

1 ***Pro-Equity Immunization and Health Systems Strengthening Strategies in select Gavi-***  
2 ***Supported Countries***

3

4 **Authors:** Ibrahim Dadari<sup>1,2,5</sup>, Ariel Higgins-Steele<sup>2</sup>, Alyssa Sharkey<sup>2</sup>, Danielle Charlet<sup>6</sup>, ASM  
5 Shahabuddin<sup>2</sup>, Robin Nandy<sup>2</sup>, Debra Jackson<sup>2,3,4</sup>

6

7

8 **Affiliations:**

9 <sup>1</sup>UNICEF Pacific Office, Honiara, Solomon Islands

10 <sup>2</sup>UNICEF Health Section, New York, USA

11 <sup>3</sup>School of Public Health, University of the Western Cape, Cape Town, South Africa

12 <sup>4</sup>London School of Hygiene and Tropical Medicine, London, UK

13 <sup>5</sup>College of Public Health, University of South Florida, Tampa, USA

14 <sup>6</sup>University Research Co., LLC (URC) & Center for Human Services, Maryland, USA

15

16

17 **Abstract**

18 **Background**

19 Achieving universal immunization coverage and reaching every child with life-saving vaccines will require  
20 the implementation of pro-equity immunization strategies, especially in poorer countries. Gavi-supported  
21 countries continue to implement and report strategies that aim to address implementation challenges and  
22 improve equity. This paper summarizes the first mapping of these strategies from country reports.

23 **Methods**

24 Thirteen Gavi-supported countries were purposively selected with emphasis on Gavi's priority ('tier 1')  
25 countries. Following a scoping of different country reports and documents submitted to Gavi, the Joint  
26 Appraisals (JAs) were considered as having the relevant content to map pro-equity strategies. JA reports  
27 conclude an annual, in-country multi-stakeholder review of the implementation progress and performance  
28 of Gavi support to the country, and of its contribution to improved immunization outcomes. Forty-seven JAs  
29 for the period between 2016 and 2019 from the 13 selected countries were included in the mapping. We  
30 used a consolidated framework synthesized from 16 different equity and health systems frameworks, which  
31 incorporated UNICEF's coverage and equity assessment approach – an adaptation of the Tanahashi  
32 model. Using search terms, the review was conducted through a combination of a manual search for  
33 approaches and use of MAXQDA qualitative analysis tool. Pro-equity strategies meeting the inclusion  
34 criteria that related to the framework, innovative or non-routine were identified and compiled in an Excel  
35 database.

36 **Results**

37 In total, 258 pro-equity strategies were implemented by the 13 sampled Gavi-supported countries between  
38 2016 and 2019. The framework determinants social norms, utilization, and management and coordination  
39 accounted for more than three-quarters of all pro-equity strategies implemented in these countries. The  
40 median number of strategies reported per country was 17. Afghanistan, Nigeria, and Uganda reported the  
41 highest number of strategies that we included as pro-equity.

42 **Conclusion**

43 Findings from this mapping can be a useful in addressing equity gaps, reaching partially immunized, and  
44 'zero dose' vaccinated children, and valuable resource for countries planning to implement pro-equity

45 strategies, especially as immunization stakeholders reimagine immunization delivery in light of Covid-19,  
46 and as Gavi finalizes its fifth organizational strategy. Future efforts should seek to identify pro-equity  
47 strategies being implemented across additional countries, and to assess the extent to which these  
48 strategies have improved immunization coverage and equity.

49

50 **Keywords:** pro-equity strategies, immunization coverage, implementation bottlenecks, health system  
51 strengthening

52

53 Abbreviations: AEFI, Adverse Events Following Immunization; BMGF, Bill & Melinda Gates Foundation;  
54 CAR, Central African Republic; CEA, Coverage and Equity  
55 Assessment; CHW, Community Health Worker; COVID-19, SRAS-2 Corona Virus Disease; CRVS, Civil  
56 Registration and Vital Statistics; CSO, Civil Society Organization; DHIS2,  
57 District Health Information System 2; DRC, Democratic Republic of Congo; eCHIS, electronic Community  
58 Health Information System; EPI, Expanded Programme on  
59 Immunization; Gavi, Gavi, the Vaccine Alliance; GIS, Geographic Information System; GPF, Grant  
60 Performance Framework; HeRAMS, Health Resources Availability Monitoring  
61 System; HSS, Health System Strengthening; ICN, Immunization Communication Network; IPC,  
62 InterPersonal Communication; IR, Implementation Research; IRDS,  
63 Implementation Research and Delivery Science; JA, Joint Appraisal; LMIS, Logistic Management  
64 Information System; LQAS, Lots Quality Assurance Sampling; MAXQDA, a  
65 Qualitative Data Analysis Software; NGO, Non-Governmental Organization; ODK, Open Data Kit; OIRIS,  
66 Optimized Integrated Routine Immunization Sessions; PBF,  
67 Performance Based Funding; PHC, Primary Health Care; PPP, Public Private Partnership; RED,  
68 Reaching Every District; RISS, Routine Immunization System Strengthening; RSO,  
69 Regional Surveillance Officer; SDG, Sustainable Development Goals; SMS, Short Message Service;  
70 SWAp, Sector Wide Approach; TCA, Targeted Country Assistance; ToR, Terms  
71 of Reference; UHC, Universal Health Coverage; UNICEF, United Nations Children's Fund; VAN, Visibility  
72 Analytics Network; VHT, Village Health Team; WAVA, Women  
73 Advocates for Vaccine Access; WHO, World Health Organization.

74

75 This work was conducted as part of the Implementation Research (IR) accelerator program funded by  
76 Gavi, the vaccine alliance.

77

78 † Corresponding author at: UNICEF Pacific Office, Honiara, Solomon Islands.

79 E-mail address: [idadari@unicef.org](mailto:idadari@unicef.org) (I. Dadari).

80

81 **INTRODUCTION**

82 Reaching every child with life-saving vaccines can only be achieved with the adoption or implementation of  
83 context-specific equity strategies for immunization and health system strengthening. Health equity requires  
84 that everyone progressively realizes his or her right to accessing quality healthcare without any undue  
85 disadvantage arising from individual or personal attributes such as demography, social, economic, or  
86 geographic strata [1]. Immunization equity will allow all children and individuals to access and utilize the  
87 immunization services they need unhindered. While vaccines are very cost-effective, with a return on  
88 investment (ROI) up to 44 times the invested amount, disparities in access to and utilization of the services  
89 have remained pervasive across regions, countries, and communities [2, 3]. Millions of children are missing  
90 essential vaccines across the developed and developing countries globally due to factors such as poverty,  
91 ethnicity, gender, remoteness, and conflicts [3-6].

92

93 Gavi, the Vaccine Alliance, is an international public-private partnership primarily focused on immunization.  
94 Established in the year 2000 Gavi aimed to provide low-income countries with access to high-impact  
95 lifesaving vaccines which until that time was only accessible to wealthier countries. [7]. By its design, Gavi  
96 is primarily an equity-focused organization helping to get vaccines to over 70 poorer countries. Gavi's  
97 mandate is to vaccinate more than 760 million children in the world's poorest countries, preventing more  
98 than 13 million deaths [7].

99

100 By the end of 2019, an estimated 20 million children had not received three doses of DPT containing  
101 vaccines, of which 14 million had not received even the first dose of DPT, with 60% of these children living  
102 in 10 countries, of which many are Gavi eligible [8]. Despite the progress being made in reaching more  
103 children with vaccines thereby improving the breadth of coverage and reducing missed opportunities – the  
104 number of unreached children has remained refractory to all our intervention keeping the proportion of the  
105 world's children who receive recommended vaccines the same over the past few years [8]. The 2030 global  
106 immunization agenda, prioritizes identifying communities and reaching children who have received no  
107 vaccines at all, referred to as 'zero-dose' children as part of its coverage and equity strategic goal [9]. Equity

108 improvements are crucial to sustainably increase global immunization coverage, including using effective  
109 tools and context-adapted approaches to map and identify missed populations and reach the unreached  
110 and marginalized populations [10]. More concerning are the initial reports from countries indicating  
111 disruption of immunization services due to the COVID-19 pandemic [11], which could potentially deny more  
112 children protection from vaccine-preventable diseases.

113  
114 Some studies have looked at different aspects of Gavi's support to countries [12-16]; however, to date,  
115 country-specific strategies designed to reach underserved children and populations (what we refer to as  
116 'pro-equity strategies') have not been reported. This paper summarizes the first mapping to synthesize  
117 evidence on pro-equity strategies being implemented across Gavi-supported countries, which could be a  
118 useful tool for stakeholders and in Gavi 5.0 towards addressing equity gaps by purposefully and  
119 systematically targeting zero-dose children and the communities they live in

120

## 121 **METHODOLOGY**

122 We reviewed relevant country reports submitted to Gavi between 2016 and 2019 to examine relevant pro-  
123 equity immunization activities implemented through the Health Systems Strengthening (HSS) strategies at  
124 national or subnational levels.

125

### 126 **Data sources**

127 The 58 currently Gavi-eligible countries [17] countries are split into three tiers of support and prioritization.  
128 Thirteen countries were selected purposively from across Tier 1, Tier 2, and Tier 3 countries (Table 1). All  
129 currently active nine Gavi Tier-1 countries were included in this study. Three countries from Tier-2 and one  
130 country from Tier-3 were purposefully selected, using convenient non-probability methods, to reflect  
131 geographic spread. As such, data collected may not be representative of all Gavi tier-2 and tier-3 countries.

132

### 133 **Source Document Selection**

134 To identify the most appropriate documents for the mapping, an initial scoping review of the following Gavi-  
135 related documents and reports were conducted: Joint Appraisals (JAs) or Joint Appraisal Updates, Grant

136 Performance Framework (GPF) Reports, Country HSS Grants Evaluation Reports, Gavi HSS Proposals  
137 Submitted by Countries, Annual HSS and Vaccines Renewal Request and Gavi Targeted Country  
138 Assistance (TCA). Besides, consultations were made with UNICEF and Gavi staff regarding the content of  
139 the various reports.

140  
141 Joint appraisals are annual in-country multi-stakeholder reports on the status of implementation, progress,  
142 and performance of Gavi support to the country, including its contribution to improving immunization  
143 outcomes [18]. The JA replaced the previous Gavi Annual Progress Reports and is conducted by a joint  
144 appraisals team which is multi-stakeholder, including the government and its partners. It reflects work done  
145 in the period of the reporting year and usually captures a comprehensive summary of all Gavi-supported  
146 activities, including HSS in the country over the specified reporting period. These reports were identified as  
147 having more comprehensive annual updated information on the specific strategies implemented by  
148 countries as compared to all other documents reviewed. Therefore, we reviewed country JAs for the years  
149 2016, 2017, 2018, and 2019 for all 13 selected countries.

150  
151 We retrieved all JAs from the Gavi website except the 2019 JA documents which we obtained from the  
152 Gavi Secretariat directly. In total, we reviewed 47 JA documents for the mapping; 35 from the Gavi website  
153 and 17 directly from the Gavi secretariat (see Figure 1).

154  
155 **Search strategy**

156 The search for and mapping of pro-equity strategies was guided by a consolidated equity framework  
157 developed from an ongoing<sup>1</sup> UNICEF review of health systems-oriented strategies to improve immunization  
158 equity outcomes in immunization, synthesized from 16 different frameworks relevant to immunization,  
159 equity, and health systems [19-34]. The consolidated framework is shown in Table 2 also incorporated  
160 UNICEF's Coverage and Equity Assessment approach – an adaptation of the Tanahashi and modified  
161 Tanahashi models [35, 36], and the four key priority areas of the equity reference group (ERG) on

---

<sup>1</sup> A review and analysis of frameworks related to immunization, equity, and health systems were conducted to understand the domains and constructs considered to be important in understanding health inequities. TERMS OF REFERENCE (TORs) Health systems strengthening, immunization, and equity consultant 16 August 2019.

162 immunization [37, 38]. Following several iterations, refined search words, terms, and synonyms relevant to  
163 each of these domains, subdomains, and priority areas were generated and used for the manual and  
164 software-assisted search in the Gavi JAs (See Annex 1). The term “pro-poor” was included in the initial  
165 search of a sample of the joint appraisals with zero yield. In addition to search words specific to each  
166 approach, we conducted an additional search for innovations using related search terms to retrieve all  
167 relevant strategies being tested or piloted in these countries. Two authors (ID and AHS) searched for the  
168 JA documents using the identified key search terms. The search was done both manually and using a  
169 qualitative data analysis tool MAXQDA<sup>2</sup>. The use of the qualitative data analysis tool was necessitated due  
170 to a large amount of text data in individual JA reports. Using the qualitative data analysis tool, multiple JA  
171 reports were searched concurrently using the search terms through an extended lexical search. In both  
172 manual and software searches, paragraphs, where the search terms were identified, were scrutinized for  
173 pro-equity strategies meeting our inclusion criteria. Pro-equity strategies retrieved from the JAs from the  
174 use of these search words or terms were tabulated in an excel-based dashboard under headings of these  
175 domains and priority areas.

176

### 177 **Inclusion and exclusion criteria**

178 The following criteria were used to identify relevant HSS strategies:

- 179 ▪ Strategies implemented at the country level covering one of the four priorities of the Equity Reference  
180 Group (ERG) on Immunization including urban poor communities, remote rural communities, conflict-  
181 affected communities, and gender (or any combination of these)
- 182 ▪ Strategies belonging to one or more of the following determinants of effective coverage: legislation and  
183 policy, budget and expenditures, management and coordination, social norms, commodities, human  
184 resources, environment, utilization, and quality of care
- 185 ▪ Innovative strategies or pilot interventions implemented in these countries to reach the unreached or  
186 hard-to-reach communities and strengthen health systems
- 187 ▪ Routine or traditional strategies implemented differently – with innovation or through enhanced/new  
188 approaches.

---

<sup>2</sup> MAXQDA Analytics Pro: <https://www.maxqda.com/products/maxqda-analytics-pro>

189 Strategies that are implemented routinely as part of the expanded program of immunization (EPI) or in a  
190 traditional way such as trainings for health workers, routine microplanning, etc., were not included.

191

## 192 **Data extraction and analysis**

193 Two individuals (ID and AHS) extracted data both manually and using qualitative data analysis software –  
194 MAXQDA, between February and May 2020. AS and AsmS provided continued inputs into data extraction,  
195 analysis, and reporting. We analyzed extracted data by equity domains, approaches, and ERG priority  
196 areas initially identified by DC. We retrieved data from specific country JA reports based on relevance to  
197 the listed approaches and coverage equity domains. We then transferred data to an Excel database and  
198 summarized individual strategies by the following headings: (a) Coverage and Equity Assessment (CEA)  
199 determinants of effective coverage; (b) approach description; (c) ERG priority/target population; and (d)  
200 gender lens. Retrieved strategies were consolidated into an excel database using the headings from the  
201 framework in Table 2. A color-coded frequency table was developed and used to summarize the data  
202 organized by country, with depth of color intensity depicting the frequency of retrieved pro-equity strategies  
203 (see table 3). Descriptive statistics for illustrative purposes were conducted using Microsoft Excel (Microsoft  
204 Corp., USA). A comparative analysis of findings between countries and domains was done. Data was  
205 presented as either a table or a chart. A publicly available tableau dashboard was also developed to  
206 disseminate findings (See Annex 2).

207

## 208 **FINDINGS**

209 Overall, 258 identified pro-equity strategies were reported to have been implemented by the 13 countries  
210 in their 2016 to 2019 JA reports (Figure 2). Pro-equity strategies related to social norms, utilization, and  
211 management and coordination accounted for more than 75% (n=168) of all pro-equity strategies reported.  
212 Table 3 shows the types of strategies implemented by the country. Uganda and Afghanistan reported  
213 implementing 14 and 11 social norms related to equity strategies, respectively, while Nigeria reported 10  
214 management and coordination strategies. Afghanistan most frequently reported pro-equity strategies  
215 relating to utilization, followed by Kenya, Pakistan, and Uganda. Determinants of effective coverage  
216 domains with the least pro-equity strategies reported include the environment which had only three



217 strategies reported, followed by budget and expenditure with seven strategies, and human resources with  
218 nine strategies. The three countries of Afghanistan, Nigeria, and Uganda have up to 34, 35, and 38 pro-  
219 equity strategies implemented and reported, the highest reported among the sampled countries.  
220 Kyrgyzstan, which is the only Gavi tier-3 country among the sample, had the least number of implemented  
221 pro-equity strategies (11), with Madagascar, a Gavi tier-2 country, reporting the second least number of  
222 implemented pro-equity strategies of 15.

223  
224 Table 4 presents examples of pro-equity strategies by determinant of effective coverage and by thematic  
225 area. Pro-equity strategies were identified for all thematic areas except: (a) digital financial services/mobile  
226 money to pay health facility staff; and (b) setting up overnight stay points to reach compromised areas. A  
227 concise narration of findings with a focus on the top three determinants of effective coverage having the  
228 highest number of reported pro-equity strategies is below.

229

### 230 **1. Social norms**

231 The identified pro-equity strategies under social norms are summarized under the following six approaches:

232 **(a) Identify normative positions and match the messenger to the recipient** employed multiple  
233 strategies to ensure all target groups receive messages from the appropriate advocates.  
234 Afghanistan reported using community-based outreach vaccinators to increase immunization  
235 service delivery in urban settings and the use of religious leaders, Ulema, to promote immunization.  
236 India, Kenya, and Kyrgyzstan also employed the use of religious leaders to boost demand for  
237 immunization services and increase coverage, while Chad utilized village chiefs and community  
238 registers to promote immunization. The Accredited Social Health Activists (or ASHA) program in  
239 India serves as an interface between the community and public health system through which  
240 ASHAs receive performance-based incentives for promoting routine immunization in the  
241 community. Kenya developed a hard-to-reach audience strategy, while Madagascar conducted  
242 operational research in 8 major cities to know the reason for non-vaccination. Nigeria explored the  
243 use of non-monetary rewards systems for religious and traditional leaders as recognition for good  
244 performance and has incorporated a community cluster survey into the monthly routine

245 immunization supportive supervision (RISS) exercise reported monthly on an ODK platform, while  
246 Pakistan established and is using slum health committees.

247 **(b) Peer/women-support groups in communities** enabled the sharing of information, healthy  
248 behavior promotion, and establishing trust. This addresses the remote rural, urban, gender, and  
249 conflict priority work areas of the ERG. Very few examples were observed in this area across the  
250 sampled Gavi countries, with one example from India in its implementation of Interpersonal  
251 communication (IPC) sessions referred to as Mother Meeting to boost immunization coverage, in  
252 addition to a vaccine hesitancy pilot in selected geographies.

253 **(c) Leveraging social norms - using champions from the target population** who are generally  
254 well-liked and influential, to shape perceptions peers have of vaccines. This addresses the remote  
255 rural, urban, gender, and conflict priority work areas of the ERG. Ethiopia created a network of  
256 informants and influencers and developed a community scorecard to help in tailoring services (time,  
257 location, care, etc.) to meet the needs of caregivers and help in the community-based monitoring  
258 of children eligible for vaccinations. Chad implemented a new Community Based Approach to  
259 Promote Immunization (CBAPI) in target districts. In Kenya, the Cabinet secretary and polio  
260 survivors were used as immunization champions which helped reduce vaccine hesitancy and  
261 advocate for immunization.

262 **(d) Proactive training of journalists, encouraging champions of health journalism** focused on the  
263 urban priority work area of the ERG. India, Kenya, and Kyrgyzstan engaged journalists to raise  
264 awareness on immunization which helped reduce vaccine hesitancy.

265 **(e) Widening the audience for Information Education and Communication (IEC) to strengthen  
266 and sustain social mobilization** focused on the remote rural, urban, gender, and conflict priority  
267 work areas of the ERG. Some of the strategies implemented across Gavi-supported countries  
268 include: a behavioral determinants survey to assess the determinants of immunization service  
269 utilization among Ethiopian Agrarian communities; a strategy for engaging and appealing to fathers  
270 to participate in immunization in Kenya; and an urban immunization strategy with linkages of  
271 services for improved community empowerment in Myanmar.

272 **(f) Gender transformative approaches** focused on the remote rural, urban, gender, and conflict  
273 priority work areas of the ERG. To overcome Ulema gender-related barriers to accessing  
274 immunization by women, Afghanistan developed specific training for female vaccinators to increase  
275 the number of female vaccinators as part of this cadre of health workers dominated by men,  
276 particularly for women to appropriately access tetanus toxoid vaccines. Kenya adopted a strategy  
277 engaging and appealing to fathers to participate in immunization, while Uganda targeted men  
278 specifically through mobilization, health education, and participatory guidance thus empowering  
279 them to support their families in immunization uptake and demand generation.

280

## 281 **2. Management & Coordination**

282 Five approaches were identified and used by Gavi-supported countries under this determinant, summarized  
283 by each approach below:

284 **(a) EPI support groups** focused on the urban priority work area of the ERG with implemented  
285 strategies such as Madagascar involving the community in all immunization activities by  
286 strengthening both interpersonal and mass communication. A combined microplanning and QGIS  
287 project in urban immunization commenced in Myanmar produced robust micro-plans as part of  
288 rolling out or implementing the urban immunization strategy. Nigeria developed immunization  
289 session plans to include outreach and mobile sessions for urban slums in line with the Reaching  
290 Every Ward (REW) micro-plan, which is an adaptation of the Reaching Every District (RED)  
291 strategy. Pakistan developed an equity-focused integrated urban immunization/health roadmap for  
292 Karachi, and Uganda is supporting outreach in slum areas and the establishment of village health  
293 team (VHT) systems in urban areas.

294 **(b) Multiple strategies for negotiating access to populations affected by conflict** with corridors of  
295 peace, safe havens, sanctuaries of peace, children as "zones of peace", working with non-  
296 traditional change agents. This focuses on the conflict area work priority of the ERG with  
297 Afghanistan, for instance, using a Public-Private Partnership (PPP) model to provide basic  
298 reproductive and immunization services in remote and insecure districts of six provinces in the  
299 country.

300 **(c) Improved communication chains among health providers and between providers and**  
301 **supervisors** focused on the conflict area work priority of the ERG. Some of the implemented  
302 strategies include: an Immunization Communication Network in Afghanistan which helps with  
303 tracking of children who have missed their vaccines; Pakistan sends targeted messages across  
304 150 WhatsApp groups with thousands of memberships; and in Nigeria, an MOU to implement an  
305 "Immunization Service Delivery Accountability" approach, which aims to address data  
306 accuracy/quality and reduce pressure on the health care worker to falsely report on targets, was  
307 developed.

308 **(d) Health Monitoring System (e.g. HeRAMS), or similar**, focuses on conflict and urban priority work  
309 areas of the ERG with examples of reported pro-equity strategies including the use of urban  
310 immunization dashboard and use of web-based data tool for reporting AEFIs<sup>3</sup> in India, to improve  
311 the quality and use of reported data as part of immunization strengthening in India's Universal  
312 Immunization Program. The use of electronic community health information systems (eCHIS) in  
313 Ethiopia as an enhanced facility-level vaccine and supplies stock visibility monitoring and reporting,  
314 Vaccine Adverse Events Management Information System (VAEMIS) in Uganda, and integrating  
315 existing logistics management information systems (LMIS) with the Visibility Analytics Network  
316 (VAN) in Nigeria.

317 **(e) Alternative approaches to immunization records** focused on remote rural, urban, gender, and  
318 conflict priority work areas of the ERG. Nigeria tried the use of reminder bracelets to improve  
319 timeliness and completeness of childhood vaccinations, while Uganda explored the use of  
320 electronic registers for immunization integrated with the HIV electronic medical records.

321 **(f) Tracking population and movement through satellite imagery and mobile phone data** focuses  
322 on remote rural, urban, gender, and conflict priority work area of the ERG with some of the pro-  
323 equity strategies including the revision of micro plans through GIS and the use of tracking bags for  
324 defaulter tracking in Afghanistan, and GIS mapping of ward boundaries and immunization sessions  
325 in India. Kenya reported the use of GIS for equity programming in immunization, while Myanmar  
326 reported geospatial information system QGIS-based micro plans developed/updated with the

---

<sup>3</sup> AEFI as part of its Surveillance and Action for Events following Vaccination (SAFE-VAC)

327 community in major cities to include migratory, peri-urban, and slum populations. Pakistan reported  
328 the use of the GSM-based GIS module explored for integration into the ZM dashboard for real-time  
329 vaccinator tracking, E-VACCS 2.0 which individually tracks vaccinator attendance and greatly  
330 increased vaccination coverage.

331

### 332 **3. Utilization**

333 Strategies reported relate to adjusted hours for and timing of immunization services, tailoring delivery to  
334 meet client needs, peer support for health workers, and reminder call systems.

#### 335 **(a) Adjust hours/timing of immunization services to better serve client/target population**

336 addressed the urban priority work area of the ERG with an example including the implementation  
337 of business-hour vaccination sessions introduced in Pakistan's urban centers. Uganda changed  
338 the timing for outreach in urban areas to weekends especially on Sundays to facilitate better access  
339 and coverage for immunization services. Kenya implemented a policy extending opening hours of  
340 health facilities in Nairobi and procured mobile clinics to increase access to immunization service  
341 delivery. Mobile teams organized by Civil Society Organizations (CSOs) for immunization sessions  
342 in Kyrgyzstan.

#### 343 **(b) Tailor location of service delivery to meet the needs of caregivers** and ensure the acceptability

344 of services for both mothers and fathers. This falls under the urban priority work area of the ERG.  
345 Pakistan implemented a transitory point immunization including locations like bus stations, airports,  
346 and regular transit areas between districts. In Afghanistan, high-risk mobile populations were  
347 vaccinated by permanent transit teams and 19 cross-border vaccination points plus geo-location  
348 monitoring. In Bangui, CAR, an immunization strategy for special populations (i.e. nomads,  
349 pygmies, IDPs/refugees, fishermen, mining sites, markets, etc.) was implemented. The Optimized  
350 Integrated Routine Immunization Sessions (OIRIS) approach was an initiative rolled out in Nigeria  
351 for reaching remote communities through periodic conduct of the Routine Immunization-Lot Quality  
352 Assurance Sampling (RI-LQAS).

#### 353 **(g) Peer-support groups for health providers** addressed the remote rural priority work area of the

354 ERG. Examples include the Immunization Communication Network (ICN) in Afghanistan, and the

355 Regional Surveillance Officer (RSO) network established in Myanmar to focus on polio eradication,  
356 routine immunization, and new vaccine introduction. Women Advocates for Vaccine Access  
357 (WAVA) is a coalition of women-focused civil society organizations in Nigeria advocating for  
358 increased routine immunization and sustainable vaccine financing. The Vaccines & Immunization  
359 Research Network and its Scientific Advisory Group (SAG) for evidence building and guidance in  
360 India is another example. Kenya implemented the Health NGO networks, HENNET, which provided  
361 the needed peer support for immunization service delivery.

362 **(h) Reminder-recall systems, such as SMS reminders and phone calls**, focused on the remote  
363 rural, urban, gender, and conflict priority work areas. In Afghanistan, tracking bags made from cloth  
364 are used for defaulter tracing and catching up on dropouts or children who missed their  
365 immunization shots. Also, an android-based app *Zindagi Mehfooz* (ZM) which is used for tracking  
366 children and following them up to ensure they complete their vaccination series was used. Kenya  
367 has implemented the nomadic strategy in Turkana to track children for vaccination, and engaged  
368 teachers, school children, and community health volunteers in tracking children who have missed  
369 their immunization. Myanmar reported deploying technology to track missed children using for  
370 example electronic registries and reminders using DHIS-2 Tracker. Nigeria has piloted the use of  
371 SMS reminders to parents and caregivers, while Pakistan reported using ZM DIR which is a QR  
372 code-based identification system to track each child in the community. Uganda is using a tracking  
373 tool to track defaulters, with social media platforms (WhatsApp, Facebook, SMS) being used to  
374 transmit information to parents and caregivers.

375

## 376 DISCUSSION

377 Achieving universal health coverage (UHC), including equitable access to safe, effective, quality, and  
378 affordable essential medicines and vaccines is a fundamental principle of the Sustainable Development  
379 Goal (SDG) 3 [3]. Much effort is being channeled towards improving immunization coverage. However,  
380 coverage trends over the past decade across various antigens point towards equity issues which if not  
381 intentionally and systematically addressed will not allow us to achieve universal immunization coverage [3,  
382 39]. Of even greater concern are the millions of zero-dose children who have received no single vaccination

383 in their communities, signifying a potentially even broader deprivation for primary healthcare services thus  
384 providing a strong case for integrated service delivery. These pockets of zero-dose communities remain  
385 most vulnerable to outbreaks and hindrances to disease control and eradication efforts, as such is a priority  
386 of the 2030 global immunization agenda. While there are no one-size-fits-all solutions to address inequities  
387 in immunization, countries could benefit from policy interventions, service adaptations to meet specific  
388 community or program needs, and systems to analyze, disaggregate and maintain data [40]. The identified  
389 pro-equity strategies from this mapping could provide a synthesis of options and country examples to  
390 address equity challenges in different contexts.

391  
392 The 13 countries in our review represent a significant proportion (i.e., approximately 50 percent) of all  
393 investments Gavi made to countries in 2019 [41]. However, these countries still have varying immunization  
394 coverage (DPT3) ranging between 41% in Chad to 94% in Kyrgyzstan, with wide-ranging equity concerns  
395 including variations in subnational immunization coverages [42]. Over time, Gavi's position and support for  
396 pro-equity work in immunization has been growing and evolving from a past focus on the introduction of  
397 new vaccines to now addressing intra- and inter-country variations in immunization access and utilization  
398 [43]. The findings from this mapping of a progressive increase in the number of pro-equity strategies  
399 implemented by Gavi-supported countries to about double between 2016 and 2019 could be a good pointer  
400 to this increasing focus by Gavi and other partners on equity. A paper co-authored by Chopra et al. and the  
401 ERG secretariat highlighted the critical importance of strategies to address inequity in immunization,  
402 including strategies to strengthen data and innovation, integration and optimizing vaccine delivery  
403 strategies, social behavior change, and use of CSOs, and gender empowerment among others [3]. This  
404 mapping suggests that countries continue to implement pro-equity strategies to reach every child with the  
405 recommended vaccinations. Evidence from our mapping showed about 75% of pro-equity strategies  
406 implemented by these 13 Gavi-supported countries are within the domains of social norms, utilization, or  
407 management and coordination.

408  
409 The effect of social norms on immunization coverage has well been studied. These studies have shown the  
410 entrenched nature of social norms and how could derail vaccination and disease control efforts [44, 45, 46].

411 These social norms are seen to mostly impact the underserved communities as such having inequity  
412 implications. Some of our sampled countries in this study were shown to have implemented pro-equity  
413 immunization strategies addressing social norms, perhaps this could have been triggered by the massive  
414 underlying social norms challenges these countries face in equitably reaching everyone with vaccines.  
415 India and Afghanistan for instance are two countries with most of their reported pro-equity strategies  
416 addressing social norms. By choosing to implement these types of pro-equity approaches, immunization  
417 stakeholders are aiming to address key drivers of inequity in childhood immunization, as reported by  
418 studies, to include gender, rural dwelling, maternal literacy, lower household wealth, lower caste, not having  
419 faith in vaccination, and minority religion, at the individual, family, and community levels [5, 47, 48]. Gender  
420 transformative approaches, using community champions and key opinion leaders have also been reported  
421 by these countries. The data from these reports do not provide enough information to conclude on the level  
422 of impact and sustainability of these implemented strategies. These findings however emphasize that a key  
423 approach to bridging the equity gap and thereby increasing routine and even supplemental immunization  
424 coverage is adapting and implementing strategies to address social norms barriers.

425  
426 Pro-equity strategies relating to management and coordination were the second most implemented  
427 strategies from our mapping. Some of these included the use of public-private partnerships, urban  
428 immunization dashboards, GIS-based micro plans, and electronic community health information systems  
429 (eCHIS), to mention a few. Some of the countries in this study reported implementing mostly management  
430 and coordination pro-equity strategies e.g. Nigeria and Pakistan. The choice of strategies in these countries  
431 could be attributed to the need to address large structural and organizational issues which are hindering  
432 efforts to effectively and equitably deliver routine immunization services [49, 50]. The need to strengthen  
433 health and immunization management system capacity to broaden participation and to expand the reach  
434 of immunization services has been highlighted particularly in developing countries [51].

435  
436 Another of the pro-equity strategies these countries reported implementing relates to improving the  
437 utilization of immunization services. Reported strategies included adjusting timing and tailoring delivery to  
438 ensure provision of immunization services at conducive timing and approach for the clients, use of reminder



439 call systems such as SMS, and peer support for health workers. Persons of low socioeconomic status, from  
440 remote or hard-to-reach areas, and those affected by conflicts natural hazards, and disasters are more  
441 likely to miss their routine immunization shots or get them delayed. Often these groups are confronted by  
442 fundamental issues of survival as a priority. As such, adjusting the timing and mode of immunization service  
443 delivery to suit their schedules or deploying tools such as reminder systems could help greatly in improving  
444 immunization reach to these underserved groups.

445  
446 Countries also reported several implemented pro-equity strategies related to legislation, commodities which  
447 included supply chain, and quality of care/research. Implementing pro-equity strategies must be situated in  
448 context and based on a fairly robust diagnostic at the national and sub-national levels. Countries such as  
449 Chad and the Central African Republic with coverage around 50% could benefit from approaches to rapidly  
450 increase coverage in tandem with pro-equity strategies for identified equity issues related to immunization.  
451 Reported national immunization coverage could be an indicator of overall improvement in coverage [42].  
452 However, most importantly for pro-equity strategy implementation, it is useful to look beyond national  
453 coverage and focus on disaggregated sub-national data, which is more informative in ensuring equitable  
454 access and utilization of services. Table 5 contains a summary of the latest available national immunization  
455 coverage data for our study countries between 2016 and 2019. An illustration could be seen in Uganda  
456 which has not shown an increase in immunization coverage over the last four years and access barriers  
457 have been reported as a primary challenge to reaching every child with vaccines [52]. In this instance,  
458 subnational data at the districts where pro-equity strategies were implemented would have provided the  
459 best measure of success or otherwise of these strategies since national aggregates often mask subnational  
460 improvements in coverage or performance. Besides, the details of how and the extent to which the  
461 strategies were implemented will be crucial in understanding context-specific issues and understanding  
462 whether these strategies were considered successful or not.

463  
464 The number of pro-equity strategies implemented does not seem to relate to the amount of Gavi funds each  
465 country received. However, there was some commonality between countries in the approaches used. For  
466 example, the use of community groups and networks to boost immunization coverage and increase uptake

467 was a strategy implemented across several of these countries. For countries that have conflict-affected  
468 areas or regions such as Nigeria, Afghanistan, and Pakistan, specific conflict-related pro-equity strategies  
469 were implemented such as a safe corridor for ensuring vaccination of children and immunization strategies  
470 specific to reaching displaced communities.

471  
472 Within the domains of human resources and environment, there were no reports by the 13 countries of  
473 these two strategies that had previously been identified, i.e. use of digital financial services/mobile money  
474 to pay health facility staff and setting up overnight stay points to reach compromised areas. There is  
475 increasing evidence that digital services can contribute to the UHC agenda [53]. Some other strategies  
476 within these domains were reported such as the use of non-financial incentives to reward vaccinators and  
477 encourage accurate reporting in Afghanistan, as well as performance-based funding for health indicators  
478 paid to health facilities in the Central African Republic (CAR). The CAR example was however noted to  
479 have negatively incentivized health workers to falsify their data to get the performance funds.

480

#### 481 **Limitations**

482 This mapping was done on a sample of country reports – Joint Appraisals – submitted to Gavi by 13  
483 countries and mapping relevant pro-equity strategies on immunization and HSS implemented and reported  
484 between 2016 and 2019, with purposive representation from the Gavi country tiers. Findings cannot be  
485 generalized for all Gavi countries. Furthermore, this mapping did not retrieve and review strategy  
486 implementation reports from the countries and we were not able to assess the effectiveness and  
487 sustainability of the reported strategies. This is an area for future analysis; besides, more research would  
488 be required to obtain subnational data and evidence on the outcomes associated with these strategies in  
489 improving equity. Expanding the mapping of pro-equity strategies to all Gavi-supported countries could be  
490 useful in guiding countries to context-specific approaches, and better tracking of effective resource  
491 utilization. Since the annual Joint Appraisals are now replaced by multi-stakeholder dialogues (MSD), the  
492 MSD should be used for the mapping of these strategies going forward.

493

494 **CONCLUSION**

495 Addressing equity gaps is crucial to achieving universal health coverage. Adopting specific pro-equity  
496 strategies will assist countries in reaching the millions of children who are either ‘zero-dose’ or partially  
497 immunized. Findings from this mapping show the range and types of pro-equity strategies implemented in  
498 different contexts and can be useful for countries facing similar challenges to consider. This will help in the  
499 drive to achieve much-needed progress towards universal vaccination, especially in low and middle-income  
500 countries. It is also encouraging to see countries going beyond traditional and more routine strategies to  
501 improve their reach of all children with vaccines. This mapping represents only pro-equity strategies  
502 implemented and reported by a sample of Gavi-supported countries and should not be taken to represent  
503 strategies implemented across all other Gavi-supported countries. However, it can serve as a start and  
504 should encourage more investment in mapping, identifying, and sharing lessons learned across Gavi-  
505 supported, and even other countries implementing pro-equity strategies to accelerate the agenda of  
506 universal childhood vaccination and broader primary healthcare (PHC). Using operational and  
507 implementation research, the benefits of these pro-equity strategies can be harnessed to the fullest.

508

509 Identifying, disseminating, and implementing relevant pro-equity strategies will be useful in reaching every  
510 child with recommended vaccines, and thereby achieving more with fewer resources. The benefits can  
511 even be greater with periodic evaluations of these strategies to ascertain the success and effectiveness of  
512 these interventions before use by policy and decision-makers. We can, therefore, reimagine immunization  
513 by synergizing across pro-equity strategies and further integrating immunization with PHC, as such a  
514 potential shift in focus towards investments that support pro-equity strategies and reach more children with  
515 life-saving vaccines and essential health interventions.

516 **References**

517 [1] World Health Organization [WHO]. Social determinants of health: What are health inequities or  
518 inequalities? [https://www.who.int/social\\_determinants/thecommission/finalreport/key\\_concepts/en/](https://www.who.int/social_determinants/thecommission/finalreport/key_concepts/en/).  
519 [Retrieved on 12<sup>th</sup> May 2020].

520  
521 [2] Ozawa S, Clark S, Portnoy A, Grewal S, Brenzel L, and Walker DG. Return on Investment from  
522 Childhood Immunization in Low- And Middle-Income Countries, 2011–20. Health Affairs (2016); 35(2):  
523 <https://doi.org/10.1377/hlthaff.2015.1086>

524  
525 [3] Chopra M, Bhutta Z, Chang Blanc D, Checchi F, Gupta A, Lemango ET., et al. Addressing the  
526 persistent inequities in immunization coverage. Bulletin of the World Health Organization [Internet]. 2020  
527 Feb [cited 2020 May 15];98(2):146–8.

528  
529 [4] Hinman AR, McKinlay MA. Immunization equity. Vaccine [Internet]. 2015 Nov 27 [cited 2020 May  
530 16];33(Supplement 4):D72–7. DOI: 10.1016/j.vaccine.2015.09.033

531  
532 [5] Corsi DJ, Bassani DG, Kumar R, Awasthi S, Jotkar R, Kaur N, et al. Gender inequity, and age-  
533 appropriate immunization coverage in India from 1992 to 2006. BMC International Health & Human  
534 Rights [Internet]. 2009 Jan 2 [cited 2020 May 18];9:1. <https://doi.org/10.1186/1472-698X-9-S1-S3>

535  
536 [6] Bardenheier B, Wortley P, Ahmed F, Gravenstein S, Rowland Hoguen CJ. Racial Inequities in Receipt  
537 of Influenza Vaccination Among Long-term Care Residents Within and Between Facilities in Michigan.  
538 Medical Care [Internet]. 2011 [cited 2020 May 18];49(4):371. <https://www.jstor.org/stable/41103928>

539  
540 [7] Gavi, the Vaccine Alliance [Gavi]. About our Alliance. <https://www.gavi.org/our-alliance/about> [Cited  
541 2020 May 18].

542

543 [8] World Health Organization [WHO]. Immunization Coverage. December 2019. Retrieved from  
544 <https://www.who.int/news-room/fact-sheets/detail/immunization-coverage> [Cited 2020 August 6].  
545

546 [9] World Health Organization [WHO]. Immunization Agenda 2030: A Global Strategy to Leave No One  
547 Behind. April 2020. Retrieved from  
548 [https://www.who.int/immunization/immunization\\_agenda\\_2030/en/](https://www.who.int/immunization/immunization_agenda_2030/en/) [Cited 2020 August 6].  
549

550 [10] Sodha SV, Dietz V. Strengthening routine immunization systems to improve global vaccination  
551 coverage. BRITISH MEDICAL BULLETIN [Internet]. 2015 [cited 2020 May 20];(1):5. DOI:  
552 10.1093/bmb/ldv001  
553

554 [11] Nelson R. COVID-19 disrupts vaccine delivery. Lancet Infectious Diseases. 2020 [cited 2020 Jun  
555 26]; 20(5): 546. [https://doi.org/10.1016/S1473-3099\(20\)30304-2](https://doi.org/10.1016/S1473-3099(20)30304-2)  
556  
557

558 [12] Naimoli JF. Global health partnerships in practice: taking stock of the GAVI Alliance's new  
559 investment in health systems strengthening. International Journal of Health Planning & Management  
560 [Internet]. 2009 Jan [cited 2020 May 17];24(1):3. DOI: 10.1002/hpm.969.  
561

562 [13] Goeman L, Galichet B, Porignon DG, Hill PS, Hammami N, Essengue Elouma MS, et al. The  
563 response to flexibility: country intervention choices in the first four rounds of the GAVI Health Systems  
564 Strengthening applications. HEALTH POLICY AND PLANNING [Internet]. 2010 [cited 2020 Jun  
565 26];(4):292. <https://doi.org/10.1093/heapol/czq002>  
566

567 [14] Saxenian H, Cornejo S, Thorien K, Hecht R, Schwalbe N. An Analysis of How The GAVI Alliance And  
568 Low- And Middle-Income Countries Can Share Costs Of New Vaccines. HEALTH AFFAIRS -MILLWOOD  
569 VA THEN BETHESDA MA- [Internet]. 2011 [cited 2020 Jun 26];(6):1122.  
570 <https://doi.org/10.1377/hlthaff.2011.0332>

571

572 [15] Vujicic M, Weber SE, Nikolic IA, Atun R, Kumar R. An analysis of GAVI, the Global Fund and World  
573 Bank support for human resources for health in developing countries. HEALTH POLICY AND PLANNING  
574 [Internet]. 2012 [cited 2020 Jun 26];(8):649. <https://doi.org/10.1093/heapol/czs012>  
575

576 [16] Tsai F, Lee H, Fan VY. Perspective and investments in health system strengthening of Gavi, the  
577 Vaccine Alliance: a content analysis of health system strengthening-specific funding. International Health  
578 (1876-3413) [Internet]. 2016 Jul [cited 2020 May 20];8(4):246. DOI: [10.1093/inthealth/ihv063](https://doi.org/10.1093/inthealth/ihv063)  
579

580 [17] Gavi, the Vaccine Alliance [Gavi]. Eligibility. [https://www.gavi.org/types-](https://www.gavi.org/types-support/sustainability/eligibility)  
581 [support/sustainability/eligibility](https://www.gavi.org/types-support/sustainability/eligibility) [Cited 2020 May 21].  
582

583 [18] Gavi, the Vaccine Alliance [Gavi]. Joint Appraisals. Retrieved from [https://www.gavi.org/our-](https://www.gavi.org/our-support/joint-appraisals)  
584 [support/joint-appraisals](https://www.gavi.org/our-support/joint-appraisals) [Cited 2020 May 21].  
585

586 [19] Woodward EN, Matthieu MM, Uchendu US, Rogal S, Kirchner JE. The health equity implementation  
587 framework: proposal and preliminary study of hepatitis C virus treatment. Implementation Science  
588 [Internet]. 2019 Mar 1 [cited 2020 Jun 29];14(1):1–18. <https://doi.org/10.1186/s13012-019-0861-y>  
589

590 [20] Dover DC and Belon AP. The health equity measurement framework: a comprehensive model to  
591 measure social inequities in health. International Journal for Equity in Health [Internet]. 2019 Feb 1 [cited  
592 2020 Jun 29];18(1):1–12. <https://doi.org/10.1186/s12939-019-0935-0>  
593

594 [21] Kilbourne AM, Switzer G, Hyman K, Crowley-Matoka M, Fine MJ. Advancing Health Disparities  
595 Research Within the Health Care System: A Conceptual Framework. American Journal of Public Health  
596 [Internet]. 2006 Dec [cited 2020 Jun 29];96(12):2113–21. doi: [10.2105/AJPH.2005.077628](https://doi.org/10.2105/AJPH.2005.077628)  
597

598 [22] O'Neill J, Tabish H, Welch V, Petticrew M, Pottie K, Clarke M, et al. Applying an equity lens to  
599 interventions: using PROGRESS ensures consideration of socially stratifying factors to illuminate  
600 inequities in health. *Journal of Clinical Epidemiology* [Internet]. 2014 Jan 1 [cited 2020 Jun 29];67(1):56–  
601 64. <http://dx.doi.org/10.1016/j.jclinepi.2013.08.005>  
602

603 [23] Tromp N, Baltussen R. Mapping of multiple criteria for priority setting of health interventions: an aid  
604 for decision makers. *BMC Health Services Research* [Internet]. 2012 Mar 15 [cited 2020 Jun 29];12(3):1–  
605 7. <http://www.biomedcentral.com/1472-6963/12/454>  
606

607 [24] Kuruville S, Sadana R, Montesinos EV, Beard J, Vasdeki JF, de Carvalho IA, et al. A life-course  
608 approach to health: synergy with sustainable development goals. *Bulletin of the World Health*  
609 *Organization* [Internet]. 2018 Jan [cited 2020 Jun 29];96(1):42–50. doi:  
610 <http://dx.doi.org/10.2471/BLT.17.198358>  
611

612 [25] World Health Organization [WHO]. Tailoring Immunization Programmes (TIP): An introductory  
613 overview. July 2018.  
614 [https://www.who.int/immunization/programmes\\_systems/Global\\_TIP\\_overview\\_July2018.pdf?ua=1](https://www.who.int/immunization/programmes_systems/Global_TIP_overview_July2018.pdf?ua=1)  
615

616 [26] Michie S, van Stralen MM, West R. The behaviour change wheel: A new method for characterising  
617 and designing behaviour change interventions. *Implementation Science* [Internet]. 2011 [cited 2020 Jun  
618 29]; <http://www.implementationscience.com/content/6/1/42>  
619

620 [27] Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour  
621 change and implementation research. *Implementation Science* [Internet]. 2012 Apr 1 [cited 2020 Jun  
622 29];7(1):37. <https://doi.org/10.1186/1748-5908-7-37>  
623

624 [28] Joint United Nations Programme on HIV/AIDS [UNAIDS]. Combination HIV Prevention: Tailoring and  
625 Coordinating Biomedical, Behavioural and Structural Strategies to Reduce New HIV Infections. A  
626 UNAIDS Discussion Paper. September 2010.  
627

628 [29] World Health Organization [WHO]. The Innov8 approach for reviewing national health programmes to  
629 leave no one behind. Technical handbook. 2016. Available on [https://www.who.int/life-](https://www.who.int/life-course/partners/innov8/innov8-technical-handbook/en/)  
630 [course/partners/innov8/innov8-technical-handbook/en/](https://www.who.int/life-course/partners/innov8/innov8-technical-handbook/en/)  
631

632 [30] Ozawa S, Yemeke TT, Evans DR, Pallas SE, Wallace AS, Lee BY. Defining hard-to-reach  
633 populations for vaccination. Vaccine [Internet]. 2019 [cited 2020 Jun 29];(37):5525.  
634 <https://doi.org/10.1016/j.vaccine.2019.06.081>  
635

636 [31] Phillips DE, Dieleman JL, Lim SS, Shearer J. Determinants of effective vaccine coverage in low and  
637 middle-income countries: a systematic review and interpretive synthesis. BMC Health Services Research  
638 (2017) 17:681 DOI 10.1186/s12913-017-2626-0  
639

640 [32] Feletto M, Sharkey A. The influence of gender on immunisation: using an ecological framework to  
641 examine intersecting inequities and pathways to change. BMJ Global Health 2019;4:e001711.  
642 doi:10.1136/bmjgh-2019-001711  
643

644 [33] O'Neill Institute for National and Global Health Law – Georgetown Law. Health Equity Programs of  
645 Action: An Implementation Framework. January 2019. Available from  
646 [http://oneill.law.georgetown.edu/projects/](http://oneill.law.georgetown.edu/projects/tuberculosis-law-and-human-rights-project/health-equity-programs-of-action/) tuberculosis-law-and-human-rights-project/health-equity-  
647 programs-of-action/  
648

649 [34] World Health Organization [WHO]. A conceptual framework for action on the social determinants of  
650 health. Social determinants of health discussion paper 2. 2010. Available on  
651 [https://www.who.int/social\\_determinants/corner/SDHDP2.pdf?ua=1](https://www.who.int/social_determinants/corner/SDHDP2.pdf?ua=1)



652

653 [35] Tanahashi T. Health service coverage and its evaluation. Bull World Health Organ. 1978;56(2):295-  
654 303. PMID: 96953; PMCID: PMC2395571.

655

656 [36] Mallory C. Sheff, Ayaga A. Bawah, Patrick O. Asuming, Pearl Kyei, Mawuli Kushitor, James F.  
657 Phillips, et al. Evaluating health service coverage in Ghana's Volta Region using a modified Tanahashi  
658 model. Global Health Action [Internet]. 2020 Dec 1 [cited 2020 Jun 26];13(1). DOI:  
659 10.1080/16549716.2020.1732664

660

661 [37] Okwo-Bele J, Conner R, McIlvaine B, Rowley E, Bernson J. ERG Discussion Paper 06: Tackling  
662 inequities in immunization outcomes in conflict contexts. December 2018.  
663 <https://sites.google.com/view/erg4immunisation/products?authuser=0> [Cited 2020 May 21].

664

665 [38] Nandy R, Rees H, Bernson J, Digre P, Rowley E, McIlvaine B. ERG Discussion Paper 07:  
666 Tackling inequities in immunization outcomes in urban contexts. December 2018.  
667 <https://sites.google.com/view/erg4immunisation/products?authuser=0> [Cited 2020 May 21].

668

669 [39] Peck M, Gacic-Dobo M, Diallo MS, Nedelec Y, Sodha SV, Wallace AS. Global Routine Vaccination  
670 Coverage, 2018. MMWR Morb Mortal Wkly Rep. 2019 Oct 25;68(42):937-942. doi:  
671 10.15585/mmwr.mm6842a1.

672

673 [40] Boyce T, Gudorf A, de Kat C, Muscat M, Butler R, Habersaat KB. Towards equity in immunisation.  
674 Euro Surveill. 2019 Jan;24(2):1800204. doi: 10.2807/1560-7917.ES.2019.24.2.1800204.

675

676 [41] Gavi, the Vaccine Alliance [Gavi]. Disbursements and commitments. Retrieved from  
677 <https://www.gavi.org/programmes-impact/our-impact/disbursements-and-commitments> [Cited 2020 May  
678 25].

679

680 [42] World Health Organization [WHO]. WHO vaccine-preventable diseases: monitoring system. 2019  
681 global summary.  
682 [https://apps.who.int/immunization\\_monitoring/globalsummary/countries?countrycriteria%5Bcountry%5D%5B%5D=COD](https://apps.who.int/immunization_monitoring/globalsummary/countries?countrycriteria%5Bcountry%5D%5B%5D=COD) [Cited 2020 May 21].  
684  
685 [43] Gandhi, G. Charting the evolution of approaches employed by the Global Alliance for Vaccines and  
686 Immunizations (GAVI) to address inequities in access to immunization: a systematic qualitative review of  
687 GAVI policies, strategies and resource allocation mechanisms through an equity lens (1999–2014). *BMC*  
688 *Public Health* **15**, 1198 (2015). <https://doi.org/10.1186/s12889-015-2521-8>  
689  
690 [44] Musa AI. Polio Immunization Social Norms in Kano State, Nigeria: Implications for Designing Polio  
691 Immunization Information and Communication Programs for Routine Immunization Services. *Global*  
692 *Health Communication* **1**, no. 1 (2015), 21-31. doi:10.1080/23762004.2016.1161419.  
693  
694 [45] Ghinai I, Willott C, Dadari I, Larson HJ. Listening to the rumours: What the northern Nigeria polio  
695 vaccine boycott can tell us ten years on. *Global Public Health* **8**, no. 10 (2013), 1138-1150.  
696 doi:10.1080/17441692.2013.859720.  
697  
698 [46] Jalloh MF, Wilhelm E, Abad N, Prybylski D. Mobilize to vaccinate: lessons learned from social  
699 mobilization for immunization in low and middle-income countries. *Human Vaccines &*  
700 *Immunotherapeutics* **16**, no. 5 (2019), 1208-1214. doi:10.1080/21645515.2019.1661206.  
701  
702 [47] Mathew JL. Inequity in childhood immunization in India: A systematic review. *INDIAN PEDIATRICS*  
703 [Internet]. 2012 [cited 2020 May 26];(3):203. DOI: <https://doi.org/10.1007/s13312-012-0063-z>  
704  
705 [48] Mugali, RR, Mansoor, F, Parwiz, S, Ahmad, F, Safi, N, Higgins-Steele, A, et al. Improving  
706 immunization in Afghanistan: results from a cross-sectional community-based survey to assess routine

707 immunization coverage. BMC Public Health [Internet]. 2017 Apr 1 [cited 2020 May 26];17(1):1–  
708 9. <https://doi.org/10.1186/s12889-017-4193-z>  
709

710 [49] Antai D. Inequitable childhood immunization uptake in Nigeria: a multilevel analysis of individual and  
711 contextual determinants. BMC Infectious Diseases [Internet]. 2009 Jan [cited 2020 May 26];9(1):181–90.  
712 DOI: <https://doi.org/10.1186/1471-2334-9-181>  
713

714 [50] Olorunsaiye CZ, Degge H. Variations in the Uptake of Routine Immunization in Nigeria: Examining  
715 Determinants of Inequitable Access. Global health communication [Internet]. 2016 [cited 2020 May  
716 26];(1):19. <https://doi.org/10.1080/23762004.2016.1206780>  
717

718 [51] Grundy J. Country-level governance of global health initiatives: an evaluation of immunization  
719 coordination mechanisms in five countries of Asia. *Health Policy and Planning* 25, no. 3 (2009), 186-196.  
720 doi:10.1093/heapol/czp047.  
721

722 [52] Malande OO, Munube D, Afaayo RN, Annet K, Bodo B, Bakainaga A, et al. Barriers to effective  
723 uptake and provision of immunization in a rural district in Uganda. PLoS ONE [Internet]. 2019 Feb 14  
724 [cited 2020 May 26];14(2):1–15. <https://doi.org/10.1371/journal.pone.0212270>  
725

726 [53] Long, LA, Pariyo, G, Kallander, K. Digital Technologies for Health Workforce Development in Low-  
727 and Middle-Income Countries: A Scoping Review. Global health, science, and practice [Internet]. 2018  
728 Jan 1 [cited 2020 May 27];6(Suppl 1): null-S48. <https://doi.org/10.9745/GHSP-D-18-00167>  
729

---

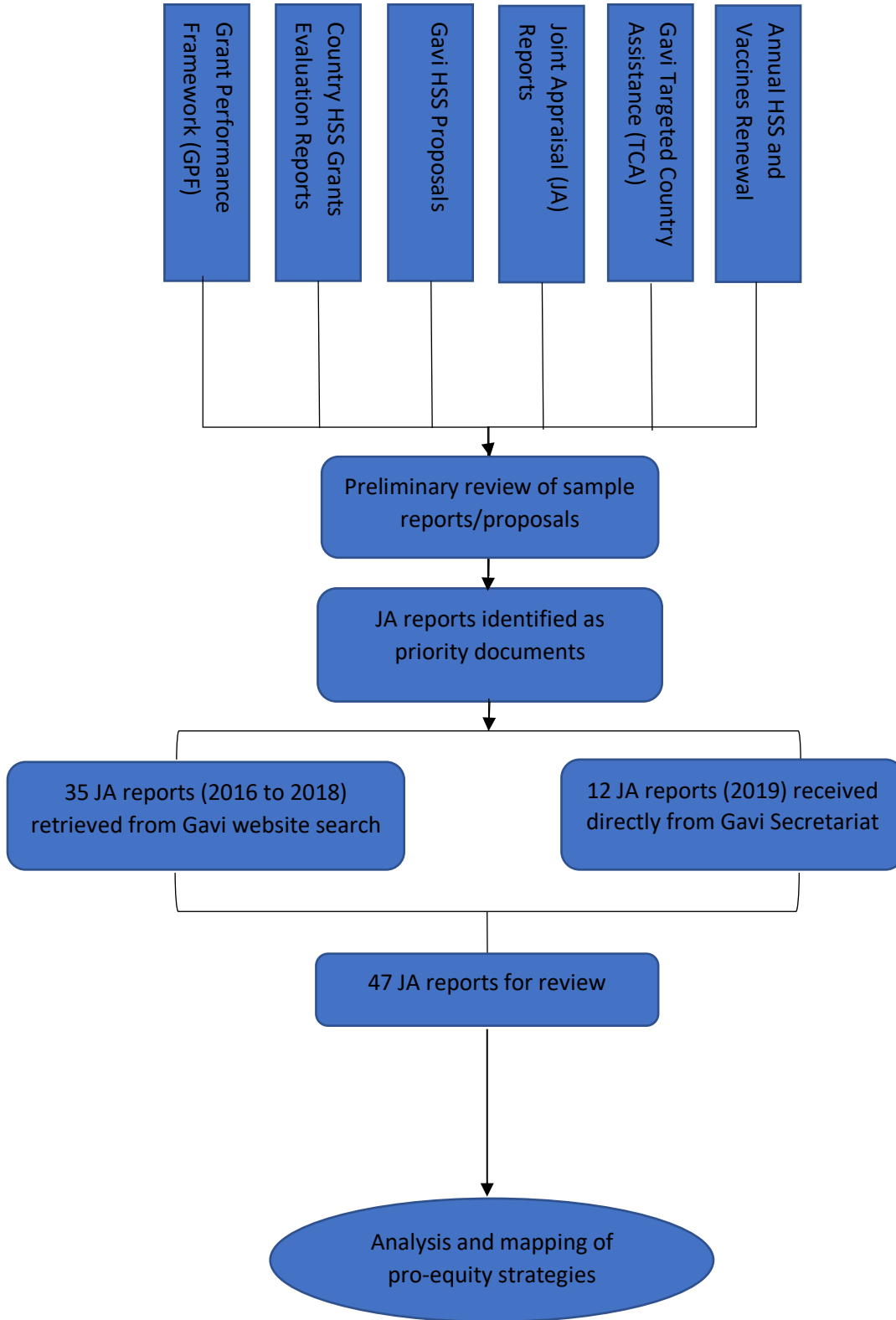


Figure 1 Schematic Diagram Showing Mapping of Pro-equity Strategies Steps

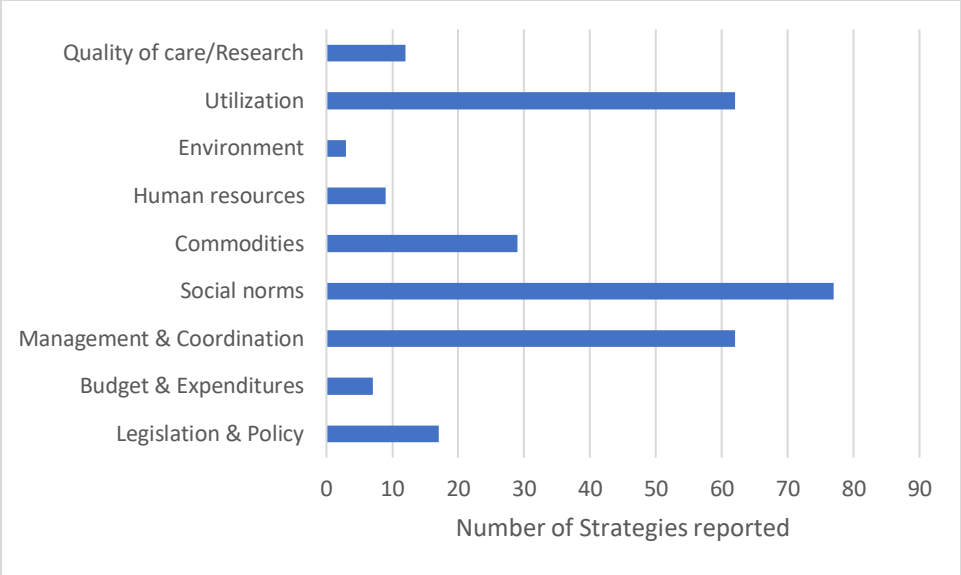


Figure 2 Pro-equity strategies reported to have been implemented by sampled Gavi-supported countries

Table 1. Gavi-supported countries included in this mapping of Pro-equity immunization strategies

<b>Gavi Tier-1 Countries</b>	<b>Gavi Tier-2 Countries</b>	<b>Gavi Tier-3 Countries</b>
Afghanistan, Chad, Democratic Republic of the Congo (DRC), Ethiopia, India, Kenya, Nigeria, Pakistan, Uganda.	Myanmar, Madagascar, Central African Republic (CAR).	Kyrgyzstan.

Table 2. Summary of Equity Framework and Domains used in the Mapping of Strategies

<b>CEA tool determinants of effective coverage</b>	<b>Equity Domain</b>	<b>Tanahashi level</b>	<b>ERG Priority Areas</b>
<ul style="list-style-type: none"> <li>○ Legislation &amp; Policy</li> <li>○ Budget &amp; Expenditures</li> <li>○ Management &amp; Coordination</li> <li>○ Social norms</li> <li>○ Commodities</li> <li>○ Human resources</li> <li>○ Environment</li> <li>○ Utilization</li> </ul>	<ul style="list-style-type: none"> <li>○ Social context, influence, circumstances</li> <li>○ Recipient Factors</li> <li>○ Rights</li> <li>○ Healthcare system and policy context</li> <li>○ Environment</li> <li>○ Local-level context</li> <li>○ Organizational level context</li> <li>○ Intervention factors</li> <li>○ Provider Factors</li> <li>○ Clinical encounter</li> </ul>	<ul style="list-style-type: none"> <li>○ Availability</li> <li>○ Accessibility</li> <li>○ Acceptability, contact, and effective coverage</li> </ul>	<ul style="list-style-type: none"> <li>○ Urban poor</li> <li>○ Remote/Rural</li> <li>○ Conflict</li> <li>○ Gender-related</li> </ul>

Table 3. Frequency of pro-equity strategies by type as reported in Joint Appraisal reports, 2016-2019

CEA determinant of effective coverage	Afghanistan	CA R	Chad	DR C	Ethiopia	India	Kenya	Kyrgyzstan	Madagascar	Myanmar	Nigeria	Pakistan	Uganda	Total
Legislation & Policy	0	1	2	3	1	0	1	0	0	3	4	1	1	17
Budget & Expenditures	0	0	0	0	0	1	1	1	2	0	1	0	1	7
Management & Coordination	6	2	1	4	6	4	2	2	4	5	10	9	7	62
Social norms	11	3	5	1	5	7	9	4	3	3	8	4	14	77
Commodities	3	4	3	4	1	3	1	2	2	2	2	1	1	29
Human resources	1	3	0	2	0	1	0	0	0	0	1	0	1	9
Environment	0	0	0	1	0	0	0	0	0	0	2	0	0	3
Utilization	9	4	5	1	2	5	8	2	2	3	5	8	8	62
Quality of care/Research	4	0	0	0	1	0	0	0	0	0	2	0	5	12
<b>Total</b>	<b>34</b>	<b>17</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>21</b>	<b>22</b>	<b>11</b>	<b>15</b>	<b>16</b>	<b>35</b>	<b>23</b>	<b>38</b>	

Table 4. Example pro-equity strategies reported by countries in their 2016-2019 Joint Appraisal reports

<b>Determinants of Effective Coverage</b>	<b>Thematic area</b>	<b>Example pro-equity strategies</b>
<b>Legislation &amp; Policy</b>	Linkages to registration systems	Setting up the DHIS2 data encoding by health facility + MAGPI data import in CAR, and a roadmap for the operationalization of DHIS2 and population estimations with the help of satellite imagery in 3 districts (Benoyé, East N'Djamena and Yao) of Char republic.
<b>Budget &amp; Expenditures</b>	Coordinated implementation plan	Nigeria reported having BMGF and Dangote Foundation supporting 6 states in the form of an MOU to address PHC and routine immunization. Kyrgyzstan reported using a Sector Wide Approach (SWAp) in health care where resources are pooled into the SWAp and managed.
<b>Management &amp; Coordination</b>	EPI support groups	Madagascar involved the community in all immunization activities by strengthening communication both interpersonal and mass communication using community registers.
	Negotiate access to populations affected by conflict	In Afghanistan, the Public-Private Partnership (PPP) model was used as an innovation to provide basic reproductive and immunization services in the remote and insecure districts of six provinces in the country where both government and NGOs are not able to provide these services to affected populations.



	Improved communication chains amongst health providers	Immunization Communication Network in Afghanistan which helps with polio eradication, tracking of children who have missed their vaccines and community mobilization, while Pakistan sends targeted messages across 150 WhatsApp groups with thousands of memberships.
	Health Monitoring System	India is using an urban immunization dashboard developed based on HMIS data review, to improve quality and use of reported data as part of immunization strengthening in India's Universal Immunization Program, while in Nigeria DHIS2 and the RI Short Message Service (SMS) are used to track the conduct of daily fixed sessions as part of the OIRIS approach.
	Alternative approaches to immunization records	Ethiopia reported using electronic community health information systems (eCHIS) in immunization reporting and monitoring, while Uganda explored the use of electronic registers for immunization integrated with the HIV electronic medical records.
	Tracking population and movement through satellite imagery and mobile phone data	Myanmar reported geospatial information system QGIS-based micro plans developed/updated with the community in major cities to include migratory, peri-urban and slum populations.

<b>Social norms</b>	Identify normative positions and match the messenger to the recipient	Chad republic conducted an advocacy and training of village chiefs on the use of community register for the promotion of immunization. India, Kenya and Kyrgyzstan employed the use of religious leaders to boost demand for immunization services and increase coverage.
	Peer/women-support groups in communities	Kenya has been working across sectors and religious bodies to address vaccine hesitancy, while Kyrgyzstan designed a comprehensive strategy to address vaccination.
	Leveraging social norms - using champions from the target population	Ethiopia created a network of informants and influencers, engaged with clan leaders and religious networks, mapped water points and livestock markets, and formed partnerships with animal health programs to improve access to immunization services.
	Proactive training of journalists, encouraging champions of health journalism	Kyrgyzstan developed a module for journalists' and conducted training for the journalists, while Uganda trained health workers and journalists on how best to respond to potential rumors about vaccines and vaccination.
	Widening the audience for IEC to strengthen and sustain social mobilization	Mapping of the urban populations that are underserved with immunization services and linking them to service points and development of an urban health communication guideline was done in Uganda.
	Gender transformative approaches	Kenya adopted a strategy for engaging and appealing to fathers to participate in

		immunization, while Uganda targeted men specifically through mobilization, health education, and participatory guidance thus empowering them to support their families in immunization uptake and demand generation.
<b>Commodities</b>	Solar direct-drive refrigerators, long-term passive cold boxes	Afghanistan implemented a Real-Time Vaccine Stock and Temperature Monitoring System (RTVSTMS), while India is using a GPS-enabled mobile application for the Cold Chain Points and the immunization session sites and real-time remote temperature monitoring of cold chain equipment.
<b>Human resources</b>	Digital financial services/mobile money to pay health facility staff	None reported.
	Increase recognition (non-financial incentive) of health workers	CAR has several implemented strategies to include PBF payment for health indicators to health facilities which allows them to implement strategies to reach their target population in more areas, improve the work environment, and motivate their staff to produce better results.
<b>Environment</b>	Security for safe access	Nigeria reported dialoguing with bandit groups to allow access for immunization services and adopted special strategies such as 'hit and run' and collaboration with the military authorities in security compromised areas to ensure access and utilization of immunization services.

	Setting up overnight stay points to reach access compromised areas	None reported.
<b>Utilization</b>	Adjust hours/timing of immunization services to better serve client/target population	The Government of Kenya implemented a policy extending opening hours of health facilities in Nairobi and procured mobile clinics to increase access to immunization service delivery.
	Tailor location of service delivery to meet the needs of caregivers	Pakistan implemented a transitory point immunization including locations like bus stations, airports, and regular transit areas between districts. The Optimized Integrated Routine Immunization Sessions (OIRIS) approach is an initiative rolled out in Nigeria for reaching remote communities.
	Peer-support groups for health providers.	Examples include the Immunization communication network - ICN in Afghanistan, the Regional Surveillance Officer (RSO) network established in Myanmar to focus on polio eradication.
	Reminder-recall systems - SMS reminders, phone calls.	Pakistan reported using ZM DIR which includes individual-level data to track each child in the community, web-based dashboard, unique QR code-based identification mechanism, interactive (2-way) SMS reminders, a decision support system to guide vaccinators for routine and catch-up immunizations.

<b>Some additional pro-equity strategies</b>	Others	Afghanistan conducted operational research on the implementation of the data quality, a pilot project on PEI support to strengthening routine immunization services, and micro-planning through RED strategy using CHWs.
--	--------	--

Table 5. Immunization Coverage WUENIC and Country Reported Data in Percentages<sup>4</sup>

Country name	Vaccine	WUENIC				Administrative Coverage			
		2019	2018	2017	2016	2019	2018	2017	2016
Afghanistan	DTP3	66	66	66	66	87	87	81	81
Central African Republic (the)	DTP3	47	47	47	47	61	74	53	54
Chad	DTP3	50	46	41	41	81	77	72	78
Democratic Republic of the Congo (the)	DTP3	57	57	57	57	95	94	94	92
Ethiopia	DTP3	69	68	69	66	96	95	96	96
India	DTP3	91	90	89	88	91	99	89	88
Kenya	DTP3	92	92	82	89	83	81	71	78
Kyrgyzstan	DTP3	95	94	92	96	95	94	92	96
Madagascar	DTP3	79	75	74	77	95	91	90	93
Myanmar	DTP3	90	91	89	90	90	91	89	90
Nigeria	DTP3	57	56	55	53	57	58	33	45
Pakistan	DTP3	75	75	75	75	75	72	75	75
Uganda	DTP3	93	93	94	93	73	79	94	93

<sup>4</sup> WHO vaccine-preventable diseases: monitoring system. 2020 global summary. [https://apps.who.int/immunization\\_monitoring/globalsummary/](https://apps.who.int/immunization_monitoring/globalsummary/) [updated July 15, 2020]