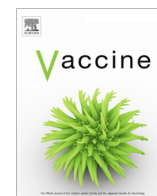


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## Polio Eradication Initiative contribution in strengthening immunization and integrated disease surveillance data management in WHO African region, 2014



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### ABSTRACT

**Introduction:** The PEI Programme in the WHO African region invested in recruitment of qualified staff in data management, developing data management system and standards operating systems since the revamp of the Polio Eradication Initiative in 1997 to cater for data management support needs in the Region. This support went beyond polio and was expanded to routine immunization and integrated surveillance of priority diseases. But the impact of the polio data management support to other programmes such as routine immunization and disease surveillance has not yet been fully documented. This is what this article seeks to demonstrate.

**Methods:** We reviewed how Polio data management area of work evolved progressively along with the expansion of the data management team capacity and the evolution of the data management systems from initiation of the AFP case-based to routine immunization, other case based disease surveillance and Supplementary immunization activities.

**Results:** IDSR has improved the data availability with support from IST Polio funded data managers who were collecting them from countries. The data management system developed by the polio team was used by countries to record information related to not only polio SIAs but also for other interventions. From the time when routine immunization data started to be part of polio data management team responsibility, the number of reports received went from around 4000 the first year (2005) to >30,000 the second year and to >47,000 in 2014.

**Conclusion:** Polio data management has helped to improve the overall VPD, IDSR and routine data management as well as emergency response in the Region. As we approach the polio end game, the African Region would benefit in using the already set infrastructure for other public health initiative in the Region.

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### 1. Introduction

The need for quality data to support evidence-based decisions and actions is essential in any system [1]. This fact becomes even more evident when it comes to public health and especially in disease surveillance and immunization [2]. In order to have ensure standardized data availability and data quality, it is important to establish a system that is composed of necessary human resources, processes, materials and software for data collection, data collation, data cleaning and data triangulation, data validation, data

quality, data analysis and information products sharing for use at different levels of the organization [3].

Many programmes within the World Health Organization, African Region (WHO-AFR) office and in countries have suffered from shortage of trained and skilled staff in the area of data management. This was amplified by the global economic crisis of 2008 which impacted negatively on WHO data management functions in programmes such as malaria and HIV/AIDS where were some critical functions like data management were forced to be abolished at the Regional Office and Inter-country Support Teams (ISTs) due to a diminished budget. Hence some of the functions were taken over by the Polio Data Management Team in ISTs to fill the gap.

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Prior to the launching of Polio Eradication Initiative (PEI) along with a strong information management structure and processes, important challenges were also faced for both immunization and disease surveillance data in WHO-AFR [4]. Data timeliness and data completeness were not adequate with consequences on information availability, information quality and delay in decision-making.

With the need to monitor the progress of PEI, robust case based surveillance of Acute Flaccid Paralysis (AFP) had to be put in place and could not meet its objective without an adequate data management system that included appropriate processes, systems, materials and human resources.

For this purpose the PEI Programme in the WHO African region invested in recruitment of qualified staff in data management, developing data management system and standards operating systems since the revamp of this programme in 1997 to cater for data management support needs in the Region. This support went beyond polio and was expanded to routine immunization and integrated surveillance of priority diseases.

Despite the fact that the influence of PEI on other infectious disease surveillance development has been documented by Nsubuga et al. [5], the impact of the polio data management support to other programmes such as routine immunization and disease surveillance has not yet been fully documented [6]. This article seeks to demonstrate the impact of the polio data management investment and support on strengthening integrated disease surveillance and routine immunization data management, quality and analysis for decision making as part of the polio legacy in the WHO African region [7–9].

## 2. Methods

Support from the WHO Polio program to surveillance and immunization programs evolved progressively along with the expansion of the data management team capacity and different disease control or elimination initiatives. This process was facilitated by the co-location of the polio program, the accelerated disease control program, and the immunization program under the same Directorate in WHO AFR office that facilitated integration of activities and support.

Table 1 illustrates the evolution of the data management systems from initiation of the AFP case-based surveillance system that set the platform for other vaccine preventable diseases. The stepwise approach in development of these systems started from 1997 to come up with a comprehensive regional data management system. This stepwise approach in developing these systems enabled each new component to progressively improve the whole system and improve its performance.

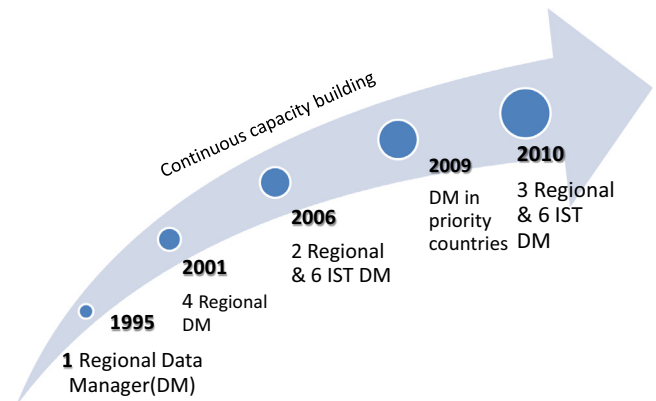
Fig. 1 illustrates evolution of the data management network, which started with one data manager based at the Regional Office 1995 and later complimented by three additional data managers in 2001. In 2006, additional data managers were recruited for polio, and along with the creation of ISTs, some data managers were distributed to IST level to provide services to clusters of countries. Additional data managers were recruited and strategically placed in Angola, Cameroon, Chad, Cote d'Ivoire, Democratic Republic of the Congo, Ethiopia, Niger, Nigeria, Sierra Leone, and South Sudan from 2009. An additional data manager bringing the total of regional data managers to three in 2009 reinforced the Regional Office. This group is the core group in data management in WHO-AFR.

### 2.1. Acute Flaccid Paralysis (AFP) case based surveillance

The polio data management team in the WHO African region was established at the same period with Acute Flaccid Paralysis (AFP) case based surveillance in 1997 [10,11]. This team was ini-

**Table 1**  
Progression of key data management tasks undertaken by Polio.

Data package	Year of inclusion in the Polio data management team scope of work						
	1997	1998	2004	2006	2010	2011	2012
AFP data management system and laboratory data	X						
IDSR		X					
Measles case based surveillance and laboratory data			X				
Yellow fever case based surveillance and laboratory data			X				
Maternal and Neonatal tetanus case based surveillance data			X				
Districts Routine immunization data			X				
New vaccine surveillance and laboratory data				X			
Polio SIAs					X		
Independent monitoring data						X	
Integrated Supplementary immunization administrative data							X
Polio LQAs data							X



**Fig. 1.** Evolution of polio data management human resources in the African Region.

tially recruited for polio related data management activities mainly AFP surveillance, polio laboratory and polio supplemental immunization activities (SIAs).

To get the work done correctly, the team developed data management standard guidelines and data management modules based on the regional context and conducted several data management trainings for national data managers and surveillance officers on the use of training modules and specific data analysis software, including computers with pre-installed data management software.

### 2.2. Integrated disease surveillance and response (IDSR) support

In 1998 the polio data management team contributed significantly to the development of the integrated disease surveillance and response (IDSR) data management system which was developed in Epi Info for use at district level [12]. Roll out of the application followed the same process as for routine immunization

application, and the polio data management teams at IST level supported all data related aspects of IDSR including data collection, collation, cleaning, analysis, and sharing with the Regional Office. The team developed a comprehensive monitoring tool for timeliness and completeness of data expected from countries weekly, monthly, annually, and ad hoc periods. This tool was developed in MS Excel and covers immunization and communicable diseases.

### 2.3. Measles inclusion

When the enhanced measles case based surveillance started in 2004 a decision was made to use the existing polio platform which was already working in both surveillance and database management [13,14]. The polio data management team developed tools and data management system for measles case based surveillance and laboratory data using its existing framework. This new tool was then deployed at country level during specific roll out workshops. Subsequently, measles was then included within polio data management team package.

### 2.4. Yellow fever and maternal and neonatal tetanus inclusion

In 2004, yellow fever [15,16], maternal and neonatal tetanus (MNT) case based surveillance was established through a similar process as measles case based surveillance [17,18], whereby guidelines and tools were developed for data format standardization across the Region. Later the isolated data management systems for the four diseases under case based surveillance namely AFP, measles, yellow fever, and maternal and neonatal tetanus were integrated in a single menu driven system developed in Epi info and disseminated in countries by the polio data management team.

### 2.5. Routine immunization and new vaccine surveillance inclusion

In 2004 recognizing the gap in availability of a standard system to monitor routine immunization by districts in countries across the Region [19], the polio data management team based on the experience developed tools and enhanced the existing systems following the same approach used with AFP surveillance data and disseminated them to countries through country specific technical support and sub-regional annual data management capacity building workshops. This is how the routine immunization became part of polio data management package.

Immunization data generated at the point of service delivery is captured using health facility registers, and daily service tally sheets [20]. The data are summarised monthly at health facility level and shared with the district level, from where the data are aggregated up to the national level on a monthly basis. The administrative immunisation coverage monitoring data are collaborated by regular data quality validation exercises and periodic coverage surveys.

In order to calculate key immunization and surveillance indicators, the polio data management team supported countries to collect different target population data by district on a yearly basis with regular updates when changes occur. This included not only AFP surveillance target populations but also other VPD and SIAs and routine immunization specific targets.

In 2005, the polio data management team also developed the standard data management system for rotavirus and paediatric bacterial meningitis (PBM) surveillance which was also deployed in countries using the existing mechanism.

### 2.6. Supplemental immunization activities inclusion

With SIAs being conducted in countries not only for polio but also for measles, yellow fever, tetanus, meningitis, and other integrated interventions, the polio data management team developed an integrated data management system. This included not only provision for all VPDs supplementary activities related data, but also for different integrated interventions such as vitamin A, deworming, malaria drug distribution, and insecticide treated nets distribution.

### 2.7. Support for joint reporting form

WHO polio data management supported countries to complete the Joint Reporting Form (JRF) every year. JRF collects data for immunization (routine and campaigns) and all disease under surveillance at country level.

### 2.8. Data quality support

The data management team also developed and implemented strategies for data quality improvement including programs for surveillance information quality check that works not only for AFP but also for measles, yellow fever and neonatal tetanus [19]. Polio data management teams at all levels support monthly data

**Table 2**

Sample extract of Polio Data Management Team for Inter-country Support Team West Africa number of weeks data compilation support for IDSR programme in 2014 by disease/condition.

Disease/condition	Benin	Burkina Faso	Cote d'Ivoire	Gambia	Ghana	Guinea	Mali	Mauritania	Niger	Nigeria	Senegal	Togo
Acute respiratory infection	-	52	-	-	-	-	-	-	-	-	-	52
Anthrax	52	-	-	-	52	-	-	-	-	-	-	52
Avian flu	-	-	-	-	-	-	-	52	-	-	-	52
Bloody diarrhoea	-	52	-	52	52	-	-	52	-	52	-	52
Cholera	52	52	52	52	52	-	52	52	52	52	53	52
Diphtheria	-	-	-	-	-	-	-	52	-	52	-	52
Guinea worm	-	52	52	-	52	-	-	52	52	52	-	52
Influenza	-	52	-	-	52	-	-	52	-	52	-	52
Lassa fever	52	-	-	-	-	-	-	-	52	-	-	-
Malaria	-	52	-	-	-	-	-	-	-	52	-	-
Measles	52	52	52	52	52	-	52	52	52	52	53	52
Meningitis	52	52	52	52	52	52	52	53	52	53	52	52
Maternal Neonatal Tetanus	52	-	52	52	52	-	-	52	-	52	53	52
Pertussis	-	-	-	-	-	-	-	52	-	52	-	52
Rabies	52	-	-	-	52	-	-	-	-	-	-	52
Shigellose	52	-	-	-	-	-	-	-	-	-	53	-
SRAS	-	-	-	-	-	-	-	52	-	52	-	-
Yellow fever	52	-	52	52	52	-	52	52	52	52	53	52

**Table 3**  
Results of integrated polio SIAs conducted in Cameroon and DR Congo in 2014.

Indicators	Country	Integrated Interventions										
		Polio	Measles	Yellow fever	Tetanus	Meningitis	Vitamin A	Deworming	Insecticide treated bednets	Anti-malarial	Tuberculosis	Other
Age group targeted by SIAs	Cameroon DR Congo	Other 0-59m	NA Other	NA NA	NA NA	NA NA	6-59m 6-59m	12-59m 12-59m	NA NA	NA NA	NA NA	NA NA
Total population for targeted group in the country	Cameroon DR Congo	10,60,237 1,68,29,864	NA 2,96,52,618	NA NA	NA NA	NA NA	4,73,989 1,50,48,926	4,18,692 1,32,67,988	NA NA	NA NA	NA NA	NA NA
Number of people targeted for SIAs	Cameroon DR Congo	10,60,237 16,36,651	NA 28,83,624	NA NA	NA NA	NA NA	4,73,989 1,4,63,461	4,18,692 12,90,270	NA NA	NA NA	NA NA	NA NA
Number of vaccinated children	Cameroon DR Congo	11,50,320 16,49,027	NA 28,10,643	NA NA	NA NA	NA NA	5,02,039 1,4,23,068	4,40,314 11,82,214	NA NA	NA NA	NA NA	NA NA
Coverage (%)	Cameroon DR Congo	104.4 104.5	NA 101.1	NA NA	NA NA	NA NA	105.9 100.9	105.2 95.1	NA NA	NA NA	NA NA	NA NA
Percentage of zero dose	Cameroon DR Congo	0.4 1.3	NA 1.8	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
Percentage of districts with $\geq 95\%$	Cameroon DR Congo	95.5 88.6	NA 85.7	NA NA	NA NA	NA NA	86.4 80.0	81.8 68.6	NA NA	NA NA	NA NA	NA NA

NA: Not applicable.  
This table illustrates how the developed SIAs data management system was used in Cameroon (31st October 2014 SIAs) and DR Congo (24th June 2014) during integrated SIAs.

reviews and harmonization in countries during which all VPD related data are being looked at.

### 2.9. Expansion of polio data management team

The increase in workload led to the expansion of the data management team by placing more key persons at regional, IST and in priority countries. Polio surveillance officers work in close collaboration with national data managers in countries where WHO did not support specific positions for data management.

## 3. Results

IDSR has improved the data availability with support from IST Polio funded data managers who are collecting them from countries as illustrated in Table 2.

The data management system developed by the polio team was used by countries to record information related to not only polio SIAs but also for other intervention (Table 3).

As indicated in Fig. 2, to get district routine immunization data prior to 2004 when routine immunization was not yet included in the polio data management package was a big challenge. Only <900 reports were available for the entire Region. The completeness of reports was less than 20%. From the time when routine immunization data started to be part of polio data management team responsibility, the number of reports went from around 4000 the first year (2005) to >30,000 the second year and to >47,000 in 2014. From 2010 to 2014 the monthly district completeness was always >90% for the Region.

An extract of the IDSR IST West Africa database in 2014 (Table 2) shows that the polio data management team compiled data received from 12 countries weekly for all diseases under surveillance for the whole year. Togo, Mauritania, Nigeria, Ghana and Benin reported on at least 50% of diseases and conditions under surveillance.

Table 3 illustrates the use of the developed SIAs data management tool in two selected countries Cameroon and Democratic Republic of the Congo. Cameroon used the tool in several rounds to document administrative coverage. The number of vaccinated children during the polio integrated SIAs combining measles, vitamin A and for deworming were compiled. Several indicators are being monitored including coverage, zero doses and percentages of districts with at least 95% coverage.

Since their inclusion in the data package, data related to measles, yellow fever and tetanus case based data as well routine immunization and SIAs from countries were collected from countries on a regular basis by the polio data team. Data quality has been systematically checked and feedback provided to countries using standardized tools.

All 47 Member States in the African Region compile and report regular databases. Yellow fever and measles case based surveillance data have been reported from 23/23 (100%) and 44/44 (100%) countries were this surveillance is established respectively with a completeness over 90%; rotavirus and paediatric bacterial meningitis (PBM) sentinel surveillance data are reported on monthly basis from in 32/32 (100%) countries each where the surveillance is in place; polio virological laboratories data are being shared by all 16/16 (100%) countries with polio laboratories; measles-rubella national serological laboratories data are being reported by in 44/44 (100%) countries. Data from three Regional polio referral laboratories, three measles-rubella and one yellow fever Regional Referral laboratories present in the Region have also been supported by polio data managers. All these databases are maintained essentially by polio funded staff on a daily basis.

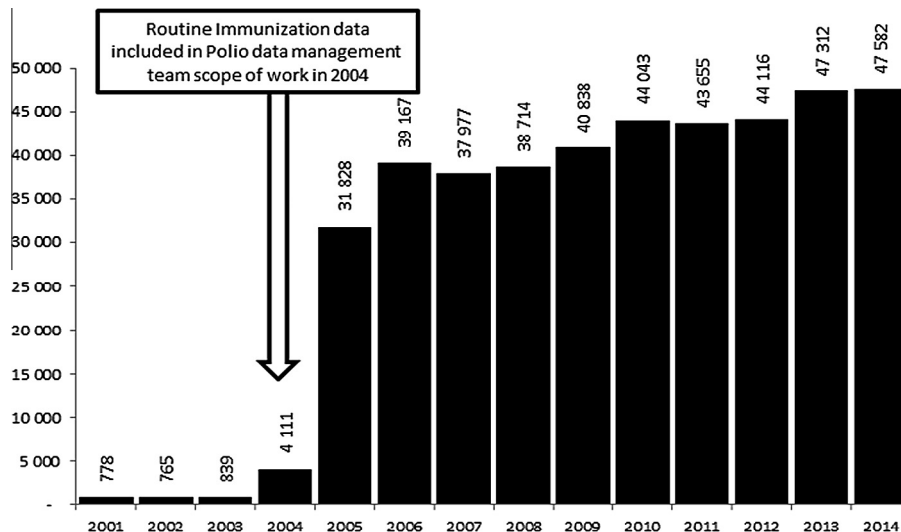


Fig. 2. Evolution of number of routine immunization monthly reports from AFR countries.

Every year, 567 routine immunization district databases, 2444 AFP case based surveillance databases, 256 yellow fever case based surveillance databases, and 2444 measles case based surveillance databases are collected from countries in the African Region and maintained with feedback on data quality provided and data analysis conducted by the polio data management team.

Information products such as regular bulletins and presentations on key surveillance and immunization indicators were prepared by the polio data management team. AFRO, IST and priority countries prepare weekly and monthly feedback that includes both immunization and surveillance.

#### 4. Discussion

We found that PEI supported not only polio related data management but also the routine immunization data, the entire vaccine preventable disease surveillance data as well as the integrated disease surveillance databases. This network of data management team constituted by a team of 18 experienced data managers has established a strong mechanism of data collection, data cleaning, data sharing, data analysis and database maintenance at all levels of the system. This has had a positive impact on overall data availability and strategic information for decision making.

The same results has indicated that after the initial installation of AFP data management system, all additional systems being routine immunization, measles, yellow fever and maternal and neonatal tetanus, were smoothly included in the established system and followed the set data sharing deadlines. IDSR was also one of the key areas that benefited from the Polio Eradication Initiative in its components of data management. Polio teams at different level were collecting, collecting, providing feedback to countries and sharing data with different levels.

Routine immunization programs and case based surveillance are the two areas that were 100% supported by polio teams in data management aspects including system development, country data managers training, data quality improvement support, information products dissemination at different levels of the health system.

We also found that outbreak and emergencies received sufficient support from the polio data management team, which was the case of Central Africa Republic in 2014 where the database for early warning surveillance system was established by the polio data management team. The AFR data management team also support data management aspect of the 2014 Ebola outbreak in Central Africa, in Nigeria and in DR Congo e.g., the data management

leads in the three most Ebola affected countries were from the polio data management team.

The collaboration within data managers from other WHO clusters such as Disease Prevention and Control, as well as with different partners supporting data management like the United States Centers for Disease Control and Prevention in the Region has contributed to an overall data management capacity in the Region. This collaboration was happening mainly during capacity building workshop and applications development.

In addition, we observed that prior to the establishment of the polio eradication data management team minimum data management processes were being undertaken but not in standards tools and very low completeness.

It is difficult to imagine that state of routine immunization and other vaccine preventable disease data in the African Region if PEI was absent (or if its support ends and is not replaced). Without this support WHO-AFR data could probably be limited to the annual JRF as it is the case in most WHO Regions, the systematic collection of monthly district data would have been just difficult if not impossible without the system put in place by PEI. Currently all AFR countries share monthly district routine immunization data with an average of completeness over 90% between 2010 and 2015. The situation would have been probably the same for other case based surveillance namely measles, yellow fever and MNT which use polio infrastructure for not only data management but also for even surveillance processes at all levels.

It is true that some of the data management support especially from partners may have been coming from non-polio fund this might be the case for workshops organized by measles and rubella initiative, also support provided in data management and data quality by some measles and rubella focal points in the region. But even considering these exceptions, the situation as presented here has shown that without the support from the polio infrastructure the entire routine immunization, VPD surveillance, and IDSR would have had very critical challenges in term of data management in the African Region.

The PEI data management team in the African Region is currently the one implementing data management for routine immunization, case based surveillance for measles, yellow fever and MNT, IDSR, and emergencies. The polio data management team's role is essentially the immunization and surveillance data management team and it is critical in the polio legacy context to make sure that this strong team of data managers already trained and with years of experience are used to maintain the routine

immunization, and other vaccine preventable disease surveillance monitoring and data management in the Region. This is even more critical for the overall public health monitoring given the Global Vaccine Action Plan (GVAP), Regional Vaccine Action Plan (RVAP) and different goal in which the region is embarked. This group is of importance for public health in the region.

### Conflict of interest

There is no conflict to declare.

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