Open Journal of Public Health

Research Article
Published: 09 Sep, 2024

Data Quality in a Routine Health Information System: The Situation in Gabon as Seen from Two Health Regions

Koumamba AP[1,2], Ngoungou EB[2] and Diallo G[1]*

[1]*Department of Chronic Disease Epidemiology and Environmental Health Research Unit, University of Bordeaux, France*

[2]*Department of Chronic Disease Epidemiology and Environmental Health Research Unit, University of Health Sciences, Gabon*

Abstract

Background: The performance of a Health Information System (HIS) is highly dependent on the quality of health data. The HIS is essential to the healthcare system, as it provides information for decision-making. The issue of data quality remains a challenge for many healthcare systems. It should be noted that the quality of the data discussed in this article is linked to its suitability for a specific purpose and is defined by different criteria, such as: (i) timeliness; (ii) completeness; (iii) accuracy; and (iv) integrity. The Gabonese health system has an HIS that systematically collects, processes and evaluates data to guide health activities. The results of several studies conducted on this HIS are consistent with the idea that it is fragmented. In the current context, we thought it appropriate to conduct a study, based on a limited number of non-exhaustive criteria, in order to assess the quality of the data in two health regions of Gabon.

Objective: To have a metric to assess the degree of relevance of health system data in Gabon.

Methods and Tools: A quantitative study was conducted based on three data quality criteria, namely: (i) the ability to capture and store data, (ii) the ability to verify the accuracy of the data, and (iii) the ability to process and analyze the data.

Results: The results show that there are shortcomings in this HIS that have the potential to compromise the quality of the data. Only 58% of structures record and store data, 53% of these structures do not verify the accuracy of the data, and 56% of structures do not meet all the criteria to facilitate data processing and analysis.

Conclusion: This study shows this HIS has limitations that affect the quality of the data.

Keywords: Data quality; HIS; Completeness; Accuracy; Timeliness

OPEN ACCESS

Correspondence:
Aimé Patrice Koumamba, Department of Chronic Disease Epidemiology and Environmental Health Research Unit, Bordeaux Population Health INSERM-U1219, University of Bordeaux, Bordeaux, France,

Received Date: *20 Aug 2024*
Accepted Date: *02 Sep 2024*
Published Date: *09 Sep 2024*

Citation:
Koumamba AP, Ngoungou EB, Diallo G. Data Quality in a Routine Health Information System: The Situation in Gabon as Seen from Two Health Regions. Open J Public Health. 2024; 6(1): 1050.

Introduction

Context

The presence of a proficient Information System (IS) that can generate high-quality data to facilitate strategic and operational decision-making is vital for any organization. In the same perspective, it is imperative for every healthcare system to possess a proficient health information system that generates pertinent information derived from high-quality data. Quality data is undeniably crucial in the process of decision-making, health planning, and the monitoring and evaluation of health activities and interventions [1]. The concept of quality data encompasses a range of definitions. In our understanding, quality data refers to data that is appropriate for the intended purpose and is characterized by specific criteria [2], such as:

- Promptness refers to the temporal interval between the data generation date and the date at which it becomes accessible.
- Completeness quantifies the extent to which all generated data is available.
- Accuracy pertains to the capacity to assess whether the accessible data accurately reflects the generated data.
- Integrity assesses the consistency of the accessible data with one another.

To ensure the quality of data, it is imperative these management operations, encompassing

data collection, processing, analysis, and distribution, are effectively organized [3]. These three criteria were used to assess data quality participle that decisions are in line with observed reality, which will allow decisions made on the basis of these data to have a real impact, especially in terms of health [3].

Challenge

One of the primary obstacles encountered by health systems in Sub-Saharan African countries (SSA) pertains to the requirement for high-quality data. The aforementioned circumstance necessitates the implementation of data management processes that are adequately structured [4]. The absence of a well-organized Health Information System (HIS) poses challenges in making informed decisions that align with the requirements of consumers. Furthermore, given these circumstances, it will provide a challenge to effectively monitor and assess the outcomes of the implemented interventions [5]. In order to effectively address this challenge, it is imperative to consistently evaluate the data management procedures within a HIS. This review serves to enhance our understanding of the organizational constraints inherent in the HIS and to identify potential avenues for development [6]. The Performance of Routine Information System Management (PRISM) method, which was established by the United States Agency for International Development (USAID), is considered to be one of the most commonly employed approaches for assessing HIS data management operations [3]. This approach aligns with the findings of several documented research [7], and it illustrates that the performance of an HIS is based on three technical, behavioral and organizational factors (Figure 1).

The management of these factors has a significant role in facilitating the effective execution of HIS procedures, hence leading to improved data quality [8].

Gabon's healthcare infrastructure encompasses a Health Information System, which is widely recognized as the National Health Information System (NHIS). The regular task of the organization within the health system involves the systematic collection, processing, analysis, and distribution of data and information essential for decision-making across all levels of the organization [9]. The investigation of the NHIS revealed the presence of technological and organizational dysfunctions [10]. From a technical standpoint, the findings revealed a fragmented system characterized by the presence of multiple digital applications that lack intercommunication capabilities. In relation to the organizational level, an inadequacy in coordination and a lack of proper consideration of the NHIS within the legal framework governing the health system in Gabon is evident. Given the presence of these technical and organizational deficiencies, it was deemed necessary to evaluate the significance of the data generated in that context [6].

To this end, we chose to assess data quality on the basis of a number of criteria that make up the elements (data collection, processing, analysis and dissemination) and processes of a SIS, the performance of which is influenced by technical, behavioral and organizational factors, as described in the PRISM approach. Indeed, when the technical, behavioral and organizational factors are effective, the data are immediately judged to be of high quality. Our approach was to assess data quality independently of these three factors.

The purpose of this study was to assess the degree of relevance of the data upon which choices within the healthcare system in Gabon are founded. The goal of this analysis is to highlight the constraints associated with the NHIS in relation to the quality of its data [11], based on the following quality criteria:

- Ability to record/store data for NHIS
- Ability to verify data accuracy
- Ability to process and analyze data

Scope of the study

The research is being conducted in two healthcare regions within the country of Gabon. The selection of two regions was driven by considerations of accessibility and financial constraints. It is important to acknowledge that the aforementioned health districts encompass the political province of Gabon, which accounts for a significant proportion of the national population, exceeding 49% [12]. Additionally, it is observed that 34% of health professionals and 32% of health facilities are present in these regions [13].

Methods

The study was conducted following a series of five steps, as depicted in Figure 2. The process of data collection was conducted in the year 2019.

Identification of data quality criteria for a data collection process

The purpose of this phase was to assess the current state of knowledge required for the effective organization of operational procedures in order to gather high-quality data that can facilitate the administration of a healthcare system.

The production of health data is reliant upon a structured framework consisting of several components, including individuals responsible for the collection, processing, analysis, and dissemination of information, as well as certain protocols and technologies for data collection [14]. The occurrence of a failure in any of these factors can result in a negative impact on the quality of the generated data. Hence, it is imperative to assess these factors by conducting a comprehensive literature analysis and engaging in talks with many stakeholders involved in health data management. Leadership of this section was provided by the main author, as the activity was part of the overall context of the Gabon NHIS Strengthening Project.

Specification of data for the generation of indicators measuring the data collection process

The aim was to provide a comprehensive collection of resources for the purpose of monitoring and evaluating health systems management. This was achieved by identifying and utilizing specific indicators that are relevant and effective in assessing the performance of these systems. This step facilitated the identification of two key aspects: Firstly, the individual steps involved in the data collection procedure, and secondly, the extent to which information system users considered data needs, the necessity to enhance data input, and the value of employing a methodology for implementing a process to enhance data quality. As part of the Gabon HIS Strengthening Project, hundreds of indicators for monitoring and evaluating health system data management had already been validated at country level. For the purposes of this study, however, it was necessary to select a few indicators to meet the study's objective.

Design of the data collection form

The primary objective of this phase involved the contextualization and adaptation of the PRISM forms. These forms collectively establish

Table 1: Distribution of structures surveyed by health region and sector.

Health Care Regions / Health Sector	West n(%)	Libreville-Owendo n(%)	Total n(%)
Private sector	1 (1)	19 (27)	20 (2)
Public sector	15 (21)	36 (51)	51 (72)
Total	16 (23)	55 (77)	71 (100)

a framework for evaluating the performance of a HIS at various levels within a healthcare institution. Given the standardized nature of this framework, it was imperative for the study's design, methodology, and purpose to incorporate certain modifications to the questionnaires in order to effectively accommodate the specific context of the Gabonese NHIS. The pre-designed PRISM form includes variables that take into account technical, organizational and behavioral factors. But also, aspects of the SNIS process (data collection, processing, analysis and dissemination). In this section, our aim was to retain only those aspects of the HIS process that were adapted to the health region level.

Data collection

Data were collected using two questionnaires (contextualized and adapted) of the PRISM framework.

- The Performance Diagnostic Tool questionnaire which determines the overall level of HIS performance, examining separately the quality of the data and the level of use of the information;

- The Management Assessment Tool questionnaire that assesses HIS governance and other functions such as HIS oversight and data quality analysis.

There are two distinct methodologies that facilitate the process of data collection: Semi-structured interviews and literature review. The data collection phase encompassed the participation of health professionals responsible for data management throughout 71 health facilities within the designated locations [14,15].

Data capture and analysis

The data were inputted and analyzed with the Epi info 7 program. The primary factors considered for the collection, processing, and analysis of data were assessed using descriptive statistics, including percentages, means, and composite scores. These scores were derived from the dimensions that define the criteria associated with the utilization of data quality:

- Ability to record/store data
- Ability to verify data accuracy
- Ability to process and analyze data

Results

A comprehensive survey was conducted, encompassing a total of 71 healthcare establishments. Among them, 55 facilities (77%) were situated in the Libreville-Owen do health region, while the other 16 (23%) were located in the West region. Out of the total sample size, 20 individuals (28%) were employed in the private sector, while 51 individuals (72%) were employed in the public sector, as indicated in Table 1. In these health facilities, 71 health professionals were interviewed. Of these, 50 (70%) were men and 21 (30%) were women.

On average, the duration of employment in the NHIS was 11 years, with a standard deviation of 5 years. The analysis revealed that there was no statistically significant disparity ($p>0.05$) in the average duration of HIS between males and females.

The primary findings, as presented in Table 2, pertaining to the various dimensions associated with the quality of data in the National Health Insurance Scheme (NHIS), as assessed in the study, indicate inadequate implementation of data production processes within healthcare settings.

When considering data collection methods, it is noteworthy that the register serves as a primary data source inside hospital settings. However, it is worth mentioning that a mere 59% of health institutions maintain general consultation registers. In relation to the acquisition and retention of data, it is observed that a mere 45% of healthcare establishments own a digital instrument for the purpose of data collecting and storage.

In order to ascertain the accuracy of the data, it is observed that while 80% of health facilities assert the presence of data in their reports that align with the information recorded in the registers, it is noteworthy that 69% of health structures lack established protocols for validating the accuracy of the data. With regards to the domain of data processing and analysis, a mere 14% of structures indicate the presence of established procedures for data processing and analysis, while 27% report engaging in the calculation of indicators. Out of the 71 health institutions that were inspected, it was found that 70 of them lack the necessary instruments for data processing and analysis.

In general, the data generating procedures within the current system exhibit certain restrictions. Indeed, a mere 42% of structures satisfy all the requisite criteria for the purpose of capturing and preserving data. In relation to the process of data verification, it is observed that a significant proportion of the structures, specifically

Table 2: Results of the data quality assessment in 71 health facilities in two health regions of Gabon in 2020.

Dimensions assessed	Evaluation Criteria	Yes n(%)	No n(%)
Data recording/storage	Keeping medical consultation records	42 (59)	29 (41)
	Existence of a digital tool for data collection and storage	32 (45)	39 (55)
Verification of data accuracy	Checking the match between the data in the report and the source registry	57 (80)	14 (20)
	Existence of procedures to check the accuracy of data	22 (31)	49 (69)
	Existence of procedures on the consequences of non-verification of data accuracy	33 (46)	38 (54)
Data processing and analysis	Existence of data processing and analysis procedures	10 (14)	61 (86)
	Calculation of structure indicators	19 (27)	52 (73)
	Harmonization of data with ministerial and regional socio-health objectives	11 (15)	60 (85)
	Comparison of data over time	20 (14)	51 (72)
	Existence of a data processing and analysis tool	01 (01)	70 (99)

Table 3: Results of observational analysis of concordance between data in the report and those in the source register.

Monitoring indicators	Collection medium	Registered cases	Discrepancy in reports
Number of malaria cases	Register	2110	+ 34 CASES
	Report	2144	
Number of cases of anemia	Register	582	+ 420 CASES
	Report	1002	

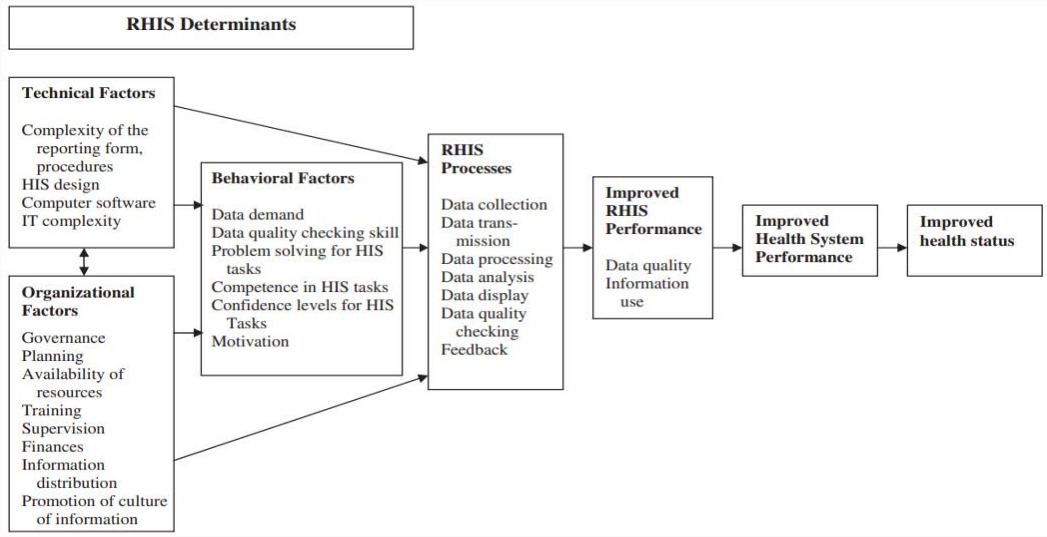

Figure 1: Cadre PRISM (Performance of Routine Information System Management).

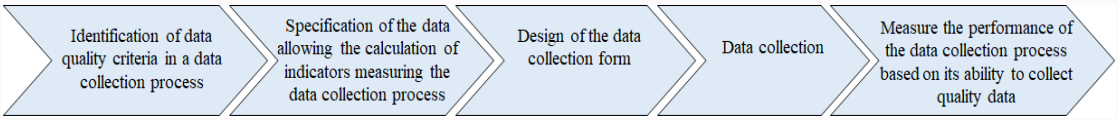

Figure 2: Steps implemented for the realization of the study.

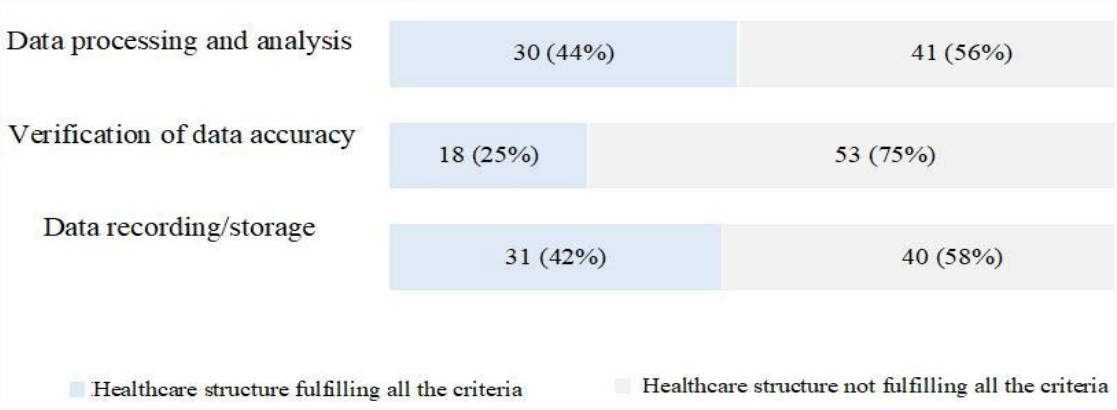

Figure 3: Global data usage scores in 2019 assessed from three dimensions influencing NHIS data quality.

75%, fail to satisfy the whole set of criteria required to ensure the accuracy of the data. Furthermore, an additional 56% of the structures examined do not fulfill the essential requirements for data processing and analysis, as depicted in Figure 3.

In relation to the comprehensiveness of the data and the foundation of two monitoring indicators, specifically the incidence of malaria cases and the prevalence of anemia cases, we conducted an assessment to ensure the coherence between the data shown in the report and the information recorded in the source registry. Regarding the disparity in case numbers between the two settings, it was seen that the reports exhibited an instance of over-reporting. Specifically, an excess of 34 cases of malaria and 420 cases of anemia were documented (Table 3).

The evaluation of the completeness rate of the data generated

Figure 4: Representation of the completeness of the data produced in 2019 by the structures surveyed.

inside this information system facilitated the assessment of data quality in relation to its level of completeness. In 2019, a grouped total of 852 hospital activity reports and registers will be randomly selected, with 12 reports and registers per facility. The activity reports record, in summary form, the individual patient information contained in the hospital registers.

These 852 comprehensive reports were submitted by the 71 health structures, with an average of 12 reports per structure per year. However, only 333 complete reports were actually received (Figure 4). The exhaustiveness rate of 39% indicates that the health statistics generated in 2019 are indicative of merely 39% of the total health data produced during that year.

Discussion

The consensus among the existing body of literature is that the effectiveness of information systems, including those utilized in the healthcare industry, is contingent upon the quality of the data they generate. It is worth noting that the dimensions that characterize the quality of the data have a wide and varied nature. It is important to note that the dimensions employed to evaluate the data quality in our study are not exhaustive. However, they do possess the advantage of effectively characterizing and providing an indication of the performance level of Gabon's health information system. In this study, an assessment was conducted on three dimensions that have the potential to guarantee data quality, taking into consideration their respective qualities or consequences.

Capacity to collect and inform NHIS data

The capacity to gather and record data is an essential element in guaranteeing the quality of data. Hence, the preservation of consultation records holds significant importance, despite the apparent lack thereof as indicated by the results. These findings reveal deficiencies in maintaining of consultation records, which serve as crucial data sources within the healthcare sector. This implies that the data provided is insufficient and the predicted indicators may not accurately represent the actual situation, particularly due to missing data resulting from certain health facilities' incapacity to maintain comprehensive consultation records.

Furthermore, the absence of backup copies for data preservation poses significant challenges in conducting data accuracy checks and retrospective analysis, thereby compromising the comprehensiveness of the records. To enhance the efficiency of data processing and analysis, the utilization of a digital instrument for data gathering and storage becomes imperative. Based on a research study, it has been shown that a mere 45% of healthcare institutions possess a digital tool that enables them to effectively gather and retain data.

Ability to verify data accuracy

The process of verifying the coherence between the information presented in the report and the original source record entails doing a comparative analysis of the data found in the medical consultation records and the NHIS reports. This examination serves to assess the accuracy of the data and ensure its overall quality.

The findings suggest that a majority of healthcare businesses, namely eighty percent, engage in the practice of conducting data consistency checks. The absence of established methodologies for validating data accuracy renders it exceedingly difficult to promptly ascertain the veracity of the generated data. The absence of data correctness management procedures in 69% of facilities indicates a significant concern regarding data accuracy. Therefore, it is imperative to provide standardized data verification tools for all stakeholders engaged in the administration of health information.

Efficient protocols are necessary to accurately identify and find all individuals involved in the production of data of superior quality. This assertion is further supported by the findings of a study [6], wherein the use of standardized and validated instruments resulted in an enhancement in data accuracy, in contrast to the data obtained from non-standardized and in validated instruments employed during the initial phase. Procedures are undeniably crucial; however, it is imperative to incorporate explanatory components that delineate the potential ramifications of inadequate control over data accuracy. This is particularly significant considering the findings of the study, which indicate that 54% of healthcare facilities lack awareness regarding the existence of procedures pertaining to the potential consequences of failing to verify data accuracy.

Ability to process and analyze data

Prior to the installation of the information system, it is imperative to create and document the objectives to be attained, as well as the related indicators, within a comprehensive strategy. Typically, this will lead to the development of protocols that standardize the processing and analysis of data to generate indicators across various entities. Unfortunately, a significant proportion of healthcare organizations, namely 86%, lack awareness regarding the presence and utilization of data processing and analysis methodologies. The absence of these methodologies poses challenges for health institutions in their efforts to establish and provide their own metrics. This finding is further corroborated by the study's results, which reveal that a mere 27% of the assessed entities engage in the practice of independently computing their own metrics. Regarding the presence of a tool for data processing and analysis, the evaluation of the technological contribution to the processing and analysis of data generated by the SIS yields unsatisfactory outcomes. Indeed, a significant majority of the examined structures, amounting to ninety-nine percent, lack the requisite tools for the processing and analysis of data. This implies that a significant majority of structures engage in the manual processing and evaluation of their data, or employ instruments that are ill-suited for such purposes. Furthermore, it is crucial to consider the alignment between the data generated and the goals of both the department and the health area. This criterion highlights the need to recognize the operational placement of healthcare facilities within the organizational framework of a healthcare system. Therefore, it is imperative that the operational activities of these entities are in accordance with the strategic goals of the healthcare system. This suggests that the data provided should enable the decision-making level to effectively monitor and evaluate the established objectives.

However, it was noted that a significant majority (85%) of the examined institutions failed to establish a connection between their data collection practices and the objectives set forth by their respective ministries and health regions.

Study limitations

As the study did not take into account aspects such as interoperability, data confidentiality and security, and also only covered two health regions out of ten, it may have some limitations in terms of the completeness of the data evaluated, as regards data quality viewed globally for the whole country.

Conclusion

Although undertaken on a limited scale, the results of this study relatively present the overall situation of all health regions and demonstrate the constraints of Gabon's health information system in providing reliable data for strategic decision-making. As a result, these findings can make a valuable contribution to efforts to improve the effectiveness of the SNIS at all levels of the health pyramid. In other words, those in charge of the healthcare system, whatever the level of decision-making, need to take ownership of these results in order to implement actions in line with healthcare needs.

Funding

APK, a PhD in public health, received funding from the Gabon National Health Information System Strengthening Project and the World Bank to support his work.

References

1. Lippeveld T, Sauerborn R, Bodart C, WHO. Design and implementation of health information systems. WHO. 2000.
2. Hong C, David H, Wang N, Ping Yu. A review of data quality assessment methods for public health information systems. Int J Environ Res Public Health. 2014;11(5):5170-207.
3. Aqil A, Lippeveld T, Hozumi D. PRISM framework: A paradigm shift for the design, strengthening and evaluation of routine health information systems. Health Policy Plan. 2009;24(3):217-28.
4. Kyomba GK, Kiyombo GM, Grépin KA, Mayaka SM, Mondo Mambu TN, Hategeka C, et al. Assessing routine health information system performance during the tenth outbreak of Ebola virus disease (2018-2020) in the Democratic Republic of the Congo: A qualitative study in North Kivu. PLOS Global Public Health. 2022;2(7):e0000429.
5. Mapatano MA, Piripiri L. Some common errors in the analysis of a health information system (DR Congo). Sante Publique. 2005;17(4):551-8.
6. Belay H, Lippeveld T. PRISM framework inventory and tools: Application of PRISM tools and interventions to enhance the performance of routine health information systems. Chap Hill. 2013.
7. Ahanhanzo YG, Saizonou J, Wodon A, Dujardin B, Wilmet-Dramaix M, Makoutodé M. Involvement of health workers in the design of data collection tools in Benin. Sante Publique. 2015;27(2):241-8.
8. Kebe M. Evaluation of the Performance of the Routine Health Information System (PRISM) in Burkina Faso. 2020.
9. Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evans DB, et al. Priorities for Disease Control in Developing Countries. 2006.
10. Jacquemont P. Health systems in Africa put to the test? Policy Cent. New South PB Policy Note. 2020;2032.
11. Koumamba AP. State of play of Gabon's health information system. Public Health (Bucur.) 2020;32(4):407-17.
12. Bignoumba GS. New tools of coastal governance in Gabon. Rev Geography too Environment. 2018;1:4351.
13. Ministry of Health. Report on the mapping of equipment, uses and perceptions of ICTs in Gabon. 2016.
14. Blockchain Technology and Universal Health Coverage: The Health Data Space in Global Migration Elsevier Enhanced Reader.
15. Hotchkiss DR, Aqil A, Lippeveld T, Mukooyo E. Evaluation of the Performance of Routine Information System Management (PRISM) cadre: Données probantes de l'Ouganda. BMC Health Serv Rés. 2010;10(1):188.