Enhancing RMNCH Monitoring through Health Facility Data: Steps in Addressing Data Quality Issues in Routine Reporting

Summary

Completeness of Monthly Facility Reporting

- Consistent high completeness (above 90%) in monthly facility reporting across districts for ANC, deliveries, immunization, and OPD visits.

- Substantial improvement in the percentage of expected monthly reports, rising from 41% in 2018 to an impressive 98% in 2022.

- 93.0% of districts achieved a completeness rate of 90% or higher in 2022.

- Improvement in Reporting of Key Health Indicators:

- Significant improvement in reporting key health indicators, including ANC, institutional delivery, postnatal care, vaccination, and IPD data, from 2018 to 2022.

- Steady increase in OPD data reporting, reaching 69% in 2022, showcasing efforts to enhance data reporting.

Extreme Outliers for ANC, Deliveries, Immunization, and OPD

- Slight decrease in the percentage of monthly values considered extreme outliers at the national level, from 99.0% in 2020 to 97.8% in 2022.

- Gradual decrease in the proportion of districts with extreme outliers, with 89.2% meeting the standard in 2022.

INTRODUCTION

The monitoring Reproductive, Maternal, Newborn, and Child Health (RMNCH) progress has been relying on demographic health surveys, typically conducted every five years. However, this prolonged interval between surveys poses challenges in comprehending the ongoing advancements towards national commitments. Moreover, the lack of granularity in Demographic and Health Surveys (DHS) data hinders the nuanced understanding of district-level contributions to national goals.

In a pivotal move in 2011/2012, the Ministry of Health (MoH) in Uganda approved the adoption of the District Health Information System 2 (DHIS2) as the national platform for health data reporting [1]. DHIS2's comprehensive implementation across districts, regional referral hospitals, and various health units in the country has paved the way for a more nuanced and timely understanding of health-related data [2]. Recognizing the limitations of conventional national surveys, health facility data, accessible through DHIS2, emerges as a promising alternative. This approach addresses the challenges associated with the lack of granularity in RMNCH estimates, offering a means to comprehend regional and district-level progress more promptly and comprehensively. It allows for a detailed exploration of the distinct contributions of different types of health facilities to mortality rates.

This evidence brief delves into a systematic approach for collecting, assessing, and adjusting health facility data. The goal is to establish a robust framework that ensures the accuracy and reliability of the data.

METHODS

The quality of facility data was assessed and adjusted by following the steps highlighted in Figure 1. The assessment focused on 1) report completeness, 2) extreme outliers, and 3) internal data consistency. Data quality adjustments for reporting completeness and extreme outliers were done before further coverage analyses on annual data (Figure 2). We also assessed denominators or target populations to ascertain the robustness of the information used in the analysis (Figure 1).
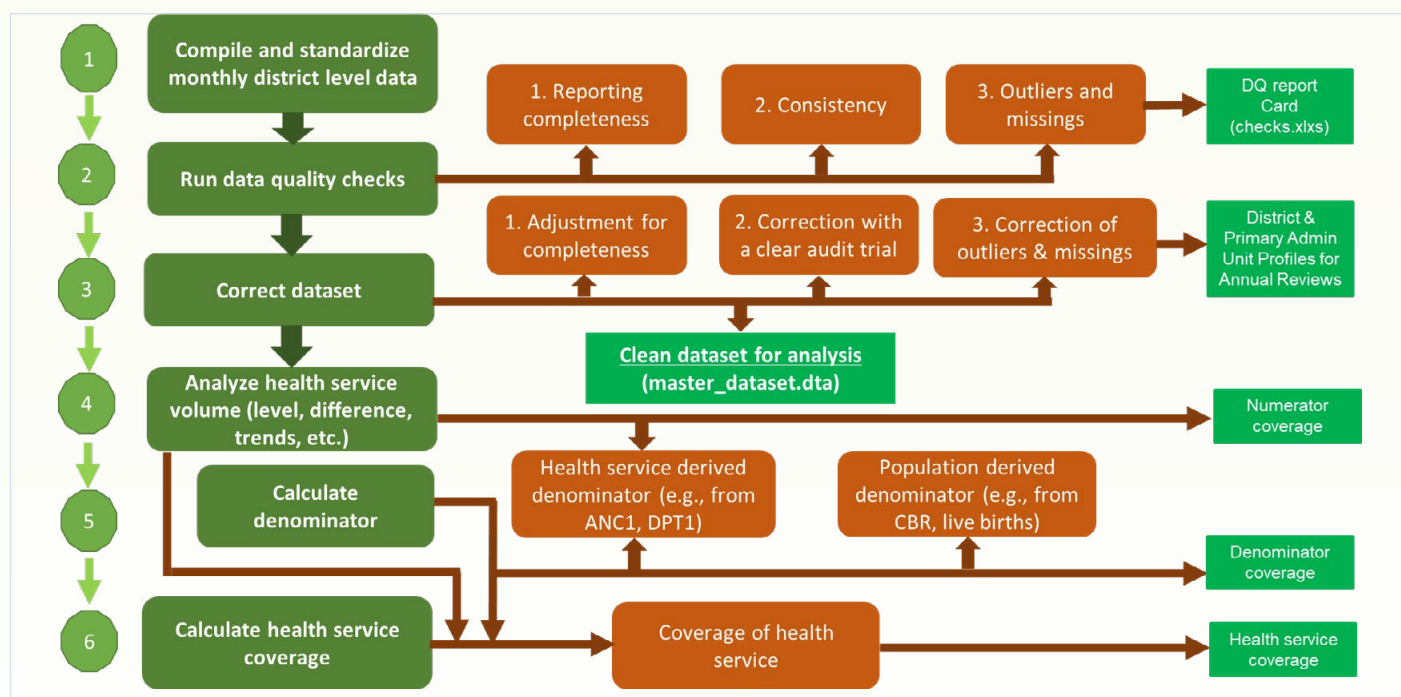
Figure 1: Health facility analysis steps

Five indicators were used to assess the data quality (Table 1). For each data quality metric, we have cutoff values to rate the results **as Acceptable; questionable; or problematic as indicated in Table 2.**

Regarding stillbirths and maternal mortality, we assume that if we know how many births are occurring in health facilities, we can estimate the community mortality from institutional mortality and population mortality estimates. The calculation follows the following steps.

- M_p = maternal mortality ratio in the population; M_i = institutional mortality maternal mortality ratio; M_c = maternal mortality ratio in the community; P_i the proportion of institutional live births, the population maternal mortality ratio can be estimated by:

$$M_p = P_i * M_i + (1 - P_i) * M_c$$ This implies that $M_c = \frac{(M_p - P_i * M_i)}{(1 - P_i)}$

The ratio ais M_c / M_i. The computation is similar for stillbirths.

FINDINGS:

Table 1 demonstrates the progress and challenges related to data quality and reporting in the health sector over the years. Overall, the data quality score has shown consistent improvement from 81.0 in 2018 to 89.0 in 2022.

Table 1: Assessing the quality of maternal mortality and stillbirth health facility data

Subject	Quality metric	Acceptable	Questionable	Problematic
Completeness of monthly health facility reporting of delivery data including death	Percentage of monthly health facility reports received out of expected	>90%	75-90%	<75%
Consistency over time of annual number of deliveries, maternal deaths, and stillbirths in health facilities	Relative difference between annual number and median for the 5-year period * 100	<25%	25-49%	>50%
Consistency between the reported number of stillbirths and maternal mortality	Ratio of the number of stillbirths to maternal mortality as reported by the health facility	Ratio >=4 and <10	Ratio of 10-14 or 3	Ratio of >14 or 3
Intrapartum/fresh stillbirth as percentage of total stillbirth	Percentage of stillbirths that were reported as stillbirths	35-60%	25-34% or 60-69%	>70% or ‹25%

Table 2: Summary of the health facility data quality assessment for 2018-2022

		2018	2019	2020	2021	2022
1	**Completeness of monthly facility reporting, for ANC, deliveries, immunization and OPD**					
1a	% of expected monthly facility reports (mean for ANC, deliveries, immunization and OPD reports, national)	80.0	79.0	96.0	97.0	98.0
1b	% of districts with completeness of facility reporting (mean for the 4 reports) >= 90%	50.0	51.0	90.0	92.0	93.0
1c	% of districts with no missing monthly values in the year for any of the 4 reports	91.9	92.0	91.8	92.1	93.0
2	**Extreme outliers for ANC, deliveries, immunization and OPD**					
2a	% of monthly values that are not extreme outliers (mean for ANC, deliveries, immunization, OPD reports, national)	98.8	98.8	99.0	98.7	97.8
2b	% of districts with no monthly extreme outliers in any of the 4 reports in the year	93.4	93.0	93.9	92.8	89.2
3	**Consistency of annual reports of ANC1 and penta1, and of penta1 and penta3**					
3a	% of districts with ANC1-penta1 ratio between 1.0 and 1.5	67.6	59.6	78.8	70.5	68.5
3b	% of districts with penta1-penta3 ratio between 1.0 and 1.5	88.2	91.2	85.6	87.7	85.6
4	**Annual data quality score (mean of the indicators 1a to 3b)**	81.0	80.0	90.0	90.0	89.0

Completeness of monthly facility reporting

Between 2020 and 2022, a high percentage (above 90%) of districts consistently had complete monthly data for all four reports. The percentage of expected monthly reports for four key areas: Antenatal Care (ANC), deliveries, immunization, and Outpatient Department (OPD) visits received from health facilities compared to the total number of reports expected improved from 41% in 2018 to 98% in 2022. The proportion of districts where the completeness of facility reporting for the four reports is 90% or higher has increased steadily over the years, reaching 93.0% in 2022.

Over the years, there was significant improvement in the reporting of key health indicators, including Antenatal Care (ANC), institutional delivery, postnatal care, vaccination, and Inpatient Department (IPD) data, from 2018 to 2022. For Outpatient Department (OPD) data, the reporting rate was initially less than 90% in 2018 and 2019 across all districts, but it steadily increased over time, reaching 69% in 2022 (Figure 2). This improvement demonstrates the efforts made to enhance data reporting in the health sector.

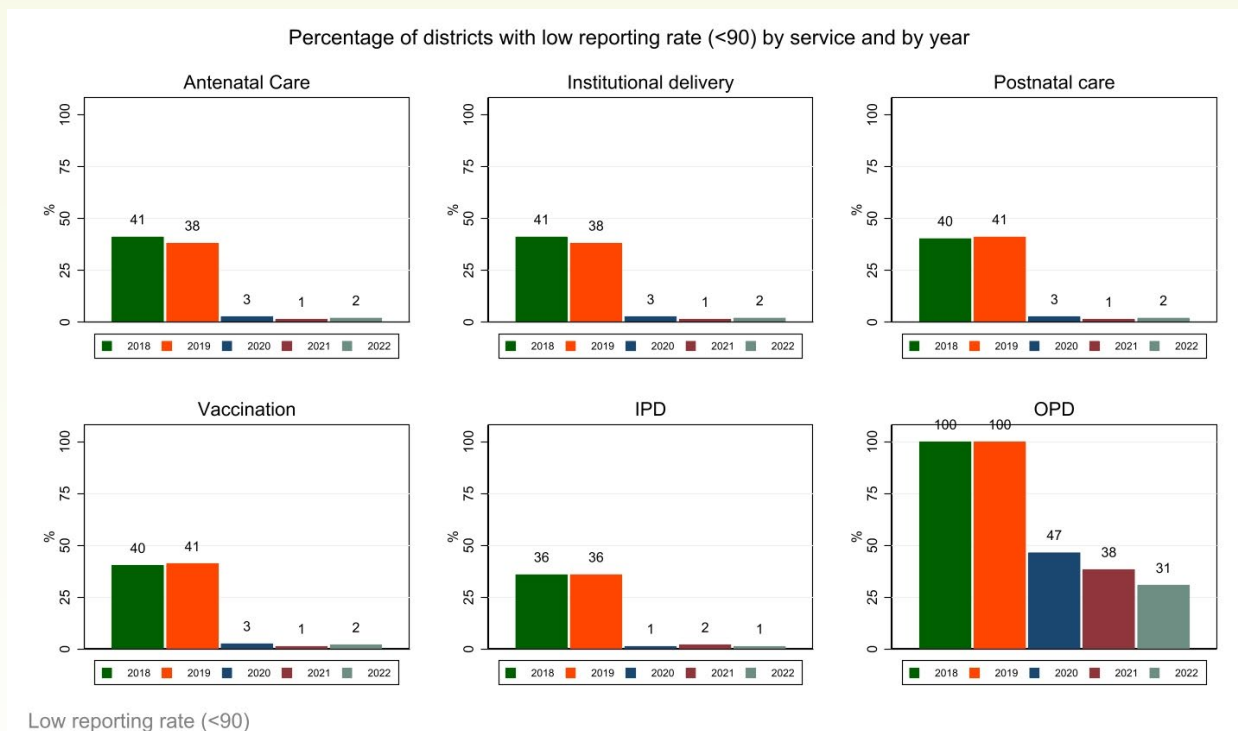# Reporting rates and consistency across individual indicators

Figure 2: Percentage of districts with low reporting rate (<90%) by service and by year

Extreme Outliers for ANC, Deliveries, Immunization, and OPD

The percentage of monthly values that were not considered extreme outliers in the data for ANC, deliveries, immunization, and OPD reports at the national level remained high, though there was a slight decrease from 99.0% in 2020 to 97.8% in 2022. On the other hand, the proportion of districts that did not have extreme outliers in any of the four reports during the year gradually decreased over the years, with 89.2% of districts meeting this standard in 2022.

Consistency of Annual Reports

Results showed that the percentage of districts meeting this criterion varied over the years. Similarly, the percentage of districts with penta1–penta3 ratio between 1.0 and 1.5 remained relatively stable over time. Despite observing some minor inconsistencies in a few districts (Figure 4), a strong correlation was evident between ANC1-penta1 and penta1-penta3 data. Remarkably, a perfect match between Penta 1 and Penta 3 vaccinations was also noted. This robust correlation underscores the reliability and accuracy of the data, indicating a high level of consistency in reporting and vaccination practices.
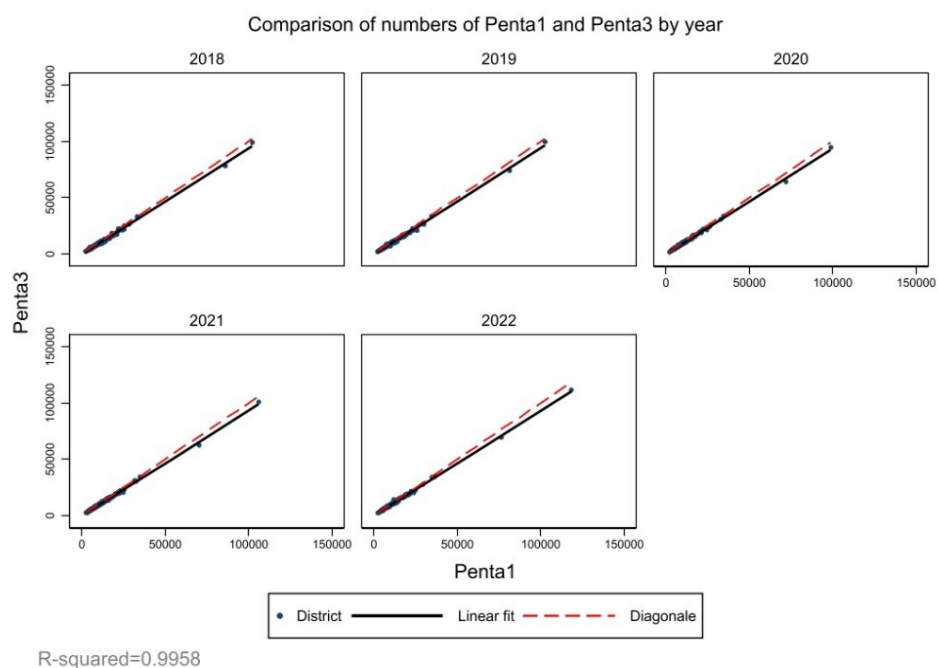

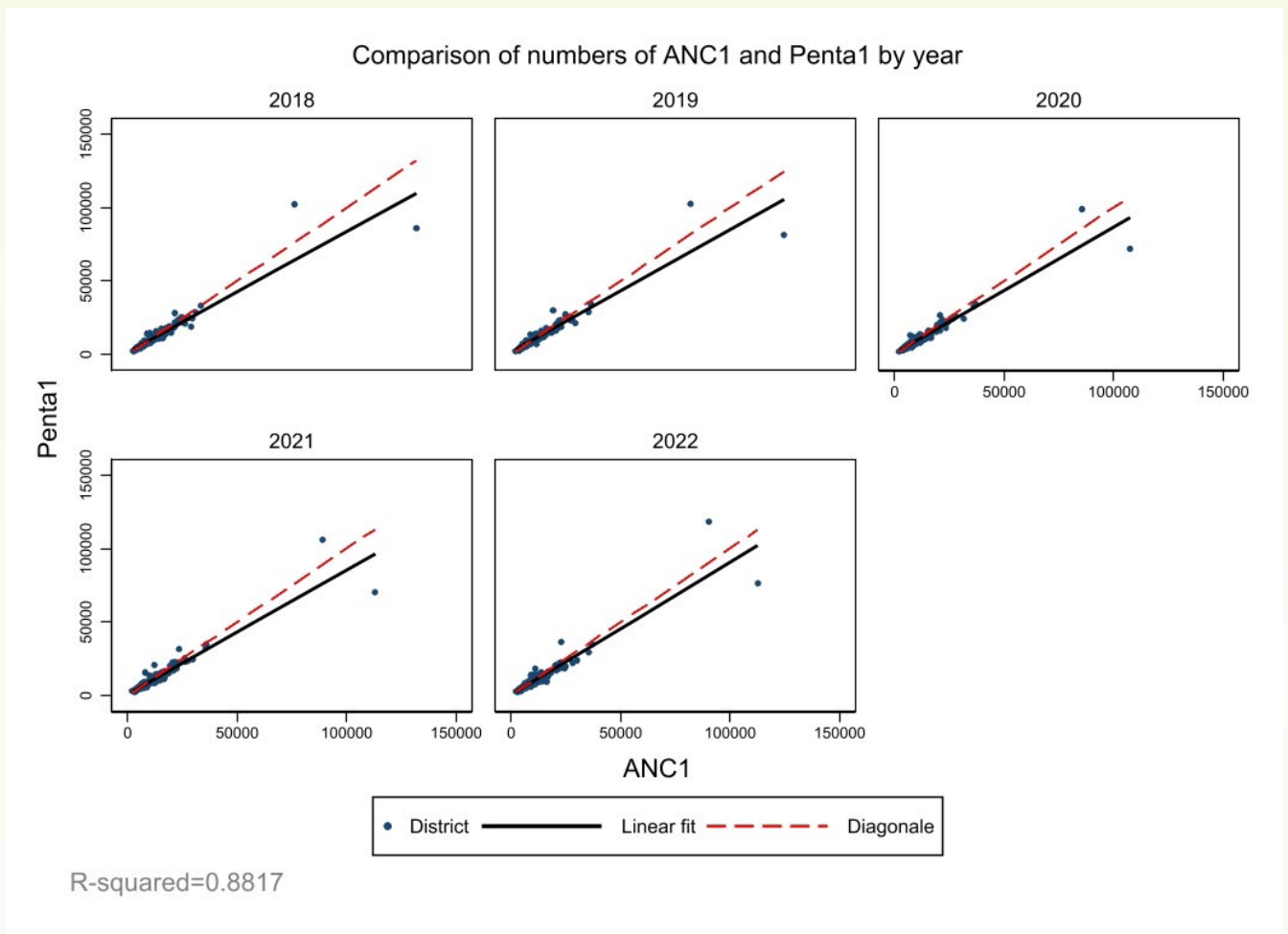Figure 3: Comparison of adjusted number of penta1-penta3 by year, Uganda

Figure 4: Comparison of adjusted number of ANC1-penta1 by year, Uganda

Table 3: Summary of adjustments made to the raw health facility data in preparation of a clean data set for the endline analysis.

Problem	Action	Adjustment
Low reporting rates: identifying low rates that were adjusted	If below **90%,** data were imputed	Median monthly value for the year was imputed for the month with low reporting
Incomplete reporting by districts, variable over time, affecting trend assessment	If reporting rates were **›=90%**, an assumption was made about the volume of services provided by the non-reporting facilities	Adjustment factor **k=0.25** was used to adjust for incomplete reporting
Extreme outliers can greatly affect coverage trend assessments	If a monthly value was greater or smaller than **5 times the median absolute deviation (MAD) from monthly median** value, an adjustment was made	Extreme monthly outliers are corrected and given the median value for the same year
Missing values	If there is a missing value, data were imputed	Median monthly value for the year was imputed for the month with missing value

Table 4: Systematic assessment of health facility data quality for maternal mortality and stillbirth rates

Data quality metrics	2018	2019	2020	2021	2022
2. Consistency annual numbers					
2a: Livebirths	9.9	8.0	0.0	1.0	2.6
2b: Stillbirths	2.5	3.6	0.5	0.0	7.2
2c: Maternal deaths	1.2	0.1	0.0	1.7	8.7
3. Ratio stillbirths to maternal deaths	17.1	17.3	14.6	14.0	13.9
4a. Ratio computed community to institutional stillbirth rate	1.0	1.0	1.0	1.1	
4b. Ratio computed community to observed institutional MMR	2.7	2.9	2.5	0.0	
5. % of stillbirths that are fresh/intrapartum	50.0	48.9	50.9	49.8	49.8

CONCLUSION:

In summary, there was an improvement in the completeness and consistency of data, with most districts having high data completeness and minimal extreme outliers. Notably, a substantial majority of districts exhibit a high level of data completeness, concurrent with a commendable reduction in extreme outliers. It is vital, however, to underscore that certain areas still manifest a degree of inconsistency warranting due attention to sustain the overarching integrity of data quality. In the context of analyzing DHIS-2 data, our recommendations are inclined towards a nuanced consideration of reporting rates and the thoughtful adjustment of outliers.

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