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# Newborn Health Data Transfer in the Cape Coast Metropolis, Ghana

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## Abstract.

Newborn data is important for decision making and planning purposes. Data transfer from facilities to district, regional and national levels must have high level of quality to benefit from its use for planning and decision making. The objective of this research was to assess the quality and accuracy of newborn health data transfer from facilities to the DHIMS II application. The study was conducted within the Cape Coast Metropolis. Four facilities (two public and two private hospitals) were selected for the study. Facilities registers were compared with summary sheets as well as the data in DHIMS II. The study revealed that there were data inaccuracies across all the indicators ranging from -46.5% to 89.3%. Percentage errors 1 and 3 were extremely high due to the inability of some facilities to produce aggregated forms. Percentage error 2 was generally low for all indicators as compared to percentage errors 1 and 3 except for institutional neonatal deaths with percentage error of 89.3%. The others range from -1.4% to 4.4% which means that there was very little error in transferring the facility register data to the web-based DHIMS-II. The overall percentage errors 1, 2 and 3 in transfer of the data were 7.5% (95% CI = 6.5% to 8.6%), 43.1% (95% CI = 41.8% to 44.3%) and 3.6% (95% CI = 3.2% to 4.0%) respectively. Newborn health data quality is essential for planning and decision making to enhance service quality.

**Keywords:** Newborn; Health; Data; Quality; Accuracy; Completeness; Timeliness; DHIMS-II.

## Introduction

Newborn health data quality is important for effective planning and decision-making that invariably affects the quality of neonatal and maternal servicesrendered in the clinical setting.The three (3) most used dimensions of data quality have been identified: timeliness, completeness and accuracy (Chen, Hailey, Wang, & Yu, 2014). Timeliness is the number of days between service date and entry date of submission of data to the system (Chen et al., 2014). Completeness is defined as "a measure of the presence of expected data items in a given dataset or collection" (Wand & Wang, 1996). Accuracy is also defined as "the closeness of data values to the truth or the veracity of the information received" (Chen et al., 2014). Though data consistency and accuracy are independent data quality dimensions, consistency can only be achieved when data is accurate and valid because the stability of data ensures consistency (Hahn, Wanjala, & Marx, 2013). Timeliness is viewed as the "extent to which a particular set of data is current in relation to a specified time" (Vaziri & Mehran, 2012).

Data can be reproduced by the Paper-based Data Collection (PDC) and Electronic Data Capturing (EDC) method.Most low and middle income countries (LMICs) utilise the PDC before uploading them to the database(Amoakoh-Coleman et al., 2015). Currently, a web-based database called the District Health Information Management System 2 (DHIMS-2) which relies on the PDC and aims to improve data acquisition is utilised in data

management in Ghana. Health facilities collate and upload their data directly to the DHIMS-II database with instant access at the district, regional and nationallevel. Subsequently, the database is compared to the primary data source (patient's folder or register) for data validation to avoid the underestimation of the proportion of errors(Nahm, 2008).

This study was undertaken within the framework of the Routine Data Quality Assessment tool (RDQA) developed by Measure Evaluation (Evaluation, 2015). RDQA is a measurement tool that has been variedly used in many countries to assess data quality in routine health information systems (Abah, 2012). The tool uses a two-pronged approach *viz*: the data verification and the systems assessment to examine data verification and system assessment in evaluating data quality. Data verification recounts reported data values against source documents and uses the values to calculate a ratio comparing the values obtained while the systems assessment focuses on a qualitative approach to assess the data management and reporting systems at data administrative levels. The assessment covers the training, indicator definitions, data requirements, data management and quality control measures in the data management process (Abah, 2012). Thus, the RDQA basically combines both quantitative and qualitative methods to assess data quality.Although, completeness and accuracy dimensions of data quality has been studied elsewhere (Chahed, Bellali, Alaya, Ali, & Mahmoudi, 2013),our study aimed to study the completeness and consistency dimensions of data quality pertaining to neonatal health in the Cape Coast Metropolis.

# 1. Methodology

## 2.1 Study design and site

A retrospective study was conducted in the Cape Coast Metropolis. The metropolis is one of the twenty districts in the Central Region of Ghana and serves as the capital of the Central Region. It is the most urbanized and shares common border with three districts. Komenda Edina EguafoAbirem to the West, AburaAsebuKwamankese to the east and Hemang Lower Denkyira to the North. It is bordered to the south by the Gulf of Guinea. There are thirty-one (31) health facilities in the Metropolis. Of these, eight (8) are private clinics and a private hospital, while the remaining twenty-three (23) are public health facilities. The public health facilities consist of three (3) hospitals, one (1) polyclinic, two (2) health centres, eleven (11) CHPS zones, two (2) public clinics, three (3) quasi clinics, one (1) CHAG facility.

## 2.2 Study indicators and Data collection

The study compared three sources of newborn health data. The newborn health data includes; total number of births, total number of livebirths, total number of fresh stillbirths, total number of macerated stillbirths and total number of institutional neonatal deaths. A data collation sheet was used to collect data on accuracy. The data collation sheet assessed the accuracy of the health information data values of the data elements in the four (4) randomly selected health facilities in the Metropolis over a retrospective twelve-month period. The data was extracted from the following sources: Daily Registers at the health facility; Monthly Summaries submitted to the electronic database (DHIMS II). In this case, the actual values extracted from the three sources were captured on a data collation sheet for each health facility for a retrospective period of twelve months.

## 2.3 Data verification

The data verification process was to see the consistency of values between the facility source documents and summaries and the DHIMS II. This process was conducted through a calculation of a verification factor using differences between the values in the different data sources for each data element and each facility (Ronveaux et al., 2005).

In calculating the accuracy of newborn data, three types of percentage errors in data accuracy across the three data sources were calculated.

Percentage Error = (Difference between both data sources / total data entered) × 100

$$= [(x_i - x_j) \times 100] / X$$

$x_i$, $x_j$ represent the sequence in data gathering sources with j always acting as the reference for i; and X is the total data inspected for the variable).

Percentage Error 1 is a measure of the error involved in the transfer of data from the primary sources to the aggregate data forms. It estimated the deviation of the facility aggregate data from the primary source data.

Percentage Error 2 is a measure of the disparity between the data in the primary source, and what is finally received at the district and regional levels through the DHIMS II. It estimated the deviation of DHIMS II data from primary source data.

Percentage Error 3 is a measure of the error that occurs during the transfer of data from the aggregate forms into the web-based DHIMS II software. It estimated the deviation of the facility aggregate data from the DHIMS II data, mainly due to data entry errors.

## 2. Results

A total of 17685 data recorded on the selected heath indicators was collated under the period of study. The study revealed that there were data inaccuracies across all the indicators ranging from -46.5% to 89.3% as presented in Figure 1 and Table 1. Percentage errors 1 and 3 were extremely high due the inability of some facilities to produce aggregated forms. Percentage error 2 was generally low for all indicators as compared to percentage errors 1 and 3 except for institutional neonatal deaths with percentage error of 89.3% as shown in Table 1. The others range from -1.4% to 4.4% signifying the occurrence of very little error in transferring the facility register data to the web-based DHIMS-II. The overall percentage errors 1, 2 and 3 in transfer of the data were 7.5% (95% CI = 6.5% to 8.6%), 43.1% (95% CI = 41.8% to 44.3%) and 3.6% (95% CI = 3.2% to 4.0%) respectively. Table 1 and figure 1 summarizes the percentage errors for all the indicators reviewed within the Cape Coast Metropolis.

**Table 1. Newborn health data transfer for the period January 2015 to December 2016 in Cape Coast Metropolis**

| | **Primary source data - register (As counted)** | **Hospital aggregate data as recorded on the form** | **Web-based DHIMS II data** | **PERCENTAGE ERROR 1 (Register Vs. Forms)** | **PERCENTAGE ERROR 2 (Register Vs. DHIMS II)** | **PERCENTAGE ERROR 3 (Forms Vs. DHIMS II)** |
|---|---|---|---|---|---|---|
| Total number of births | 8669 | 6022 | 8660 | **30.5%** | **0.1%** | **-43.8%** |
| Total number of live births | 8251 | 5712 | 8368 | **30.8%** | **-1.4%** | **-46.5%** |
| Total number of fresh stillbirths | 191 | 167 | 183 | **12.6%** | **4.2%** | **-9.6%** |
| Total number of macerated stillbirths | 181 | 146 | 173 | **19.3%** | **4.4%** | **-18.5%** |
| Total number of institutional neonatal deaths | 393 | 349 | 42 | **11.2%** | **89.3%** | **88.0%** |
| **Mean (95% Confidence Interval)** | **N/A** | **N/A** | **N/A** | **7.5% (95% CI = 6.5% to 8.6%),** | **43.1% (95% CI = 41.8% to 44.3%)** | **3.6% (95% CI = 3.2% to 4.0%)** |

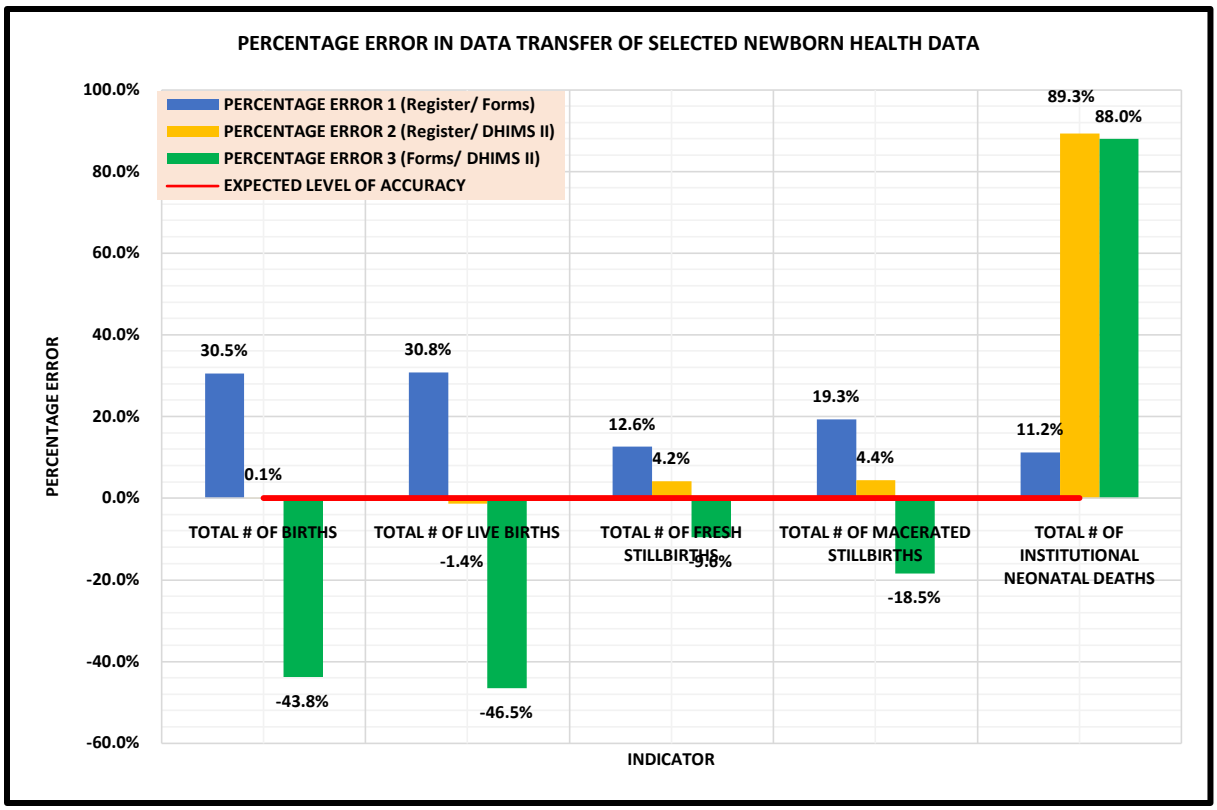


**Figure 1. Overall percentage error in data transfer of selected newborn health data in Cape Coast Metropolis**

## 3. Discussion

Although, previous studies have suggested that DHIMS II data is relatively accurate and reliable for use (Amoakoh-Coleman et al., 2015), the present study demonstrated inaccuracies in the reported values with discrepancies between facilities register data, summary form figures and the figures in DHIMS II. Data inaccuracies were found to be present in both public and private health facilities. These inaccuracies were progressively worse as the data was aggregated and captured (Summary forms and DHIMS II). There was generally under-reporting from facility registers to summary forms and over-reporting from the summary forms to DHIMS II except for institutional neonatal mortality which was largely under-reported.

Overall, percentage error 2 was markedly high [43.1% (95% CI = 41.8% to 44.3%)] compared to percentage error 1 [7.5% (95% CI = 6.5% to 8.6%)] and percentage error 3 [3.6% (95% CI = 3.2% to 4.0%)]. These discrepancies may have occurred because data from primary source went missing or there may have been errors in arithmetic or transcribing. Common sources of error have been attributed to inaccurate collation of the primary data; and improper numbering of the registers, ineligible handwriting and coding, collation of the facility data before the end of the month and inadequate supply of delivery and antenatal register, inadequate training of data collectors, incomplete capturing of data, absence of regular data checks(Amoakoh-Coleman et al., 2015; Ronveaux et al., 2005). Moreover, at the health unit level, limited appropriate training and expertise on the data management processes was observed as tools and skills were acquired through workshops by only few leading staffs since there is no tertiary programme on monitoring and evaluation. Monitoring and evaluation (M&E) data management responsibilities were generally poor, similar to the findings of Glèlè Ahanhanzo et al., 2015.Midwives did not necessarily view the recording of patient and health facility information in registers as one of their job responsibilities.There was often a lack of ownership of M&E-related tasks. This finding may support the assertion that whereas health facility managers continue in their health working professions irrespective of the managing duties, district health managers are first and foremost managers, who may sometimes also engage in clinical work(Bonenberger, Aikins, Akweongo, Bosch-Capblanch, & Wyss, 2015; Daire & Gilson, 2014).This could explain the relative proportion of errors accounted in this study.

A major problem may be the intentional underreporting of certain indicators in the DHIMS II concealing the true state of neonatal health in the Metropolis. Clearly, pragmatic measures need to be put in place to minimize the rates of error data management if the quality and consistency of reported data is to improve. The existence of proper mechanisms to monitor the data processing at all levels of the flow of information (health facilities, district and regional units), adequate in service training and motivation of the technical staff for the health information system, supportive supervision visits concerted efforts at the health facility and district could lead to improvements in data recording and reporting which will have direct positive effect on the DHIMS II and could in turn ensure the improvements in the quality and accuracy of the data collected.

## 4. Conclusion

In conclusion, complete, accurate and quality data is important for effective decision making and effective health policies. DHIMS-II was initiated to provide a platform for all managers at all levels to have evidence to manage the complex health system.This paper presents both inconsistent and underreporting of most data elements pertaining to newborn health in the area of study. The challenge now is the implementation of radical steps and procedures that will strengthen the monitoring systems so that the data generated in the DHIMS II will be reliable.Data quality can be improved with the introduction of electronic health records system which would significantly eliminate manual entry of data into the DHIMS-II. High-quality data can be obtained if practical quality assurance procedures are in place in the work environment.Transparency and accountability on the part of health managers in the Cape Coast Metropolis will help to realize and strengthen this goal.

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## Authors' contribution

EKA, GA, ROB and OUL contributed to the concept, data collection, and review of the article. GA contributed to the data analysis of the research. EKA and RO contributed to the writeup and review of the article.

## References

Abah, S. O. (2012). HIA practices in Nigeria. *Impact Assessment and Project Appraisal*, *30*(3), 207–213. http://doi.org/10.1080/14615517.2012.705064

Amoakoh-Coleman, M., Kayode, G. A., Brown-Davies, C., Agyepong, I. A., Grobbee, D. E., Klipstein-Grobusch, K., & Ansah, E. K. (2015). Completeness and accuracy of data transfer of routine maternal health services data in the greater Accra region. *BMC Research Notes*, *8*(1). http://doi.org/10.1186/s13104-015-1058-3

Bonenberger, M., Aikins, M., Akweongo, P., Bosch-Capblanch, X., & Wyss, K. (2015). What do district health managers in Ghana use their working time for? A case study of three districts. *PLoS ONE*, *10*(6), 1–15. http://doi.org/10.1371/journal.pone.0130633

Chahed, M. K., Bellali, H., Alaya, N. Ben, Ali, M., & Mahmoudi, B. (2013). Auditing the quality of immunization data in Tunisia. *Asian Pacific Journal of Tropical Disease*, *3*(1), 65–70. http://doi.org/10.1016/S2222-1808(13)60014-6

Chen, H., Hailey, D., Wang, N., & Yu, P. (2014). A review of data quality assessment methods for public health information systems. *International Journal of Environmental Research and Public Health*. http://doi.org/10.3390/ijerph110505170

Daire, J., & Gilson, L. (2014). Does identity shape leadership and management practice? Experiences of PHC facility managers in Cape Town, South Africa. *Health Policy and Planning*, *29*, ii82-ii97. http://doi.org/10.1093/heapol/czu075

Evaluation, M. (2015). *User Manual Routine Data Quality Assessment*.

Glèlè Ahanhanzo, Y., Ouendo, E.-M., Kpozèhouen, A., Levêque, A., Makoutodé, M., & Dramaix-Wilmet, M.

(2015). Data quality assessment in the routine health information system: an application of the Lot Quality Assurance Sampling in Benin. *Health Policy and Planning*, *30*(7), 837–843. http://doi.org/10.1093/heapol/czu067

Hahn, D., Wanjala, P., & Marx, M. (2013). Where is information quality lost at clinical level? A mixed-method study on information systems and data quality in three urban Kenyan ANC clinics. *Global Health Action*, *6*(1), 1–10. http://doi.org/10.3402/gha.v6i0.21424

Nahm, M. (2008). Clinical Research Informatics. *Essentials of Medical Genomics: Second Edition*, 237–249. http://doi.org/10.1002/9780470336168.ch11

Ronveaux, O., Rickert, D., Hadler, S., Groom, H., Lloyd, J., Bchir, A., & Birmingham, M. (2005). The immunization data quality audit: verifying the quality and consistency of immunization monitoring systems TT - Contrôle de la qualité des données de vaccination: vérification de la qualité et de la cohérence des systèmes de vaccinovigilance TT - Aud. *Bulletin of the World Health Organization*, *83*(7), 503–510. http://doi.org/S0042-96862005000700010 [pii]

Vaziri, R., & Mehran, M. (2012). A Questionnaire-Based Data Quality Methodology. *International Journal of Database Management Systems*, *4*(2), 55–68. http://doi.org/10.5121/ijdms.2012.4204

Wand, Y., & Wang, R. (1996). Anchoring Data Quality Dimensions Ontological Foundations. *Communications of the ACM*, *39*(11), 86–95.