

## Brief report

## Monitoring coverage of fully immunized children

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## ABSTRACT

Immunization programs monitor 3rd dose of DPT-containing vaccine coverage as a principal indicator; however, this does not inform about coverage with other vaccines. A mini-survey was conducted to assess the status of monitoring coverage of fully immunized children (FIC) in Eastern and Southern African countries. We designed and distributed a structured self-administered questionnaire to all 19 national program managers attending a meeting in March 2014 in Harare, Zimbabwe. We learned that most countries already monitor FIC coverage and managers appreciate the importance of monitoring this as a national indicator, as it aligns with the full benefits of immunization. This mini-survey concluded that at national level, FIC coverage could be used as a principal indicator; however, at global level DPT3 has some additional advantages across all countries in standardizing the capacity of the immunization program to deliver multiple doses of the same vaccine to all children by 12 months of age.

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## 1. Introduction

Immunization program coverage is monitored regularly and used as one of the health development indicators. Globally, WHO and UNICEF estimate country immunization coverage using the available information like administrative reports captured mostly through the health information system and reported through a Joint Reporting Form, as well as national coverage surveys such as Demographic and Health survey (DHS), Multiple Indicator Cluster Survey (MICS) and EPI Cluster Surveys. The country coverage is aggregated into regional and global coverage estimates. Country reports and WHO and UNICEF estimates use the third dose of DPT-containing vaccine (referred in this paper as DPT3) as one of the main indicators of vaccination coverage and particularly of the strength of the vaccination program to deliver multiple doses of the same vaccine within the first year of life. DPT3 coverage indicates the vaccination status of children vaccinated against diphtheria, pertussis and tetanus and usually against *Haemophilus influenzae* type b and/or hepatitis B (when these latter two antigens are included it is called pentavalent vaccine). However, DPT3 coverage does not indicate if children have been vaccinated with the rest of the traditional antigens like BCG, measles, oral polio vaccine and the new vaccines being widely introduced in many countries (e.g., rotavirus and pneumococcal vaccines) nor newly introduced vaccines targeted

at certain regions (e.g., Japanese encephalitis or meningococcal A vaccines).

Some immunization thought leaders argue that DPT3 coverage does not indicate the full benefit of immunization and that a better indicator is the fully immunized children (FIC) coverage [1], which measures the vaccination of infants with all antigens in the country schedule. However, countries have different antigens in their immunization schedules and also varying age groups are targeted in the immunization program. In many countries the immunization schedule extends beyond 12 months of age to include booster doses for DPT, second dose for measles and in recent years HPV vaccine introduced for teenage girls [2]. As a result, the definition of FIC varies not only from country to country but also among countries targeting different age groups. FIC coverage is not included in the country joint reporting forms (JRF) [3] and WHO and UNICEF do not estimate FIC coverage, instead using DPT3 coverage as a proxy indicator for completeness. Such discussions on preferred indicators typically occur at global levels, but the countries which produce the reports are not systematically consulted. Consequently, we used the opportunity of the WHO Eastern and Southern African EPI (Expanded Program on Immunization) Managers Meeting held in March 2014 in Harare, Zimbabwe involving the EPI managers from 19 countries in the sub-region to conduct a small survey.

The objective was to learn about the status of country-level monitoring of fully immunized children coverage and contribute to the global discussion. All 19 national EPI managers filled the self-administered questions, attached as annex I.

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**Table 1**  
Countries' Immunization schedule.

Country	Antigens										
	BCG	DPT-HepB-Hib (pentavalent)	Oral polio vaccine (OPV)	1st dose of Measles	Pneumococcal conjugate vaccine (PCV)	Rotavirus	Hepatitis B birth dose	2nd dose of Measles	DT/Td/DPT booster dose	Human papillomavirus (HPV)	Yellow fever
Botswana	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Comoros	Yes	Yes	Yes	Yes							
Eritrea	Yes	Yes	Yes	Yes				Yes			
Ethiopia	Yes	Yes	Yes	Yes	Yes	Yes					
Kenya	Yes	Yes	Yes	Yes	Yes						Yes
Lesotho	Yes	Yes	Yes	Yes				Yes	Yes		
Madagascar	Yes	Yes	Yes	Yes	Yes						
Malawi	Yes	Yes	Yes	Yes	Yes	Yes					
Mozambique	Yes	Yes	Yes	Yes	Yes						
Namibia	Yes	Yes	Yes	Yes					Yes		
Rwanda	Yes	Yes	Yes	Yes	Yes	Yes				Yes	
Seychelles	Yes	Yes	Yes	Yes <sup>b</sup>			Yes	Yes	Yes	Yes	Yes
South Africa	Yes	Yes <sup>a</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
South Sudan	Yes	Yes	Yes	Yes							
Swaziland	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
Tanzania	Yes	Yes	Yes	Yes	Yes	Yes					
Uganda	Yes	Yes	Yes	Yes							
Zambia	Yes	Yes	Yes	Yes							
Zimbabwe	Yes	Yes	Yes	Yes	Yes	Yes		Yes			

Source: [http://apps.who.int/immunization\\_monitoring/globalsummary/countries?countrycriteria](http://apps.who.int/immunization_monitoring/globalsummary/countries?countrycriteria) (accessed on October 14, 2014 and it is based on the 2013 country immunization report to WHO and UNICEF). Some countries have introduced new vaccines after the 2013 report and are not included in this table.

<sup>a</sup> In South Africa pentavalent vaccine is DPT-Hib-IPV.

<sup>b</sup> In Seychelles measles containing vaccine is MMR (Measles-Mumps-Rubella).

## 2. Findings from the survey

Eighteen of the 19 countries defined FIC as an infant vaccinated with all doses recommended in the national schedule before 12 months of age. In Seychelles the definition includes those children fully vaccinated by two years of age, including a DPT booster dose administered at 18 months of age and an MMR (measles, mumps and rubella) dose administered at 15 months of age. Some other countries also include booster doses for children above 12 months of age (Table 1); however their definition of FIC includes only children under one year of age.

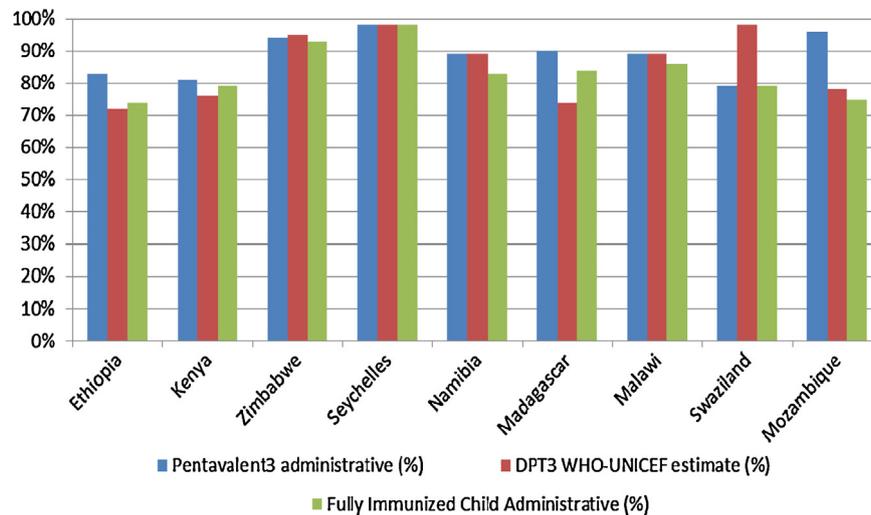
Sixteen (84%) countries monitor FIC coverage in their national health system (Table 2). The category "fully immunized child" is recorded in the tally sheet in 13 (68%) countries and included in the summary sheets/registers and vaccination cards in 14 (74%) and 11 (58%) countries, respectively. In 12 (63%) countries, FIC appears in the registration book. In 14 (74%) countries, it is reported to the national level. EPI managers were asked about their preferred single indicator to be monitored at national level and 12 (63%) preferred FIC and seven (37%) preferred pentavalent3 (defined as DPT-hepatitis B-Hib for 18 countries in the sub-region and DPT-Hib-IPV for South Africa). If they could report only two national immunization indicators and the first was FIC coverage, 12 (63%) managers preferred the second indicator to be pentavalent3 coverage and seven (37%) preferred the first dose of measles-containing vaccine. The managers were asked at the meeting if they had calculated their administrative pentavalent3 and FIC vaccination coverage for the year 2013. Sixteen (84%) countries had pentavalent3 coverage data and only nine (47%) had FIC coverage data. The average pentavalent3 administrative coverage (unweighted) for the nine countries was 89% with a range of 79–98%. The average (unweighted) WHO-UNICEF estimated 3rd dose of DPT containing vaccine coverage released in July 2014 [4] for the nine countries was 85% with a range from 72% to 98% (Fig. 1). The average (unweighted) administrative FIC coverage for the same nine countries was 83% with a range of 74–98% (Fig. 1). Managers were asked for any additional comment about monitoring

FIC and only seven (37%) had comments. In summary, they stated that FIC data are not captured well at service delivery level and there is a need for training of health workers for better quality data.

**Table 2**

Status of monitoring of fully immunized children in Eastern and Southern African countries: results of a survey of 19 national EPI managers, March 2014.

Indicator	Number (19)	%
Monitor full immunized children administrative coverage	16	84
Fully immunized children		
In the tally sheet	13	68
In the vaccination card	11	58
In the registration book	12	63
In the summary sheet/reporting form	14	74
Reported to the national level	14	74
Included in the Health management information system (HMIS)	14	74
Reported to the national level through HMIS	11	58
If the MOH requests you to report only one national immunization indicator, which one do you prefer?		
Pentavalent3 coverage	7	37
Fully immunized children coverage	12	63
If MOH request you to report only 2 national immunization indicators and if the first one is fully immunized children, what will be your 2nd preference?		
Pentavalent3 coverage	12	63
Measles containing vaccine (MCV) coverage	7	37



**Fig. 1.** Comparison of immunization coverage\* by data source and country for Eastern and Southern African sub-region, 2013. (\* Administrative pentavalent3 coverage as reported by countries, WHO–UNICEF estimate of 3rd dose of DPT containing vaccine coverage and fully immunized children administrative coverage for the nine countries with FIC coverage data available at the WHO meeting during the survey.)

### 3. Discussion and conclusion

There is no agreed and standard definition of “fully immunized child” and we note that “vaccinated” does not necessarily mean “immunized”; however, the two words are in use interchangeably in many documents and we decided to do the same. Despite challenges in overall immunization data quality, program performance is regularly monitored at country, regional and global levels. Infant DPT3 coverage is used as a proxy indicator of overall country performance; however, DPT3 coverage does not indicate FIC coverage. There is a current discussion [1] on the importance of using FIC coverage rather than, or in addition to, DPT3 coverage as the main indicator. Our survey was conducted to contribute to the global discussion. The survey indicated that most of the countries in the WHO Eastern and Southern African region record and report FIC coverage along with antigen- and dose-specific coverage; however, FIC is not universally used as a national indicator of performance. A majority of national EPI managers in the sub-region prefer FIC coverage to become the main national performance indicator, and they suggested that health workers should be trained at all levels on the importance of capturing, monitoring and reporting FIC data. It should also be noted that recording FIC at service delivery level is not as easy as recording individual doses; a child may not possess a child health or vaccination card or may have received different antigens at different health facilities and sites; and the service provider may not be sure that the child has received all doses before 12 months of age to declare that the child is fully vaccinated. Immunization data quality remains a challenge in many countries and this has been shown by significant discrepancies between surveys and administrative reports [5].

The results of this survey could be used to initiate a wider discussion on the relative merits of tracking DPT3 or FIC coverage indicators. Some national managers believe that FIC coverage at 12 months of age could be used as the main national immunization indicator at country level, as it covers all antigens in the national schedule and thus better reflects the full benefits of investment in immunization. However, as countries have different antigens in their immunization schedules as shown in Table 1 and a number of countries include vaccines for children above 12 months of age including measles 2nd dose, DPT booster dose, etc., use of FIC coverage as a regional and global indicator will be difficult to interpret. DPT3 coverage as an indicator has some advantages across all

countries as a standardized measure of capacity to deliver multiple doses of the same vaccine in the same year to all children by 12 months of age, irrespective of which additional vaccines across varying age groups have been variously introduced by phase in different countries.

#### Disclaimer

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#### Conflict of interest

The authors have no conflicts to disclose related to this work.

#### Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.vaccine.2014.10.057>.

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