



Research Article

ASSESSMENT OF THE ROUTINE IMMUNIZATION DATA QUALITY IN TSHISHIMBI HEALTH ZONE, DEMOCRATIC REPUBLIC OF CONGO

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ABSTRACT

**Background:** Data Quality Self-Assessment (DQS) tools are an important instrument to identify and address gaps in the immunization system of a country. The DQS described here was designed to assess the accuracy of the immunization data reported in the medical registers, as well as measure the quality of the immunization monitoring system at the district and local levels.

**Methods:** We conducted a cross-sectional study evaluating immunization data in four randomly selected health facilities which offer immunization services in the Tshishimbi Health zone of East Kasai province. Two DQS tools were used: (1) the Verification Factor (VF), which measures the accuracy of immunization data, and (2) the Quality Index (QI), which measure the quality of the immunization system monitoring.

**Results:** Over-reporting on administration of third-dose of pentavalent vaccine was identified in Tshiaba, Mukeba and Ditalala health facilities. Over-reporting for the measles antigen was found in Tshiaba and Tshibombo health facilities, while under-reporting for this antigen was evident in Ditalala and Mukeba health facilities. The mean QI was well below the 80% threshold for both the district and health facilities: 63% and 49%, respectively.

**Conclusion:** Data reporting and quality of the immunization monitoring system need to be improved, one possible solution is through regular supportive supervision.

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INTRODUCTION

Immunization is among the most important public health interventions for preventing and reducing child morbidity and mortality. The global effort to use vaccination as a public health intervention began in 1974 when the World Health Organization (WHO) launched the Expanded Programme on Immunization (EPI). Timely, complete and accurate data are essential to evaluate the impact of immunization interventions and measure their outcomes [1].

The collection, analysis and use of data to measure and improve immunization program performance have been set as priority areas for country partners. However, performance estimates can be subject to bias and over-reporting when transmitted to higher administrative levels [2]. Regular review of immunization data is essential not only for countries to monitor and improve their immunization program performance, but also to strengthen accountability, especially for countries whose programs are mainly funded by large donor initiatives such as Gavi, the Vaccine Alliance [2].

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We consider data to be of high quality when they provide reliable information to support sound decision-making. High quality data and effective data quality assessment are required for accurately evaluating the impact of public health interventions and measuring public health outcomes. Data, data use, and data collection process, as the three dimensions of data quality, all need to be assessed for overall data quality assessment [3]. Given the importance of data accuracy, we need standards to assess whether the information available to decision-makers is comprehensive, timely, accessible and reliable. Inadequate data quality may impair our understanding of the true vaccination coverage and may hinder our ability to meet program objectives. Therefore, it is important to regularly assess data quality to ensure good performance, sound decision making and efficient use of resources.

Multiple countries report discrepancies between tallied data at the vaccination delivery sites and reported data from the same vaccination sites to the higher administrative levels [4][5]. This situation requires operational research to identify the root causes of the problem and propose adequate solutions, since high immunization coverage and the Millennium Development Goal#4 (reduce child mortality) cannot be achieved without quality data and a strong data management system[6]. It is in

this context that we undertook this Data Quality Self-Assessment (DQS), whose main goal was to evaluate the accuracy of vaccination data and the quality of the vaccination monitoring system in Tshishimbi health zone of the Democratic Republic of Congo (DRC). While DQS for immunization systems are often done in the DRC, this is the first one where results have published.

**METHODOLOGY**

**Study Design and Health Facility Sampling**

We conducted a descriptive cross-sectional study in Tshishimbi Health Zone during January-June. First, we identified all of the facilities in the Zone. Next, performance indicators were used to stratify these facilities. Performance was defined according to administrative vaccination coverage rates of Haemophilus Influenza Type B (Hib) among children 0-11 months old. Thus a threshold of 80% was used. From there, we randomly selected our final sample based on performance: we selected two health facilities belonging to the "poor performance" category if the coverage is less than 80%, and two in the "high performance" category if is greater than or equal to this threshold. Our final selection fell on the health facilities of Mukeba and Ditalala among the worst performers, and Tshiaba and Tshibombo for the high performers.

We assessed the immunization program by using the World Health Organization’s (WHO) Data Quality Self-Assessment (DQS) protocol. The DQS is a flexible toolbox of methods that evaluates different aspects of the immunization monitoring system at district and health center levels. The assessment includes a review of data accuracy at different levels and a self-designed questionnaire reviewing monitoring quality issues (e.g. availability of vaccination cards, use of tally sheets, directly-observed recording and reporting practices). The questionnaire responses are then analysed to identify strengths and weaknesses and to formulate practical recommendations, which aim to improve the use of accurate, timely and complete data for action at all levels [7].

To measure performance associated with these components, we rely on two measures proposed by the DQS tool: the verification factor (VF) for data accuracy, and the quality index (QI) for the immunization monitoring system. In the selected health facilities, the DQS team reviewed the medical records of children aged 0 to 11 months who received one dose of third dose pentavalent vaccine (Penta 3) and one dose of measles vaccine, as well as the administrative data collected at the Tshishimbi health zone.

The VF is the ratio between the number of administered vaccination doses that were verified or recounted from a source at the Health facility (numerator), compared to the number of vaccinations reported to the District office (denominator). This ratio gives the proportion of vaccine doses in the District Vaccination Data Management Tool (DVD-MT)/ District Health Information Software (DHIS2) database that could be verified from the medical records, and it is expressed as a percent. If the accuracy ratio is lower than 100% then the data are over-reported. On the other hand, if the accuracy ratio is higher than 100%, then the data are under-reported [8]. The relationship is described in the formula below:

$$VF = \frac{\text{Number of vaccinations recounted}}{\text{Number of reported vaccinations}} \times 100$$

The quality index (QI) is a quantitative measure of the quality of each component of the monitoring system. To evaluate the quality of the immunization monitoring system, we examined seven components at both the health facilities and District office levels: Planning/demographic information Epidemiological surveillance, Vaccine management and other materials, Equipment, monitoring, reporting and archiving Formative supervision. Immunization safety (injection safety, waste and AEFI management), Link with the community.

In calculating QI scores, one to three points are given for each question answered or observation made or task performed correctly. Scores are calculated for each of the identified components, with the number of points corresponding to correct answers as the numerator and the number of possible scores as the denominator. A “no” scores 0, a “yes” scores from 1 to 3 according to its importance, and an “NA” is not recorded in the denominator. The overall QI is the proportion generated as the sum of all numerators and all denominators [7]. We consider acceptable an QI greater or equal to 80% (WHO standard)[9]. The relationship is described in the formula below:

$$QI = \frac{\text{Number of weighted "Yes" answers} \times 100}{\text{Total number of points} - \text{Number of weighted "NA" responses}}$$

**RESULTS**

**Table 1** Number of doses administered for Penta 3, as reported across four different tools in the health facilities visited, January to June 2018.

Healthfacility	vaccination record	Vaccination scorecard	Form F1 archived at Health facility	Form F1 archived at Health zone	VF (%)	Discrepancy (%)
Ditalala	131	162	166	138	95	53
Mukeba	296	251	258	309	96	18
Tshiaba	209	234	291	291	72	28
Tshibombo	199	183	195	195	102	3

This table I show a discrepancy of 3% in Tshibombo and 28% in Tshiaba (high-performing health facilities). In Mukeba and Ditalala (poor-performing health facilities), the discrepancy was 18% and 53%, respectively. Over-reporting was identified in Tshiaba, Mukeba and Ditalala, where the VF score is 72%, 96% and 95%, respectively. Therefore, all health facilities display errors that under-report the true number of children vaccinated for Penta 3, regardless of reported performance in Hib vaccination coverage. But an under-reported was identified in Tshibombo health facility (102%).

**Table 2** Number of doses administered for measles, as reported across four different tools in the health facilities visited, January to June 2018.

sources Healthfacility	Vaccination record	Vaccination scorecard	Form F1 archived at Health facility	Form F1 archived at Health zone	VF(%)	Discrepancy (%)
Mukeba	329	259	262	313	105	8
Tshiaba	247	245	304	291	85	20
Tshibombo	185	186	196	196	94	6
Ditalala	180	157	163	138	132	52

For measles, the data analysis revealed a discrepancy of 52% in Ditalala and 8% in Mukeba, while in Tshiaba and Tshibombo health facilities the discrepancy was 20% and 6%, respectively. The VF score is above 100% in Ditalala and Mukeba health facilities (132% and 105%, respectively) and below 100% in Tshiaba and Tshibombo health facilities (85% and 94%, respectively).

**Quality Index**

We calculated QI scores at both the Health Zone and health facilities level, assessing the same elements of the routine immunization system. Using the data reported to the

Tshishimbi Health District Central Office, we calculated an overall QI score of 63%.

As shown in Figure 1, only vaccination safety (injection safety, waste management and AEFI) reported a score of 100% on the QI. The management of vaccines and other inputs/equipment received a score of 89%. The planning/demographic information component is an outstanding indicator in Tshishimbi Health Zone, with a score of only 17%. The score that measures links with the community is 40%. When analyzing the QI scores of the four health facilities together, the result is 49%. No component scored above 80%, as shown in Figure 2.

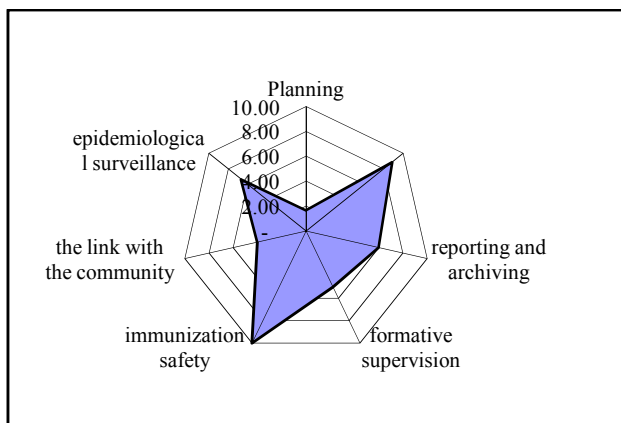


Figure 1 Performance of the QI components at the Tshishimbi Health Zone Central Office, January – June 2018

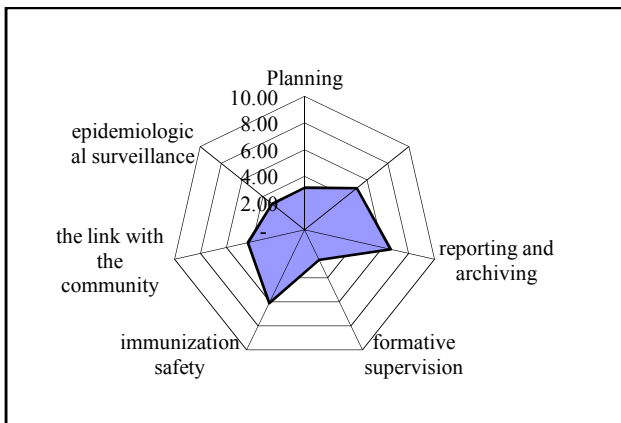


Figure 2 Performance of the QI components in the four health facilities, January – June 2018

## DISCUSSION

The over-reporting VF score observed in most health facilities (Tshiaba, Mukeba, Ditalala) during our assessment for the Penta 3 antigen suggests that not all vaccine doses recorded in the health facilities data collection forms are then reported in the DVD-MT/DHIS2 database. Our result suggest that the high-performing health facilities (Tshibombo and Tshiaba) are committing transcription and/or summation errors that under-report their performance in measles antigen administration. On the other hand, the poor-performing health facilities (Ditalala and Mukeba) commit errors that over-report their performance. Tally sheets, which are the main tool used to prepare EPI monthly reports, may be under-utilized or improperly stored at this level. Also, the compilation of immunization data at this level is mainly manual; this may have led to miscalculations, or transcription, when the health center's activity report was being prepared. Several studies have reported inconsistencies in data reporting as well as poor support mechanisms to ensure

data quality at the district level [7-9]. For example a study done in Nepal found that data obtained from the facility registers were lower than the data reported at the district level; showing a tendency of over-reporting to the higher levels[12]. Other studies showed that errors in reporting were due to lack of supervision and feedback from the superior levels as well as inadequate incentives to health workers. Elsewhere, studies demonstrated that reporting errors were due to insufficient formative supervision and lack of motivation among health workers[13]. Finally, failure to present some data collection forms during the DQS visits contributed to underestimating the number of children registered at the health facilities level. On the other hand, both health facilities from the poor-performing group (Tshiaba and Mukeba) had an over-reporting VF score for measles, while the high-performing group (Tshiaba and Tshibombo) had an under-reporting score for this antigen. Therefore, it is possible that poor-performing health facilities are classified as such because they do not accurately report the antigens they administer, rather than failing to immunize their target population. As for high-performing health facilities, their immunization records should be reviewed periodically to ensure that there is no inflation in their reporting to the administrative level above.

In addition, the QI of the immunization monitoring system was sub-optimal at both the district (QI = 63%) and health facilities (QI = 49%) levels. For both, the weakest components were planning/demographic information, links with the community, formative supervision, and reporting and archiving. In other studies, the results obtained were similar to ours, with an average quality index of 63% at the district level and 58% at the health facilities level. Of the five components evaluated in one study, the lowest score was assigned to the "monitoring and evaluation" component at all levels of the system [14]. In Burundi, a Data Quality Assessment (DQA) carried out in 2006 gave an average QI of 76% at the district level and 78% at the CS level [9].

These results may be explained by several gaps in the implementation of the EPI observed in the health facilities we evaluated. First, many elements of the EPI - including performance and process indicator objectives, strategies, prescribed activities, and monitoring indicators - are not taken into account in the operational action plan. Second, community representatives participate in monthly follow-up meetings, but they do not discuss how community relays and mapping exercises can find missed children or address resistance cases. Third, the central office does not have a supervision schedule. Not all planned supervisory visits have been carried out, and many recommendations from the last visit are not applied. Lastly, the DQS team could find no monitoring curves to measure Penta1-Penta3 dropout rates in the health facilities. Some experiences, for example in Kyrgyzstan and in South Africa, showed that data quality can be improved by giving healthcare workers the basic skills to monitor their own work, leading to a sense of ownership of the generated information.[13-14]

Different approaches to improve the support mechanisms. For example, increasing the quality of the supervision visits regarding the quality of data from the tally sheet, as well as providing adequate feedback mechanism to the producers of data at the remote sites. Also, supervision visits could include a more comprehensive data analysis on EPI. It could be used as a way to do in-job training on basic concepts and

monitoring indicators, a strategy used in some countries producing satisfactory results [15]. The "eyeballing" approach (a quick review of the forms), the 3C's approach (completeness, correctness and consistency) could also be promoted as a first step towards data quality improvement, and could be an essential part of health workers at the remote sites.

## CONCLUSION

To improve the fight against vaccine-preventable diseases, it is necessary to ensure the quality of immunization data so that the DRC EPI can improve its performance. This DQS revealed shortcomings in the accuracy of the Penta3 and measles vaccine data, as well as problems in the quality of the vaccine delivery monitoring system in the Tshishimbi Health Zone. These results will inform similar operations in DRC, and support preparations for the national-level DQS planned for the future. Thus, the system for monitoring immunization services must receive regular formative supervision and on-the-job training, using the forms and guidelines included in the DQS tool. At the central level, standard operating procedures for performance monitoring need to be developed.

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