



doi:10.5281/zenodo.20087340

Health Workers' Behavioral Factors Affecting Osun State's Routine Health Information System's Data Quality

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ABSTRACT

Health workers' behaviour is a vital factor that influences the quality of data produced from Routine Health Information Systems (RHIS), especially in rural and low resource environments. In low- and middle-income countries, such as Nigeria, low data quality and ineffective health system performance are related to poor training, motivation, attitude and workload among health workers. This study assessed the behavioural factors that affect data quality in RHIS in Osun State, Nigeria, including differences between levels of care, including rural primary health facilities. A cross-sectional study was conducted among 317 health workers in 22 public health facilities (primary, secondary and tertiary health care) in Osun State using a multistage sampling approach. A questionnaire based on the PRISM framework and a checklist were used to collect data. The questionnaire had acceptable reliability (Cronbach's alpha = 0.790). Descriptive statistics and a regression analysis with SPSS version 30.0 were used to analyse the data and test the effect of behavioural factors on RHIS data quality. The study found health workers were motivated, competent and had favourable attitudes (mean behavioural score 72.09±9.85). Most of them were committed to documentation, use and monitoring of performance; more than 80% reported being competent in data analysis and decision-making, even in low-resource and rural environments. Data quality aspects were generally good for completeness (8.78 ± 2.0), timeliness (9.11 ± 1.7) and reliability (13.04 ± 3.2). But accuracy was poor, with only 21.7% of facilities having accurate reporting, and significant discrepancies between source registers and summary reports. Primary health facilities (many in rural areas) had the highest overall data quality (43.59 ± 5.78), indicating strong individual effort despite institutional limitations. Linear regression analysis indicated that behaviours significantly and positively affect RHIS data quality ($\beta = 0.298$, $t = 5.253$, $p < 0.05$), accounting for 8.9% of the variance ($R^2 = 0.089$). While health workers show high intrinsic motivation, positive attitude and competence in managing RHIS data, gaps in data accuracy and lack of institutional support factors limit the quality of data, especially in rural and resource-poor health facilities. RHIS data quality is largely reliant on individual effort without due system support. Performance-based incentives, institutionalising ongoing training and professional development, improving supportive supervision and feedback, and fostering data use are key to maintaining positive behavioural factors and enhancing RHIS data quality, particularly in rural health facilities.

Keywords: Health workers' behavior, public health facilities

1. INTRODUCTION

National, state and local government data are crucial for the efficient management of health services. But the quality of data remains a significant concern, especially in developing nations like Nigeria,

where poor-quality data impede health planning, implementation, and delivery of health services (Omole, 2019). Low-quality data also affect decision-making, escalate costs and lead to poor health system performance (Daneshkohan, 2022). These issues are particularly prevalent in rural and poorly resourced areas where infrastructural and human resource constraints also impact data management.

Health workers play a critical role in data collection, recording, processing and reporting for Routine Health Information Systems (RHIS). As such, health workers' behaviour, skills and motivation play an important role in the quality, completeness and timeliness of data (WHO, 2023). The Performance of Routine Information System Management (PRISM) framework identifies behavioural factors such as knowledge, skills, attitudes, values and motivation as important determinants of RHIS performance (USAID & MEASURE Evaluation, 2008).

Health workers' knowledge and skills are critical for data management. Poor knowledge and capacity building lead to errors in data collection and reporting (Morris, 2024), which is more common in rural health facilities with limited training opportunities. Likewise, perceptions and attitudes towards data-related activities also affect performance; when these activities are perceived as a "waste of time" or less important, data quality is compromised through underreporting and incomplete data recording.

Motivation is another key determinant. Health workers who are motivated and see the value of data in decision-making are more likely to report data accurately, while a lack of motivation - from demanding workloads, inadequate incentives or poor working conditions - has a negative impact on data quality (Morris, 2024). In many facilities, particularly rural ones, workload and time pressures on health workers may result in data management activities being deprioritised.

Lack of capacity to analyse and apply data also diminishes the value of data, resulting in poor data quality and underuse. In Nigeria and other settings, behavioural factors - such as lack of training, motivation and positive attitudes - lead to underreporting, overreporting and inconsistencies in health data (Ahanhanzo, 2014; Morris, 2024). In Osun State, these factors are further exacerbated by poor management, including high workload and lack of institutional support, especially in rural areas.

In summary, behavioural factors - knowledge, skills, attitudes, motivation and workload - significantly influence RHIS data quality. Managing these determinants is crucial for enhancing the accuracy, completeness, timeliness and reliability of data, and ultimately to enhance health information systems, particularly in rural facilities.

2. Statement of Problem

Health worker behaviour is a key factor in determining the quality of data being produced by Routine Health Information Systems (RHIS). In Nigeria, the lack of training, motivation and a positive attitude towards data management is a major factor affecting data quality (McKing, 2021; WHO, 2023), especially in rural and resource-poor areas.

In Osun State, the heavy workload, lack of training, and incentives, affect data management and lead to errors, under-reporting, and delays that impact on the quality of the data (accuracy, completeness, timeliness). This is more pronounced in rural health facilities due to low staffing levels and lack of supervision.

The inability to analyse and use data also lowers RHIS engagement, resulting in poor documentation and reporting. Poor attitudes, low accountability and the preference for clinical work over data collection also lead to poor reporting. Finally, a lack of ongoing training and supervision maintains knowledge and practice gaps.

As such, it is important to understand the effect of behavioural factors (knowledge, skills, attitudes, motivation and workload) on the quality of RHIS data in Osun State in order to inform strategies for data quality improvement and evidence-based health-care practice (Adejimi, 2017; WHO, 2023).

3. Objective of the Study

To explore health workers' behavioral factors affecting Osun State's RHIS data quality.

4. Theoretical Framework

We draw on the Human Capital Theory and Adult Learning Theory (Andragogy) to examine the behavioural attributes that influence health workers' RHIS data quality in Osun State. Human Capital Theory highlights that educational, training and skills development activities improve employee competency, productivity and performance in data management (Schultz, 1961 (in PEPRAH, 2018); Becker, 1964; Wuttaphan, 2017). Competence, motivation, attitude, and problem-solving skills of health workers play a critical role in the accuracy, completeness and quality of RHIS data (Morris, 2024). Similarly, Andragogy theory states that adult learners are self-directed, experiential, and seek

practical applications (Nallaluthan, 2023; Anand, 2024). Problem-based and context-specific training that mirrors data quality challenges in health workers' data management enhances their motivation and performance in RHIS activities. These theories are crucial in this study as they explain the influence of behavioural factors like skills, motivation and attitudes on data quality, and guide the design of capacity-building programs to enhance the quality of RHIS data.

5. METHODS

This study used a cross-sectional design to explore the role of behavior factors on the quality of RHIS data among health workers in Osun State. A multistage sampling approach was used to sample 22 health facilities (14 primaries, 6 secondaries and 2 tertiary) across the three senatorial districts, with representation of different levels of care., and a sample of 317 was randomly selected from the population of 1,139 eligible health workers. The data collection tools comprised a questionnaire developed based on the PRISM concepts, including behavioral constructs such as knowledge, competence, motivation, attitude and data usage patterns.

The validity of the behavioral constructs was confirmed by expert review and was supported by construct validity tests (significant Bartlett's test and high factor loadings). Reliability testing showed good internal consistency (Cronbach's alpha = 0.790), suggesting that the behavioral items were consistent in measuring the constructs. Data collection was conducted over three months by trained data collectors using a standardised approach. Data were analysed using SPSS version 30.0 and descriptive statistics and regression analysis were used to measure the effects of the behavioural factors on the quality of RHIS data. Standards of ethical conduct (e.g., informed consent, privacy, and participation) were upheld.

6. RESULTS

6.1: Socio-demographic characteristics of the structured questionnaire respondents

A total of 297 out of 317 questionnaires were returned (response rate 93.69%). Table 1 shows that most respondents (74.7%) are female and they are in the age groups 30-39 years (33.7%) and 40-49 years (27.9%). The majority had a Bachelor's degree (47.5%) and 21.2% had PD/ND and HND, respectively. They were mostly married (68.0%) and 30.6% were singles.

With regard to years of experience, 30.0% had 1-5 years and 19.2% had 6-11 years of experience. Most of the participants were Health Information Management officers and nurses (28.3% each), and were predominantly from primary health facilities (42.7%) and secondary health facilities (36.4%).

Table 1: Socio-Demographical Characteristics of the Respondents from the selected Facilities across the tiers of Healthcare Deliveries in Osun State

Variable	Frequency (n=297)	Percentage (%)
Sex		
Male	75	25.3
Female	222	74.7
Age Group		
18-29	82	27.6
30-39	100	33.7
40-49	83	27.9
50 and above	32	10.7
Level of Education		
PD/ND	63	21.2
HND	63	21.2
Bachelor's degree	141	47.5
Post Graduate degree (Master/PhD)	30	10.1
Marital Status		
Single	91	30.6
Married	202	68.0
Divorced/Separated/Widowed	4	1.3
Duration of Employment		
<1 year	24	8.1
1-5 years	89	30.0
6-11 years	57	19.2
12-17 years	54	18.2
18-24 years	29	9.8
25 & above	44	14.8

Profession		
HIM	84	28.3
Nurse	84	28.3
CHO	36	12.1
CHEW	22	7.4
MLS	32	10.8
Medical Officer	10	3.4
Pharmacist	14	4.7
No Response	15	5.0
Facility Category		
Primary	127	42.7
Secondary	108	36.4
Tertiary	62	20.9

6.2 The Current State of Data Quality in Osun State’s RHIS (Accuracy, Completeness, Timeliness and Reliability)

6.2.1 Data Accuracy in Osun State’s RHIS

As table 2 shows, the accuracy of data in Osun State's RHIS was satisfactory (mean = 10.68±4.3), but differed across facilities. A total of 31.0% always, 23.2% often compared register data with reports from the computer, and 24.6% rarely or never performed this exercise. Equally, 31.0% always and 23.6% often compared registers to reports in the past three months but 27.3% rarely or never compared data. Trend monitoring was better, with 46.8% always and 21.5% often comparing data, but 16.5% rarely or never compared data. Overall, weaknesses in routine data verification exist despite satisfactory performance.

Table 2: Data Accuracy in Osun State’s RHIS

Data Accuracy Check (F= 297)	Frequency	Percent
How often do you compare the information from the register with the computer-generated reports?		
Never	55	18.5
Rarely	18	6.1
Sometimes	63	21.2
Often	69	23.2
Always	92	31.0
How frequently have you compared the information from the register with the computer-generated reports over the last three months?		
Never	62	20.9
Rarely	19	6.4
Sometimes	54	18.2
Often	70	23.6
Always	92	31.0
How often does this facility compare data over time (monitoring over time)?		
Never		
Rarely	31	10.4
Sometimes	18	6.1
Often	45	15.2
Always	64	21.5
	139	46.8

Data Quality status (mean score ± SD) = 10.68 ± 4.3

Max obtainable score (is 3 items x 5max score) = 15. Average score is 7.5. Therefore, <7.5 = Poor status; >7.5 = Good status

6.2.2 Data Completeness in Osun State’s RHIS

The results in table 3 show that data completeness in Osun State’s RHIS was satisfactory (mean = 8.78 ± 2.0). Most respondents (60.3% always and 25.6% often) completed monthly report forms, with 6.7% rarely or never completing them. Likewise, 67.3% always and 19.9% often completed report in the past three months, while 6.7% rarely or never completed reports. Overall, while the performance was good, there is still a minority of facilities with incomplete reporting.

Table 3: Data Completeness in Osun State’s RHIS

Data Completeness (F=297)	Frequency	Percentage
How often do you fill the monthly report form completely?		
Never	12	4.0
Rarely	8	2.7
Sometimes	22	7.4
Often	76	25.6
Always	179	60.3
How frequently have you filled in the monthly report form completely in the last three months?		
Never	14	4.7
Rarely	6	2.0
Sometimes	18	6.1
Often	59	19.9
Always	200	67.3

Data Quality status (mean score \pm SD) = 8.78 \pm 2.0

Max obtainable score (is 2 items x 5max score) = 10. Average score is 5. Therefore, <5 = Poor status; >5 = Good status

6.2.3: Data Timeliness in Osun State’s RHIS

As illustrated in table 4, Data timeliness in the Osun State's RHIS was satisfactory (9.11 \pm 1.7). Most facilities reported they always (73.7%) and often (18.5%) submitted reports on time, while 3.4% rarely or never submitted on time. Likewise, in the past three months, 68.4% always and 22.9% often reported on time, while 5.1% rarely or never reported on time. In summary, although performance is good, a small percentage of facilities still report late.

Table 4: Data Timeliness in Osun State’s RHIS

Data Timeliness (F=297)	Frequency	Percentage
How often does this facility submit its report by the specified deadline?		
Never	7	2.4
Rarely	3	1.0
Sometimes	13	4.4
Often	55	18.5
Always	219	73.7
How frequently have you submitted the monthly report by the specified deadline in the last three months?		
Never	10	3.4
Rarely	5	1.7
Sometimes	11	3.7
Often	68	22.9
Always	203	68.4

Data Quality status (mean score \pm SD) = 9.11 \pm 1.7

Max obtainable score (is 2 items x 5max score) = 10. Average score is 5. Therefore, <5 = Poor status; >5 = Good status

6.2.4: Data Reliability in Osun State’s RHIS

As shown in table 5, Data reliability in Osun State’s RHIS was generally satisfactory (mean = 13.04 \pm 3.2). The majority of facilities always had copies of monthly reports (62.3%) and often did (23.9%) while 7.1% rarely or never did. Likewise, 63.6% always had data processing instruments (such as tally sheets) 21.5% often did, and 6.1% rarely or never did. Also, 61.6% always had data collection procedure manuals, 21.2% often had them, and 9.1% rarely or never had them. In summary, while data reliability was good, some facilities did not have critical documents and procedures.

Table 5: Data Reliability in Osun State’s RHIS

Data Consistency/Reliability (F=297)	Frequency	Percentage
How often does this facility keep copies of the RHIS monthly reports sent to the district office?		
Never		
Rarely	13	4.4
Sometimes	8	2.7
Often	20	6.7
Always	71	23.9
	185	62.3
How often do data processing procedures or a tally sheet exist in this facility?		
Never		
Rarely	13	4.4
Sometimes	5	1.7
Often	26	8.8
Always	64	21.5
	189	63.6
How often does a procedure manual for data collection (with definitions) exist in this facility?		
Never	20	6.7
Rarely	7	2.4
Sometimes	24	8.1
Often	63	21.2
Always	183	61.6

Data Quality status (mean score \pm SD) = 13.04 \pm 3.2

Max obtainable score (is 3 items x 5max score) = 15. Average score is 7.5. Therefore, <7.5 = Poor status; >7.5 = Good status

6.3: Observational Checklist Reports on the Current State of Data Quality in Osun State’s RHIS (Accuracy, Completeness, Timeliness and Reliability)

From Table 6, the data accuracy is still low and 21.7% of the facilities have accurate monthly reports and there is predominant disagreement between the source registers and summary report to services such as malaria (52.2% disagreed) and antenatal care (ANC) (39.1% disagreed). It's data accuracy is also very low with immunisation, measles, nutrition, diarrhoea, TB, HTN, URTI, and DM with missing data more than 65%. There is also low comparison of register to computer generated report with 39.1% of the facilities comparing. On the other hand, completeness is not very low with 78.3% of facilities having complete data reporting and good completeness for most of the items reported.

Concerning timeliness, most facilities (73.9) report in the first week of the following month and almost all district offices (95.7) have the date of receipt. However, almost half (45%) of the reports were reported on time in January and July of 2024, and many of the unreported data were available. The data consistency and reliability have better scores as most of the facilities are engaged in indicator calculation (69.6%), comparing with district or national targets (78.3%) and trend monitoring (95.7%). The official data-processing procedures are not so common (34.8%) but the procedures manuals (95.7) are everywhere and there is systematic monitoring, which speaks for a high reliability and harmonised data management in the facilities.

Table 6: Current State of RHIS Data Quality across Healthcare Facilities in Osun State (Observational Checklist Report)

Data Quality Dimension (n = 23)	Response Summary	Key Findings (%)
A. Accuracy		
Copies of RHIS monthly reports sent to district office	Majority of facilities send copies to district office	Yes (91.3)
Availability of last 12 months' reports	Reports largely inaccurate or incomplete	Accurate (21.7), Inaccurate (60.9)
Malaria data match (register vs summary)	Moderate accuracy	Matched (34.8), Mismatched (52.2)
ANC data match	Relatively better performance	Matched (43.5), Mismatched (39.1)
Immunization, Measles, Nutrition, Diarrhoea, TB, HTN, URTI, DM	Very poor accuracy; high missing data	Missing data >65 for all
Comparison of register with computer-generated report	Most do not perform data comparison	Yes (39.1), No (60.9)
Overall Accuracy Impression	Accuracy performance is weak, with substantial mismatches and missing data across service areas	<50 accurate reporting
B. Completeness		
Facility completeness level (FCL)	High overall completeness levels	(78.3)
Completeness of data items	Most data items were fully reported	Complete (78.3), Incomplete (21.7)
Overall Completeness Impression	Data completeness is satisfactory in most facilities	>75 completeness
C. Timeliness		
Deadline for submitting RHIS monthly report	Majority submit within the first week of following month	Timely (73.9)
District office records receipt date	Nearly all district offices record receipt dates	Yes (95.7)
Timeliness (January 2024)	Around half submitted on time	Timely (43.5), Untimely (8.7), Missing (47.8)
Timeliness (July 2024)	Similar pattern to January	Timely (39.1), Untimely (8.7), Missing (52.2)
Overall Timeliness Impression	Reasonably timely submission pattern, but significantly missing reporting data	≈45 timely reporting
D. Data Consistency/reliability		
Availability of data-processing procedure/tally sheet	Limited use of formal tally sheets	Yes (34.8), No (65.2)
Facility calculates catchment indicators	Majority perform indicator calculations	Yes (69.6)
Facility compares data with district/national targets	Widespread use of comparative analysis	Yes (78.3)
Facility compares service coverage types	Common practice across facilities	Yes (73.9)
Facility monitors data over time	Almost all facilities track data trends	Yes (95.7)
Availability of procedure manual for data collection	Nearly universal presence of manuals	Yes (95.7)
Overall Data Consistency/reliability Impression	Data analysis and monitoring practices are strong, though procedural documentation is inconsistent	>70 performance level

6.4 Health Workers' Behavioral Factors Affecting Osun State's RHIS Data Quality

With regard to behavioural factors influencing the quality of RHIS data in Osun State, the results shown in Table 7 suggest respondents are motivated, competent and have good attitudes. In terms of motivation, most respondents reported positive work practices: 53.2% strongly agreed and 38.0% agreed that they are punctual; 56.6% strongly agreed and 37.7% agreed that they document activities and keep records; and 56.2% strongly agreed and 35.4% agreed that they feel committed to improving the health status of the target population. Equally, 45.8% strongly agreed and 44.8% agreed that they set appropriate and achievable performance targets, and 80.1% agreed or strongly agreed that they feel guilty if they do not perform up to standard (indicator of a sense of responsibility).

In terms of competence, most respondents were confident in their data management. Some 71.4% agreed or strongly agreed that they use data from HMIS to manage their facilities and 78.1% agreed or strongly agreed that they display data to monitor targets. Many also demonstrated strong analytical skills, with most agreeing or strongly agreeing that they can collect data to determine the causes of problems (84.8%), develop criteria for selecting intervention (87.2%), develop outcomes for interventions (84.2%), check the accuracy of data (87.5%), calculate percentages or rates of data (86.2%), determine whether targets are achieved (87.5%) and use data to identify gaps and set targets (80.1%).

Attitude-wise, more than half of the respondents denied negative attitudes towards data tasks: 55.2% disagreed or strongly disagreed that collecting information makes them feel bored, and 52.9% disagreed or strongly disagreed that data collection is forced on them. On the other hand, positive perspectives were noted, with 87.2% agreeing or strongly agreeing that collecting information is meaningful and 89.2% agreeing or strongly agreeing that data are required to monitor facility performance.

The overall mean behavioral score of 72.09 (SD = 9.85), which is above the recommended >70, reflects a very good behavioral status of RHIS staff in Osun State. This reflects good staff motivation, capacity and attitude toward good quality RHIS data, however, regular engagement and capacity-building would help maintain this and enhance performance in all facilities.

Table 7: Health Workers' Behavioral Factors affecting Osun State's RHIS Data Quality

Motivation (f = 297)	Frequency	Percent
I am punctual		
Strongly disagree	3	1.0
Disagree	16	5.4
Neither disagree nor agree	7	2.4
Agree	113	38.0
Strongly agree	158	53.2
I document my activities and keep records		
Strongly disagree	5	1.7
Disagree	5	1.7
Neither disagree nor agree	7	2.4
Agree	112	37.7
Strongly agree	168	56.6
I feel committed to improving health status of the target population		
Strongly disagree	6	2.0
Disagree	12	4.0
Neither disagree nor agree	7	2.4
Agree	105	35.4
Strongly agree	167	56.2
I set appropriate and doable target of my performance		
Strongly disagree	5	1.7
Disagree	12	4.0
Neither disagree nor agree	11	3.7
Agree	133	44.8
Strongly agree	136	45.8
I feel guilty for not accomplishing the set target/performance		
Strongly disagree	7	2.4
Disagree	19	6.4
Neither disagree nor agree	33	11.1
Agree	145	48.8
Strongly agree	93	31.3
Competence		

I use HMIS data for day to day management activities of the facility		
Strongly disagree	20	6.7
Disagree	26	8.8
Neither disagree nor agree	39	13.1
Agree	115	38.7
Strongly agree	97	32.7
I display data for monitoring my set target		
Strongly disagree	15	5.1
Disagree	29	9.8
Neither disagree nor agree	21	7.1
Agree	136	45.8
Strongly agree	96	32.3
I can gather data to find the root cause(s) of a problem		
Strongly disagree	7	2.4
Disagree	13	4.4
Neither disagree nor agree	25	8.4
Agree	148	49.8
Strongly agree	104	35.0
I can develop appropriate criteria for selecting interventions for a given problem		
Strongly disagree	7	2.4
Disagree	12	4.0
Neither disagree nor agree	19	6.4
Agree	161	54.2
Strongly agree	98	33.0
I can develop appropriate outcomes for a particular intervention		
Strongly disagree	10	3.4
Disagree	17	5.7
Neither disagree nor agree	20	6.7
Agree	146	49.2
Strongly agree	104	35.0
I can check data accuracy		
Strongly disagree	5	1.7
Disagree	14	4.7
Neither disagree nor agree	18	6.1
Agree	148	49.8
Strongly agree	112	37.7
I can calculate percentages/rates correctly		
Strongly disagree	5	1.7
Disagree	13	4.4
Neither disagree nor agree	23	7.7
Agree	147	49.5
Strongly agree	109	36.7
I can evaluate whether the targets or outcomes have been achieved		
Strongly disagree	3	1.0
Disagree	8	2.7
Neither disagree nor agree	26	8.8
Agree	149	50.2
Strongly agree	111	37.3

I can use data for identifying gaps and setting targets		
Strongly disagree	14	4.7
Disagree	16	5.4
Neither disagree nor agree	29	9.8
Agree	136	45.8
Strongly agree	102	34.3
Attitude		
Collecting information makes me feel bored		
Strongly disagree	74	24.9
Disagree	90	30.3
Neither disagree nor agree	23	7.7
Agree	60	20.2
Strongly agree	50	16.8
Collecting information is meaningful for me		
Strongly disagree	11	3.7
Disagree	17	5.7
Neither disagree nor agree	10	3.4
Agree	125	42.1
Strongly agree	134	45.1
Collecting information gives me the feeling that data is needed for monitoring facility performance		
Strongly disagree	10	3.4
Disagree	10	3.4
Neither disagree nor agree	12	4.0
Agree	117	39.4
Strongly agree	148	49.8
Collecting information give me the feeling that it is forced on me		
Strongly disagree	73	24.6
Disagree	84	28.3
Neither disagree nor agree	28	9.4
Agree	68	22.9
Strongly agree	44	14.8

Behavior mean score \pm SD = 72.09 \pm 9.85

Max obtainable score (is 18 items x 5max score) = 90. Average score is 45. Therefore, <45 = Poor Status; >45 = Good Status. You can say 45-70 – Good, >70 – Very Good.

6.5: Comparison of Data Quality and Associated Factors Across Facility Levels

The summary of data quality and related behavioral factors across the three facility levels in table 8 shows that primary facilities had the best overall data quality (43.59 \pm 5.78) than the secondary (40.03 \pm 7.48) and tertiary facilities (40.31 \pm 7.73). Primary facilities also led in specific dimensions of data quality, including accuracy (11.31 \pm 3.72), completeness (9.13 \pm 1.44), timeliness (9.25 \pm 1.53), and consistency (13.91 \pm 1.67). This implies that primary facilities' staff pay more attention to data collection and reporting, possibly because of less workload or more direct supervision, or perhaps because they have more motivation to provide accurate and timely data.

Other factors relating to staff behavior also varied between facility levels, with tertiary facilities scoring slightly higher in motivation (22.03 \pm 3.09) and competence (32.81 \pm 4.87), while primary facilities had a slightly higher attitude (14.13 \pm 2.75) and overall behavior (73.34 \pm 10.27) scores compared to secondary (70.55 \pm 10.08) and tertiary (72.19 \pm 8.24) facilities. This suggests that although staff in higher-level facilities may have more formal training and competence, primary facilities have a more engaged, positive and motivated staff, which may contribute to better data quality. This highlights the importance of staff behavior in supporting the systems of the facility to ensure the performance of the RHIS in all the levels of facilities.

Table 8: Comparison of Data Quality and Associated Factors Across Facility Levels

Assessed Parameters	Primary (mean ± SD)	Secondary (mean ± SD)	Tertiary (mean ± SD)
Data accuracy	11.31 ± 3.72	9.778 ± 3.78	10.95 ± 3.64142
Data completeness	9.13 ± 1.44	8.68 ± 1.85	8.27 ± 2.04994
Data timeliness	9.25 ± 1.53	9.10 ± 1.48	8.85 ± 1.74475
Data consistency	13.91 ± 1.67	12.49 ± 3.31	12.23 ± 2.98312
Motivation	21.57 ± 3.40	21.17 ± 3.15	22.03 ± 3.08868
Competence	33.71 ± 6.78	31.63 ± 5.67	32.81 ± 4.87159
Attitude	14.13 ± 2.75	14.00 ± 3.30	13.58 ± 2.66457
Data Quality	43.59 ± 5.78	40.03 ± 7.48	40.31 ± 7.73451
Behavioral factors	73.34 ± 10.27	70.55 ± 10.08	72.19 ± 8.24191

6.6: Test of Hypothesis

To determine whether health workers' Behavioral Factors have any impact on RHIS data quality in Osun State, a regression analysis was conducted to test the null hypothesis that Behavioral Factors have no effect on data quality. The findings (Table 9) show that Behavioral Factors have a positive and significant impact on RHIS data quality ($B = 0.322$, $\beta = 0.298$, $t = 5.253$, $p < 0.001$). The relationship between Behavioral Factors and data quality is moderate ($R = 0.298$) and accounts for about 8.9% of the variance in the RHIS data quality ($R^2 = 0.089$, Adjusted $R^2 = 0.085$) and the model is significant ($F = 27.591$, $p < 0.05$). This suggests that health workers' motivation, skill and attitude have a positive effect on the accuracy, completeness and timeliness of RHIS data.

Ho: Health workers' Behavioral Factor has no significant effect of Data Quality in Osun State's RHIS

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
1 (Constant)	3.111	.273		11.399	.000
Behavioral Factors in RHIS Data Quality	.322	.061	.298	5.253	.000

a. Dependent Variable: Level of RHIS Data Quality

R=0.298, R²=0.089, Adjusted R²= 0.085, F=27.591, P < 0.05

7. DISCUSSION

The results show that behaviour factors affecting the quality of data in the Routine Health Information System (RHIS) in Osun State are generally positive, with high health worker motivation, commitment and positive attitudes towards routine data processes. Survey findings show the majority of respondents are thorough in documenting data, prompt in reporting and use RHIS data to monitor service delivery and inform decision-making. This suggests a staff that understands the value of complete, accurate and timely data in improving health system performance. This is consistent with the work of Salihu (2024), Chekol et al. (2023), Oladipupo (2023), and Ubalaeze (2024), who found staff motivation, accountability and technical skills to be important factors in the quality of RHIS data, and Ojo et al. (2025), who observed that health workers who view data as a management tool are more likely to produce accurate data. But the lack of feedback and reward mechanisms constrains long-term motivation, unlike Adeyemi (2022) and Morris (2024), who reported institutionalised feedback and reward mechanisms improve staff performance and consistency.

While awareness and attitudes were high, some behavioural barriers exist. Health workers found data capture, especially in paper-based systems, to be cumbersome and boring, leading to fatigue and low interest in data capture activities, in line with Anand (2024) and Ghalavand (2024). Supportive supervision and training had a positive impact on motivation and data management, consistent with Morris (2024), but there is a lack of formal systems for capacity-building. Furthermore, lack of formal incentive and accountability measures reduce performance reinforcement, echoing Adeyemi (2022) and Ubalaeze (2024) that intrinsic motivation is not enough for improvement in data quality. Differences in

knowledge and skill levels were also observed among health workers, with those who are more experienced and have previously been trained having a deeper understanding and making better use of RHIS data than their counterparts. This is consistent with the Human Capital Theory (Becker, 1993), and findings of Ezekiel (2021) and Ubalaeze (2024), but also echoes Ghalavand's (2024) concerns about performance loss in the absence of continuous retraining.

8. Application Of The Theoretical Framework To The Findings Of This Study

From a Human Capital and Andragogy perspective, the results show that in Osun State, RHIS data quality is largely determined by health workers' competence, motivation and experiential learning, but is limited by the absence of a continuous capacity development and learning system. The very good behavioural mean score (72.09 ± 9.85) and clear evidence of competence in data analysis, validation and use demonstrate high levels of human capital, consistent with the proposition that education and training boost productivity and performance in data management. But existing data errors, lack of full data validation, and differences in performance between facilities suggest that this human capital is not being continuously developed and fully leveraged. Andragogically, the mostly positive attitudes and high intrinsic motivation of health workers suggest willingness for self-directed and problem-based learning; however, the lack of access to regular, structured, practical and context-specific training opportunities limits experiential learning and skill development. Further, the large effect of behavioural factors on data quality ($\beta = 0.298$, $p < 0.001$) suggests that although motivation and competence are vital for data quality, they need to be continually nurtured through continuous professional development, feedback, and incentives to achieve consistent high performance. In summary, the results indicate that to enhance the quality of RHIS data, not only do initial investments in human capital need to be made, but also systems for institutionalising principles of adult learning (through frequent and practical training, mentoring and performance feedback and appraisal) are required to translate health workers' positive attitudes and capabilities into high-quality data across facilities.

9. CONCLUSION

The research suggests that although health workers in Osun State have high intrinsic motivation, have positive attitudes, and are competent in managing RHIS data, the lack of formal incentives, ongoing training and feedback pose a threat to the sustainability of positive behaviours. Data quality is largely reliant on individual effort rather than organisational support.

10. RECOMMENDATIONS

1. Osun State Ministry of Health in collaboration with Development Partners should adopt and implement a reward system based on performance that recognises facilities that have consistently improved the quality, completeness and timeliness of the data.
2. In-service education should be established to build capacity of staff on RHIS data management and use.
3. Supportive supervision and feedback should be encouraged to improve staff motivation and accountability.
4. Osun State health care training institutions such as the School of Health Information Management, School of Community Health Programmes, School of Nursing e.t.c. would need to organise competency refresh training using adult learning strategies.
5. The facilities should also develop a culture for data use by promoting the use of RHIS data for decision-making, planning and performance monitoring at all levels.

11. LIMITATION

The study had difficulty coordinating interviews and surveys with health workers due to their workload, impacting the collection of behavioural data. There was a risk of response bias, where health workers might have overstated their motivation, competency and positive attitudes. Furthermore, differences in staff experience and training among facilities might have affected the generalisability of the study's results on behavioural factors affecting data quality.

Other Information

1. Funding Statement: This research was self-funded by the authors, and no external financial support was received for the conduct of this study.

2. Ethical Statement

Ethics Approval and Participant Consent

Ethical approval for this study was obtained from the appropriate institutional review authority of Obafemi Awolowo University Teaching Hospitals Complex prior to data collection. Informed consent was obtained from all participating patients, ensuring voluntary participation. Strict measures were implemented to maintain confidentiality and anonymity of all respondents, and all procedures were conducted in accordance with established ethical standards for research involving human participants.

3. Conflict of Interest Statement

Disclosure of conflict of interest: The authors declare that there are no conflicts of interest or competing interests associated with this study.

4. Acknowledgement

The authors sincerely acknowledge the Research and Project Committee of the School of Health Information Management, Obafemi Awolowo University Teaching Hospitals Complex, for their constructive feedback and valuable contributions. Appreciation is also extended to the academic staff of the School, particularly Mr. Lamidi, Mr. Kolawole, Mr. Jeje, and Mr. Akilo, for their guidance and support. The authors further thank the 2024/2025 final year students and all participants across the selected Local Government Areas in Osun State for their time and cooperation in this study.

5. Author Contribution Statements

OSA conceived the study, initiated the study design, participated in data analysis and coordination, and drafted the manuscript. OAD contributed to the study design and coordination and critically reviewed the manuscript for intellectual content. EKC also contributed to the study design and coordination and reviewed the manuscript. AAK participated in the study design and coordination and was actively involved in data collection and data analysis. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work in line with the recommendations of the International Committee of Medical Journal Editors.

6. Clinical Trial Registration

Not applicable (NA). This study did not involve a clinical trial and therefore was not subject to registration in accordance with the recommendations of the International Committee of Medical Journal Editors.

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