Global Vaccine Action Plan

Priority Country reports on progress towards GVAP-RVAP goals

Annex to the GVAP Secretariat Annual Report 2017

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Introduction

In its Global Vaccine Action Plan (GVAP) Assessment Report 2015, the Strategic Group of Experts on Immunization (SAGE) recommended that the " Decade of Vaccines secretariat agencies report to SAGE in 2016 on their supporting activities conducted in the 10 countries where most of the unvaccinated and under-vaccinated children live. This annual reporting mechanism should include discussion of those reports in regional technical advisory groups. ".

To address this recommendation, the Decade of Vaccines secretariat included in its 2016 report an analysis describing the challenges, successes and opportunities that seven priority countries are facing in improving their immunization programme, as well as information on the activities conducted by some technical partners and donors to support those countries. The countries were the following: Chad, Democratic Republic of Congo, Ethiopia, Indonesia, Nigeria, Pakistan and Uganda.

This year's report provides short updates for these seven countries as well as full reports for four additional countries, namely India, Madagascar, Papua New Guinea and Yemen.

The objective of those reports is to illustrate with some concrete examples, the situations and challenges countries are dealing with. Even though the reports focus on specific countries, many findings may apply to a wider range of countries including those having achieved most of the GVAP goals.

The countries have been selected to illustrate the diversity of the situations countries are facing, using several criteria including the number of unvaccinated-under-vaccinated children, the achievement of diseases elimination goals, disease incidence and immunization coverage rates.

Note : All immunization score cards in the text are based on WHO/UNICEF Estimates of National Immunization Coverage (WUENIC).

Acknowledgement

We would like to thank all the experts from the countries and the technical agencies that have provided the material to develop the reports. Their names are included in each of the reports.

We would like to thank Denise DeRoeck for coordinating the development and drafting of the reports.

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CHAD
Follow-up report

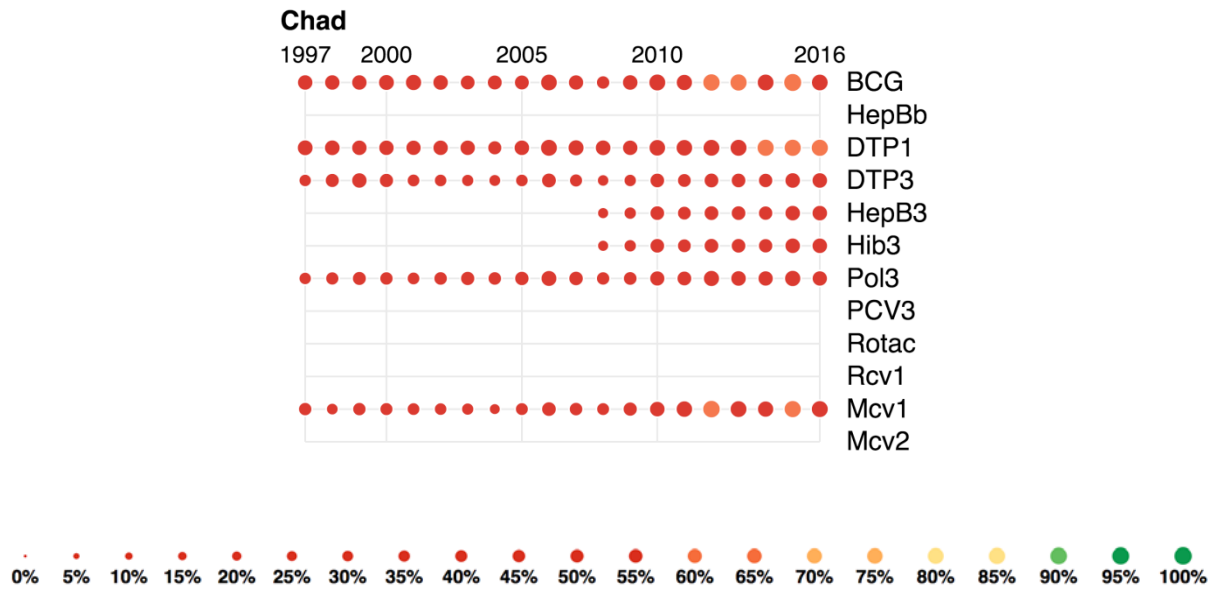
Area	Indicator	Chad
Socio-demographic	GNI /capita (US$) 2016	880
	WB Status	Low-income
	Infant mortality (<12 M) 2015 UN IAG CME	85
	Gavi Status	Eligible
	Total Population 2016	14,452,543
	Birth Cohort 2016	626,938
	Surviving Infants (JRF) 2016	574,517
1. Interrupt wild poliovirus transmission	Transmission Interrupted	Yes
	Risk of late detection: Percent of adequate stool specimens (Rolling 12m) Target > 80%	93%
	Risk of late detection: Non polio AFP rate (Rolling 12m) Target > 2	8/100,000
	Risk of spread after importation: % of children 6M-59M having received less than 3 doses in the last year before occurrence case/environmental positive)	11%
2. Neonatal tetanus elimination	TT2 coverage (reported 2016)	80%
	Protection at Birth against tetanus (WUENIC 2016)	NA
	Last SIAs conducted in the country	2015
	Elimination validation date	Not Yet Eliminated
3. Measles Elimination	Coverage MCV1 (2016 WUENIC)	58%
	Coverage MCV2	Not in schedule
	Percentage of districts with MCV1 coverage >=95% (2016 JRF)	26%
	Last national SIA	2016
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Coverage Rubella	Vaccine not introduced
	SIAs planned?	2018
5. Coverage with 3rd dose of DTP-containing vaccine	National coverage (WUENIC 2016)	46%
	Drop-out rate DTP1 DTP3 (2016 WUENIC) (DTP1-DTP3)/DTP1*100	23%
	Actual numbers of children who dropped out (2016 WUENIC)	80,432
	Difference between poorest and richest quintile DTP3 coverage (2014 data)	17 points
	% districts reaching 80% coverage from 2016 JRF	66%
6. Coverage with all vaccines in the national immunization schedule	National Coverage (2016 WUENIC)	BCG: 56% DTwP-Hib-HepB: 46% Pol3: 44% MCV1: 58% YF: 44%

Area	Indicator	Chad
7. Introduction of new vaccines	New vaccines introduced	Hib: 2008 IPV: 2015 Meningitis A (routine) : 2017
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	2010: 160.1 2015: 138.7 (13.4%)
9. NITAG	NITAG established?	No (2016)
10. Government expenditure on routine immunization per live birth USD	Baseline 2010-2011 and average for 2015-2016 (% change)	3.86 to 4.16 (8%)

Summary points

- The continued economic downturn in Chad led to drastic cuts to the national health budget in 2016, negatively affecting immunization funding (for traditional vaccines, operational costs for routine and RED/REC activities), and causing a four-month health worker strike, due to non-payment of salaries.
- Eleven polio vaccination campaigns, including 4 NIDs and 7 SNIDs (the latter in response to the WPV outbreak in Nigeria), a nation-wide measles follow-up campaign, and TT SIAs for women of child-bearing age nation-wide all took place from early 2016 to mid-2017.
- Coverage rates – both official country data and WUENIC estimates – declined sharply for some vaccines between 2015 and 2016 due to budget cuts, health worker strike, focus on SIAs, among other factors.
- Meningitis A vaccine was introduced into the routine vaccination schedule (at 6-11 months) nation-wide in July 2017.

Immunization score card, Chad, 1997-2016



Update on country situation and recent developments affecting the immunization program

- **Continued economic crisis and slashing of the national health budget.** The continued low global price of oil – Chad's main source of income – has resulted in a continual decline in the country's economy and sharp reductions in public expenditures in the past year. The Government imposed an austerity plan in 2016, resulting in drastic cuts to the health budget and considerable delays in the release of funds from the central level to the provinces. The EPI budget was cut in half from ≈$1.96 million (1.1 billion CFA) in 2015 to $982,000 (550 million CFA) in 2016 – its lowest level since 2010.[1,2] The severe cuts and slow release of funds had many negative repercussions on the routine immunization program in 2016, including:
  - National stockouts of traditional vaccines that the Government procures on its own – BCG, bOPV, measles – which lasted 51-78 days. This was the result of an agreement not being executed due to problems with the government releasing funds.[3] The Government met its co-financing obligations for pentavalent and yellow fever vaccines in 2016, despite the budget crisis.
  - A slowdown in the Reaching Every District (RED)/ Reaching Every Child (REC) activities in 56 target districts supported by GAVI, the Government, UNICEF and WHO, due to the MOH not releasing funds to these districts in the past year to cover the costs of these activities;
  - The completion of only 38% of activities in the 2016 EPI action plan and partial completion of 34% of planned activities, with 28% not taking place.
- **Health worker strike.** Because of the public financing crisis, health workers stopped receiving salaries and allowances, leading to a strike from September to December 2016. As a result of this four-month strike, hospitals and health centers closed, affecting immunization coverage and vaccine-preventable disease surveillance – with few AFP cases reported during those weeks.
- **Focus on response to wild polio virus (WPV) cases in Northeast Nigeria.** The four WPV cases discovered in Borno state, Nigeria in July 2016 led to health ministers in five countries in the Lake Chad basin (Nigeria, Chad, Cameroon, Niger, Central African Republic) declaring an emergency, which in turn led to a series of seven subnational and two national vaccination campaigns between August 2016 and May 2017 (see below).

The planning and implementation of these campaigns diverted attention and resources away from the routine immunization activities of both the government and partners. Health staff from areas at low risk of polio transmission were temporarily transferred to high-risk areas to work on the polio campaigns, while partners, such as WHO, focused on intensifying AFP/polio surveillance, including collecting samples from healthy children in "silent" districts to ensure that no cases went undetected. It should be noted that Chad was declared polio-free in early July 2016. Consequently, the country was supposed to begin the transition from polio funding in 2017. The transition has been delayed because of the outbreak in Nigeria and outbreak response activities. The polio program is funding the three-member WHO immunization team of professionals working at the central level, as well as the approximately 140 UNICEF and WHO personnel working from six polio hubs on surveillance, SIAs, communications, RED/REC, and other immunization activities.

- **Interim management and financing of the EPI.** The management of the EPI is currently in flux, with the EPI manager having left (to work for WHO) and an Acting Manager in his place. This has had an impact on decision-making within the program. In addition, the first GAVI HSS grant ended in 2016, and due to financial management issues discovered during a GAVI audit and to the rejection by GAVI of the MOH's HSS2 proposal, the program is receiving extraordinary interim financing from GAVI for a nine-month period (January to September 2017) to ensure that key immunization activities continue to take place and to build local capacity in program management and planning. The $749,000 interim funding, which will be channeled entirely through UNICEF, is being used to establish a Project Management Unit for GAVI grants, conduct assessments (e.g., cold chain equipment inventory; knowledge, attitudes and practices (KAP) survey); develop planning documents, including the next National Health Development Plan (PNDS3), a new cMYP and a Country Engagement Framework plan; ensure funding for vaccine deliveries; conduct trainings (e.g., in administration and finance, cold chain management); and implement RED/REC in 10 districts with a total of more than 39,000 unvaccinated children (≈18% of the total) by providing funding for outreach sessions, supervisory visits, community meetings and EPI review meetings. It is also expected that a revised HSS2 proposal will be developed, resubmitted and accepted during this period, enabling the program to receive new GAVI funds without a gap in financing.

1 Memo from the Vaccination and Epidemiological Surveillance Department of the MOH, Financement interimaire du programme de vaccination au Tchad, 2016.
2 Joint Appraisal report, 2016.
3 Direction de la Vaccination et de la Surveillance Epidemiologique. Plan d'action operationnel du PEV pur l'année 2017, Bongor, 12-16 December 2016.

Key achievements, activities and progress towards the GVAP goals in the past year

Planning and implementation of vaccination campaigns against polio, measles and maternal and neonatal tetanus (MNT)

The past year of the EPI program has been dominated by a series of SIAs – for polio, measles and MNT. Two round of polio national immunization days (NIDs) using bivalent OPV were conducted in January and March 2016. Following detection of WPV cases in Borno State, Nigeria in late July, six outbreak response campaigns were conducted over a five-month period in high-risk districts, consisting of door-to-door vaccination of all children under five (Table 1). These were followed by two rounds of national SIAs in March and April 2017, and a campaign covering half the country in May.

Table 1: Polio outbreak response activities conducted in Chad in 2016 and 2017

Time	Scope (% of districts)	Type of vaccine
August 2016	Subnational (31%)	Bivalent OPV
September 2016	Subnational (79%)	Bivalent OPV
October 2016	Subnational (79%)	Bivalent OPV
December 2016	Subnational (16%)	Bivalent OPV
December 2016	Subnational (15%)	Monovalent OPV2
January 2017	Subnational (25%)	Monovalent OPV2
March 2017	National	Bivalent OPV
April 2017	National	Bivalent OPV
May 2017	Subnational (50%)	Bivalent OPV

A national follow-up measles vaccination campaign (for all children under five) – originally planned for September/October 2016 – took place in November 2016 in 14 regions and in February 2017 in the remaining nine regions. The delays and splitting of the campaign into two phases were due to the preoccupation of the program with the polio SIAs that were taking place at the time. Case-based measles surveillance has continued to improve, as noted in last year's GVAP report. However, the system has not yet quite reached the target indicators – with 1.84 cases of non-measles febrile illnesses report nationally per 100,000 children (vs. the target of ≥2/100,000), around 80% of districts reporting at least one measles case, and two "silent" districts.

To achieve MNT elimination, the EPI conducted TT campaigns for women of child-bearing age throughout the country in two phases (in February and May 2016). This follows three rounds of TT campaigns conducted between September 2014 and October 2015. WHO will assess the performance of MNT case-based surveillance – as many cases in the past weren't investigated – before a pre-validation assessment takes place.

Decline in vaccination coverage rates

Official country data show a decline in vaccination coverage rates of 9 to 19 points from 2015 to 2016 for all vaccines in the immunization program (Table 2). Consequently, considerably fewer districts met the target coverage rate for DPT3 of at least 80% in 2016, compared to 2015, and the number of districts with coverage of less than 50%, according to administrative data, climbed from six in 2015 to ten in 2016 (Fig. 1).

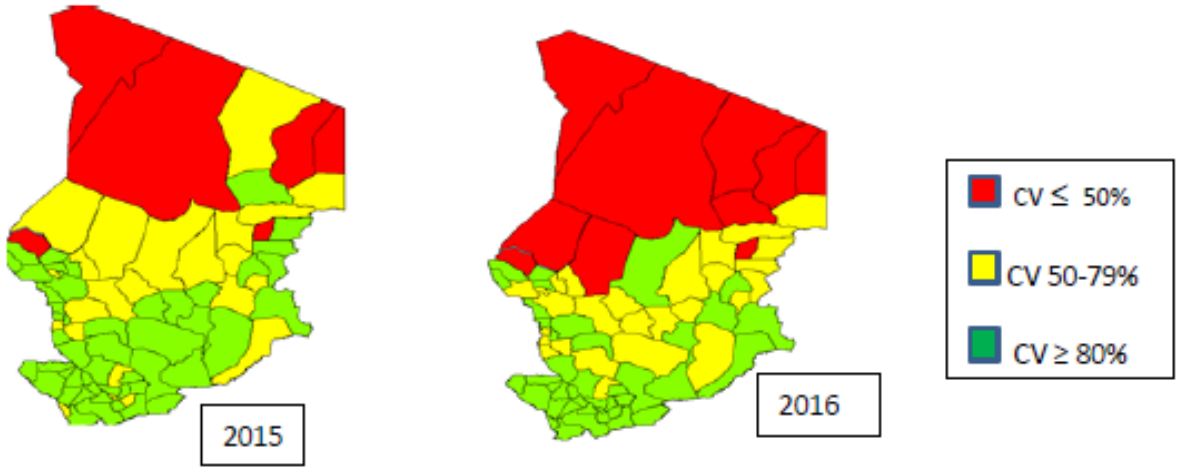
In addition, every year the WHO-UNICEF estimates (WUENIC) for the entire time series are adjusted based on newest data available (coverage data, surveys, etc.).

This resulted in a downward adjustment in the estimates for 2015 and prior years for most vaccines – most notably polio 3 by 10 points (from 62% to 52%) and DPT3 by nine points (from 55% to 46%). Even with the lower estimates for 2015, the WUENIC rates fell further in 2016 for some vaccines, especially BCG (from 68% to 56%) and polio 3 (from 52% to 44%).

Table 2: Vaccination coverage rate estimates (%), 2015 and 2016

Vaccine	2016 WUENIC rates	2015 WUENIC revised rates	2015 WUENIC rates pre-revisions (presented in last year's report)	2016 official country estimates	2015 official country estimates
BCG	56	68	70	75	96
DPT1	60	60	60	90	99
DPT3	46	46	55	78	92
Polio 3	44	52	62	75	89
Measles 1	58	60	62	75	87
Yellow fever	44	44	49	70	84

Figure 1: Estimated administrative coverage rates for the third dose of pentavalent vaccine in 2015 and 2016 by district



Source: Plan d'action ooperationnel du PEV pour l'annee 2017. Bongor, du 12 au 16 décembre 2016

The fall in coverage rates in the past year has been attributed to many of the developments and factors mentioned above, including the budget cuts and resulting reduction in funds for operational expenses and low disbursement rates, the four-month health worker strike, stockouts of some vaccines, and the focus on polio SIAs in the second half of 2016, diverting human and financing resources away from the routine immunization program.

A vaccination coverage survey began in late 2016. Once completed, the data should help to further pinpoint low-performing areas and provide further insights in developing strategies to improve coverage.

Modernization and expansion of the cold chain system

The four sub-national depots with cold rooms that had been constructed, as reported in last year's GVAP report, are now fully operational, and one – in Abéché, which covers seven regions in the Northeast – will soon run completely on solar power. The sub-national cold rooms are receiving UNICEF and WHO support for fuel costs,

training of staff and technical assistance. To increase the number of health facilities with working cold chain equipment – which stood at around 62% in 2015 – and to switch to solar power, 113 solar fridges were procured in 2016.[4] At present, around 16% of health facilities have solar-powered cold chain refrigerators; the eventual goal is 100%.

Vaccine introductions

As a follow-up to mass vaccination campaigns for meningitis A in 2011 and 2012, the MenAfriVac vaccine was introduced nation-wide into the routine immunization schedule for children 6-11 months old in early July 2017. The launch was preceded by nation-wide training of health workers involved in immunization. The introduction of MR vaccine, initially through mass vaccination campaigns, is currently planned for 2018.

Reaching unvaccinated children using a community-based approach

With technical support from UNICEF and financial support through the GAVI HSS grant, Chad's EPI has been implementing a community-based pilot program (*l'approche communautaire de la promotion de la vaccination* (ACPV)) in 31 districts – 11 priority districts at high risk of polio transmission, and 20 districts implementing the RED/REC strategy. The goal of the program is to involve communities in efforts to identify AFP cases, promote immunization, and identify and reach children for vaccination during SIAs and routine immunization activities. The project involves microplanning using GIS mapping to locate communities, community health workers (CHWs) and health facilities; developing community registers – listings of all children – by combing through hospitals records and working with community health workers and community groups (e.g., women's groups); and the regular follow-up of these children. This includes using the network of CHWs to improve tracking and follow up of nomadic populations. The project also involves community awareness raising through radio communications and community meetings, as well as the training of health workers in inter-personal communications and monthly M&E meetings.

Results from January to March 2017 in the 11 polio-priority districts show a sharp increase in vaccination coverage (e.g., from 6% to 34% for measles and from 9% to 46% for DPT3 and polio 3), as well as a 79% reduction in the DPT1 – DPT3 dropout rate (from 29% to 6%).[5] While the initial results have been positive, the strategy has been quite costly to implement and has relied heavily on external technical assistance, thereby making it difficult to sustain without partner support.

Other developments

Targeted country approach (TCA) funds have been used to hire two professional staff at the WHO Country Office to work on immunization (one in 2016 and one in 2017). However, the funds both years have not been received till mid-year, delaying the recruitment and hiring of these individuals.

Discussions are also underway between WHO and the Ministry of Health regarding the establishment of a national immunization technical advisory group (NITAG), with plans for AFRO to hire a consultant to assist with this endeavor.

[4] Direction de la Vaccination et de la Surveillance Epidemiologique. Plan d'action operationnel du PEV pur l'année 2017, Bongor, 12-16 December 2016.
[5] Chris Ngwa, Community-based approach to promote improved surveillance and vaccination, Pilot project in Chad, presentation.

Table 3: An update on progress against the GVAP goals

Polio eradication	Chad was declared polio-free in 2016, but conducted 2 NIDs in early 2016, followed by 6 SIAs in high-risk areas in response to WPV cases found in Borno state, Nigeria, and 2 more NIDs in 2017. Despite a decline in AFP/polio surveillance during the last 4 months of 2016, due to the health worker strike, polio surveillance indicators have steadily improved since 2014 – from a non-polio AFP rate of 6.51/100,000 children to 6.95 in 2015, 7.93 in 2016 and 8.75 thus far in 2017. The stool adequacy rate was 93% in 2016 and 91% in 2017 to date.
MNT elimination	TT vaccination campaigns for women 15-49 years of age were conducted in February and May 2016 throughout the country. An assessment of case-based surveillance will determine if a pre-validation assessment should take place next.
Measles elimination and rubella/CRS control	Nation-wide measles vaccination campaigns were conducted in 2 phases in 2016 and 2017 among children <5. MR surveillance indicators for 2016: non-measles febrile illness reporting rate of 1.84 per 100,000 nationally (target: >2/100,000) and 80% of districts reporting at least one case of measles. Rubella vaccine introduction (as MR) planned for 2018.
Immunization coverage (90% nation-wide and 80% in all districts for all vaccines)	Reduction in coverage rates seen for most vaccines from 2015-2016: to 70-78%, according to official country data, and to 44-58%, according to WUENIC estimates (DPT3: 46%). DPT1 – 3 dropout rate, using WUENIC estimates, was 23% in 2016. RED/REC strategy is being implemented in 56 of the country's 99 districts, but implementation was stalled in the past year due to the budget crisis.
New vaccine introductions	Meningitis A in routine schedule was launched in July 2017 nation-wide. MR vaccine introduction planned for 2018 with GAVI support.

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DEMOCRATIC REPUBLIC OF CONGO

Follow-up report

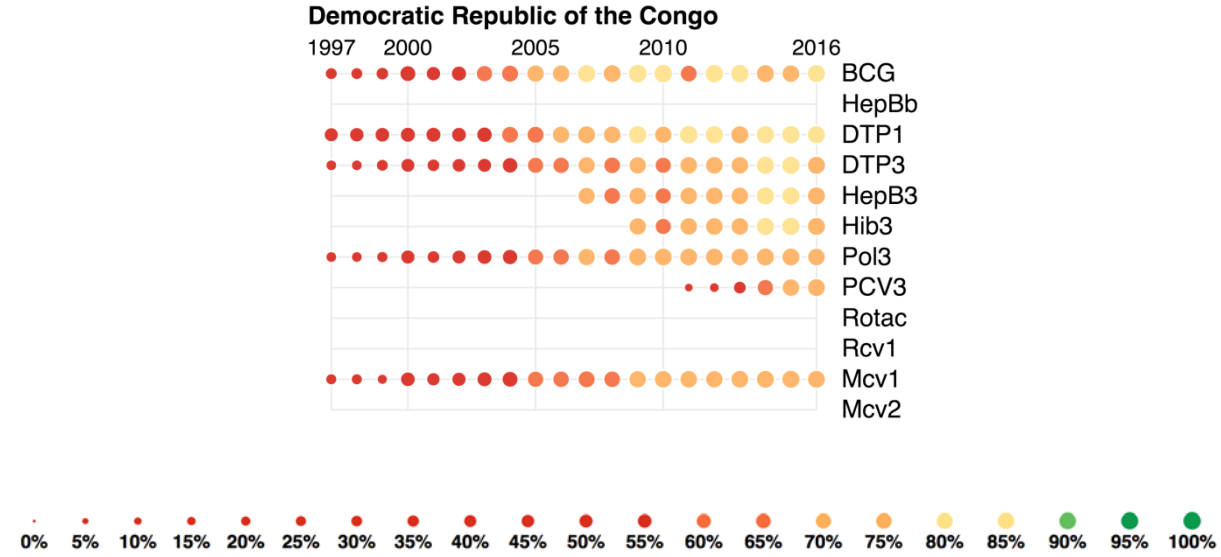
Area	Indicator	Democratic Republic of the Congo
Socio-demographic	GNI /capita (US$) 2016	410
	WB Status	Low-income
	Infant mortality (<12 M) 2015 UN IAG CME	75
	Gavi Status	Eligible
	Total Population 2016	78,736,153
	Birth Cohort 2016	3,335,137
	Surviving Infants (JRF) 2016	3,110,732
1. Interrupt wild poliovirus transmission	Transmission Interrupted	Yes
	Risk of late detection Percent of adequate stool specimens (Rolling 12m) Target > 80%	90%
	Risk of late detection Non polio AFP rate (Rolling 12m) Target > 2	5/100,000
	Risk of spread after importation: % of children 6M-59M having received less than 3 doses in the last year before occurrence case/environmental positive)	20
2. Neonatal tetanus elimination	TT2 coverage (reported 2016)	89%
	Protection at Birth against tetanus (WUENIC 2016)	85%
	Last SIAs conducted in the country	2013
	Elimination validation date	Not yet eliminated
3. Measles Elimination	Coverage MCV1 (2016 WUENIC)	77%
	Coverage MCV2	Not in schedule
	Percentage of districts with MCV1 coverage >=95% (2016 JRF)	38%
	Last national SIA	2016
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Rubella coverage	Vaccine not introduced
	SIAs planned?	No
5. Coverage with 3rd dose of DTP-containing vaccine	National coverage (WUENIC 2016)	79%
	Drop-out rate DTP1 DTP3 (2016 WUENIC) (DTP1-DTP3)/DTP1*100	1%
	Actual numbers of children who dropped out (2016 WUENIC)	31,000
	Difference between poorest and richest quintile DTP3 coverage (2013 data)	35 percentage points
	% districts reaching 80% coverage from 2016 JRF	83%
6. Coverage with all vaccines in the national immunization schedule	National Coverage (2016 WUENIC)	BCG: 80% DTwPHibHepB: 79% MCV1: 77% Polio3: 74% PCV3: 77% YFV: 67%

Area	Indicator	Democratic Republic of the Congo
7. Introduction of new vaccines	New vaccines introduced	Pentavalent: 2009 PCV: 2011-2013 (phased in) IPV: 2015
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	2010: 116.1 2015: 98.3 (15.3%)
9. NITAG	NITAG established?	Yes (2016)
10. Government expenditure on routine immunization per live birth USD	Baseline 2010-2011 and average for 2015-2016 (% change)	0.63 to 1.07 (72%)

Summary points

- DRC is establishing a national immunization technical advisory committee (NITAG) to provide independent advice to the Ministry of Public Health on vaccine introductions and other program policies.
- A series of large- and small-scale campaigns took place in the past year to vaccinate against yellow fever, polio, measles, cholera and maternal and neonatal tetanus – many in response to disease outbreaks.
- The country is making progress in expanding and solarizing its cold chain system, including greatly increasing the number of health centers with working refrigerators.
- Immunization data quality improvements are taking place in six provinces with WHO support.

Immunization score card, DRC, 1997-2016



Update on country situation and recent developments affecting the immunization program

Disease outbreaks

DRC experienced a series of infectious disease outbreaks in the past year. A yellow fever outbreak that began in February 2016 in the Southwestern part of the country caused 78 confirmed cases and 16 deaths by the end of October 2016.[1] A protracted cholera outbreak that began in August 2015 and spread to different parts of the country – including Kinshasa in 2016 – has caused more than 43,000 cases and 1,220 deaths as of the end of June 2017.[2] These include 13,700 cases and 403 deaths during the first half of 2017, predominantly in six provinces in different parts of the country. In addition, a national public health emergency was declared by the Government in May 2017, following confirmation of three cases of vaccine-derived polio virus type 2 in the provinces of Haut Lomami and Maniema in the East-Central part of the country. As of August 11, 2017, there have been seven confirmed cases of VDPV2 in two separate outbreaks.

Measles outbreaks also continue to proliferate – including following measles vaccination campaigns conducted in 2016 and 2017 – and the number of cases reported by early June 2017 had already reached nearly as many cases as reported in all of 2016. Factors contributing to the continuous measles outbreaks include inadequate case-based surveillance (with <10% of suspected cases lab-tested), wide variations among provinces in measles vaccination coverage rates through the routine program, and inadequate coverage through the measles SIAs (see below). The EPI is currently planning to apply for GAVI support in 2019 for the introduction of a second measles dose into the routine immunization schedule.

The outbreaks of yellow fever, vaccine-derived polio, cholera and measles have all led to outbreak response vaccination campaigns in affected parts of the country (in the case of cholera, in Kinshasa in November 2016), temporarily affecting the delivery of routine services in these areas.

Lastly, the country had to contend with an outbreak of Ebola that occurred in April-May 2017 in five health zones in the remote region of Likati near the border with the Central African Republic, leading the Ministry of Public Health (MOPH) to declare a public health emergency on May 11. The outbreak was small – resulting in eight cases, including four who died – and was declared over by July 2, 2017, following a swift and effective response by the Government, with WHO support.[3]

Political unrest

National elections that were scheduled for December 2016 did not take place and there is currently a transitional government in place until new elections are held. The postponement of the elections led to violence, especially in three central provinces (Kasai, Kasai Oriental and Kasai Central), which affected the delivery of immunization services, including polio campaigns, and lowered vaccination coverage rates in these areas.

Continued under-funding of the immunization program

Due to a continued economic crisis resulting from low market prices of export commodities that DRC's economy depends heavily on (e.g., copper, gold, cobalt, petroleum), the proposed EPI budget for the past two years has covered only a fraction of what it needs to pay for traditional vaccines, co-finance GAVI-supported vaccines (PCV, pentavalent and yellow fever), and pay operational costs for routine service delivery. The proposed 2017/2018 budget, for instance, is around $3 million, while $15-16 million are required. To enable the program to function, the World Bank paid the government's co-financing share in 2016, and UNICEF covered the cost of traditional vaccines.

This continued budgetary crisis – along with the slow release of funds from the central government – limits the program's ability to pay for operational costs for routine immunization services, such as outreach

[1] Point de situation de la RDC pour la teleconference avec AFRO et WCARO, November 8, 2016.
[2] AFRO, Weekly Bulletin on Outbreaks and other Emergencies, Week 26: 24-30 June 2017.
[3] Yong E. How the Democratic Republic of the Congo beat Ebola in 42 days. The Atlantic, July 3, 2017. Found at: https://www.theatlantic.com/science/archive/2017/07/how-the-democratic-republic-of-congo-beat-ebola-in-42-days/532590/.

activities, supervision, vaccine transport from the districts to health facilities, and the like. In addition, GAVI HSS funds used to implement Reach Every District/Reach Every Child activities in 112 zones in eight provinces were suspended for several months in 2016 after the bank holding the GAVI fund crashed, until the Government was able to reimburse GAVI for the balance.

Polio transition

The transition from polio program funding has already begun in DRC, which was declared polio-free in 2015. Thirty-four WHO surveillance officers working on contract – who provided assistance with VPD surveillance (polio, measles, NNT), vaccination campaigns and the routine immunization program – left in April 2017 when funding for these positions ended. However, permanent polio-funded staff, including 12 WHO technical officers working at the national level, as well as STOP team members from the U.S. CDC, remain in place.

A technical committee appointed by the Secretary General of Health organized a workshop in June 2017, during which a polio transition plan was developed. However, government commitments to assume financing of staff and other assets currently funded through the polio program cannot be made while the transitional government is in place and must await the election of a new government.

Key achievements, activities and progress towards the GVAP goals in the past year

Establishment of a national immunization technical advisory group (NITAG)

A ministerial decree establishing a NITAG was approved in October 2016. This was the result of considerable advocacy and technical assistance from the regional and country WHO offices, including the sharing of experiences and documents from other countries on how their NITAGs were established and are functioning, and a joint WHO-MOPH workshop to draft the decree.

The committee will consist of around 15 core members from the EPI, University of Kinshasa, and other organizations representing a range of relevant medical and scientific expertise. WHO will provide technical and financial support to help get the NITAG established and functioning.

Implementation of a series of preventive and reactive vaccination campaigns

Much of the efforts of the EPI and partners in the past year has been devoted to planning, implementing and evaluating both large- and small-scale vaccination campaigns, many in response to the disease outbreaks described above. These campaigns include:

- A series of yellow fever SIAs in 2016 in 62 high-risk health zones (out of 517);
- Seven large-scale polio campaigns from January 2016 to May 2017, including two national campaigns conducted in response to a case of cVDPV detected in March 2016, and several sub-national campaigns. Following the discovery of new cases of cVDPV type 2 in the provinces of Maniema and Haut Lomani in May 2017, two rounds of SIAs using monovalent OPV type 2 were conducted for children under the age of five across the two provinces in June and July.
- National measles follow-up campaigns for children under five, which were conducted over three phases (in August 2016, October 2016 and February 2017) by blocs of provinces. A post-campaign survey following Phase 3 estimated a coverage rate of 85%. A number

of post-SIA outbreaks have been reported, however, and as mentioned above, the number of measles cases in 2017 is on track to double from last year's incidence. A series of SIAs has been conducted in 2016 and 2017 in response to the outbreaks in 10 provinces, most led by MSF, but by the MOPH and provincial government in the province of Kasai Oriental.

- An oral cholera vaccination campaign in five health zones in Kinshasa that took place over two rounds (for the two doses) in October and November 2016.
- TT campaigns in six provinces assessed in 2016 to be at high risk of neonatal tetanus, in the aim of achieving MNT elimination.

Progress with cold chain system modernization and expansion

The construction and equipping of a new, expanded vaccine depot near the airport in Kinshasa, which has a mix of solar-powered and electric cold chain equipment, was near completion in June 2017, with support from the GAVI HSS grant. As part of the country's Cold Chain Improvement Plan, DRC also plans to convert 23 of the 45 sub-provincial (*antennes*) cold stores to 100% solar power, following the successful solarization pilot project in the Kenge *antenne*. In addition, more than 2,300 solar direct drive (SDD) refrigerators were purchased and installed at health centers with HSS funding – increasing the percent of health centers with working cold chain equipment nation-wide from 27% to 52%.[4]

The EPI was also awarded a $16.7 million GAVI CCEOP grant in February 2017 to purchase 2,087 additional SDD refrigerators, along with temperature monitoring devices and spare parts, with the goal of increasing nation-wide cold chain coverage of health centers from 52% at present to 75%. The lack of functioning cold chain equipment in health facilities (only 16% of which were found to have refrigerators in a 2014 survey)[5] has been a major bottleneck to increasing the frequency of immunization sessions (with most health centers offering services only once a month) and thus to improving vaccination coverage rates. A second proposal (CCEOP2) was approved for an amount of $32.6 million to cover the purchase of 4,000 additional refrigerators. This will increase cold chain coverage of health centers from 75% to 99.4% by 2018.

Provincial-level efforts to improve immunization data quality and use

DRC has had an immunization data quality improvement plan (DQIP) since 2014. However, its implementation has been sub-optimal, in part due to a lack of funding.[6] Improvements in data quality, analysis and monitoring are now being decentralized, with WHO technical assistance and GAVI PEF funding, initially in six (of the country's 26) provinces. In each province, data validation committees trained by WHO have been established and have monthly data review meetings and prepare monthly data quality assurance reports.

Table 1: An update on progress against the GVAP goals in DR Congo

Polio eradication	Country declared polio-free in November 2015. Seven cVDPV cases found since May 2017 in 2 provinces (Haut Lomami and Maniema), leading to outbreak response campaigns in June and July using mOPV2. This makes 9 large-scale OPV campaigns since January 2016. A polio transition plan has been developed. Surveillance indicators: non-polio AFP rate: 4.6; stool adequacy: 90%.
MNT elimination	TT campaigns have been conducted in six provinces found to be at high risk in a risk analysis conducted in 2016. MNT surveillance remains inadequate, with only 7.5% of suspected cases investigated (up to Week 14 in 2017).
Measles elimination and rubella/CRS control	DRC is continuing to experience measles outbreaks and incidence has increased in 2017 (over 2016). A national catch-up measles vaccination campaign was conducted in 3 phases from August 2016 to February 2017. Outbreak response SIAs have also been implemented in 10 provinces. Surveillance indicators (for weeks 1-41, 2016) were below target thresholds: a febrile reporting rate among children <15 of 1.86/100,000 (target: >2/100,000) (with 11 provinces <1/100,000) and 61% of health zones reporting at least 1 suspected measles case. EPI plans to introduce a second measles vaccine dose in 2019.

[4] GAVI decision letter for cold chain equipment optimization platform support, February 21, 2017.
[5] WHO. Service Availability and Readiness Assessment (SARA) in the DR Congo, June 2015 report.
[6] Joint Appraisal report for DRC, 2016.

Immunization coverage (90% nation-wide and 80% in all districts for all vaccines)	WUENIC 2016 coverage rates remain largely unchanged from 2015, with BCG, DPT3, MCV1 and PCV all at 77-80%. Official country rates are 87-96% for most vaccines. Data quality improvements are underway in six provinces to improve accuracy of government data and their use for action.
New vaccine introductions	GAVI has approved support for rotavirus vaccine introduction planned for 2018 MR introduction (starting with SIA for 1-15 year olds nation-wide) is included in the cMYP for 2019; national MCV1 coverage will need to reach 80% before GAVI can support.

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ETHIOPIA
Follow-up report

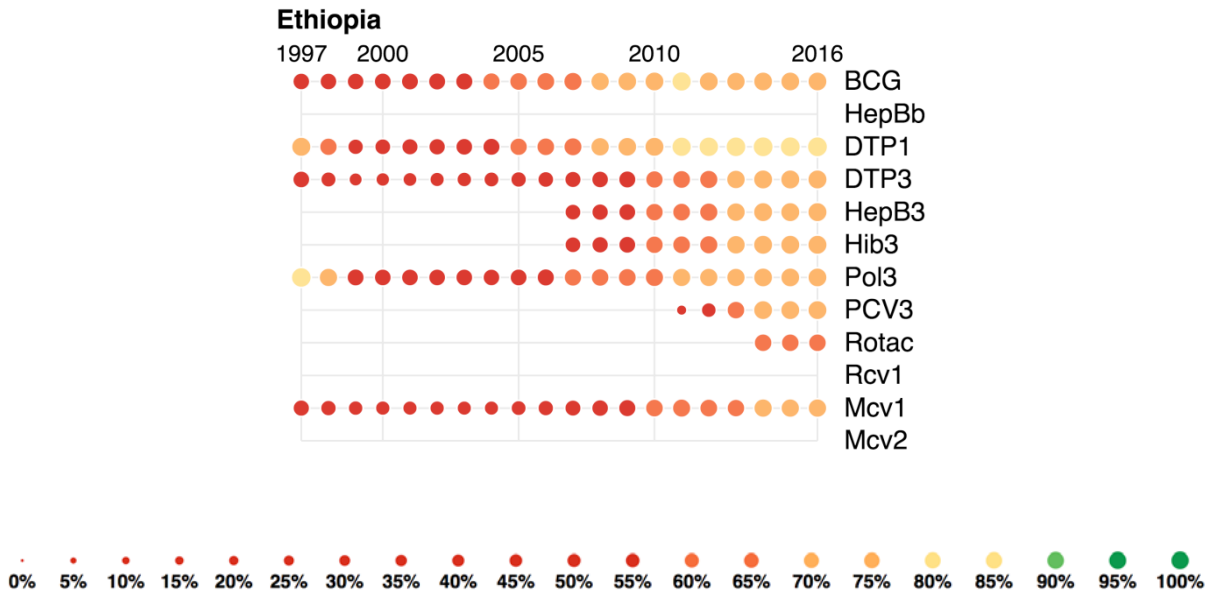
Area	Indicator	Ethiopia
Socio-demographic	GNI /capita (US$) 2016	590
	WB Status	Low-income
	Infant mortality (<12 M) 2015 UN IAG CME	41
	Gavi Status	Eligible
	Total Population 2016	102,403,196
	Birth Cohort 2016	3,257,962
	Surviving Infants (JRF) 2016	3,130,076
1. Interrupt wild poliovirus transmission	Transmission Interrupted	Yes
	Risk of late detection: Percent of adequate stool specimens (Rolling 12m) Target > 80%	91%
	Risk of late detection: Non polio AFP rate (Rolling 12m) Target > 2	3/100,000
	Risk of spread after importation: % of children 6M-59M having received less than 3 doses in the last year before occurrence case/environmental positive)	16
2. Neonatal tetanus elimination	TT2 coverage (reported 2016)	NA
	Protection at Birth against tetanus (WUENIC 2016)	80%
	Last SIAs conducted in the country	2012
	Elimination validation date	June 2017
3. Measles Elimination	Coverage MCV1 (2016 WUENIC)	70%
	Coverage MCV2	Not in schedule
	Percentage of districts with MCV1 coverage >=95% (2016 JRF)	43%
	Last national SIA	2016
	Post SIA coverage survey conducted	Yes
4. Rubella/CRS Elimination	Rubella coverage	Not introduced
	SIAs planned?	Yes, in 2018
5. Coverage with 3rd dose of DTP-containing vaccine	National coverage (WUENIC 2016)	77%
	Drop-out rate DTP1 DTP3 (2016 WUENIC) (DTP1-DTP3)/DTP1*100	10%
	Actual numbers of children that dropped out (2016 WUENIC)	281,707
	Difference between poorest and richest quintile DTP3 coverage (2011 data)	38 percentage points
	% districts reaching 80% coverage (2016 JRF)	76%
6. Coverage with all vaccines in the national immunization schedule	National Coverage (2016 WUENIC)	BCG: 75% DTwP-Hib-HepB: 77% MCV1: 70% Pol3: 75% PCV3: 76% RotaC: 63%

Area	Indicator	Ethiopia
7. Introduction of new vaccines	New vaccines introduced	PCV in 2011; Rotavirus in 2013-2014; MenA SIAs (2013-15); IPV; HPV demonstration completed in 2016
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	2010: 75.7 2015: 59.2 (21.8%)
9. NITAG	NITAG established?	Yes (meeting all 6 criteria in 2016)
10. Government expenditure on routine immunization per live birth USD	Baseline 2010-2011 and average for 2015-2016 (% change)	10.67 to 14.33 (34%)

Summary points

- Ethiopia validated for elimination of maternal and neonatal tetanus in 2017 and documentation for polio-free status accepted by the African Regional Certification Committee.
- New immunization coverage estimates from the 2016 DHS show rates considerably lower than WHO-UNICEF or official government estimates, leading to new analyses and a government review of problems and issues.
- The EPI program is experiencing a loss in immunization Technical Assistants, with the phasing out of the polio eradication program and the partner-supported Routine Immunization Improvement Plan (RIIP).
- SIAs in 2016 and 2017 resulted in a sharp declined in measles incidence since 2015.
- Ethiopia continues to make progress in improving its cold chain and logistics system, including the establishment of 17 regional hubs with cold rooms.

Immunization score card, Ethiopia, 1997-2016



Update on country situation and recent developments affecting the immunization program

- **Start of "polio transition".** Ethiopia entered into a five-year period of transitioning from funding from the Global Polio Eradication Initiative (GPEI) in January 2017. This means an incremental reduction in polio-funded staff employed by WHO and UNICEF, who provide technical assistance to support surveillance of vaccine-preventable diseases (including polio and measles), SIAs and the routine immunization program. WHO technical and support staff funded by the GPEI have already been reduced by 30% since April 2017 (from 160 to 111). The federal government is in the process of developing a business case to mobilize resources to sustain activities conducted through the GPEI to strengthen immunization and disease surveillance.

- **Phase out of partner support for routine immunization strengthening.** The Routine Immunization Improvement Plan (RIIP), a two and a half-year project supported by multiple partners (UNICEF, WHO, CDC, USAID), began in 2014 with the goal of increasing immunization coverage in the country's 51 poorest-performing zones (out of 103). The plan employed 51 EPI Technical Assistants to help zones and districts with training, microplanning, social mobilization, monitoring and other activities to improve program performance. Results reported in last year's GVAP Ethiopia report show a marked increase in DPT3 coverage in a few years in the target zones – from 17% of zones achieving ≥80% coverage in 2013 to 41% of zones meeting this threshold by 2015. All of the 25 WHO or CDC-supported EPI Technical Assistants have left, as have many of the UNICEF-supported Technical Assistants, and the remaining positions are likely to close by the end of the year or are uncertain. The project was a short-term solution to accelerate program improvements and build capacity among existing health staff, so that these improvements can continue. The extent to which local capacity has been built and these gains can be maintained now that funding has ended is uncertain.

- **Release of new immunization coverage survey results.** A draft report of the 2016 Demographic and Health Survey (DHS), shared by the MOH with partners, shows coverage rates for most vaccines (complete series) in the 50s percent range, as compared to WHO-UNICEF estimates in the 70s and official government estimates in the 90s (Table 1). The DHS results show that 38.5% of 12-23 month olds had been fully immunized with all basic vaccines (BCG, pentavalent 3, polio 3, measles). The Government has issues with the DHS estimates, as they do not reflect the gains believed to have been made in the past decade or so with the creation and expansion of the Health Extension Worker (HEW) force, the construction of more than 16,000 new health posts, creation of a Health Development Army of community-based volunteers, the RIIP and other improvements. The MOH consequently plans to conduct a coverage evaluation survey in 2018. Nonetheless, the MOH has already taken a number of actions to improve immunization data quality in response to the DHS results, including:

  - Preparing an annual immunization workplan based on the DHS results;

  - Revising monitoring and supervision practices to better understand immunization-related issues, including having immunization-specific review meetings and supportive supervision activities in place of integrated child health reviews and supervisory visits, as had been standard practice;

  - Requesting WHO to conduct a review of sub-national coverage data and convene a workshop (in September) to examine the data.

In addition, the Government is adopting the DHIS2 platform for its national health information system as a key step in improving data quality.

Table 1: National immunization coverage estimates (%) from the 2016 Ethiopia Demographic and Health Survey, compared with other estimates

Vaccine/dose	2016 DHS (12-23 month olds)	WUENIC 2016 estimates*	Official country estimates (2016)
BCG	69	75	92
Pentavalent 1	73	86	99
Pentavalent 3	53	77	96
Polio 3	56	75	90
Measles 1	54	70	93
PCV 3	49	76	96
Rotavirus 2	56	63	94

* The WUENIC estimates have not been revised based on the DHS results yet, since the report is not finalized.

Other recent developments include the appointment of a new health minister in 2017, who has included immunization as a priority and is working closely with partners on this issue; and the development of the Ethiopia Health Sector Transformation Plan (2016-2020), which is focusing on equity and quality of health service delivery.

Key achievements, activities and progress towards the GVAP goals in the past year

Progress towards obtaining polio-free status

The African Regional Certification Committee (ARCC) in June 2017 accepted the polio-free status documentation submitted by Ethiopia, following a verification visit in April. The country is waiting for official word from the committee about its status. This follows a series of activities to eliminate the disease, including four national immunization days between 2013 and 2015 and many rounds of sub-national immunization days – in response to 10 confirmed imported WPV cases in 2013/14; establishment of 28 permanent vaccination points at border crossings with Somalia and at major transit points; stepped up AFP/polio surveillance, including community-based surveillance in several regions; and the introduction of IPV in 2015.

Validation for the elimination of maternal and neonatal tetanus

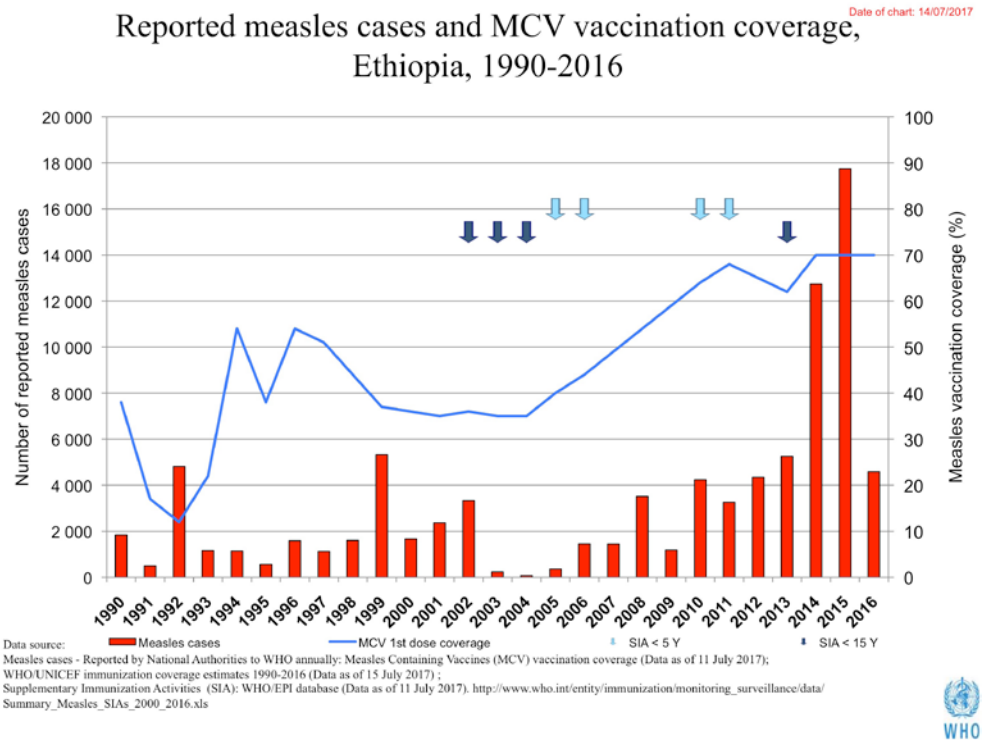
Ethiopia received validation for MNT elimination on June 30, 2017, after completing TT campaigns for women of child-bearing age in five zones in the Somali region – the last region to achieve elimination – reaching 80% coverage in one zone and 90% in the other four. The MOH, along with partners and regional officials, agreed to follow the recommendations of the validation committee to sustain elimination, including conducting regular risk analyses, continuing efforts to provide all pregnant women with TT at antenatal care clinics and during routine child immunization sessions, and maintaining case-based MNT surveillance.

Making headway in the control of measles

In last year's GVAP country report, we reported that there had been a surge in measles incidence and that outbreaks had spread beyond the usual hotspots in "developing regions", such as Somali and Afar. In response, the Government, with considerable partner assistance, conducted measles vaccination campaigns in April 2016, targeting children under 15 years of age in 505 of the country's 941 districts (54%) that were drought-affected or measles hotspots. This was followed by nation-wide campaigns in February/March 2017 in all regions but Somali, targeting children under five in the districts that had implemented the 2016 catch-up campaigns (as a follow-up campaign) and children under 15 years of age in the remaining districts. The SIAs in Somali were conducted in June and July. For the first time, readiness assessments were used, with WHO assistance, and zones had to pass them before conducting the campaign. Independent monitoring of the 2017 campaign found that 85% of districts had achieved the target coverage rate of at least 95%, while administrative data reported an overall coverage rate of 96%.[1] Seven deaths following the campaigns were also reported and are being investigated by the country's National AEFI Committee.

The number of reported measles cases has declined sharply since the back-to-back campaigns – from nearly 19,800 cases in 2015 to around 6,300 in 2016 and around 2,400 thus far in 2017 (Fig. 1). WHO country staff believe that the decline is real – since surveillance performance indicators have changed little during this period – and attribute it to the campaigns. This decline in reported measles incidence is despite the relatively low measles coverage rate of 54% among 12-13 month olds found in the new DHS.

Figure 1: Trends in reported measles cases and MCV vaccination coverage



Ethiopia's National Immunization Technical Advisory Group (E-NITAG) becomes fully functional

E-NITAG, established in 2016, became fully functional in the past year, holding its first meeting in May 2016 and a total of four meetings thus far (up to July 17, 2017). Several of the meetings revolved around a review of the MOH's HPV application to GAVI for nation-wide introduction, which had already been approved by the Government. It consists of around 12-13 experts in relevant fields, serving in their own capacity,

[1] Ethiopia February/March 2017 measles campaign technical report summary.

including six core (voting) members from academia, research institutes, professional societies and the like. The rest of the members are *ex-officio* members (from government departments such as the agency responsible for pharmaceutical logistics and distribution (PFSA), and liaison members, such as WHO and UNICEF).

In lieu of a technical sub-committee or working group, the E-NITAG invites several experts in a particular technical area to discuss a specific topic, such as a new vaccine introduction. The E-NITAG has developed a workplan and has a terms of reference, which stipulates that it meet at least twice a year.

Continued progress with the country's Cold Chain Rehabilitation and Expansion Plan

Ethiopia's plan for the transition from the EPI's management of vaccine storage and distribution to the Pharmaceuticals Fund Supply Agency (PFSA), which handles all medical supplies, taking over this responsibility is progressing well. As planned, all 17 regional storage/distribution hubs now handle vaccines (up from four in in last year's report), after having been equipped with walk-in cold rooms with remote temperature monitoring devices, and staff trained. Seven of the hubs now deliver vaccines to the districts in newly-purchased refrigerator trucks; the remaining ten hubs have not yet reached this stage. More than 2,000 solar direct drive (SDD) refrigerators have been installed in health posts, primarily those located in remote areas without a reliable electrical supply. The eventual goal is to equip all approximately 16,000 health posts with solar refrigerators. To assist with this and other objectives of the cold chain rehabilitation and expansion plan, the MOH is applying to GAVI for a Cold Chain Equipment Optimization Program (CCEOP) grant.

Table 2: An update on progress against the GVAP goals

Polio eradication	Documentation to obtain polio-free status submitted to and accepted by the ARCC in June 2017. AFP/polio surveillance indicators show a well-performing surveillance system, with a non-polio AFP rate of 3 per 100,000 children <15 (meeting the target of at least 2/100,000) and a stool adequacy rate of 94%.
MNT elimination	Elimination of MNT validated in June 2017. The country plans to conduct regular risk analyses and maintain case-based MNT surveillance to sustain elimination.
Measles elimination and rubella/CRS control	Sharp reduction in measles incidence observed from 2015 to 2017, following SIAs in 2016 and 2017, the latter achieving ≥95% coverage in 85% of districts, according to independent monitoring. A measles second dose will be introduced into the routine schedule in 2018. No decision has yet been taken by the Government to introduce MR vaccine (in cMYP for 2019).
Immunization coverage (90% nation-wide and 80% in all districts for all vaccines)	2016 DHS finds coverage rates 6-27% points lower than 2016 WUENIC estimates and 23-47% points lower than official government estimates. The MOH, with WHO, is examining local data in-depth to identify problems, and plans to conduct EPI-specific supportive supervision and regular review meetings. MOH is also in the process of installing the DHIS2 platform for the HMIS, which will allow analysis at the facility level and should improve reporting. The country also plans to conduct a vaccination coverage survey in 2018.
New vaccine introductions	Successful HPV demonstration project completed and Ethiopia's application to GAVI for support of nation-wide introduction of HPV accepted. Introduction is planned to start in late 2017. No decision yet made to introduce yellow fever vaccine (in cMYP for 2018).

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INDIA
Full country report

A. Progress towards achievement of GVAP goals

1. Summary

The summary table below describes the current situation in India regarding achieving the GVAP goals. Additional data on the immunization program can be found in the annex.

Area	Indicator	India
Socio-demographic	GNI/capita (USD) 2016	1 680
	WB Status	Lower-middle-income
	Infant mortality (<12 M) 2016 UN IAG CME	38/1000
	GAVI status	In transition
	Total population	1 324 171 000
	Birth cohort	25 197 000
	Surviving infants (JRF)	24 277 000
1. Interrupt wild poliovirus transmission	Transmission interrupted	Yes (since 2011)
	Risk of late detection: Percent of adequate stool specimens (Rolling 12 mo.) (Target > 80%)	87%
	Risk of late detection: Non polio AFP rate (Rolling 12 mo.) (Target > 2/100 000 children	13/100 000
	Risk of spread after importation: % of 6-59 month olds having received less than 3 doses in the last year before occurrence case/environmental positive)	0.8%
2. Neonatal tetanus elimination	TT2+ coverage (reported on JRF 2016)	76%
	Protection at Birth against tetanus (WUENIC 2016)	87%
	Last SIAs conducted in the country	2000[1]
	Elimination validation date	May 2015
3. Measles Elimination	Coverage MCV1 (WUENIC 2016)	88%
	Coverage MCV2	76%
	Percentage of districts with MCV1 coverage ≥95% (2016 JRF)	30%
	Last national SIA	2017
	Post SIA coverage survey conducted	No

[1] India used a strategy of improving TT rates for pregnant women and increasing the rate of safe deliveries, instead of SIAs.

Area	Indicator	India
4. Rubella/CRS Elimination	Rubella vaccination coverage	Introduced in 2017 as part of Measles-Rubella vaccination campaign, no data yet
	SIAs planned?	Yes, in 2017-2018, as part of Measles-Rubella vaccination campaign
5. Coverage with 3rd dose of DTP-containing vaccine	National DTP3 coverage (WUENIC 2016)	88%
	Drop-out rate DTP1 to DTP3 (WUENIC 2016) (DTP1-DTP3)/ DTP1	3%
	Actual numbers of children that dropped out (WUENIC 2016)	728 312
	Difference between poorest and richest quintile DTP3 coverage (2013 survey data)	48
	% District coverage reaching 80% coverage from 2016 JRF	69
6. Coverage with all vaccines in the national immunization schedule	National Coverage (WUENIC 2016)	BCG: 89% DTP3-HepB3: 88% Hib3: 80% IPV1: 47% MCV1: 88% MCV2: 76% Pol3: 86%
7. Introduction of new vaccines	New vaccines introduced	Pentavalent: 2011-2015 IPV: 2015 and 2016 Rotavirus: started in 2016 (now in nine states) PCV: started in 2017 (now in 3 states) Measles-Rubella: started in 2017 (now in 10 states)
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	-20%
9. NITAG	NITAG established?	Yes (2011)
10. Government expenditure on routine immunization per live birth (USD)	Baseline 2010-2011 and average for 2015-2016 (% change)	+19%

2. Country ownership of the immunization program

There is a strong country ownership of India's national immunization program, called the Universal Immunization Programme (UIP), especially in the past several years. Since 2015, the program is monitored directly by the Prime Minister's Office, which has emphasized the need for an aggressive action plan to achieve the new UIP agenda. This ambitious agenda, announced in 2014, includes efforts to

improve immunization coverage and equity in low-performing areas – through a program called Mission Indradhanush (MI) – and the introduction of several new vaccines by 2016, including IPV, measles-rubella (MR), and rotavirus. This agenda has been backed up by efforts to establish or strengthen decision-making or monitoring committees around immunization; a boost to government funding for the program and for health services in general; and efforts to build the technical capacity of the UIP at the national level, while also substantially increasing the workforce and skills of frontline health workers.

2.1 Immunization policy decision-making capacity

India's National Technical Advisory Group on Immunization (NTAGI) was established in 2001 to advise the Ministry of Health and Family Welfare (MOHFW) on all immunization-related issues. The committee consists of 34 representatives from national research and health organizations, professional associations, state governments, various government ministries and agencies, partner organizations, as well as independent experts. It is headed by the Secretary of Health and Family Health and has two co-chairs: the Secretary of the Department of Biotechnology (under the Ministry of Science and Technology) and the Secretary of the Department of Health Research under the MOHFW.

However, for several years, the NTAGI met irregularly – only six times from 2001 to 2009 – and clear rules for meetings, procedures for evidence-based decision-making, and scientific protocols for studies were lacking. Consequently, the group was reconstituted twice – in 2010 and in 2013, when a Standing Technical Sub-Committee of 10-15 independent experts was established to strengthen its decision-making capacity. Under this sub-committee is a permanent Standing Working Group that focuses on surveillance, research and capacity-building for the NTAGI, and *ad hoc* working groups formed on a time-limited basis to address specific issues, such as the introduction of a new vaccine.

To further strengthen the functioning of the NTAGI, a Secretariat was established under the Immunization Technical Support Unit (ITSU), which was estimated to provide technical support to the UIP (see Section 2.3). A detailed Code of Practice was prepared in 2015 to codify the responsibilities, structure, functioning and procedures of the NTAGI and Standing Technical Sub-Committee. The Code of Practice stipulates that the NTAGI meet at least once a year and the Standing Sub-Committee at least once per quarter. The MOHFW has recently taken over responsibility for managing and funding the NTAGI secretariat under the National Institute of Health & Family Welfare.

In terms of a coordinating body for immunization activities, India – which largely funds the immunization program itself – does not have a formal inter-agency coordinating committee (ICC), though immunization partners often meet around specific topics at different venues. Instead, the MOHFW established an Immunization Action Group (IAG) to provide technical advice to the UIP on ways to improve routine immunization coverage and on issues around new and under-utilized vaccines. While it has not always met quarterly, as envisioned, the Joint Secretary (Reproductive and Child Health) now calls and chairs these IAG meetings.

- Decision-making and monitoring of the immunization program at the sub-national level has been significantly enhanced in the past few years, with the establishment of state- and district-level EPI Task Forces, many of which were formed from the existing polio taskforces. Upon a directive by the federal government, all states and 97% of the country's 712 districts have established these task forces, consisting of representatives from different government departments, civil society organizations, and panchayati raj organizations (local political groups). The task forces generally meet on a monthly basis at the district level and around once a quarter at the state level to review surveillance and immunization coverage data shared by the WHO-supported National Polio Surveillance Project (NPSP) network of surveillance officers and field monitors, and to recommend corrective actions when problems are identified. The district EPI task forces are reportedly quite engaged and have regular monthly meetings, though not in all states.

2.2 Government financing of immunization

The Government of India has historically paid the vast majority of the costs of the UIP, which in 2012 totalled around $718 million (covering both the routine program and vaccination campaigns (SIAs)).[2] The Government's

[2] Chatterjee S, Pant M, Haldar R et al. Current costs and projected financial needs of India's Universal Immunization Program. *Indian Journal of Medical Research 2016/June; 143(6):801-806.*

share was around 90% in 2015 and 93% in 2016,[3] with the remainder funded by WHO, GAVI and UNICEF. Much of the external funding for the immunization programme has come from two primary sources:

1. The **Global Polio Eradication Initiative (GPEI)**, which supported a network of polio testing laboratories, a workforce of 250 surveillance medical officers (SMOs) and 950 field monitors through the WHO National Polio Surveillance Project (NPSP), as well as a Social Mobilization Network (SMNet) supported by UNICEF that employs more than 7 000 community mobilizers in under-served and at-risk communities to increase vaccination rates.

2. The **GAVI Alliance**, which has provided support for new vaccine introductions – starting in 2003 with hepatitis B – and for a range of activities to improve routine immunization through a three-year (2014-2016), $107 million HSS grant. Per the agreement between GAVI and the Government, GAVI 's support for vaccine introductions has covered the vaccine procurement costs for the initial phase of these state-by-state introductions, as "catalytic support" to accelerate the introduction of new vaccines, while the Government puts in place procurement and other procedures. Thus, GAVI is supporting the introduction of PCV in five states (to cover 20% of the birth cohort for three years), rotavirus vaccine in four states (also to cover 20% of the birth cohort in three years), and the first two phases of MR campaigns (covering 44% of the required doses).

The Indian Government has honoured its co-financing commitments for the GAVI-supported vaccines, which was one-third of the cost for pentavalent.

With the introduction of new vaccines and given the partial, short-term nature of GAVI support, India's immunization budget has grown substantially over the past five or so years. Also contributing to the increase in the UIP budget has been the implementation of the Government's Mission Indradhanush (MI), launched in December 2014 to rapidly improve routine vaccination coverage through special immunization drives in traditionally low coverage areas, in order to achieve the goal of 90% full immunization coverage nation-wide by 2020 (see Section 3.3).

In addition to these increases in the immunization budget, states have received additional funding from the national government for their health programs through the National Health Mission (NHM), which was formed in 2013 when the National Rural Health Mission (launched in 2005) merged with the newer National Urban Health Mission. The NHM uses a bottom-up, flexible approach in which funding is provided to states in response to Programme Implementation Plans (PIPs) (essentially budgets) that they prepare, based on their needs. While NHM funds, supplemented by additional state funding in some states, are for all health programs, they have been used in ways that have positively impacted immunization services. This includes the establishment of a new cadre of Accredited Social Health Activists (ASHAs) to conduct community-based social mobilization activities for health services, including immunization, and a substantial increase in the number of frontline health workers, including Auxiliary Nurse Midwives (ANMs), who provide the bulk of vaccinations in India.

India is currently in a period of transitioning from both key sources of external support for its immunization program, both beginning in 2017.

India's polio transition plan details the transition of the externally-funded NPSP and SMNet polio-focused programs to government-funded resources that focus on improving routine immunization and addressing other public health issues. The WHO NPSP workforce of surveillance medical officers (SMOs) and field monitors have already been heavily involved in implementing Mission Indradhanush (MI); conducting intensive, concurrent routine immunization monitoring in low-coverage areas; assisting with new vaccine introductions; as well with vaccine-preventable disease surveillance. The network has also provided need-based support for surveillance and monitoring of neglected tropical diseases, including kala azar, leprosy and lymphatic filariasis. The transition plan calls for the Government to progressively assume the costs of the SMOs – who will be reduced in number but whose time allocation for routine immunization activities will double from 25% to 50% by 2021 – as well as the field monitors, who will be replaced by Immunization Field Volunteers (IFVs) to be funded through state PIPs under the National Health Mission. Seven states have already assumed funding for the IFVs. The transition will take ten years (2017-2026), after which time the NPSP will be phased out. The Government has already assumed 100% of the financing of the country's network of polio/measles/rubella laboratories set up by WHO (amounting to $3 million a year) and has begun contributing to a portion of the SMOs' salaries.

India is currently in the accelerated transition phase of GAVI support, which lasts five years (until the end of 2021). During this period, GAVI will provide $500 million as catalytic support, to work in tandem with the polio transition plan. One hundred million dollars will be provided through WHO and UNICEF to further strengthen India's UIP through an HSS 2 grant,

[3] Joint appraisal report, 2015 and the HSS2 proposal to GAVI.

which will focus on immunization training for health workers, continued support for Mission Indradhanush, cold chain and vaccine logistics improvements, enhancing country capacity to generate demand for immunization services, and strengthening vaccine-preventable disease surveillance and immunization data systems. The remaining $400 million will be used to support the initial phases of the introduction of new vaccines during this period, including, as mentioned above, PCV, rotavirus, MR campaigns, and potentially HPV.

2.3 Human resource situation

For many years, a key factor contributing to India's slow progress in improving immunization coverage rates and the overall program was inadequate numbers of frontline health workers and immunization-specific staff at all levels, many of them not adequately trained in immunization or their specific technical area. Based on the findings of a study on HR needs by Mavlankar in UIP, the Immunization Division at the MoHFW is understaffed to manage such a large program. It currently consists of two Deputy Commissioners, an Assistant Commissioner and support staff, but no specialists in such areas as cold chain and logistics management, social mobilization and communication, and AEFI monitoring. This limits – their ability to provide guidance, technical support and training to the states, which are responsible for implementing the immunization program.

And while most states have had dedicated state EPI officers and districts have District Immunization Officers (DIOs), the immunization staff at these levels was also inadequate, with insufficient numbers of cold chain technicians, data managers and other experts, especially in areas with poorer-performing programs. Frequent transfers and high staff turnover – leaving new staff often with little training – compounded the human resource problem. As stated in the 2013-17 comprehensive Multi-Year Plan (cMYP), "The lack of human resource capacity and poorly defined roles and responsibilities at various levels have a cascading effect on all other areas of program performance, including monitoring and evaluation, supply chain and logistics management, and strategic communications."[4]

The number and distribution of ANMs operating from sub-centers, primary health care centers and community health centers have also been inadequate in many parts of the county and training in immunization has often been irregular and infrequent. For example, according to a recent analysis, the percent of ANM positions that were vacant ranged from 29-40% in five out of nine districts in Rajasthan, and from 14-57% in five districts in Bihar.[5]

However, the human resource situation with respect to the immunization program has significantly improved in recent years, as part of the Government's push to eradicate polio, improve the routine program, introduce new vaccines, and increase access to health services through the NHM. These improvements include:

- **Establishment of an Immunization Technical Support Unit (ITSU)** in 2012/2013. This unit was set up in the Public Health Foundation of India (PHFI), with funding from the Gates Foundation, through an agreement between the MOHFW and PHFI, to provide critical technical and programmatic support to the UIP as its workload increased. The creation of the unit outside of the Government has enabled the immunization program to rapidly build capacity without the need to go through the often slow bureaucratic process of creating new government positions. The ITSU has been able to hire experts to establish six technical units that work closely with UIP staff in the following areas: 1) translating evidence to policy; 2) strategic planning and systems design, including serving as the NTAGI Secretariat; 3) strategic communications; 4) vaccine logistics and cold chain management; 5) management of AEFIs and vaccine safety and quality, including serving as the Secretariat of the National AEFI Committee; and 6) monitoring and evaluation. The NTAGI Secretariat has recently moved back to the MOHFW, as mentioned above, and management of the rest of the ITSU has moved from the PHFI to the JSI country office.

- **Creation of a new workforce of community-based social mobilizers.** As part of the National Rural Health Mission (now the NHM), the Government has established a force of around 915 000 Accredited Social Health Activists (ASHAs) to serve as a critical link between communities and the public health system. The ASHAs, who work under ANMs in the local health facility, receive training in behaviour change communications (BCC) and in microplanning in order to conduct social mobilization activities, and identify and refer children who have missed vaccinations. These volunteers – largely women from their community who do not receive a salary but are given incentives – have been important players in implementing MI, by conducting household censuses,

[4] cMYP 2013-2017, p. 17.
[5] WHO presentation on "Intensified Mission Indradhanush, a PRAGATI Initiative".

preparing child lists and identifying missed children. They are reportedly active in every state and many have received training; one assessment found that 80% or more had received BCC training in nine out of 12 priority states.[6] There have reportedly been some issues with incentives, which can vary from place to place and can lead the volunteers to vaccinate children unnecessarily, when based on performance.

- **Development of a workforce of Immunization Field Volunteers (IFVs).** This workforce has been created in seven states through the National Health Mission to assist with intensive monitoring of routine immunization sessions and follow-up in high-priority districts. These volunteers are hired by state governments through their Programme Implementation Plans (PIPs) and have received training with GAVI HSS1 support.
- **A sharp increase in the number of frontline health workers.** Under the NHM, there has been a 57% increase in auxiliary nurse-midwives (ANMs) from 2013 to 2015 (from 127 000 to around 200 000), as well as nearly 41 000 new staff nurses and an increase of 10 600 medical officers working in the public sector.[7]
- **Increased flexibility for states to create additional immunization positions.** Under the NHM PIPs, states now have the flexibility to expand human resources to better meet their needs. This includes new technical EPI positions at the state and district levels. The number of cold chain and logistics personnel has also increased considerably at the district level in 12 states through the e-VIN (electronic vaccine management) system, as discussed in Section 3.3.

3. Progress towards specific GVAP goals

3.1 Goal 1: Achieve a world free of poliomyelitis

Has polio transmission been interrupted?

The last case of wild polio virus (WPV) in India occurred in January 2011 and the country was declared polio-free in March 2014. There have not been any WPV cases in the past six years. In addition, out of 700 environmental sewage samples collected between January and July 2017, none tested positive for WPV and one tested positive for vaccine-derived polio virus (VDPV).

Polio eradication in India came about after nearly 20 years of intensive efforts that included the establishment of high-quality nation-wide AFP/polio surveillance, and a Pulse Polio program consisting of a series of national and sub-national immunization days each year based on high-quality microplanning and using 2.3 million vaccinators who conducted intensive outreach in high-risk areas, including door-to-door vaccination. In addition, polio vaccination coverage gradually increased through the routine program: from a WHO-UNICEF estimated national coverage rate of 57% for the third dose of OPV in 2000 to 86% by 2015. However, a recent estimate from the 2015-2016 National Family Health Survey (NFHS) for OPV 3 was 73%.

What needs to be done to keep India polio-free?

The Government of India is taking a number of steps to ensure that polio does not re-emerge in the country, including importations. These include maintaining high-quality AFP/polio case-based surveillance, backed by a network of eight WHO-accredited polio laboratories established by WHO, but now fully funded by the Government. AFP/polio surveillance indicators show a national non-polio AFP rate of 13 per 100 000 children under 15 years of age, with all states meeting the target rate of >2/100 000. The stool adequacy rate is currently 87% nationally, with all states meeting the 80% target. Environmental surveillance has also been expanded to 35 sites in eight states. Any detection of WPV or VDPV type 2 in humans or in environmental samples is treated as a public health emergency.

To respond to such potential emergencies, the Government has developed Emergency Preparedness and Response Plans at the national and state levels. In addition, the Government conducts simulation exercises in selected states to ensure their readiness to respond to polio cases or outbreaks.

[6] HSS2 proposal to GAVI.
[7] HSS2 proposal to GAVI.

To reduce the risk of polio importation, travelers from neighboring polio-affected countries crossing over into India by land are vaccinated systematically with OPV at border crossings. Each year, more than 1.7 million children are vaccinated at 102 international borders crossing points through this program. And to reduce the risk of VDPV type 2 cases, the UIP switched from the trivalent to the bivalent OPV in April 2016, as well as introduced IPV into the immunization schedule in phases by state, beginning in five states in November 2015. Thirty-four of India's 36 states and union territories have now switched from using a full to a fractional dose of IPV as a dose-sparing strategy. The introduction of IPV, for which GAVI is providing one year of support, was delayed due to a global shortage of the vaccine.

An example of India's efforts to prevent further cases of polio and treat any evidence of the virus as an emergency is the response in Telangana state to the detection of a single isolate of cVDPV type 2 in an environmental sample from a sewage system serving the districts of Hyderabad and Rangareddy.[8] Within 14 days – the recommended maximum interval – the state conducted a mass vaccination campaign using fractional IPV, during which more than 311 000 children six weeks to three years of age were vaccinated over six days at fixed sites in two districts, achieving an estimated coverage rate of 94%.

Ensuring that India remains polio-free will require continued high-quality clinical and environmental AFP/polio surveillance, as well as high polio vaccination coverage through the routine program.

3.2 Goal 2: Meet global and regional elimination targets

3.2.1 Achieve maternal and neonatal tetanus (MNT) elimination

India was certified by WHO as having eliminated MNT in May 2015, one year after being declared polio-free, thus meeting its target date of 2015 included in the cMYP. The number of reported MNT cases declined from around 80 000 in 1980 to 491 by 2015 – a rate of ≈0.02 cases per 1 000 live births, well below the elimination threshold of less than one case/1 000 live births. Unlike many countries, India's strategies for achieving MNT elimination did not include mass tetanus toxoid (TT) vaccination campaigns for women of child-bearing age in high-risk districts. Instead, the country focused on improving TT vaccination rates among pregnant women at both antenatal care clinics and during routine immunization sessions for infants, as well as on promoting safe deliveries. The latter was accomplished by providing cash incentives to women to give birth at health facilities through two maternal care voucher programs (*Janani Suraksha Yojna* and *Janani Shishu Suraksha Karayakaram*), training traditional birth attendants and ANMs in safe delivery practices, and promoting safe umbilical cord practices through intensive BCC and the distribution of delivery kits. By 2015/16, the percent of institutional births had risen to 79% from 39% in 2005/06.[9] At the same time, official government estimates for coverage of two TT doses was 76% in 2016 and the WHO-UNICEF estimate of the percent of children protected at birth was 87%.

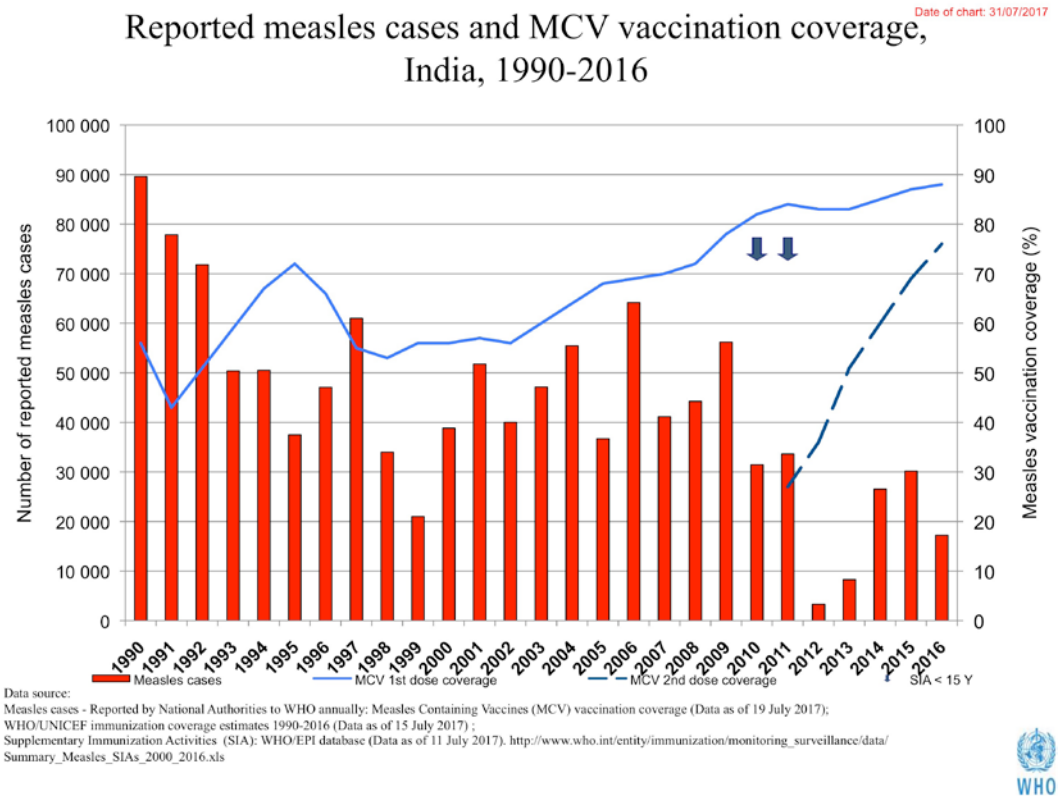
The 2013-2017 cMYP outlines strategies for India to maintain MNT elimination. These include ensuring that TT is systematically offered at all ANC clinics and routine immunization sessions to continue to improve TT2 coverage rates, and sustaining efforts to ensure safe deliveries. Improving MNT surveillance will also be a critical strategy to prevent an uptick in cases. In that regard, case-based, laboratory-supported surveillance of diphtheria, pertussis and neonatal tetanus (NNT) is being gradually rolled out with support from WHO (see more information in Section 3.3).

3.2.2 Achieve measles elimination and rubella & CRS control

India has yet to meet this goal, but has seen a significant reduction in reported measles cases in the past 10 years, even as measles/rubella surveillance has expanded and improved (Fig. 1). Nonetheless, around 27 000 and 30 000 cases were officially reported in 2014 and 2015 respectively, and 17 000 in 2016 (down from more than 55 000 cases in 2009 and 65 000 cases in 2006). A reduction in the number of reported measles outbreaks was seen from 2015 (1 115 outbreaks) to 2016 (798).[10] At the same time, reported rubella outbreaks doubled – from 130 in 2015 (3 300 cases reported) to 266 in 2016 (8 300 cases reported).

[8] Bahl S, Verma H, Bhatnagar P et al. Fractional-dose inactivated poliovirus vaccine immunization campaign – Telangana State, India, June 2016. Morbidity and Mortality Weekly Report 2016/August 26; 65(33):859-863.
[9] National Family Health Survey, 2015-16.
[10] Presentation by Dr Lucky Sangal and Dr Sudhir Joshi, WHO Country Office on "VPD Surveillance in India: a glance".

Figure 1: Reported measles cases and MCV vaccination coverage rates in India



The main reason for the continued incidence of measles outbreaks and cases has been insufficient coverage of measles vaccination for many years in a number of states, including several large states. According to the 2015-2016 National Family Health Survey, MCV1 coverage rates ranged from 50% to 96%, and were below 75% in seven states, including Uttar Pradesh (at 71%). The fact that nearly one-half of confirmed measles cases investigated in 2015 and 2016 were in unvaccinated children highlights this problem.[10] However, to meet the regional goal by 2020, India, with partner support, has made significant progress on two fronts: measles-rubella surveillance and vaccination.

Lab-supported surveillance of measles and rubella outbreaks began in 2005 in one state and was phased in over a 10-year period, reaching nine states by 2010 and all 36 states and union territories (UTs) by 2015. The introduction of this surveillance was a major undertaking, involving the development of Master Trainers in each state and cascade training down to block-level medical officers. The system is supported by 15 WHO-accredited laboratories, including two reference labs. As the system was expanding, the quality and sensitivity of surveillance was also being enhanced – by gradually reducing the number of cases that would trigger an outbreak investigation, and starting in 2016, by transitioning from surveillance of outbreaks only to "modified case-based surveillance". This method, which combines outbreak surveillance using a smaller number of samples, but "epi-linking" them to estimate the number of cases, with surveillance of sporadic cases, has begun in five states and is being phased in over a three-year period.[10] There are now more than 41 000 measles-rubella reporting sites in the country. The Indian Government also took over funding of the MR labs from WHO in 2014. Lab-supported MR surveillance will be expanded in the future through a network of 45 viral testing laboratories run by the Indian Centre of Medical Research (ICMR), with WHO technical assistance.

On the vaccination side, a second dose of measles vaccine was introduced into the routine immunization schedule (at 16-24 months, along with the first DPT booster dose), beginning in 2010/2011 in 21 states that had an MCV1 administrative coverage rate of more than 80%. In 14 states with coverage below that threshold, mass measles catch-up vaccination campaigns for children nine months to nine years of age took place first (in 2010 and 2011), after which time the second dose was included in the routine program. Measles vaccination coverage has been increasing steadily in the past several years; the WUENIC national MCV1 rate surpassed 80% in 2010 and reached 88% in 2016, while the MCV2 rate has climbed steadily from its

introduction to 76% by 2016. This progress is reflected in the 2015-2016 National Family Health Survey estimated measles vaccination coverage rate among 12-23 month olds of 81% nationwide.

India is introducing MR vaccine in a phased manner through catch-up campaigns for children nine months to 15 years of age in 2017 and 2018. The first phase took place in February 2017 in five states and UTs (Karnataka, Tamil Nadu, Goa, Puducherry and Lakshadweep) with GAVI support, targeting nearly 36 million children. The second phase – in seven more states – is currently scheduled for September/October 2017. Subsequent phases will be covered entirely with government funding. The program aims to achieve high coverage (>95%) with these campaigns to rapidly reduce the susceptible population, and consequently, the campaign schedule in some states may have to be extended to ensure their readiness to conduct high-quality campaigns. Four cities and union territories have introduced MMR vaccine instead of MR, using their own funds.

3.3 Goal 3: Meet vaccination coverage targets

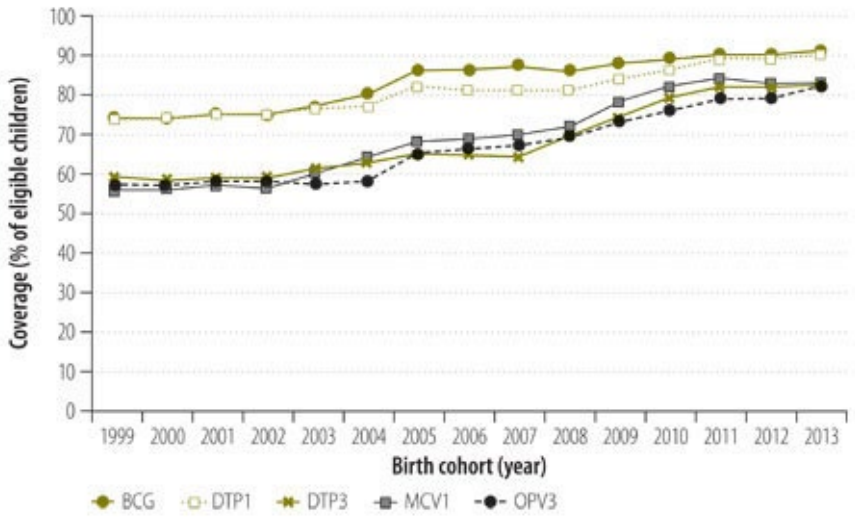
a. **Achieve 90% national coverage and 80% in every district with three doses of diphtheria-tetanus-pertussis containing vaccines**

b. **Achieve 90% national coverage and 80% in every district with all vaccines included in the national schedule**

For much of the past 20 years or so, the WUENIC estimated coverage rates for the third dose of DPT-containing vaccine stayed in the upper 50s to the low 70s and was similar for other vaccines in the program. For example, following a 2008 national coverage survey, the rate was held constant at 72% until 2014. This was due to a lack of national surveys upon which to base new estimates, as well as sometimes wild swings in administrative coverage data from year to year. These rates also seemed inconsistent with the perceptions among health professionals that immunization coverage had indeed been improving in the past several years.

A systematic analysis of coverage data from 17 states from 1999 to 2013 – based largely on locally conducted surveys – revealed a gradual but substantial increase in coverage of all vaccines – from the mid to upper 50s for most vaccines in 1999 to the low 80s by 2013 (Fig. 2).[11]

Figure 2: Estimates of vaccination coverage rates from a systematic data analysis[13]



This led WHO and UNICEF to revise their coverage estimates in 2014 and to do so retroactively from 2009 (Fig. 3). The 2016 WUENIC estimates are 88% for pentavalent 3 and MCV1, 89% for BCG, 86% for the third dose of OPVs and 76% for MCV2. Coverage rates from the 2015/2016 National Family Health Survey (NFHS) are generally lower, especially for DPT3 (78%) and OPV 3 (73%), but they confirm the relatively high coverage rates for measles and BCG (Table 1).

One reason for the increase in coverage in the past decade has been a steady reduction in the dropout rates

[11] Bhatnagar P, Gupta S, Kumar R, Haldar P, Sethi R, Bahl S. Estimation of child vaccination coverage at state and national levels in India. Bull World Health Organ 2016; 94:728-734.

between vaccine doses (Fig. 4). DPT1 to 3 and DPT1 to measles dropout rates, according to the WUENIC estimates, were both 3% in 2016 (from 90% for the first dose to 87% for the last). This compared to a DPT1 to 3 dropout rate in 2000 of 22% – indicating a substantial improvement in following up children for subsequent doses. Similarly, the number of states and UTs with less than 10% DPT1 to 3 dropout rates has increased from 25 (69% of states) in 2011 to 30-31 (83-89%) between 2013 and 2015.[12]

Figure 3: 2016 WUENIC national DPT 3 coverage rates for India

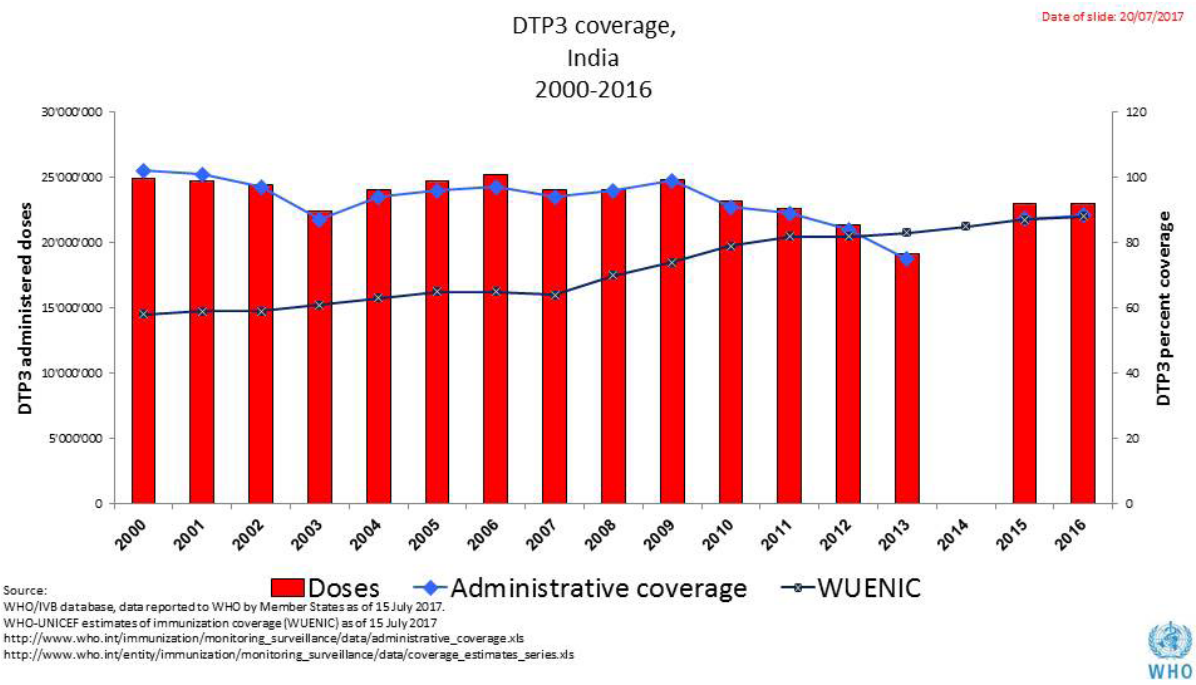
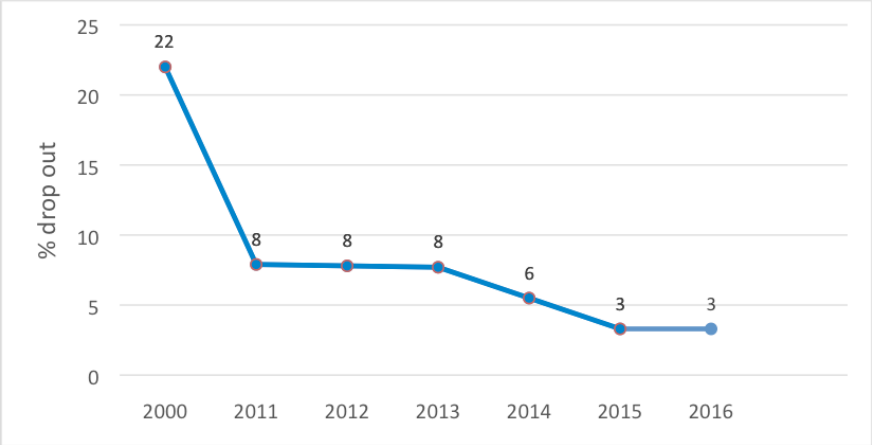


Table 1: Estimated vaccination coverage rates (percent) from WHO-UNICEF 2016 and the National Family Health Survey (2015-16)

Vaccine/dose	WUENIC 2016	NFHS 2015-16		
		Total	Urban	Rural
BCG	89	91.9	93.2	91.4
DPT3	88	78.4	80.2	77.7
Polio 3	86	72.8	73.4	72.6
Measles 1	88	81.1	83.2	80.3
Fully-immunized children	80	62.0	63.9	61.3

[12] HSS 2 proposal.

Figure 4: Trend in DPT1-3 dropout rates in India, using revised 2016 WUENIC estimates



Coverage rates, while improved over time, still vary considerably by geographic area, population group and income level, revealing continued inequities. According to government data from 2016, 31% of districts did not reach DPT3 coverage of more than 80%, and 70% of districts did not achieve a measles first dose coverage of at least 95%. Traditionally, official government coverage rates in the Southern states have been more than 85%, as compared to 60-65% in the Northern Hindi heartland, though with the increase in overall coverage, these differences by states are likely narrowing.[13] A national Rapid Survey on Children (RSOC) conducted in 2013-14 showed a 9.6% point difference in DPT3 coverage rates between urban (72%) and rural (62.4%) populations.[14] The RSOC also found a large, nearly 30% point difference in DPT3 rates by income (80% in the richest quintile vs. 50.6% in the poorest) and lower rates amongst scheduled tribes and castes (56-62%), as compared to the overall population (72%). However, perhaps due to recent initiatives focusing on rural, low-performing areas, the 2015-16 NFHS found a surprisingly small difference in rates (0.8-2.9% points) between rural and urban residence (see Table 1 above).

There are a host of factors contributing to the increase in immunization coverage in the past eight or so years. Among the key changes and initiatives that have addressed major barriers to improvements in routine coverage and have made and are making a difference are the following:

An increase in the number of frontline health workers and volunteers and in health care funding to states through the National Rural Health Mission (NRHM) and National Urban Health Mission (NUHM)

As described above, the national rural and urban health missions led to a large increase in the number of Auxiliary Nurse Midwives (ANMs) and created a new workforce of community-based ASHAs and Immunization Field Volunteers (in seven states) to increase knowledge about and demand for immunization services in their communities. The ASHAs and ANMs have received training in BCC and immunization, with partner support. There are still, however, a large number of vacancies in ANM, ASHA, Medical Officer and other positions in a number of states.

Improvements in the cold chain and logistics management system

India's cold chain system in the past was plagued by poor distribution of cold chain points, especially in rural areas; an inadequate transportation system – with ANMs required to pick up vaccines themselves at cold chain points; a lack of monitoring of cold chain equipment and vaccine stocks in real-time; and large numbers of old and broken down equipment, due in turn to a lack of trained cold chain and logistics personnel in many districts. To improve this situation, the number of cold chain points in under-served areas was increased, with the installation of 54 walk-in cold rooms and purchase of 5 160 ice-lined refrigerators and 100 direct drive solar refrigerators, using GAVI

[13] Joint Appraisal report 2015.
[14] HSS 2 proposal.

HSS grant funding. In addition, an Alternative Vaccine Delivery (AVD) model was established throughout the country to eliminate the need for health workers to pick up vaccines themselves. The system involves individuals contracted by state governments, using NMH funding, to deliver vaccines to health facilities by motorbike or bicycle prior to a scheduled immunization session. However, AVD implementation varies from state to state and is quite weak in several poorer performing states. To address the lack of trained cold chain technicians, the Government, with UNICEF, also established two national cold chain training and resource centers (described in Section B).

Another key innovation has been the launch in three states in 2014 of the Electronic Vaccine Intelligence Network (eVIN) system, a digitalized stock management system that uses mobile phones at health facilities and cold chain points to monitor vaccine stocks in real-time. Health workers receive alerts when stocks are expiring or running low (based on their forecasted needs), information on delivery status, temperature alerts, among other information. The system was expanded to 12 states in all by 2015. The eVIN project, funded with GAVI HSS support, has also involved an increase in the number of trained cold chain and logistics personnel, including a new cadre of state- and district-level Vaccine Cold Chain Managers (VCCMs) employed by UNDP, who work with government cold chain handlers in all 370 districts currently implementing the system in the 12 states. Results in first three states (Uttar Pradesh, Madhya Pradesh and Rajasthan) showed a 51% reduction in vaccine stockouts over six months, a 32% reduction in the duration of stockouts, and an increase in the number of cold chain points with a vaccine availability index of >90%.[15] Under the agreement with GAVI for the next HSS grant, the Government will take over funding the VCCMs (as consultants) in the 12 states.

Intensification of routine immunization, with a focus on low-performing and underserved areas

Starting in 2012, the Government began activities to "intensify" routine immunization in low-performing areas by launching Immunization Weeks, making improvements to the cold chain and logistics management system, setting up the ITSU, establishing the National Cold Chain Training Center, among other activities. Following back-to-back successes in eradicating polio and eliminating MNT – which gave the Government renewed confidence to improve routine immunization coverage nation-wide – the Prime Minister and the MOHFW launched Mission Indradhanush (MI) in December 2016. The goal of the initiative is to increase the percentage of fully immunized children (who receive all vaccinations in the national program) from 65% to 90% during the first year of life by 2020. The recognition that new vaccines should not be introduced without also increasing coverage was another impetus for the initiative. Using successful approaches from the polio eradication program, MI has focused in the initial phase on 201 of the nation's 675 districts with low coverage rates – accounting for more than 50% of all unvaccinated or partially-vaccinated children – and within these, 400 000 high-risk settlements identified by the polio program. The settlements include traditionally under-served and missed populations (e.g., migrants, slum dwellers, families living in brick kiln communities and construction sites), as well as those experiencing measles or diphtheria outbreaks and areas with vacant health sub-centers or many missed routine immunization sessions.

The main approach to improve immunization coverage in these areas has been through intensive immunization drives, consisting of rounds of outreach activities for one week per month for four consecutive months – with sometimes two rounds in a year. High-quality microplanning and community visits by ASHAs, *anganwadi* workers and other volunteers to conduct a house-to-house census, prepare child lists and mobilize residents, take place prior to the outreach sessions, which are conducted by ANMs. Over a nine-month period in 2015 and 2016, 3.7 million children were vaccinated during the first two drives, resulting in an increase in full immunization coverage nation-wide from 65% to 70%, according to survey data (INCHES survey). This initiative enjoys strong support from the Prime Minister, who took part in the program's launch ceremony and who receives data on a regular basis from intensified monitoring of these drives, as part of his Proactive Government and Timely Implementation (PRAGATI) Initiative.

One obstacle to further improving coverage rates through MI has reportedly been the reluctance of ANMs to travel outside of their health facility catchment area to conduct outreaches – as they are required to do – because travel costs are not covered and vehicles often unavailable. The increases in coverage are therefore mainly a result of increased outreaches within their catchment areas and less to their going to new areas.

In response to slow progress in improving immunization coverage in some MI districts and urban areas, the Prime Minister has requested that an Intensified Mission Indradhanush be initiated, with the new goal

[15] eVIN presentation on "Transforming immunization supply chains using last mile data: the India story", April 2017.

of achieving 90% full immunization coverage nation-wide by the end of 2018. The new initiative will focus on 118 districts and 17 urban areas – primarily in five states – where immunization coverage has been low despite repeated Mission Indradhanush drives. Specific interventions and strategies to be carried during the outreach drives will be based on a comprehensive gap analysis. There will also be more emphasis on strengthening health systems and microplanning in order to sustain the coverage gains achieved through the immunization drives.

Efforts to increase community acceptance of and demand for vaccination

A common barrier to improving immunization rates in India has been insufficient social mobilization on the part of frontline health workers, who have often had little training and poor skills in this area. The result has often been a lack of promotion of immunization within communities and a lack of follow-up of defaulters, contributing to high left-out and dropout rates. Common reasons for children missing vaccinations were found in a study to be a lack of awareness among parents on the need for immunization or where and when to obtain services, limited access to broadcast media (and thus promotional messages) in rural areas, and the fear of adverse side effects from vaccines.[16] Efforts to improve the social mobilization skills of health workers and increase population demand for immunization services have included in recent years:

1. The establishment and training of the ASHA workforce;

2. The creation of the Social Mobilization Network (SMNet) – an army of more than 6 000 trained community mobilizers supported by UNICEF who were part of the polio eradication program but are now involved in promoting routine immunization. As part of the polio transition, funding for this network is being transferred to the GAVI HSS grant and eventually to the Government of India;

3. Building of a training team in social and behavioral change communications (SBCC) – now numbering more than 300 state-level Master Trainers and 1,400 district-level trainers who in turn have trained ANMs, ASHAs and other frontline workers on generating demand for immunization and counseling.[17]

Intensive concurrent monitoring of routine immunization activities

A robust system to monitor the quality of immunization activities has been established, with HSS support, in high-risk areas in 31 states beginning in 2012. The system uses the WHO NPSP network of SMOs and field monitors, UNICEF-supported social mobilization coordinators, and (in seven states) Immunization Field Volunteers, who jointly are responsible for ensuring that marginalized and low-coverage communities are included in routine immunization microplans and that immunization sessions are well planned and executed. They also conduct follow-up house-to-house visits to check children's vaccination status. More than 300 000 routine immunization sessions are monitored and the vaccination status of more than two million children aged 0-35 months is verified through this program each year.

In eight GAVI-supported states, the percent of high-risk areas included in microplans increased from 32% in 2013 to 97% by 2016, and the DPT1 to 3 dropout rate declined from 13% in 2013 to 8% in 2016, while the reported rate of fully-immunized children rose from 68% in 2013 to 88% by 2016.[18] This system generates considerable data that are shared regularly for feedback with immunization officials up the chain and reviewed by district and state EPI Task Forces. This information system is now being transferred to a phone-based app.

Immunization data improvements

According to one informant, 60-70% of states have improved the quality of their immunization data, with a reduction in the gap between reported and evaluated vaccination coverage rates. This has been the result of improved use of the country's HMIS, which includes immunization data; the establishment of a Mother and Child Tracking System in 2010 that collects information on pregnant women and infants; and the involvement of the ITSU and state and district EPI Task Forces in reviewing immunization data and providing feedback. Another factor contributing to data improvements has been the generation of new data from initiatives, such as Mission Indradhanush and the concurrent monitoring program in 31 states. These data are compiled and updated regularly in an Immunization Dashboard produced by the MoHFW with support from the ITSU, WHO, UNICEF, JSI and UNDP.[19]

To further improve the quality and use of immunization data, discussions are currently underway between the Government and WHO to develop a structured training package on improving data quality for data managers and data handlers.

[16] cMYP 2013-2017.
[17] HSS 2 proposal.
[18] Sources: Presentation by Dr. Balwinder Singh on "Coverage and equity situation in immunization", and HSS2 proposal.
[19] Can be found at: https://itsuorg.wordpress.com/category/immunization-dashboard/.

3.4 Goal 4: Introduce new and improved vaccines and technologies

The introduction of new and under-utilized vaccines has been slower in India than in a number of other countries. This is because of the huge size of the population and the need to phase in introduction by blocks of states often over several years. This, in turn, is due to variations across states in their readiness to add a new vaccine to their program, insufficient global supplies of some vaccines to meet the country's large requirements, and the large increases in the budget that new vaccines require, given that GAVI supports only the first phase of introduction in most cases. Phase 1 states are those with the highest performing programs and the most interest in introducing the specific vaccine. Since the introduction of pentavalent vaccine, which took place in three phases over a four-year period from December 2011 to 2015, states must pass a detailed preparedness assessment developed by WHO before they can introduce a new vaccine (see Section B. Partner support).

As mentioned in Section 3.1, IPV was introduced in 2015 and 2016 with one year of GAVI support. Other vaccines that have begun the first phase of introduction, including with GAVI transition funding of $400 million, are:

- **Pneumococcal conjugate vaccine (PCV).** Phase 1, which GAVI is supporting, includes five states,[20] three of which had introduced the vaccine by July 2017. It is expected to take at least four years to complete the roll-out of the vaccine, given the current limited global production capacity and the high cost of the vaccine.

- **Rotavirus vaccine,** which will be rolled out over three years and has already been introduced in nine states. The three-year time span is considered realistic, since there is a plentiful supply of the vaccine (including locally-produced vaccine) and the cost is relatively low compared to some other newer vaccines.

- The **measles-rubella (MR) vaccine,** which is being phased in by blocs of states, starting with catch-up campaigns, and followed by introduction into the routine program, as discussed above in Section 3.2.

In India, Japanese Encephalitis (JE) vaccination campaigns started in 2006 in JE endemic districts and the vaccine has been in the routine immunization schedule for children at 9-11 months for the first dose and 16-24 months for the second dose since 2013 in these districts. Up until July 2017, 149.2 million children aged 1-15 years were vaccinated through campaigns conducted in 216 of the 231 identified endemic districts across 21 states. In addition, as of July 2017, nearly 33 million people aged 15-65 years were were vaccinated during a campaign completed in 31 districts that were found to have a high number of adult JE cases.

The state of Punjab also conducted a successful pilot introduction of HPV vaccine in two districts in 2016 among public school girls in Class 6 (11-12 year olds), who were sent on busses to health facilities to receive the vaccination. This was an initiative of the state government, which paid for the vaccine, and was prompted by a concern for the state's high cervical cancer rate. The pilot was deemed successful – with a reported 97% coverage rate of the target population – which was attributed to the establishment of a Technical Expert Group that provided advice and served as a credible resource to the media and public; a strong communications campaign that included sensitization workshops for medical associations and the media; and high population awareness of cervical cancer in the state. The Punjab government will be expanding HPV vaccination to the entire state. HPV introduction across India is less certain, as the vaccine has not yet been recommended by the NTAGI. However, a few states, such as Delhi and Sikkim, are considering introducing the vaccine with their own funding.

[20] One of the states is Uttar Pradesh, where introduction will take place during Phase 1 in only parts of the state.

B. Partner support to address remaining challenges to meet the GVAP goals and targets

Partners have provided technical and financial support to many of the initiatives described above that have helped improve and expand India's immunization program, especially strategic support to strengthen different parts of the immunization and health systems that are critical to developing and sustaining a robust immunization program. Support from partners, including through the GAVI HSS grant, has allowed greater flexibility in investing in resources, hiring personnel and technical experts, and meeting other needs to make rapid improvements than can a large bureaucracy like the Indian Government, where creating, receiving approval for, and funding new staff positions can take years and where funds can be diverted to other programs. The creation of the ITSU as a means of rapidly building a team of experts to support the UIP is such an example of how partner support can kick-start program improvements.

Other examples are the key role that the WHO NPSP workforce of surveillance medical officers and field monitors have played in planning and implementing Mission Indradhanush, the concurrent routine immunization monitoring program, and many other immunization and disease surveillance activities, and the role of UNDP Vaccine Cold Chain Managers in implementing vaccine logistics management improvements at the state and district levels through the eVIN system. The challenge is to ensure that these resources are sustained (e.g., funded by the Government) as India transitions out of both GAVI and GPEI funding.

While the portfolio of partner support to the UIP is quite large, below are a few additional, salient examples of how partner-initiated or supported activities have strengthened critical aspects of the immunization program:

Establishment of case-based surveillance and diphtheria, pertussis and neonatal tetanus

While case-based, laboratory-supported surveillance is now well established for AFP/polio in India and measles-rubella surveillance has transitioned from aggregate to case-based surveillance in five states, surveillance for other vaccine-preventable diseases (VDPs), especially for diphtheria, pertussis and neonatal tetanus, is not cased-based nor lab-supported in most parts of the country, and thus these diseases are often undiagnosed or misdiagnosed. Upon request from the Government of India, WHO has helped introduce case-based surveillance of these three diseases, initially in one state and now in five (Bihar, Haryana, Kerala, Madhya Pradesh and Uttar Pradesh).

This initiative, conducted with the U.S. CDC and other partners, involved developing surveillance and laboratory testing guidelines, cascade training of medical officers down to the block (sub-district) level, monitoring by WHO NPSP Surveillance Medical Officers, as well as the establishment of seven bacteriological laboratories, including a reference lab at Christian Medical College in Vellore. The results have already informed policy decision-making. The surveillance system identified a diphtheria outbreak in the North of Kerala state in 2016, and in response, the state conducted Td catch-up campaigns for school children in the outbreak districts. The state also decided to substitute TT with Td vaccine for pregnant women, since many cases were among adult female caregivers. The surveillance results have also strengthened the NTAGI's decision to recommend a switch from TT to Td for routine immunization of pregnant women nation-wide (this is still under consideration by the Government). In addition, the surveillance has increased awareness among doctors of pertussis and has detected smaller outbreaks of this disease. Plans to expand case-based VPD surveillance to other states will depend on government funding.

Strengthening of India's AEFI surveillance system

An assessment of India's pharmacovigilance system conducted in 2012 found that AEFI surveillance in the country was weak. This led to the establishment in 2012, with WHO financial support, of an AEFI Secretariat within the ITSU to strengthen and support the country's National AEFI Committee. It also led to revisions to the national AEFI guidelines and to the establishment or strengthening and training of state- and district-level AEFI committees in all 36 states and union territories and in 98.5% of districts. The revised guidelines and training program for AEFI committees focuses on conducting causality assessments, and recording and reporting serious (not mild) AEFIs. The training program has also been extended to medical officers throughout the country. AEFI reporting is now being digitalized using the Vaccine Adverse Events Information Management System (VAEIMS), with causality investigations entered into the system in real-time. WHO's support has included assisting with the revisions of the AEFI guidelines, development of the training program, monitoring using surveillance medical officers, and conceptualizing the VAEIMS.

The strengthened National AEFI committee was able to thoroughly investigate rumors of serious AEFIs following pentavalent vaccination during its phased introduction and make the results public, which helped mitigate the rumors and resolve court cases. In addition, a recent NRA assessment by WHO in February 2017 gave India's AEFI surveillance system the highest mark possible (Maturity level 4) – a substantial improvement accomplished within a few years. Plans to sustain these improvements include using checklists developed for the NRA as a template for reviewing AEFI mechanisms at all levels.

Wide-scale training of health workers in immunization

As a key strategy to improve the routine immunization program, WHO has been assisting the Government of India to implement an ambitious agenda to improve the knowledge and skills in immunization of a range of health workers across the country, by first coming out with updated guidelines and then conducting a series of training programs based on the guidelines. These training programs, funded in part with GAVI HSS support, include:

1. A three-day mandatory training for all of the nearly 60 000 medical officers on the revised *Routine Immunization Handbook for Medical Officers*, developed with WHO assistance. The training is conducted within the states by a pool of master trainers and is extremely hands-on – consisting of games, exercises, field visits, discussion and brainstorming sessions, and roleplaying. A facilitator guide and a specially-designed kit that contains all the required materials have been developed to standardize the training methodology across the country.
2. A two-day training in strengthening microplanning for immunization for program managers, medical officers and frontline health workers. This program was first rolled out in Uttar Pradesh and has now been expanded to nine other states. The training goes beyond the microplanning guidelines that outline what components are needed to develop good microplans by showing trainees exactly *how* to develop them. It consists entirely of hands-on exercises demonstrating different steps and strengthening specific skills required for microplanning geared towards each level of the health system (such as exercises on developing due lists under various scenarios). An evaluation of the impact of this training program is underway.
3. Immunization training for ANMs: a two-day, interactive training program is still in the planning stage. It will be conducted for batches of 30 ANMs at the district level by medical officers and will be based on the revised ANM Immunization Handbook. This cascade training will take several years to complete nation-wide for approximately 200 000 ANMs.

Establishment of national cold chain resource and training centers

To build in-country capacity in cold chain and vaccine logistics, the Government partnered with UNICEF to establish the National Cold Chain Training Center (NCCTC) in Pune in 2011. The center develops training materials and runs training programs on cold chain equipment repair and maintenance for cold chain technicians and immunization program managers. It also assists the MOHFW with cold chain equipment purchasing decisions, helps states to strengthen their cold chain systems; and runs a cold chain equipment testing lab to test equipment performance and experiment with new cold chain technologies. While set up with funding from the Norwegian government, the Indian Government financed the construction of a building to house the center, hired its staff, and now funds its operational costs.

Based on the success of the Pune center, a National Cold Chain Vaccine Management Resource Center (NCCVMRC) was established in Delhi, with GAVI HSS and government funds and UNICEF technical support. The Delhi center also conducts similar training, research and technical support activities for the MOHFW and states as the Pune center, but in addition, is responsible for developing, managing and rolling out nation-wide the National Cold Chain Management Information System that tracks cold chain equipment in real-time down to cold chain points.

Development of a comprehensive methodology to assess district and state readiness for new vaccine introductions

With WHO and other partners, India has implemented a system of comprehensive health system reviews to determine the readiness of a state to introduce a new vaccine. The system consists of self-assessment preparedness checklists covering a series of 13-14 key components, such as manpower availability; microplanning status; reported immunization coverage rates; vaccine management, transport and logistics; adverse events following immunization; and advocacy and communications. The checklists are completed in each district, reviewed by district authorities, and then compiled into a state-level checklist, which receives a composite score based on various established indicators. The key issues identified in checklists are shared with the MOHFW for corrective actions. This assessment system, started for the pentavalent vaccine introduction, has been fully adopted by the Government and partners, and is now required before any state introduces a new vaccine either with Government support or its own funding.

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UNDP: Manish Pant

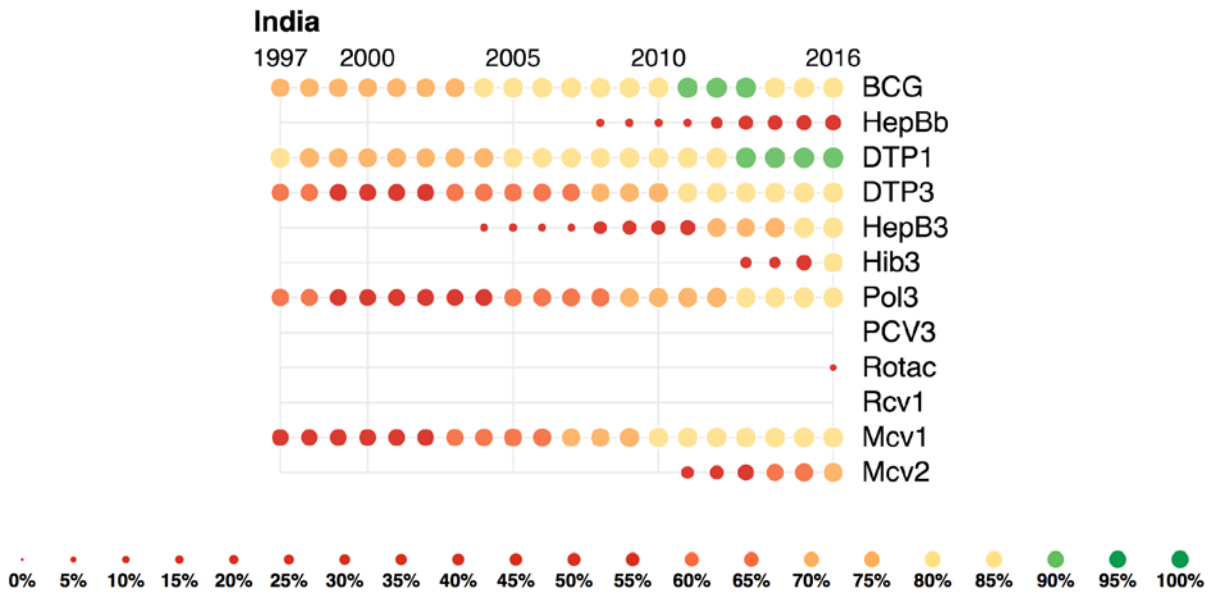
UNICEF: Satish Gupta

Annex: Country Immunization profile

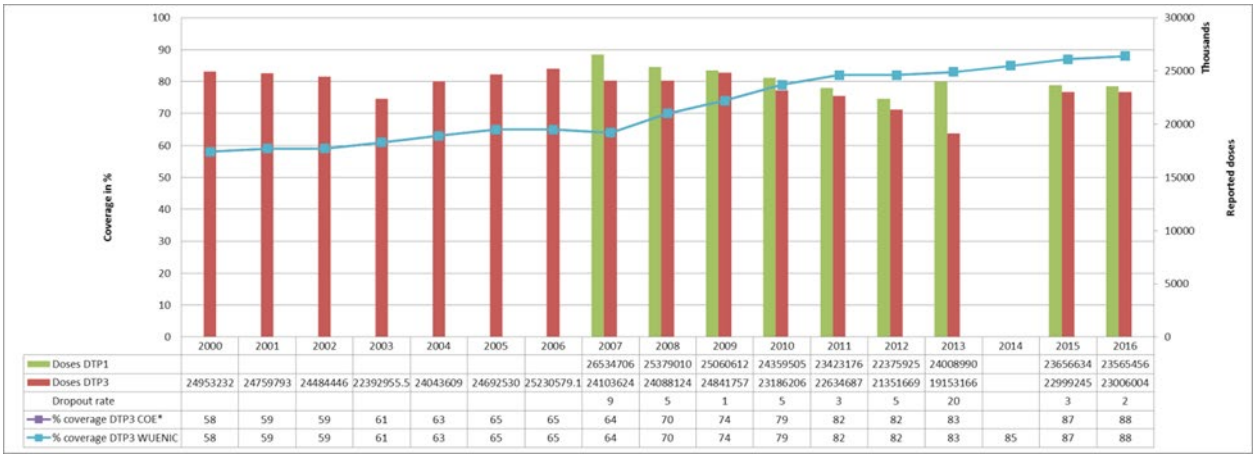
Annex 1: Immunization schedule 2016 in India

Vaccine	Schedule
BCG	birth;
DTwP	16-24 months; 5 years;
DTwP-Hib-HepB	6, 10, 14 weeks;
HepB	Birth;
IPV (fractional)	6, 14 weeks;
JE_LiveAtd	9, 16-24 months;
Measles	9-12, 16-24 months;
MR	9 months - 2 years;
OPV	birth; 6, 10, 14 weeks; 16-24 months;
Pneumo_conj	Up to 1 year;
Rotavirus	6, 10, 14 weeks;
TT	10, 16 years;
Vitamin A	9, 18, 24, 30, 36, 42 months;

Annex 2: Immunization score card, India, 1997-2016



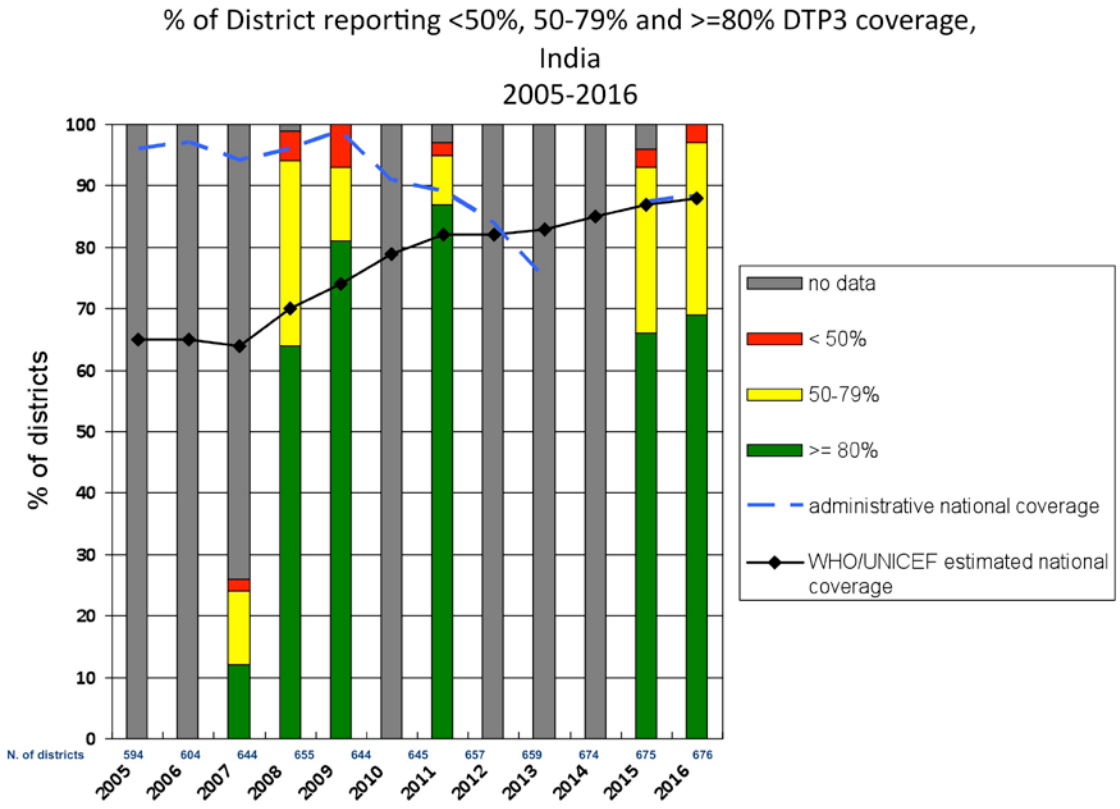
Annex 3: DTP Coverage for India, 2000-2016



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Doses DTP1								26534706	25379010	25060612	24359505	23423176	22375925	24008990		23656634	23565456
Doses DTP3	24953232	24759793	24484446	22392955.5	24043609	24692530	25230579.1	24103624	24088124	24841757	23186206	22634687	21351669	19153166		22999245	23006004
Dropout rate								9	5	1	5	3	5	20		3	2
% coverage DTP3 COE*	58	59	59	61	63	65	65	64	70	74	79	82	82	83		87	88
% coverage DTP3 WUENIC	58	59	59	61	63	65	65	64	70	74	79	82	82	83	85	87	88

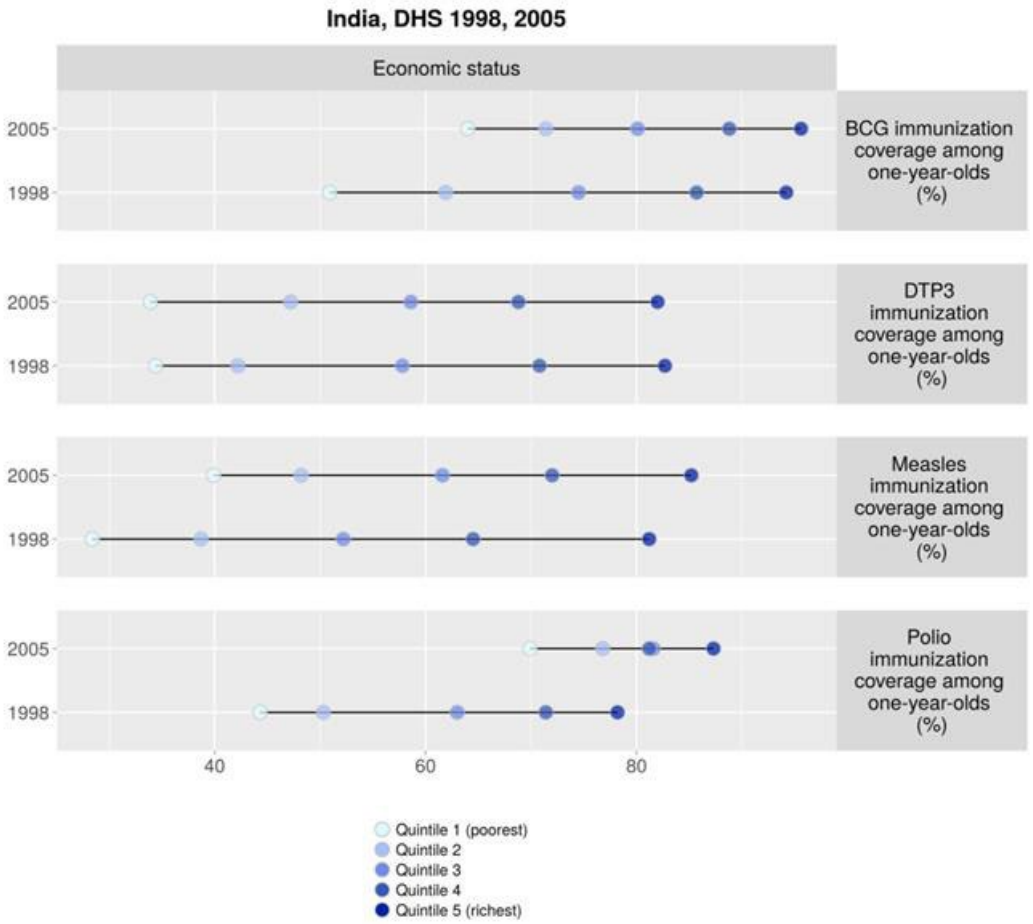
Annex 4: DTP3 district coverage rates, in India, 2005-2016

Date of slide: 01 Aug 2017



This stacked bar graph represents the percentage of districts that have achieved different coverage levels.
Data source:
WHO/IVB database (as of 19 July 2017), data reported to WHO by Member States and
WHO/UNICEF national coverage estimates (as of 15 July 2017).

Annex 5: Vaccine coverage by wealth quintiles in India



Source: Health Equity Assessment Toolkit (HEAT): Software for exploring and comparing health inequalities in countries. Built-in database edition. Version 2.0. Geneva, World Health Organization, 2017.
Data source: The disaggregated data used in this version were drawn from the WHO Health Equity Monitor database (2016 update) which may have been revised or updated since that time. The most recent version of that database is available on the WHO website.

INDONESIA
Follow-up report

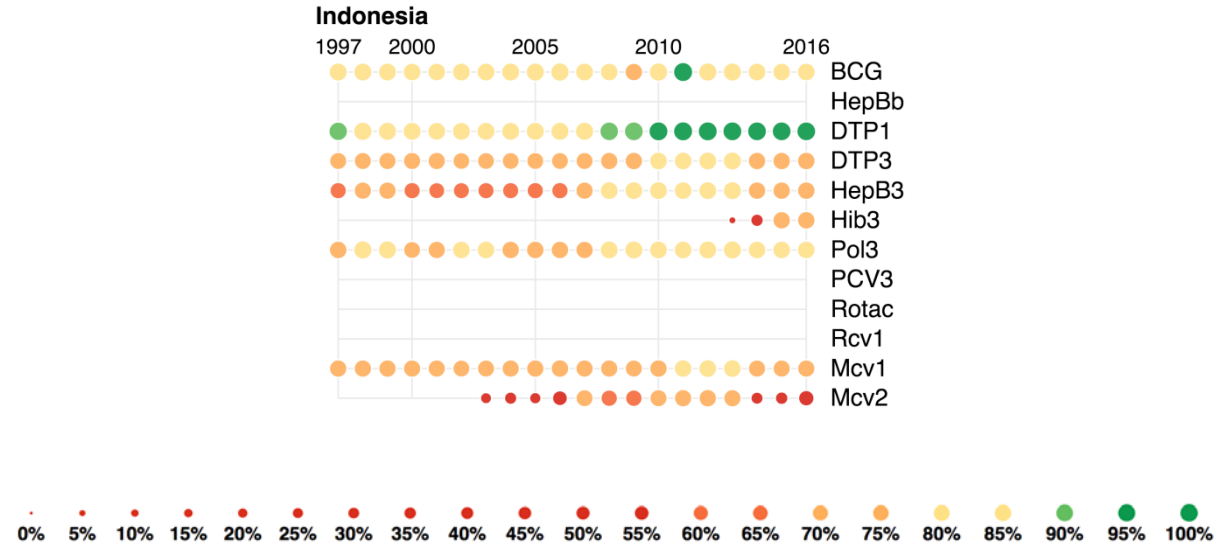
Area	Indicator	Indonesia
Socio-demographic	GNI 2016	3440
	WB Status	Lower Middle Income
	Infant mortality (<12 M) 2016 UN IAG CME	23/1000
	GAVI status	Graduating (2016)
	Total population	261,115,000
	Birth cohort	4,953,000
	Surviving infants (JRF)	4,843,000
1. Interrupt wild poliovirus transmission	Transmission interrupted	Yes (since 2006)
	Risk of late detection: Percent of adequate stool specimens (Rolling 12 mo.)(Target > 80%)	86%
	Risk of late detection: Non polio AFP rate (Rolling 12 mo.) (Target > 2/100,000 children	1.94
	Risk of spread after importation: % of 6-59 month olds having received less than 3 doses in the last year before occurrence case/environmental positive	18%
2. Neonatal tetanus elimination	TT2+ coverage (reported on JRF 2016)	65%
	Protection at Birth against tetanus (WUENIC 2016)	85%
	Last SIAs conducted in the country	2014
	Elimination validation date	May 2016
3. Measles Elimination	Coverage MCV1 (WUENIC 2016)	76%
	Coverage MCV2	56%
	Percentage of districts with MCV1 coverage ≥95% (2016 JRF)	37%
	Last national SIA	2009-2011
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Rubella vaccination coverage	Not introduced in 2016
	SIAs planned?	Yes (2017-2018)
5. Coverage with 3rd dose of DTP-containing vaccine	National coverage (WUENIC 2016)	79%
	Drop-out rate DTP1 to DTP3 (WUENIC 2016)	17%
	Actual numbers of children who dropped out (WUENIC 2016)	77 488
	Difference between poorest and richest quintile DTP3 coverage (2013 survey data)	27 points
	% of districts reaching 80% coverage (2016 JRF)	74%
6. Coverage with all vaccines in the national immunization schedule	National coverage (WUENIC 2016)	BCG: 81% Pentavalent 1: 95% Pentavalent 3: 79% MCV1: 76% Polio 3 : 80%

Area	Indicator	Indonesia
7. Introduction of new vaccines	New vaccines introduced	Hib (pentavalent) in 2013-2015; introducing MR in SIAs in progress; JE in 2018 in the endemic province of Bali; HPV demonstration project in 2 districts of Jogjakarta in 2017 and expansion to Surabaya city; PCV demonstration in 2 districts starting in 2017
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	2010: 33.1 2015: 27.2 (17.8%)
9. NITAG	NITAG established?	Yes
10. Government expenditure on routine immunization per live birth (USD)	Baseline 2010-2011 and average for 2013-2016 (% change)	12.0 to 12.4 (+3%)

Summary points

- Indonesia has graduated from GAVI support, but is continuing to receive catalytic support for vaccine introductions until 2018, as well as technical assistance.
- The country is transitioning from polio eradication program support, which has funded nine technical positions through WHO that will end in 2019. A declining trend in AFP/polio surveillance in the past few years has been observed.
- Vaccine introductions planned in the cMYP are on schedule, with IPV introduced in 2016, measles-rubella in 2017-2018, Japanese encephalitis (in Bali) in 2018, and pilot introductions of HPV (starting in 2016) and PCV (starting in 2017).
- Efforts to reduce high vaccination dropout rates initiated in 2016 to focus on district-specific interventions through continuous supportive supervision and on-the-job training in low-performing districts. Other efforts include updating defaulter tracking tools and guidelines, and the use of Rapid Pro SMS-based technology in urban slums to monitor coverage in real-time.

Immunization score card, Indonesia, 1997-2016



Update on country situation and recent developments affecting the immunization program

Major developments affecting Indonesia's National Immunization Program (NIP) in the past year (2016-2017) concern the country's transition from its two main sources of external support – both technical and financial – to the program:

- **Graduation from GAVI support in December 2016.** Indonesia was in the GAVI "accelerated transition phase" from 2012 to 2016, during which time its co-financing of pentavalent vaccine (introduced nation-wide from 2013 to 2015) rose incrementally from 20% to 80%, and to 100% since the beginning of 2017. The GAVI HSS grant ended in July 2017, following a no-cost extension that was granted because of the relatively slow implementation of grant activities due to the limited capacity of NGOs and local governments responsible for implementing many of the activities. These activities included intensive outreach activities and defaulter follow-up to reduce dropout rates in low-coverage areas; improving immunization data quality; training of health workers in immunization; and social mobilization and communications activities to increase population demand for immunization. Despite Indonesia's graduation, the NIP will continue to benefit from GAVI support (or from savings from past grants) until at least 2018 through the following mechanisms:

  1. "Exceptional catalytic support" that GAVI is providing for the introduction of new vaccines by covering 50% of the vaccine costs for nation-wide MR campaigns taking place in 2017 and 2018, a Japanese encephalitis vaccination campaign in Bali province and an HPV vaccine demonstration in Java (see below under "Achievements");

  2. Funding for IPV for three years (2016-2018) for the full costs of the vaccine, after which time the Government will assume full financing;

  3. Technical assistance from WHO and UNICEF through the PEF TCA funding mechanism;

  4. A Coverage, Equity and Sustainability Action Program (CESAP), a $22 million GAVI transition plan for 2017 and 2018. The plan will be funded with around $15 million in savings from the lower cost of BioFarma's pentavalent vaccine than GAVI budgeted in its grant, unspent funds from the HSS and vaccine introduction grants, interest, and other income. The goal of CESAP is to reduce the estimated 1.7 million unimmunized or under-immunized children in Indonesia – many living in urban areas – by increasing demand for vaccination (by strengthening IEC and community-based social mobilization strategies, along with advocacy to national and local governments) and by strengthening key components of the immunization program and factors affecting supply (e.g., continued targeted efforts to reduce dropout rates, improved disease surveillance and immunization data quality, cold chain system assessments and improvements). Of the approximate $22 million, it is proposed that $6.8 million be provided to WHO and UNICEF to support catalytic activities.

- **Transition from polio eradication program support.** While GAVI and other partners have provided financial support to Indonesia's NIP, the key contribution of partners in the country, according to informants, is the technical support that they have been providing, largely with funds from the polio program. Indonesia is in the transition phase of GPEI funding, which will end entirely in 2019. The polio program has supported nine WHO immunization, surveillance and data management officers. A few WHO positions have already moved to non-polio funding. The potential impact of the loss in technical support on the quality of vaccine-preventable disease surveillance is especially a concern; the reported national non-polio AFP rate has already declined from 2.4 per 100,000 children under 15 in 2014 to 1.97 per 100,000 in 2016 – just below the target of >2/100,000, with several provinces and districts below this threshold.[1] While the Government is assuming some of the operational costs of AFP/polio surveillance (e.g., laboratory costs and environmental surveillance), its overall technical surveillance capacity, including human resources, needs to be strengthened during this transition period.

- **Growing vaccine hesitancy.** A fake vaccine incident in July 2016 has led to fear in the community and trust issues among parents concerning immunization programs. There is also a growing anti-vaccine lobby, with religious groups opposing the use of non halal products in vaccines.

[1] CESAP draft document.

Key achievements, activities and progress towards the GVAP goals in the past year

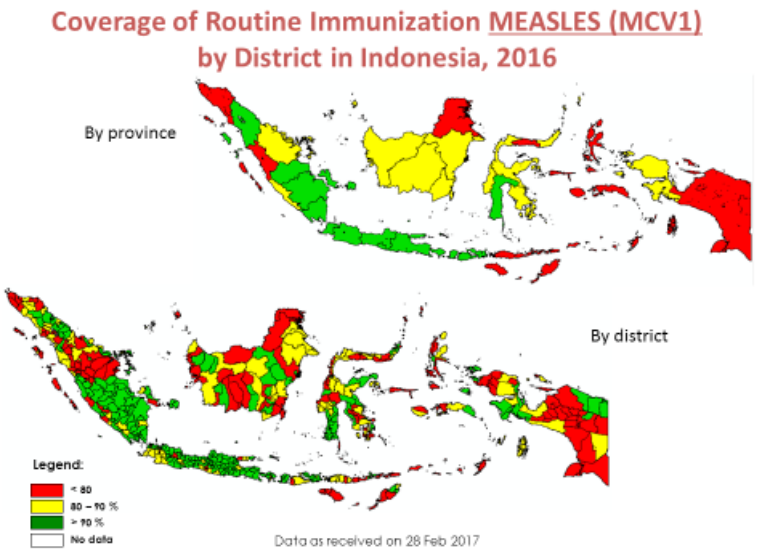
Progress towards achieving measles and rubella elimination

Due to gaps in measles immunity in children under age five, measles incidence has not been declining in the past few years, according to the WHO Country Office. This is despite a reduction in officially reported cases, which may be largely due to a decline in testing at MR laboratories, as a result of a lack of testing kits due to procurement issues. A major reason for the continued measles transmission is the wide variation in vaccination coverage rates in the country, with many districts reporting <80% MCV1 coverage (Figure 1).

In response to the continued incidence of measles, the NIP conducted a major measles campaign in August 2016 in 183 high-risk districts (36% of all districts). WHO is also using TCA funding from GAVI for lab supplies (test kits and reagents) to increase laboratory testing of measles and rubella.

To further accelerate the control of measles and to introduce rubella vaccine, a major activity in the past year has been the planning of a mass catch-up MR vaccination campaign targeting all children nine months to 15 years of age. The campaign, to be conducted in two phases, will target nearly 70 million children. Phase 1 will take place throughout Java starting in August 2017, beginning with school-based vaccination for children 6-15 years of age, followed one month later by vaccination of nine month to five year olds through health facilities and community-based outreach posts (*posyandus*). The campaign for younger children will also screen them to identify missed vaccinations, using health worker records, as an opportunity to "catch up" unimmunized and under-immunized children and reduce the country's relatively high dropout rates (see below). Phase 2 will take place in 2018 in the rest of the country, including many difficult-to-access areas in remote islands and regions (e.g., West Papua, Maluku).

Figure 1: Variation in measles vaccination coverage by province and district in Indonesia



* Source: Presentation on Indonesia Measles Epidemiology – 2016, MOH administrative data

A recent mission by partners has determined that the country is on track to conduct a good quality campaign, as it has other SIAs, reaching at least 80% of the target population. The challenge will be to achieve the high (95%) coverage rate that is required for MR campaigns to prevent an increased risk of congenital rubella syndrome (CRS). It will especially be difficult to achieve such high coverage among remote, rural and small

island populations during Phase 2, as well as among the large unregistered urban poor populations in cities, such as Jakarta and Surabaya during Phase 1. However, provinces will be using an SIA readiness assessment tool to determine the preparedness of each district to conduct the campaigns, which could potentially result in delays in some areas to allow time to improve their planning to ensure that challenging populations are reached. Enhanced technical assistance will also likely be required to prepare for high-quality SIAs, especially in the most remote and difficult-to-access areas. Concerns around non-halal vaccines will also need to be addressed.

In addition, two innovative practices using technology will be employed to monitor the campaign's progress and address potential problems in real-time: 1) the Rapid Pro program that enables the central Health Operations Center in Jakarta to monitor coverage in real-time from data sent via mobile phones from local areas; and 2) a social media analysis system (Pulse Lab) that can rapidly identify and address rumors and misinformation concerning the campaign or the vaccine, monitor the population's understanding of campaign messages, and provide other insights to adjust implementation plans and communications messages and strategies in order to maximize coverage.

Meeting the vaccine introduction goals and timelines set out in the 2015-2019 cMYP

The NIP is on schedule with its plans to introduce four new vaccines as laid out in the cMYP, and, in fact, is piloting a fifth vaccine:

- **IPV** was introduced in July 2016, after some delay and with three years of support from GAVI (2016-2018). Vaccination coverage since its introduction has been quite low, however. According to administrative data for the first half of 2017, national IPV coverage for the year is on track to be around 30% compared to 73% for the third dose of pentavalent vaccine.

- **Rubella** is being introduced, using MR vaccine, initially in mass catch-up campaigns in 2017 and 2018 (see above), followed by its replacement of measles vaccine in the routine schedule at nine and 18-24 months one month after the campaign takes place in each area;

- **Japanese encephalitis (JE)** vaccination (using the live Chinese vaccine, SA 14-14-2) will be introduced in the second quarter of 2018 throughout Bali, which has been shown to be endemic for the disease. The introduction will start with catch-up campaigns for all 9 month to 14 year old children, followed by its incorporation into the routine immunization schedule at nine months (in Bali only);

- **HPV** was successfully introduced throughout the province of Jakarta in 2016 – through the country's school-based ("BIAS") program – for 71,000 girls in Grade 5, achieving an estimated 92% coverage for the first dose[2] (the second dose is planned for October 2017). The Government of Indonesia, which shared the costs of this program with the Jakarta provincial government, will be expanding HPV vaccination to the city of Surabaya. An additional pilot introduction will be conducted with GAVI support in 2017 in two rural districts in Jogjakarta Province to gain experience in introducing the vaccine in rural areas, which may pose additional challenges. The pilot will also be school-based, but efforts will be made to identify girls missed in schools and have them vaccinated at health centers and outreach sites;

- Going beyond the cMYP, the MOH will fund a demonstration of **PCV** introduction in two districts in Lombok, starting the last quarter of 2017, with funding from the federal government. The project will include an impact and cost-effectiveness analysis to help with advocacy efforts to the federal government and to the districts (which must pay the operational costs) to convince them of the need to introduce the vaccine nation-wide. The eventual nation-wide introduction is unlikely to occur before polio funding has ended in 2019 and thus it will not benefit from the technical support provided by partners during past introductions, unless these positions are funded by the government or by GAVI.

Vaccine introductions in Indonesia have generally taken place more slowly than in many other countries, due in part to the Government's policy of relying on local production (by BioFarma) for vaccines used by the National Immunization Program. The introduction of pentavalent vaccine, for instance, did not begin until 2013, using BioFarma's new vaccine, and not completed nation-wide until 2015. However, the Government has recently become more open to using imported vaccine – at least in the short-run – to avoid delays in introducing other new or under-utilized vaccines. For example, before BioFarma was able to meet its long-term goal of producing IPV, it entered into an agreement with Sanofi to initially purchase ready-to-use vials from the company for one or two years and then to fill-finish Sanofi's vaccine purchased in bulk (by 2018). Similarly, the MR vaccine used for the SIAs will initially be imported from Serum Institute of India, with the

[2] Source: SEARO Regional Director's annual report, 2016.

possibility of later combining SII's bulk rubella vaccine with Bio Farma's own measles vaccine to fill-finish locally. Bio Farma's goal is to produce MR from scratch by around 2019. And while Bio Farma is developing a pneumococcal conjugate vaccine, the PCV pilot in Lombok will use imported vaccine. In addition, for the pilot introductions of HPV vaccine, the Government is procuring vaccine through UNICEF for the first time and Bio Farma as yet has no plans to produce the vaccine.

Innovative efforts to improve immunization coverage in lower performing areas through targeted interventions based on individual district needs

Indonesia's NIP enjoys high population access, as shown by the WHO-UNICEF estimated coverage rate for the first dose of pentavalent vaccine of 95%. However, it has a significant problem with dropouts – with only an estimated 79% of children receiving the third pentavalent dose – for a national dropout rate of 17%. Two programs were piloted in the past year to reduce dropout rates and otherwise improve vaccination coverage by focusing on the lowest-performing districts and providing them with support tailored to their specific needs and areas of weakness.

Under the START program, CDC-funded consultants were sent to ten districts in two provinces with large numbers of unimmunized or under-immunized children to provide supportive supervision and on-the-job training to health workers on a frequent basis (e.g., two or three visits per week for six months or more often, as needed). Instead of the standard pre-planned set of didactic trainings conducted in a cascade manner, the training and supervision take place in the workers' health facilities and are based on an assessment of their needs, whether it be to improve microplanning or defaulter tracing or cold chain management. EPI staff at the sub-district level also receives capacity-building support.

The program has been well received in the ten districts, which have continued to implement it using their own staff and provincial government funds since CDC support ended in February 2017. It is now being expanded to 13 new districts, with funding from the CDC, and the MOH has requested that it be scaled up in 50 more districts through the CESAP, with the goal of setting up this model in at least one district in each of the country's 33 provinces for other districts to emulate.

The second initiative provides intensive technical assistance in 31 districts found in a 2015 survey to have high dropout rates. WHO technical officers, funded through the polio program, work with these districts to develop strategies to better reach defaulters, again tailored to the specific needs and circumstances in districts – whether it be to address vaccine refusals through advocacy, improve data quality to pinpoint low-coverage areas, or improve microplanning. In contrast to the on-going Drop-Out Follow-Up (DOFU) strategy, which targets children under one year of age, this new initiative targets all children under three years of age for the full complement of vaccinations including MCV2 and DPT booster doses – through "sweeps" or other strategies. An evaluation is planned for the end of 2017 to determine the program's impact on coverage.

The screening of children during the measles-rubella campaigns, as mentioned above, will be yet another strategy to catch up children with missed vaccinations and thus improve coverage rates. Other activities to improve vaccination coverage rates and reduce dropouts include updating defaulter tracking tools and guidelines, and the use of Rapid Pro SMS-based technology in urban slums to monitor coverage in real-time.

Efforts to maintain good quality AFP/polio case-based surveillance

In response to the declining performance of the country's polio surveillance system, based on common indicators, WHO developed a polio advocacy package for health workers to promote the importance of maintaining strong AFP/polio surveillance, despite the fact that the disease has been eradicated. A five-day training program for 37 provincial surveillance officers took place in 2016, followed by a meeting with all 33 provinces to review the surveillance data and provide feedback to the provinces. In addition, environmental surveillance has been expanded from two to four sites. Some support from partners to fund operational costs for polio surveillance and lab testing will also be provided through the CESAP program.

Table 2: An update on progress against the GVAP goals

Polio eradication	Indonesia has been polio-free since 2006 and the WHO Southeast Asia region was certified for polio eradication in March 2014. Decline in AFP/polio surveillance indicators has been observed since 2014, with national non-polio AFP rate at 1.94/100,000 (below target of 2/100,000). Efforts to reverse the situation include expansion of environment surveillance, training of all provincial-level surveillance officers, development of new polio advocacy tools, and continued support for AFP-polio surveillance through the CESAP program during the GAVI transition. Coverage for IPV, introduced in July 2016, needs to be improved.
MNT elimination	Country was certified for MNT elimination in May 2016. TT vaccine continues to be provided through the school-based BIAS program for children in Grades 2 and 3.
Measles elimination and rubella/CRS control	Quality of case-based MR surveillance is inadequate, with lab testing declining due to a reduction in external funding. Second dose of measles vaccine introduced into routine schedule in 2013, but coverage is still low. MR catch-up campaigns are scheduled for 2017-2018 nation-wide, followed by MR introduction into the routine program. Efforts are being made to increase the number of MR labs from four to seven. The high cost of shipping lab samples from remote islands remains a barrier.
Immunization coverage (90% nation-wide and 80% in all districts for all vaccines)	Dropout rates continue to be high, with a national DTP1 to 3 dropout rate of 17% and DPT1 to MCV1 of 20% (WUENIC 2016). Efforts to reduce dropouts and increase coverage in low-performing areas include more intensive supportive supervision and on-the-job training (in 22 districts thus far), revision of defaulter tracking tools and guidelines, and two programs to follow-up defaulters (Dropout Follow-Up or DOFU for < 1 year olds and a 31-district program for <3 year olds), and the Sustained Outreach Service (SOS) Strategy in remote areas.
New vaccine introductions	IPV: introduced nation-wide in 2016, but coverage remains inadequate. MR: being introduced, starting with two-phase SIAs in 2017 and 2018. JE: introduction in Bali, starting with catch-up campaigns for children under 15 years of age, planned for 2018. HPV: introduced through schools with government funding in Jakarta, and GAVI-supported school-based pilot project in two rural districts in Java planned for 2017. Demonstration of PCV, using government funding, planned for late 2017 in two districts in Lombok to gather data on impact and cost-effectiveness to inform national decisions about nation-wide introduction.

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MADAGASCAR

Full country report

A. Progress towards achievement of GVAP goals

1. Summary

The summary table below describes the current situation in Madagascar regarding achieving the GVAP goals.

Area	Indicator	Madagascar
Socio-demographic	GNI/capita (USD) 2016	420
	WB Status	Low income country
	Infant mortality (<12 M) 2016 UN IAG CME	36/1 000
	GAVI status	Eligible
	Total population	24 895 000
	Birth cohort	827 000
	Surviving infants (JRF)	801 000
1. Interrupt wild poliovirus transmission	Transmission Interrupted	Yes
	Risk of late detection: Percent of adequate stool specimens (Rolling 12 mo.)(Target > 80%)	86%
	Risk of late detection: Non polio AFP rate (Rolling 12 mo.) (Target > 2/100,000 children	8/100 000
	Risk of spread after importation: % of 6-59 month olds having received less than 3 doses in the last year before occurrence case/environmental positive)	6%
2. Neonatal tetanus elimination	TT2+ coverage (reported on JRF 2016)	52%
	Protection at Birth against tetanus (WUENIC 2016)	78%
	Last SIAs conducted in the country	2013
	Elimination validation date	2014
3. Measles Elimination	Coverage MCV1 (WUENIC 2016)	58%
	Coverage MCV2	No second dose yet introduced
	Percentage of districts with MCV1 coverage ≥95% (2016 JRF)	53%
	Last national SIA	2016
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Rubella vaccination coverage	Not introduced
	SIAs planned?	Yes, 2019

Area	Indicator	Madagascar
5. Coverage with 3rd dose of DTP-containing vaccine	National DTP3 coverage (WUENIC 2016)	77%
	Drop-out rate DTP1 to DTP3 (WUENIC 2016)	8%
	Actual numbers of children that dropped out (WUENIC 2016)	56 000
	Difference between poorest and richest quintile DTP3 coverage (2013 survey data)	39 points: Poorest : 53% Richest : 92%
	% of districts reaching 80% coverage from 2016 JRF	94%
6. . Coverage with all vaccines in the national immunization schedule	National coverage (WUENIC 2016)	BCG: 70% DTP3-HepB3-Hib3: 77% MCV1: 58% Pol3: 75% RotaC: 78% PCV3: 76%
7. Introduction of new vaccines	New vaccines introduced	PCV-10: 2012 Rotavirus: 2014 IPV: 2015
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	18%
9. NITAG	NITAG established?	No
10. Government expenditure on routine immunization per live birth (USD)	Baseline 2010-2011 and average for 2015-2016 (% change)	0.88 to 2.81 (+220%)

2. Economic and political situation in Madagascar

Madagascar's economic and political situation has been volatile for decades. In recent years, a coup d'état in 2009 led to the withdrawal of funding from major donors (e.g., the World Bank), resulting in austerity in government funding to meet IMF obligations and a reversal in many economic and social gains. One result of the sharp reduction in financing was a decline in the routine immunization program and increase in the number of children not fully immunized.

The political crisis eased somewhat with the election of a president in 2014 and the gradual return of donor support. The political situation continues to be fragile, however, with an attempt to impeach the president 18 months after he took office, and three prime ministers serving since 2014.

The result of this political instability and relative slow economic growth has been a continual decline in the living standards and economic conditions of the Malagasy population. The country's ranking on the Human Development Index fell from 149th in 2010 to 158th (of 188 countries) in 2015. The percent of the population living in extreme poverty (<$1.25 a day) rose from 26.5% in 2005[1] to 56% in 2015[2] – one of the highest rates in the world. In addition, the Southern part of the country has experienced a prolonged drought since 2013, leaving more than a million people without sufficient food to eat.[3]

Madagascar is heavily dependent on foreign aid, which accounts for more than 80% of health expenditures.

[1] Bertelsmann Stiftung's Transformation Index (BTI), 2016.
[2] Madagascar cMYP 2016-2019.
[3] USAID Website article, Back on the path of democracy, found at: www.usaid.gov/madagascar/back-on-the-path-to-democracy.

3. Country ownership of the immunization program

3.1 Immunization policy decision-making capacity

In the absence of a National Immunization Technical Advisory Group (NITAG), Madagascar's decision-making body for immunization activities is the combined Inter-Agency Coordinating Committee/ Health Sector Coordinating Committee (ICC/HSCC), which was formed in 2011 by merging the two separate committees (the ICC, established in 1997 and the HSCC, created in 2009) to improve coordination of GAVI HSS and ISS activities and reduce redundancies. The ICC/ HSCC consists of two committees: 1) the coordination or decision-making *"Comité décisionnel"*, headed by the Secretary General of Health and consisting of around 26 high-level representatives from different Ministry of Public Health (MOPH) departments and other government sectors, international partners (e.g., the WHO representative) and NGOs/CSOs; and 2) the Technical Committee, consisting of technical-level personnel, such as the EPI Manager, and WHO and UNICEF immunization focal points, and which conducts technical discussions and prepares documents for the *Comité décisionnel* to review and approve.

The functioning of the ICC/HSCC has been considered quite weak, however. Its terms of reference haven't been very clear, the *Comité décisionnel* meets on an as-needed basis to handle urgent matters, instead of regularly (although it met five times in 2016), and not all relevant agencies or organizations are systematically invited to the meetings. The main role of the committee has been to approve proposals and other documents prepared by the Technical Committee, while not focusing on overseeing program activities or financing.

In response to recommendations from GAVI and other partners to strengthen the ICC/HSCC, new terms of reference were prepared in 2016 to clarify and codify membership of both the decision-making and technical committees, their roles and responsibilities, the frequency and procedures of the meetings, documentation, what constitutes a quorum for decisions, and so forth. The TORs specify and expand membership of the *Comité décisionnel* to 30 members – one-third each from government agencies, international partner organizations, and civil society. The committee's responsibilities will now include monitoring program activities and use of resources, having a role in selecting auditing firms, and approving recommendations from audit reports and program evaluations. The TORs require that the committee meet every three months. To further strengthen the ICC/HSCC and improve the quality and productivity of their meetings, the Technical Committee will serve essentially as the committee's secretariat, organizing the meetings, preparing the agenda and minutes, in addition to preparing and presenting all key documents, such as annual workplans, budgets, GAVI proposals and status reports. The Technical Committee is also given a role in reviewing and supervising the implementation of program activities and use of GAVI and other funds, and includes as a member a representative from the Internal Audit Unit of the MOPH. As a first step in implementing the new TORs, new lists of invitees for both the decision-making and technical committees have been completed.

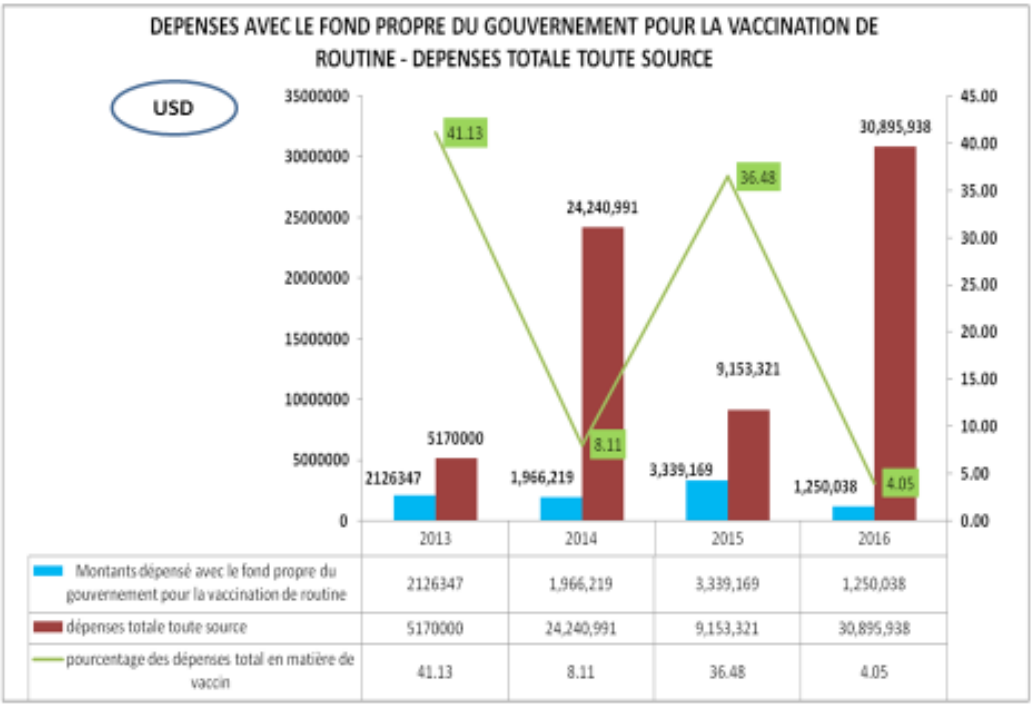
Partners, including at the recent Joint Appraisal mission in June 2017, have strongly recommended the establishment of a NITAG, and, in that vein, a visit by AFRO to assist the country in setting up such a committee was scheduled for July 2017, but has been postponed. Nonetheless, the MOPH recognized during the Joint Appraisal the need for a NITAG to advise them on new vaccine introductions and strategies, such as HPV and fractional dose IPV. To move forward, a high-level mission from WHO is likely needed to explain how a NITAG differs from an ICC and the benefits of having an independent advisory committee. It is hoped that the MOPH will request this in the coming months.

3.2 Government financing of immunization

Are government expenditures for immunization increasing over time?

The Malagasy government's annual contribution towards immunization program expenditures was around $2 million in 2013 and 2014 and jumped to $3.3 million in 2015 (Fig. 1). However, it declined by two-thirds – to only $1.25 million – in 2016, due to cuts in the health budget and the apparent low priority of the immunization program among budgetary decision-makers. In terms of the percent of the Government's contribution to immunization program spending, it fluctuates greatly from year to year, mainly because of wide variations in annual donor financing. In 2013, when total expenditures were $5.2 million, the Government's contribution represented 41% of the total spending, while in 2016, its $1.25 million contribution represented only 4% of the total of nearly $31 million spent on the program, with donors and partners paying the remaining 96%.

Figure 1: Government and total spending for the immunization program, 2013-2016



Note: The red bars represent total EPI spending, the blue bars Government EPI spending, and the green line the % of total EPI spending contributed by the Government. Source: Joint Appraisal report 2017.

Is the Government meeting its immunization financing goals and commitments?

One reason for the reduction in Government immunization spending in 2016 was a decline in its contribution towards the purchase of traditional vaccines (BCG, TT, OPV, measles). While the Government's contribution for traditional vaccines increased from 13% in 2005 to 25% by 2011, it declined to only around 8% in 2016 (for the purchase of OPV).

Madagascar has often been late with payments to meet its co-financing obligations for GAVI-supported vaccines (pentavalent, PCV, rotavirus), as it was again in 2016. Its obligation in 2016 totalled $1.47 million, which is greater than the amount the Government spent on the entire program that year ($1.25 million). However, the situation has improved in 2017; in May 2017 the Government paid the $587,000 in arrears from 2016, as well as all but $299,000 of its co-financing commitments for 2017.[4]

[4] Joint Appraisal report, 2017.

With the reduction in government spending and most of this going towards vaccine purchases, the program is increasingly dependent on partners to fund cold chain equipment purchases and operational costs, including implementation of the Reach Every Community/ Reach Every Child (REC) strategy with GAVI HSS grant funding. However, the release of funds from the central government to the provinces and districts is chronically slow and the Government's absorption capacity to use HSS funding was only 47% in 2016.[5] The situation worsened in September 2016 when the GAVI HSS grant was suspended, following unsatisfactory results from an independent audit conducted by GAVI. At the same time, the HSS2 grant, which had been approved, was suspended, as were CCEOP funds for cold chain improvements, which has slowed down the planned replacement of kerosene refrigerators with solar refrigerators in many of the country's health facilities.

The impact of reduced funding for operational costs and their slow release to districts in the past few years has been predictable – with fewer and fewer outreach activities taking place and implementation of REC activities in the 54 HSS-supported districts slowed down. To prevent further backsliding, GAVI has recently approved the use of $628,000 from the country's HSS2 grant to fund priority activities, such as microplanning and supervision to keep REC activities going. Resumption of HSS2 and CCEOP funding is contingent upon a satisfactory fiscal oversight mechanism to improve the financial management and reporting of GAVI grants being agreed between the Government and GAVI.

To increase the Government's financing for immunization, a law drafted with technical support from Sabin Institute that sets up a National Immunization Fund was passed by the Parliament in early 2017. To put the law into effect, a decree must still be written and published, requiring the participation of the ICC and several government ministries.

It should also be noted that polio program resources will be reduced once the country is declared polio-free. Following a series of polio vaccination campaigns since 2015, in response to an outbreak of vaccine-derived cases, the country plans on submitting documentation for certification in 2018 (see Section 4.1).

3.3 Human resources situation

Frontline workers providing immunization services

Vaccinations in Madagascar are provided primarily by nurses and nurse-midwives (collectively called *paramédicaux*), working mainly out of the country's more than 2,600 basic health centers. The current number of public sector nurses and nurse-midwives – around 7,200 – is vastly inadequate and unevenly distributed, causing a severe shortage in rural and more remote areas. While all health centers are supposed to have at least two health workers, 49% in 2017 are without a doctor and 52% are manned by a single health worker, who is responsible for providing both curative and preventive care services.[6] This makes it extremely challenging for sole health workers to delivery immunization services regularly, especially outreach sessions.

There are many factors contributing to the health worker shortage, especially in rural areas. Training institutes for nurses and nurse-midwives produce only around 400 graduates a year, barely keeping up with retirements. Turnover rates are high and retention rates low, especially in more remote rural areas, where health workers can feel isolated, lack support, and in some areas feel unsafe due to banditry, making it critical for them to forge a relationship with the local police.[7] Low salaries and a lack of career opportunities are additional reasons for the high attrition rate among health workers and low motivation among those who stay.

The Government and partners have made a number of efforts to improve the availability of frontline workers in recent years. The Government recognizes the need to fill 7,500 health positions, including 1,200 *paramédicaux* and 800 doctors in 2018 alone. It has already hired more than 340 nurse/midwives trained in private institutions, though their skills level is considered inadequate. Another 340 health workers under contract through GAVI HSS funding were hired and placed in mainly remote health centers, some of which had been closed since 2010. Most have since become regular government employees. In addition, 52 new basic health centers were built between 2014 and 2016 with GAVI and other funds, and various incentives, such as vehicles and allowances, have been provided in some areas, though these are limited due to financing constraints.

[5] Joint Appraisal report, 2016.
[6] Joint Appraisal report, 2017.
[7] Joint Appraisal report, 2017.

Immunization staff

The EPI team at the national level in the MOPH is quite sizeable – 64 people in all, including 16 medical doctors and 15 nurse/midwives serving in various technical areas (e.g., logistics, social mobilization, surveillance, M&E, data management). In April 2016, the Immunization Unit ("Service" in French) was upgraded to the level of a directorate, reporting directly to the Secretary General of Health. This upgrade has given the program more autonomy in spending available funds, and in making decisions directly with partners than it had previously. It has not made it immune to severe budget cuts, however, as discussed above.

At the sub-national level, there is a designated EPI manager in each of the 22 regions, but not in the districts. There are no full-time (dedicated) cold chain managers at either the provincial or district levels, though there are cold chain technicians at these levels, who recently have received training in installing and maintaining solar-powered equipment.

4. Progress towards specific GVAP goals

4.1 Goal 1: Achieve a world free of poliomyelitis

Has polio transmission been interrupted?

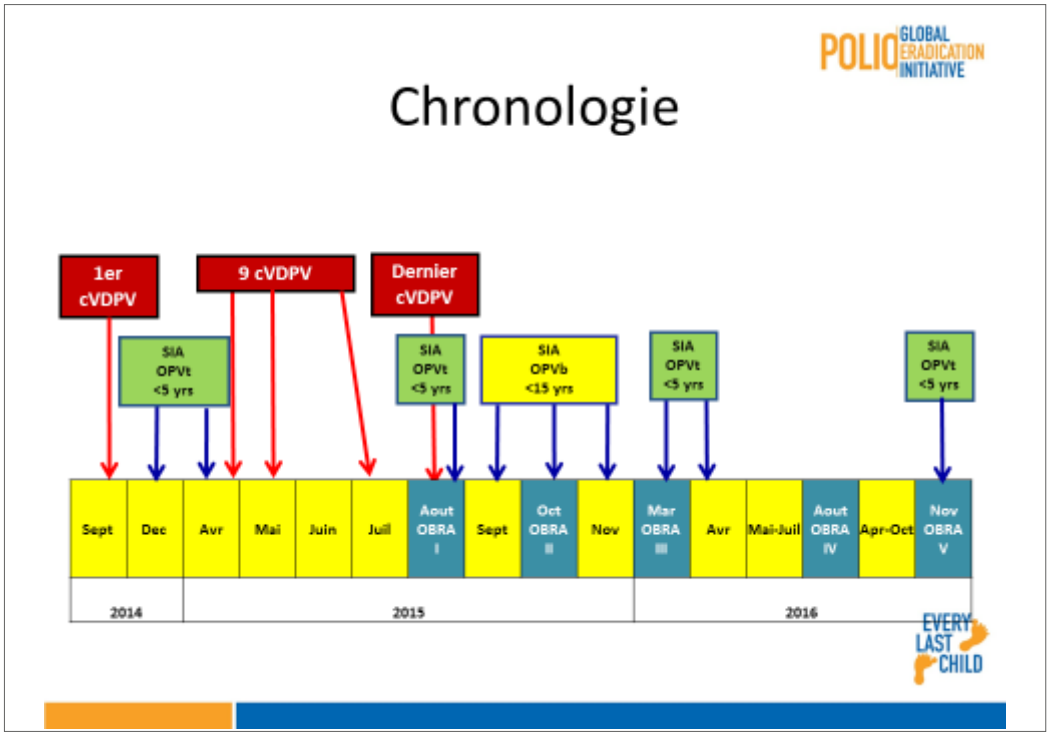
Madagascar reported its last case of wild polio virus in 1997. However, the country experienced an outbreak of vaccine-derived polio virus (VDPV) type 1 from September 2014 to August 2015, consisting of 11 cases reported from different parts of the country. This outbreak has been attributed to relatively low immunization coverage through the routine program – in the low to mid 70s in the past 10 years or so, according to WUENIC estimates, and undoubtedly lower in under-served areas. The low coverage has, in turn, been due to a weak cold chain system and insufficient efforts to identify and reach children through microplanning, outreach sessions, and the like. AFP/polio surveillance had also declined, as it was discovered that some of the VDPV cases hadn't been detected for three years.[8]

The VDPV outbreak led to a robust response, both in terms of vaccination campaigns and surveillance activities. On the vaccination front, the EPI conducted 10 polio SIAs between December 2014 and March 2017 – including nine national campaigns and one targeting areas where cases were detected (see Fig. 2). Seven of the SIAs targeted children under five, using the trivalent vaccine, while three (in September, October and November 2015) targeted all children under 15 years of age nation-wide using the bivalent OPV. The campaigns involved teams of vaccinators (≈46,000 in the February/March 2017 campaign alone) going door-to-door, as well as administering vaccinations at public squares, markets, bus and train stations, transit points and difficult-to-reach areas.

To improve communications and social mobilization for the campaigns, more than 3,800 vaccinators and social mobilizers received training in communicating with families, and regional planning officers were trained in developing regional communications plans for polio vaccination campaigns. This resulted in an increase in the number of high-quality district communications plans (based on socio-behavioral data) from five in March 2016 to 40 by November.[9] A monitoring survey conducted in November 2016 found that around 90% of parents nation-wide had been informed about the polio campaigns before they began, largely by frontline health workers and community mobilizers.

[8] Joint Appraisal report, 2016.
[9] Global Polio Eradication Initiative presentation on "5th independent evaluation of the VDPV outbreak response in Madagascar, 12-15 December 2016.

Figure 2: Timeline of cVDPV cases and vaccination outbreak response campaigns in Madagascar, 2014 – 2016



Independent monitoring of the campaigns in 2015 and 2016 found coverage rates in the low to mid 90s, even for the campaigns targeting the large cohort of children under 15 years of age.[10] An outbreak response assessment found a 50% increase in the number of children under five vaccinated against polio between August 2015 and August 2016 in the districts where cases had occurred, and a 15% increase nation-wide.[11] As another indicator of the success of these campaigns, a study of AFP cases in children under five found that during the first half of 2017, 90% of cases had had at least three OPV doses, 80% had had four or more, and all children had received at least one dose (very few had unknown vaccination status).[12] This is a sharp increase from the first half of 2015, when 50-55% of AFP cases had had at least three doses, around 5% had received no OPV doses and the vaccination status was unknown for around 45% of cases.

However, for the first time since these outbreak response campaigns began, the March 2017 nation-wide campaign encountered a problem with vaccine refusers, primarily in the capital, Antananarivo and other cities (11 districts in all). Around eight percent of children under five were found by independent monitoring to have not been vaccinated during the campaign, and the number one reason was refusal – accounting for 40% of unvaccinated children.[13] Mop-up campaigns are being planned in the 11 districts with high refusal rates.

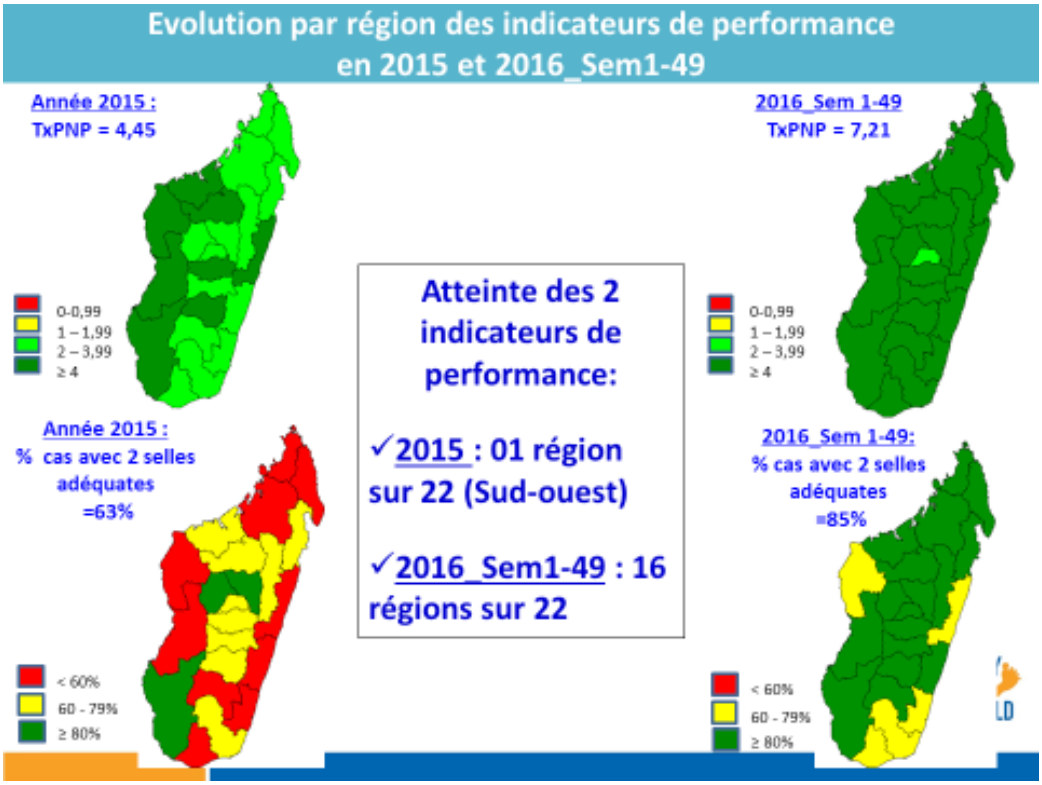
AFP/polio surveillance has also been strengthened considerably in the past two years. Ten technical assistance hubs were set up in 2016, manned by staff and consultants from WHO, UNICEF and other organizations, 36 of whom work with provincial and district health teams to improve AFP/polio surveillance and assist with the polio vaccination campaigns. Environmental surveillance was also established in three sites in 2015 (in Antananarivo, Mahajanga and Tolrary).

The result has been a dramatic improvement in the performance of the surveillance system, as measured by two key indicators: a reporting rate of non-polio AFP per 100,000 children under age 15 (target: >2/100,000) and a stool adequacy rate (percent of cases with two stool samples collected within 14 days of a case being suspected) (target: ≥80%). Nationally, the non-polio AFP rate has increased substantially since 2014 – from 4.38/100,000 in 2014 to 8.08/100,000 in 2016 and 6.9/100,000 in 2017 (and compared to 2.08 – 2.49 from 2007 to 2009). The results by region are more dramatic; whereas a single region in 2015 reached the targets for both indicators, 16 of the 22 regions had done so by December 2016 (Fig. 3). This number reached 20 regions and 71 out of 114 districts (62%) by mid-May 2017.[14] However, surveillance is still inadequate in several districts; the situation report for Week 21, 2017 (end of May) found 11 of the 114 districts did not report a single AFP case, and four did not meet either target indicator.[15]

[10] cMYP 2016-2019.
[11] Global Polio Eradication Initiative presentation on "5th independent evaluation of the VDPV outbreak response in Madagascar, 12-15 December 2016.
[12] Situation report for polio and measles, Week 20, 2017.
[13] Presentation: Resultats MI et LQAs, JNV March 2017.

The AFP/polio surveillance system has not detected a case of VDPV since August 2015 and the fifth independent evaluation of the country's outbreak response conducted in December 2016 concluded that, given the increased sensitivity of the surveillance system, it is very likely that transmission has been interrupted.[16]

Figure 3: Change in AFP/polio surveillance performance indicators by region from 2015 to 2016 (non-polio AFP reporting rates (top of figure) and stool adequacy rates (bottom of figure)



Global Polio Eradication Initiative presentation on "5th independent evaluation of the VDPV outbreak response in Madagascar, 12-15 December 2016.

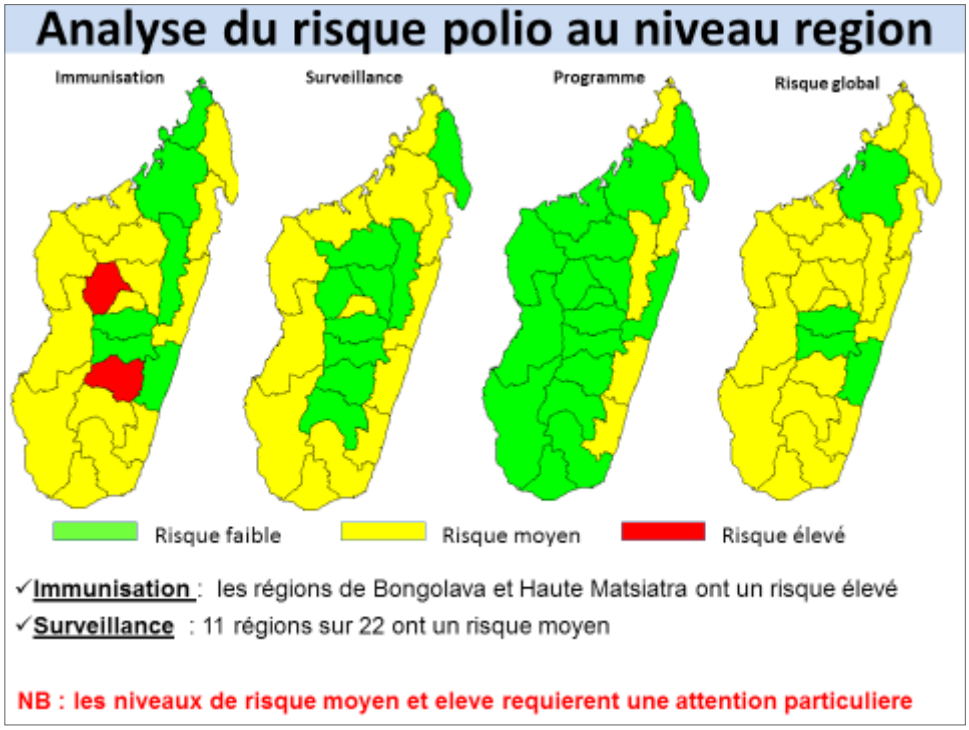
Is the country considered at high risk of polio transmission?

According to a GPEI risk analysis conducted in late 2016, eighteen of the country's 22 regions fall into the medium risk category for polio transmission, with the others considered at low risk (Fig. 4).[17] This is due largely to insufficient polio vaccination coverage rates and inadequate surveillance. National OPV3 coverage rates, using the WHO-UNICEF estimates, remain in the 70s, though they increased to 76% in 2016 from 71-73% in the five previous years. As shown in Fig. 4, the OPV3 rate is below 50% in two regions. To further lower the risk, the MOPH is planning two more polio SIAs in 2017: a nation-wide campaign in October and a sub-national campaign covering half of the country in November.

Madagascar is currently preparing documentation to be certified polio-free, which it will submit to the Regional Certification Committee in 2018.

[14] Situation report for polio and measles, Week 20, 2017.
[15] Joint Appraisal 2017.
[16] Global Polio Eradication Initiative presentation on "5th independent evaluation of the VDPV outbreak response in Madagascar, 12-15 December 2016.
[17] Analyse du risque polio a Madagascar au 4eme trimester 2016, WHO presentation.

Figure 4: Polio transmission level of risk in Madagascar by region



4.2 Goal 2: Meet global and regional elimination targets

4.2.1 Achieve maternal and neonatal tetanus elimination

The EPI conducted TT campaigns for women of child-bearing age in high-risk districts twice a year from 2005 to 2013 in conjunction with Mother and Child Health Weeks. These campaigns, along with the promotion of safe deliveries and strengthening MNT surveillance, led to the country being validated for MNT elimination in 2014, following an assessment in the highest risk district. Madagascar continues to report a small number of cases each year: 27 in 2016, 13 in 2015 and 7-9 annually from 2012 to 2014 – all well below the elimination threshold of <1/1,000 live births. Nonetheless, MNT surveillance is considered quite weak and cases are likely under-reported.[18]

Official country data show a relatively low TT2+ coverage rate: 52% in 2016 and varying from 47% to 63% in the prior four years, – all well below the 80% target threshold. According to the 2017 Joint Appraisal, however, these rates are likely under-estimates of the true coverage, since subsequent TT doses among pregnant women are often recorded as TT1, due to poor retention of vaccination cards.

Maintaining MNT elimination, according to the cMYP, will require reinforcing the education of mothers about good cord care practices (during ANC visits, vaccination sessions and delivery), as well as the promotion of childbirth assisted by a qualified birth attendant.

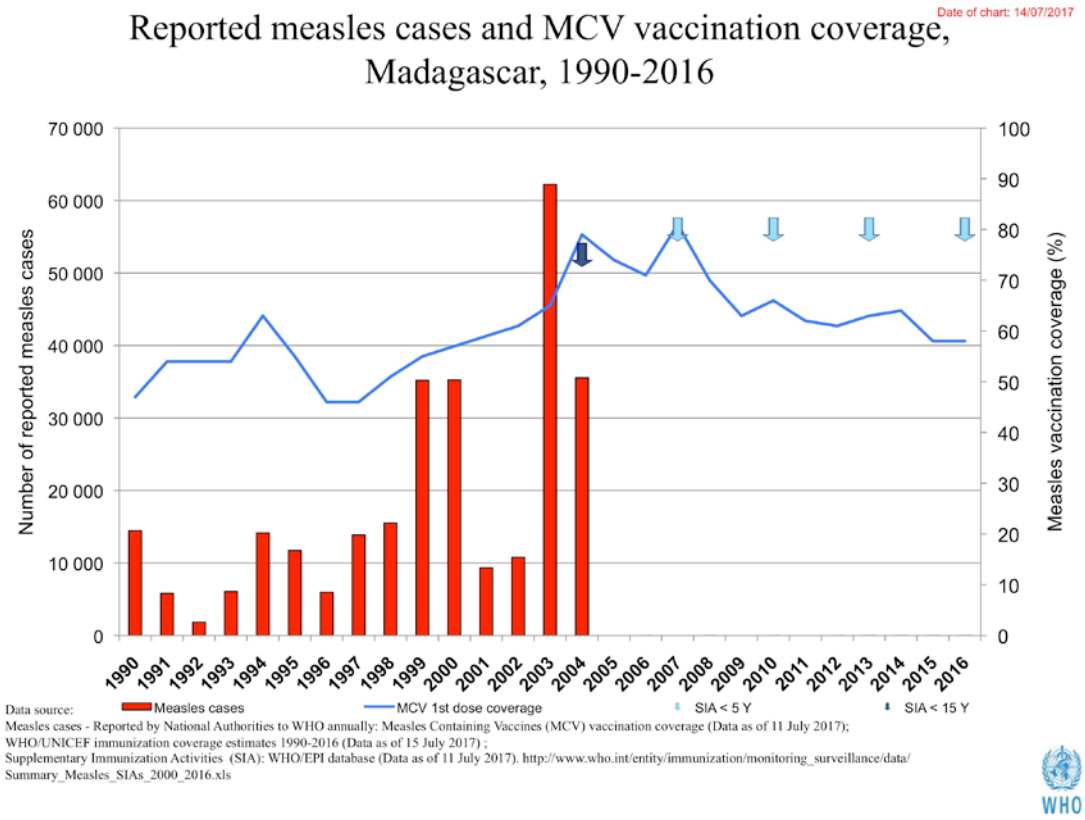
4.2.2 Achieve measles elimination and rubella & CRS control

Measles

The last reported measles outbreak in Madagascar occurred in 2003/04, when around 100,000 cases were reported (Fig. 5). Since then, only a handful of confirmed cases have been reported each year (e.g., 2-6 cases from 2012 to 2016). While cases are likely under-reported through the case-based measles/rubella surveillance system, surveillance indicators have reached or come close to reaching target thresholds for the past several years. The non-measles reporting rate was 2.3 – 3.7 per 100,000 children under the age of 15 and 79-90% of districts reported at least one suspected case with a blood sample from 2011 to 2014. While these indicators declined in 2015 to a non-measles reporting rate of 1.65/100,000 and 68% of districts reporting at least one case,[19] they bounced back in 2016. This suggests that the reduction in measles incidence is real and not a reflection of deteriorating surveillance or reporting.

[18] cMYP 2016-2019.
[19] cMYP 2016-2019.

Figure 5: Reported measles cases and MCV vaccination coverage rates



The reduction in measles incidence occurred despite a decline in measles vaccination coverage over the past 10 years – peaking, according to WHO-UNICEF estimates, to 78% in 2007 and declining to 58% in 2015 and 2016. The reduction in incidence appears to have been accomplished instead through a series of national measles vaccination campaigns, beginning with a catch-up campaign for children under 15 years of age in 2004, in response to the 2003-04 outbreak, and followed by SIAs for children under five every three years from 2007 to 2013. The last follow-up campaign was conducted in October 2016 nation-wide over a two-week period – the first week coinciding with a Mother and Child Health Week. An independent evaluation of the campaign estimated an overall coverage rate of 82.5%, with coverage actually lower in urban areas (78%) than rural areas (84%).[20] However, of the districts included in the study, only 14% reached the target ≥95% coverage rate, 42% of districts had coverage between 80% and 94%, and 38% achieved coverage of <80%. Suboptimal coverage in low-performing districts was found to be due to insufficient communications and organizational problems, including long-wait times and absenteeism among vaccinators. The lower urban vs. rural coverage rates were attributed in part to parents having to work and a lack of interest in having their children vaccinated if they had already received the measles vaccine through the routine program.

Maintaining low measles incidence and achieving elimination will require substantially increasing measles vaccination coverage through the routine program, as well as maintaining high-quality measles surveillance. Madagascar has not introduced a second measles vaccine dose into the routine schedule, which would also increase the protection of children.

Rubella

Between 2009 and 2013, around 30% of suspected measles cases tested were confirmed as rubella.[21] The number of confirmed cases jumped from 89 in 2015 to 204 in 2016. The country has yet to introduce measles-rubella (MR) vaccine, though MR campaigns are included in the cMYP for 2019, to be followed by its introduction into the routine vaccination schedule.

[20] Ministry of Public Health, Madagascar. Evaluation of the vaccination campaign against measles, Firmin SEKA, May 2017.
[21] cMYP 2016-2019.

4.3 Goal 3: Meet vaccination coverage targets

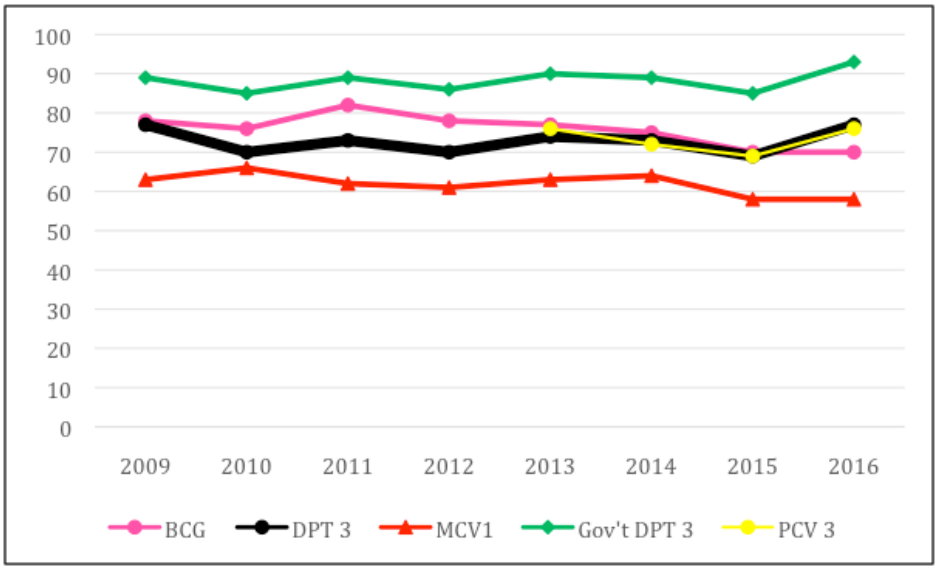
a. **Achieve 90% national coverage and 80% in every district with three doses of diphtheria-tetanus-pertussis containing vaccines**

b. **Achieve 90% national coverage and 80% in every district with all vaccines included in the national schedule**

According to the WHO-UNICEF (WUENIC) estimates, national DPT3 coverage has been stuck in the low to mid 70s for the past seven or so years, as has OPV3 coverage (Fig. 6).[22] Coverage for most vaccines declined from 2014 to 2015, which some have attributed partly to the intensive response to vaccine-derived polio cases in 2015.[23] The WUENIC coverage rates for several vaccines given in early infancy rose significantly in 2016 – by eight points for DPT3 (from 69% to 77%), nine points for rotavirus (from 69% to 78%) and seven points for PCV 3 (from 69% to 76%), based on sharp increases in administrative coverage. One possible reason for the increase in coverage in the past year is the increased technical support from partners to the provinces and districts through a decentralization technical assistance strategy (see Section B. on Partner Support).

Measles vaccination coverage, however, remains the lowest – at 58%, using the WUENIC estimate – and in fact has decreased in the past few years.

Figure 6: WHO-UNICEF estimated national immunization coverage rates for Madagascar, 2009 to 2016 plus official country rates for DPT3



Looking at coverage rates by district, the Government reported that 94% of districts met the target coverage rate for DPT3-containing vaccine of ≥80% in 2016, up from 66% of districts in 2015. However, given the 16-point spread in national DPT3 coverage between the country and WHO-UNICEF estimates, this is likely an over-estimate. That is why the district coverage estimates are not considered valid according to WHO standards. Some of the lowest performing areas and the ones with the greatest number of unimmunized children are in large cities, including the capital of Antananarivo and the surrounding region of Analamanga, as well as the Southern and Western parts of the country, which are remote, have security problems and lack health services. The reasons given for the low rates in urban areas are many and include the large number of marginalized, poor and highly-mobile populations living in slums; insufficient outreach activities to reach them; a greater reliance of urban populations on the use of private health providers, many of which do not report immunization data to the Government; and the low use of immunization services among certain ethnic groups concentrated in cities (e.g., Indo-Pakistani communities).

One of the reasons for the increase in national DPT3 coverage from 2015 to 2016 has been a reduction in the dropout rate from the first to the third dose – from 12.7% in 2015 to 8.3% in 2016, using WUENIC estimates.

[22] OPV3 coverage rates, not shown in the figure, were 69-73% from 2010 to 2015 and rose to 76% in 2016.
[23] Joint Appraisal report 2017.

Among the major reasons for Madagascar not achieving its vaccination coverage goals are the following:

- **Insufficient access to health services and a lack of outreach activities**
  Around 40% of the Malagasy population lives beyond a five-mile radius of a health facility, limiting their access to health services, including routine immunizations. Poor transportation, high poverty rates and insecurity, especially an issue in "bandit" (*dahalo*) areas, also reduce their ability to obtain routine health services in many areas. Frequent outreach sessions to such communities, including urban slums, are critical to improving vaccination coverage. Monitoring data from WHO show, however, that only around 40% of basic health centers conduct outreach sessions at least once a month. One reason is the fact that more than half of basic health centers have a single health worker, requiring that he or she close the facility to conduct outreach activities. Another is the lack of funds, including those provided through the GAVI HSS grant (up to September 2016), flowing down to the districts to pay for transportation and other costs. Insufficient supervision of health workers and low motivation are also likely contributing factors. The Government has been building additional health facilities in under-served areas to improve access, including 55 basic health centers from 2014 to 2016, 30 of these with GAVI HSS support.[24]

- **An inadequate cold chain system**
  According to the WHO country office, health facilities with working refrigerators typically offer immunization services twice a week, while those without should hold sessions at least once a month. While 92% of health facilities were found to have cold chain equipment in 2016, an inventory conducted in June 2016 found that 35% of basic health centers – where the vast majority of vaccinations take place – had no working refrigerators.[25] The cold chain system in Madagascar, especially at the peripheral levels, has been described as "grossly insufficient" and a key bottleneck to improving immunization coverage and equity in the country.

  One major problem is that two-thirds of refrigerators in basic health centers run on kerosene, and due to delays in the release of funds for such operational costs from the central Government and to nation-wide kerosene shortages, as well as a lack of spare parts, these refrigerators are often not functioning. The country has been purchasing solar refrigerators for basic health centers – which now account of 25% of cold chain equipment in these facilities – and an CCEOP application to GAVI for the purchase of more than 1,200 more solar refrigerators was approved, but the grant is currently on hold, due to the auditing issues mentioned above.

- **Insufficient activities to identify, track and follow-up children for immunization**
  The Reach Every Child (REC) strategy to improve immunization coverage through microplanning, working with communities to identify children, defaulter tracking, regular immunization review meetings and other activities has been adopted by the Government. However, its implementation has been uneven across the country and inadequate in many districts, which often expect additional funding to carry out these activities.[26] In April 2016, 54 districts (47%) were identified for GAVI HSS support to implement the REC strategy. REC implementation has been affected by the suspension of GAVI HSS funding, and is mainly being carried out at the present time in 11 districts that are receiving financial support from UNICEF (eight districts) and CDC (three districts).

  In addition, it is likely that many of the health workers hired in recent years are not carrying out sufficient activities to identify unimmunized children and track those lost to follow-up, since they haven't yet been trained in immunization practices. The last such training was in 2013 and plans to conduct immunization training for health workers using PEF funds are currently on hold, due to the GAVI grant suspension. In the meantime, WHO staff in the field try to provide on-the-job training during supportive supervisory visits.

- **Lack of demand generation and community mobilization for routine immunization services**
  Madagascar has a network of community health volunteers (*agents communautaires*), as well as village health committees called COSAN (*comités de santé*), both of which can serve as a liaison between the health system and the community, and play an important role in microplanning, defaulter tracking and other efforts to improve immunization coverage. However, the involvement of community volunteers in immunization is low in some areas, only some of which offer them incentives; they often lack support and supervision from health workers at the local health center; and they lack skills and training in social mobilization and immunization. The development of a coalition of civil society organizations (CSOs) to strengthen community involvement in immunization activities (COMARESS), supported by the GAVI HSS grant, is described in Section B.

  It has also been suggested that the many polio SIAs that were conducted in the past few years negatively

[24] Presentation during the 2017 Joint Appraisal, Rapport de l'Evaluation Conjointe 2917: RSS et Performances des subventions GAVI.
[25] Joint Appraisal report 2016.
[26] cMYP 2016-2019.

impacted the routine immunization program, especially in 2015. According to the 2016 Joint Appraisal report, the polio campaigns disrupted outreach activities for the routine program, diverting resources meant for these activities and leaving little time to carry them out. The 2017 Joint Appraisal also attributes the decline in vaccination coverage from 2014 to 2015 in part to the polio campaigns. However, others, including the WHO country office, argue that these campaigns have helped strengthen the routine program in a number of ways. They have provided an opportunity to train health workers in immunization practices and provided supportive supervision (including during routine immunization sessions), strengthening their skills in such areas as vaccine and cold chain management. The campaigns also prompted the procurement of more than 200 solar refrigerators and the transport of routine vaccines to hard-to-reach areas. In addition, the SIAs helped children "catch up" on missed doses of other vaccines, as parents were referred to their local basic health centers, which were supplied ahead of time with all vaccines in the schedule and where routine EPI sessions were organized during the campaigns.

- **Poor quality of immunization data**
There is a 14-18 percentage point different in national coverage rates between the official government data – in the low to mid 90s for most vaccines – and the WHO-UNICEF estimates that ranged from 58% to 77% in 2016. The gap was greatest for measles vaccination coverage in 2016: 39 percentage points (97% vs. 58%). It is more difficult for health officials or partners to make the case with health policymakers to improve coverage or to accurately identify low-performing areas that need help when official coverage rates are so high. This is due to both nominator issues (e.g., over-reporting of vaccinations) and inaccurate population data for the denominators, often resulting in district-level coverage rates of more than 100%. There is also poor analysis and use of immunization data among EPI managers and health staff, due to a lack of training in this area. Madagascar continues to have parallel reporting systems – the national health management information system (HMIS) and the immunization-specific DVD-MT – which reportedly produce different results. The country has begun to address this issue by organizing monthly data analysis meetings at the national level (although they are not always held regularly), as well as quarterly review meetings at the regional and district levels.[27]

4.4 Goal 4: Introduce new and improved vaccines and technologies

The Madagascar EPI introduced three vaccines nation-wide since 2012, with GAVI support:

- **PCV 10** was introduced in October 2012, but there was a national stockout two months after its introduction. By 2013, however, vaccination coverage using the WUENIC estimates, was on par with DPT and other vaccines in the routine schedule (Table 1);

- **Rotavirus:** following its introduction in 2014, coverage was low at first (39%), due to problems with health workers determining age eligibility for the vaccine, as revealed by a post-introduction evaluation. This was corrected and coverage rose to the level of the other vaccines by the second year;

- **IPV** was introduced in May 2015 with the third OPV dose at 14 weeks of age, before the switch from the trivalent to the bivalent OPV in April 2016. Because of a global shortage of IPV– resulting in a national stockout for three and a half months – administrative and WUENIC coverage was only 30% in 2015, but rose to 65% by 2016. The reason that the rate in 2016 remained somewhat lower than for other vaccines (e.g., 77% for DPT3) is reportedly due to an initial misunderstanding on the part of some health workers about the need to provide both IPV and the third dose of OPV at the same time, instead of choosing between them. This is gradually being corrected as a result of a directive sent by the MOPH.

[27] Joint Appraisal report 2017.

Table 1: New vaccines introduced into the Madagascar routine immunization schedule in recent years and coverage rates

Vaccine	Date of introduction	Coverage rates (WUENIC)
PCV-10	October 2012	2013: 76% 2014: 72% 2015: 69% 2016: 76%
Rotavirus	May 2014	2014: 39% 2015: 69% 2016: 78%
IPV	May 2015	2015: 30% 2016: 65%

A GAVI-supported demonstration of HPV vaccine was conducted in two districts over two academic years (2013-2015) for girls in Grade CM2 (the equivalent of 5th grade) and 10 year old girls out of school. An evaluation and coverage survey revealed no major problems with the introduction, effective training at all levels, sufficient supplies of vaccines and injection supplies, and a coverage rate for three doses of 62% in the first year and 67% in the second year – well above the target of 50% coverage.[28] The Government is hesitant to make the decision to introduce the vaccine nation-wide at this time, given the financial implications and problems it is having in meeting its current co-financing obligations. It prefers that this decision be taking up by a NITAG, once one is established.

The introduction of MR vaccine is included in the cMYP, with SIAs planned for 2019. However, its introduction at that time is uncertain because of the additional financial burden that it will entail. This is another decision that may need to await the establishment of a NITAG.

[28] cMYP 2016-2019.

B. Partner support to address remaining challenges to meet the GVAP goals and targets

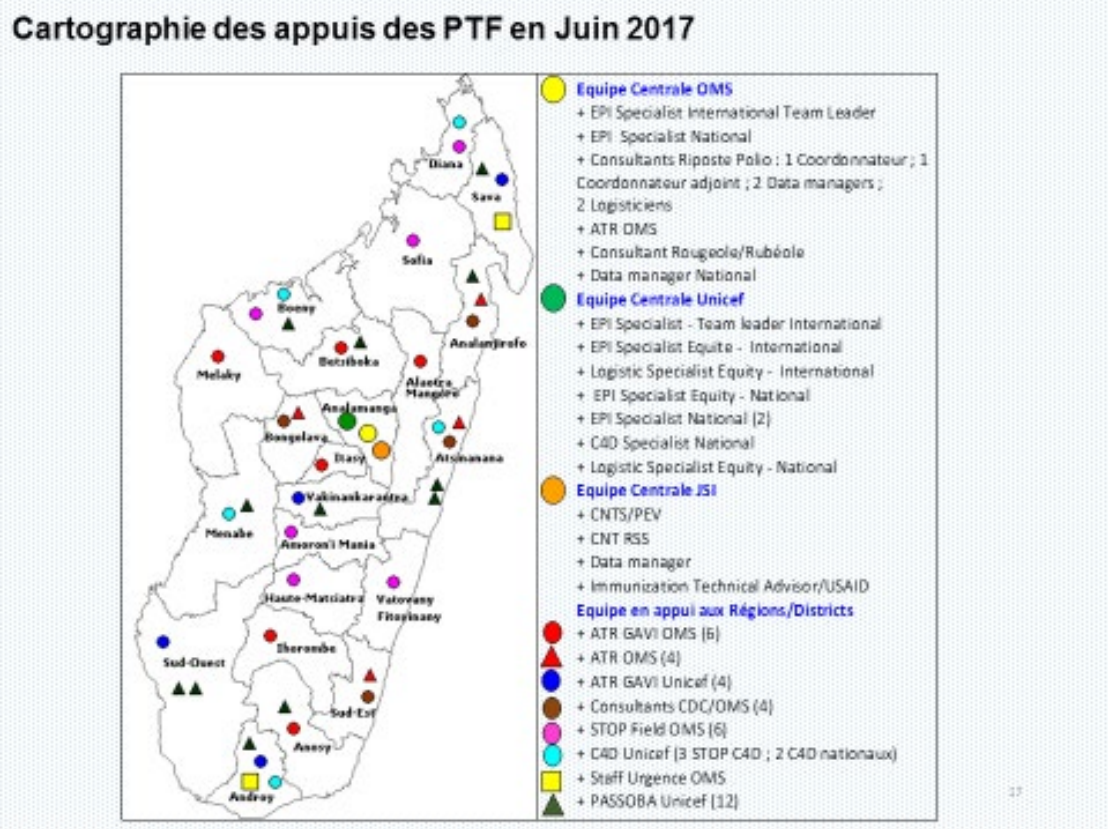
Partners continue to contribute the bulk of financing for the EPI, as well as provide critical technical support. Key partners working on immunization in Madagascar include WHO, UNICEF, JSI, and CDC ("stoppers"). An example of partner assistance is the support to improve the routine immunization program through the GAVI HSS 1 grant, which began in 2008 and targeted 74 districts with DPT3 administrative coverage rates of <60%. The broad range of support included rehabilitating and equipping 20 basic health; centers, hiring around 340 health workers on contract to work in health centers in under-served areas; procurement of vehicles and cold chain equipment; and training in a range of areas, including cold chain maintenance, data analysis and use, financial management, and microplanning/REC strategies.

Another major activity supported by the HSS 1 grant was the creation in 2014 of the Malagasy Coalition to Strengthen the Health and Immunization System (COMARESS) – a national network of 184 CSOs covering all 22 regions. A major aim of the network is to improve immunization coverage and equity by mobilizing local CSOs and communities to survey non-immunized children, find children lost to follow-up, and strengthen communities' skills in VPD surveillance. Following training workshops for COMARESS members, the CSOs have conducted a series of advocacy and communication/education activities to promote immunization, including meetings with an organization of religious, traditional and political leaders (APART), local-level public health officials and community members; home visits and group education sessions in the community; and the broadcasting of radio spots promoting immunization. Data from 65 basic health centers in areas where COMARESS is active show that in February/March 2017, 87% of children lost to follow-up were tracked and the number of non-immunized children was cut by more than 50%.[29]

A major development concerning partner support that began in 2016 was the decentralization of technical assistance through the creation of 10 regional hubs, which were set up initially for the polio outbreak response and to which international and national staff and consultants from WHO, UNICEF and other organizations were sent (Fig. 7). This TA team, funded by the polio program, the EU, USAID and the GAVI PEF/TCA, currently consists of 35 staff and consultants employed through WHO, UNICEF and the CDC, including several CDC STOP team members. In addition to being a key part of the polio response, they provide capacity-building and coaching to regional and district health teams to improve the routine immunization program. This on-the-ground support to the local EPI staff has enabled assistance that is tailored to local realities and has been considered critical to the continuation of EPI activities during the suspension of HSS funding.

[29] Joint Appraisal report 2017.

Figure 7: Location of partner staff and consultants in the regions, June 2017



According to WHO country office staff, the increase in immunization coverage between 2015 and 2016 can be attributed, at least in part, to this decentralized technical assistant workforce – all of which are provided with vehicles and other critical logistical support.

This partner workforce also played a major role in the rapid improvements to the polio/AFP surveillance system. WHO and UNICEF plan to extend this support to all of the country's 22 regions, if funds are available.

Acknowledgments

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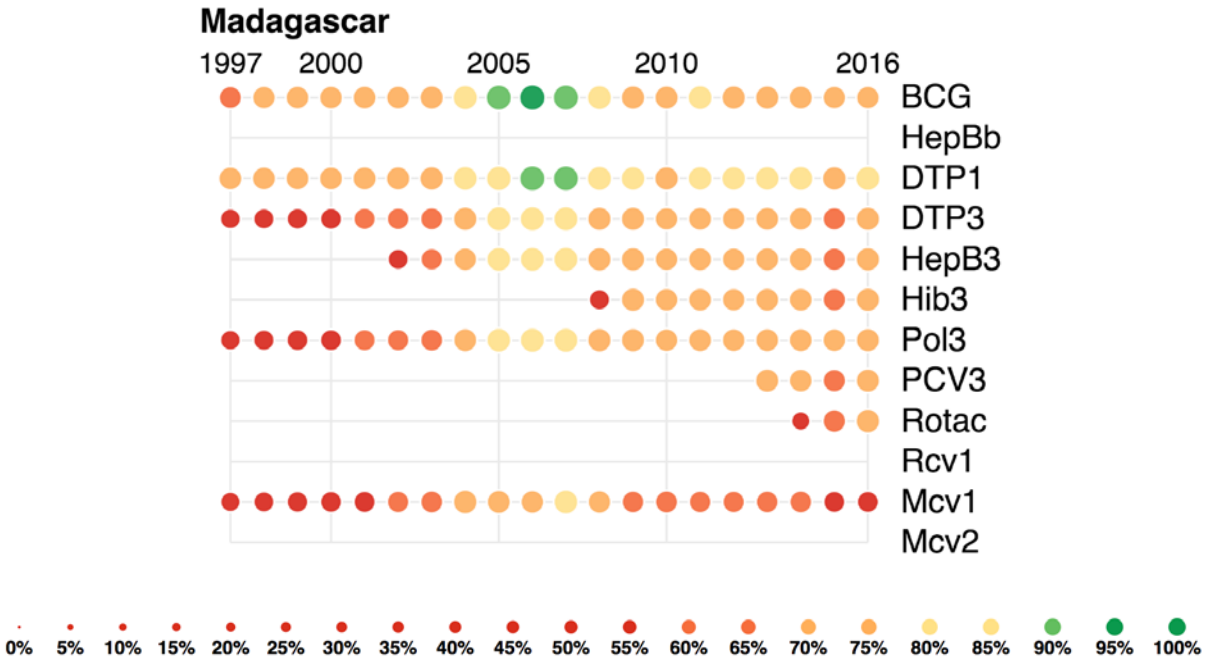
- Yolande Vuo Masembe, WHO/Madagascar immunization focal point
- Gill Mayers, WHO/EPI

Annex: Country Immunization profile

Annex 1: Immunization schedule 2016 in Madagascar

Vaccine	Schedule
BCG	birth;
DTwP-Hib-HepB	6, 10, 14 weeks;
HPV	1st contact; 6 months;
IPV	14 weeks;
Measles	9 months;
OPV	Birth; 6, 10, 14 weeks;
Pneumo_conj	6, 10, 14 weeks;
Rotavirus	6, 10 weeks;
TT	1st contact pregnancy; +1, +6 months; +1, +1 year;

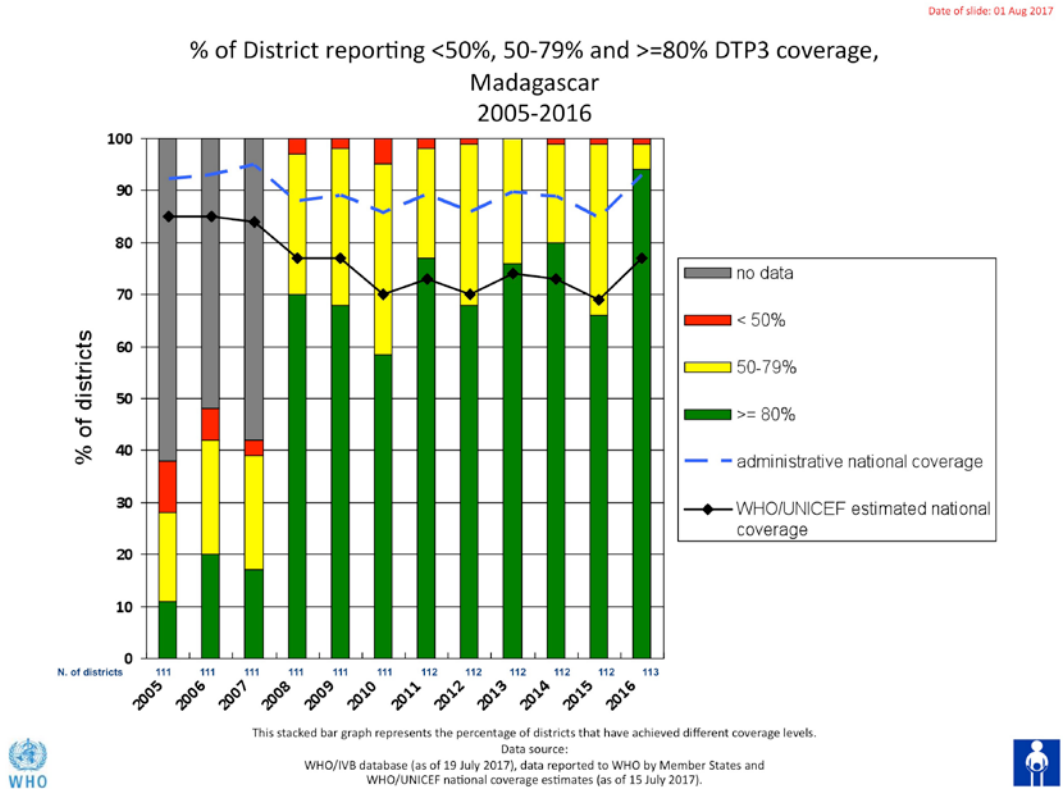
Annex 2: Immunization score card for Madagascar, 1997-2016



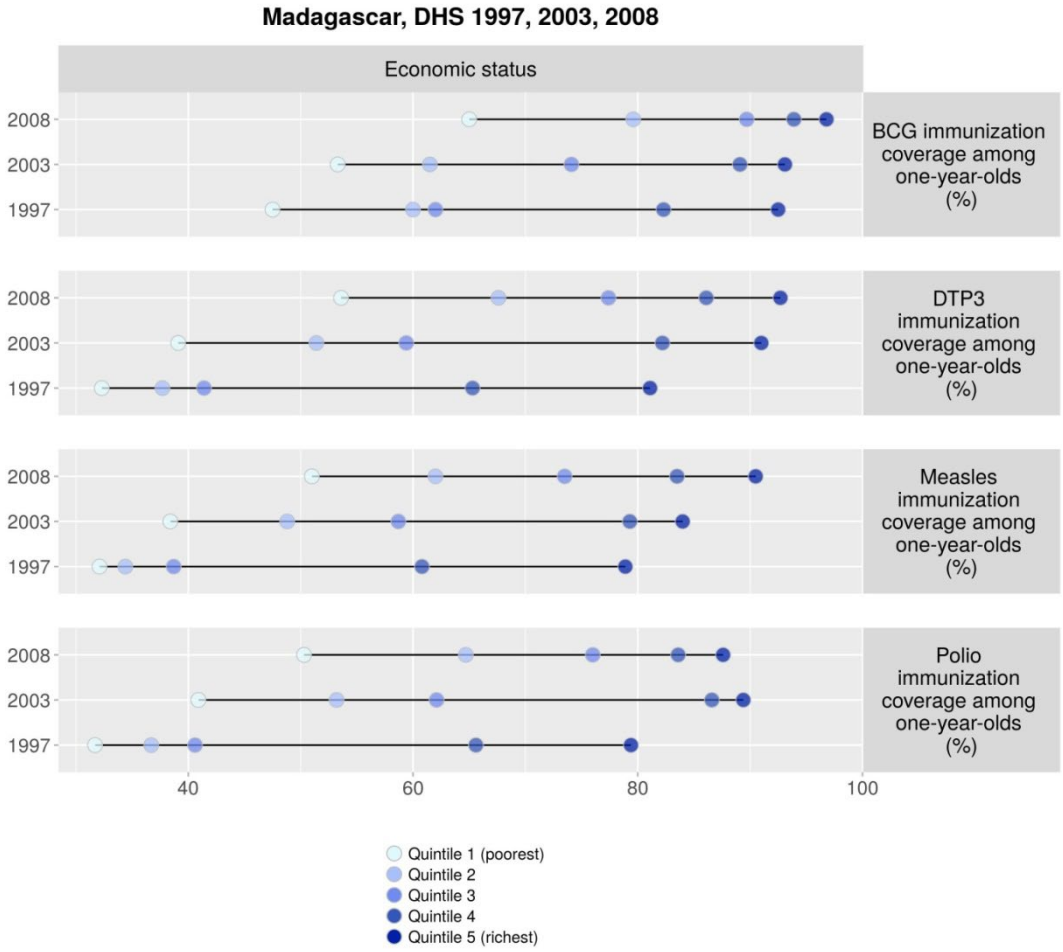
Annex 3: DTP Coverage for Madagascar, 2000-2016

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Doses DTP1			425343	576258	519321	544510	609725	657042	691580	674520	683024	717487	741021	748217	792920	755390	814548
Doses DTP3	474409	330199	348617	506991	450171	548916	571390	597230	600065	625041	622667	666111	660797	700172	715041	673358	757993
Dropout rate			18	12	13	-1	6	9	13	7	9	7	11	6	10	11	7
% coverage DTP3 COE*	80	37	62	87	75	92	93	95	88	89	85	89	86	90	89	85	93
% coverage DTP3 WUENIC	57	60	62	66	78	85	85	84	77	77	70	73	70	74	73	69	77

Annex 4: DTP3 district coverage rates, in Madagascar, 2005-2016



Annex 5: Vaccine coverage by wealth quintiles in Madagascar



Source: Health Equity Assessment Toolkit (HEAT): Software for exploring and comparing health inequalities in countries. Built-in database edition. Version 2.0. Geneva, World Health Organization, 2017.
Data source: The disaggregated data used in this version were drawn from the WHO Health Equity Monitor database (2016 update) which may have been revised or updated since that time. The most recent version of that database is available on the WHO website.

NIGERIA
Follow-up report

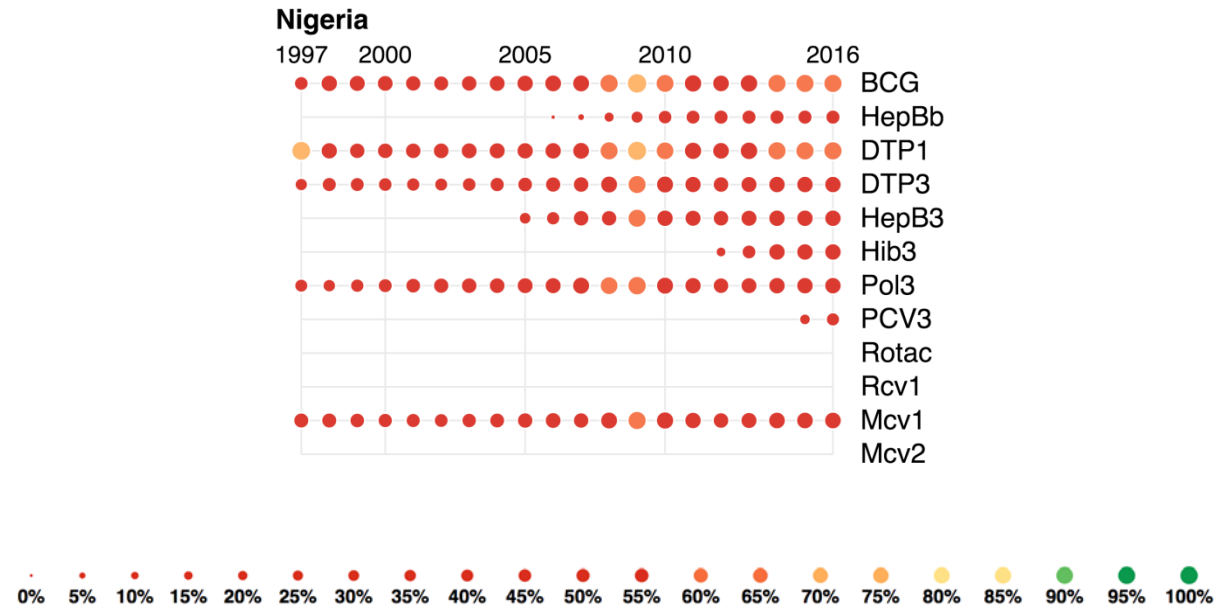
Area	Indicator	Nigeria
Socio-demographic	GNI /capita (US$) 2016	2,820
	WB Status	Lower Middle Income
	Infant mortality (<12 M) 2015 UN IAG CME	69 /1 000
	Gavi Status	Eligible (entered the accelerated transition phase in Jan 2017)
	Total Population 2016	185,989,640
	Birth Cohort 2016	7,239,712
	Surviving Infants (JRF) 2016	6,754,000
1. Interrupt wild poliovirus transmission	Transmission Interrupted	No, 4 new WPV cases detected in 2016
	Risk of late detection: Percent of adequate stool specimens (Rolling 12m) Target > 80%	99%
	Risk of late detection Non polio AFP rate (Rolling 12m) Target > 2	25/100,000
	Risk of spread after importation: % of children 6M-59M having received less than 3 doses in the last year before occurrence case/environmental positive	2%
2. Neonatal tetanus elimination	TT2 coverage (reported 2016)	47%
	Protection at Birth against tetanus (WUENIC 2016)	63%
	Last SIAs conducted in the country	2016
	Elimination validation date	Not yet validated
3. Measles Elimination	Coverage MCV1 (2016 WUENIC)	51%
	Coverage MCV2	Not in schedule
	Percentage of districts with MCV1 coverage >=95% (2016 JRF)	56%
	Last national SIA	2016
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Rubella vaccine coverage	Not introduced
	SIAs planned?	Not yet
5. Coverage with 3rd dose of DTP-containing vaccine	National coverage (WUENIC 2016)	49%
	Drop-out rate DTP1 to DTP3 (2016 WUENIC) (DTP1-DTP3)/DTP1*100	23%
	Actual numbers of children who dropped out (2016 WUENIC)	1,013,100
	Difference between poorest and richest quintile in DTP3 coverage (2013 data)	72 percentage points
	% of districts reaching 80% coverage (2016 JRF)	69%
6. Coverage with all vaccines in the national immunization schedule	National coverage (2016 WUENIC)	BCG: 64% DTwP-Hib-HepB: 49% MCV1: 51% PCV3: 26% Pol3: 49% YF: 51%

Area	Indicator	Nigeria
7. Introduction of new vaccines	New vaccines introduced	Pentavalent: 2012-2014; PCV: 2014-2016; IPV in 2015 and 2016. Meningitis A in routine program planned for 2017 and Rotavirus for 2018.
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	2010: 130.3 2015: 108.8 (16.5%)
9. NITAG	NITAG established?	Yes (meeting all 6 criteria in 2016)
10. Government expenditure on routine immunization per live birth (USD)	Baseline 2010-2011 and average for 2015-2016 (% change)	4.02 to 22.79 (467%)

Summary points

- The routine immunization program was affected by the suspension of federal funds to states for the past two years and the suspension of GAVI cash support since 2014.
- Series of national and sub-national polio SIAs were conducted in response to four wild polio virus cases found in 2016, including in conflict areas using innovative delivery strategies.
- The government is planning immunization program improvements based on results of a new national survey (MICS/NICS) showing lower than expected vaccination coverage rates.
- Routine immunization program improvements in 2016: rollout of electronic health management information system in 20 states and intensive WHO-led supportive supervision visits made to 6,300 health facilities.
- Innovative agreements with states to increase their funding for immunization has proven successful in the first two states, with 4 more states entering into similar agreements.

Immunization score card, Nigeria, 1997-2016



Update on country situation and recent developments affecting the immunization program

- **Nigeria's economic crisis continues:** With global oil prices still relatively low and oil revenues accounting for around 70% of the country's consolidated revenues, Nigeria continues to experience an economic crisis. This was further exacerbated in June 2016 when the naira was devaluated, losing 37% of its value in the past year (from 198 naira per USD in June 20, 2016 to 314 naira per USD one year later).[1] As a result of the economic situation, the federal government has not provided any direct funding for health to the states for the past two years, despite its commitment to allocate 1% of consolidated revenues each year to the states under the National Health Act of 2014, as a key strategy in meeting its goal of providing universal access to primary health care services through its "primary health care under one roof" policy. Consequently, health workers in several states are still not receiving salaries and health facilities lack funds to conduct outreach activities, pick up vaccines from local government area (LGA) stores, or cover other critical operational costs – all negatively affecting the delivery of immunization services and undoubtedly suppressing vaccination coverage rates.

- **The continued suspension of GAVI cash support, including HSS2 grant funding:** GAVI is awaiting reimbursement from the Government of $5.4 million in misused or unaccounted for funds and the resolution of audit issues before it can lift the suspension, which went into effect in March 2014. While several critical activities have continued under the HSS2 grant with funds channeled through UNICEF and other partners – including measles follow-up vaccination campaigns and the purchase of solar (SDD) refrigerators – the suspension has caused delays in other activities, such as the implementation of mini catch-up meningitis A campaigns and the introduction of this vaccine into the routine immunization schedule.

- **A shift in GAVI and partner support:** Nigeria entered the "accelerated transition phase" of GAVI support in January 2017, with support scheduled to end entirely by the end of 2021. This normally means that this year (2017) is the last year that the Government can apply for support for new vaccine introductions and its co-financing share will increase by 20% each year until it reaches 100% by the end of the five-year transition period. However, GAVI has selected Nigeria for its new Country Engagement Framework (CEF) approach, which allows more flexibility in designing an assistance program that looks at the country's needs as a whole and that involves an integrated work plan and budget for all types of GAVI support (e.g., new vaccine support, health system strengthening, optimizing the cold chain system). The Government is in the process of developing an Immunization Strategy – a long-term plan that will determine the design of the CEF program and that will focus on increasing coverage and equity of routine immunization services, working with state governments that are responsible for financing and implementing immunization activities. This new type of support may go beyond the normal GAVI programs and may lead to a delay in the country's transition from GAVI support.

- **New leadership at the agency managing the national immunization program:** A new Executive Director joined the National Primary Health Care Development Agency (NPHCDA) in January 2017, setting out renewed priorities to strengthen the country's routine immunization program, improve the quality and management of immunization data, eradicate polio, and implement the country's PHC agenda. Along with the Minister of Health, he has accepted the immunization coverage estimates from a recently completed survey (see next section) – which are lower than the Government's official estimates and the 2016 WUENIC estimates – and is using these new estimates as the basis for planning program improvements.

- **Vaccine-preventable disease outbreaks and response:** Much of the focus of the immunization program in the past year has been on conducting vaccination campaigns in response to cases of wild polio virus (type 1) discovered in mid-2016 in Borno state and to cases of vaccine-derived polio virus (VDPV) type 2 following the campaigns. In addition, an outbreak of cerebrospinal meningitis caused by meningitis C began in December 2016, spreading to six states and causing more than 8,000 suspected cases and 745 deaths by April 17, 2017. The outbreak prompted an emergency response involving vaccination campaigns using meningitis C-containing vaccine donated by GAVI and other donors.

[1] Focus Economics, Nigeria: Naira depreciates drastically following scrapping of currency peg in June, August 18, 2016. Found at: http://www.focus-economics.com/countries/nigeria/news/exchange-rate/naira-depreciates-drastically-following-scrapping-of-currency.

Key achievements, activities and progress towards the GVAP goals in the past year

Combatting polio

The Nigerian immunization program conducted two scheduled national immunization days (NIDS) and two sub-national immunization days (SNIDs) (in the North) from January to May 2016. In response to cases of VDPV, including 285 cases of type 2 VDPV from January to May and four cases of wild polio virus discovered in Borno state in July,[2] a series of outbreak response campaigns using a variety of vaccines (trivalent, bivalent, monovalent OPV and some IPV) was conducted throughout the year and has continued into 2017 (Fig. 1). The cases of VDPV type 2 reflect the country's low OPV coverage rates through the routine program.

The immunization program, with WHO and other partner support, carried out a series of innovative efforts to find and reach children in high-risk and security-compromised areas in the North of the country. These intensive efforts included:

- Combining geographic information system (GIS) data with a Vaccination Tracking System that follows the movement of vaccinators during polio campaigns in order to identify missed and poorly-covered population settlements that were then followed up;

- Engaging security forces to enable vaccination in security-compromised areas in Borno state. Starting in August 2016, Rapid Access Vaccination Teams – consisting of medical personnel, civilian joint task force personnel and, where necessary, members of the military – systematically visited areas affected by the Boko Haram insurgency to vaccinate children against polio, using tactics such as "hit and run", in which the normally four-day campaigns are condensed to two days (using additional personnel) in previously inaccessible areas where there have been WPV cases. In some cases, soldiers administer the vaccines themselves after receiving training. Through the Rapid Access Teams and Reach Every Community activities, more than 53,000 children were vaccinated against polio in the state in 2016.[3]

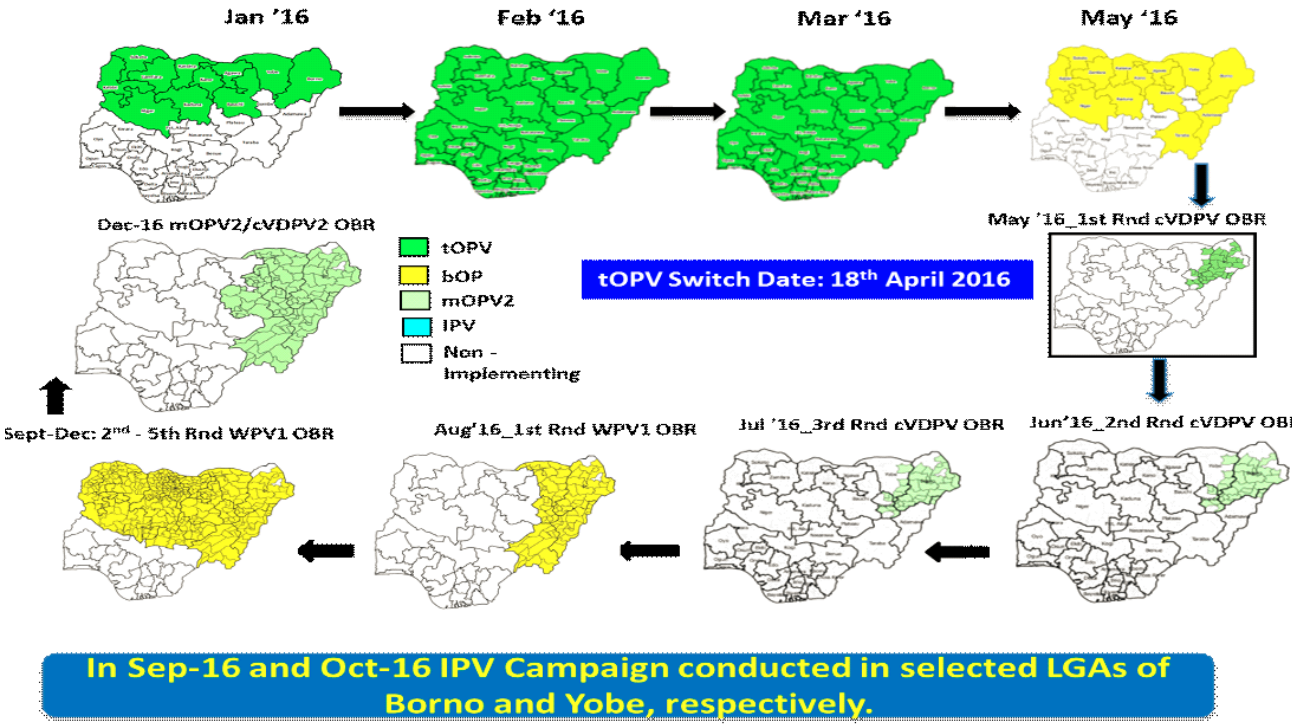
- Sending vaccination teams to markets, transit points, internally-displaced persons (IDP) settlements and nomadic areas, and other special interventions that reached 4.2 million children in the country's Northeast zone in 2016.[4]

- Conducting integrated immunization services that combine polio vaccination (using OPV or IPV) with measles vaccination, TT vaccination and anti-malarial treatment for pregnant women (IPT), and the distribution of vitamin A and deworming medicine in 67 hard-to-reach LGAs in four states. More than 1.8 million children received OPV through this strategy.

Considerable efforts to improve the country's AFP/polio surveillance system to prevent further "surprises" like the detection of WPV cases also took place in 2016. Training and sensitization activities on AFP/polio surveillance were conducted in all 36 states and the federal capital territory (FCT) for more than 47,000 disease surveillance officers; community, IDP camp and nomadic informants; state epidemiologists; and others, as well as special training for Civilian Joint Task Force members in security-compromised areas. The AFP surveillance training focused on improving the quality of stool collection and transportation. As a result, the number of reported AFP cases rose 69% between 2014 and 2016 (from 10,506 to 17,803) and by 130% in Borno state, with 99% of LGAs meeting the two key surveillance indicators (a non-polio AFP rate of ≥3 per 100,000 children < 15 years old and a stool adequacy rate of ≥80%).[5]

[2] WHO, Nigeria Weekly Polio Update, Week 12 (20-26th March 2017).
[3] World Health Organization Nigeria Country Office. Immunization, Vaccines and Emergencies Annual Report, 2016.
[4] Idib.
[5] Idib.

Figure 1: Polio SIAs conducting in 2016 in Nigeria*



* Source: Nigeria WHO country office. Immunization, vaccines & emergencies annual report, 2016.

Intensifying routine immunization in low-performing states, including those with prolonged health worker strikes

With funding from the Gates Foundation and WHO support, routine immunization intensification – involving strengthening of microplanning, increasing mobile outreach sessions, intensifying social mobilization activities and supportive supervision – was implemented in 43 LGAs in three states. Three rounds of Local Immunization Days, during which all vaccines in the immunization schedule were provided, were conducted with support from the Canadian government in 78 LGAs in another seven states that have experienced high attrition rates of health workers. The LIDs mostly took place in late 2016 and thus may not be entirely reflected in the coverage rates found in the recent MICS/NICS survey discussed below.

Completion of a national vaccine coverage survey and government acceptance of its results

After a year delay, the National Bureau of Statistics completed a combined Multiple Indicator Coverage Survey (MICS) and National Immunization Coverage Survey (NICS). The results show considerably lower rates than the 2016 WHO-UNICEF estimates (WUENIC) (Table 1). The Government has accepted the results, which are being used to identify areas most in need of improvement and to inform the development of the country's Immunization Strategy.

Table 1: Comparison of the 2016 NICS/MICS vaccine coverage estimates (%) with other estimates

Vaccine	2016 NICS/MICS	WUENIC 2016 estimates	Official country estimates (2016)
BCG	53	64	58
Pentavalent 3	33	49	45
Measles-containing vaccine (1 dose)	42	51	43
Polio 3	33	49	37

Advocacy efforts by the National Immunization Financing Task Team (NIFT) for government funding of immunization

The NIFT was created in 2015 by the NPHCDA, with technical assistance from Johns Hopkins University's IVAC project, to coordinate efforts by partners, civil society organizations, and government entities in order to advocate for sufficient and sustainable financing of immunization in view of the country's transition from GAVI support. The coalition, made up of members of the MOH, NPHCDA, local and international foundations (CHAI, Gates), medical associations, among others, analyzes the financial needs and funding gaps of the immunization program and conducts high-level advocacy with members of the legislature, Ministry of Finance, and the private sector to raise the priority of the immunization budget and awareness of future funding gaps. The NIFT successfully prevented the National Assembly from cutting the immunization budget for 2015/2016. It is now advocating for the creation of a National Immunization Trust Fund to increase the sustainability of immunization financing, which is slated to be debated in the National Assembly.

Committing states to adequately finance routine immunization

In last year's GVAP country report for Nigeria, we described the agreements that two Northern states (Kano and Bauchi) had entered into with two foundations (Gates Foundation and the local Dangote Foundation) to adequately fund operational costs for routine immunization and to ensure that at least one health facility per ward could store vaccines. Over the three years of the agreement, cost-sharing shifts from the foundations paying 75% (largely for cold chain equipment and other capital costs) and the state paying 25% to the state covering 100% of the costs by the end of the third year. Both states have fulfilled their commitments and are 100% self-financing. Four additional states with low-performing immunization programs (Yobe, Borno, Kaduna and Sokoto) have since signed similar MOUs. As a result of the agreement in Kano state and support from the foundations, the percent of wards with solar cold chain equipment rose from 11% to 94% (a 7.5 fold increase), the number of walk-in cold rooms increased from one to six, and the availability of vaccine stock in health facilities with refrigerators rose from 55% to 99%.[6] Another key outcome of the Kano program has been the active participation of the traditional governance system in generating community demand for routine immunization. This has included the participation of the emirate council, including the Emir, in developing and agreeing to a community engagement strategy, the involvement of traditional leaders in collecting data on community engagement activities, and the training and sensitization of thousands of TBAs and community health volunteers in baby tracking and routine immunization.

Using surveillance data to advocate to state governments to strengthen immunization services

The Health Minister has used disease surveillance and outbreak data provided by WHO to push state governments to increase their funding for operational costs. As a result of an MOH team visit, the state of Bayelsa mobilized resources to purchase cold chain equipment, overcoming a major obstacle to the provision of routine immunization in the state.

[6] Presentation on "MOU to strengthen routine immunization in Kano State", January 10, 2017.

Addressing the issue of immunization data quality

This has been a major obstacle to improving routine immunization performance, since administrative data often show coverage rates that are 20-30 percentage points higher than the WHO-UNICEF estimates, and up to 50 points higher than the recent NICS/MICS estimates. WHO, CDC and the national STOP team are working with the MOH to replace the current paper-based EPI reporting system that used the DVD-MT platform with an integrated HMIS system (that uses the DHIS-2 platform) and includes a routine immunization module. This new electronic system, already rolled out in 28 states, will enable real-time monitoring of immunization program performance to identify and address problems in a timely manner, down to the specific health facility. Partners also supported the development of a data quality improvement plan, which was approved by the ICC in May 2017 and will be incorporated into the country's new Immunization Strategy being prepared to mobilize new partner support.

Conducting supportive supervisory visits to strengthen routine immunization

WHO polio surge staff conducted more than 40,000 integrated supportive supervisory visits to over 6,300 health facilities throughout the country in 2016 (most in Northern states). The visits involve the use of electronic checklists to obtain real-time data on microplanning, social mobilization activities, cold chain maintenance, temperature monitoring and other critical elements of immunization services, enabling immediate follow-up when problems are identified. According to the WHO Country Office, these visits have resulted in noticeable improvements, including an increase in microplanning and better temperature monitoring in many places. Government counterparts accompany the WHO staff on these visits to order to make them a sustainable, routine practice.

Table 2: An update on progress against the GVAP goals

Polio eradication	Two NIDs and a series of SNIDs conducted in 2016 and 2017, many of the SNIDs in response to 4 WPV cases found in Borno state in July 2016 and to cases of VDPV (type 2). A variety of strategies were used to find population settlements, track and vaccinate children in security-compromised and other hard-to-reach areas and among IDPs. AFP/polio surveillance has been enhanced through wide-scale training of health workers at all levels, as well as community volunteers.
MNT elimination	The last of 3 rounds of Td campaigns in 61 high-risk LGAs in six states were conducted in September 2016. Pre-validation exercise in 1 zone (Southwest) found that 8 wards (in Oyo and Ogun states) did not meet the criteria for elimination and will undergo additional Td campaigns.
Measles elimination and rubella/CRS control	National campaigns in 2 phases were conducted in late 2015 and early 2016 for children 5-59 months of age. Nearly 20,000 suspected cases (11,858 confirmed) were reported, mainly in the North. The country has requested GAVI support for a nation-wide campaign in 2017/18. No firm plans yet to introduce MR vaccine or to set up rubella/CRS surveillance. Possibility of adding a second measles dose to the schedule to be discussed in the development of the Immunization Strategy and CEF. Surveillance: the national rate of non-measles febrile rash illness was 5.3/100,000 children in 2016, with 5 out of 37 states not meeting the target of at least 2/100,000.
Immunization coverage (90% nation-wide and 80% in all districts for all vaccines)	New NICS/MICS data show lower coverage than previous estimates. A series of special activities were conducted in selected, low-performing states (e.g., routine immunization intensification and local immunization days) to increase coverage, with partner support.
New vaccine introductions	IPV introduced nation-wide over 8 months in 2015 and last phase (3) of PCV introduction implemented in 14 states in July 2016. Meningitis A: mini-catchup campaigns and introduction into routine program planned for 2017, but is on hold until financial audit completed and issues resolved. Rotavirus: introduction with GAVI support approved by GAVI for 2018. Introduction on hold until financial issues resolved. HPV: introduction is being discussed as part of the Country Strategy/CEF process, but there are as yet no concrete plans to introduce the vaccine. The Government is also examining the financial implications of HPV introduction as it graduates from GAVI support.

Acknowledgments

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- Rachel Seruyange, Immunization Focal Point, WHO Country Office
- Karan Singh Sagar, Senior Country Manager, GAVI
- Jan Gravendonk, WHO EPI Technical Officer

PAKISTAN
Follow-up report

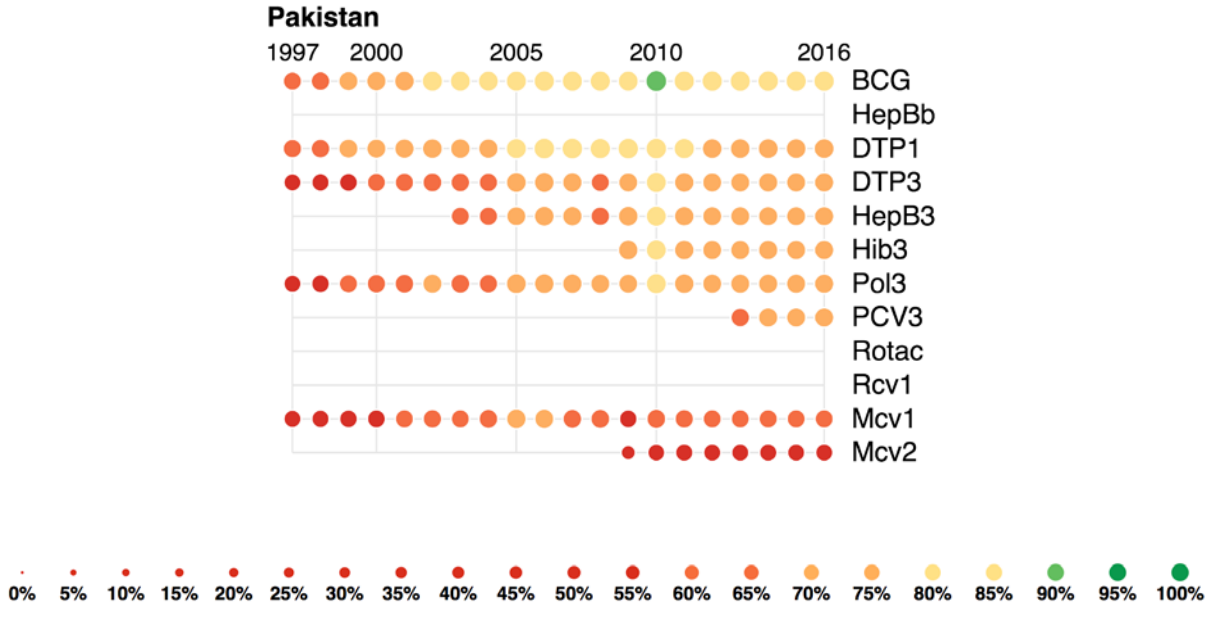
Area	Indicator	Pakistan
Socio-demographic	GNI /capita (US$) 2016	1,440
	WB Status	Lower Middle Income
	Infant mortality (<12 M) 2015 UN IAG CME	66/1 000
	Gavi Status	Eligible
	Total Population 2016	193,203,476
	Birth Cohort 2016	5,451,869
	Surviving Infants (JRF) 2016	5,093,857
1. Interrupt wild poliovirus transmission	Transmission interrupted	No
	Risk of late detection: Percent of adequate stool specimens (Rolling 12m) Target > 80%	87%
	Risk of late detection: Non polio AFP rate (Rolling 12m) Target >2/100,000	13/100,000
	Risk of spread after importation: % of children 6M-59M having received less than 3 doses in the last year before occurrence case/environmental positive	1%
2. Neonatal tetanus elimination	TT2 coverage (reported 2016)	78%
	Protection at Birth against tetanus (WUENIC 2016)	80%
	Last SIAs conducted in the country	2015
	Elimination validation date	Not yet validated nationally (validated in Punjab province in 2016)
3. Measles elimination	Coverage MCV1 (2016 WUENIC)	61%
	Coverage MCV2	53%
	Percentage of districts with MCV1 coverage >=95% (2016 JRF)	35%
	Last national SIA	2015
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Rubella vaccine coverage	Not introduced
	SIAs planned?	No
5. Coverage with 3rd dose of DTP-containing vaccine	National coverage (WUENIC 2016)	72%
	Drop-out rate DTP1 to DTP3 (2016 WUENIC) (DTP1-DTP3)/DTP1*100	10%
	Actual numbers of children who dropped out (2016 WUENIC)	356,570
	Difference between poorest and richest quintile DTP3 coverage (2012 data)	58 percentage points
	% of districts reaching 80% coverage (2016 JRF)	64%
6. Coverage with all vaccines in the national immunization schedule	National coverage (2016 WUENIC)	BCG: 85% DTP3-HepB3-Hib3: 72% MCV1: 61% MCV2: 53% PCV3: 72% Pol3: 72%

Area	Indicator	Pakistan
7. Introduction of new vaccines	New vaccines introduced	PCV in 2012; rotavirus vaccine partially introduced in 2016, nation-wide introduction planned for late 2017.
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	2010: 91.8 2015: 81.1 (11.7%)
9. NITAG	NITAG established?	Yes (meeting all 6 criteria in 2016)
10. Government expenditure on routine immunization per live birth USD	Baseline 2010-2011 and average for 2015-2016 (% change)	9.12 to 5.77 (-37%)

Summary points

- Funding to the federal and provincial governments for immunization has increased and is more assured as a result of the National Immunization Support Project (NISP) and a pooled health funding mechanism (Multi-Donor Trust Fund), both launched in 2016.
- More than 3,000 new vaccinators have been deployed as a result of this new funding, and more than 22,000 Lady Health Workers trained to provide immunizations to further expand the immunization workforce.
- Elimination of maternal and neonatal tetanus validated in 2016 in Punjab province – home of 52% of Pakistan's population.
- Nearly all of the country's districts (140 out of 149) have completed immunization data quality assessments and prepared data quality improvement plans in the past year, with WHO technical support.
- As of July 2017, seventeen new technical officers, funded by the GAVI PEF and employed through WHO and UNICEF, are providing technical assistance to federal and provincial governments to improve immunization coverage and equity.

Immunization score card, Pakistan, 1997-2016



Update on country situation and recent developments affecting the immunization program

- **Continued measles outbreaks.** There have been dozens of measles outbreaks in the past year and some reported deaths. In response, each province conducted a measles risk analysis, with WHO technical assistance, and mop-up campaigns in areas identified by the analyses as at high risk, though these have been patchy. A well-planned mop-up campaign targeting 1.5 million children in Karachi is scheduled for the 3rd and 4th weeks of August 2017, to be funded by Sindh province (for the vaccine) and GAVI (for operational costs).

- **An increase in assured funding for immunization.** The immunization program and all donor-supported projects are funded through the development budget, which unlike the regular budget, varies from year to year and is vulnerable to budget cuts and delays in the release of funds from the Ministry of Planning. This has especially been the case for preventive health programs, including the EPI, which have a lower priority than, for example, hospital services. This situation improved considerably in 2016 with the launch of the National Immunization Support Project (NISP) (2016-2020), which is aimed at improving equitable coverage of immunization services in children under the age of two years, and the establishment of a Multi-Donor Trust Fund (MDTF), a pooled funding mechanism managed by the World Bank through which donor funds for the NISP, including GAVI HSS, are distributed.

  To access NISP and other development budget funds, the federal government and each of the four provinces must complete and receive approval for a Planning Committee document (PC-1), which is a detailed five-year workplan and budget. A key development in the past year has been the approval of the federal and all provincial PC-1s for 2015/16 to 2019/20, thus providing a direct funding stream to the immunization program for staffing, the procurement of vaccines, and other program activities. As a result of PC-1 funding, more than 3,000 new vaccinator positions have been created and filled, mainly in Punjab and Khyber Pakhtunkhwa (KP) provinces. In addition, the program will also be receiving $34 million worth of cold chain equipment in the coming year, to be funded through the MDTF, in part with GAVI CCEOP funds. This funding will cover the government's 50% contribution required under the CCEOP.

Key achievements, activities and progress towards the GVAP goals in the past year

Validation of maternal and neonatal tetanus (MNT) elimination in Punjab province

MNT elimination was validated by WHO in November 2016 in Punjab province, which makes up 52% of Pakistan's population of 189 million people. The validation followed a Lot Quality Assurance-Cluster Sampling (LQA-CS) survey conducted among nearly 11,000 households in the province's two districts considered to be at highest risk of MNT due to their low TT coverage rates and/or poor cord care practices.[1] The results of the survey, which found no neonatal tetanus (NNT) deaths in the prior 12 months, coupled with high TT2 coverage rates (>90%) and moderate to high use of skilled birth attendants in these two districts, led the validation team to conclude that NNT has been eliminated in these districts and, by extension, in the province as a whole.

The Punjab government used a multi-pronged strategy to achieve MNT elimination, which included increasing routine TT coverage among pregnant women, improving NNT surveillance, and conducting a series of TT campaigns for women of child-bearing age over the past 15 years. These included SIAs conducted in one

[1] WHO, Maternal and neonatal tetanus elimination: validation in Punjab Province, Pakistan, November 2016, *Weekly Epidemiological Record*, 20 January 2017; 92(3):21-36.

to three rounds in 11 districts assessed to be at medium or high risk (out of the province's 36 districts). The SIAs were implemented in phases from 2011 to 2015, due to political unrest and insecurity in some districts. Pakistan's other three provinces (Sindh, Balochistan and KP) and four territories have yet to eliminate the disease. According to a review of MNT indicators conducted in 2013, there are still 60 districts in the country at high risk of MNT.

Augmenting and improving the skills of the workforce providing vaccinations

Considerable progress has been made in the past few years to increase the numbers of health workers who can administer vaccinations and enhance their skills. Through the PC-1 budget process, the provinces of Punjab, KP and Balochistan recruited and trained more than 3,000 new vaccinators since 2016 in order to increase the delivery of routine immunization services and coverage rates. In addition, 22,000 of the country's 110,000 lady health workers (LHWs) – who play a key role in social mobilization and health education in Pakistan and serve as a link between health facilities and the community, especially in rural areas – have been trained, with GAVI support, to administer vaccinations. This training consisted of six days of classroom instruction, followed by six months of on-the-job training and supervision. The extent to which LHWs are providing vaccinations, however, is difficult to determine, since the reporting mechanism doesn't include information on vaccinations done by different cadres of health workers, and in addition, there is no uniform strategy yet in place on how to use LHWs for routine immunization.

To improve the skills of immunization program managers, district and sub-district managers from every district in the country – with a target of at least four people per district – are receiving mid-level manager (MLM) training in immunization, using unspent GAVI funds. Around half of the approximate 600 EPI managers have been trained thus far and Punjab province has already met its target of 80% of its EPI management staff receiving MLM training. However, the number of technical EPI positions remains inadequate in most provinces and territories; there especially lacks specialists in data management, as well as in communications, EPI service delivery, and cold chain/logistics management.

Assessing and planning improvements in immunization data quality and use

The quality and use of immunization data has been a long-standing problem in Pakistan, with a difference between official government and WUENIC estimated coverage in 2016 of 14 percentage points for DPT3 (86% vs. 72%), and a similar point spread for other vaccines. Key factors contributing to this problem are inaccurate population data for the denominators, since there hasn't been a census since 1998, and the non-registration of urban slum areas. Updated population figures will become available once the 2017 census is completed. Data quality assessments (DQAs), led by WHO/EMRO, started in 2016 at the national and provincial levels, followed by the development of a national data quality improvement plan (DQIP), and the preparation of DQIPs in each of the provinces. This has been followed by assessments and DQIPs in 94% of the country's districts. This activity has been funded by provincial governments and unspent GAVI funding.

Integrating the management of polio and routine immunization activities

In Pakistan, the management of the polio eradication program and the routine immunization program is totally separate at the central, provincial and district levels. The polio program is run not from the Ministry of Health, but directly out of the Prime Minister's office, and at the provincial and district levels, by the general administration. The EPI is managed by the MOH and by provincial and district health officials. The management of the polio program remains highly centralized, while the EPI – like the health system overall – has been decentralized, with funding provided through the provincial PC-1s, and provinces now responsible even for purchasing vaccines through a central pooled procurement mechanism. This set up results in parallel systems for disease surveillance, training, financing, M&E, technical guidance (i.e., separate TAGs) – with little or no coordination or collaboration between the two.

At the health facility level, however, the same vaccinators and other health workers are used to implement the polio campaigns and provide routine immunization services. The campaigns, which take place nearly every month, take up almost half of the vaccinators' time – for training, organizing and implementing the three-day campaigns, conducting mop-ups and so on – during which outreach sessions for routine immunization services cease. Some districts have stopped using vaccinators based at health centers for the polio SIAs, but many still do.

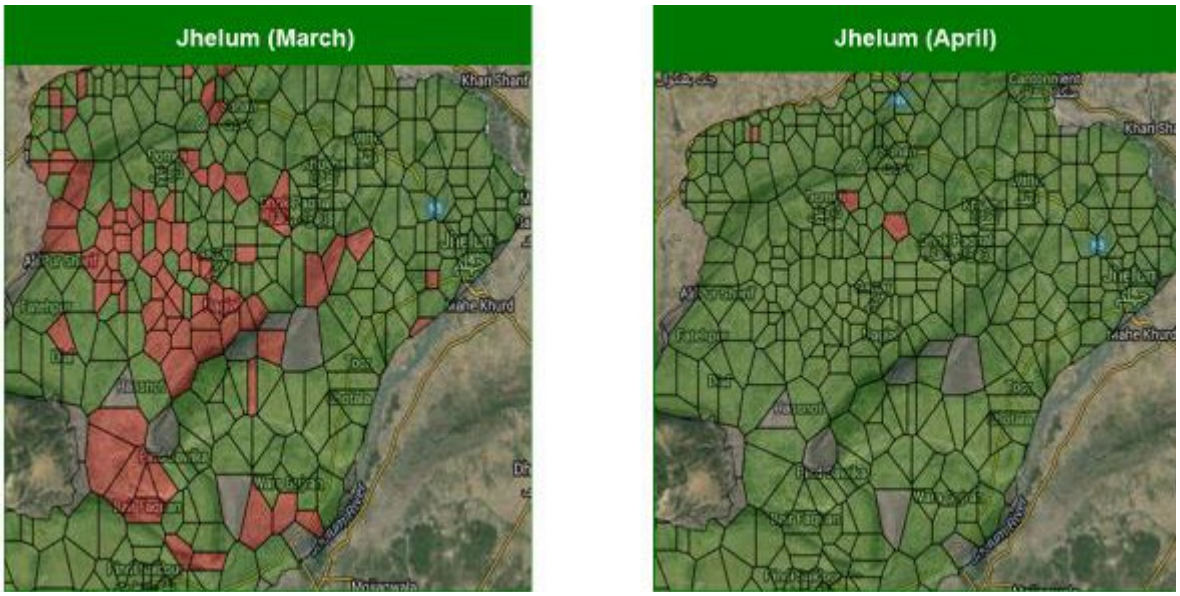
To improve the coordination of the two programs and enable synergies between them, including the sharing of personnel, materials and activities, the Government prepared a Polio Synergy Plan in 2015. Thus far, the plan has been successfully implemented in Punjab province, and, to a lesser extent in Sindh. In Punjab, both EPI and polio activities are now under the direction of the provincial EPI manager, and many assets, such as data and personnel, are shared. As an example, EPI teams used data from the polio program collected during SIAs that had identified more than 444,000 unvaccinated children to reach more than 333,000 of these children with routine vaccines through outreach activities.[2] In Sindh, collaboration between the EPI and polio programs has begun, with the two sharing data and the polio team assisting with the upcoming measles vaccination mop-up campaigns.

Using innovative technology to increase the delivery of immunization services

A contributing factor to low vaccination coverage rates in Pakistan has been vaccinators not showing up at outreach posts for planned immunization sessions, through which an estimated two-thirds of children receive vaccinations, according to the WHO country office. To address this problem, the Punjab provincial government has introduced a GPS tool, e-VACCS 2.0, which tracks the movement of individual vaccinators through mobile phones provided to them. The e-VACCS program maps areas by attendance rates of vaccinators at outreach posts, upon which vaccinator incentives are based. This information is also used to target under-performing districts with additional personnel and funding. In one year, vaccinator attendance rates at outreach posts more than doubled (from 40% to >90%) throughout the province, resulting in a large increase in vaccination coverage in low-performing areas (Fig. 1).[3]

The e-VACCS tool is being rolled out in KP and Balochistan provinces, while Sindh province is piloting the use of a different immunization monitoring tool.

Figure 1: Change in DPT3 coverage rates in one district in Punjab following introduction of the e-VACCS android-based monitoring tool



[2] Joint Appraisal report 2016.
[3] Joint Appraisal report 2016.

Use of Partner Engagement Framework (PEF) funds to increase technical assistance in immunization to provincial governments

Using GAVI PEF funds, WHO and UNICEF have created a total of 17 new positions since 2016 to provide key technical support to the central and provincial governments in such areas as immunization systems and service delivery, data management and analysis, communications, and supply chain management. Thirteen of these technical officers (nine from WHO) – nearly all of whom are nationals – have been placed in the provinces to cover all four provinces and four territories. The impact of this technical assistance has to date included an improvement in measles surveillance, including the number of cases investigated, and an increase in the completeness and timeliness of immunization program data from the districts and provinces.

Table 1: An update on progress against the GVAP goals in Pakistan

Polio eradication	Three WPV cases confirmed in 2017 (up to August 10), 20 in 2016 and 54 in 2015. There have been only 3 cases of VDPV found since 2015 and none to date in 2017. Environmental surveillance is finding WPV isolates, causing some concern. Regular polio SIAs (both NIDs and SNIDs in high-risk districts) continue.
MNT elimination	Elimination validated in Punjab province in November 2016. Sixty districts in other provinces and territories still considered as high-risk.
Measles elimination and rubella/CRS control	Measles outbreaks occurring throughout the country and some deaths reported. Provinces are planning mop-up campaigns for <5s, including Sindh province in August 2017. Pakistan is requesting GAVI support for measles campaigns in 2018 (application needs to be resubmitted). Measles-rubella SIA currently planned for 2018, to be followed by its introduction into the routine schedule.
Immunization coverage (90% nation-wide and 80% in all districts for all vaccines)	Official country data show a jump in coverage from 2015 to 2016 for several vaccines (e.g., DPT3 from 75% to 86%, MCV1 from 75% to 83%, PCV3 from 73% to 86%, OPV 3 from 75% to 86%). WHO-UNICEF estimates remain largely unchanged from 2015, however – at 72% for DPT3, PCV3 and OPV3 and 61% for MCV1. Planned coverage survey has been delayed (last one was in 2013).
New vaccine introductions	Rotavirus vaccine was introduced in six districts in Punjab province in 2016, with provincial government funds. Nation-wide roll-out of the vaccine, with GAVI support, is planned for December 2017.

Acknowledgments

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PAPUA NEW GUINEA

Full country report

A. Progress towards achievement of GVAP goals

1. Summary

The summary table below describes the current situation in PNG regarding achieving the GVAP goals.

More information on PNG's immunization program is provided in the Annex.

Area	Indicator	Papua New Guinea
Socio-demographic	GNI/capita (USD) 2014	2 140
	WB Status	Lower middle Income
	Infant mortality (<12 M) 2016 UN IAG CME	45/1 000
	GAVI status	In transition
	Total population	8 085 000
	Birth cohort	223 000
	Surviving infants (JRF)	213 000
1. Interrupt wild poliovirus transmission	Transmission interrupted	Yes
	Risk of late detection: Percent of adequate stool specimens (Rolling 12 mo.)(Target > 80%)	43%
	Risk of late detection: Non polio AFP rate (Rolling 12 mo.) (Target > 2/100,000 children	0.9
	Risk of spread after importation: % of 6-59 month olds having received less than 3 doses in the last year before occurrence case/environmental positive	NA
2. Neonatal tetanus elimination	TT2+ coverage (reported on JRF 2016)	48%
	Protection at Birth against tetanus (WUENIC 2016)	75%
	Last SIAs conducted in the country	2016-2017
	Elimination validation date	Survey conducted to validate elimination (possible validation in 2018)
3. Measles Elimination	Coverage MCV1 (WUENIC 2016)	70%
	Coverage MCV2	Dose at 18 months just introduced in 2016. Coverage data not yet available.
	Percentage of districts with MCV1 coverage ≥95% (2016 JRF)	6%
	Last national SIA	2015/2016
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Rubella vaccination coverage	70%
	SIAs planned?	No, completed in 2015-16

Area	Indicator	Papua New Guinea
5. Coverage with 3rd dose of DTP-containing vaccine	National DTP3 coverage (WUENIC 2016)	72%
	Drop-out rate DTP1 to DTP3 (WUENIC 2016) (DTP1-DTP3)/ DTP1	17%
	Actual numbers of children that dropped out (WUENIC 2016)	33 000
	Difference between poorest and richest quintile DTP3 coverage	No data
	% of districts reaching 80% coverage (2016 JRF)	17%
6. Coverage with all vaccines in the national immunization schedule	National Coverage (WUENIC 2016)	BCG: 89% DPT3-HepB3-Hib3: 72% MR1: 70% PCV3: 20% Pol3: 73%
7. Introduction of new vaccines	New vaccines introduced	PCV: 2013 - 2015 IPV: 2015 HPV pilot program in the capital city in 2017
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	-13%
9. NITAG	NITAG established?	No
10. Government expenditure on routine immunization per live birth (USD)	Baseline 2010-2011 and average for 2015-2016 (% change)	-21%

2. Country ownership of the immunization program

2.1 Immunization policy decision-making capacity

PNG's Inter-agency Coordinating Committee (ICC) is the main decision-making body for the country's immunization program. Its members include several National Department of Health (NDOH) officials (Executive Director of Public Health, Family Health Manager, EPI Manager); representatives from the country's medical school, national referral hospital, and civil society organizations; as well as WHO, UNICEF, DFAT (the Australian bilateral aid agency) and other partners. Its chairperson is the Deputy Secretary of the NDOH. However, according to a World Bank Immunization Scoping Mission report from March 2017, the Committee does not always meet quarterly, as expected, and is not always chaired by the Deputy Secretary or other senior officials.[1] Members from key government departments, including Treasury, Finance, and National Planning and Monitoring (DNPM), have reportedly not attended a meeting since 2007.

Another influential group, which is also represented on the ICC, is the Child Health Advisory Committee (CHAC), an official oversight body made up of top paediatricians, other medical and health specialists, as well as WHO and UNICEF representatives. The CHAC enjoys influence within the NDOH and plays a vital decision-making role in all child health-related policies, including new vaccine introductions. It is also

[1] Kemp Jo, Immunization scoping mission, Papua New Guinea, March 2017.

responsible for monitoring the country's Child Health Policy and Plan (2009-2020).

Plans for the use of PNG's HHS grant funding made during the 2016 Joint Appraisal included the establishment of a national immunization technical advisory group (NITAG) by March 2017. There have been discussions within the NDOH and with WHO about forming a NITAG, but this has not yet occurred. The challenge will be to ensure the group's independence and lack of conflict of interest, according to informants.

Authorities in PNG's 22 provinces and 89 districts are also important decision-makers concerning public health services, including immunization, ever since the health system was decentralization in 1995. It is up to provincial and district administrations to finance the operational costs and manage all non-hospital health care services, such as immunization and other maternal and child health care interventions, as well as rural health facilities. According to a GAVI document prepared in May 2017 for the Country Engagement Framework, these sub-national governments have "virtual autonomy" over health service delivery and resources.[2] Two additional health system reforms – the establishment of Provincial Health Authorities (PHAs), starting in 2007, and the creation of District Development Authorities (DDAs) in 2015 – have further strengthened the decision-making and budgetary power of local governments.

Provincial Health Authorities – now established in 10 provinces – integrate the management and control of hospital services (previously run by the NDOH) and government- or Church-run rural public health services under one institution headed by a Provincial Chief Executive Officer (CEO), who reports to a PHA Board. Under the CEO is the Director of Public Health, who heads the province's immunization program, as well as other public health programs. PHAs have direct management control over various federal health grants provided to provinces, as well as health workers, enabling better management, coordination and streamlining of health services and programs. Those with strong leaders and/or ones receiving technical support from partners (e.g., CDC, WHO, UNICEF), have reportedly been successful in mobilizing additional resources from both federal and provincial governments, and in making gains in health outcomes, including immunization coverage rates, according to informants (see more details in Section 3.3).

Funding decisions are being devolved further to the country's 89 districts under a new law passed in 2015 that establishes District Development Authorities, which are chaired by the local Member of Parliament. The respective roles and responsibilities of the DDAs and PHAs (where these exist) in health service delivery are still being worked out. There is also concern that the PHAs and DDAs are not being supported by adequate financial management systems or realistic budgets in some provinces, limiting their ability to deliver adequate immunization and other health services.[3]

Such a fragmented and decentralized health system makes it more difficult for health authorities to focus on a common immunization agenda and common goals, especially without strong central leadership and direction from the NDOH and its immunization program, which is currently in flux (discussed in Section 2.3). The result appears to be wide variation among provinces and districts in the leadership of and priority accorded to the immunization program at these levels, and consequently in their performance.

2.2 Government financing of immunization

Are government expenditures increasing over time?

According to data from GAVI, the PNG government's expenditures for immunization financing increased significantly in dollar amounts from 2010 to 2014 for vaccines and for the overall routine program (Fig. 1). However, in 2015, total government expenditures for immunization fell by 62% in one year (from $3.3 million in 2014 to $1.25 million in 2015) – with all of it going to the cost of procuring vaccines. The Government's share of financing has fluctuated from year to year, but overall has declined from 75% in 2010 to 30-60% from 2011 to 2014 to only 12% in 2015. This has occurred while the cost of the program has grown, especially with the introduction of PCV vaccine beginning in 2013.

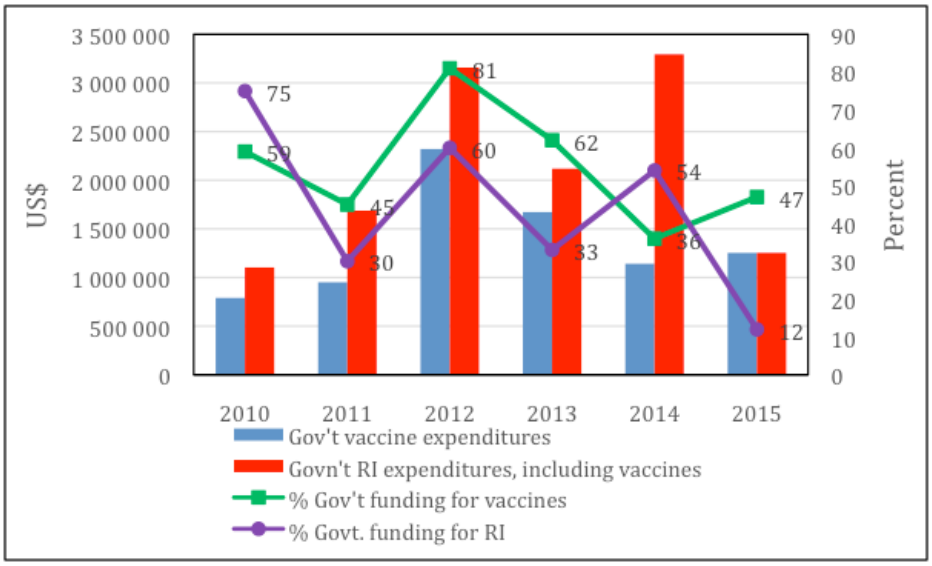
The actual immunization program expenditures covered by domestic sources, however, are difficult to calculate and likely under-estimated, since the operational costs paid by provincial and district governments from various federal health grants are likely not included.

The reduction in government financing for immunization has been attributed to a public financing and cash flow problem that PNG has been experiencing in the past few years, due to a decline in economic

[2] GAVI, PNG Country Engagement Framework, 21 May, 2017, Annex 2: Desk review.
[3] GAVI, PNG Country Engagement Framework, 21 May, 2017, Annex 2: Desk review.

growth as a result of falling prices of key export commodities (oil, natural gas, gold, copper) and the closure of two major gold and copper mines, as well as other industries. Consequently, the Government health budget fell 33%[4] from 2015 to 2016 (by around US$102 million) and by another 40% in 2017. According to one analysis, health expenditures are projected to decline in real terms by 42% from 2016 to 2020, while per capita health spending is projected to fall from 2014 to 2020 by 61% (taking inflation and population growth into account).[5]

Figure 1: PNG government expenditures for vaccines and the routine program, in dollar amounts and as a percentage of total expenditures, 2010 – 2015



Source: GAVI co-financing sheet on PNG

The reduced health budget, along with delays in the release of funds from the central government to the provinces and districts through Health Function grants and other types of support, are negatively impacting health services that were already underfunded. According to the GAVI CEF document, 29% of health centers and 54% of aid posts hadn't received any cash or in-kind support from the Government or other external sources in 2015, relying instead on user fees. Hospitals are reportedly experiencing shortages of medicines and essential supplies.

Is the Government meeting its commitments in immunization financing, including co-financing of GAVI-supported vaccines?

The Government pays the full costs of traditional EPI vaccines (BCG, TT, OPV), which beginning in 2017, it is procuring through UNICEF. PNG is also paying its share of the co-financing for GAVI-supported vaccines (pentavalent and PCV), though it has been late with payments several times in the recent past, including both in 2015 and 2016. GAVI is covering the costs of IPV (until 2018) and the rubella component of the 2nd dose of MR vaccine (until 2017). In all, the Government contributed 47% of total vaccine costs in 2015.

As PNG entered the five-year "accelerated transition phase" of GAVI support in 2016, its co-financing obligations are increasing each year by 15%. This, coupled with the decline in the overall EPI budget since 2014, will likely mean that more and more government immunization spending will go towards vaccines, leaving less for other program costs. Meeting its co-financing commitment for 2017 may be challenging, since the amount will rise by another 15% this year and since the country is obligated to reimburse GAVI for $750,000 in misused funds from the HSS and other grants. Given that government funding for immunization is declining at the same time that the GAVI transition is occurring, there is concern among partners that the country may not be ready for graduation from GAVI support by 2020.[6] GAVI is therefore considering continuing its support through a Country Engagement Framework, if PNG produces a robust country immunization strategy. This will allow more flexible funding from GAVI than countries in the accelerated transition phase can normally receive, even potentially for vaccination campaigns (SIAs) and new vaccine support.

[4] Joint Appraisal report for 2016.
[5] GAVI, PNG Country Engagement Framework, 21 May, 2017, Annex 2: Desk review.
[6] GAVI, PNG Country Engagement Framework, 21 May, 2017, Annex 2: Desk review.

While government immunization expenditures have decreased in the past few years, overall spending on immunization has, in fact, risen – from $7.3 million in 2011 to $12.1 million 2015, due to increases in financial support from donors. Key donors for the immunization program include GAVI (for new vaccine support and HSS funding), DFAT (mainly for cold chain equipment), and WHO and UNICEF through the U.N. Development Assistance Framework. GAVI HSS funding was frozen in 2016, due to unaccounted for funds. However, around $2 million in HSS funding will be channelled in 2017 to WHO and UNICEF for various activities, including leadership/management technical assistance to the NDOH; and procurement, distribution and installation of cold chain equipment.

2.3 Human resources situation

Situation with front-line health workers

According the cMYP, around 7,000 health workers throughout PNG are involved in immunization. This includes sisters-in-charge and other mid-level managers responsible for planning, organizing and overseeing immunization activities, and community health workers, nurses, midwives, and health extension officers. These health personnel work from hospitals and urban clinics in the cities, and from four levels of health facilities in rural areas – district and rural hospitals, health centers, health sub-centers, and aid posts – the latter of which make up 78% of the country's approximately 3,400 health facilities that existed in 2010. However, according to the WHO Country Office, more than 1,100 aid posts have closed in the past several years; the number of functioning aid posts is currently around 1,850. Church missions run around half of the country's health centers and sub-centers, located especially in hard-to-reach areas.

The human resource situation in the health center in PNG has been called by the World Bank and others a "nation-wide health workforce crisis". Health workers are greatly mal-distributed – with only 51 (13%) of the country's 379 Medical Officers in 2013 working in rural areas, where 87% of the population lives.[7] Similarly, of 3,252 nursing officers, only 45% in 2013 were working in rural areas. There is instead a much greater reliance in rural parts of the country on a lower level of health worker – community health workers (CHWs), who receive two years of training and who make up three of every five health workers in the rural health system.

Even with the CHWs and a much smaller force of health extension officers, the number of health workers in PNG, especially in rural areas, is insufficient. Retention of workers in rural areas is a serious problem and is due to low salaries, a lack of incentives such as staff housing and schools for their children, as well as a lack of law and order in some regions. Attrition of health workers from these areas has resulted in many aid posts closing and is cited as a factor for low immunization rates in many rural areas.[8]

In addition, the health workforce is aging rapidly and described as "uncharacteristically old",[9] which will worsen the situation unless they are replaced by younger, newly-trained workers. The existing workforce often has poor qualifications and the country lacks a systematic in-service training program for health workers.

EPI management staff

The EPI management team at the national level has been depleted, as several team members, including the National EPI Manager, have left, due to mismanagement of GAVI funds. The team currently consists of an Acting EPI manager, who is also the cold chain specialist, a data manager, and two temporary staff under contract who are working on cold chain and vaccine logistics management. The EPI manager normally reports to the Family Health Services Branch Manager, but this position is currently vacant and therefore he is reporting directly to the Executive Manager of Public Health, a senior official with many other responsibilities.

The workload for this small team operating on a temporary or acting basis is unsustainable, predictably leading to gaps in coordination between different national players involved in the program, as well as between development partners. As an example, the organization responsible for vaccine procurement (the Medical Supplies Branch or MSB), recently procured vaccine upon instructions from the EPI, but due to a lack of coordination with the private company that distributes vaccines to the provinces, there was no space to store the new vaccine supply, as the distributor hadn't sent the current stock out to the provinces.[10]

This personnel and leadership gap is also affecting the willingness of donors to support the immunization program. GAVI is requiring that a permanent EPI

[7] cMYP, 2016-2020.
[8] Kemp Jo, Immunization scoping mission, Papua New Guinea, March 2017.
[9] GAVI, PNG Country Engagement Framework, 21 May, 2017, Annex 2: Desk review, p. 6.
[10] Kemp Jo, Immunization scoping mission, Papua New Guinea, March 2017.

Manager be put in place before it can provide additional support through a CEF. In addition, a number of partners interested in supporting the installation of a logistics management information system (*mSupply*) are hesitant to do so until the EPI leadership issues are addressed and there are sufficient numbers of qualified people at the sub-national levels to support the system.[11]

To remedy the situation, the NDOH has proposed a new EPI team structure, consisting of an EPI Manager and six officers who are specialists in different technical areas (vaccine management, cold chain, logistics, data management and surveillance, vaccine preventable diseases, and administration). Under one proposal, the EPI Manager would report directly to the Executive Manager of Public Health, skipping the layer of Family Health Services Branch Manager, thus elevating the importance of the program within the NDOH. It has been agreed that once a suitable national candidate is found, GAVI will hire a consultant for two years to provide mentoring support to the EPI Manager and team through GAVI's Leadership, Management and Coordination (LMC) program, in order to build the leadership and management capabilities of the new team. As of this writing, a few candidates for the EPI Manager position have reportedly been identified, but no one hired yet. It should also be noted that there is currently a hiring freeze on federal government personnel, holding up approval of the proposed new EPI team structure by the federal government's Department of Personnel Management.

Leadership of the EPI at the provincial and district levels is also generally weak, though it varies significantly by province and location. Some provinces, such as Milne Bay, have a highly-committed EPI staff. There are no designated or dedicated immunization focal points at the provincial or district level, except in six provinces where DFAT is supporting provincial and district level EPI managers. In the other 16 provinces, the program is overseen by the Director of Public Health in provinces with Provincial Health Authorities and by Provincial Family Health Coordinators in non-PHA provinces – all of whom oversee other health programs and services.

3. Progress towards specific GVAP goals

3.1 Goal 1: Achieve a world free of poliomyelitis

Has polio transmission been interrupted?

PNG was certified as polio-free in 2000 by the WHO Polio Regional Certification Committee, as part of certification for the entire WHO Western Pacific region. No cases (including imported cases) of wild polio virus or vaccine-derived disease have been reported since 1997.

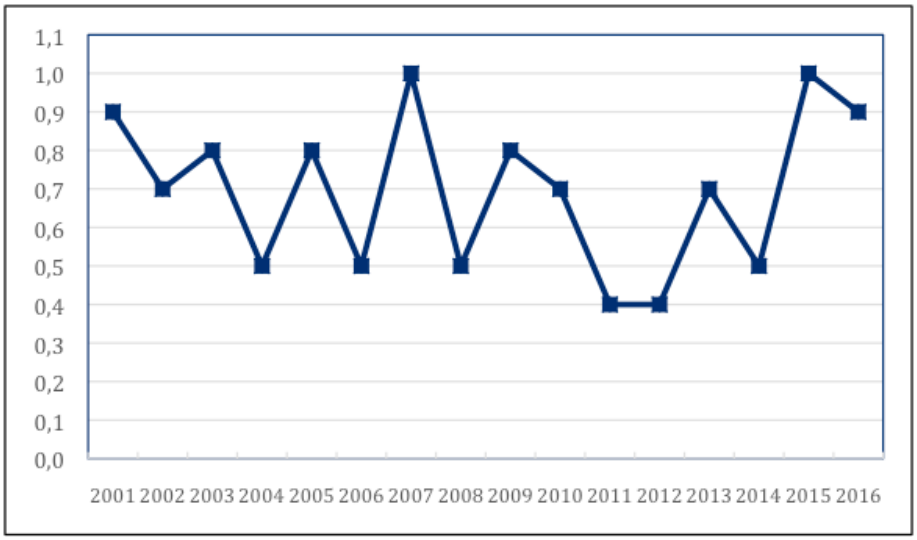
Is PNG considered at high risk of polio transmission and what is being done to keep it polio-free?

Despite the lack of polio cases for many years, WPRO's Certification Committee included PNG as one of the highest-risk countries for importation and circulation of the virus from polio-endemic countries.[12] Factors contributing to this risk include the country's poor health care infrastructure, sub-optimal polio vaccination coverage for the routine program as well as for SIAs conducted in highly-populated provinces, and insufficient surveillance activities, especially in remote areas, due in part to a lack of training of health workers in diagnosing and investigating AFP cases.

AFP/polio surveillance indicators have fluctuated since 2000, with non-polio AFP rates per 100,000 children under 15 dipping as low as 0.4 in 2011 and 2012 – below the minimum standard of >1/100,000 in non-endemic countries – and stool collection adequacy rates dropping to 17% in 2008.[13] In addition, in 2015, 50% of provinces and sentinel surveillance sites did not report a single AFP case.[14] This poses a definite challenge for the detection of any imported polio cases. However, the national non-polio AFP rate reached the 1/100,000 threshold in 2015, and was just below the threshold in 2016 (0.9/100,000) (Fig. 2). This improvement has been attributed to VPD surveillance training of provincial disease control officers and pediatricians from provincial hospitals.

[11] Kemp Jo, Immunization scoping mission, Papua New Guinea, March 2017.
[12] Datta SS, Ropa B, Sui GP, Khattar R, Krishnan RSSG, Okayasu H. Using short-message service notification as a method to improve acute flaccid paralysis surveillance in Papua New Guinea. BMC Public Health 2016; 16:409.
[13] GPEI Website and data from the GPEI.
[14] cMYP 2016-2020.

Figure 2: Non-polio AFP rates per 100,000 children in PNG 2001 to 2016



Another critical measure to prevent re-importation and transmission of polio is by keeping vaccination rates high throughout the country. Both official government coverage estimates and the WHO-UNICEF estimates show a marked increase in the national OPV3 coverage rate since 2000 – from 47% in that year to 62% in 2016, according to official government data, and 73%, according to WUENIC. Nonetheless, this is below the target of 90% national coverage and the rates have plateaued or fluctuated for the past seven years (Fig. 4b below). According to the cMYP, 20% of provinces in 2014 had OPV3 coverage rates of >80%.

As part of the Government's Polio Eradication Endgame Strategic Plan, which is based on the global endgame strategy, IPV was introduced in a phased manner in 2015 and 2016 as part of the Special Integrated Routine EPI Strengthening Program (SIREP) Plus, which combines integrated outreach activities of SIREP with measles-rubella campaigns and new vaccine introductions, as discussed below. Officially reported coverage of IPV has been low (14% in 2016), due to its phased introduction, the global IPV shortage, and the fact that the HMIS database did not include IPV until recently. PNG also took part in the synchronized switch from the trivalent to bivalent OPV in April 2016.

PNG last conducted a national OPV campaign (combined with measles) in 2013 and has no plans to conduct additional SIAs at this point, preferring to focus on improving routine coverage instead. Vaccination campaigns have been viewed by provincial health officials as disrupting the routine immunization program.

3.2 Goal 2: Meet global and regional elimination targets

3.2.1 Achieve maternal and neonatal tetanus (MNT) elimination

PNG has conducted two sets of TT campaigns (of three rounds each) for women of child-bearing age in the past five years. The first campaign took place nation-wide from 2012 to 2013, with disappointing results. Round 1 was supported by partners and achieved quite high coverage (>80%), while Rounds 2 and 3 were funded entirely by local governments, and were affected by insufficient funding, vaccine shortages in some areas, and false rumors that kept women away in some parts of the country.[15] As a result, only eight out of 22 provinces completed all three rounds and the overall coverage for Rounds 2 and 3 was around 20%.

A joint assessment conducted by NDOH, UNICEF and WHO, which identified 61 high-risk districts in four provinces, led to a new action plan that called for three TT vaccination rounds to be conducted in 2015 and 2016 in the 61 districts. Implementation of the campaigns has thus far been relatively slow, with Round 1 completed in one province (Jiwaka) in August-October 2016 (achieving 86% coverage), in two others (Madang and Hela) in the second quarter of 2017, and still pending in the fourth province (East Sepik). Several of the challenges encountered during

[15] Papua New Guinea: Maternal and Neonatal Tetanus Elimination (MNTE) Consultant announcement in UN Careers, December 30, 2016. Found at: https://uncareer.net/vacancy/maternal-and-neonatal-tetanus-elimination-mnte-consultant-85628.

the 2012-2013 campaign have also affected these SIAs, including a lack of demand for the vaccine, delays in funding and procurement, limited geographic access to services in rural areas, and a shortage of health workers. An advocacy and monitoring mission by WHO is being planned for the third quarter of 2017 to help with efforts to improve and accelerate the MNTE campaigns.

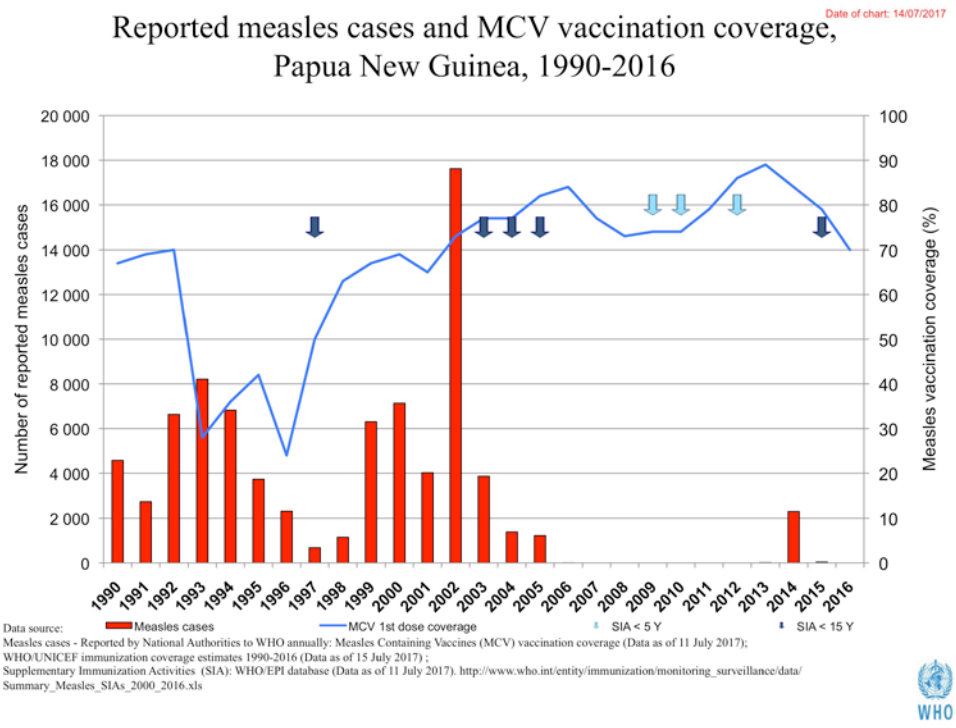
3.2.2 Achieve measles elimination and rubella & CRS control

After reporting few if any confirmed measles cases from 2006 to 2012, PNG experienced a major outbreak from September 2013 to September 2015, with 2,649 lab-confirmed cases and no reported deaths. However, there were more than 85,800 suspected cases during the outbreak and according to the cMYP, 312 deaths up to the end of December 2014. Since the outbreak ended, the national surveillance system has reported few confirmed cases, including zero in 2016. This may not be an accurate picture of measles incidence in the country at the present time, however, since case-based MR surveillance, supported by the Central Public Health Laboratory in Port Moresby, is not sufficiently sensitive. According to the 2016 Joint Appraisal report, the national non-measles/non-rubella rate of febrile illnesses was 0.5 per 100,000 children in 2016 (vs. the target of >2/100,000), with 10% of provinces meeting the target reporting rate.[16] In addition, 54% of cases were adequately investigated within 48 hours (vs. the target of 80%).[17]

The 2013-15 outbreak was blamed on the accumulation of unvaccinated children exposed to measles throughout the country, due to declining measles vaccination coverage rates (Fig. 3). Official country estimates show a reduction in national MCV1 coverage rates from 70% in 2013 to 51% in 2016 (while the WHO-UNICEF rates declined from 89% in 2013 to 70% in 2016). This is part of a trend in lower vaccination coverages rates in general in the past seven years, though the decline in measles coverage rates is especially dramatic. It should be noted that two measles vaccine doses are given in infancy: at six and nine months. The MCV1 rates cited are actually for the dose provided at nine months to comply with global indicators.

In response to the outbreak, the Government decided to conduct catch-up campaigns using MR vaccine for children six months to 15 years of age, integrating them into the SIREP program of intensive outreaches that provide all vaccines and other MCH interventions (described in Section 3.3). This SIREP Plus strategy – combining outreaches and mobile clinics with SIAs and new vaccine introductions – was how MR vaccine was introduced in PNG in two phases: in 12 provinces in 2015 and in ten provinces in 2016. The 2016 campaign overall achieved an estimated coverage rate of 63%.

Figure 3: Reported measles cases and MCV vaccination coverage rates in PNG



[16] Joint Appraisal report 2016.
[17] cMYP 2016-2020.

In addition, a third MR dose was added to the routine immunization schedule in early 2016 (at 18 months). No MCV coverage rates for the dose at 18 months (MCV2) are yet available.

Meeting the measles and rubella elimination goals in PNG will require considerable efforts to both improve and expand case-based MR surveillance and increase MR vaccination coverage rates.

3.3 Goal 3: Meet vaccination coverage targets

a. **Achieve 90% national coverage and 80% in every district with three doses of diphtheria-tetanus-pertussis containing vaccines**

b. **Achieve 90% national coverage and 80% in every district with all vaccines included in the national schedule**

Vaccination coverage rates and trends

The WHO-UNICEF estimated coverage rates for 2016 (Table 1) show rates in the low 70 percent for DPT3, the first dose of MR and polio 3. In contrast to most developing countries, the official country data show rates that are 11-19 percentage points lower than the WUENIC estimates for these vaccines (51-62%). Official coverage data are not considered very reliable due to both denominator and nominator issues and there hasn't been a national survey that includes immunization coverage data since the Demographic and Health Survey (DHS) conducted in 2005. Official coverage of the third dose of PCV, which was rolled out over two years starting in 2013, remains low (at 20%), as does IPV. The WHO country office attributes these low rates in part to under-reporting through the HMIS, as the system did not initially update its database to include new vaccines.

Table 1: 2016 vaccination coverage rate estimates (%)

Vaccine	WUENIC	Official country data
BCG	89	72
DPT1	87	87
DPT3	72	61
IPV	14	14
MR1	70	51
Polio 3	73	62
PCV3	20	20

Looking at coverage across districts, government data show that only 17% of districts (15 out of 89) reached pentavalent 3 rates of more than 80% in 2016. Nine out of 22 provinces (41%) and 43 out of 89 districts (44%) had pentavalent rates of less than 50%, according to the 2016 Joint Reporting Format. In contrast, five provinces showed pentavalent rates of at least 80% and two of these (the National Capital District and Milne Bay) reported rates of 97%. The range in rates across provinces was 20-97% in 2016.

Both the Government and WHO-UNICEF data show a serious problem with dropouts from the initial to later vaccine doses; the dropout rate between the first and third dose of pentavalent vaccine in 2016 was 17%, according to the WUENIC estimate, and 30%, according to the Government estimate.

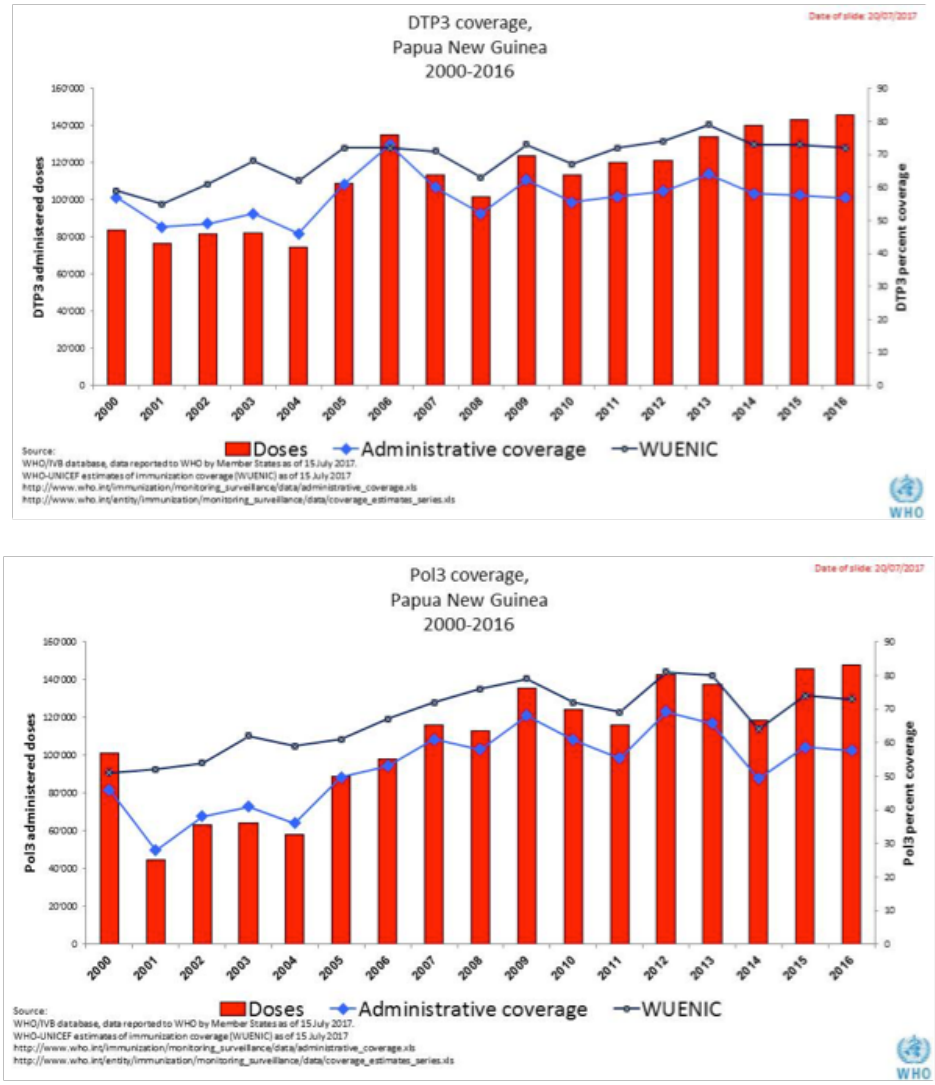
Coverage rates for most vaccines seem to have peaked around 2012 or 2013 and have declined or plateaued since then (Fig. 4). Similarly, the percent of districts achieving a DPT3 rate of at least 80% declined steadily from 39% in 2012 to just 17% in 2016, though again, caution must be taken in interpreting government data.

Factors contributing to declining or plateauing vaccination coverage rates

There are a number of factors contributing to the lack of progress in increasing vaccination coverage in recent years in PNG – many of them linked to the underlying problems of declining funding for health services and reliance on provincial governments to cover these costs, as well as the shortage and uneven distribution of health workers. These include:

- **Limited access to health services in many areas**
  PNG has been called "one of the hardest countries in the world to deliver health services". Eighty-seven percent of its population live in widely-scattered rural communities spread over rugged terrain in the highlands, islands, and forests. Only three percent of its roads are paved and thus most travel between provinces is by air (including vaccine deliveries from the capital).

Figure 4 a and b: DTP3 and Polio 3 administrative and WUENIC estimated coverage rates, 2000 - 2016



The health infrastructure has also deteriorated in recent years. One assessment in 2012 found that one-third of rural aid posts had closed or do not fully function – in many cases because of a lack of staff.[18] The facilities that provide immunization services, including health centers and sub-centers, are often under-funded and neglected, lacking running water and maintenance, since provincial governments put most of their health resources into hospitals. The frequency of immunization sessions at fixed sites – estimated to account for 70% of all immunizations provided[19] – is largely unknown, due to a lack of reliable data. Disadvantaged urban communities also lack access to health services.

[18] GAVI, PNG Country Engagement Framework, 21 May, 2017, Annex 2: Desk review.
[19] cMYP 2016-2020.

- **Insufficient outreach and mobile sessions**
  Given the many widely-dispersed and remote communities in rural areas of PNG, outreach and mobile services are critical to improving vaccination coverage rates in the country. However, these are irregular and declining in frequency. While the government target is 100 outreach clinics per 1,000 children under age five per year, the national average fell from 42 per 1,000 children in 2010 to 29 per 1,000 by 2016 – a 31% reduction.[20] The reasons cited include a lack of means of transportation and travel funds from provincial and district governments, a lack of supervision, and many of the issues cited above (e.g., lack of sufficient numbers of health workers, remoteness and isolation, and security risks due to tribal clashes and crime). The major measles outbreak, which occupied health workers for many months, may have also contributed to recent declines in vaccination coverage rates.

- **A lack of health worker motivation and support for routine immunization activities**
  While health workers receive allowances, logistical support and supervision for vaccination campaigns (e.g., for polio, measles), there are few incentives for them to conduct routine immunization services, especially outreach and mobile visits. Polio and measles SIAs have also been considered disruptive to the provision of routine immunization services. Supportive supervision, which can increase staff motivation even in the absence of salary increases or incentives – as found in some NGO and foundation-run programs – has declined in recent years. The 2013 EPI review found that some facilities hadn't received a visit from a provincial supervisor in more than two years, while NDOH data show a recent sharp decline in supervisory support to MCH clinics – from 62-68% between 2011 and 2013 to 22-29% from 2014 to 2016.[21]

- **A deficient vaccine stock management and cold chain system**
  PNG lacks a computerized stock management and tracking system for vaccines and injection supplies, as well as a comprehensive distribution plan at the national and subnational levels. In addition, the NDOH exerts little control over the private company (LD Logistics) that distributes vaccines to the provinces and districts, and, as described above, coordination between the company, the agency responsible for vaccine procurement and storage (Medical Supplies Branch), and the NDOH could be improved. People at all levels of the supply chain are not certain when and how vaccines will arrive.[22] Adding to these problems is the fact that only eight out of 89 districts have vaccine stores, and thus vaccines must often travel long distances from provincial stores to individual health facilities in most provinces. The results of these deficiencies in vaccine stock management and distribution are frequent stockouts at the local level, affecting the ability of health facilities to conduct planned EPI sessions, as well as vaccine overstocks.

The lack of working refrigerators also affects the availability of immunization services at the health facility level. According to one source, 30% of health facilities have no cold chain equipment and 30% of existing equipment is more than 10 years old.[23] The 2016 EVM assessment found that 70% of cold chain equipment across the country was "not effective" – broken down, out-of-fuel, old, or vandalized – and there is a lack of cold chain technicians to maintain and repair the equipment at the province and district levels.[24] There is also no allocation for cold chain equipment and maintenance in the NDOH budget, and thus the government relies on donations of new equipment (e.g., from JICA and DFAT).

The decentralized structure of the health system and unclear roles and responsibilities of the different levels of government can have an impact on such donations, however. Because of non-payment to distributors, which the NDOH is now requiring the provinces to make, $2 million worth of cold chain equipment procured in 2015 by WHO with DFAT funding has yet to be installed in health facilities and is sitting in a warehouse. HSS funding will likely be used to distribute and install the equipment.

A proposal for a cold chain equipment optimization platform (CCEOP) to expand and modernize PNG's cold chain system will likely be included in the GAVI Country Engagement Framework and country strategy.

- **Insufficient social mobilization and demand generation activities**
  The cMYP labeled this component "the weakest point of the national immunization program in recent years". The EPI has yet to develop strategies to engage different groups within communities to promote and support the program. To fill this gap, a key strategy of the new SIREP program that is being rolled out nation-wide (described below) is to improve communications, advocacy and social mobilization to strengthen the routine immunization program.

- **Data quality issues**
  Health facility staff often do not have a clear idea of their catchment areas and target populations, thus making it difficult to accurately estimate coverage rates at the local level and to identify low-coverage

[20] Presentation on "Special Integrated Routine EPI Strengthening Program in Papua New Guinea" given at the 26th Technical Advisory Group meeting on Immunization and Vaccine Preventable Diseases, Manila, Philippines, June 13-16, 2017.
[21] Presentation on "Special Integrated Routine EPI Strengthening Program in Papua New Guinea" given at the 26th Technical Advisory Group meeting on Immunization and Vaccine Preventable Diseases, Manila, Philippines, June 13-16, 2017.
[22] Kemp Jo, Immunization scoping mission, Papua New Guinea, March 2017.
[23] Presentation on "Special Integrated Routine EPI Strengthening Program in Papua New Guinea" given at the 26th Technical Advisory Group meeting on Immunization and Vaccine Preventable Diseases, Manila, Philippines, June 13-16, 2017.
[24] Kemp Jo, Immunization scoping mission, Papua New Guinea, March 2017.

areas for remedial actions.[25] The national and sub-national coverage rates derived from administrative data are therefore not considered accurate. There is also no system in place to analyze data quality on a regular basis, and a formal data quality assessment (DQA) has not yet been conducted. However, the Asian Development Bank, under its Rural Primary Health Services Delivery Project, is installing an electronic national health information system (e-NHIS), which should significantly improve data quality and enable the EPI Cell to receive data in real-time.

Efforts to improve the performance of PNG's routine immunization program: the SIREP program

In response to the lack of improvements in vaccination rates in recent years, as well as the large measles outbreak that was occurring, the Government decided in 2014 to develop the Special Integrated Routine EPI Strengthening Program (SIREP), instead of just implementing measles campaigns. The program involves conducting outreach and mobile activities more consistently, but less frequently (once a quarter vs. once a month) to save costs and thus better ensure that these activities take place in the face of constrained budgets, limited transportation and personnel shortages. The outreaches are preceded by detailed population-based microplanning in each village, with a focus on identifying unvaccinated children and at-risk populations. To attract the public and ensure that they are reached with maternal and child health and other basic health services at least once every three months, the outreach sessions provide integrated MCH services, including all vaccinations in the routine program, vitamin A and albendazole, as well as other preventive and curative services (e.g., rapid diagnosis and treatment for malaria, TB treatment, family planning, ANC, limited curative care).

SIREP Plus combines the SIREP outreach strategy with vaccination campaigns – specifically measles-rubella SIAs – and the introduction of new vaccines (e.g., IPV, PVC), as they are phased in province by province.

The goal of SIREP is to increase vaccination coverage rates by 5-10% a year and reach 95% coverage for all routine vaccines within five years. To meet this goal and enable successful outreach sessions, the program also addresses – with technical assistance from partners – four major components of the immunization program that need strengthening: 1) leadership, management and coordination; 2) advocacy to provincial and district governments to mobilize resources, communications and social mobilization; 3) vaccine management and cold chain rehabilitation; and 4) supervision and monitoring.

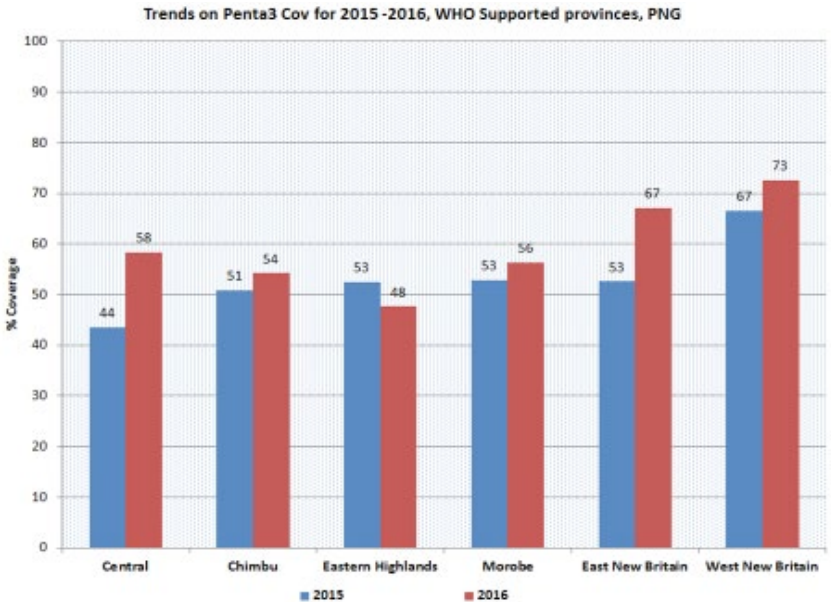
The program was rolled out in 12 provinces in 2015 (Phase 1) and in eight provinces in 2016 (Phase 2), with the two remaining provinces yet to implement it. Through the HSS grant, GAVI has contributed around 40% of the operational costs of SIREP, and provincial and district governments are supposed to contribute the remaining 60%. With Partner Engagement Framework (PEF) funding, WHO is providing technical support to eight provinces (using CDC "Stoppers"), while UNICEF is providing technical advisors in six others. A key strategy in the eight WHO-supported provinces has been to identify immunization focal points – primarily nurses – at the provincial, district and health facility levels and build their skills in EPI training, cold chain management and vaccine logistics, as well as in advocating for immunization programs to their local governments.

According to informants, six of the eight provinces receiving WHO technical assistance have been successful in mobilizing resources to fill the gap in funding not covered by GAVI, which they have used to buy cold chain equipment from local suppliers, conduct supervision, fund transport for outreaches, and other critical inputs. This, along with strong management at district and provincial levels, led to measurable increases in immunization coverage in five provinces in one year (Fig. 5). (In Eastern Highlands province, the local government did not cover the required operational costs and pentavalent coverage actually declined after SIREP was introduced.)

While encouraging, continued progress through SIREP is limited by the overall weaknesses of the immunization and health systems, including limited cold chain capacity at the local level, little supervision in some areas, a lack of sufficient funding for operational costs, and varying local leadership – which is a crucial element. Technical assistance from partners has also been critical to the progress made in provinces supported by WHO and UNICEF. Nonetheless, the program, which will form the backbone of the GAVI Country Engagement Framework, provides the opportunity to strengthen the routine immunization program's management and leadership, financing, and other building blocks of the health and immunization system.

[25] cMYP 2016-2020.

Figure 5: Trends in pentavalent 3 coverage from 2015 to 2016 in provinces implementing SIREP with WHO support



3.4 Goal 4: Introduce new and improved vaccines and technologies

PNG has introduced the following vaccines since 2013:

- **Pneumococcal conjugate vaccine (PCV).** Introduction began in one province in November 2013 and was rolled out nation-wide province by province over a two-year period. The drawn-out introduction was due to the major measles epidemic that took place over the same period, and to the fact that the GAVI vaccine introduction grant (VIG) – which provides $0.40 per child across all countries – didn't cover the training and other operational costs in a country with many remote and hard-to-reach areas. To save resources, the roll-out of the vaccine was combined with the MR SIAs in many provinces, under SIREP Plus. As a result of the delay in its introduction, a GAVI audit found 175,500 doses of PCV due to expire in six months in the central cold room in 2016. The vaccine was shipped to the provinces, with instructions to broaden the target age to all children under two years old, but it's not clear what happened with the doses and if this directive was followed everywhere. Coverage estimates of PCV have remained low – at 20% (both country and WUENIC estimates) since its introduction, due in part to delays in updating the HMIS database to include this vaccine.

- **Measles-rubella (MR) vaccine.** As mentioned in Section 3.2, MR was introduced in a phase manner under SIREP Plus through campaigns in 2015 and 2016, followed by its inclusion into the routine immunization schedule at six and nine months and, since early 2016, when the third dose was added to the schedule, at 18 months.

- **Inactivated polio vaccine (IPV)** was introduced in 2015 and 2016 through the SIREP Plus outreach strategy.

- **Human papilloma virus (HPV).** Since PNG entered the GAVI accelerated transition phase last year, it is no longer eligible to apply for new vaccine support, including HPV. Due to political pressure, however, the NDOH included the vaccine in the cMYP (for introduction in 2018) and a pilot demonstration for 9-14 year old girls started in the National Capital District in 2017, with financial support from Rotary International. Financial support for its introduction will need to be found and there are some concerns about the EPI system's capacity – cold chain and otherwise – to handle the addition of this vaccine at this point in time.

PNG also included plans for the introduction of rotavirus vaccine in 2018 in the cMYP. This vaccine introduction will also not receive GAVI support unless it is included in the upcoming CEF. Rotavirus, as well as HPV, will require additional expansion of cold storage capacity at the central and sub-national levels.

B. Partner support to address remaining challenges to meet the GVAP goals and targets

Partner staff working on immunization in PNG is very limited. UNICEF has two immunization technical officers (one international and one national), while WHO has one immunization officer, supported by three CDC STOP team members, who stay for five months at a time and are assisting with disease surveillance, data management, and the MR campaigns. In addition, the Australian aid agency, DFAT, is supporting eight EPI officers in the provinces.

Despite this small number of people working exclusively on immunization, partners and donor funding have played an important role in implementing SIREP and SIREP Plus, the introduction of PCV and IPV; the roll-out of MR campaigns; and the development of plans, assessments and guidelines, such as the cMYP, EVM assessment and cold chain improvement and expansion plan, and guidelines for conducting TT campaigns. Assistance by a number of partners (WHO, UNICEF, DFAT, GAVI, Oil Search Health Foundation) to several Provincial Health Authorities has reportedly played a role in their success in mobilization resources for MCH and immunization services and in improving health service delivery (e.g., in Milne Bay, Western Highlands, Enga and Chimbu).

Funds remaining from the HSS grant (>$2 million) will be provided to UNICEF and WHO for cold chain equipment and other health system improvements. The development of a CEF will also provide an opportunity to address the key weaknesses affecting the immunization program and its progress towards the GVAP goals by strengthening health and immunization system components. Two vehicles for doing so using CEF funding will likely be the SIREP and support to Provincial Health Authorities in improving their health services. Now is also an opportune time for all major partners working in PNG – DFAT, ABD, the World Bank, the Global Fund and GAVI – to coordinate in planning and implementing health system improvements with the NDOH, since all of these partners are starting new funding cycles in 2018. Examples of partner support that is or will improve the immunization program are the work of the ABD-funded Rural Primary Health Services Delivery Project in developing and rolling out the electronic national health information system (e-NHIS) as well as provincial health plans; DFAT funding for cold chain equipment; and Global Fund support for the rollout of the *mSupply* electronic medical supply tracking system, which will include vaccines.

Acknowledgments

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- Dr. Mohammad Salim Reza, Technical Officer-EPI, WHO PNG Country Office
- Alexa Reynolds, PNG Senior Country Manager, GAVI Alliance
- Adam Cohen, WHO/HQ/EPI

Annex: Country Immunization profile

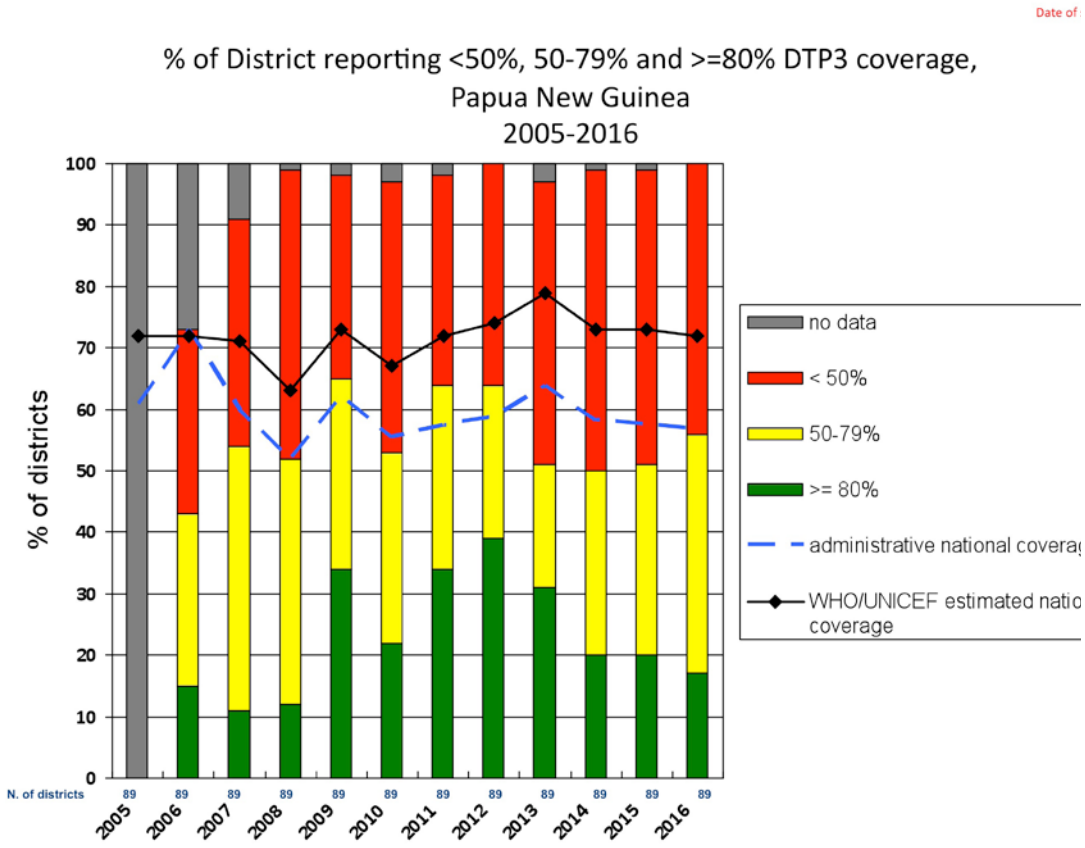
Annex 1: Immunization schedule 2016, Papua New Guinea

Vaccine	Schedule
BCG	birth;
DTwPHibHepB	1, 2, 3 months;
HepB_Pediatric	birth;
IPV	3 months;
MR	6, 9, 18 months;
OPV	1, 2, 3 months;
Pneumo_conj	1, 2, 3 months;
TT	7, 13 years;
Vitamin A	6, 9, 18 months;

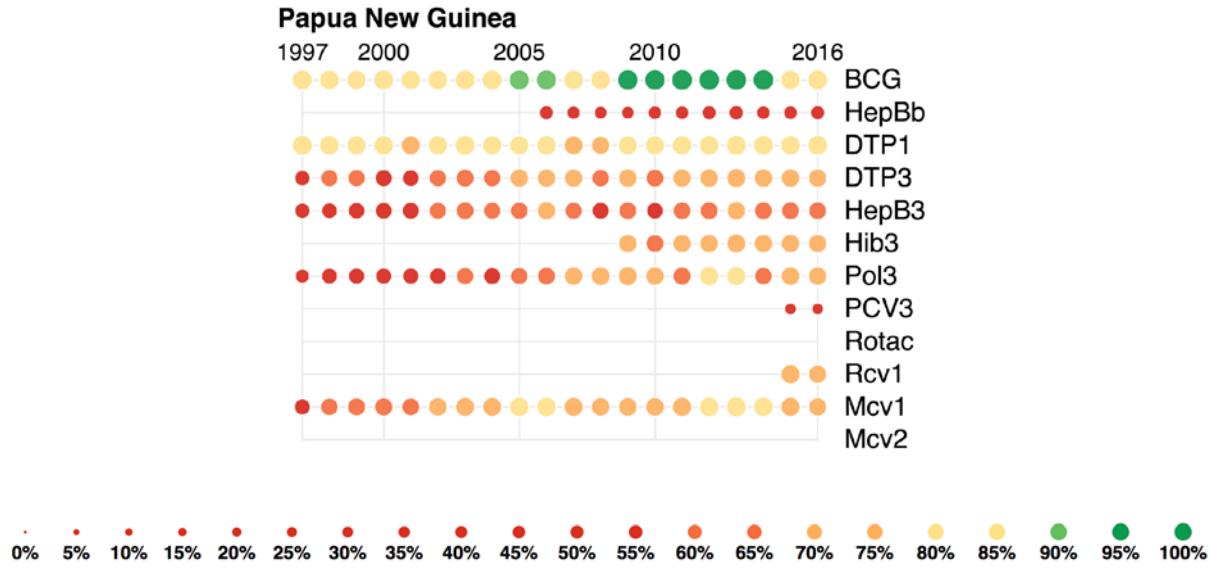
Annex 2: DTP Coverage for Papua New Guinea, 2000-2016

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Doses DTP1								144294	139274	158995	162465	168199	168527	195824		196035	212126
Doses DTP3	83572	76722	81884	82304	74474	108792	134958	113480	101620	123807	113523	120247	121051	133855		143391	145676
Dropout rate								21	27	22	30	29	28	32		27	31
% coverage DTP3 COE*	59	55	61	68	62	61	75	60	52	64	70	61	63	68		62	61
% coverage DTP3 WUENIC	59	55	61	68	62	72	72	71	63	73	67	72	74	79	73	73	72

Annex 3: DTP3 district coverage rates, in Papua New Guinea, 2005-2016



Annex 4: Immunization score card for Papua New Guinea, 1997-2016



UGANDA
Follow-up report

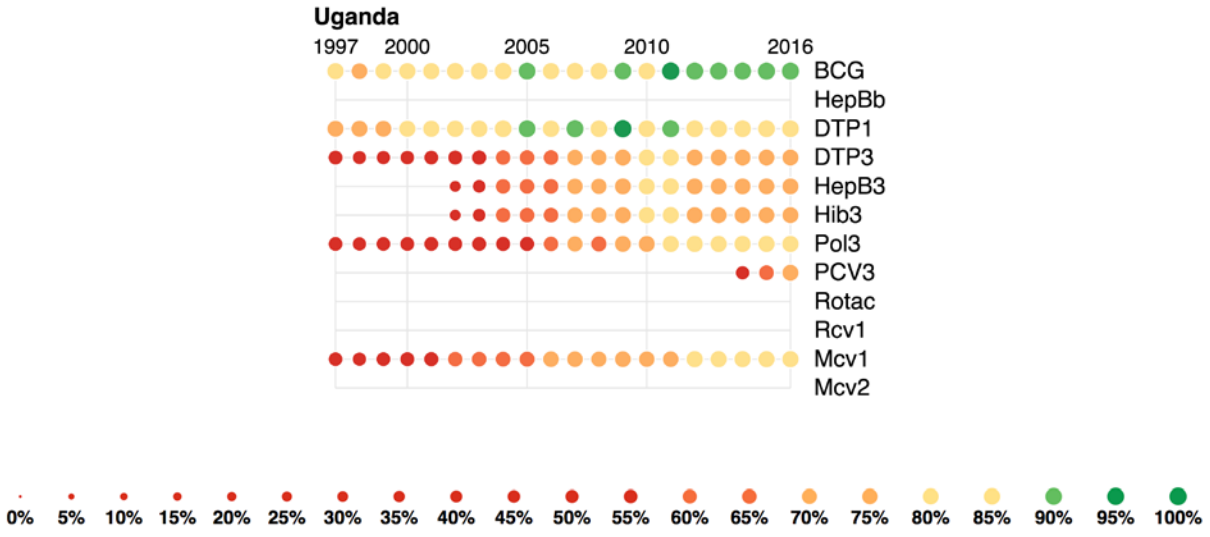
Area	Indicator	Uganda
Socio-demographic	GNI /capita (US$) 2016	670
	WB Status	Low Income
	Infant mortality (<12 M) 2015 UN IAG CME	38/1,000 live births
	Gavi Status	Eligible
	Total Population 2016	41,487,965
	Birth Cohort 2016	1,752,577
	Surviving Infants (JRF) 2016	1,653,663
1. Interrupt wild poliovirus transmission	Transmission interrupted	Yes
	Risk of late detection: Percent of adequate stool specimens (Rolling 12m) Target > 80%	90%
	Risk of late detection: Non polio AFP rate (Rolling 12m) Target > 2	3/100,000
	Risk of spread after importation: % of children 6M-59M having received less than 3 doses in the last year before occurrence case/environmental positive	9%
2. Neonatal tetanus elimination	TT2 coverage (reported 2016)	57%
	Protection at Birth against tetanus (WUENIC 2016)	87%
	Last SIAs conducted in the country	2009
	Elimination validation date	Validated in 2011
3. Measles Elimination	Coverage MCV1 (2016 WUENIC)	82%
	Coverage MCV2	Not in schedule
	Percentage of districts with MCV1 coverage >=95% (2016 JRF)	34%
	Last national SIA	2015
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Rubella vaccine coverage	Not introduced
	SIAs planned?	Not yet
5. Coverage with 3rd dose of DTP-containing vaccine	National coverage (WUENIC 2016)	78%
	Drop-out rate DTP1 to DTP3 (2016 WUENIC) (DTP1-DTP3)/DTP1*100	12%
	Actual numbers of children who dropped out (2016 WUENIC)	181,903
	Difference in DTP3 coverage between poorest and richest quintile (2011 data)	0.3 percentage points
	% of districts reaching 80% coverage (2016 JRF)	90%
6. Coverage with all vaccines in the national immunization schedule	National Coverage (2016 WUENIC)	BCG: 93% DTwP-Hib-HepB: 78% MCV1: 82% PCV3: 78% Polio3: 82%

Area	Indicator	Uganda
7. Introduction of new vaccines	New vaccines introduced	PCV10 in 2013; HPV in 2015; IPV in 2016. Meningitis A campaign approved by GAVI. Rotavirus introduction also approved by GAVI but currently on hold by Government
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	2010: 75.2 2015: 54.6 (27.4%)
9. NITAG	NITAG established?	Yes (meeting all 6 criteria in 2016)
10. Government expenditure on routine immunization per live birth USD	Baseline 2010-2011 and average for 2015-2016 (% change)	2.03 to 9.39 (362%)

Summary points

- To improve the financing of the national immunization program, a financial sustainability plan that analyzed various programmatic options (including new vaccine introductions) and financing scenarios, was completed in 2017 and the design and operationalizing of a national Immunization Fund is underway, with partner assistance.
- More than seven million people 1-29 years of age in 39 high-risk districts were vaccinated against Meningitis A in a mass campaign conducted in January 2017.
- Thirty-six districts plus Kampala were identified as having the greatest inequities in vaccination coverage in an immunization equity assessment and will be targeted for support to improve performance through the new HSS2 grant.
- The country's ever-growing refugee population, many from South Sudan and largely consisting of women and children, were targeted for combined polio-measles vaccination campaigns in late 2016, and will be included in a follow-up house-to-house polio campaign to be conducted the third quarter of 2017.

Immunization score card, Uganda, 1997-2016



Update on country situation and recent developments affecting the immunization program

- **Continued currency devaluation and inflation.** The Uganda shilling depreciated against the US dollar 25% in 2015 and another 5.5% in 2016, while the inflation rate was 5.2% in 2016 and 7.2% thus far this year.[1] This has led to a decline in the health budget in the past year, affecting the availability of funds for operational costs for immunization and other health services, and to continued difficulty for the country to meet its co-financing obligations for GAVI-supported vaccines on time. Uganda was in arrears on its 2016 commitment, but paid the outstanding balance in 2017. GAVI has agreed to harmonize the co-financing payment schedule with the Government's fiscal year (July – June), which should allow the country to pay the entire annual co-financing amount at the beginning of each fiscal year, thus avoiding future defaults.

- **Continual flow of refugees into the country.** Uganda has an estimated 1.25 million refugees and asylum seekers as of mid-May 2017 – the highest number in its history – and it is the home of the world's fastest-growing refugee camp.[2] Seventy-three percent of refugees are from South Sudan and are settled mainly in the North near the border, while others come from DRC, Burundi, among other countries. Eighty-five percent are women and children. In response to concerns about the risk among refugees for the transmission of vaccine-preventable diseases, combined polio-measles preventive campaigns were conducted in late 2016 with UNICEF support targeting refugee children under five living in host communities. In one district (Adjumani) where South Sudanese refugees have settled, more than 39,000 children received one or both vaccines, for a coverage rate of 85-86%.[3] Districts hosting refugees are also included in the 73 high-risk districts targeted for polio SIAs to be conducted the third quarter of 2017, which will involve house-to-house vaccination. In addition, GAVI has agreed to provide financial support for an extra supply of all vaccines used in the routine program to accommodate the burgeoning refugee population. These vaccines may be administered through an emergency catch-up campaign for refugees in 2017, and in 2018 through the routine program.

- **Creation of new districts.** Four new districts were created in July 2016 (from 112 to 116), and six more will be added in 2017, for a total of 122. During the next two fiscal years, the number of districts will reach 133. This expansion is not adequately taken into account in planning documents, including EPI annual plans. For each new district, a vaccine store needs to be created, a new district EPI manager and additional vaccinators recruited, and these new staff trained (in immunization practices, leadership, etc.). The Health system strengthening (HSS) 2 grant includes training for the immunization staff in the newly-created districts.

Key achievements, activities and progress towards the GVAP goals in the past year

Planning for sustainable financing of the Uganda EPI (UNEPI)

Uganda has had trouble paying its co-financing obligations on time each year, especially as they have increased with the addition of PCV (since 2013) and HPV vaccine (since 2015). In 2016, the Government financed 22% of the EPI budget (≈$17.8 million), while GAVI contributed 63% (≈$51 million).[4] To improve the planning of immunization financing and help inform decisions regarding additional vaccines introductions, the Uganda National Immunization Technical Advisory Group (UNITAG) recommended that the Government develop an immunization financial sustainability plan, which was completed in 2017. The plan estimated the

[1] Joint Appraisal report 2017.
[2] Joint Appraisal report 2017.
[3] Polio and measles SIAs – Adjumani district, presentation given at a district-level feedback meeting, December 7, 2016.
[4] Republic of Uganda. Financial Sustainability Plan for Uganda's Immunization Program, 2016/17 – 2020/21.

costs and financing gaps for five different scenarios that vary by which new vaccines are introduced (e.g., rotavirus, yellow fever, MR) and by level of funding for the routine program (at current vs. ideal levels based on objectives of the comprehensive multi-year strategic plan (cMYP) for immunization. The document estimates that without GAVI funding, there would be a 90% financing gap over a five-year period under a scenario that excludes the introduction of any additional vaccines, but properly finances the routine program.

Following completion of the sustainability plan, the Government developed a list of possible vaccines to introduce into the routine program (e.g., measles rubella (MR), yellow fever, a birth dose of hepatitis B, meningitis A, Td as a replacement for TT) and has asked the UNITAG to prioritize them. A UNITAG Working Group is developing a prioritization framework to assist with this exercise and, and plans to introduce any other vaccines, including MR, are on hold until the prioritization exercise is completed. The decision to introduce rotavirus vaccine, however, had already been made, and is planned for February 2018, with GAVI support.)

To increase the sustainability of the immunization program, in view of the eventual withdrawal of GAVI support, the Government in 2016 passed a national Immunization Act, which calls for the establishment of an Immunization Fund. The Government, with partners, is currently assessing options for the design of the fund and possible financing sources, and has agreed upon a division of labor for making the fund operational (e.g., PATH will assist with its establishment, WHO will develop a tool to track expenditures drawn from the fund, and UNICEF will develop a resource mobilization plan).

The Parliamentary Forum on Immunization, which in the past successfully pushed for budget increases (including increases in the number of health workers and their salaries), became inactive in the past year when its chairman lost his election as a member of Parliament. Support to reactivate this group has been identified as a priority activity of the PEF in 2018.

Implementation of mass catch-up campaigns for meningitis A vaccination in high-risk districts

A major achievement of UNEPI in the past year was the implementation of a mass preventive meningitis A vaccination campaign that targeted 1-29 year olds in the country's 39 high-risk districts over a five-day period. The intensive preparation of the campaign – through which 7.2 million people were vaccinated – included a national consensus meeting with 190 district officials, an average of four district coordination and microplanning meetings in each of the 39 districts, the training of more than 12,000 health workers, sensitization sessions for more than 6,000 social mobilizers, a cold chain inventory in each district, and extensive social mobilization and communications activities to inform the public about the campaign. While there were issues with the timely distribution of funds, IEC materials, and recording forms to the districts; insufficient numbers of available health posts in some areas; as well as resistance from some religious sects, the campaign was on the whole considered successful. A coverage survey has been conducted and the report is currently being prepared.

Efforts to improve immunization coverage and equity

An immunization equity assessment was completed in September 2016, which identified populations with high inequities in immunization coverage (e.g., refugees, migrants, the urban poor, certain religious communities, remote areas) and identified 36 districts plus Kampala as priority districts as the "most inequitable", based on the numbers of unimmunized children, dropout and coverage rates, measles outbreaks, and other criteria. UNEPI, with assistance from WHO and UNICEF and financial support from the newly-approved GAVI HSS2 grant, is following up with a detailed micro-mapping of these districts at the lowest administrative level by cultural, religious, geographical access and other characteristics to identify low-performing areas and to develop effective strategies to increase coverage in these communities.

A national immunization coverage survey has also been completed and the report is in development. This follows a Demographic and Health Survey (DHS) conducted in 2016, which estimated coverage rates among 12-23 month old children of 79% for DPT3, 66% for polio 3, 64% for PCV, and 55% fully-immunized.

UNEPI, with assistance from partners, also conducted a rapid assessment of HPV vaccination, which was introduced in November 2015 nation-wide for 10 year old girls (through fixed health facilities, schools and other community settings) to determine why coverage dropped from 82% for the first dose to 22-36% for the second dose, which is given six months later. The assessment found that the following factors likely contribute to the large drop-off in coverage between doses: the mix of delivery strategies and venues, including during Child Health Plus Days and through the routine program, which may have caused confusion; limited training of health workers; and low awareness among caretakers and school personnel about the vaccine and the need for the second dose.[5] A post-introduction evaluation scheduled for October 2017 should also help elucidate the causes of low second-dose coverage and develop recommendations to improve coverage for the full vaccination series.

Approval of GAVI grants to strengthen the immunization program and health systems

Two requests for GAVI support were accepted in the past year – a $29 million HSS 2 grant and an $8.3 million two-year grant for Cold Chain Equipment Optimisation Platform (CCEOP) support. The objectives of the HSS grant are to increase access to immunization and other reproductive, maternal, newborn, child & adolescent Health (RMNCAH) services (by, for example, increasing outreach services and EPI-focused supportive supervision); strengthen the vaccine supply chain (by expanding cold chain capacity, establishing a logistics management information system, among other improvements improve the quality and use of immunization and surveillance data; make the Immunization Fund operational; and increase community demand for immunization by training Community Health Extension Workers (a new class of health worker yet to be fully deployed) and strengthening social mobilization activities.

An addition activity under the HSS 2 grant will be an expansion of the project supported by HSS1 that provided private clinics in Kampala with cold chain equipment, as well as immunization training and supportive supervision, in order to increase the private health sector's role in providing and reporting immunization services in the city. One hundred and sixty of the target 170 private sector clinics in Kampala now report immunization activities on a regular basis using the DHIS2 platform.[6] Under the HSS2 grant, this support will be provided to private clinics – which account for an estimated 19% of all health service providers in Uganda – in other parts of the country. To inform this activity, a landscape analysis of immunization services provided by the private sector throughout the country is current underway and the final report, with recommendations, will be available by the end of 2017.

Through the CCEOP grant, more than 1,600 solar direct-drive (SDD) refrigerators and more than 400 ice-lined (electric) refrigerators will be procured, as well as temperature monitoring devices, spare parts and related equipment.

Increased partner collaboration

Through the PEF, the various partners supporting UNEPI, including WHO, UNICEF, CHAI, PATH and JSI, are working to better coordinate activities and avoid duplication by developing joint multi-year plans, holding monthly coordination meetings, chaired by the EPI manager, and harmonizing guidelines, such as the RED/REC guidelines.

[5] Joint Appraisal 2017.
[6] Presentation by GAVI on "Uganda: 2016 Performance", given during the July 2017 Joint Appraisal.

Table 2: An update on progress against the GVAP goals

Polio eradication	Uganda has not reported a case of WPV since 2010, and no vaccine-derived polio since 2015. Surveillance indicators for 2017 include a non-polio AFP reporting rate of 2.73 per 100,000 children <15 (target: >2/100,000) and a stool adequacy rate of 91% (target: ≥90%). Vaccination campaigns against polio and measles for refugee children took place in late 2016. SIAs in 73 high-risk districts, accounting for 67% of children under five, are planned for the third quarter of 2017, including all refugee populations
MNT elimination	Efforts are being put in place to integrate NNT with AFP surveillance, in order to strengthen case-based NNT surveillance. UNITAG has been asked by the MOH to look into strategies to increase TT vaccination coverage. A possible switch from TT to Td is also under consideration as part of the vaccine prioritization exercise that UNITAG is conducting.
Measles elimination and rubella/CRS control	Four measles outbreaks and 252 cases – mostly in children under five – were confirmed in 2016, though these are likely under-reported through case-based surveillance, which needs to be strengthened. Fourteen rubella outbreaks (289 cases) were confirmed in 2016 as well. The decision to introduce MR vaccine, originally planned for 2018, starting with catch-up vaccination campaigns, is on hold until an exercise by UNITAG to prioritize new vaccine introductions is completed. Refugee children under five were also vaccinated against measles during combined polio-measles SIAs in late 2016.
Immunization coverage (90% nation-wide and 80% in all districts for all vaccines)	The WUENIC estimates remained the same in 2016 as in 2015 for DPT3 (78%), OPV 3 and measles (82%) and BCG (93%). Coverage for all 3 doses of PCV, introduced in 2013/14, increased to 78% in 2016 (up from 66% in 2015 and 50% in 2014), demonstrating that the vaccine has become "routinized" into the immunization program. The 2016 DHS shows a similar DPT 3 rate of 79% among 12-23 month olds and a fully-immunized rate of 55%.
New vaccine introductions	Support for rotavirus introduction, planned for early 2018, was approved by GAVI. A cost analysis and sustainability plan was completed that estimates the cost and financial needs for different combinations of new vaccines. UNITAG is conducting a new vaccine prioritization exercise before decisions about any further vaccine introductions (e.g., MR, yellow fever, meningitis A) are made.

Acknowledgments

We would like to thank Annet Kisayke of the Uganda WHO Country Office, who was interviewed for this report and provided prompt comments on the draft.

YEMEN
Full country report

A. Progress towards achievement of GVAP goals

1. Summary

The summary table below describes the current situation in Yemen regarding achieving the GVAP goals. Data used to assess progress towards achievement of GVAP goals are included in the annex (Country immunization profile).

Area	Indicator	Yemen
Socio-demographic	WB Status	Low income country
	Infant mortality (<12 M) 2015 UN IAG CME	43/1,000
	GAVI status	Eligible
	Total population	27 584 000
	Birth cohort	872 000
	Surviving infants (JRF)	834 000
1. Interrupt wild poliovirus transmission	Transmission interrupted	Yes
	Risk of late detection: Percent of adequate stool specimens (Rolling 12 mo.)(Target > 80%)	92%
	Risk of late detection: Non polio AFP rate (Rolling 12 mo.) (Target > 2/100,000 children	6/100 000
	Risk of spread after importation: % of 6-59 month olds having received less than 3 doses in the last year before occurrence case/environmental positive	11%
2. Neonatal tetanus elimination	TT2+ coverage (reported on JRF 2016)	19%
	Protection at Birth against tetanus (WUENIC 2016)	70%
	Last SIAs conducted in the country	2009
	Elimination validation date	Not yet eliminated
3. Measles Elimination	Coverage MCV1 (WUENIC 2016)	70%
	Coverage MCV2	49%
	Percentage of districts with MCV1 coverage ≥95% (2016 JRF)	50%
	Last national SIA	2017
	Post SIA coverage survey conducted	No
4. Rubella/CRS Elimination	Rubella vaccination coverage	70%
	SIAs planned?	2018

5. Coverage with 3rd dose of DTP-containing vaccine	National DTP3 coverage (WUENIC 2016)	71%
	Drop-out rate DTP1 to DTP3 (WUENIC 2016)	7%
	Actual numbers of children who dropped out (WUENIC 2016)	41 700
	Difference between poorest and richest quintile DTP3 coverage (2013 DHS data)	(24% vs. 62%)
	% of districts reaching 80% coverage (2016 JRF)	64%
6. Coverage with all vaccines in the national immunization schedule	National coverage (WUENIC 2016)	BCG: 73% DTP3-HepB3-Hib3: 71% MR1: 70% Pol3: 65% RotaC: 59%
7. Introduction of new vaccines	New vaccines introduced	Pentavalent: 2005 PCV: 2011 Rotavirus: 2012 MR: 2014 IPV: 2015
8. Reduction in under 5 mortality rate	Percent reduction from 2010 to 2015	23%
9. NITAG	NITAG established?	Yes (2008)
10. Government expenditure on routine immunization per live birth (USD)	Baseline 2010-2011 and average for 2015-2016 (% change)	-80%

2. Crisis situation in Yemen

Yemen is currently facing the largest cholera outbreak in the world with half a million suspect cases between the beginning of the epidemic in April 2017 and mid-August 2017. The rapid spread of the outbreak is due to deteriorating hygiene and sanitation conditions and disruptions to the water supply across the country. This situation is putting its already fragile health system under significant additional stress.

Yemen has been in a state of civil war since March 2015, when Houthi rebels descended on the capital of Sana'a and occupied much of the Northern governorates,[1] forming a *de facto* government. The elected, "internationally-recognized" government, headed by Abdo Rabo Mansour Hadi – the Vice President under the previous long-term leader, Ali Abdullah Saleh – initially fled to Saudi Arabia and is now based in Aden in the country's South.

Each government has set up its own health ministry and the U.N. agencies work with both sides, establishing a neutral stand. While WHO, UNICEF and other health partners work primarily with the Ministry of Public Health & Population (MoPHP) under the *de facto* government in Sana'a, they also collaborate with the Coalition-based government in Aden as well as with governorates under its control. The story of immunization in Yemen is the story of how recognition of the importance of maternal and child health services, especially immunization, among both sides of the war can transcend open conflict and enable these services to continue, despite enormous challenges, albeit using emergency modes of operation, such as integrated outreach rounds, mobile teams and vaccination campaigns (SIAs). This has been made possible by the country's belief in prevention, its continued efforts to prioritize vaccination and an immunization program with a strong track record. Moreover, experts on critical

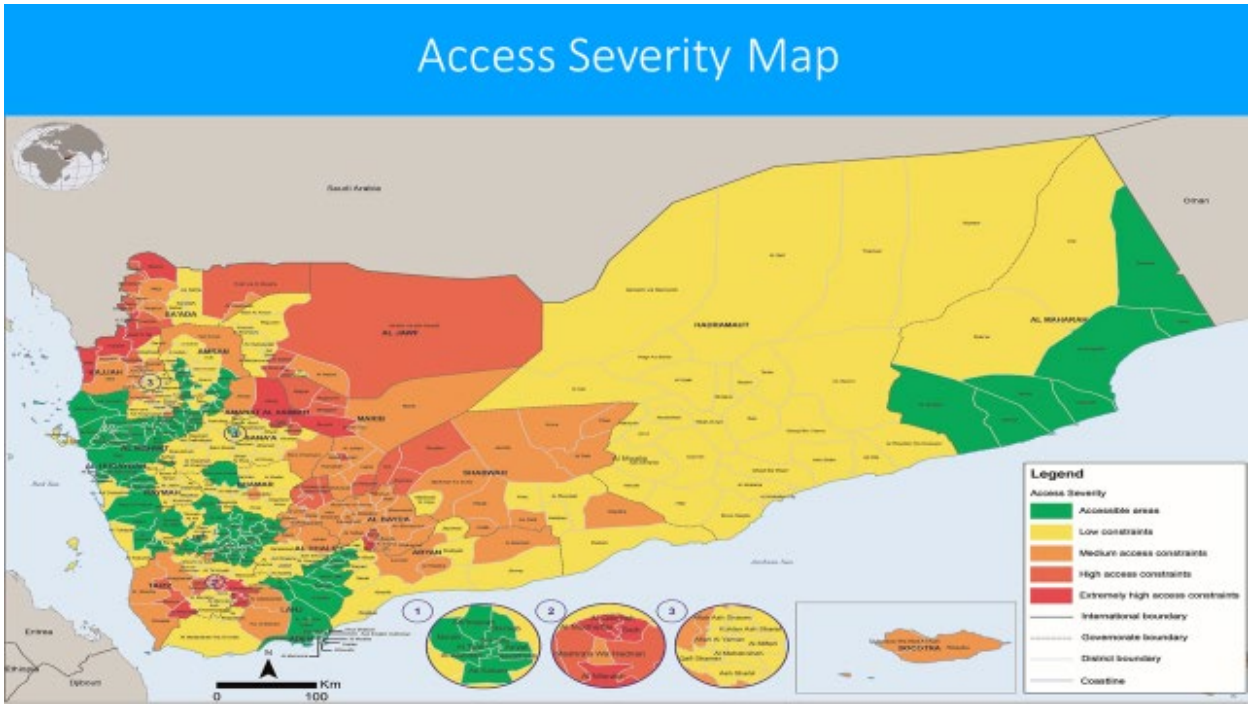
[1] Similar to provinces.

oversight and decision-making committees (e.g., the NITAG, HSSCC and EPI Task Force), have stayed on despite the change in regime – providing continuity and long-term technical experience. The strong support of international aid agencies has also been a key factor.

More than half of the country's population of around 28 million people live in areas directly affected by the conflict, including airstrikes, although, according to an assessment conducted in November 2016, around 69% of districts are fully accessible to humanitarian services or have relatively few access constraints (see Figure 1).[2] Around 2.1 million people live in areas that are the most difficult to access, concentrated primarily in Northeastern governorates (e.g., Sa'ada, Al Jawf, Hajjah, Marib), as well as in Taiz in the South. The war has also displaced around 3.5 million people, the majority of whom are women and children living in other communities (e.g., with host families).

The war has also caused an economic crisis, with a 79% decline in foreign reserves from 2014 to September 2016, the closure of the central bank in Sana'a, and a 50% increase in the public budget deficit in a few years.[3] As a result, the currency was devaluated by 7% in 2016 and little circulating cash is currently available in the country. At the same time, the Coalition and elected government (in Aden) banned commercial flights from landing at the international airport in Sana'a in August 2016 and airstrikes on the country' main seaport in Al Hudaydah have further limited imports of critical commodities – in a country that depends on imports for more than 90% of its food and nearly all of its fuel and medicines.[4]

Figure 1: Districts of Yemen by level of accessibility



Source: OCHA

As a result of the combined financial crisis and import restrictions, basic commodities, including food, are increasingly scarce and costly. At the same time, salaries of public employees, including health workers, have been interrupted or stopped altogether, leaving nearly 30% of the population without a regular income and causing a "double impact".[5] More than 17 million people (≈60%) are now food insecure and an estimated 1.9 million children under the age of five were found to be acutely malnourished in a nutrition survey conducted in November 2016, including 360,000 with severe acute malnutrition.[6] According to one estimate, more than 10,000 children died each year in 2015 and 2016, mainly from preventable diseases due to a lack of access to health care, but 1,800 deaths were due to the airstrikes and other violence.[7]

The impact of the war on the health sector has been devastating. The MoPHP in Sana's stopped paying for most operational costs for health services in September 2016 and health worker salaries in October (salaries are still being paid to some extent by the Aden government). Due to these and other effects of the conflict, only 45% of the country's approximately 4,200 health facilities

[2] Similar to provinces.
[3] U.N. Office for the Coordination of Humanitarian Affairs (UNOCHA), 2017. Found at: http://ochayemen.org/hrp-2017/.
[4] U.N. Office for the Coordination of Humanitarian Affairs (UNOCHA), 2017. Found at: http://ochayemen.org/hrp-2017/.
[5] U.N. Office for the Coordination of Humanitarian Affairs (UNOCHA), 2017. Found at: http://ochayemen.org/hrp-2017/.
[6] Joint Appraisal report 2017 .
[7] Presentation on Routine Immunization Activities given at the 2017 Joint Appraisal meeting, May 15-17, 2017, Beirut.

were found to be fully functional in a health availability assessment conducted in October 2016 in 16 of the country's 23 governorates.[8] Another 38% were partially functional and 17% was non-functional or closed. Adding to the devastation is the major cholera outbreak that began in late April 2017 and has spread rapidly to 20 governorates, reaching over 500,000 suspected cases and 2,000 deaths as of August 14, 2017 and increasing at a rate of 5,000 cases a day.[9] The overall caseload nation-wide has declined since early July, particularly in the worst affected areas, but the disease is still spreading rapidly in more recently-affected districts.

In response to the crisis, humanitarian partners have set up five field hubs – in Sana's, Aden, Ibb, Sa'ada, and Al Hudaydah – to coordinate humanitarian assistance and facilitate logistical operations in areas with the greatest need. UNICEF, WHO and other partners also operate from these hubs. In addition, UNICEF set up a hub in Djibouti after the war began as a center for storing and sending medical supplies, including vaccines, to Yemen. What has been rather unique in Yemen since the war began is that, in addition to emergency health services provided through strategies such as outreach rounds and SIAs, many of the typical "development" activities that normally cease in a conflict situation – such as meetings of the EPI Task Force, health worker trainings, cold chain system improvements, and maternal and neonatal tetanus (MNT) elimination campaigns – have continued during the war through the collaboration of partners and both governments.

3. Country ownership of the immunization program

3.1 Immunization policy decision-making capacity

Three groups have an oversight and decision-making role in the immunization program and have continued to be actively engaged despite the civil war:

- The **Health System Strengthening Coordinating Committee (HSSCC)** was created in 2007 by expanding the Inter-agency Coordinating Committee (ICC) to include members from other sectors, such as finance, planning, education, and non-governmental organizations (NGOs). The committee, chaired by the Health Minister and mandated to meet on a quarterly basis, also includes representatives from major partners, including WHO and UNICEF. While its current chair was appointed by the *de facto* government after the conflict broke out, its other members has largely remained the same and have stayed above the political fray. The HSSCC monitors and assesses the program's performance and is responsible for endorsing all key policy decisions – from new vaccine introductions and applications for GAVI support to plans for SIAs and integrated outreach rounds. Deemed "highly effective" by the Joint Assessment team in 2017, the committee was able to meet three times both in 2015 and 2016.
- The **National Immunization Technical Advisory Group (NITAG)**, formed in 2008, consists of six experts in such areas as paediatrics and child health from academia and civil society. The group, which functions without a technical subcommittee or working group, has been able to meet twice both in 2015 and 2016 and most recently in January 2017.
- The **EPI Task Force** was established in 2014 to provide critical oversight and decision-making on a monthly basis concerning all major immunization program activities, such as polio and measles vaccination campaigns, outreach rounds and the functioning of fixed EPI centers. Chaired by the Deputy Health Minister and consisting of staff from the MoPHP, WHO, UNICEF and NGOs, the Task Force is viewed as having played a pivotal role in the continuity of immunization services and in preventing the expected decline in coverage since the war began. Among its major achievements and actions have been the establishment of an EPI emergency operations room and central hotline in Sana'a to ensure the smooth operation and coordination of SIAs and outreach rounds;[10] ensuring the safety of stored vaccines once the war began; coordinating fuel supplies for the cold chain system during total power outages that

[8] Ministry of Public Health & Population and WHO. Service Availability and Health Facilities Functionality in 16 Governorates, Final report, October 2016.
[9] Outbreak News Today. Assessed June 28, 2017 at: http://outbreaknewstoday.com/yemen-cholera-death-toll-rises-1400/.
[10] See Section 4.1 for more details on the emergency operational room.

have occurred during the conflict; ensuring that health facilities remain operational during the crisis; and conducting rapid assessments and supervision activities. The EPI Task Force met 14 times in 2015 and 10 times in 2016.

3.2 Government financing of immunization

Donors have paid the majority of the costs of Yemen's EPI program for many years. However, the Government of Yemen's contribution to the program had been increasing – from 16% in 2013 for the routine program (excluding campaign and shared costs) to 21% in 2014.[11] If one includes shared costs of the program funded by the Government (e.g., for health worker salaries, operational costs of health facilities), as well as the cost of campaigns – funded entirely by GAVI, UNICEF and WHO – the Government's contribution in 2014 rose to 39%. This contribution included 100% of the cost of traditional vaccines (OPV, BCG, TT, MR) purchased from UNICEF, as well as its co-financing commitments for new GAVI-supported vaccines since these payments began in 2009. These commitments included a 35% share of the cost of pentavalent vaccine in 2009 – increasing 10% per year – and 10% co-financing of PCV and rotavirus vaccines – also increasing by 10% a year since they were introduced in 2011 and 2012, respectively. The Yemeni Government has had a history of meeting their co-financing obligations fully and on-time, and in fact was paying more than the required minimum amount.

However, since the war began in March 2015, the Government in Sana'a has been unable to make any payments for traditional vaccines or meet its co-financing obligations. Thus, the country's contribution to the costs of the immunization program plummeted from 21% in 2014 to 9% in 2015, to cover mainly health worker salaries.[12] Government payments for fuel and transport for the delivery and storage of vaccines also ceased in 2015. The situation worsened when, as mentioned above, government payments for first the operational costs of health facilities and then health worker salaries stopped in the fall of 2016.

To make up for these losses and maintain the delivery of immunizations and other maternal and child health services, partner agencies – primarily GAVI, the World Bank, UNICEF and WHO – have assumed almost the entire cost of immunization services since October 2016. UNICEF has covered the costs of traditional vaccines and the Government's co-financing share of GAVI-supported vaccines since 2015. GAVI's share of immunization financing, including SIAs, rose from 56% in 2015 to 65% in 2016. These include funds provided to UNICEF to cover the costs of fuel for the cold chain system and for transporting vaccines from the central cold rooms in Sana'a down to the districts, as well as funds to reopen hundreds of closed health facilities (to cover fuel and other cold chain costs and staff compensation). All of the costs of SIAs, integrated outreach rounds and mobile team visits – which have become major strategies for vaccine delivery – are now covered by GAVI and the World Bank (through UNICEF and WHO). These costs include payments to health workers in the form of per diems, travel reimbursement or other incentives. GAVI, through the HSS grant, has also covered the costs of medicines and other (non-vaccine) medical supplies for the integrated outreach rounds. Recently, with the cholera epidemic raging, UNICEF has decided to cover some health worker salaries to ensure their availability to respond to the epidemic and treat cholera patients.

A new $200 million, four-year World Bank project – to be implemented by UNICEF and WHO with the MoPHP – will provide a much needed stable stream of funding to both support emergency operations and maintain the capacity of the existing health system. The World Bank Emergency Health and Nutrition Project, beginning in 2017, will cover the costs of traditional vaccines and the government's co-financing share of GAVI-supported vaccines, as well as the operational costs of all special immunization activities (integrated outreach rounds, SIAs and mobile teams). In addition, the project will provide funding to maintain the country's cold chain and vaccine distribution system and the delivery of immunization, integrated management of childhood illnesses (IMCI) and other health services at fixed health facilities.

3.3 Human resources situation

The EPI in Yemen has a strong human resource infrastructure in place. At the national level in Sana'a, there is an EPI manager, working under the Director General for Primary Health Care, and a team of 63 professionals, including experts in cold chain and vaccine management, planning, monitoring

[11] MoPHP. Comprehensive Multi-Year Plan (cMYP), 2016-2020, October 14, 2016 draft.
[12] Ibid

and supervision. Each of the 23 governorates has an EPI supervisor and cold chain manager. Each of the country's 333 districts also has an EPI district supervisor, all of whom were in place in 2015, according to the 2016-2020 cMYP, as were store keepers in 250 of the districts. In addition, there is a parallel system of integrated surveillance officers in each governorate and district.

Vaccinations are administered primarily by health workers operating from health units (manned by one or two staff), health centers, and district and governorate hospitals. Before the crisis there were approximately 4,200 health facilities of all kinds throughout the country, with an estimated 81% providing immunization on a regular basis. As a result of the crisis, the number of EPI centers fell at one point by 22%, but many of the closed EPI centers have since become operational once again. As of July 2017, of the 3,886 accredited vaccination sites, 3,325 (86%) are functional (i.e., have cold chain equipment, personnel and recording tools).

Yemen has had a number of health workforce challenges, including health worker shortages, especially in rural areas, and considerable turnover, due in part to low compensation. Many health units have only one health worker trained in immunization, affecting the availability of service when this person is absent.[13]

A number were self-motivated despite the low compensation, reportedly using their own funds to pick up vaccines from district stores and buying fuel for cold chain equipment, according to WHO country and regional office informants. Since the conflict began in 2015, however, many health workers have left their positions, with a number being displaced due to the hostilities or to the closure of their facilities, and others leaving to work for NGOs or even to start mobile clinics in camps for internally displaced persons (IDP).[14] A good number, however, have stayed on, receiving some salary support from partners, and make up the workforce that conducts the outreach rounds and other special immunization activities, for which they are fully paid through partner funding.

Yemen has also established a system of community health volunteers (CHVs) to serve as a liaison between health facilities and communities for various health programs, including nutrition, IMCI, reproductive health, and immunization. These volunteers are respected members of their communities who mobilize residents and help organize outreach sessions, follow up missed children or dropouts, and encourage referrals to health facilities. However, there are only around 10,500 CHVs – thus serving less than 8% of the country's 136,000 settlements – and most have not received training in immunization for many years, if at all.

4. Progress towards specific GVAP goals

4.1 Goal 1: Achieve a world free of poliomyelitis

Has polio transmission been interrupted?

The last lab-confirmed case of wild polio virus (WPV) in Yemen occurred in 2006, at the tail end of an outbreak that started in 2005 from cases imported from Africa. This outbreak resulted in 478 cases of paralysis among children – one-third of the global polio burden in 2005. The country was declared polio-free in 2009. Since then, there have been three outbreaks of vaccine-derived polio virus (cVDPV) in 2011 and 2013, but few VDPV cases after 2013, which has been attributed to improvements in AFP/polio surveillance and to a series of high-quality, large-scale vaccination campaigns conducted from 2011 to 2014 in response to the cVDPV outbreaks.[15]

To maintain its polio-free status and upon recommendation of the regional polio technical advisory group, the county has continued to conduct national polio vaccination campaigns (NIDs) since the conflict began. These include two rounds both in 2015 (in August and November) and in 2016 (January and April), each reaching 4.5 to 4.8 million children under the age of five, out of a target of approximately 5.1 million (88-94%)[16] and another round in 2017 (see below). The original plan was to conduct four rounds in 2016, but two were postponed due to insecurity.

[13] Joint Appraisal report, 2016.
[14] Joint Appraisal report, 2016.
[15] One case was found in Aden in 2016, according to the UNICEF country office.
[16] Presentation on Routine Immunization Activities given at the 2017 Joint Appraisal meeting, May 15-17, 2017, Beirut.

Yemen also introduced IPV in the routine program in November 2015 and made the switch from the trivalent to the bivalent OPV in April 2016.

Is the country considered at high risk of polio transmission?

A recent analysis conducted by EMRO found the country to be at "medium-high" risk of WPV importation and spread or the emergence of VDPV.[17] This assessment was based on the potential pool of susceptible children resulting from low (<80%) vaccination coverage rates in previous campaigns in several areas (with a total population of ≈400,000 children), the lack of recent polio campaigns in two districts, and a decline in the routine program since the conflict began. Population movement, including a large IDP population and immigration from high-risk countries, was another factor. The assessment also found a low to medium risk of undetected or delayed detection of polio cases due to the fact that 41% of districts did not meet the targets for two key surveillance indicators (a non-polio AFP rate of >2 per 100,000 children under 15 and a stool adequacy rate of >80%) – with 27% of districts meeting neither target. According to official government data, the country as a whole meets both indicators – with a non-polio AFP rate of 5.3 per 100,000 and a stool adequacy rate of 91%. The country's capacity to respond rapidly to an outbreak was judged as medium-high.

What needs to be done to keep Yemen polio free?

To prevent the reemergence of polio in this conflict-ridden country, Yemen, with WHO, UNICEF and World Bank assistance, conducted another national OPV campaign in February 2017, reaching 4.8 million children under five years of age, for an estimated coverage of 93%, according to an independent monitoring report.[18] The campaign made special efforts to target IDPs and refugees, and engaged health workers, volunteers, religious leaders and local council officials in mobilizing their communities. A survey found relatively high population awareness of the campaign – 79% – due to a wide-ranging communications campaign that included SMS messages, radio and TV announcements, and social mobilization through mosques, schools and community health workers. The three-day, door-to-door campaign – involving an estimated 40,000 vaccinators – reached children in areas where the violence has intensified, such as Sa'ada governorate, and has cut off access to health services.[19]

A key factor in the successful implementation of this and other recent SIAs since the conflict began has been the establishment by the EPI Task Force of an EPI emergency operations room within the MoPHP in Sana'a, and parallel structures in the governorates. The central emergency operations room, which includes a central hotline, allows daily coordination and communications with the governorates to make sure that they and the districts receive vaccines, IEC materials and other supplies during the campaigns, and that any bottlenecks are resolved quickly. The emergency operations room is manned by a team of 15 MoPHP employees during the integrated outreach rounds and 11 employees during polio campaigns, who receive additional compensation from partners.

A second OPV round is scheduled for July/August 2017. Additional SIAs are not at present being planned and instead the focus will be on improving polio vaccination coverage through integrated outreach rounds, mobile team visits, and at fixed facilities. Maintaining AFP/polio surveillance and improving it in low-performing areas will also be critical to preventing polio from re-emerging in the country.

4.2 Goal 2: Meet global and regional elimination targets

4.2.1 Achieve maternal and neonatal tetanus elimination

Yemen adopted a high-risk approach to eliminating MNT in 2000, consisting of tetanus toxoid (TT) vaccination campaigns for women of child-bearing age in high-risk districts, coupled with vaccination of pregnant women through antenatal care (ANC) services. However, the TT campaigns often did not take place, due to competing priorities and a lack of funding.

The country therefore missed its MNT elimination targets in 2000, 2005 and 2015, and reported 117 cases in 2015 – double the number of cases reported in 2013.[20] Besides the intermittent implementation of SIAs, the reasons Yemen has not yet achieved this goal include:

- Low TT2+ coverage rates among pregnant women, which in the past five years have been 13-18% nationally, according to country official estimates.

[17] "Poliovirus risk analysis for conflict-affected polio-free countries", EMRO, December 2016 presentation, found at: http://polioeradication.org/wp-content/uploads/2017/04/Risk-Assessment_Specific_EMR_Countries_2017.pdf.
[18] Presentation on Routine Immunization Activities given at the 2017 Joint Appraisal meeting, May 15-17, 2017, Beirut.
[19] WHO EMRO press release: National polio immunization campaign launched in Yemen, 20 February 2017. Found at: http://www.emro.who.int/yem/yemen-news/national-polio-immunization-campaign-launched-in-yemen.html.
[20] cMYP 2016-2020.

This is a decline from the 31-39% rates achieved in the early 2000s (Fig. 2). The low coverage rates are a reflection of the low use of antenatal care services in the country – with only 60% of pregnant women receiving any ANC services and 25% making at least four ANC clinic visits.[21]

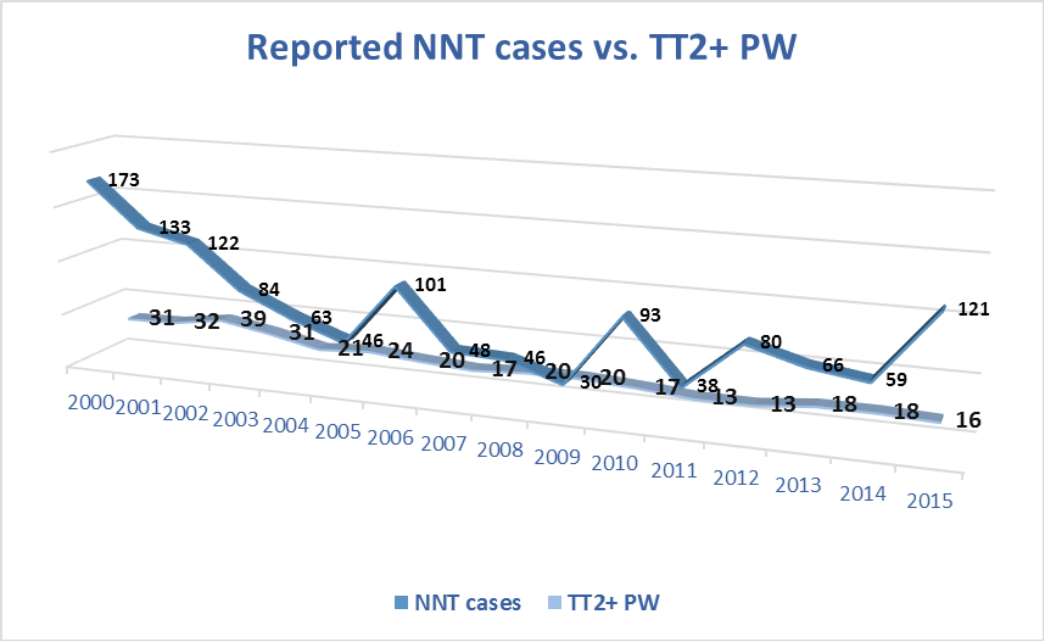
- A high rate of home births (69%), along with unhygienic childbirth and cord care practices in parts of the country.
- A largely agrarian lifestyle in rural areas, with people living close to farm animals.

In addition, the case-based MNT surveillance system is considered weak, with only 25% of reported cases investigated in 2015.[22]

To increase TT coverage in the midst of the conflict, TT vaccination of pregnant women is included in the integrated outreach rounds that are described in Section 4.3. In 2016, of the approximate 565,000 pregnant women who received TT vaccine, 47% were vaccinated during the outreach rounds.[23]

The MoPHP has worked with UNICEF to address the recent dramatic increase in MNT cases and low TT coverage rates by developing a new accelerated disease control plan that combines efforts to increase routine TT vaccination of pregnant women with high-quality SIAs in 46 high-risk districts identified using the UNICEF MNT risk assessment tool. The plan calls for two rounds of SIAs in 2017. The first, which took place in April/May, was well-organized – targeting girls and women in schools and universities, as well as in communities, and achieving a preliminary coverage rate of 81%.[24] This campaign illustrated the willingness of both sides of the conflict to conduct non-emergency immunization activities during a civil war and to do so successfully, with partner support. The decision to implement the campaign was initially made by the *de facto* government, while the internationally-recognized government in Aden resisted, calling it "a Northern decision". The SIAs therefore began in the Northern governorates, but within a week, the South agreed to implement the campaigns in their governorates. The second, final round is scheduled for October 2017.

Figure 2: Reported neonatal tetanus cases and TT2 coverage rates (%) among pregnant women (PW)



Source: cMYP

[21] Yemen DHS 2013.
[22] cMYP 2016-2020.
[23] Presentation on Routine Immunization Activities given at the 2017 Joint Appraisal meeting, May 15-17, 2017, Beirut.
[24] Bilal Ahmed, UNICEF, personal communication.

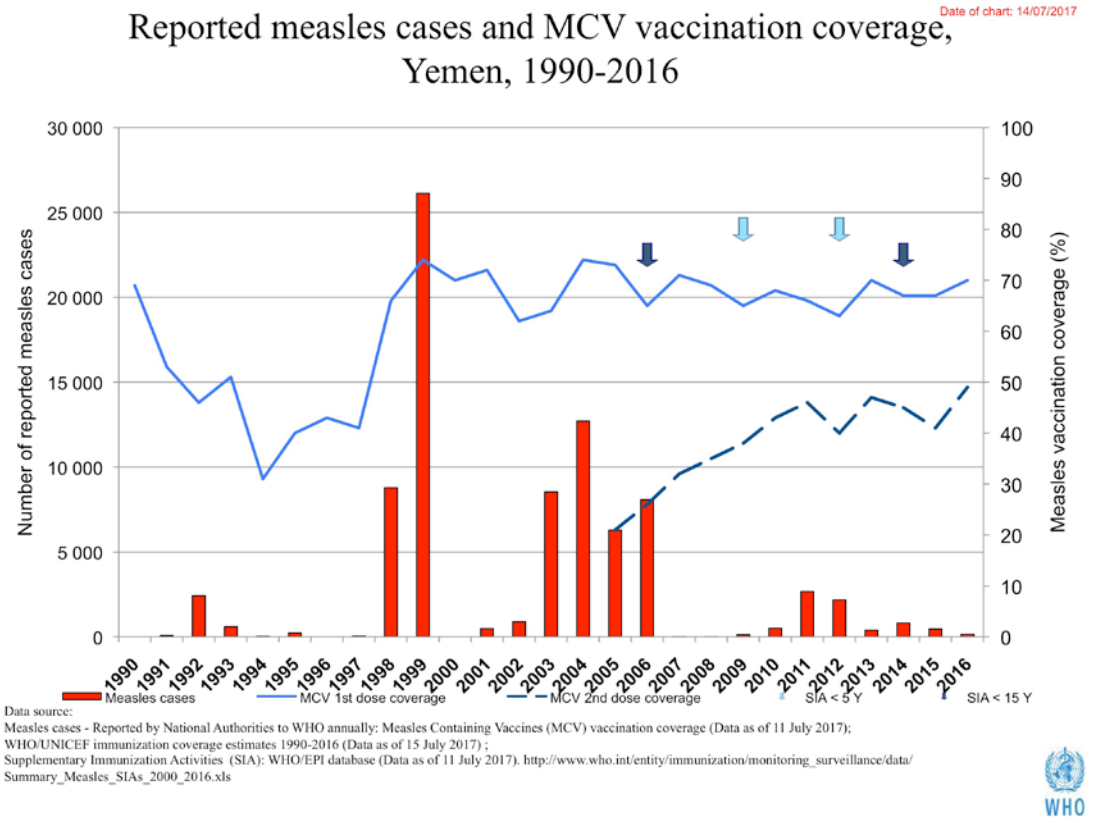
4.2.2 Achieve measles elimination and rubella & CRS control

Measles

While Yemen has not yet achieved measles elimination, it has made a concerted effort to control the disease in the past 13 years or so, including since the civil conflict began in March 2015. Measles was the fourth cause of death among children under five, responsible for 12% of deaths in this age group in a 2003 Family Health Survey – with 8,000 - 10,000 cases reported in 2003 and 2004. Since then reported incidence has declined markedly (Fig. 3), to 468 cases in 2015 and to 143 cases in 2016. The rate per one million population had thus declined from 196 in 2006 to 104 in 2011 and to 18.5 by 2015 (measles elimination is defined as a rate of ≤1 case per million) (See Annex 2).

The EPI introduced a second measles vaccine dose into the routine immunization schedule in 2004 and also conducted a series of national and sub-national vaccination campaigns, starting with a national catch-up campaign for 9 month – 15 year olds in 2006, and follow-up campaigns for children under five in 2009 and 2012. While cases declined sharply, an outbreak occurred again in 2011/2012 (with 4,800 reported cases), leading to another national catch-up campaign in late 2014, during which measles-rubella (MR) vaccine was also introduced.

Figure 3: Reported measles cases and MCV vaccination coverage rates

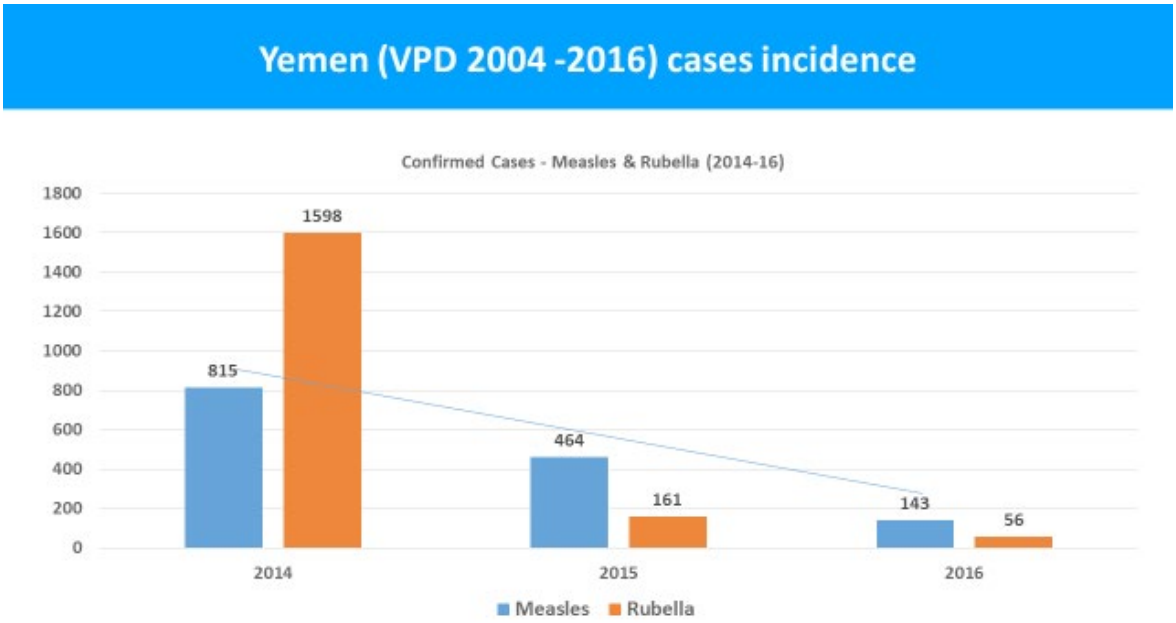


In response to reports of an increase in cases, mop-up campaigns for under-five year olds were conducted in August 2015 (in conjunction with the polio NID) and in June 2016 in a total of 126 low-performing or at-risk districts. The campaigns achieved coverage rates of 87-93%, according to post-campaign surveys.[25]

As mentioned, the number of confirmed cases has continued to decline – to 143 cases in 2016 (Fig. 4), though cases are still occurring in areas with no functional health facilities, leading to mop-up campaigns in four governorates in the second half of 2016.

[25] Joint Appraisal report 2016.

Figure 4: Recent trend in confirmed measles and rubella incidence



While the number of actual cases is likely vastly under-reported, the reduction in cases in the past 10 years is considered to be real and not a result of a decline in measles surveillance. In fact, surveillance has improved substantially during this period, with the introduction of case-based surveillance in 2006. The non-measles, non-rubella rate of febrile illnesses nationally was 7.1 per 100,000 children in 2015 – with all 23 governorates having rates above the target of 2/100,000 – and the national serum adequacy rate was 94%.[26] It should also be noted that both the official government coverage estimates and the WHO-UNICEF estimates show relatively flat coverage of MCV1 since 2005, as well as of MCV2 since around 2012. Thus, the decline in cases are mostly likely due largely to the various SIAs that have taken place since 2006.

The country has submitted an application to GAVI for another national MR catch-up campaign, currently planned for March 2018, as part of a five-year MR response plan to be included in the next revisions of the 2016-2020 cMYP.

Rubella

Measles-rubella (MR) vaccine was introduced in late 2014 through the national measles catch-up campaigns for <15 year olds, followed by its inclusion in the routine schedule (at 9 and 18 months) in February 2015. The vaccine was introduced upon a recommendation of the NITAG in response to a sharp increase in cases of rubella found through MR case-based surveillance (from 7-14 cases per year in 2007-2012 to 41-52 cases in 2013 and 2014).[27] The introduction of MR vaccine has led to a 96% reduction in the reported rubella incidence rate in two years: from 63.8 per 1 million population in 2014 (1,593 cases) to 6.4 per million in 2015 (161 cases) and to 2.2 per million in 2016 (56 cases) (Annex 3). The national MR campaign planned for 2018, as well as the continual integrated outreach rounds, should help to further reduce or at least maintain the current low level of rubella incidence in the country. There is currently no CRS surveillance data available.

4.3 Goal 3: Meet vaccination coverage targets

a. **Achieve 90% national coverage and 80% in every district with three doses of diphtheria-tetanus-pertussis containing vaccines**

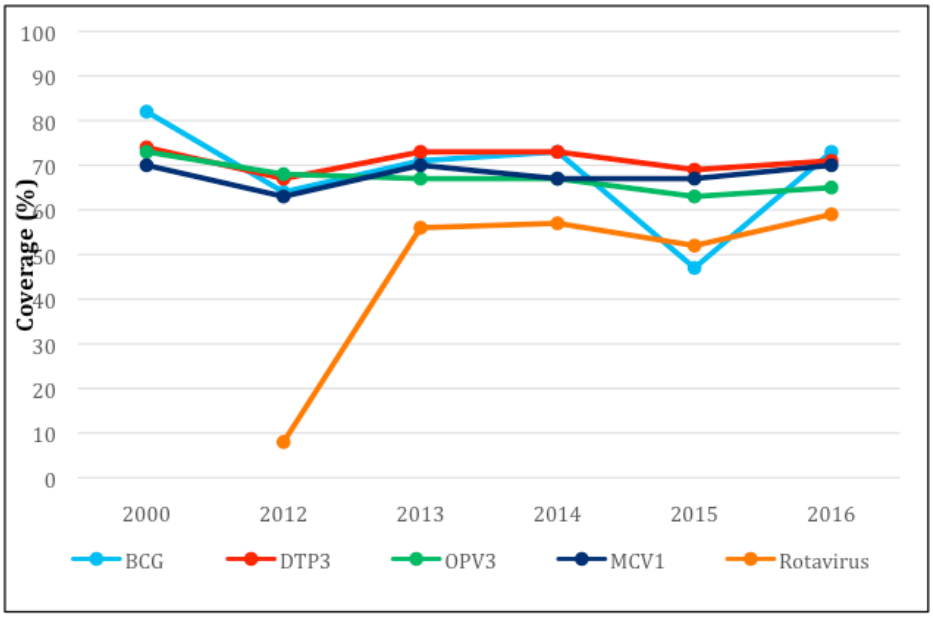
b. **Achieve 90% national coverage and 80% in every district with all vaccines included in the national schedule**

[26] cMYP 2016-2020.
[27] cMYP 2016-2020.

Yemen has not yet been able to achieve these coverage targets. The WHO-UNICEF (WUENIC) estimates show national coverage rates of 71% in 2016 for the third dose of DTP-containing vaccine (pentavalent) and rates for the complete series of other vaccines in the mid-60s to low 70s (Fig. 5). The generally higher official government estimates for national coverage have also not reached the 90% mark; they range in 2016 from 86% for the third dose of pentavalent, polio and PCV to a low of 73% for BCG.

Government data show that 64% of districts in 2016 achieved a pentavalent 3 coverage rate of 80% or more (vs. the target of 90% of districts). However, the district data is not considered reliable as there is a significant difference between the WUENIC national estimate for DTP3 (71%) and the official country estimate (86%).

Figure 5: WHO-UNICEF estimated national immunization coverage rates for Yemen over time



As shown in Fig. 5, the coverage rate trends have been fairly flat for the past several years, though they dipped somewhat in 2015 once the conflict began. However, they are back up to around pre-conflict levels in 2016. The relatively low BCG rates as compared to many countries stem from the low percent of deliveries in health facilities (≈30%)[28] and the fact that many of the hospitals where women give birth do not provide immunization services. The low BCG rate in 2015 was due to a global shortage of the vaccine and has since bounced back.

One issue affecting coverage has been the rate of dropouts between vaccine doses, which, using the WUENIC estimates, was 10.4% from the first to the third dose of pentavalent vaccine (from 77% to 69%) in 2015 and 11% in 2014. However, it fell to 6.6% in 2016. Dropout rates between the two doses of MR vaccine were higher – at 33% in 2014, 39% in 2015 and 31% in 2016.

Among the reasons for Yemen not meeting its coverage targets even before civil conflict began in early 2015 are:

- Large discrepancies in coverage rates between geographic areas and income levels. According to the 2013 Demographic and Health Survey (DHS), the proportion of children fully vaccinated was 59% in urban areas, compared to 37% in rural areas, and was 2 ½ times greater among children in the wealthiest income quintile (62%) as compared to those in the lowest (24%).[29]
- Insufficient access to basic health services in many rural areas – as reflected in the above figures – as well as among nomads, refugees and other marginalized populations.
- Many health units (the basic health facilities that account for 78% of all facilities in the country) are manned by only one or two health workers – often only one of whom has been trained in immunization – thus limiting their ability to conduct outreach services or even vaccination sessions at their facility.[30]
- Insufficient linkages between communities and health facilities, affecting the ability of the health system to

[28] cMYP 2016-2020.
[29] Republic of Yemen, Yemen National Health and Demographic Survey 2013. Published July 2015.
[30] Joint Appraisal report, 2016.

promote immunization services, especially in remote areas; to mobilize communities for immunization activities; and to identify and follow up missed children and defaulters. As mentioned above, there is a system of community health volunteers who conduct such activities, but in only around 8% of the country's settlements.

- Insufficient knowledge about vaccination amongst the population. While a knowledge, attitudes and practices (KAP) survey conducted in 2015 indicated wide population acceptance of vaccination – with 83-88% strongly agreeing that immunization of their children is one of their primary responsibilities and 90% of women and 97% of men strongly agreeing that vaccinators should be allowed into their homes – there was limited knowledge about the frequency and types of vaccinations that children should receive in their first year.[31] Only 5% were aware that DTP and Hib vaccines were needed during the first year of life – compared to awareness among 70% or more of the importance of polio and measles vaccinations.

A major role of the immunization program and partners has been to prevent a decline in immunization coverage once the conflict broke out in early 2015. Indeed, official government data suggest that after a dip in coverage in 2015, the rates have recovered to pre-war levels. Among the key reasons for the sustained coverage rates are:

- **Political commitment on both sides to maintain immunization services and a strong existing immunization infrastructure.** The Yemeni government has historically shown a strong commitment to providing immunizations to children, having fully and promptly paid for all traditional vaccines and the co-financing of GAVI-supported vaccines until the war began. Since the conflict broke out, both sides have also demonstrated a willingness to work with partners to continue EPI activities, including regular "development" activities normally suspended during armed conflicts, such as trainings, EPI review meetings, and assessments (see below). There was also in place a relatively strong infrastructure for providing and overseeing immunization services. According to the 2013 EPI review, 81% of the more than 4,200 public health facilities provided immunization services[32] and ninety-five percent of districts had adequate numbers of appropriate cold chain equipment.[33] Even since the war, a recent census of health facilities shows 3,886 vaccination sites, 86% of them functional (meaning they have cold chain equipment and provide EPI on a regular basis) and 14% are "non-functional" (without cold chain equipment), but still provide immunization services periodically using vaccines brought to the clinics in vaccine carriers. In addition, the program has benefitted from strong technical capacity at the central level – many of whom remain in their positions – as well as a substantial personnel structure of EPI supervisors, EPI focal points, and cold chain and vaccine logistics managers at the governorate and district levels.

- **Strong financial and technical support from partners.** As discussed above, partners, especially GAVI and the World Bank, have assumed more and more of the costs of maintaining the immunization program since the conflict began, including paying all of the costs of procuring, storing and distributing all vaccines and covering operational costs, including compensation of health workers. Their technical assistance in planning and implementing special immunization activities, resolving bottlenecks caused by the conflict, and other support have been critical to maintaining services during this period.

- **A continued supply of vaccine throughout the health system.** While there have been delays with some vaccine shipments into the country, no national stockouts occurred in either 2015 or 2016, except for BCG, due to a global shortage. Once the Sana'a airport was closed to international flights, UNICEF set up a logistics and supply hub in Djibouti, where vaccines and other medical supplies are sent, stored and then delivered by chartered plane to Sana'a through a special arrangement with the *de facto* government (see details under Section B. Partner Support). The central- and local-level cold rooms continue to operate, with UNICEF support, and UNICEF has assumed the responsibility of delivering vaccines to all districts, hiring drivers and paying all transport costs. According to a UNICEF staff person, the flow of vaccines is "99% smooth", with only some problems delivering cold chain equipment, caused by security personnel.

- **Efforts to maintain and reopen health facilities, while also shifting the mix of service delivery methods.** Before the war, approximately 75% of immunizations were provided at fixed facilities, with the rest provided through outreach activities and mobile team teams to the most remote areas.[34] With the closure of 900 health facilities since the war and a reduction in operations at many others, there has been a shift towards outreach and mobile strategies, funded largely by GAVI and the World Bank (through UNICEF and WHO). According to the UNICEF country office, the current estimated breakdown of immunization services is:
  - 55-60% provided at fixed facilities

[31] cMYP 2016-2020.
[32] Republic of Yemen, Comprehensive EPI review – Yemen, July 2013.
[33] cMYP 2016-2020.
[34] EPI Review, 2013.

- 30-45% provided during integrated outreach rounds, and
- 5-7% provided through mobile team visits.

Concerning **fixed facilities**, considerable efforts have been made to keep them operational, with UNICEF and other partners covering fuel costs for cold chain equipment, purchasing solar refrigerators for health facilities (200 units in 2015), and paying incentives for health workers to remain in place. In addition, ≈540 closed health facilities (60%) have been reopened, with UNICEF support.[35] Immunization services are still provided at most open health facilities, including those assessed as partially functional, although the frequency of services varies.

Integrated outreach rounds have become a key strategy to reach children and pregnant women with immunization and other MCH services since the war began, especially in areas with non-functional health facilities and conflict zones. They are also a key strategy to prevent a major drop in coverage. These rounds involve teams of health workers – with at least one woman in each team – who travel to outreach sites to deliver the full range of childhood vaccines for children under the age of one, TT for pregnant women, as well as a range of other services, including IMCI and antenatal and newborn care services. Health workers are fully paid to conduct these rounds and are thus highly motivated. Five rounds were conducted each in 2015 – reaching 276 of the country's 333 districts (83%) – and in 2016, where they took place in 207 districts (92%). The rounds in 2016 provided immunization to 1.1 million children under one year, TT to 215,000 women, and IMCI services to 547,000 children under age five.[36] While they accounted for around 34% of all immunizations provided in 2016, some areas, such as Sana'a governorate, Raymah and Al Dalee, were dependent on these outreach rounds to provide 40-63% of vaccinations.[37] In other areas, such as Sana'a city and Aden, where most immunizations are still provided at fixed facilities, the rounds only accounted for 1-3% of vaccinations.

There have been several challenges in implementing these outreaches, however. Each year, the rounds have not begun until the middle of the year, due to delays in releasing funds and obtaining funding for non-vaccine medical supplies – resulting in some rounds providing only vaccinations. Security concerns and governance issues have also delayed the outreach rounds in some governorates, such as Al Jawaf. These delays have likely resulted in missed opportunities, especially in the case of rotavirus vaccination, given the age restrictions for the vaccine.

Mobile teams consisting of three to four health workers provide integrated MCH services in the most difficult to access and security-compromised areas. They are either government employees or work for NGOs that contract with UNICEF. Around 150 mobile teams provided services in 119 districts in 21 of the country's 23 governorates in 2016, including vaccinations for more than 524,000 children. Some teams are not functional due to contract delays with NGOs.

- **Continuation of regular EPI activities, including efforts to strengthen the program.** The EPI, working with partners, has continued to carry out capacity-building, planning, monitoring and other activities to maintain and strengthen the program, despite challenges posed by the conflict. In 2016, these activities included:
  - Workshops to update microplans in 18 governorates;
  - Trainings on different topics (for mid-level managers (MLM), EPI guidelines, OPV switch) for more than 4,000 health workers, managers and supervisors;
  - Mid-year and end of year EPI review meetings;
  - A nation-wide cold chain assessment in which more than 4,000 health facilities completed a questionnaire in preparation for the development of a Cold Chain Equipment Optimization Platform proposal to GAVI;
  - The development of a communications strategy to increase population demand for immunization;
  - Development of planning documents, including the 2016-2020 cMYP and annual workplan;
  - As mentioned above, regular meetings of the HSSCC, the EPI Task Force and the NITAG.

With the increased intensity of the conflict, some of these activities, including trainings and mid-year EPI reviews, are now conducted separately in the North and the South. In addition, some activities, such as a planned EPI review, have been postponed due to the conflict.

[35] GAVI presentation at the Joint Appraisal meeting in May 2017 on PEF TCA Updates: Yemen.
[36] Presentation on Routine Immunization Activities given at the 2017 Joint Appraisal meeting, May 15-17, 2017, Beirut.
[37] Joint Appraisal report, 2017.

4.4 Goal 4: Introduce new and improved vaccines and technologies

Yemen has a strong history of introducing new and under-utilized vaccines with GAVI support, having introduced pentavalent vaccine in 2005, PCV in 2011, rotavirus vaccine in 2012 and MR in January 2015 (in two doses at nine and 18 months). The last vaccine to be introduced was IPV in November 2015 after the civil conflict began. Coverage for PCV and MR have reached the levels of pentavalent and polio vaccines (70-71% according to the 2016 WUENIC estimates). Coverage is lowest for the two-dose rotavirus vaccine – at 59% in 2016, with dropout rates of around 8-10% between doses. Delays in the implementation of the integrated outreach rounds to the second half of the year two years in a row are likely contributing to the relatively low rotavirus coverage.

Sentinel site surveillance for meningitis and rotavirus was expanded in 2015 from four to nine sites.[38] However, there have been disruptions in the supply of test kits, affecting surveillance.

Concerning other new vaccines, the country has:

- Made preparations for the introduction of a birth dose of hepatitis B vaccine and plans (when feasible) to conduct a sero-prevalence study of the HB surface antigen to advocate for this;
- Included plans in the cMYP to conduct a cost-effectiveness analysis for the introduction of the human papilloma virus (HPV) vaccine and establish a cervical cancer registry.

[38] cMYP 2016-2020.

B. Partner support to address remaining challenges to meet the GVAP goals and targets

Partners have played a vital role in financing and providing technical support for EPI operations since the war began. Partners, including GAVI and UNICEF, have shown considerable flexibility in re-directing resources to keep the cold chain system operational, maintain and revitalize EPI centers, and conduct integrated outreach activities and mobile sessions to prevent a decline in vaccination coverage. In addition, GAVI TCA funding is being used to support 15 national consultants working for UNICEF and WHO, who are experts in immunization management, communications and cold chain and vaccine logistics management at the central and governorate levels to ensure that the program remains functional.

An example of the vital role that partners have played to ensure the continuation of immunization services during the conflict is the efforts to ensure vaccine deliveries into the country after the airport in Sana'a was closed to international flights. UNICEF hires a charter plan to deliver vaccines and other medical supplies from its new hub in Djibouti to Sana'a, following an arrangement with the *de facto* government to allow the airport to remain open for three to four hours for these flights to land. However, in October 2016, a chartered flight carrying more than 500,000 doses of PCV was not allowed to off-load its cargo on two separate occasions. WHO, UNICEF and the MoPHP conducted a series of negotiations and advocacy with the national authorities in Sana'a to allow this and subsequent vaccine deliveries into the country. The PCV shipment successfully took place in November and there have not been problems with vaccine deliveries since them. However, the potential of such risks remains given the situation in Yemen.

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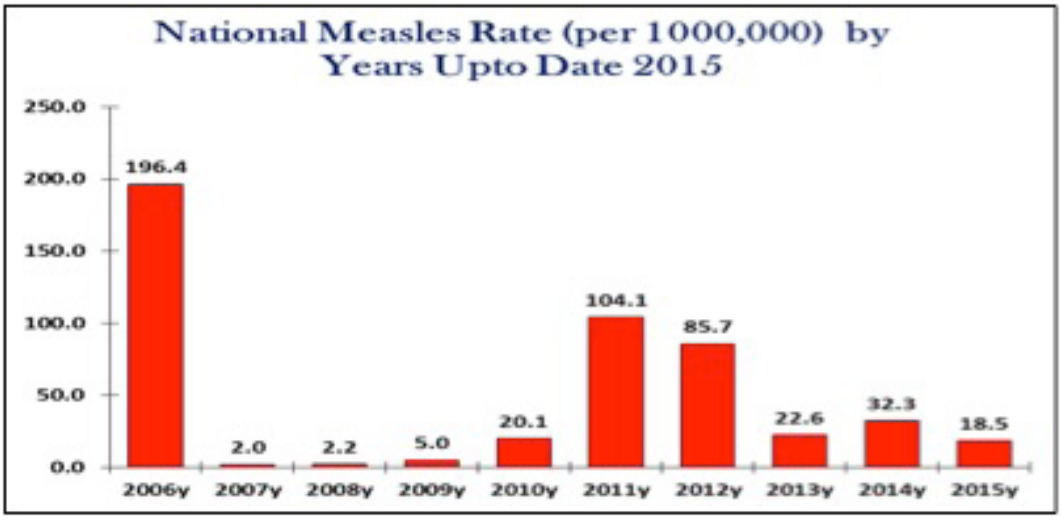
- Carolina Danovaro, WHO/EPI

Annex: Country Immunization profile

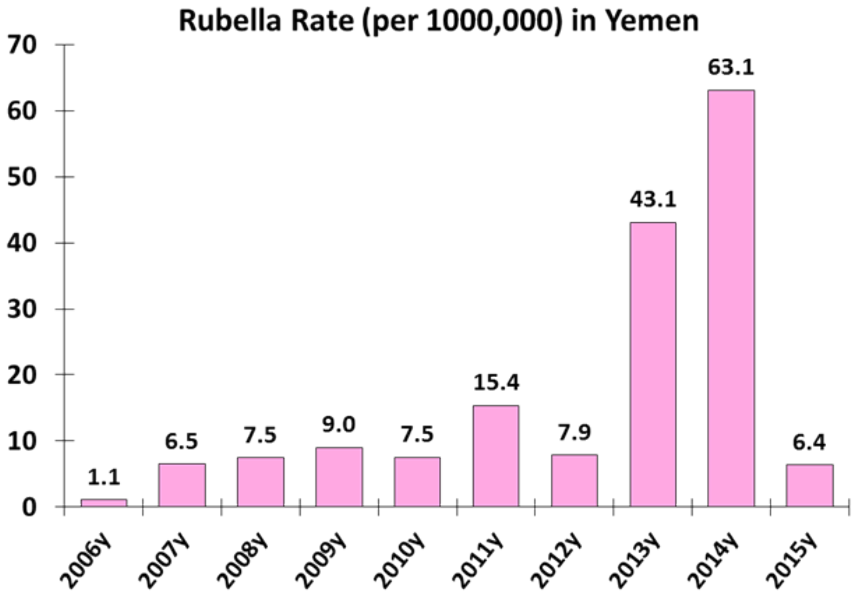
Annex 1: **Immunization schedule 2016 in Yemen**

Vaccine	Schedule
BCG	birth;
DTwP-Hib-HepB	6, 10, 14 weeks;
IPV	14 weeks;
MR	9, 18 months;
OPV	birth; 6, 10, 14 weeks; 9, 18 months;
Pneumo_conj	6, 10, 14 weeks;
Rotavirus	6, 10 weeks;
TT	1st contact; +1, +6 months; +1, +1 year;

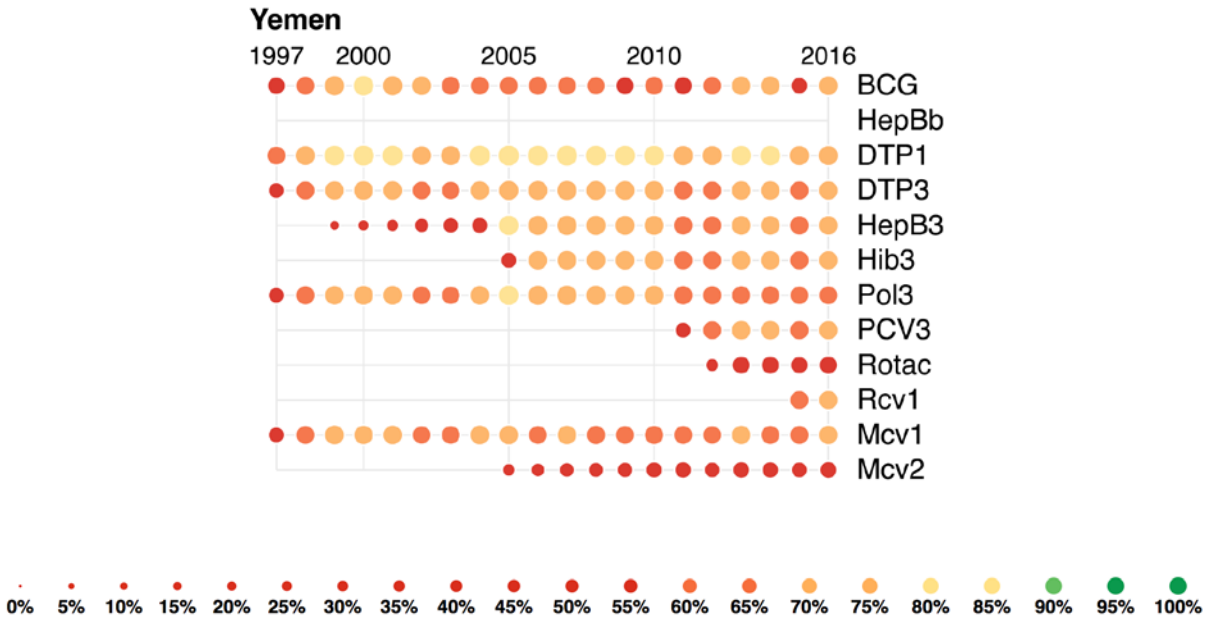
Annex 2: **Measles incidence rates, 2006 to 2015**



Annex 3: Rubella incidence in Yemen

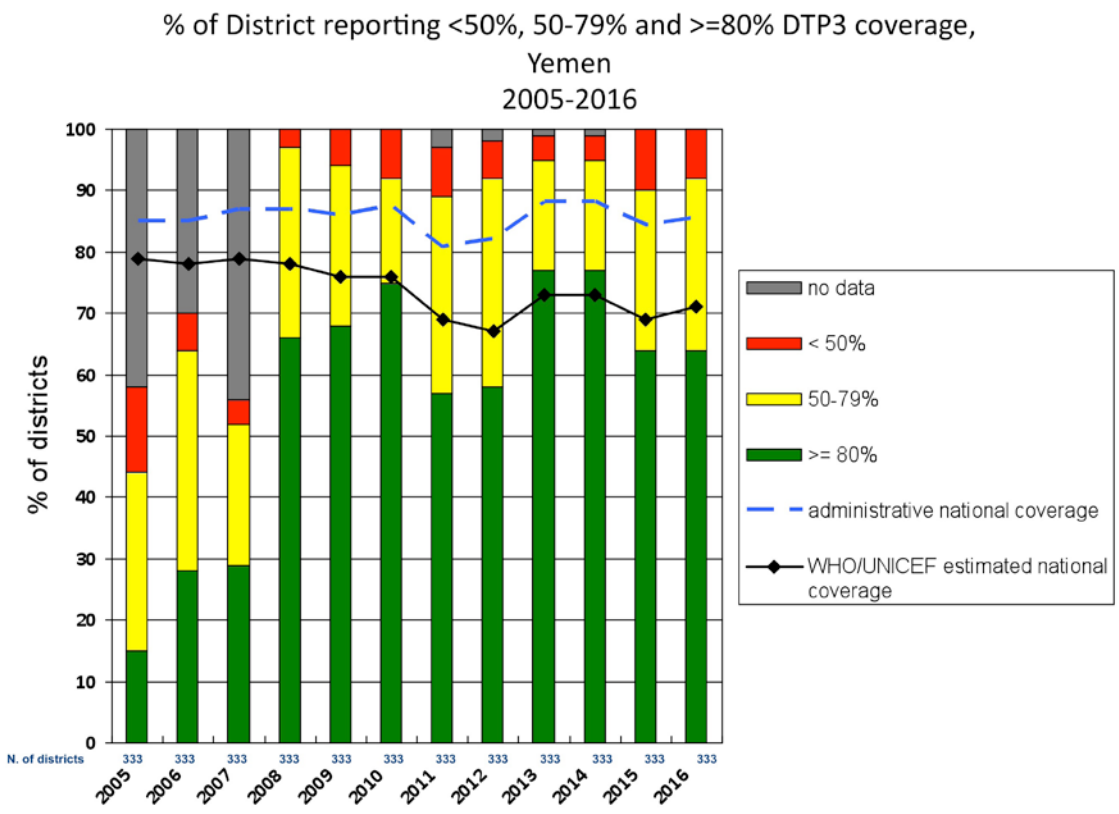


Annex 4: Immunization score card for Yemen



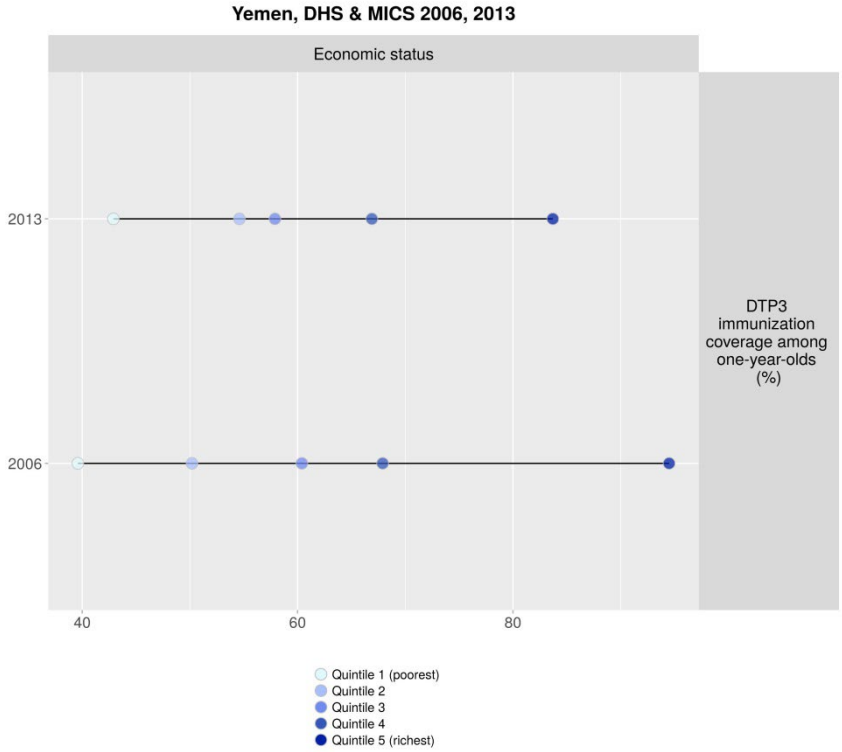
Annexe 5 : DTP3 district coverage rates, in Yemen, 2005-2016

Date of slide: 01 Aug 2017



This stacked bar graph represents the percentage of districts that have achieved different coverage levels.
Data source:
WHO/IVB database (as of 19 July 2017), data reported to WHO by Member States and
WHO/UNICEF national coverage estimates (as of 15 July 2017).

Annex 6: DTP3 coverage by wealth quintiles



Source: Health Equity Assessment Toolkit (HEAT): Software for exploring and comparing health inequalities in countries. Built-in database edition. Version 2.0. Geneva, World Health Organization, 2017.
Data source: The disaggregated data used in this version were drawn from the WHO Health Equity Monitor database (2016 update) which may have been revised or updated since that time. The most recent version of that database is available on the WHO website.