et al. A Partnership Model for Improving Service Delivery in Remote Papua New Guinea: A Mixed Methods Evaluation. *Int J Health Policy Manag*. 2018;7(10):923-933. doi:10.15171/ijhpm.2018.50
29. Ahonkhai AA, Odusanya OO, Meurice FP, et al. Lessons for strengthening childhood immunization in low- and middle-income countries from a successful public-private partnership in rural Nigeria. *Int Health*. 2022;14(6):632-638. doi:10.1093/inthealth/ihab089
30. Omoleke SA, Getachew B, Igoh CS, Yusuf TA, Lukman SA, Loveday N. The Potential Contribution of Supplementary Immunization Activities to Routine Immunization in Kebbi State, Nigeria. *J Prim Care Community Health*. 2020;11:2150132720932698. doi:10.1177/2150132720932698
31. Ducharme J, Correa GC, Reynolds HW, Sharkey AB, Fonner VA, Johri M. Mapping of Pro-Equity Interventions Proposed by Immunisation Programs in Gavi Health Systems Strengthening Grants. *Vaccines (Basel)*. 2023;11(2):341. doi:10.3390/vaccines11020341
32. Dadari I, Higgins-Steele A, Sharkey A, et al. Pro-equity immunization and health systems strengthening strategies in select Gavi-supported countries. *Vaccine*. 2021;39(17):2434-2444. doi:10.1016/j.vaccine.2021.03.044
33. Ivanova V, Shahabuddin ASM, Sharkey A, Johri M. Advancing Immunization Coverage and Equity: A Structured Synthesis of Pro-Equity Strategies in 61 Gavi-Supported Countries. *Vaccines (Basel)*. 2023;11(1):191. doi:10.3390/vaccines11010191
34. Behavioural and social drivers of vaccination: tools and practical guidance for achieving high uptake. Accessed March 7, 2023. <https://apps.who.int/iris/handle/10665/354459>
35. World Health Organization. Quality Immunization Services: A Planning Guide. World Health Organization; 2022. Accessed March 7, 2023. <https://apps.who.int/iris/handle/10665/354403>
36. Strengthening Immunization Service Experience: Global, Regional and Country Insight Gathering – The Vaccination Demand Hub. Accessed March 7, 2023. <https://demandhub.org/strengthening-aa1-immunization-service-experience-global-regional-and-country-insight-gathering-2/>
37. Strengthening Immunization Service Experience in Mozambique. JSI. Accessed March 7, 2023. <https://www.jsi.com/resource/strengthening-immunization-service-experience-in-mozambique/>
38. Lessons Learned and Good Practices: Country-specific case studies on immunization activities during the COVID-19 pandemic. Accessed March 7, 2023. <https://www.unicef.org/documents/lessons-learned-and-good-practices-country-specific-case-studies-immunization-activities>
39. Siddiqi DA, Abdullah S, Dharma VK, et al. Assessment of vaccination service delivery and quality: a cross-sectional survey of over 1300 health facilities from 29 districts in Sindh, Pakistan conducted between 2017–18. *BMC Health Services Research*. 2022;22(1):727. doi:10.1186/s12913-022-08098-9
40. Context Assessment Evaluation Report Deck. USAID MOMENTUM. Accessed March 7, 2023. <https://usaidmomentum.org/resource/context-assessment-evaluation-report-deck/>
41. Lora Shimp - Participatory Approaches for Monitoring & Evaluation.; 2022. Accessed March 7, 2023. https://www.youtube.com/watch?v=2dkbR8_tGV0
42. Polio-Final-Report.pdf. Accessed March 7, 2023. <https://www.projecthope.org/wp-content/uploads/2023/01/Polio-Final-Report.pdf>
43. IA2030_Annex_FrameworkForActionv04.pdf. Accessed March 7, 2023. https://www.immunizationagenda2030.org/images/documents/IA2030_Annex_FrameworkForActionv04.pdf
44. Meta Workshop 3 (Sept 2022) – The Vaccination Demand Hub. Accessed March 7, 2023. <https://demandhub.org/meta-workshop-3-sept-20>

ANNEX 1

Search terms and categories for peer-reviewed literature search

Search term category	Search term	Copy + paste search	Final search
Interventions	Intervention	"Intervention*" OR "Tools*" OR "M&E" OR "Measurement and evaluation" OR "Measurement" OR "Evaluation" OR "MEL" OR "Monitoring" OR "Learning" OR "program" OR "strateg*" OR "activit*" OR "assessment"	
	Tools		
	M&E		
	Measurement and evaluation		
	Measurement		
	Evaluation		
	MEL		
	Monitoring		
	program		
	strateg*		
	activit*		
	assessment		
AND			
Service experience	Service experience	"Service experience" OR "SE" OR "patient experience" OR "service quality" OR "service design" OR "service delivery" OR "service interaction" OR "trust" OR "quality of care" OR "patient-centered care" OR "patient centered care" OR "person-centered care" OR "person centered care" OR "community voice" OR "advocacy" OR "quality of service"	("Intervention*" OR "Tools*" OR "M&E" OR "Measurement and evaluation" OR "Measurement" OR "Evaluation" OR "MEL" OR "Monitoring" OR "program" OR "strateg*" OR "activit*" OR "assessment") AND ("Service experience" OR "SE" OR "patient experience" OR "service quality" OR "service design" OR "service delivery" OR "service interaction" OR "quality of care" OR "patient-centered care" OR "patient centered care" OR "person-centered care" OR "person centered care" OR "community voice" OR "advocacy" OR "quality of service") AND ("Zero dose" OR "Zero-dose" OR "unvaccinated" OR "un-vaccinated" OR "under-vaccinated" OR "under vaccinated" OR "missed communit*" OR "immuni*" OR "vaccin*")
	SE		
	patient experience		
	service quality		
	service design		
	service delivery		
	service interaction		
	quality of care		
	patient-centered care		
	patient centered care		
	person-centered care		
	person centered care		
	community voice		
	advocacy		
	quality of service		
AND			
Immunization	Zero dose	"Zero dose" OR "Zero-dose" OR "unvaccinated" OR "un-vaccinated" OR "under-vaccinated" OR "under vaccinated" OR "missed communit*" OR "immuni*" OR "vaccin*"	
	Zero-dose		
	unvaccinated		
	un-vaccinated		
	under-vaccinated		
	under vaccinated		
	missed communit*		
	immuni*		
	vaccin*		

ANNEX 2

Intervention synthesis



QUESTION 1

What SE-focused interventions exist that are focused on reaching zero-dose and under-immunized children and have been used?

This synthesis section is organized by thematic categories for interventions that emerged from the review of literature. In the tables for each category, pertinent details of sources are provided. Each table includes, from left to right columns:

1. The source name and summary of the interventions used,
2. the intervention result/findings that were measured or otherwise observed and described in the study,
3. the measurement approaches used, if described in the source,
4. relevance to SE components from the framework (figure 1 above), based on reviewers' impressions,
5. barriers and enablers to implementing the intervention, if described in the source, and
6. indication of whether the intervention was adapted or scaled, if described in the source.

Table 1. Communication campaigns with social media

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
The Philippines Campaign: Meta Workshop 2– The Vaccination Demand Hub- 2022.¹ 4 separate campaigns with targeted messaging on: • Safety and efficacy concerns • Self-efficacy and agency for vaccination • Values (Liberty-oriented values) • Storytelling and testimonials (dual language) Messengers included Healthcare workers, Faith leaders, Peers, and Parents with their children	• Campaigns reached total of 9.4 million people and tested with 158 impressions overall • Drove 340 K to the UNICEF Philippines Routine Immunization page. • Evaluation results showed statistically significant increases in recall of campaign content and shifts in attitudes for all campaign themes (no measurement data given)	None described	Community voice, input & demand/Community actors and stakeholders Responsive messaging through community-based influencers that connects audiences with prosocial values, pro-vaccine norms, and inspires credibility and trust in vaccines.	None were described	No information given

Table 1. Communcatiom campaigns with social media

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
India Campaign: Building confidence in routine childhood vaccines-2023.² 4 separate campaigns with targeted messaging on: • Social cohesion/national pride • Social norming • Use of vaccination card • Prioritizing fathers Compared campaigns in low-coverage and zero-dose regions (Bihar, Rajasthan, Madhya Pradesh, Uttar Pradesh and the cities of New Delhi and Mumbai) with national campaigns. Messengers included Healthcare worker “heroes”, Lay public, parents with their children, Faith leaders	• Campaigns reached a combined total of nearly 280 million people • More 3.4 million visiting the campaign landing page; highest click-through rate in Bihar • More than 80% of respondents self-reported approval for childhood vaccines in their communities. Results showed differential effects campaigns lower- and higher-coverage populations, demonstrating the importance of context-specific messaging	Brand-lift study (BLS) 5-question survey of Facebook; tool provided (See also Social Media Studies section of Measurement synthesis)	Community voice, input & demand/Community actors and stakeholders Responsive messaging through community-based influencers that connects audiences with prosocial values, pro-vaccine norms, and inspires credibility and trust in vaccines.	None were described	No information given

Table 1. Communcatiom campaigns with social media

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Indonesia Campaign: Building-confidence-in-routine-childhood-vaccines-2023.³ 3 separate campaigns with targeted messaging on: - Emotional messaging featuring images parents with their children - Information messaging (risks and rights) - Values messaging (focusing on religious beliefs about bodily and moral purity beliefs in relation to health) Design: segmented populations by low coverage (below 80%) and high (80% or more) Messengers included parents with children with testimonial-style messaging	3 campaigns reached a combined total of more than 91 million people. - Approximately 2.1 million people accessed the campaign landing page, a cost-effective approach to drive traffic to resource pages (\$0.06 USD per person). - Campaigns that featured parents and children had the greatest reach in both low-and high-coverage regions. - Informational campaigns and value-based campaigns perform better in low-coverage rather than high-coverage settings.	Brand-lift study (BLS) 5-question survey of Facebook; tool provided	Community voice, input & demand/Community actors and stakeholders Responsive messaging through community-based influencers that connects audiences with prosocial values, pro-vaccine norms, and inspires credibility and trust in vaccines.	None were described	No information given

Table 2. Multi-faceted community engagement, including outreach vaccination

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Okonofua F, et al. Effect of a multifaceted intervention on the utilisation of primary health for maternal and child health care in rural Nigeria: a quasi-experimental study. <i>BMJ Open</i>. 2022;12(2).⁴ This study assessed the community-led development of seven interventions to address the low utilization of primary healthcare in rural Edo State, Nigeria, (20 communities and primary health centers) in Esan Southeast and Etsako East Local Government Areas in Edo State in southern Nigeria). Interventions consisting of a community health fund, emergency transport, rapid (SMS), drug revolving fund, community education, advocacy, retraining of health workers, and provision of basic equipment.	Following the implementation of interventions, the odds of using the project primary health centers on the 4 outcomes were significantly higher at endline compared with baseline: antenatal care (OR 3.87, CI 2.84 to 5.26 $p < 0.001$), delivery care (OR 3.88, CI 2.86 to 5.26), postnatal care (OR 3.66, CI 2.58 to 5.18) and childhood immunization (OR 2.87, CI 1.90 to 4.33)	Pre-post, quasi-experimental outcome evaluation.	Outreach services: Committee members and healthcare workers provide joint community mobilization activities and home visits Advocacy, governance, leadership, financing: Local committees drive advocacy in communities and with government stakeholders. Also set up local fundraising, insurance schemes, emergency transportation, and rapid SMS to service support pregnant women to seek primary and emergency care. Health worker empowerment: Use of drug revolving fund to ensure availability of essential medicines; nurses and midwives received regular MCH training.	Barriers Gender barriers for women, getting husbands approval to seek immunization; Difficulties in raising sufficient funds. Enablers Community trust and support of interventions	No information given

Table 2. Multi-faceted community engagement, including outreach vaccination

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Akwataghibe NN, et al. Using participatory action research to improve immunization utilization in areas with pockets of unimmunized children in Nigeria. Health Res Policy Syst. 2021;19(Suppl 2):88.⁵ Participatory action research intervention was conducted to address the problem of poor immunization coverage in the Remo North area of Ogun state. Two rounds of dialogue and action took place between community women and men in Ipara and Ilara wards, front-line health workers in both wards, and local government officials. Action plans were developed out of dialogue with community members which included the role of Ward Development Committees, local advocacy, home visits for health promotion, and re-establishment of maternal health services.	A significantly greater number of caregivers visited fixed government health facilities for routine immunization at endline (83.2%) than at baseline (54.2%) ($p<.05$) At endline, assessment by cards for children older than 9 months showed a significant increase in those fully immunized, from 60.7% to 90.9% ($p<.05$).	Pre-post intervention only design with mixed methods (household survey, focus group discussions)	Community actors: Established mixed gender/age Joint Action Committees and Ward Development Committees, which were involved in design and implementation of interventions. Key stakeholders collaborate and co-design interventions or immunization service delivery Outreach services: Committee members and healthcare workers provide joint community mobilization activities and home visits Advocacy, governance, leadership, financing: Local government officials and health workers carried out health promotion activities and ensured the availability of vaccines at scheduled times.	Barriers planning of the study limited by poor quality NHMIS data requires utilization of immunization cards to assess utilization. Enablers None were described	Describes spontaneous scale-up of actions that occurred across Remo North study due to the involvement of local government officials.

Table 2. Multi-faceted community engagement, including outreach vaccination

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Timothy A, et al. Using an adaptive, codesign approach to strengthen clinic-level immunisation services in Khayelitsha, Western Cape Province, South Africa. <i>BMJ Glob Health</i>. 2021;6(3).⁶ A rapid participatory assessment of childhood immunization and service delivery barriers in the Khayelitsha slum of Cape Town, South Africa generated a suite of community-focused interventions. These included weekly community immunization education radio sessions, daily clinic health talks, immunization, education and promotion materials, and service provider and parent quality checklists.	The intervention led to improvements in: • parents'/guardians' knowledge about immunization (non-significant), • parents level of comfort and satisfaction with services (significant), • and service provider commitment to improvement in service quality. Radio sessions and immunization education and communication materials were deemed most useful by parents and providers.	Pre-post survey and interviews/ focus groups with parents/ guardians and service providers.	Outreach services: Creation of weekly community radio sessions hosted by local nurses who addressed all aspects of childhood immunization and questions for callers Facility environment: Nurse-led immunization education sessions at each clinic carried out four times each day. Multi-language health promotional postcards with immunization information given to parents to take home Quality of the interaction and service provided: Multi-language and linked service provider and parent quality checklists were developed to optimize delivery of all components of the immunization sessions.	None were described	

Table 2. Multi-faceted community engagement, including outreach vaccination

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Service experience: interlinking supply and demand for immunization (16th TechNet Conference).⁷ Presentation on dimensions of immunization service experience highlights interlinked supply--demand interventions used in Shela Borkoshe PHCU Ethiopia: (1) Bottom-up microplanning with QI tools (2) Expanded reach of RI and health services (3) Using community and local leader engagement (4) Increasing funding from local sources	• 21% increase in funding for the PHCU following micro-plan • Addition of 7 new outreach sites • 84 additionally monthly immunization sessions in a year 397 outreach sessions in Sodo Zuria Woreda, in the same year, 276 conducted in hard-to-reach areas	None described	Outreach services: Establish trust with communities, build confidence and together tailor programs to meet local needs Logistics and operational resources: Community mapping: More accurate target population and identification of delivery approaches responsive to community needs	None were described	

Table 2. Multi-faceted community engagement, including outreach vaccination

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Oyo-Ita A, et al. Interventions for improving coverage of childhood immunisation in low- and middle-income countries. <i>Cochrane Database Syst Rev.</i> 2016;7(7).⁸ Cochrane Library review of interventions to improve coverage of childhood immunization in LMICs compiled 14 studies from 10 countries (Ghana, Georgia, Honduras, India, Mali, Mexico, Nicaragua, Nepal, Pakistan, and Zimbabwe). Interventions included: - community-based health education (three studies), - facility-based health education (three studies), - household incentives (three studies), - regular immunization outreach sessions (one study), - home visits (one study), - supportive supervision (one study), - information campaigns (one study), and - integration of immunization services with intermittent preventive treatment of malaria (one study).	- Health education at village meetings at homes improves three doses of DTP vaccines (RR 1.68, 95% confidence interval (CI) 1.09 to 2.59) – <i>Moderate certainty</i> - Facility-based health education plus redesigned vaccination reminder cards improves DTP3 coverage (RR 1.50, 95% CI 1.21 to 1.87) – <i>Low certainty</i> - Regular immunization outreach improves full immunization coverage (RR 3.09, 95% CI 1.69 to 5.67, which may greatly improve if combined with household incentives (RR 6.66, 95% CI 3.93 to 11.28) – <i>Low certainty</i> - Household monetary incentives, on their own, may have little or no effect on full immunization coverage (RR 1.05, 95% CI 0.90 to 1.23) – <i>Low certainty</i> - Home visits to identify non-vaccinated children and refer them to health clinics might improve uptake of three doses of OPV (RR 1.22, 95% CI 1.07 to 1.39) – <i>Low certainty</i> - Integration of immunization with other services (malaria) may improve DTP3 coverage (RR 1.92, 95% CI 1.42 to 2.59) – <i>Low certainty</i>	Studies reviewed included RCTs, non-RCTs, before-after studies, interrupted time-series studies		None were described	

Table 2. Multi-faceted community engagement, including outreach vaccination

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Mupere E, et al. Family Health Days program contributions in vaccination of unreached and under-immunized children during routine vaccinations in Uganda. PLoS One. 2020;15(1).⁹ 6 quarterly family health days were developed and implemented by MOH and UNICEF in 31 districts in 7 sub-regions of Uganda to reach un- and under-immunized children. A total of 178,709 and 191,223 children received measles and (DTP3) vaccinations, respectively. DTP1 was not included in this intervention.	All subregions attained over and above the targets of DPT3 (85%) and Measles (95%). Family Health Days contributions were 126% and 144% for measles and 103% and 122% for DPT3 in 2012 and 2013, respectively of the estimated unreached annual target populations.	Cross-sectional descriptive analysis at different time frames.	Outreach services: Services were delivered at churches and mosques on prayer days to complement and extend the reach of facility-based and other outreach health services. Community outreach post sites identified by community members for hard-to-reach or mobile populations Public & private sector: Health care services were provided by health care workers from public, private-not-for-profit, and private-for-profit facilities where possible Health worker: empowerment Use of drug revolving fund to ensure availability of essential medicines; nurses and midwives received regular MCH training. Integration of immunization within service packages: Package was expanded for pregnant, lactating, and non-lactating women as well as men. SE across all levels of the health system: Technical working groups for planning supply chain management, promotion and social mobilization, and M&E convened on a regular basis to assess challenges, lessons learned, and share good practices	Barriers Family days requires additional time and money for EPI and healthcare workers Enablers: Scheduling on non-working days and integrating other health services were effective for reaching commonly missed populations.	

Table 2. Multi-faceted community engagement, including outreach vaccination

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Nepal Immunization Service Experience (no date).¹⁰ A brief that summarizes SE-related factors found in Nepal and describes some community engagement interventions that have served as SE improvement strategies, which included: • Microplanning • Village and district immunization committees • Health facility management and operational committees • Female community health volunteers • Mothers' groups	Key informants reported that interventions resulted in longer and more regular service hours, improved quality of care, and increased immunization coverage, among other positive outcomes. No other evaluation data was provided.	None were described	Community actors: Involving local stakeholders helps to target services based on community need, provides community representation in management, extends reach for home visits for health education, and establishes a forum for women to discuss right and quality of immunization services	None were described	
Mogojwe H. Case study : Improving vaccination equity in rural Uganda. Clinton Health Access Initiative, 2022.¹¹ CHAI Uganda team piloted an intervention that monitors geographic variations in care-seeking trends in high-volume health facilities, detecting villages with the highest number of unimmunized (zero-dose) children within their catchment areas in 14 low-coverage districts. Interventions included: • empowering community leaders with the correct information to sensitize their communities, • engaging vaccine-resistant subgroups • optimizing immunization outreach sessions, • assuring immunization service availability at local health facilities, and working together to track children who fail to complete their full immunization schedule.	• In one year, the number of children vaccinated for diphtheria, tetanus, and pertussis (DPT1 and DPT3), measles (MR1), and human papillomavirus (HPV2) increased by 82%, 76%, and 99% respectively. • The number of children from underserved villages vaccinated against DPT3 and MR1 at static sites increased by almost 50%. • The number of children vaccinated against HPV2 and MR1 greatly improved through optimizing the location, time, and frequency of outreach sessions, by 222% and 117% respectively.	None were described	Community actors: Empowering leaders to sensitize their own communities, and engaging vaccine resistant groups Outreach services: tracking and following up children who have not completed vaccine schedule Facility environment: Maintaining availability of immunization services and tracking children	Barriers None were described Enablers Active engagement and participation of healthcare workers and community members in the design and implementation of the intervention. Availability of reliable data and technology for monitoring and tracking immunization coverage and care-seeking trends in high-volume health facilities	Progressive scaling of family days to districts and sub-regions during implementation

Table 3. Digital information systems

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Sullivan E, et al. Electronic immunization information systems: a case report of lessons learned from implementation in Pakistan. <i>Mhealth</i>. 2020;6:31.¹² A technical support program to Sindh Province EPI in Pakistan developed an electronic immunization information system used by district health officers in 8 districts to (1) register and track individual immunization status, (2) improve vaccine logistics, (3) generate more accurate population estimates and vaccination targets, (4) provide information to parents and communities about immunization, (5) strengthen the knowledge and capacity of vaccinators and district health managers, (6) and monitor and refine RI service delivery approaches. This multifaceted Information systems was digitized from district to provincial level and paper-based below district level to household.	Over 18 months 830,610 children (aged 0 to 23 months) and 348,315 pregnant women in 28,565 villages At end of 18 months • About 64% of registered children under 2 received a third dose of Pentavalent vaccine (27% at baseline) • About 52% of registered children were fully immunized (18% at baseline) • About 65% of registered women vaccinated with at least two doses of tetanus toxoid vaccine (26% at baseline)	Not described in study, though study indicates that causation was not measured and cannot be assumed.	Advocacy, governance, leadership, & financing: Hired and trained district managers on registering target populations. Provincial EPI adopted practice of hiring District Immunization Officers for all 29 districts and increased transportation allowances (per vaccinator/per month) to enhance outreach activities Health workers empowerment: Intervention trained 3,503 health-care providers (vaccinators, district managers, lady health workers, and other types of community health workers) on the basics of immunization, created linkages between vaccinators and local communities, and practical microplanning SE across the health system: An integrated mobile messaging platform provided: • SMS-based vaccination reminders and five different awareness messages to caregivers • one reminder for vaccinators to visit specific villages based on their microplans; and • one notification to community focal persons informing them that vaccinators would be visiting their villages on certain dates	Barriers Not described Enablers Up to date data facilitated initial microplanning Standard checklists used by District Immunization Officers System could send SMS vaccination reminders.	No information given

Table 3. Digital information systems

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
El-Halabi S, et al. Children Immunization App (CIMA): A Non-randomized Controlled Trial Among Syrian Refugees in Zaatari Camp, Jordan. J Prev (2022).¹³ This study assessed the impact of a Children Immunization App (CIMA) for Android mobile phone on vaccination follow-up visits among parents of vaccine-eligible children residing in the Zaatari Refugee Camp in Jordan. Zaatari is one the largest camps in Jordan and Middle East, where 20% of the population is made up of children 0-5 years. Interventions targeted parents with newborns that required between one and four first vaccination doses. 94% of babies that were included had vaccination cards, so not primarily zero-dose children The app automated appointment reminders and stored and summarized immunization records in both Arabic and English.	936 babies were recruited in comparison to those receiving usual care. One quarter (26%) of mother-baby pairs of the intervention group came back within one week (versus 22% for the control group). 22% of the intervention group and 28% of the control group were lost-to-follow-up (p=0.06) (Relative risk reduction: 19%). - In comparison with the card-based vaccination appointments, the proportion of babies that came back on time was higher in the intervention group.	Non-randomized control trial	Community voice, input, & demand: Parents in cohort reported that immunization reminders and health education and vaccination messages were helpful and important. Community actors & stakeholders: Arabic posters in clinics advertised the study; Clinicians and social workers also informed camp residents about the study. Expectations & perceptions of SE: CIMA App was free to download on personal Android phones, with help of study staff. Users received two notifications in the coming days of the scheduled vaccine in case of missing the appointment. Fathers and mothers felt that child vaccination must be an important topic if it is recorded on a phone app.	None were described	No information given

Table 3. Digital information systems

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Oteri J, Idi Hussaini M, Bawa S, et al. Application of the Geographic Information System (GIS) in immunisation service delivery; its use in the 2017/2018 measles vaccination campaign in Nigeria. <i>Vaccine</i>. 2021;39 Suppl 3:C29-C37.¹⁴ A GIS mapping intervention was used for a measles vaccination campaign in multiple states in northern Nigeria with a focus on improving accuracy of ward-level microplanning.	States that used GIS technology in Nigeria had closer operational target populations per the verified microplan compared to non-GIS states. GIS-informed microplanning led to establishing vaccine posts with one kilometer radius of settlements, which decreased the proportion of sampled communities that viewed distance as a major barrier to vaccinating children. In states with GIS ward maps, no enumeration areas sampled had zero-vaccination coverage, except one (because of security issues).	Pre-and post-intervention coverage surveys with differing methodologies	Logistics & operational resources: GIS was integrated into the measles ward-level microplanning process through four steps: (1) planning stage, (2) fieldwork and estimation of workload and location of vaccination posts, (3) validation, and (4) feedback to key stakeholders Outreach services: GIS technology showed sub-optimal placement of vaccination posts, as shown in post-campaign survey, and enabled the installment of health posts within a kilometer of every settlement to avoid missing children. Health worker empowerment: The IT provider also trained EPI staff to effectively use the software	Barriers Security challenges and displacement leads to flux of population, inaccuracies because of spatial resolution limitations required manual correction Enablers None were described	

Table 3. Digital information systems

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Maintaining, Restoring, and Strengthening Immunization: Gavi Innovation Catalogue: Gavi Innovation Catalogue¹⁵ The Gavi Innovation Catalog compiled information technologies interventions to enhance immunization surveillance, tracking, community engagement, and demand creation. These interventions are described as in progress and not fully tested. GIS MAPPING: Gavi Innovation Catalog describes Country EPIs using GIS technology (maps and satellite) to strengthen planning for service delivery, by visualizing missed settlements and estimating population size. One setting was Accra, Ghana with technical support from the organization Mapping & Analytics for Health Activities (MAHA), that provided the mapping technology The two other settings were described as Anglophone and Francophone Africa, supported by the Center for International Earth Science Information Network (CIESEN) and Flowminder.	Limited view of outcomes from initial experiences in different settings; requires forthcoming independent evaluation	None were described	Logistics & operational resources: GIS Technology (digital maps and satellite) improve service delivery planning, e.g. by visualizing missed settlements and estimating population size. Public & private sector: Partnerships between EPIs and informational technology firms to enhance community reach and demand for immunization programs.	Barriers Requires access to data from physical maps, and existing digital programmatic and geographical data requires local IT partners to host data capacity building needed for day-to-use setting up and training staff on GIS takes a long time and has variable operational costs by context Enablers Availability of real-time health service data for use in GIS due to COVID-19 User-friendly software makes it easier for local governments and agencies to do mapping.	Nothing described explicitly; however the interventions described could be considered adaptations because they build on experience of technology providers and previous interventions, which are noted in the Catalog

Table 3. Digital information systems

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Maintaining, Restoring, and Strengthening Immunization: Gavi Innovation Catalogue: Gavi Innovation Catalogue¹⁵ DIGITAL IDENTITY CARD: Gavi Innovation Catalog describes a digital identity system, targeting missed communities and under-immunized children in Mauritania. The system tracks a child's immunization history using an electronic medical record (Wellness Pass) on an NFC enabled chip card (like a credit card). Parents retain the pass and use it during immunization sessions to feed records into a centralized information system.	Limited view of outcomes; awaiting evaluation post-test from 18-month pilot. Missed communities and under-immunized children, including those receiving first dose, are noted as target groups. However, no specific information is provided on whether and how the Wellness Pass facilitated initial access to services for zero-dose groups.	Pre-post evaluation not yet finalized	Public & private sector: Partnerships between EPIs and informational technology firms to enhance community reach and demand for immunization programs	Barriers High cost of Wellness Pass (US\$4 per unit, projected to drop to US\$1 at scale) Enablers Accepted by local government	Nothing described explicitly; however the interventions described could be considered adaptations because they build on experience of technology providers and previous interventions, which are noted in the Catalog
Maintaining, Restoring, and Strengthening Immunization: Gavi Innovation Catalogue: Gavi Innovation Catalogue¹⁵ DIGITIZATION for PAPER-BASED DATA COLLECTION: Gavi Innovation Catalog describes "Shifo," a data collection system that scans paper-based templates of immunization data ("Smart Paper") and digitizes them for a centralized system. Templates can be used at remote health centers without internet connectivity, which is relevant to health worker performance that serves communities with zero-dose and under-immunized children. Missed communities and under-immunized children are noted as target groups. No further information is provided. Noted countries include Haiti, Pakistan, Gambia, and Kenya	District health workers anecdotally reported a reduction in data-entry workload; further evaluation needed. Reducing workload has positive implications for improving service experience.	Pre-post evaluation not yet finalized	Public & private sector: Partnerships between EPIs and informational technology firms to enhance community reach and demand for immunization programs	Barriers Higher cost of Smart Paper templates compared to standard forms Once printed and configured, there is little room to change data fields Enablers Financially sustainable for local government using existing funding based on cost-analyses	Nothing described explicitly; however the interventions described could be considered adaptations because they build on experience of technology providers and previous interventions, which are noted in the Catalog

Table 3. Digital information systems

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Maintaining, Restoring, and Strengthening Immunization: Gavi Innovation Catalogue: Gavi Innovation Catalogue¹⁵ ENGAGEMENT and DEMAND CREATION: • Social listening through social media to identify communication trends and concerns around immunization posts and mitigate spread of inaccurate information. Draws on experience with Facebook in Brazil, Asia-Pacific region and Anglophone Africa region on COVID-19 vaccines, Polio, Measles, Zika, and Rubella. • SMS-based tool for community engagement and feedback, linked to information management dashboards. Draws on UNICEF experience with the “U-report” system that looked at COVID-19 impact and immunization demand in around 60 countries. • WhatsApp tool for three-way communication between EPI staff, healthcare workers and parents to share information and do collaborative disease surveillance. Draws on previous experience with Praekelt in multiple continents. • Mobile phone text and voice messaging to educate caregivers on immunization and send appointment reminders; health care workers can use the system to input immunization data. Draws on experience with M-Vaccin app and Orange (cellular service provider) in Côte d’Ivoire. • Human-centered design toolkit and workshops, drawing on practices and materials that UNICEF developed and implemented in Asia Pacific region, Malawi, and Zimbabwe.	Limited view of outcomes. Project awaiting completion of independent evaluations. Describes results of Pakistan: polio drive after social listening campaign, which reported an 80% decrease in vaccination refusals compared to previous drive		Public & private sector: Partnerships between EPIs and informational technology firms to enhance community reach and demand for immunization programs	Barriers and enablers Describes possible factors for both, but not those directly observed, for example: Zero-dose communities tend to have limited access to social media, which makes analogue approaches to social listening (e.g., engaging with journalists or researchers) more realistic options.	Nothing described explicitly; however the interventions described could be considered adaptations because they build on experience of technology providers and previous interventions, which are noted in the Catalog

Table 4. Energy infrastructure/electrification

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Khogali A, et al. Building powerful health systems: the impacts of electrification on health outcomes in LMICs. <i>Psychol Health Med</i>. 2022;27(sup1):124-137.¹⁶ A global systematic review (12 included studies) evaluated the impact of electrification on healthcare facilities in Sub-Saharan Africa (mostly Uganda), India, and Fiji.	In the India study, the probability of receiving the first dose of various vaccines increased significantly following an electrification project; ANC check-ups in the first trimester increased by 10%. Community satisfaction and approval of health facilities increased from 10% to 95% in Ghana and from 34% to 96% in Uganda	Reviewed studies included quasi-experimental, randomized control trial, cross-sectional survey, retrospective survey, and case-control designs	Logistics & operational resources: Five studies spoke to the effectiveness of electrification on service readiness, including vaccine infrastructures	None were described	No information given
Reaching zero-dose children with solar power in Kenya - Gavi, the Vaccine Alliance (2020).¹⁷ Green Life Energy Company donated a solar powered freezer to a health center in Kambu village in Makueni County, Kenya. Kambu and other neighboring villages were not on the energy grid.	Immunization coverage at Kambu health center increased from around 25% to 95%, and from 25% to 50% at two local dispensaries	No information given; but can assume pre-post evaluation	Logistics & operational resources/outreach services: Solar powered freezers enabled relocation of vaccine storage site from hospital to community health center and cut down travel distance to collect and return vaccines from nearly 96 km to 30 km.	Barriers None were described Enablers Donation from private sector The solar-powered freezer requires very little maintenance	No information given

Table 5. Health service delivery and management (HSDM)

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Only H, et al. Developing health service delivery in a poor and marginalised community in North West Pakistan. Pak J Med Sci. 2018;34(3):757-760.¹⁸ A three-year, multifaceted, intervention was developed for an existing healthcare facility in rural Peshawar District, Khyber Pakhtunkhwa Province. It had four main components: (1) service development, (2) staff capacity development, (3) community engagement and the introduction of a (4) micro-credit scheme.	Descriptive results of an evaluation survey indicated increased vaccination rates for women and children (no specific data given)	Evaluation pre-post with survey; focus group at end-line	Community actors & stakeholders: Community engagement, including the formation of village health committees to promote awareness and assist with health campaigns and referrals to the health center. Sustainability was achieved by training local volunteers as community health workers. Outreach services: Outreach workers made 13,386 household visits to promote awareness of the services available at the health center - They also conducted 158 health and hygiene sessions in schools (96 male schools and 62 female schools). Integration of immunization with service packages: Service development including reproductive health, immunizations, gynecological, safe delivery and nutrition services. Health worker empowerment: Staff capacity development including professional staff and volunteers. Expectation & Perceptions of SE: Introduction of a micro-credit scheme to provide financial support to pregnant women to cover the cost of ultrasound, transport expenses, medicine and delivery charges - Women reported that the micro-credit scheme made a big difference to the affordability of healthcare in such a poor community.	Barriers Negative attitudes in community associated with health system Power supply to health centers experience interruptions (solved by solar panels) Intervention carried out in locations with difficult and poor roads Enablers Community buy-in and trust of program	No information given

Table 5. Health service delivery and management (HSDM)

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Erismann S, et al. Effects of a four-year health systems intervention on the use of maternal and infant health services: Results from a programme evaluation in two districts of rural Chad. BMC Public Health. 2021;21(1):2304.¹⁹ This study assessed the use of antenatal (ANC) and postnatal care (PNC) services, health facility delivery, and infant health services after 4 years of a health systems intervention for improving the infrastructure, supplies, training, and sensitization for maternal and infant health in two districts of rural Chad. The intervention compared settled communities with mobile pastoralists.	Infants' reported health outcomes and general vaccination coverage (specific vaccines not described) considerably improved over three years. The vaccination coverage based on parental recall of the last child vaccinated increased at end-line among mobile pastoralists from 15% to 84%, and among mobile pastoralists in one-specific region (1% to 85%). Among settled communities, a minor increase over three years was detectable from 80% at baseline to 83% at endline.	Repeated cross-sectional household survey with a stratified two-stage cluster sampling methodology	Community actors & stakeholders: Carried out an educational behavioral change strategy with community participation. Advocacy, governance, leadership, & financing: Joint human and animal vaccination campaigns (OneHealth or mixed campaigns) with mobile pastoralist involved sensitization about benefits of vaccines and disease control programs. Performance-based contracting to finance health activities and provide remuneration based on performance. Facility environment: Reinforced health care services at facilities and district hospitals through the construction and rehabilitation of the infrastructures and the provision of biomedical equipment. Integration of immunization with service packages Integrated management of childhood illness, application of national protocols. Health worker empowerment: Strengthened the medicines supply management system. Trainings to improve the technical skills of health staff and the managerial capacities of health administration (supervision, planning and leadership skills).	Barriers Woman not attending ANC Distance from the intervention facility Seeking vaccination not part of their habits Shortage of supplies Low awareness of modern reproductive and maternal health services and their benefits reinforced by a lack of culturally sensitive approaches to communicating about them Enablers Affordability of services Accessibility to clinics	No information given

Table 5. Health service delivery and management (HSDM)

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Ghana Immunization Service Experience – The Vaccination Demand Hub (no date)²⁰ This document summarizes SE-related factors found in Ghana. And some interventions that have served as SE improvement strategies. These include: • Growth Platform which integrates, growth monitoring, nutrition, immunization, and counseling • Free immunization services and vaccines in public facilities Community Health Management Committees (CHMCs) that support childhood immunization operations	Results of interventions are not systematically discussed. Only a few effects are mentioned in anecdote. For example: • Use of integrated Growth Platform reduces cost and time for accessing multiple services CHMCs expand human resources for immunization in rural areas and increase community participation in immunization	None described, but suggested approaches described include: Extrapolating from existing quality of care indicators, e.g., Attitude of service provider Availability of medicines and diagnostic services Facility cleanliness and safety Child's level of pain and support for client to respond Ghana Health Service teams could conduct periodic client satisfaction surveys.	Community voice, input, & demand: CHMCs in Ghana support immunization program in rural areas with logistics, planning, and social mobilization and other services to strengthen community participation. Integration of immunization with service packages: Growth Platform integrates immunization with MNCH services.	Barriers Financing hurdles for vaccine supply and cold chains, facilities, and equipment especially in hard-to-reach areas. Challenges with M&E data accuracy and use Political, organizational, institutional barriers Enablers Integration of immunization service experience into quality assurance interventions	No information given

Table 5. Health service delivery and management (HSDM)

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Idris IO, et al. Impact evaluation of immunisation service integration to nutrition programmes and paediatric outpatient departments of primary healthcare centres in Rumbek East and Rumbek Centre counties of South Sudan. <i>Fam Med Community Health</i>. 2021;9(3).²¹ The integration of immunization services (EPI) into nutrition programs and pediatric outpatient departments of primary healthcare centers in Rumbek East and Rumbek Centre counties of South Sudan.	Integration intervention improved immunization coverage and reduced dropout rates: Rumbek Center -- Uptake of Penta1 vaccine improved from 61-96%, Penta2 37-69%, Penta3 57%-36-62%, reduced dropout rate from 57%-47% (p<0.001 for all). Rumbek Center East -- Uptake of Penta1 vaccine improved from 55-77%, Penta2 36-62%, Penta3 44%-63%, reduced dropout rate from 40%-28% (p<0.001 for all). Children were more likely to be immunized with Penta1 after immunization service integration into the nutrition programs of the PHCCs compared with integration into pediatric outpatient departments.	Pre-post impact evaluation	Integration of immunization with service packages: Strategy to integrate EPI services into nutrition programs in all the PHCCs in Rumbek Centre (under 5-year-old outpatient departments in selected primary health centers in Rumbek East. Health worker empowerment: Weekly reorientation and on-job training on rapid adoption of the functional approaches and practice of service integration into their daily practice.	None were described	No information given

Table 5. Health service delivery and management (HSDM)

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Gera R, Kapoor N, et al. Implementation of “health systems approach” to improve vaccination at birth in institutional deliveries at public health facilities; experience from six states of India. <i>J Family Med Prim Care</i>. 2019;8(5):1630-1636.²² An Intervention based in Health system technical support for scaling up RMNCH+A was developed and implemented in 26 poor performing districts of six states in India. Intervention components were not detailed, but described in general terms around • sustained advocacy and regular evidence-based feedback activities, • health worker sensitization and training on interaction with clients, supportive supervision for building skills, particularly around documentation and record-keeping • empowering district level staff to monitor and mitigate stock-outs at facilities and supply chain issues.	After implementation of the strategy, newborn vaccination improved from 55% to 88% across 10 quarters of program implementation. HepB and OPV coverage increased to 94% and 95% respectively across six states. Sensitization of stakeholders, vaccination on holidays, rigorous documentation, and supportive supervision of health staff were key reasons for improvement in service delivery.	Pre-post evaluation; project-based Management Information System to track immunization indicators across time from time of birth, qualitative methods	Advocacy, governance, leadership, & financing To bring in a responsive health system, the intervention focused on nurturing programmatic stewardship at all levels through sustained advocacy and regular evidence-based feedback. Health worker empowerment: Auxiliary nurse midwives were sensitized for providing immunization services. Regular supportive supervision builds health worker clinical skills and confidence and encourages proper record-keeping. The district health staff was trained to analyze facility data to identify and manage stock-outs and otherwise poorly performing facilities.	Barriers Requires timely policy reforms and internally driven system strengthening mechanisms backed by evidence, guidelines and top-down support Enablers Strengthening of general health systems building blocks are mentioned	Review describes interventions as adaptations of routine immunization delivery for conflict/humanitarian conditions.

Table 5. Health service delivery and management (HSDM)

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Ismail SA, et al. Strengthening vaccination delivery system resilience in the context of protracted humanitarian crisis: a realist-informed systematic review. <i>BMC Health Serv Res.</i> 2022;22(1):1277.²³ Systematic review of 50 studies of interventions that adapted routine immunization delivery for refugee, internally displaced and host community populations in conflict and post-conflict affected settings in sub-Saharan Africa. Target population was children aged 0–5, but also incorporating older displaced children, teenagers and adults in consideration for vaccine catch-up. Key interventions were: • multi-modal vaccination campaigns • health financing • creation of collaterals through service integration • health information and surveillance • health worker recruitment and trainings • community engagement and mobilization Specific ways that these activities were adapted were not described.	• Generally positive evidence of impact on routine vaccination uptake by bringing services closer to target populations and leveraging trust that had already been built with communities. • Reduction in the number of missed opportunities for polio vaccination and documented polio cases following intervention introduction • Reduction in the number of geographical locations with zero vaccination coverage by comparison with control areas in one (GIS-based) intervention. The effectiveness of rapid monitoring for campaign delivery is unclear. • Reduction in reported polio case load, and improvements in performance against a series of AFP surveillance criteria. (Authors indicate that summary statistics of intervention effects were not provided because of diversity of study types, designs, and contexts)	Mixed-method evaluations that were diverse in nature across studies Most studies observational with methodological limitations, variable data quality, weak study objectives and baseline data	Community voice, input, & demand: Community mobilization activities increased vaccination coverage, or reductions in missed opportunities for vaccination. Advocacy, governance, leadership, & financing: • Improved coverage for selected antigens over time following uplift in macro-level financing • Civil military engagement facilitate access to targeted areas during intervention, as well as reductions in number of zero-dose children • Cross border coordination - improvements in vaccination coverage, case ascertainment for AFP among high-risk populations identified following intervention implementation. Outreach services: • Mobile health teams helped increase coverage for selected antigens over time but with variations across population groups • Reductions in the number of missed opportunities for polio vaccination following intervention introduction (humanitarian) Public & private sectors SE Private sector engagement showed significant increases in coverage for selected antigens in intervention area by comparison with controls	None were described	No information given

Table 6: HSDM Capacity building for service quality improvement

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Manyazewal T, et al. Improving immunization capacity in Ethiopia through continuous quality improvement interventions: a prospective quasi-experimental study. <i>Infect Dis Poverty</i>. 2018;7(1):119.²⁴ Implementation of CQI approach in a health system strengthening package which included onsite technical support, training, and supportive supervision in a plan-do-check-act (PDCA) cycle. The content of these activities was determined based on baseline needs assessment and alignment with national immunization improvement plan indicators. 781 government health sectors (556 healthcare facilities, 196 district health offices, and 29 zonal health departments) were selected from developing and emerging regions in Ethiopia.	Following the interventions, vaccination coverage improved significantly from • 63.6% at baseline to 79.3% for pentavalent (p= 0.0001) • 62.5 to 72.8% for measles (P= 0.009), • 62.4 to 73.5% for BCG (P= 0.0001), • 65.3 to 81.0% for PCV (P= 0.02), and • And insignificantly from 56.2 to 74.2% for full vaccination.	Prospective, quasi-experimental design and time-series analysis using 53 process and outcome measures	Health workers empowerment: Health workers trained on managing the immunization program or delivering immunization services via WHO's Immunization Integration Program curriculum. Mid-level managers trained on cold chain and equipment management, immunization safety, and other responsibilities. CQI approach empowered zone, district, and facility-level government health sectors to exercise accountability and share ownership of immunization outcomes.	Barriers Not described Enablers Engaging communities to identify service gaps	Study advocates for adapting the model for other EPI countries, but does not describe any examples where it has been done.

Table 6: HSDM Capacity building for service quality improvement

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Individual and interpersonal-level interventions and strategies – The Vaccination Demand Hub (2020).²⁵ Presentation describes comprehensive training about interpersonal communication for immunization (IPC/I) and motivational interviewing (MI) as strategies that can improve interactions between client and health workers, influence service experience, and generate trust in demand for vaccines at individual and interpersonal levels. Reviews examples of individual and interpersonal intervention ideas generated through an HCD field study in Ethiopia, which include • Formal ceremonies to recognize completion of immunization, • community dialogues with caregivers and community leaders, • employee of the month awards and • involving community stakeholders in microplanning and mobilization activities.	No measurement of interventions discussed.	None described	Community voice, input, & demand: Discussions were held with the study site's head, immunization focal person, maternal and child health focal person, and immunization service providers. Then, each site was informed to develop plans to fill gaps identified in the baseline assessment. Expectation & perceptions of SE: IPC/I and MI largely influence perception of services and increase beneficiaries acceptance of and trust in vaccines and health workers provided vaccines.	Barriers Limited and fluctuating human resources in service environments are barriers to effectively doing IPC/I and MI Enablers Not described	No information given

Table 6: HSDM Capacity building for service quality improvement

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Chelagat T, et al. Effect of project-based experiential learning on the health service delivery indicators: a quasi-experiment study. BMC Health Serv Res. 2020;20(1):144.²⁶ A study on effects of experiential learning intervention model (leadership training and team coaching) on health service delivery indicators addressed by 15 health management teams from 13 counties in Kenya.	In intervention facilities with trained managers and team coaching, full immunization of children increased by 52%, out-patient turn-around time reduced on average by 65% and quality and customer satisfaction increased by 38.8%, among other positive results. These improvements were sustained for 60 months after the leadership training.	Quasi-experimental design (without random sample)	Health workers empowerment: Health facility managers participate in a 9-month leadership training, complemented with facility-based team coaching based on 15 priority institutional service improvement projects. The program's design unique feature includes its ability to challenge the participants to learn and apply leadership and management practices through the application of real health service delivery challenges.	Barriers Lack of follow-up or refreshers post-training leads to skills-decline or the need to learn new skills in a changing environment. Enablers Adequate time to participate in trainings. Over 90 percent of the respondents attributed team-coaching built around priority institutional health service improvement projects as a key enabler to their success.	Kenya experiential learning strategy was adapted from Management Systems for Health's "integrated leadership management and governance results framework."

Table 7: HDSM Partnership models

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Reaching Zero-dose Children: Evidence for Engaging the Private Sector. USAID MOMENTUM (2023).²⁷ A partnership in rural Angola between an INGO and a non-profit mission hospital (co-owned by government and public-Catholic diocese) implemented a multi-faceted intervention involving - community outreach sessions, - healthcare worker trainings and rotations between vaccination points and outreach sessions - improving vaccine stockpile monitoring - strengthening engagement with community health workers and traditional birth attendants	Community engagement and outreach activities through NGO partnerships increase doses administered by 26% (95% CI 9%–45%) in the comuna. Doses administered during outreach sessions during the intervention were 62% more than before implementation (95% CI 28%–107%). Statistically significant increases in the number of doses were observed for OPV2 (76%), OPV3 (100%), Penta3 (53%), PCV3 (53%), and Rota2 (43%).	Binomial regression analysis	Community voice, input, & demand: Tailored activities to address needs and complexities of communities and strengthen community relationships. Advocacy, governance, leadership, & finance: District health department provided vaccines, cold chain equipment, and supplies; helped draft outreach activity plans and improved immunization data sharing with hospitals. Outreach services: Tailored outreach services around community needs; Health Program Team boosted workforce capacity through conducting clinical attachments. Public & private sector: Public private partnership model increases rates of immunization. Integration of immunization within service packages: Integrating additional health services into immunization outreach.	Barriers None described Enablers Activities tailored to the needs and complexities of communities, strengthening community relationships, integrating other health services, conducting routine performance reviews.	No information given

Table 7: HDSM Partnership models

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Reaching Zero-dose Children: Evidence for Engaging the Private Sector. USAID MOMENTUM (2023).²⁷ NGOs provided vaccines in an urban slum in Dhaka, Bangladesh through monthly outreach sessions and through static clinics. The also collaborated with national and municipal government and a health research team on a package of services that - Extended the EPI service schedule - Trained providers dosing and managing AEFIs - Deployed a screening tool to identify immunization needs among clinic attendants - Mobilized an EPI support group for social mobilization activities	Proportion of children 12-23 months old who had received all valid doses of recommended antigens by 12 months increased from 43% at baseline to 99% at endline. Fully immunized children of working parents increased from 14% to 99%. Immunization drop-out reduced from 33% to 1%	Pre-post evaluation surveys, qualitative interviews	Advocacy, governance, leadership, & finance: EPI support group for social mobilization. Outreach services: Tailored outreach services around community needs; Health Program Team boosted workforce capacity through conducting clinical attachments. Facility environment: Extended time for the immunization service schedule (expanded hours or additional days not specified). Public & Private Sector: Public private partnership model increases rates of immunization. Integration of immunization within service packages: Integrating additional health services into immunization outreach. Health worker empowerment: Trained healthcare providers on administering vaccines and monitoring AEFIs.	Barriers None described Enablers Home visits by EPI support team and delivery of intervention package by existing orgs providing immunization improves accountability.	No information given

Table 7: HDSM Partnership models

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Field E, Abo D, Samiak L, et al. A Partnership Model for Improving Service Delivery in Remote Papua New Guinea: A Mixed Methods Evaluation. <i>Int J Health Policy Manag.</i> 2018;7(10):923-933.²⁸ A “contracting-out” model of public-private engagement for service delivery (engaging the support of non-government or private providers to deliver defined health services) in remote Papua New Guinea.	As a result of the health program, increases in vaccination coverage for infants aged <1 year were observed: 58 % for Penta1 (P<.001) and 75% for OPV1 (P<.001), 30% for Penta3 (P<.001) and 26% for MCV (P<.001)	Midterm evaluation; pre-post assessment of service delivery indicators; semi-structured interviews	Community actors & stakeholders: Quarterly partnership meetings held between health service providers and NGOs; Lay health workers in villages trained on health promotion and first aid (PNG). Logistics & operational resources: Coordination of medical supplies ordering and distribution to health facilities though the government system. Outreach services: Tailored outreach services around community needs; Health Program Team boosted workforce capacity through conducting clinical attachments. Facility environment: Provision of medical equipment, at National Health Service Standards, vaccine fridges and health radios; transportation for outreach and patient transfers; renovation of health facilities including, lighting, plumbing for running water. Public & private sector: Public private partnership model increases rates of immunization. Health worker empowerment: Coordination and delivery of health worker training; Procurement of construction materials for health staff housing.	Barriers None described Enablers Lack of basic supplies (providing a boat but not giving it fuel, medical supplies) Lack of supervision Lack of community support and cultural barriers that prevented people from accessing services (female health worker treating males, lack of male participation in maternal and reproductive health Perception that different treatment provided by church run services for people from different religions.	No information given

Table 7: HDSM Partnership models

Source name and intervention description	Results/ findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Ahonkhai AA, et al. Lessons for strengthening childhood immunization in low- and middle-income countries from a successful public-private partnership in rural Nigeria. <i>Int Health</i>. 2022;14(6):632-638.²⁹ Review of the Sabongida-Ora childhood vaccination project implemented in rural Nigeria (Sabongida-Ora) by a public-private partnership. (a Corporate Social Responsibility initiative funded by GSKBio) The program provided free comprehensive immunization services for children without routine access until the government sponsored services stopped.	Providing no-cost immunization to the target community for a 16-year period increased age-appropriate immunization coverage from 43% to 78%.	Specific approach not described; assumed to be pre-post assessment.	Community voice, input, & demand: Conducted a needs assessment informed by in depth interviews with community representatives in the church and local government, medical directors at the healthcare facilities in the community, and mothers of children aged <5. Community actors & stakeholders: Multiple consultations were held to align with local traditional rulers, neighboring communities, and local government authorities of Edo State. Assembled a cohesive team with expertise from public health nursing, family medicine, vaccinology and pharmaceutical medicine. Public & private sector: After hours medical services made available in a nearby private hospital for babies with possible vaccine-associated complaints or concerns. Integration of immunization within service packages: Integrating additional health services into immunization outreach.	Barriers None described Enablers early and sustained community engagement and collaboration use of RE-AIM implementation research framework non-vaccine supplies were sourced locally used lower cost kerosene-fueled refrigerators and freezers to maintain cold-chain	No information given

Table 8: Supplementary immunization activities (SLA)

Source name and intervention description	Results/findings	Measurement approach	Relevance to SE components	Intervention barriers and enablers	Adapted or scaled?
Omoleke SA, et al. The Potential Contribution of Supplementary Immunization Activities to Routine Immunization in Kebbi State, Nigeria. J Prim Care Community Health.³⁰ A descriptive study to assess the contribution of SIAs on routine immunization program access and utilization over time. Focused on 2 Oral Polio Virus (OPV) campaigns, 1 Fractional Inactivated Polio Vaccine (fIPV) and 1 Maternal and Neonatal Tetanus Elimination (MNTE campaign), conducted across 10 local government areas in Kebbi State, Nigeria. The study did not specify a focus on zero-dose children though does report the effect of polio SIAs on Penta 1 coverage (a key indicator of service accessibility and initial use) and Penta 3 coverage (an indicator of client satisfaction and retention in services) The SIAs were conducted in January, April, August, and September of the same year.	The addition of periodic SIAs into the RI system can improve RI coverage and potentially reduce dropout rates, especially with good quality of integration done at short and regular intervals. Study reports: • The 9-month trend of RI coverage (Penta 1 and 3) in the 10 local government areas was mostly above 100% and as high as 237%. • Reported contributions of SIAs on routine immunization over 7 months: - Penta 1: 30% (Jan), 38% (Apr), 74% (Aug) - Penta 3: 29% (Jan), 33% (Apr), 66% (Aug) - Study also reports contribution to BCG and measles, though these antigens were not included as part of SIA. • Pentavalent dropout rate was lowest in February (0%), highest in June (12%); all other months <10%	Data obtained from DHIS 2.0	Community voice, input, & demand: SIAs serves as a conduit for reaching communities that were previously missed or poorly covered by RI, as well as to deliver optimized RI service through community-based delivery method, intensifying community mobilization, and using incentives. Outreach services: OPV campaigns implemented within regular framework of Immunization Plus Days; different types of vaccination teams used to identify and vaccinate children in home visits, community settings, and health facilities and were aided by community mobilizers; food incentives provided at fixed post sites.	Barriers Did not eliminate the influence of potential confounders, such as intensified RI activities and in-between Round Activities Enablers Offered unimmunized children and defaulters from RI services (fixed or outreach sessions) an opportunity to be reached and get immunized with polio vaccine and tetanus containing vaccine (i.e. Pentavalent vaccine).	No information provided

Table 9. Pro-equity strategies

Source name and intervention description	Relevance to SE components	Adapted or scaled?
Ducharme J, et al. Mapping of Pro-Equity Interventions Proposed by Immunisation Programs in Gavi Health Systems Strengthening Grants. <i>Vaccines</i> (Basel). 2023;11(2):341.³¹ Review of Gavi Health System Strengthening proposals submitted to Gavi from (2014-2021); 56 interventions were identified and mapped them to a framework reflecting Gavi 5.0 guidance on reaching zero-dose children and missed communities. This mapping was consistent with the results of UNICEF's pro-equity mapping of JA reports.³² - Majority of proposals bundled interventions that involved outreach, microplanning, and community education implemented at district, facility, and community levels. However, the rationale behind approaches to bundling requires clarification through theory of change development. Interventions that were not bundled risked limited sustainability and effectiveness. - Almost half of the proposals targeted rural-remote areas, a little over a quarter addressed gender barriers. 42 addressed demand-side factors and 51 addressed supply-side factors.	Community actors & stakeholders Engage religious/community leaders to promote immunization, immunization champions/ambassadors. Advocacy, governance, leadership, & finance: Advocacy at community level and with local government representatives. Logistics & operational resources: District microplanning and RED strategies, purchase of transportation equipment, strengthening cold chain functionality, providing security resources for safe immunization activities. Outreach services: Tailored locations of outreach service for local settings. SIA targeted at vulnerable communities Facility environment: Reminders and strategies to reduce time, costs, and opportunity barriers Public & Private Sector: Communication strategies (print, radio, TV, etc.) to generate demand Integration of immunization within service packages: Integration of immunization within service packages and PHC Health worker empowerment: Training health workers and health managers on equitable service delivery, financial and non-financial incentives for staff, Peer support groups for health providers. Expectation & perception of SE: Health facility level education and counseling around immunization	No information provided

Table 9. Pro-equity strategies

Source name and intervention description	Relevance to SE components	Adapted or scaled?
Ivanova V, et al. Advancing Immunization Coverage and Equity: A Structured Synthesis of Pro-Equity Strategies in 61 Gavi-Supported Countries. <i>Vaccines</i> (Basel). 2023;11(1):191.33 A review of pro-equity strategies across 61 countries receiving programmatic support from Gavi and drawn from 174 Country Joint Appraisals and Multi-Stakeholder Dialogue reports (2016-2020). Synthesis based on UNICEF's Journey to Health and Immunization (JTHI) and the Global Routine Immunization Strategies and Practices (GRISP) and expands previous UNICEF mapping³² with more recent data on original countries and includes 48 additional Gavi-supported countries. The study results on pro-equity strategies informed the creation of UNICEF's web-based Solutions Library Database: https://www.ige.health/solutions/ • 607 unique strategies identified, grouped into 24 themes • Used UNICEF's JHTI Framework to group strategies into JHTI Steps, with the most common interventions pertaining to improving care at the point of service (44%); <i>improving knowledge, awareness and beliefs</i> (25%); and <i>addressing preparation, cost and effort barriers</i> (13%). Fewer strategies targeted experience of care (8%), intent, (7%) and after-service (3%). • 58 interventions were identified for experience of care, which were categorized into two thematic groups: - Utilization: <i>Adjusting service delivery approach, engaging community to ensure acceptability</i> (44 in study/31 on Solutions Library) - Utilization interventions included <i>Community volunteers in outreach and SIAs, registering and tracking immunized children, defaulter tracing, community support and resource groups, social mobilization and advocacy activities, using community liaisons, community scorecard, vaccination triage at health facilities, community dialogues and meetings, and training community health workers and civil society groups</i> - Human resources/Workforce: <i>Health workers have the skills and motivation they need</i> (14 in study; 11 on Solutions Library) Human resource/Workforce interventions included <i>Health worker trainings, AEFI surveillance, and logistics management; outreach participation; capacity building on interpersonal comms for health care workers, community health workers, and volunteers; logistics, community sensitization and mobilization activities, and volunteers for SIAs</i>	Community actors & stakeholders Engage religious/community leaders to promote immunization, immunization champions/ambassadors. Advocacy, governance, leadership, & finance: Advocacy at community level and with local government representatives. Logistics & operational resources: District microplanning and RED strategies, purchase of transportation equipment, strengthening cold chain functionality, providing security resources for safe immunization activities. Outreach services: Tailored locations of outreach service for local settings. SIA targeted at vulnerable communities Public & private sector: Communication strategies (print, radio, TV, etc.) to generate demand Integration of immunization within service packages: Integration of immunization within service packages and PHC Health worker empowerment: Training health workers and health managers on equitable service delivery, financial and non-financial incentives for staff, Peer support groups for health providers Expectation & perception of SE: Health facility level education and counseling around immunization	No information provided

ANNEX 3

Measurement Synthesis



QUESTION 2

What mechanisms or data collection tools exist to measure and monitor immunization SE at country level (i.e., facility level up to national)?

This synthesis section is organized by types of measurement approaches tools reviewed and thematic categories that emerged. In the tables for each category, pertinent details of sources are provided. Each table includes from left to right columns:

1. The source name and description of measurement approaches and/or tools,
2. description of the context of use, include aims, and level of use in health system, if described in the source,
3. relevance to SE components from the framework (figure 1 above), based on reviewers' impressions,
4. barriers and enablers of using and the approaches and/or tools, if described in the source documents.

Table 10. Behavioural and social drivers toolkit

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Behavioural and social drivers of vaccination: tools and practical guidance for achieving high uptake (2022)³⁴ The behavioural and social drivers (BeSD) Toolkit measures behavioral and social drivers^c of vaccine uptake that encompass individual-level indicators that correspond to domains described in <i>theory of planned behavior</i> and <i>theory of reasoned action</i>^d. Priority and optional indicators for childhood (under 5 years of age) include: 1. Thinking and feeling (confidence in vaccine benefits, safety, and in health workers) 2. Social processes (family, peer, and community norms around vaccination; caregiver autonomy) 3. Motivation (intention to get a vaccine) 4. Practical issues (access barriers, service quality, service satisfaction) The Toolkit includes (1) childhood vaccination indicators, (2) a 32-item caregiver survey and (3) four In-depth interview (IDI) guides for use with caregivers, health workers, community influencers, program managers). It also includes guides for immunization program planning and context adaptation and an Excel template for supporting interpretation of qualitative responses.	The tool is intended for use at community and facility levels with caregivers, health workers, community influencers and immunization program managers. Routine tracking of BeSD data provides information on how to continually improve program implementation; the Quality Immunization Services Planning Guide (WHO)³⁵ also recommends routine tracking of BeSD data. The Toolkit can inform study questions like 1. Which social and behavioral drivers predict vaccine uptake among X population? 2. What are the barriers to and enablers of vaccine uptake among X population? 3. How are vaccination services experienced among X population? A limitation of the tool is its focus on immunization, without questions on historical or previous interactions with the health system and how previous interactions, especially negative ones may influence health seeking behavior. The BeSD surveys can supplement other data collection activities, such as an EPI review and program data, coverage surveys, administrative data, social listening data and surveillance data. No description or examples of tool implementation was provided, except for a short anecdote about adapting tools from Guatemala context.	Community voice, input & demand: Indicators on thoughts, feelings, motivations, social processes, practical access barriers Community actors and Stakeholders: Indicators on social processes, barriers, and influencers Facility environment: Indicators on barriers and facilitators of uptake at facilities Quality of the interaction and service provided: Several specific questions around service quality are included in the childhood vaccination survey for caregivers (e.g. how satisfied are you with vaccination services, what is not satisfactory, etc.)	Barrier and enablers of Use Using tools to supplement other data collection activities requires good coordination, expert input and strong partner engagement. Adaptation of BeSD tools is only recommended when three steps are employed involving translating into local languages, cognitive interviews to test meaning of constructs, and pilot testing (local Guatemala example provided)

c Social drivers are vaccination-specific beliefs, attitudes, behaviors, and experiences that programs may be able to modify to boost vaccine uptake

d Brewer, NT, et al. (2017). Increasing Vaccination: Putting Psychological Science into Action. *Psychological Science in the Public Interest*, 18(3), 149–207.

Table 11. Strengthening immunization service experience: Insight gathering tool

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Strengthening Immunization Service Experience: Global, Regional and Country Insight Gathering – The Vaccination Demand Hub (2022).³⁶ The Strengthening Immunization Service Experience Insight Gathering Brief from the Vaccination Demand Hub compiles and describes potential data collection methods that can be used and adapted to monitor service experience: • Supportive supervision tools • Mystery client at facilities (e.g., used by Ghana Coalition of NGOs in Health) • Client exit interviews and mini surveys • Client satisfaction cards • Community score cards (e.g., CARE Community Scorecard Toolkit) • Health committees (e.g., used in Ghana) • Anecdotal evidence gathering through community actors (e.g., Nepali government support for female community health volunteer structure) • EPI periodic cluster surveys, Multiple Indicator Cluster Surveys, Demographic and Health Surveys Some proposed thematic areas for indicators to measure Service Experience (non-exhaustive): • respectful and compassionate care • waiting time for provision of services • availability, accessibility, and affordability of immunization services • leadership and management of facilities • cleanliness and safety of facility • information provided to clients on vaccines • the attitude of both health workers and clients	Not described	Community voice, input, & demand: The suite of tools enables community members and immunization program users to input into identification of barriers, opportunities, and solutions for improving service experience Expectation & perception of SE: The suite of approaches and methods provide multiple, interrelating ways to capture attitudes, perceptions, and experiences of immunization from community members, which can provide deeper understanding and rigor to analysis of immunization service experience data.	Supportive supervision – capacity building needed with supervisors/district management teams Exit interviews are not regularly done due to lack of interest, accountability, time, or skills; many supported with external financial support Satisfaction cards are placed in hospital windows for public access but no formal, collaborative feedback with communities takes place Community scorecard approach – adaptation of lessons learned needs to be more systematic and independent of external financial support Existing surveys provide a platform through which service experience indicators could be incorporated and systematically collected

Table 11. Strengthening immunization service experience: Insight gathering tool

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Strengthening Immunization Service Experience in Mozambique. JSI (2023).³⁷ A summary of service experience-related issues found in Mozambique describes some tools and approaches to evaluate service experience drawing from the Vaccination Demand Hub Service Experience Guide described above. These include: 1. Immunization Program Exit Survey – a mini-survey conducted outside health facility immediately after outpatient consultation 2. MNCH Satisfaction Cards – Caregivers vote with colored cards to express satisfaction after attending facility; results compiled monthly and displayed for public access 3. Health Committees – involve communities in planning community-based programs and in transparent evaluation of healthcare workers	The approaches described were used at both community- and facility levels with caregivers, facility/immunization staff, students, and health committees. Although they do not use validated indicators, they capture the perceptions of clients and health workers in various ways, which are being used in on-going monitoring of service experience and interactions between health workers and clients in country.	Community actors & stakeholders: Health committees involve communities in planning and evaluation of services Health worker empowerment: Results of votes with satisfaction cards are publicly displayed, which can provide near real-time feedback to facility staff, but requires formal dialogue with the community to address gaps.	Barriers Exit survey: Not done regularly due to lack of interest, accountability, time, or skills. MNCH satisfaction cards: No formal feedback with the communities occurs. Health Committees: Occurs only with support from NGOs in certain communities or provinces. Enablers Clear communication and explanation of the purpose and benefits of the survey to health workers and community members. Availability and accessibility of the satisfaction cards to mothers/caregivers, including providing them in local languages and ensuring they are culturally appropriate. Active involvement of community members and health workers in the development and implementation of health committees, including their roles and responsibilities and providing them with the necessary resources and support.

Table 12. Immunization campaign tool

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Lessons Learned and Good Practices: Country-specific case studies on immunization activities during the COVID-19 pandemic (2022).³⁸ UNICEF's report on six country-specific case studies on stabilizing routine immunization activities during the COVID-19 pandemic contains a 24-item semi-structured survey instrument and interview guide. The interview guide covers 15 thematic areas including one on community engagement and social mobilization, which is relevant to service experience. Questions in this theme ask about • Channels used for engaging communities and trust-building • Approaches to identify and mitigate immunization access barriers • Communication practices, plans and materials • Community engagement challenges and successes • Identifying and mitigating vaccine rumors • Evaluation effectiveness of messaging and materials	Case-study countries were from Angola, Bangladesh, India, Papua New Guinea, Philippines and Yemen. The interview guide was used with UNICEF and WHO country and regional office staff in the six countries in the format of individual and group interviews. These included specialists and officers for immunization, public health, communications for development. The community engagement and social mobilization question are largely operational in nature nested within a tool that covers a broad set of other operational themes. No information was provided as to whether these relevant interview questions were being continually monitored in countries after the immunization campaigns. However, given that community engagement and social mobilization are core immunization programming activities, it is likely that subnational EPI programming data would regularly capture these themes in some way or could adapt them from this tool.	Community voice, input & demand: Questions on approaches, challenges and success in engaging communities, building trust, and mitigating vaccine rumors Community actors and stakeholders: Questions on access barriers Facility environment Questions on access barriers	In some instances study team could not validate interview findings with other data sources In some countries respondents had limited time or were unable to participate because of conflict with campaign implementation activities

Table 13. Health facility assessment tools

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Siddiqi DA, et al. Assessment of vaccination service delivery and quality: a cross-sectional survey of over 1300 health facilities from 29 districts in Sindh, Pakistan conducted between 2017–18. BMC Health Services Research. 2022;22(1):727.³⁹ This paper presents a survey instrument for health facility assessment used in Sindh Province, Pakistan. The tool was adapted from a similar survey developed by the USAID-supported Basic Support for Institutionalizing Child Survival (BASICS) Project and EPI-Sindh. The adapted final survey had four main sections, including Quality of Vaccination Service, Immunization Processes, Cold Chain Processes and Health Worker Experience. Facilities were assessed on whether they were 'High', 'Moderate', or 'Low' functioning in these areas in terms of whether they had material or human resources available and presence and functioning of associate processes. However the paper does not systematically describe variables for quality of vaccination service or for health worker experience.	This tool was used to guide the first-ever comprehensive health facility assessment at provincial level in Sindh Province. The study design was cross-sectional and assessed a total of 1396 public, private, and public-private health facilities. The adapted tool was pilot tested to ensure validity and translated into the local language prior to deployment in the field. Data was collected using an Android Open Data Kit application. Health worker data contained information on vaccinators, lady health workers/vaccinators, and other facility staff responsible for administering immunizations at facilities and outreach.	Logistics & operational resources: Tool assesses vaccine supply and cold chain management Health worker empowerment: Tool contains “Health Worker Data” section to measure health worker experience Quality of the interaction and service provided: Tool contains “Quality of Service” section to measure quality of vaccination service	Data collectors must be trained to use Open Data Kit (ODK) software Bias of the assessor who may want to make facilities appear better than they are, but mitigated by use of non-staff data collectors Infrastructure and process indicators measures are only proxies for program performance Data collectors must be trained to use Open Data Kit (ODK) software Bias of the assessor who may want to make facilities appear better than they are, but mitigated by use of non-staff data collectors Infrastructure and process indicators measures are only proxies for program performance

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Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Context Assessment Evaluation Report Deck. USAID MOMENTUM (2022).⁴⁰ The Context Assessment Toolkit (developed by Ariadne Labs) identifies and helps address facility-level factors that may influence the success of implementing a practice improvement. These include: (1) Ability to implement, (2) Commitment and Motivation, (3) Internal Culture, (4) Clinical Team Functionality. This toolkit consists of 4 modules: three surveys (online or paper-based) and one conversation guide: • Pre-implementation survey: collects close-ended data to inform decisions about implementation readiness • Conversation guide: collects open-ended data to inform decision about implementation readiness • Progress Survey: collects close-ended data to assess contextual factors that could jeopardize implementation and inform course-corrections • Implementation Pulse Check: collects close-and open-ended data to monitor progress and implementation risks	The overall aims of the tools are to guide health facilities to implement quality improvement strategies for quality service delivery. The four tools are self-administered at various time points during implementation by health facility leaders, health-care workers, implementation team members. Implementing partners administer the conversation guide to community members but not to self. USAID Momentum Project has piloted and evaluated the toolkit in Indonesia (10 sites). Lifebox Clean Cut Program did the same in Ethiopia (10 sites).	Workplace community: Measuring leadership commitment, staff motivation, and communication norms, team functionality, resource availability, and internal culture	Barriers Facilities require additional socializing of tools and quality improvement concepts in advance. Survey and conversation guide questions were sometimes difficult to understand for facility staff. Mixed feedback on what combination of tools to use between facility staff and implementing partners. Implementing partners were unclear on how to use results to improve implementation. Enablers of use Discussions facilitated group problem solving and raised group awareness of issues for facility staff. Excitement from facility staff about the prospect of using Context Assessment results to make improvements. Socializing the Context Assessment tools with facility staff before administering them is critical to improve participation rates and relevance.

Table 13. Health facility assessment tools

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Individual and interpersonal-level interventions and strategies – The Vaccination Demand Hub (2022)²⁵ Presentation describes comprehensive training about interpersonal communication for immunization (IPC/I) and motivational interviewing (MI) as strategies that can improve interactions between client and health workers, influence service experience, and generate trust in demand for vaccines at individual and interpersonal levels. Catalogs example metrics for evaluation IPC/I & MI For healthcare workers (HCWs): • % correct on IPC/I & MI knowledge test • # or % of HCWs newly trained on techniques • # or % of HCWs receiving refresher training • # or % of supervisors training for IPC/I & MI supportive supervision For clients • # or % of clients reporting high/very high satisfaction with immunization visit • # or % of clients reporting positive interactions with HCWs • # or % reporting trust in HCWs around communication for immunization Other metrics • # of facilities where IPC/I&MI is integrated in pre-service and CE • # of HCWs reporting effective supervisor support • # of supportive supervision visits	Metrics are described as part of general training on IPC/I & MI; specific case examples of use were not described.	Health worker empowerment: Indicators on health worker training and supervision on IPC/I & MI Quality of the interaction and services provided: Indicators on client satisfaction and trust with services	Tailor evaluation metrics according to scope of IPCI & MI interventions based on resource considerations

Table 14. Participatory, community-based assessments

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Presentation on participatory monitoring & evaluation for vaccination communications and demand (2022).⁴¹ Types of approaches and methods listed in presentation: - Exit interviews, key informant interview, intercept interviews - Most significant change methods (narrative-based data and analysis that links decision makers with people affected) - Interactive case studies, narratives, personas - Action reviews – participatory feedback and analysis around agreed upon indicators and tools for anticipated activities and their results - Regular monitoring review meetings - Quality improvement methods (e.g., PDSA cycles) - My Village, My Home (MVMH) - Tailoring Immunization Programs (TIP) - Collaborative community checklists and collective measurement (scorecards, Champion Community Approach) - Digital interactive methods - App-based learning with survey metrics - Community video - Interactive Voice Response surveys - Rapid online input and feedback (e.g., Mentimeter)	Example provided of: PDSA and participatory action reviews in Ethiopia for engaging communities on microplanning and activity plan reviews. MVMH and Home-Based Records (HBR) strategies used in low coverage districts in Zimbabwe. Interactive Voice Response surveys to capture community perceptions on health services and vaccination in Burkina Faso, Ghana, Mali, and Nigeria. Benefit of Participatory research and evaluation methods over purely extractive/outcomes focus methods: - affords opportunities for individual and group representation, consultation, and collaboration - allows interactive knowledge and information exchange and cross-learning - minimizes “extractive data gathering” that privilege scientific/technical systems of power and hierarchy over local knowledge and cultural norms, - enables systematic approach to collaborative feedback, rapid problem solving, and quality and sustained improvements - provides linkage of qualitative and quantitative data, including process data for more holistic understanding of service experience domains	Community voice, input, & demand/Community actors & stakeholders/Expectation & perception of SE/Quality of the interaction and service provided - PDSA and participatory action reviews - Agreed upon measures included: <i># of vaccination sessions held per plan each month; # of caregivers/adults given information about vaccination sessions compared with # that attended sessions</i> - Action reviews with community contacts to assess interactions with caregivers of newborns, how they are informed about vaccinating infants, and caregiver tracking - MVMH and HBR strategies link facility immunization registers to community registers, which are visible to and usable by community members to assess immunization progress and gaps.	Engage communities and implementers in M&E design from conceptual stage in during implementation; don't come with pre-determined approaches and solutions Tailor toolbox of M&E approaches/technologies to different cultural and operating environments and resource availability Ensure sufficiently representative samples/groupings of populations. Acknowledge methodological limitations, including response bias and need to triangulate with other data sources M&E is not well-understood by everyone, so effort is needed to facilitate a culture of learning and problem-solving with data at community level.

Table 14. Participatory, community-based assessments

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Reaching zero-dose and under-immunized children in remote and underserved setting of Ethiopia: Evaluation.⁴² Project Hope (Ethiopia) Study was carried out to identify and map clusters of missed communities and zero dose children in Ethiopia. Among topics of focus, the study explored demand and supply barriers, including gender and socio-cultural constraints. Study included situational assessment, vaccination coverage survey, barrier and enabler (B&E) analysis and formative assessment for developing key strategies. The report includes measurement instruments for different studies that were conducted. Project Hope Study assessment tools included • Interview Guides (Situational Assessment study; Barrier and Enabler Analysis) • Focus Group Guide (Barrier and Enabler Analysis) • Community-based survey tool Interview Guides for most respondent groups contain questions grouped under the following themes: • Service delivery barriers (e.g., physical access; health worker availability, motivation, workload, private sector engagement) • Demand barriers (e.g., socio-cultural factors, individual/family level factors, vaccine hesitancy, health literacy, efforts to improve interpersonal communication, social mobilization and demand creation, SBCC strategies, benefits and harms of vaccines) • Gender related barriers (e.g., supply and demand side, resource control and decision making in households and communities, women's leadership roles in health services, access to vaccine information, domestic violence) • Zero-dose interventions Focus group guide for Mothers and Caregivers include questions on • Knowledge and concerns about vaccination • Patterns and reasons for vaccination • Performance and motivation of health workers • Availability and accessibility of vaccine services • Satisfaction and experiences with vaccination • Community engagement and mobilization • Social cultural factors, and gender factors, individual/family, factors Community-based survey tool contains sections on • Knowledge and attitudes on vaccination – 26 items • Barriers and enablers to vaccination – 9 items • Gender empowerment – 25 items	Situational Assessment study and Barrier and Enabler Analysis • Respondents included government officials, program managers, focal persons, health professionals, volunteer community health care workers, community/religious leaders) • Interview guides used at federal, regional, and woreda levels • Focus group guide used with mothers and caregivers at the community level The mixed method studies and tools were used in 11 regions in Ethiopia and among • Pastoralist regions and populations • Developing and newly established regions • Underserved urban populations • Hard-to-reach areas in major regions • Internally displaced peoples • Refugees	Community voice, input, & demand/ Community actors & stakeholders/ Expectation & perception of SE/ Quality of the inter-action and service provided Suite of Project Hope tools provide multiple, interrelating ways to capture knowledge, attitudes, perceptions, and experiences of immunization from community members and health system stakeholders, which can provide deeper understanding and rigor to analysis.	Physical and social challenges of accessing missing populations and hard-to-reach populations Political instability in some regions. Barriers and enablers from specific studies not systematically described

Table 15. Global immunization metrics

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Immunization Agenda 2030 - Monitoring and Evaluation Framework.⁴³ IA2030 Global Strategic Priority Objective Indicators. GLOBAL Strategic Indicator 2.2 – “Proportion of countries that have implemented behavioral or social strategies (i.e., demand generation strategies) to address under vaccination.” REGIONAL/COUNTRY Strategic Indicators 2.2 – Includes above language and the following: “Implementation of behavioral or social strategies (i.e. demand generation strategies) to address under-vaccination in the previous year.” Proposed indicator options for regional use 1. Government support for community action (e.g. earmarked funds for community action, provision of technical tools tailored to communities, programs for subgroups at particular risk) 2. Countries with dedicated online resource for sharing accurate information about vaccines and immunization, including local schedule 3. Countries with routine digital listening platforms established Indicator options for country use 1. Health facility microplans that include engagement with civil society and community representatives 2. Health facilities with staff that received training (refresher or other) on interpersonal communications or similar 3. % of population that values vaccination 4. Placeholder for additional BeSD-based indicator 5. Placeholder for programmatic indicator on overcoming gender-related barriers to immunization	The 15 IA2030 Global Strategic Priority Objective Indicators are intended to assess progress and be used to recommend actions for performance improvement at the global level and to highlight critical performance gaps that need to be further evaluated and tackled at regional and country levels. Country-level data on these indicators are intended for country self-reporting through the UNICEF/WHO Joint Reporting Form (JRF). No information is provided on whether or where they have been implemented for country monitoring.	Community actors and stakeholders: Indicator for engaging community stakeholders in microplanning Advocacy, governance, leadership & financing: Indicators for government financial and technical support for community action; provision of online resource for sharing accurate vaccine/immunization information; provision of digital listening platforms Health worker empowerment: Indicator for health facility staff with training on interpersonal communication	Adoption by countries/regions to tailor to specific immunization context Strong understanding of service experience construct and measurement

Table 16. Social media studies

Source name and description of approach/tools	Context of use	Relevance to SE components	Barriers and enablers of use
Meta Workshop 3 – The Vaccination Demand Hub (2022).⁴⁴ UNICEF presentation on different approaches to testing the effectiveness of communication campaigns. Measurement approaches include the following: Organic Social Media Posts – These posts are any free content shared on social media. How they perform in actual usage can generate insights for future messaging strategies and investments. Can also track similar metrics for paid advertisements, rather than free content. Brand lift studies (BLS) – Brand Lift Studies are surveys run with experimental designs to understand what digital communication strategies connect the most with audiences. Industry uses BLS to measure what ads generate demand for goods and services. UNICEF Country Offices can use BLS to understand what campaign strategies will resonate with a target audience. A BLS survey of vaccination messaging would use questions to assess performance of content including • Recall – how memorable was the content (mandatory) • Attitudes, Knowledge or Information outcomes - E.g., Vaccine confidence safety, effectiveness, benefits vs risks, social approval of vaccines, trust in organizations/healthcare workers A/B testing – allows for comparing a change in one variable of difference (e.g., visual elements, text, ad object, target audience, language) between ads or messaging content, all else being equal. Website developers and social media platforms like Facebook often use how A/B testing experiments to gather insights on user preferences. Off-platform studies, and participatory research – Involves testing proposed campaign content with real off-platform surveys or through focus groups and interviews.	Presentation describes how these types of testing approaches have been used in comparing the performance of 4 large social media campaigns for vaccine messaging in India2 (national level/low coverage states and cities). For example, BLS was used in India to compare performance of social cohesion/national pride campaign with a social norming campaign across different campaign areas. Using these approaches for testing or pre-testing campaigns yields information on audience engagement (clicks), what content should be boosted, potential for impact, and considerations for audience segmentation.	Community voice, input, demand: Different approaches to measuring social media messaging campaigns provide insights into attitudes about and demand for vaccines the best ways to reach and engage audiences in diverse settings. Public & private sector SE: Social media firms provide technical support, funding, tools, and systems to implementing organization and public sector for designing and implementing social media testing.	No information provided

