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Review

Breaking the inertia in coverage: Mainstreaming under-utilized immunization strategies in the Middle East and North Africa region

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ABSTRACT

Vaccination coverage rates have stagnated in the past several years in many middle-income countries (MICs), especially in the UNICEF Middle East and North Africa region, with political and economic turmoil as contributing factors. This paper reviews country experiences with three under-utilized strategies aimed at increasing vaccination coverage and reducing disparities between socio-economic and geographic groups in MICs. These strategies include: (1) identifying and accounting for displaced, mobile and neglected populations; (2) assessing and addressing missed opportunities for vaccination, including by expanding immunization into the second year of life and beyond; and (3) engaging effectively with the private/nongovernmental health providers in the coordination, provision and reporting of immunization services. The examples focus primarily on quality data collection, analysis, use and reporting aspects of the strategies. While data are limited, there is evidence from MICs that each of these strategies can have a positive impact on vaccination coverage, especially among marginalized populations.

Contents

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1. Introduction

The community of nations has agreed to ambitious goals of the Global Vaccine Action Plan (GVAP), which requires each country to achieve at least 90% national coverage with all vaccines in their child immunization schedule, 80% coverage in all districts, and the eradication of polio and elimination of maternal and neonatal tetanus, measles and rubella by 2020 [1]. Great progress has been made globally in increasing vaccination coverage in the past two decades, with coverage rates for the third dose of diphtheria-pertussis-tetanus vaccine (DTP3) (using WHO-UNICEF estimates) having increased globally from 72% in 2000 to 86% in 2016 [2]. However, global coverage rates have stagnated since around 2009, leaving an estimated 19.5 million infants worldwide under or un-vaccinated in 2016 [3].

The Middle East and North Africa (MENA) region consists of 14 middle-income countries (MICs) and six high-income countries. Of the 14 MICs, Djibouti, the Sudan (henceforth, Sudan) and Yemen have been eligible for Gavi assistance since 2000. Currently Iraq, Libya, the Syrian Arab Republic (henceforth, Syria) and Yemen are facing prolonged conflicts and instability. In 2016 at least 14 of the 20 countries (data from State of Palestine are missing) achieved and maintained high immunization coverage (greater than 90% DPT3). However, the overall regional coverage rate in 2016 (88%) was around the same as in 2000 (87%), resulting in an estimated 1.3 million children who were not completely vaccinated in 2016 [3]. Nearly nine out of ten (88%) missed children live in five countries, which include the war-torn countries of Iraq (with an estimated DTP3 coverage rate of 63% in 2016), Syria (42%) and Yemen (71%), as well as Egypt and Sudan. Moreover, almost all MENA countries, except for Bahrain and Jordan, reported measles cases in 2017 [4].

In addition, subnational coverage data indicate disparities exist between geographic areas and socio-economic groups in several countries. For example, only 17% of districts in Djibouti reported DPT3 coverage of more than 80%, as did 41% of districts in Syria, 42% in Iraq and 64% in Yemen [3]. Continual progress in reaching the GVAP goals will require reducing the vast inequality in vaccination coverage, thus increasing the opportunity of all children – whether they have been uprooted by civil conflict, live in sprawling urban slums or reside in remote impoverished areas with limited access to health services – to receive the full complement of vaccines in their national immunization programs.

However, immunization programs often do not focus sufficiently on improving equitable access to services when monitoring program performance, reviewing surveillance data on vaccine-preventable diseases (VPDs) or developing microplans or strategies. Particularly, many immunization data systems and tools were not designed with the goals of universal health coverage and equity in mind, and thus information needed to identify unvaccinated children or to track those who have not completed their vaccinations is often lacking.

Achieving high levels of vaccination coverage to meet the GVAP goals and bridge equity gaps will require strategies that go beyond those that proved successful in many countries in the past 30 years. Efforts to improve DPT3 coverage from 40% to 80%, for example, may have been more straightforward, consisting of increased investments in health infrastructure and the supply chain, as well as ensuring reasonable levels of demand or utilization of immunization services. However, reaching and maintaining the target of >90% and breaking the inertia of coverage, especially in a complex context such as the MENA region, will require building upon existing capacities and systems by mainstreaming under-utilized strategies. These include: (1) intensifying efforts to identify, estimate and track displaced, mobile and neglected (henceforth, "special") populations, such as urban slum dwellers, those displaced by conflict, migrants, and nomads; (2) finding ways to identify and reduce missed opportunities for vaccination (MOV), including providing and integrating immunization services during the second year of life ("2YL") and beyond; and (3) engaging effectively with the private/nongovernmental (henceforth, private) health providers in order to improve the coordination, quality, access to and particularly reporting of immunization services.

In this paper, we attempt to analyze and present these strategies and selected actions and tools. This paper is neither an exhaustive review of the literature on these strategies nor does it intend to cover all components of each strategy. The idea was inspired by a regional workshop on Equity-Informed Microplanning, organized by the UNICEF MENA Regional Office with several key partners in September 2017 [5]. Participating countries recognized the value of these under-utilized strategies and acknowledged that their existing data collection tools, reporting forms and microplans did not always take these issues into account. Workshop participants recommended a publication that would summarize and draw the attention of policymakers, development partners, program managers and front-line health care workers to these under-utilized strategies and the importance of updating data collection tools or reporting forms to accommodate the analysis and use of quality data in improving coverage and equity.

2. Methods

A non-systematic review of published and unpublished literature, including guidelines, reports, and meeting presentations (from the MENA workshop and other meetings), was conducted for each of the three topics. Telephone interviews with key informants in Yemen and Sudan were also conducted to obtain in-depth information on successful examples of implementing these strategies.

3. Data and discussion

3.1. Identifying and accounting for special populations

Populations most at-risk of being un- or partially vaccinated that require special attention primarily consist of three groups: (1) refugees and internally-displaced persons (IDPs) fleeing conflict or political unrest; (2) urban slum residents; and (3) nomads and other transient groups in remote locations. These groups combined make up an important proportion of the total population in many countries in the MENA region, especially since the advent of conflicts in Iraq, Syria and Yemen.

3.1.1. Refugees and IDPs

As of the end of 2016, there were an estimated 14.4 million IDPs and 3.9 million refugees in the MENA region (Table 1), for a total of 18.3 million displaced persons [6,7]. This represents 28% of the estimated 65.5 million forcibly-displaced people worldwide at the end of 2016. Four countries in the region (Syria, Iraq, Sudan and Yemen) have among the world's ten largest IDP populations, with Syria alone accounting for 44% of the region's total [6]. An estimated 51% of forcibly-displaced persons in 2016 were children [7].

Vaccination coverage rates have declined markedly in several conflict-affected countries – for example, from 80% in 2010 to 42% in 2016 in Syria for DPT3, and from 80% in 2000 to 63% in 2016 in Iraq [2]. An exception is Yemen, which, due to a series of intensive immunization activities, including integrated outreach rounds conducted up to five times a year, vaccination campaigns

Table 1
Numbers of refugees and internally displaced persons (IDPs) in the MENA region, end of 2016.

Country	Refugees (in country)	IDPs	Total
Egypt	213,530	–	213,530
Iran*	979,435	–	979,435
Iraq	261,888	3,604,285	3,866,173
Jordan*	685,200	–	685,200
Lebanon	1,012,969	–	1,012,969
Libya	9301	174,510	183,811
Sudan	421,466	2,225,557	2,647,023
Syria	19,809	6,325,978	6,345,787
Yemen	269,783	2,025,060	2,294,843
Other countries	37,573	–	37,573
Total	**3,910,954**	**14,355,390**	**18,266,344**

Source: [6], except for countries indicated with * [7].

and mobile team visits, has managed to prevent a precipitous decline in vaccination coverage (sustained at ≈70%). Consequently, children affected by conflict suffer disproportionately from disease outbreaks, including measles and vaccine-derived polio in Syria [8,9]. Of nearly 3400 polio cases reported globally from 2010 to 2016, 70% were in conflict-affected countries [8]. Thus, tracking and reaching children caught up in conflicts will be critical to meeting global eradication and elimination goals for vaccine-preventable diseases.

3.1.2. Urban slums residents

The estimated slum population worldwide was 880 million in 2014 (up from 689 million in 1990) [10] and is nearly 41 million in nine middle-income MENA countries alone (Table 2). The proportion of urban residents living in slums in these countries ranges from 11 to 13% in Egypt, Morocco and Jordan to 60% or greater in Yemen, Djibouti and Sudan – where in the latter more than 90% of its urban population (nearly 12 million people) reside in slums [11].

The growth in slum populations has been greatest in several countries affected by conflict. These include Iraq, where the percentage (and numbers) of the urban population living in slums nearly tripled from 17% (2.89 million) in 2000 to 47% (11.4 million) by 2014, and Syria, where the slum population more than doubled from 2005 to 2014, currently estimated at 2.4 million [11].

Vaccination coverage rates among slum dwellers are difficult to determine given the constant mobility of people in and out of urban slums, and since routine data do not differentiate between slum and non-slum populations. In addition, slums are often overlooked or their populations undercounted in censuses and surveys.

Table 2
Estimated urban slum populations in selected countries in the Middle East and North Africa.

Country	Percent urban (of total population) (2017)[a]	Percent of urban population living in slums (2014)	Approximate number living in slums (2014)
Djibouti	77.5%	65.6%	449,000
Egypt	43.3%	10.6%	3,807,000
Iraq	69.7%	47.2%	11,383,000
Jordan	84.1%	12.9%	808,000
Lebanon	88.0%	53.1%	2,312,000
Morocco	61.2%	13.1%	2,619,000
Sudan	34.2%	91.6%	11,939,000
Syria	58.5%	19.3%	2,429,000
Yemen	35.8%	60.8%	5,166,000
Total			**40,912,000**

Source: [11].
[a] Projection for 2017, based on 2014 data.

However, data from Demographic and Health Surveys (DHS) show substantially lower immunization rates in many countries between urban residents in the lowest income quintile – which can serve as a proxy for slum populations – and those in the highest quintile, with a difference of as much as 58 percentage points in DPT3 coverage in urban areas in several low- and middle-income countries [10]. In the MENA region, the difference in DPT3 coverage rates between the highest and lowest income quintiles in urban areas was found to be 38 percentage points in Sudan, 17–18 percentage points in Yemen and Iraq, while inequality in coverage between income groups was considerably less or non-existent in Jordan, Morocco and Egypt (Table 3) [12]. Coverage rates among the poorest urban dwellers have been found in some countries, including Sudan, to be close to or even less than those of rural populations.

Factors from the literature explaining low coverage in urban slums include the lack of assimilation and social networks among recent migrants and marginalized ethnic groups, social (versus geographic) isolation reducing access to and awareness of health services, the inability of working parents to take time off to bring in their children for health services, the lack of legal status of populations in informal settlements, as well as socio-demographic characteristics associated with low health care utilization (e.g., poverty, low educational levels) [10,13].

The lower vaccination coverage rates, coupled with the higher risk of infectious diseases in these areas due to poor water and sanitation, malnutrition, crowded living conditions, as well as the continuous flow of migrants possibly bringing new pools of infectious agents, result in higher rates of vaccine-preventable diseases among the urban poor in many countries [10,14]. Disease outbreaks, such as the vaccine-derived polio in an urban slum (Rasafa) in Baghdad, Iraq, are evidence of vaccination coverage gaps in urban slums.

3.1.3. Nomads and other transient communities

Among others, this group includes Bedouins in countries such as Egypt, Djibouti and Jordan. While many have settled into communities in recent decades, they still constitute an important population in some countries, such as Djibouti, where they were found in the most recent (2009) census to make up 20% of the total population [15]. Nomadic populations are often left out or undercounted in censuses and health surveys and historically have limited access to health services, including immunization.

3.1.4. Challenges in locating, counting and targeting special populations for immunization services

Immunization programs face great challenges in locating, estimating the size of, and tracking the immunization status of children in special populations. Conflicts can cause sudden displacements of large numbers of people to more secure areas, swelling their population rapidly and limiting the ability of host

Table 3
Urban DPT3 vaccination coverage rates by income quintile from Demographic and Health Surveys, selected countries in the Middle East and North Africa.

Country	Urban population			Rural population
	Lowest quintile	Highest quintile	Overall urban population	
Egypt	98	99	99	98
Iraq	66	83	77	58
Jordan	96	99	98	98
Morocco	88	95	93	74
Sudan	54	92	74	59
Yemen	54	72	60	37

Source: [12].

communities to adequately plan for and provide health services. In 2016 alone, there were nearly two million new displacements of people in Iraq, Syria and Yemen due to conflict [16]. In addition, most IDPs and refugees in the Middle East are not in camps or separate communities, but are dispersed within host communities, such as urban areas, or scattered through the country, living in rented accommodations or make-shift dwellings, often in impoverished conditions. In Lebanon, for example, where the construction of refugee camps has been banned, the one million Syrian refugees live in 1600 host communities, mainly in the country's poorest Northern regions [17].

Similarly, urban slums can grow rapidly, and the constant in- and out-migration complicates efforts to accurately enumerate children and track their vaccination status, as well as to measure the performance of the immunization program in these areas.

To identify and forecast their program needs and plan activities, immunization programs typically use population data from national censuses. They also use data on immunization coverage from periodic health surveys, such as DHS, Multi-Indicator Cluster Surveys (MICS) and immunization coverage surveys. These surveys tend to be more accurate than administrative data in many countries and often the main source of data showing disparities in coverage between socio-economic and other demographic groups. Censuses, however, are too infrequent to capture rapid population movements caused by conflict or rural-to-urban migration, and most censuses do not distinguish between slum and non-slum areas and may exclude informal or illegal settlements for political or legal reasons [10]. The result, described by Litford et al. is that "although slums are easily identifiable physically in many cities in low middle-income countries (LMICs), they remain invisible in many data systems that drive research and policy" [18]. Since most health surveys use census-track data to develop their sampling frames, children in slums are often excluded or under-sampled, making it difficult to measure disparities in vaccination coverage and to have accurate data on their numbers to target them for activities, such as mobile, outreach and periodic intensive routine immunization activities.

For all of the above reasons, special populations are often insufficiently accounted for in official policies, budgets, and plans, including district- or facility-based microplans.

3.1.5. Actions and tools to better account for and include special populations in immunization programs

Improving the design and implementation of censuses and surveys. The 2015 census conducted in Jordan includes a form for non-Jordanians, enabling the enumeration of refugees by age group, location, length of stay in the country, asylum status, country of origin, and other characteristics. Djibouti similarly added a section in its last census (in 2009) to enumerate its nomadic population [15]. It has also been recommended that countries identify all urban census tracts as slum or non-slum areas to better capture slum populations [18].

Conducting special data collection exercises in specific areas. Micro-censuses and other special studies conducted in specific, underserved areas, which, for instance, list all children under age five by household and vaccination status, can be an effective way to obtain accurate data on special populations to measure and respond to differences in vaccination coverage. Examples from the field outside the MENA region include a three-city project led by a civil society organization in Pakistan, in which community members successfully mapped out and profiled slum areas and conducted micro-censuses as initial steps to increase vaccination coverage in these areas [13]. A comprehensive project in Manila, Philippines that was started in 2015 to reduce inequities in immunization services among poor children involved, among other activities, recruiting and training local neighborhood ("village") health volunteers to develop master lists and conduct default tracking, rapid coverage assessments conducted each quarter to identify missed children in high-risk zones, and the development of an on-line electronic target client list that sends automatic reminders to health center staff when a child's vaccination is due [19].

Since the war began in Yemen in 2015, it has not been possible to conduct micro-censuses that list each household and eligible child in target communities (e.g., IDPs, Somali refugees). Instead, for the integrated outreach rounds and various vaccination campaigns, health workers have relied on information gathered from successive immunization activities to develop microplans. These included a series of door-to-door polio campaigns, during which health workers counted the number of age-eligible children in their area [20–22].

Using satellite imagery technology. Technologies, such as Geographic Information System (GIS) mapping and remote sensing imagery, have successfully been used to detect settlements missing from census maps and estimate population size in densely-populated areas, such as urban slums. To inform polio vaccination campaigns in Nigeria following detection of wild poliovirus cases in 2016, GIS mapping found settlements missing from census maps, which were then visited to conduct micro-censuses (small-scale censuses in specific, limited areas). The exercise found census projections to be unreliable below the state level [23]. Satellite imagery from a census was also used as a starting point in Bangladesh to identify slums for an urban health survey, followed by an on-the-ground assessment to profile and estimate the size of slum communities [14].

3.2. Assessing and addressing missed opportunities for vaccination, including by expanding immunization into the second year of life (2YL) and beyond

A growing body of evidence shows that a significant portion of un- or under-immunized children may already be accessing treatment and preventive health services, but that missed opportunities for vaccination (MOV) when children are in contact with the health care system can be an important factor contributing to inadequate coverage. The World Health Organization (WHO) defines an MOV as "any contact with health services by a child (or adult) who is eligible for vaccination (unvaccinated, partially vaccinated or not up-to-date, and free of contraindications to vaccination), but which does not result in the individual receiving all the vaccine doses for which he or she is eligible" [24].

Missed opportunities for vaccination can occur when children visit a health facility for immunization services, for treatment of an illness or injury, for other preventive health services, or to accompany another family member to a health facility for any reason [24]. Many of the reasons that MOV occur stem from the failure of health workers to follow, or misconceptions about, established policies or procedures. These include a failure to review children's vaccination status, especially during curative care visits; refusal to vaccinate an ill child, one who is behind in his or her vaccinations or considered too old to be eligible; and aversion to opening a multi-dose vaccine vial for a single child [24–26]. Health workers' reluctance to vaccinate a child without a home-based record available is also a common reason; preliminary findings from a recent (2017) MOV assessment in Jordan showed that nearly 20% of health workers interviewed would not vaccinate a child without a card, even though around 90% of children visiting the clinic for any reason did not bring cards with them [27]. MOV studies in Malawi and Chad found that such health worker-related reasons accounted for 63% of all MOV [25].

Another set of reasons for MOV relate to the health system. These include limited days and times that immunization services are available in health facilities; the lack of integration of services–thus preventing vaccinations from being readily available during curative care visits; vaccine stockouts; and staff shortages. Another common factor is data collection forms that make it challenging to record delayed vaccinations and that can lead to health workers foregoing vaccination altogether for children beyond the recommended ages. A common example of the latter is child health records that list the first dose of measles-containing vaccine (MCV1) at nine months and the second dose (MCV2) at 18 months, making it difficult for health workers to correctly record a first dose, for example, at 15 months, or perhaps leading to the child not receiving the second dose if it's after 18 months. Another example is tally sheets that record vaccinations only up to a certain age (e.g., 23 months).

Amongst the most affected by missed opportunities are children (and their caregivers) in hard-to-reach, impoverished and under-served areas, since they are the least likely to receive regular health services – due to social and geographic distance or other factors – and thus the least likely to make a return visit to a health facility to receive all of their vaccinations.

Several studies in LMICs have estimated the prevalence of MOV. An analysis of DHS and MICS data found that MOV occurred at least half of the time that mothers or their children received recommended maternal and child health services in eight out of 14 countries [28]. A meta-analysis of 45 studies estimated a pooled prevalence rate of MOV of 32% among children [25]. A recent study found that the proportion of missed opportunities – in terms of total eligible doses not given to children during contacts with health facilities – was 73% in Malawi and 42% in Chad [29]. While MOV were most common during curative care visits and when a child was accompanying an adult, even vaccination-specific visits resulted in a rate of around 30% of eligible doses not given in both countries.

An analysis conducted in 2013 using DHS and MICS data from 14 African and Asian LMICs on the percent of un- or under-vaccinated children who had made a recent treatment visit to a health facility estimated that, if all MOV were eliminated during these visits alone, DPT3 coverage rates (using WHO-UNICEF estimates) would increase by 2–14 percentage points and 10–14 percentage points in four countries, including India [24]. These increases would push national DPT3 coverage rates to more than 90% in half of these countries. Similarly, a study in six health facilities in a Nairobi slum found that coverage of the third oral polio vaccine dose would increase by 11%, DPT3 by 7%, and measles by 19% if all missed opportunities were eliminated [10].

Significant reductions in vaccination coverage rates after the first year of life, even in countries with scheduled vaccinations beyond infancy, also contribute to MOV and to lowering overall coverage. Among six countries in the MENA region, WHO-UNICEF estimated coverage rates in 2016 between the first doses of measles-containing vaccine (scheduled at nine or 12 months) and the second dose (given at 15 or 18 months) dropped by one to 21 percentage points, with the largest decline found in Yemen (Fig. 1) [2]. Reasons cited in the literature for the decrease in coverage rates for vaccinations scheduled during the second year of life include the lack of focus and training on vaccinations beyond infancy; and unclear policies about age eligibility for late doses (e.g., MCV1 beyond 12 months), which are often compounded by data collection forms that specify doses by age or that measure a 'fully immunized child (FIC)' only at one year of age. Other factors include a lack of caregivers' awareness that vaccinations can be given beyond infancy; and the fact that the addition of new doses to the schedule, such as MCV2 and a booster dose of DPT, are not treated as new vaccine launches, thus reducing the public's and health workers' awareness of these doses and their importance [30–32].

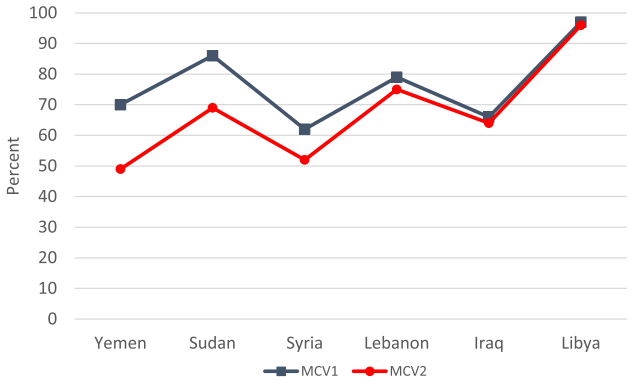

Fig. 1. National coverage rates (2016) for measles-containing vaccine doses 1 and 2, WHO-UNICEF estimates.

However, providing vaccinations during the second year of life and beyond (e.g. school entry) can have a major impact on closing coverage gaps between residential and socio-economic groups and hence in increasing overall coverage rates – not only for vaccine doses scheduled for beyond 12 months, but also for "catch-up" doses of vaccinations that children missed during infancy. A study using DHS data from 45 low- and middle-income countries found an increase in median DPT3 coverage rates from 65% by age 12 months to 74% by 24 months, and an even larger jump in MCV1 coverage: from 54% at 12 months to 80% by 24 months (Fig. 2) [33]. With the introduction of new vaccines and schedules that extend into year two, as well as recent recommendations for additional doses beyond 12 months for traditional Expanded Programme on Immunization (EPI) vaccines (Table 4), immunization programs now have more opportunities to provide vaccinations during the second year of life and beyond.

3.2.1. Actions and tools to assess and reduce missed opportunities and increase immunization coverage during the second year of life and beyond

The global immunization community is paying increasing attention to the issue of MOV and immunization during the second year of life and beyond, as articulated in the GVAP and recent Strategic Advisory Group of Experts on Immunization (SAGE) meetings [30]. WHO, with UNICEF and other partners, has developed a ten-step MOV Strategy and a series of guides to assist countries in assessing and reducing MOV and in strengthening immunization services during the second year of life [24,31,34]. A consortium of partners has also been formed to coordinate support to countries for MOV assessment and reduction efforts.

Many of the activities recommended to address MOV and 2YL vaccinations will involve policy changes. These include establish-

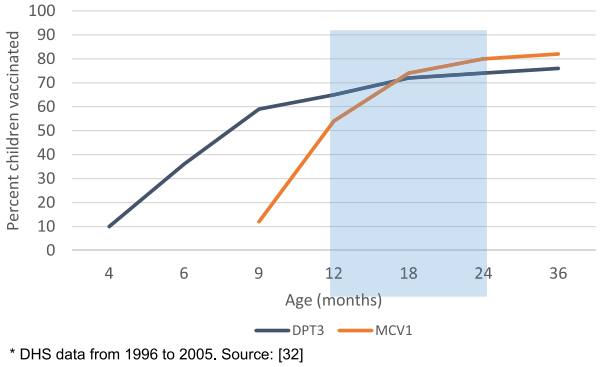

Fig. 2. Median coverage rates for DPT3 and MCV1 at different ages across 45 low and middle-income countries. *Source:* [32].

Table 4
Vaccine doses recommended by WHO to be administered during the second year of life.

Vaccine	Recommendation
2nd dose of measles-containing vaccine	MCV2 to be added to the routine immunization schedule in all countries. Where the risk of measles mortality remains high, MCV2 should be administered at 15–18 months. In countries with low risk of measles infection among infants, the optimal age for delivering MCV2 is based on programmatic considerations
Diphtheria-tetanus-pertussis (DPT) 4th dose	Booster dose recommended, preferably during the second year of life
Pneumococcal conjugate vaccine (PCV)	WHO supports "2p + 1" option of providing 2 primary doses in infancy and the third (booster) dose at 9–18 months
Meningitis A conjugate vaccine	Single (primary) dose at 9–18 months in high-risk countries
Typhoid conjugate vaccine	Single dose between 6 and 23 months in endemic countries, based on programmatic and epidemiological considerations
Seasonal influenza vaccine	Starting at 6 months and extending to 23 or 59 months for countries that decide to introduce it

Source: [31].

ing a routine immunization and well-baby visit in the second year of life for booster and catch-up doses and reorganizing health services to better integrate curative and preventive care. Other key policy changes include refresher training of health workers in order to reinforce adherence to the vaccination schedule, sensitize them on reviewing the vaccination status of all children visiting a health facility for any reason, counter false contraindications to vaccinations such as mild illnesses, and encourage administration of catch-up vaccination for children arriving late or with missing doses; as well as increasing awareness of parents and the public about MOV and the importance of completing all vaccinations and of retaining vaccination cards/home-based records and bringing them to every contact with health services. However, here we focus on the use of data collection and reporting forms and systems designed to reduce MOV, to catch up children with missed doses during the second year of life and beyond, and to otherwise facilitate a change in the mindset to "vaccinate children as a default response", as recommended by the WHO SAGE [30]. Examples from the field include:

- A tally sheet used in Kenya that allows more flexibility in administering and recording delayed vaccine doses, by replacing specific ages listed in the schedule with broader categories such as "Under 1 year" and "above 1 year" for the first measles dose, and "At 1½–2 years" and "Above 2 years" for the second dose.
- Revised indicators in Ghana to accommodate booster doses and delayed vaccinations. The FIC indicator is now split into three categories: "FIC by age 1", "FIC by age 2", and "FIC after age 2", based on having received all age-appropriate vaccines up to each point in time [31].
- An innovative vaccination referral system being piloted in Chad that uses "EPI coupons" (referral slips) that are available in all health center departments outside of the vaccination center [29]. All clinicians are trained to obtain the immunization history of every child they see under the age of five, and to fill out the coupon listing missing vaccinations for which the child is eligible. The mother is then requested to take the child to the EPI center for the required vaccinations, which are recorded on the coupon. The system – designed to reduce MOV – also enhances accountability and monitoring, since the date, time and name of the referring clinician must be noted on the slip, and the health center director must report to district authorities the number of referral coupons handed out and the number received by the vaccination center each month.

3.3. Engaging effectively with the private health providers in the coordination, provision and reporting of immunization services

In many countries, the contribution to the provision of immunization services by the private sector – including for-profit providers and non-profit health facilities run by faith-based, civil society or nongovernmental organizations (NGOs) – is largely unknown [36,41]. This is due to the lack of information about private health providers offering vaccinations, the limited monitoring and regulation of these providers, and their lack of participation in reporting vaccinations to the government. The data that do exist – from two literature reviews, special surveys and data from WHO-UNICEF joint reporting forms (JRFs) – suggest that the role of non-profit institutions in immunization is generally higher (e.g., accounting for up 30–40% of all child vaccinations in some low-income countries), than that of for-profit providers, who contribute less than 10–15% of total vaccinations in most LMICs [36,41–43].

Nonetheless, private providers, including for-profit entities, play a major role in immunization in certain areas, especially cities. In India, 9% of children 12–23 months nationwide – but 22% in urban areas – were partially or fully vaccinated in the private sector in 2009, according to a coverage survey, and the percentage by state ranged from ≈1% to 22% [43]. In Uganda, around 60% of children who received three doses of pentavalent vaccine in 2016 in the capital, Kampala were vaccinated at private (for-profit and non-profit) health facilities, as compared to ≈25% in the entire country [39]. In Dhaka, Bangladesh, 100% of childhood vaccinations are provided by NGO-run clinics through contracts with the Dhaka City Corporation and with vaccines provided by the Ministry of Health.

In the MENA region, the contribution of the private sector in immunization seems to be limited or under-reported in some countries – for example, according to 2015 JRF data, 10% or less of all vaccinations administered in Jordan, Yemen, Morocco and Djibouti [43]. Iraq and Libya prohibit the provision of vaccinations outside of the public sector. In a few MICs, however, the private sector has a major – and growing – role in delivering immunization services. An estimated 27–45% of all vaccinations administered in Lebanon are given by nongovernmental providers, while in Sudan, a low-middle income country transitioning from GAVI support, the percentage of children receiving three pentavalent vaccine doses who were reached through the private sector (primarily NGOs) was 52% in 2016 in Khartoum state (an area inhabited largely by the urban poor), 31% in West Darfur, and 9% in West Kordofan state [44].

NGOs and other non-profit organizations play a vital role in many countries in serving under-privileged children, such as the urban poor, those living in remote rural areas, and refugees, thereby resulting in a more equitable distribution of immunization services. However, it can be argued that the participation of for-profit providers in immunization can increase disparities, since they tend to serve wealthier populations; charge fees; and offer newer, more expensive vaccines not yet available in government health facilities. On the other hand, the participation of private sector in immunization service delivery, including the for-profit (e.g., in urban areas), can reduce inequities, if they are given free vaccines from the government in exchange for agreeing to provide vaccinations free-of-charge.

These agreements – often codified in contracts or memorandums of understanding – also require providers to submit regular reports on vaccinations and adverse events following immuniza-

tion (AEFI). More wide-ranging collaboration can involve establishing a regulatory system in which non-public providers must adhere to quality standards and agree to regular monitoring to be allowed to provide vaccination services, and arrangements, as in Sudan, in which the private sector is well integrated into the immunization system. In the case of Sudan, this integration involves being included in microplans and participating in disease and vaccination reporting, as well as receiving similar Ministry of Health support (training, supervision, monitoring) as public sector providers.

3.3.1. Actions and tools to increase effective collaboration with the private health providers in immunization

Public-private collaboration in immunization can have a positive impact on sustainable and equitable service delivery and on increasing coverage, especially in geographic areas where the private sector is an important provider of health and immunization services. As a first step, the WHO guidance note recommends that countries conduct assessments of the current and potential role of nongovernmental providers in immunization, followed by efforts to determine the optimal model of public-private engagement, and the establishment of dialogue, collaborative activities and formal agreements [35]. Specifically, the public and private sectors should deliberately engage in improving delivery and quality of services and increasing timely data flow and reporting.

Improving delivery and quality of immunization services. A series of studies in LMICs show that, in general, for-profit health providers are much less likely to offer vaccination services than the public sector, while at the same time the role of non-profit facilities in delivering vaccination services can be increased in many countries. In Uganda, while for-profit providers make up 37% of the country's health facilities, only 3% offer vaccination services, compared to 15% of NGO-run facilities and 82% of government facilities [39]. A study of four African countries (Kenya, Tanzania, Senegal, Malawi) found that 25–37% of for-profit providers offered vaccinations, compared to 91–96% of public facilities and a wide range (16%-95%) of NGO and faith-based facilities [40].

There is also evidence of a greater frequency of missed opportunities for vaccination among private versus public providers. In the Philippines, hepatitis B birth dose study in low-performing regions, the coverage rate of a timely dose (within 24 h of birth) was 50% in private hospitals, compared to 87–90% in government facilities [38]. In the study in four African countries mentioned above [40], private providers were less likely to assess the vaccination status of ill children than public sector providers in three of the four countries (by 27–33% in the case of for-profit providers) and less likely in all four countries to offer measles vaccination on a daily basis. The gap in the delivery of vaccination services between the private and public sectors could thus be considerably narrowed through the provision by governments of free vaccines, training and other incentives, and harmonization of reporting systems.

While data are limited, existing evidence suggests that the quality of immunization services in the for-profit private sector is generally inferior to that in public facilities in many LMICs [36,41]. Common issues cited are poor cold chain and vaccine management, insufficient use of auto-disabled (disposable) syringes, and a lack of knowledge about government immunization policies or adherence to the national vaccination schedule [37,41,42]. These problems can be addressed by instituting regular supervision and monitoring of immunization practices in private facilities (e.g., as part of formal agreements), the inclusion of private practitioners in EPI-run trainings, and the establishment and enforcement of a regulatory or accreditation system. In Bahrain, for example, private clinics that are permitted by the government to administer vaccinations receive quarterly visits by the Ministry of Health to monitor their immunization and cold chain practices against quality standards [36].

Increasing private health providers reporting. Reporting of data from the private sector to the government on vaccine doses administered, VPD cases diagnosed and possible AEFIs is sporadic or nonexistent in many LMICs [35,36]. A study of private providers in two cities in Gujarat State, India found that 69% of those surveyed did not report vaccinations to the government, 88% would not report cases of measles, and 36% would not report suspected polio cases [37]. In a study of health facilities providing childbirth services in eight regions of the Philippines with low coverage of a timely birth dose of hepatitis B vaccine, only 36% of private hospitals reported the vaccinations to the government, compared to 96% of government hospitals [38]. Responses to an email survey from several MENA countries also indicate limited and inconsistent reporting of vaccinations or VPD and AEFI cases from private providers in several countries. Private health providers in Lebanon, for example, do not consistently report vaccinations to the government, except for polio and MCV, which they receive for free from the government and in turn submit reports, many on a daily basis, using the national electronic health information system.

Increased reporting by private health providers can significantly improve the accuracy of vaccination coverage rates, as well as disease and AEFI surveillance (including the early detection of outbreaks), especially in areas where a high proportion of curative services are provided through the private sector. Engaging the private sector by providing training and incentives, such as free vaccines in exchange for administrative data, has been shown in some cases to significantly improve reporting from private providers. In Kampala, Uganda, where the government started a program offering free vaccines and cold chain equipment, as well as training and reporting tools to for-profit providers, the percent of all AEFI reports coming from for-profit clinics rose from 19% in 2014 to 37% by 2016 [39]. In 2018–19 UNICEF MENA Regional Office is leading a multi-country effort to study the contributions of the private sector to immunization coverage, successful public-private collaboration, and practices related to vaccine procurement and the reporting of vaccinations.

4. Conclusions

The authors of this paper believe that the majority of the immunization programs in MENA countries can benefit greatly from employing all or a combination of the presented strategies, actions and tools. Identifying and including the special populations in their annual plans, and particularly in facility- and community-based microplans; updating data forms and tools and recording MOV and immunization during the second year of life and beyond; and engaging effectively with the private health providers with a focus on increasing regular and quality reporting can contribute to improving coverage and reducing disparities, especially for those countries and programs facing persistent stagnation in coverage rates in recent years. However, undertaking and scaling up these strategies will require evidence-based advocacy and political will at the country level. In this effort, UNICEF, development partners, academia and civil society are encouraged to coordinate and support countries and immunization programs in generating evidence, influencing policies, mobilizing domestic resources and providing targeted technical and operational assistance.

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Conflict of interest

None declared.

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