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Socio-demographic Factors Influencing District Health Information System -2 (DHIS-2) Utilisation in Burundi: A Cross-sectional Study

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ABSTRACT

Background: The utilization of Electronic Health Information System is crucial in informing credible decision- making process, especially in developing countries such as Burundi. This study aimed to investigate the socio-demographic factors associated with Health Workers' utilization of the District Health Information Software 2 (DHIS-2) platform in Burundi.

Methods: A cross-sectional study was conducted among health workers involved in health data collecting and validating in health facilities and health district offices in Burundi.

Results: Several socio-demographic factors were significantly associated with DHIS-2 platform utilisation in the Burundi health system. Marital status (P=.011), education level (P=.007), gender (P=.005) and travel time from home to workplace (P=.001) were associated with indicators related to DHIS-2 effects on data use. Travel time from home to workplace was also associated with satisfaction with administrative support for DHIS-2 implementation (P = .001). Further more, travel time from home to workplace (P =.030), profession role (P =.034), geographical area of work (P<.001), and education level (P =.041) were associated with several DHIS-2 design related indicators.

Conclusion: Social-demographic factors are important considerations in the implementation and utilisation of DHIS-2 within the Burundi health system. Efforts to promote gender, educational, and professional equity, together with interventions that improve workplace accessibility and support for health workers, may contribute to more effective and sustainable DHIS-2 implementation.

BACKGROUND

There is a global consensus that the Health Information System (HIS) plays a pivotal role in advancing Universal Health Coverage (UHC).[1,2] According to Sunny *et al.*, the HIS requires resources and regular monitoring of health data from the points of care to national level in order to inform decision making process for sustainable health outcomes.[3]

In this regard, the HIS is transitioning from paper-based to electronic-based systems, with a view to complying with the rapid evolution of health technology for UHC, especially in developing countries.[4] From a global public health perspective, the electronic-based HIS (eHIS) has been proven to improve data quality while aligning fragmented reporting demands from bilateral and multilateral funding agencies, and policy makers.[5] Evidence suggests that the utilization of eHIS is crucial in informing credible decision-making for UHC.[6]

Currently, many developing countries are implementing DHIS-2 as an electronic-based data management system to achieve UHC.[7] DHIS-2 is an online health platform used to collect, report, analyze, and validate health data and inform health professionals at all levels of the health system.[8] Worryingly, strong emphasis has been placed at national, regional, and provincial levels, while technical health workers at district health offices and health facilities, who are expected to significantly contribute to the use and operationalization of the DHIS-2 platform are left behind.[9]

In Burundi, the DHIS-2 was introduced into the health system in 2014 to strengthen health data management and support the implementation of the National Health Policy and National Plan for Health Development.[10] Despite the financial and technical investments made by the Ministry of Health and development partners to operationalize the DHIS-2 at local levels, several challenges persist. These include the continued use of paper-based system for data collection district health offices and health facilities, resulting in reporting errors, and poor internet connectivity at district health offices and at health facilities. Moreover, brain drain and shortage of qualified personnel continue to hinder DHIS-2 implementation, necessitating regularly training of health workers, especially the newly appointed DHIS-2 managers.

These challenges may compromise data quality and limit evidence-based decision making for UHC.[11] To address these issues, the Ministry of Health, with support from international partners equipped public health facilities with Information and Communication Technology (ICT) infrastructure. At each health facility, a DHIS-2 focal person with basic ICT competencies was selected and trained in DHIS-2 data entry, reporting and analysis. Following data entry into the DHIS-2 platform, monthly reports are submitted and subsequently validated at district and provincial levels. The National Department of Health Information system provides DHIS-2 implementation guidelines and support. It organises regularly training of health workers especially new appointed DHIS-2 managers at health facilities.

Extensive research has shown that involvement of technical health workers in the utilisation and operationalizing e-health systems for health service management is an indispensable precondition for achieving expected health outcomes.[12,13] While current literature highlights the role of users' sociodemographic characteristics in the implementation of electronic health projects, little is known about the influence of health workers' socio-demographic factors on DHIS-2 utilisation for efficacy data management [14,15,16] A study in Ethiopia applying a descriptive analysis showed that male health workers demonstrated positive perception of electronic health information systems more frequently than female health workers (48.3% versus 42.7%).[13] Another qualitative study reported that the involvement of young health workers and those with higher educational attainment contributed to the successful utilisation of electronic information system.[17] Previous studies have also emphasised the role of users' sociodemographic characteristics in promoting equity and achieving sustainable e-health outcomes.[18]

However, evidence on the influence of health worker's sociodemographic characteristics on DHIS-2 utilisation remains limited in Burundi. Therefore, this study aimed to investigate the socio-demographic factors associated with the utilisation of the District Health Information System 2 platform among health workers in Burundi.

MATERIALS AND METHODS

Study Setting

This study was conducted in Burundi, a low-income country located in Sub-Sahara Africa. DHIS-2 is an essential resource that Burundi is adopting to support the digitalisation of its health systems and accelerate the achievement of UHC. To this end, Burundi has invested in training key health system staff on DHIS-2 utilization and providing the necessary technologies to collect and analyse health data, aimed at promoting evidence-informed decision making process, from community to national levels.[4] This study sought to test the null hypothesis that there is no relationship between socio-demographic factors and the utilisation of the DHIS-2 platform in Burundi.

Study Design

We conducted a cross-sectional study among health workers involved in health data collection and validation in health facilities between July and October 2023. Given that the study was conducted nearly a decade after the introduction of DHIS-2 platform in Burundi,[4] it was considered vital to examine the socio-demographic factors that can influence the utilization of such a platform. Participants were DHIS-2 managers in charge of data entry, validation and reporting at public health facilities.

Study Population, Inclusion and Exclusion Criteria

The study population comprised health workers responsible for health data collection and validation at health centres, hospitals and Health district offices across Burundi's 18 provinces. It should be noted that Burundi was administratively reorganised into five provinces after completion of this study. These administrative changes occurred after data collection and therefore had no affect on the conduct or findings of the study. At each health facility, the health worker responsible for managing DHIS-2 was eligible to participate. Health workers who are not officially designated as DHIS-2 managers at the time of study were excluded.

Sampling Methods

We used a multi-stage sampling method to identify and select.

Stage 1: Selection of Provinces: Three of Burundi's 18 provinces were purposively selected based on geographical representation. Kirundo and Cankunzo provinces were selected because they are the most geographically remote areas of Burundi, and experience limited internet connectivity, which may affect the operationalize of DHIS-2. Sharing borders with Rwanda and Tanzania in Northern and Eastern of Burundi, these provinces were considered representative of remotest settings. Muramvya province was selected because of its central location between the country's political and economic centres and was considered representative of urban, peri-urban and central regions of Burundi.

Stage 2: Selection of Health District Offices: The three selected provinces comprised a total of eight health district offices (two in Kirundo, four in Cankuzo, and two in Muramvya). All eight district offices were included in the study through census sampling.

Stage 3: Selection of Health Facilities: The eight health districts contained 137 health facilities (public and private), of which 76 were randomly selected. We excluded 44 private health facilities from the sample because they frequently lacked publicly accessible data,[19] which could have affected the robustness of the findings. Moreover, despite Ministry of public health requirements regarding DHIS-2 implementation, private health facilities are not fully integrated in the Burundi health information system.

The sample size of 76 facilities was determined from a population size of 93 eligible public health facilities using the Raosoft sample size calculator with a 95% confidence level.[20] The Raosoft web-based sample size calculator is a widely used tool for estimating representative survey samples.[20] This estimation is based on the following formula:

$$X = Z\left(\frac{c}{100}\right)^2 r(100-r)$$

$$n=\frac{NX}{((N-1)E^2+X)}$$

$$E = Sqrt[\frac{(N-n)X}{n(N-1)}]$$

Where N is the population size, r the fraction of response which is equal to 50% for no response setting, and Z(c/100) is the critical value for the confidence level of 95%. A sampling frame of the 93 eligible health facilities was established, and a Random Number Table was used to systematically pick the 76 health facilities.

Stage 4: Selection of Participants: In each of the 76 selected health facilities, one participant was selected. The participant was the designated DHIS-2 manager available during the data collecting period. Furthermore, one DHIS-2 manager from each of the eight health district offices was recruited because if their direct involvement in data validation activities. At total of 84 health workers participated in the study.

Data Collection

A survey method was employed to collect data because it was considered appropriate for the study design.[19] Before data collection, a pilot survey was conducted among 20 health data managers conveniently selected from health facilities outside the study sites. The questionnaire was sent to the data manager of each pilot health facility to assess its reliability and validity. Cronbach's alpha test was used to validate our questionnaire. The test revealed that the questionnaire has acceptable reliability with $\alpha = 0.809$ (reliability test). The questionnaire was also reviewed and validated by DHIS-2 experts from the National Health Information System department in Burundi. Data were collected at a single point in time, with no follow-up. Face-to-face interviews were conducted by two trained research assistants using a structured questionnaire to ensure completeness of responses. We used ODK-Kobotool software to digitalize the questionnaire before field implementation. Interviews were conducted in French, the official working language used in Burundi. Responses were subsequently translated t into English for analysis and reporting.

Measurement Variables

The dependent variables consisted four groups of DHIS-2 management indicators.[21]

The first group comprised six variables related to administrative support, namely; internet availability, allocation of financial resources for DHIS-2, health facility engagement with DHIS-2 functionality, encouragement of DHIS-2 utilisation, availability of technical support, and satisfaction with DHIS-2 training.

The second group comprised eleven variables related to DHIS-2 system design, namely; required security elements, data transfer security, protection against data modification, assurance of personal privacy, ease of learning, interoperability, -ease of use, compatibility with patient records and registers, compatibility with existing health facility management tools, compatibility with the national health information system, and alignment with national health policy objectives.

The third group comprised five variables related to the effect of DHIS-2 on data utilization, namely; Operational efficiency and effectiveness, improvement in information quality, enhancement of information management, improved accessibility of health information, and minimisation of information error.

The fourth group comprised four variables related to services provision, namely; improvement in service quality, increase in service volume, reduction in operational costs, and enhancement of service delivery efficiency.

Independent variables consisted of socio-demographic characteristics of health workers. These included demographic characteristics (gender, marital status, age, educational level, and geographical area of work) and professional characteristics (years of DHI-2 utilisation, place of work, travel time to work, and professional role). These variables were selected based on the study of Jamebozorgi et al.[22]

Data Analysis

Following data cleaning, the dataset was imported into the latest version of SPSS version 25 for analysis. Chi-Square tests were used to measure the association between the four groups DHIS-2 utilization variables and the socio-demographic factors described above. Statistical significance was determined using an alpha level of 0.05. The results of the Chi-Square tests were used to determine whether to reject or keep the null hypothesis.

Ethics Considerations

After explaining the goal of the study, every participant was asked to give verbal consent before participation. Participants who declined consent did not proceed with the interview. Confidentiality was maintained throughout the study process. Participant were informed of their right to withdraw from the study at any time without consequence. All identifiers were coded to ensure anonymity, and access to the dataset was restricted to the authors. Ethical clearance for the study was granted by the General Directorate of Health Services Provision and Accreditation (Réf No.: 635/52/DGOSA/2023). Since this study involved health professionals and did not collect sensitive personal information, it was considered to pose minimal risk to participants.

RESULTS

Socio-demographic factors

Table 1 presents the categories and frequencies of the sociodemographic factors included in the study.

A total of 84 participants from 76 health facilities and 8 health district offices responded to the questionnaire. Most participants were male (82.1%), married (82.1%), young adults (84.5%), had fewer years of DHIS-2 experience (75%), served as data managers (77.4%), worked in health centres (79.8%), lived close to their workplace (67.8%), and with a lower level of education (66.7%).

TABLE 1: Socio-demographic Factors

Variables/ Categories	Numbers	Frequency (%)
Gender		
Male	69	82.1
Female	15	17.9
Marital status		
Married	69	82.1
Single	15	17.9
Age in years		
<=40	71	84.5
>40	13	15.4
Years with DHIS-2 utilization		
<=5	63	75
>5	21	25
Place of work		
Health center	67	79.8
Hospital	9	10.7
District office	8	9.5
Time travel to service in hour		
≤1	57	67.8
>1	27	32.1
Province		
Cankuzo	25	29.7
Kirundo	30	35.7
Muramvya	29	34.5
Educational level		
High school diploma	56	66.7
University level	28	33.3
Health worker function		
Heath facility manager	19	22.6
Data manager	65	77.4

Chi-square Test Results for Independent and Dependent Variables

Only statistically significant associations are reported in order to highlight the socio-demographic factors associated with DHIS-2 utilisation. The observed associations led to the null hypothesis that there is no relationship between socio-demographic factors and utilisation of the DHIS-2 platform.

Socio-Demographic Factors and DHIS-2 Effect on Data Utilization

Table 2 shows that marital status, travel time from home to workplace, education level and gender were significantly associated indicators related to DHIS-2 effects on data utilisation. Married participants, males, participants with a secondary level of education, and those living closer to their workplace generally reported more favourable perception of DHIS-2 data utilization (Figure 1).

Marital status and travel time to the workplace were significantly associated with both improvement in information quality (χ^2= 6.437, *P*= .011 and χ^2= 11.224, *P*= .001) and improvement in information management (χ^2= 5.053, *P*=.025 and χ^2 = 6.568, *P*=.010 respectively). For quality information and information management, married participants represented 97.1% and 98.6% respectively, compared with 80.0% and 86.7% among single participants. Participants whose travel time to work was one hour or less represented 100% of those reporting improvement in information quality and information management, whereas those travelling more than one hour represented 81.5% and 88.9%, respectively.

Gender was significantly associated with enhanced accessibility of health information (χ^2= 7.995, *P*=.005). The proportion reporting enhanced accessibility was 92.8% among males compared with 66.7% among females.

Education level was significantly associated with information error minimisation (χ^2 = 7.243, *P*=.007). Participants with a secondary level of education represented 91.1%, compared with 67.9% among those with a university level education.

TABLE 2: Chi-square Test of Socio-demographic Factors and DHIS-2 Effect on Data Utilization

Factors	χ2	Cramer's V	*P*
Improvement of quality information			
Marital status			
Single	6.437	.277	.011
Married			
Time travel to service in hour			
≤1	11.224	.366	.001
>1			
Information management improvement			
Marital status			
Single	5.053	.245	.025
Married			
Time travel to service in hour			
<=1	6.568	.280	.010
>1			
Information error minimization			
Educational level			
Secondary	7.243	.294	.007
University			
Enhancement of health information accessibility			
Gender			
Female	7.995	.309	.005
Male			

Socio-demographic Factors and DHIS-2 Administrative Support

Table 3 shows a significant association between travel time from home to workplace and satisfaction with administrative support for DHIS-2 implementation. Participants living closer to their workplace generally reported higher levels of satisfaction with administrative support (Figure 2).

Travel time to the workplace was significantly associated with satisfaction with DHIS-2 training (χ2 = 16.374, *P*= .001). Participants whose travel time was one hour or less represented 57.9%, whereas those travelling more than one hour represented 11.1%.

Socio-demographic Factors and DHIS-2 Design

Table 4 indicates that travel time from home to workplace, profession role, geographical area of work, and education level were significantly associated with DHIS-2 design related indicators. Participants living closer to their

workplace, health facility managers, health workers from Kirundo province, and those with a secondary level of education generally reported more favourable perceptions of DHIS-2 design characteristics (Figure 3).

FIGURE 1: Socio-demographic Factors and DHIS-2 Effect on Data Utilization

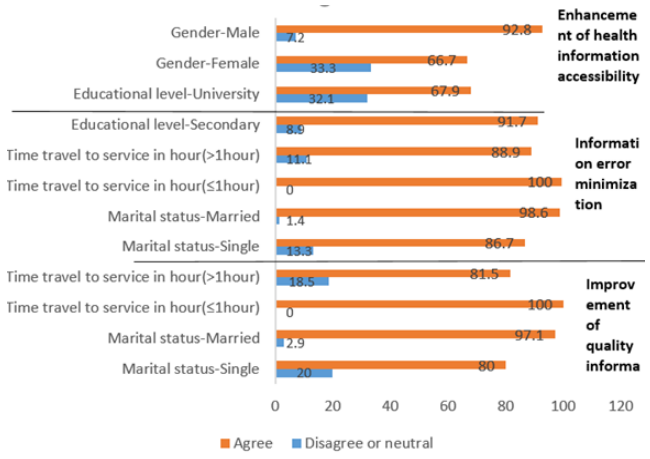
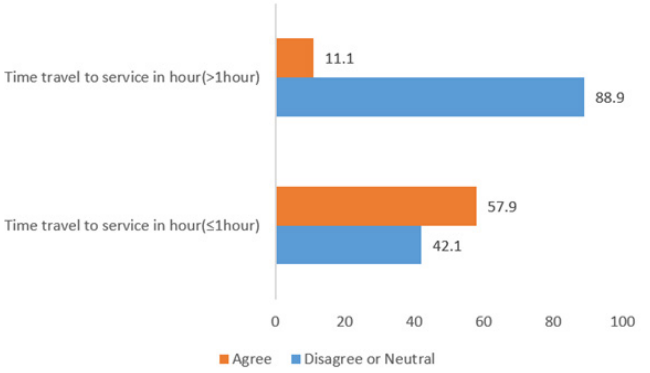


FIGURE 2: Socio-Demographic Factors and DHIS-2 Effect and Administrative Support



Travel time to the workplace was significantly associated with: (i) Compatibility of DHIS-2 with health facility management tools ($\chi2 = 4.726$, P=.030), (ii) Compatibility with the national health information system design ($\chi2 = 8.023$, P=.005), (iii) Compatibility with primary health information tools such as patient records and registers ($\chi2 = 9.339.023$, P=.002), (iv) Compatibility with national health policy objectives ($\chi2= 9.699$, P=.002), (v) Required-security elements ($\chi2= 14.205$, P=.001), (vi) Data transfer security ($\chi2= 6.288$, P=.012), (vii) Protection against data modification ($\chi2= 6.497$, P=.011), and (viii) Assurance of personal privacy ($\chi2 = 7.650$, P=.006). Among participants with a travel time of one hour or less, the corresponding proportions were 84.2%, 84.2%, 86.0%, 93.0%, 93.0%, 84.2%, 89.5% , and 93.0%, respectively.

TABLE 3: Chi-square Test Analysis of Socio-Demographic Factors and DHIS-2 Administrative Support

Factors	χ2	Cramer's V	P
Satisfaction with DHIS-2 training			
Time travel to service in hour			
≤1	16.374	.442	.000
>1			

TABLE 4: Chi-Square Test Analysis of Socio-demographic Factors and DHIS-2 Design

Factors	χ2	Cramer's V	P
Compatibility with current health facility management tools			
Time travel to service			
<=1hour	4.726	.237	.030
>1hour			
National health information system design			
Time travel to service			
<=1hour	8.023	.309	.005
>1hour			
In line with primary health information tools			
Time travel to service			
<=1hour	9.339	.333	.002
>1hour			
Compatibility with the national health policy objective			
Profession			
Data manager	4.496	.231	.034
Health facility manager			
Time travel to service			
<=1hour	9.699	.340	.002
>1hour			
Ease to use			
Province			
Cankuzo	10.287	.350	.006
Kirundo			
Muramvya			
Required security elements			
Time travel to service			
<=1hour	14.205	.411	.000
>1hour			
Data transfer security			
Time travel to service			
<=1hour	6.288	.0274	.012
>1hour			
Data protection against modification			
Time travel to service			
<=1hour	6.497	.278	.011
>1hour			
Assurance of personal privacy			
Time travel to service			
<=1hour	7.650	.302	.006
>1hour			

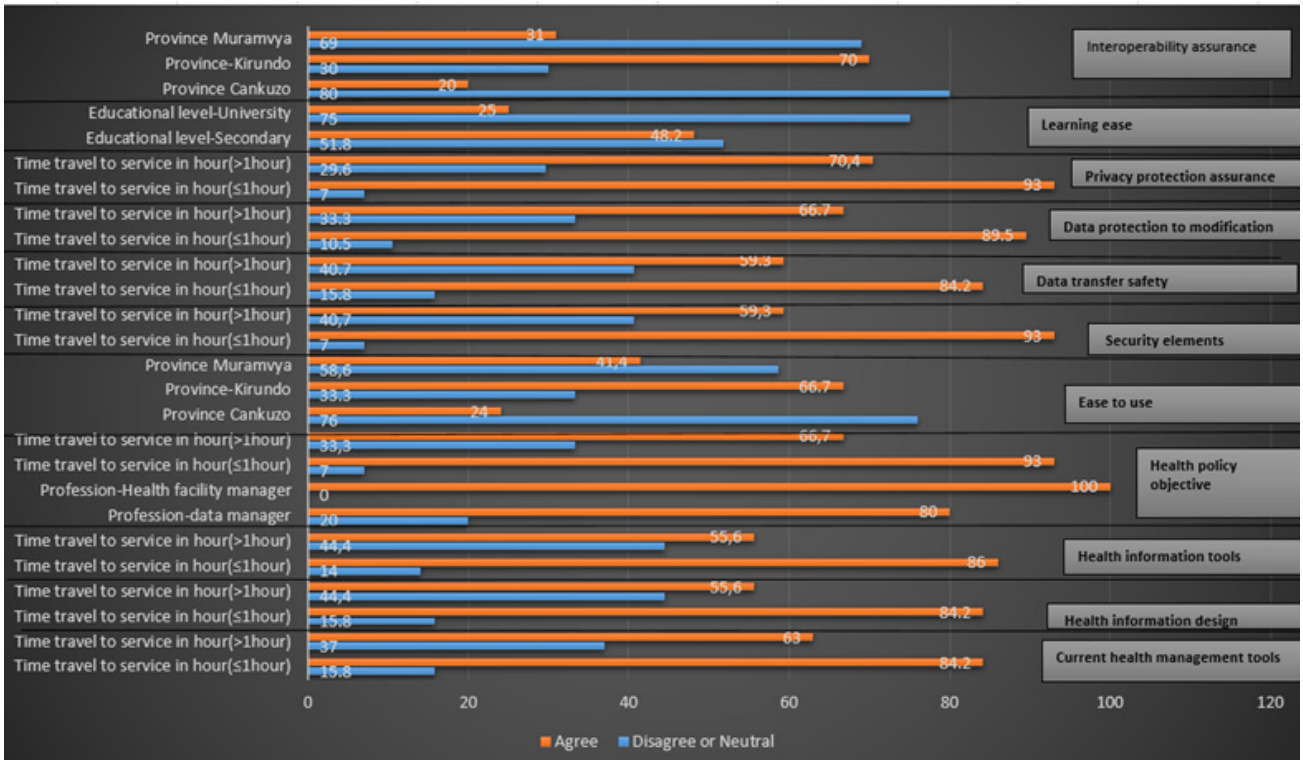
Continue

TABLE 4: Continued

Factors	χ2	Cramer's V	*P*
	Learning ease		
Education level Secondary University level	4.175	.223	.041
	Interoperability assurance		
Province Cankuzo Kirundo Muramvya	16.086	.438	.000

Proportional role was significantly associated with compatibility of DHIS-2 with national health policy objectives (χ2=4.496, *P*=.034). Positive responses were reported by 100% of health facility managers compared with 80% of data managers. Geographical area of work (province) was significantly associated with ease of use and interoperability of DHIS-2 (χ2= 10.287, *P*= .006 and χ2 = 16.086, *P*= .0001, respectively). Kirundo province accounted for 66.7% and 70% of positive responses respectively; Cankuzo province accounted for 24.0% and 20.0%, and Muramvya province accounted for 41.4 % and 31.0%. Educational level was significantly associated with ease of learning DHIS-2 (χ2 = 4.175, *P*=.041). Participants with a secondary level of education represented 48.2% of those reporting ease of learning.

FIGURE 3: Socio-demographic Factors and DHIS-2 Design



DISCUSSION

To our knowledge, this is the first study to explore socio-demographic factors associated with the utilisation of DHIS-2 platform in Burundi. The study was conducted in three of the country's 18 provinces. Among the 84 participants, most were male (82.1%), and 79.8% worked in health centres. Similarly, a study conducted in Sierra Leone reported that 77% of DHIS-2 users were male.[21] In contrast, a study conducted in Brazil found that females were the most frequent users of electronic health systems, with no significant association with socio-economic factors. [23]

Male gender was significantly associated with enhanced access to health information through DHIS-2 (χ2 = 7.995, *P*=.005). This finding is consistent with a study conducted in Ethiopia, which reported a significant association between male gender and knowledge of electronic health records.[24]

In contrast, a study conducted in Nigeria found that female gender was significantly associated with electronic health information utilisation.[25] One possible explanation is that DHIS-2 requires regular use of computers and internet-based technologies, and previous studies have reported higher levels of computer and internet use among males than females in some settings.[26] These findings suggest the importance of strengthening digital health training opportunities for women to promote gender equity and sustainable DHIS-2 implementation in Burundi.

Marital status was significantly associated with both improvement of information quality ($\chi2 = 6.437$, $P= .011$) and improvement in health information management ($\chi2= 5.053$, $P= .025$). These findings are consistent with studies conducted in the United States of America that reported significant associations between marital status and the use of digital health interventions.[27] Several explanations may account for this observation. Married health workers may experience greater residential stability and social support, which could positively influence work performance and engagement. In addition, family responsibilities may increase commitment to employment-related activities. However, these explanations remain speculative and warrant further investigation.

Shorter travel time from home to the workplace was significantly associated with improvement in information quality ($\chi2= 11.224$, $P= .001$), health information management ($\chi2= 6.568$, $P= .010$), satisfaction with DHIS-2 training ($\chi2= 16.374$, $P= .001$), compatibility with health facility management tools ($\chi2 = 4.726$, $P= .030$), national health information system design ($\chi2= 8.023$, $P= .005$), compatibility with primary health information tools such as patient records and registers ($\chi2= 9.339$, $P= .002$), compatibility with national health policy objectives ($\chi2= 9.699$, $P= .002$), required security elements ($\chi2= 14.205$, $P= .001$), data transfer security ($\chi2= 6.288$, $P= .012$), protection against data modification ($\chi2= 6.497$, $P= .011$), and assurance of personal privacy ($\chi2= 7.650$, $P= .006$). These findings are consistent with evidence from West Asia indicating that shorter commuting times are associated with improved health worker performance and job satisfaction.[28] One possible explanation is that health workers who spend less time travelling may have more time and energy available to engage with DHIS-2 related activities. A study conducted among physicians in the United States found that electronic health record use frequently extends beyond normal working hours.[29] Similar patterns may occur with DHIS-2 utilisation. Therefore, interventions that reduce commuting time burdens, such as provide staff accommodation, transport support or rural retention incentives, may contribute to improved DHIS-2 utilisation.

Unexpectedly, lower educational attainment was significantly associated with information error minimization ($\chi2= 7.243$, $P= .007$) and ease of learning DHIS-2 ($\chi2 = 4.175$, $P= .041$). These findings differ from studies conducted in developed countries, which generally report higher levels of e-health utilisation among individuals with higher educational attainment.[14,32,33] However, they are partially consistent with studies conducted in Turkey and Albania that reported association between lower educational levels and job satisfaction.[30,31] Several contextual factors may explain this finding. First, health workers with secondary level of education who are appointed to DHIS-2 related responsibilities may perceive these rules as opportunities for professional growth, resulting in strong engagement. Second, because DHIS-2 is not systematically integrated into formal educational curricula, implementation largely depends on in-house training. Consequently, motivation and participation in DHIS-2 training may be more influential than formal educational attainment. Third, differences in job expectations and career aspirations between educational groups may influence engagement with DHIS-2 activities. Nevertheless, these explanations should be interpreted cautiously and explored through further research. Strengthening DHIS-2 content within formal health training programs and improving staff motivation may contribute to implementation outcomes. Previous studies have suggested that higher educational attainment may be associated with increased expectations for professional advancement and recognition among health workers.[32] When these expectations are not satisfied, it can lead to work demotivation.[34] In the Burundi context, where DHIS-2 related responsibilities may be similar across different levels of education, differences in expectations rather than technical competence may partly explain the observed findings. This could also explain the increased level of significance of information error minimization reported in health workers with lower education levels compared to those with higher education levels. However, this interpretation was not directly assessed in the present study and warrants further investigation. Staff motivation and integration of formal curriculum strategies, particularly in University education programs on DHIS-2 implementation strategies, would improve DHIS-2 outcomes.

Health worker function was significantly associated with DHIS-2 compatibility with national health policy objectives ($\chi2 =4.496$, $P= .034$). This finding is in line with previous findings from a study conducted in Asia that reported significant associations between health workers occupation and electronic health utilization.[35] One possible explanation is that health facility managers than data managers are more likely to participate in Ministry of Health training activities and policy-oriented programs, thereby- gaining a better understanding national health priorities.. Expanding policy-oriented training opportunities to all categories of health workers involved in DHIS-2 implementation may promote a shared understanding of national health objectives and strengthen DHIS-2 utilisation.

Another interesting finding was that geographical area of work (province) was significantly associated with DHIS-2 ease of use and interoperability ($\chi2 = 10.287$, $P= .006$ and $\chi2 = 16.086$, $P= .001$), with the highest rates observed in the remotest area of Kirundo province Kirundo Province was one of the provinces that piloted DHIS-2 in the Burundi. In contrast, a study conducted in South Africa revealed a high difference between information technology utilization between urban and rural area region.[36] The higher significance reported in this province can thus be explained by its extended experience with DHIS-2 utilization in comparison to other provinces studied. To promote equitable and sustainable implementation, additional support may be required in

regions that did not participate in the initial DHIS-2 pilot phase.

Limitations

This study is among the first to assess sociodemographic factors influencing DHIS-2 utilization in Burundi. Nevertheless, several limitations should be considered when interpreting the findings.

First, the cross-sectional design limits causal inferences and does not allow determination of temporal relationships between socio-demographic factors and DHIS-2 utilisation. Longitudinal studies are needed to assess changes in adoption over time.

Second, while we selected three provinces to ensure geographical diversity, the findings may not be fully generalisable to all regions of Burundi, especially those with different socio-economic conditions or digital infrastructure. Additionally, the exclusion of private health facilities limits the applicability of the findings to public healthcare settings.

Third, selection bias may have occurred if health workers with greater familiarity or interest in DHIS-2 were more likely to participate. Furthermore, the study relied on self-reported data, which may be affected by social desirability and response biases. Future studies should incorporate objective measures, such as DHIS-2 usage logs to validate self-reported responses.

Fourth, the quantitative design did not permit an deeper exploration of the factors underlying DHIS-2 utilisation. Future studies employing qualitative or mixed- method approaches could provide richer insights into facilitators, barriers, and user experiences.

Finally, infrastructure related factors such as access to computers, electricity reliability, and internet connectivity were not examined in detail, despite their potential influence on DHIS-2 utilisation. Future research should explore these factors alongside organisational, cultural and policy-related determinants of digital health adoption.

CONCLUSION

This study demonstrated that several socio-demographic factors are significantly associated with DHIS-2 utilisation withing the Burundi health system. The finding highlights the importance of considering sociodemographic factors when designing strategies to promote equitable and sustainable DHIS-2 implementation.

The results suggest the need for targeted digital health training for women, integration of DHIS-2 competences into formal education programs, additional support for regions with limited DHIS-2 implementation experience, improved staff motivation and interventions that reduce barriers related to workplace accessibility.

Future large-scale studies using mixed method designs and involving both health workers and health system managers are needed to generate a more comprehensive understanding of factors influencing DHIS-2 utilisation. Overall, sociodemographic factors should be considered in efforts to strengthen DHIS-2 implementation and support evidence-informed decision making for the achievement of Universal Health Coverage in fragile health systems.

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