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ORIGINAL RESEARCH

Facilitators and barriers to the implementation of digital tools and harmonization of community health worker reporting tools and registers: The Zimbabwean experience

Addmore Chadambuka[1*], Gerald Shambira[1], Tsitsi P Juru[1], Simukai T Zizhou[2], Gibson Mandozana[1], Meggie Gabida[3], Norest Hama[3], Hamady Ba[3], ASM Shahabuddin[4], Remy Mwamba[4], Mufuta Tshimanga[1]

[1]Department of Global Public Health and Family Medicine, University of Zimbabwe, Harare, Zimbabwe
[2]Ministry of Health and Child Care, Harare, Zimbabwe
[3]UNICEF, Harare, Zimbabwe
[4]Maternal Newborn Child and Adolescent Health Programme, UNICEF, New York, USA

***Corresponding author:** achadambuka1@yahoo.co.uk

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ABSTRACT

Introduction: Zimbabwe's Community Health Information System (CHIS) has transitioned from a centralized to a decentralized model using harmonized paper-based and digital tools. These aim to reduce workload, improve data quality, support timely reporting, and enhance data use. Despite this shift, little has been documented on the adoption of these tools. This study explored the use of digital and harmonized paper registers by village health workers (VHWs), identifying key barriers and facilitators across four provinces.

Methods: A mixed-methods study was conducted in two regions. In the south (Midlands and Matabeleland South), we assessed harmonized paper tools; in the north (Manicaland and Mashonaland West), digital tools. Provinces were selected based on their implementation stage. We surveyed 200 VHWs to collect data on tool usage, training, device access, and reporting challenges. Key informants provided additional insights on infrastructure, equipment, funding, training, stakeholder coordination, and the overall progress of CHIS digitalization and harmonization.

Results: Most VHWs (83%) were female, with a median of 10 years of service. The majority (72.5%) used paper-based tools, while others used both paper and digital systems. Districts piloting digital tools reported mixed use. The availability of revised registers varied by district. Fewer than half of VHWs used digital tools consistently. Key barriers included long distances to health facilities, lack of training, unavailability of tools and poor network coverage. Reporting timeliness and completeness were highest in Manicaland and lowest in Midlands. Key informants highlighted resource gaps affecting data collection and reporting.

Conclusion: The implementation of harmonized and digital reporting tools faced challenges due to poor coordination and lack of essential resources. Delays between training, register distribution, form delivery, and software installation hindered CHIS rollout. However, strong enablers included VHWs' willingness to adopt both systems, consistent supervision from facility staff, and generally good network connectivity in surveyed areas.

Keywords: Village health workers, community, information system, harmonized, digital.

Abstract in Español at the end of the article

INTRODUCTION

Strengthening the delivery of essential health services at the community level is crucial in order to achieve the ambitious targets set out by the Sustainable Development Goals (SDGs). Community health plays a vital role in reaching populations that are often left furthest behind with limited access to formal health systems. Improving and sustaining community health is paramount to strengthening primary health care (PHC) and is integral to overall health systems strengthening efforts [1]. Likewise, investing in health information systems, including community health, is critical for contributing to the national effort to monitor progress toward national outcomes and the SDG targets related to health, gender equality, and universal health coverage by 2030, particularly in underserved communities and resource-limited settings. A Community Health Information System (CHIS) is a systematic approach to collecting, managing, analysing, and disseminating health-related data and information within a specific community or population [2]. It is designed to support public health efforts at the community level by providing timely and accurate information for decision-making, planning, monitoring, and evaluating health programs and interventions.

Health Information Systems are one of the six health systems building blocks, and CHIS is a type of health information system that links community stakeholders and healthcare providers in each community [2]. It is designed for community health workers to manage and monitor their work in educating households and delivering an integrated package of promotive, preventive, and basic curative health services to families. This system involves the collection, management, analysis, and dissemination of data on health and related services provided to communities outside of facilities. The information gathered by CHIS can be utilized to monitor the health care continuum, identify populations who require special attention, guide programmes and policy decisions, and address issues related to accessibility, equity, and accountability [3].

Likewise, a well-functioning CHIS plays a crucial role in improving the health outcomes of a community by enabling data-driven decision-making, fostering collaboration among healthcare providers, and empowering individuals to take control of their health.

Historically, Health Management Information Systems (HMIS) have been fragmented, owing to siloed funding and programs. The community-based health information system (CBHIS) plays an essential role in the health system at the community level, as it evaluates the delivery of healthcare services and produces data for the planning, monitoring, and assessment of community health programs. CBHIS encourages decisions based on data by pinpointing key interventions and initiatives, directing the distribution of resources, and aiding in the formulation of policies grounded in evidence (Kuvuna et al., 2024). According to Walker (2019), Community-Based Health Information Systems (CBHIS) and national HMIS frequently do not have standardized data elements, which hampers efforts to harmonize the system and to integrate community health data in the national HMIS2. Given this, some benefits will accrue from the harmonization of CBHIS and HMIS, which include standardizing indicator definitions and measurement, reducing duplication and inefficiencies in the generation, compilation, analysis, reporting, and storage of data, reducing data quality issues, optimizing human and financial resources as well as providing access to actionable health data to improve health outcomes [4].

Currently, there are global efforts to harness Information Communication and Technologies (ICTs) to digitize CHIS. With the increased availability of mobile phones and tablets, several countries have begun to move away from manual paper-based systems towards digitalization of data systems at the community level [6]. However, in most Low- and Middle-Income Countries (LMICs), community information systems are still paper-based, and data cannot often be integrated into national health information systems or shared easily for evidence-based decision-making [6]. It has been demonstrated in some settings that using mobile technology (simple-feature phones) was feasible and viable for the provision of near real-time community-based health information linked to the national HMIS, knowing that CHIS is only effective as the community health programmes, they are embedded within [6]. Wosny et al. state that digital tools include electronic health records (EHRs), clinical decision support (CDS) tools, artificial intelligence (AI) applications, telemedicine, wearable devices, and health applications which hold great potential to transform and revolutionize the delivery of health care services [7].

As the implementation of CHIS gathers pace in LMICs, several challenges and bottlenecks affecting sustainability have been described. Common challenges are inadequate domestic funding, insufficient human resources, lack of technical capacity for adapting and implementing software solutions, poor data quality and challenges with completeness and timeliness of reporting. The barriers related to the enabling environment include poor ICT infrastructure, unreliable power supply and non-availability or unstable mobile networks [3, 8]. This trajectory guided the design of CHIS in Zimbabwe, where the country is working towards a unified electronic community health information system (eCHIS) to address fragmented systems across different program areas. The eCHIS is a mobile-based application that works online and offline. The application facilitates referral communications, provides electronic decision support, facilitates faster referrals and patient tracking, minimizes duplication in recording and reporting, improves the quality of data, and enhances communication between providers, leading to improved service quality and health outcomes as stated by Bogale et al. [8]. In Zimbabwe CHIS data is collected either using standard paper-based forms or in some cases using electronic mobile devices where piloted. Data is routinely collected

on a daily, weekly, or monthly basis against defined indicators.

Over the past decade, the CHIS in Zimbabwe has been transitioning from a centralized to a more decentralized structure. Currently, the country utilizes a predominantly paper-based system where Village Health Workers (VHWs) record routine data in paper-based village registers. At the end of each month, the VHWs, with assistance from the nurse-in-charge at the reporting health facility, verify the completeness of the data in their registers and summarize it in a monthly reporting form containing thirty-one (31) indicators spanning various health program areas such as health promotion, HIV/AIDS, TB, Nutrition, Family Planning, maternal, newborn, child, and malaria. The Nurse in Charge at the health facility then consolidates the data from all VHWs in the facility's catchment areas into a single health facility summary report, which is submitted to the district health office. The district health office further consolidates all facility reports into a district data summary report for VHWs, which is eventually entered into DHIS2 [9].

The decentralized system aligns with the aspirations of the National Community Health Strategy (NCHS) and Comprehensive Community Health Package (CCHP) for harmonizing community-level activities, where the community-level health indicators have been consolidated into a standard VHW Summary Reporting format. This will form the basis of the eCHIS national reporting structure. As a first step, the country completed the standardized community health indicators that addressed the current Community-Based Primary Health Care (CBPHC) programme needs. This was validated by key stakeholders and adopted to guide programming. A consensus to enable the deployment of a well-functioning eCHIS integrated within the broader Health Information Systems (HIS) was reached to close the identified information gaps. The Ministry of Health and Child Care (MOHCC) updated the Health Information Enterprise architecture (HIE) to address community level information needs. In line with HIE architecture, the MOHCC designed an SMS-based system that integrates *RapidPro* to the DHIS 2 national data repository. The final reporting structure, as defined in DHIS 2, had organizational units at ward and village levels, enabling data disaggregation down to the village level. Zimbabwe is still in the pilot stage of digitalisation of CHIS [10].

The information generated by community health workers is vital for informed decision-making at all levels. In addition, VHWs may use information on mobile devices to plan their home visits, provide health information to clients, schedule clients for follow-up, and track those who miss appointments. Given the power of community-based data to inform decision-making, the MOHCC took significant strides to ensure the data being collected at the community level is of high quality and in an easily usable format. As such, the MOHCC anticipated that the transition to harmonized and digitized data collection would lead to reduced workload, timely reporting, better data quality, better quality of care, improved data use and reduced inefficiencies [11].

The overall objective of the study was to determine the effectiveness of harmonization and of digitization of reporting tools on the productivity, timeliness in reporting by VHWs, and the quality of data and data use in Midlands, Matabeleland South, Mashonaland West and Manicaland provinces of Zimbabwe. Specifically, to:

i) assess the existing community health information systems reporting in Manicaland, Midlands, Matabeleland South, and Mashonaland West provinces;

ii) identify the facilitators and barriers to the implementation of harmonized reporting tools by Village Health Workers in selected districts within 2 southern provinces (Midlands and Matabeleland South);

iii) identify the facilitators and barriers to implementing digital reporting tools by Village Health Workers in selected districts within 2 northern provinces (Manicaland and Mashonaland West); and

iv) assess Village Health Workers' performance in reporting and data use in selected districts within the four provinces.

METHODS

Study design

This was a mixed-approach design involving a descriptive cross-sectional study and a qualitative inquiry to assess the use of existing CHIS registers and reporting forms and the extent of harmonisation of these tools and to assess the implementation of digital health interventions (DHIs) in Zimbabwe. The assessment of the harmonisation of the registers and reporting forms was conducted in three districts: Gokwe South in Midlands province and Insiza and Mangwe in Matabeleland South province, while the assessment of the implementation of digital health was conducted in six districts in Manicaland province (Mutasa, Nyanga, Makoni, Buhera) and Mashonaland West province (Chegutu, Mhondoro).

Study setting

The study was conducted in four provinces of Zimbabwe: using harmonised paper-based tools in the southern region (Midlands and Matabeleland South provinces) and using digital tools in the northern region (Manicaland and Mashonaland West provinces). Nine districts were randomly selected from the four provinces. This initial selection of provinces and districts to pilot the digital tools and harmonized paper registers was done by Ministry of Health and Child Care. The authors therefore purposively selected the these as they were the ones implementing the intervention. The four provinces were selected based on different implementation stages (paper harmonisation versus digital pilot) and geographical

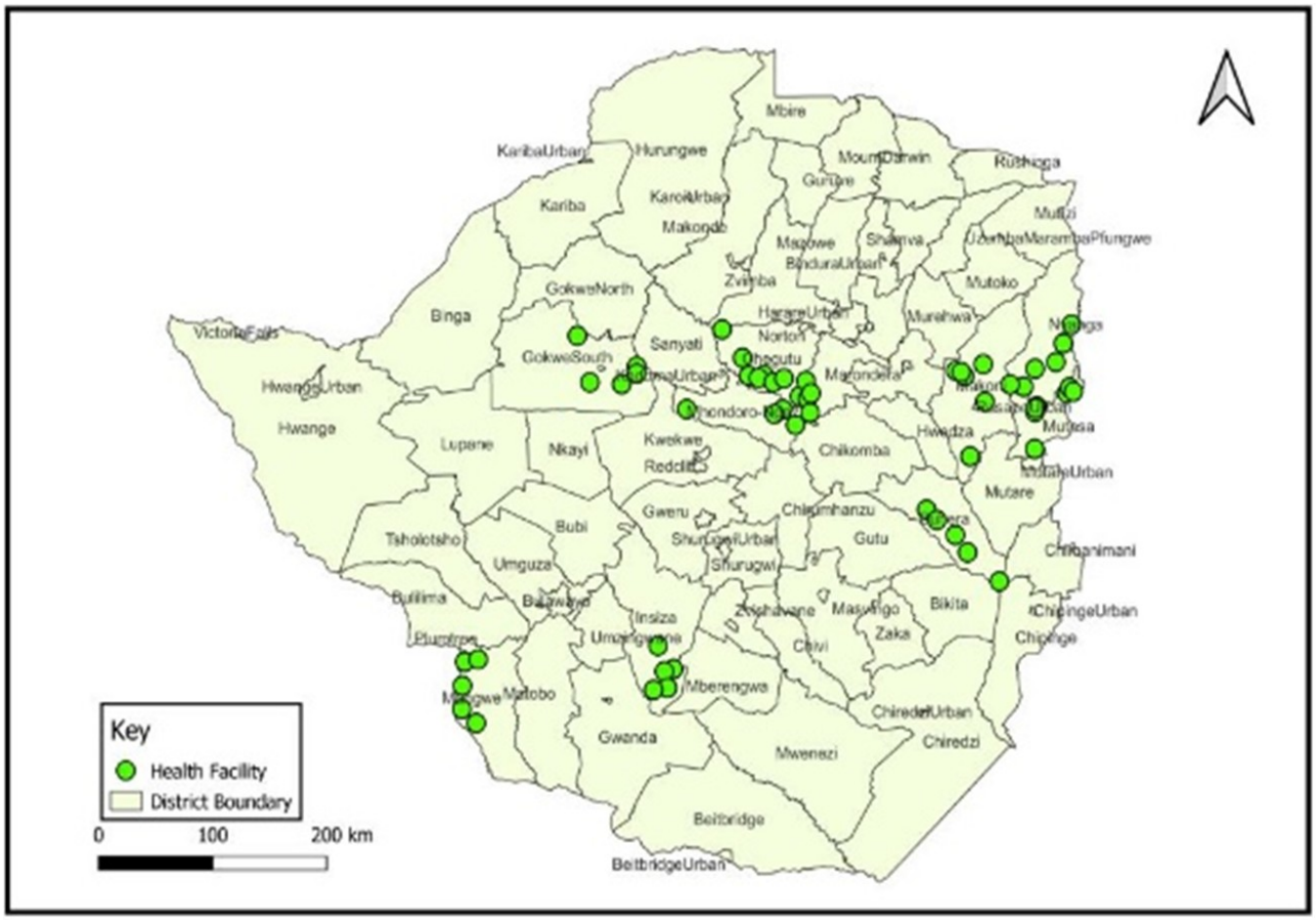

Figure 1. Distribution of primary health facilities that participated in the community health information system assessment, Zimbabwe, 2024.

diversity. Nine districts were randomly selected from the four provinces.

The survey was conducted by a trained research team that interviewed VHWs and key informants in nine districts in four provinces: Manicaland (Buhera, Mutasa, Nyanga and Makoni districts), Mashonaland West (Chegutu and Mhondoro districts), Midlands (Gokwe South District), and Matabeleland South (Mangwe and Insiza districts). The survey was conducted in fifty randomly selected primary health facilities, five in each district, except for Chegutu where 10 facilities were selected, as shown in the map (Figure 1). Chegutu district was proportionally larger and had more health facilities compared to the other districts.

Sample size determination

Using Dobson formula at 95% confidence and assuming 50% of VHWs submitted the monthly report on time, a sample size of 196 VHWs was obtained. Thus, four VHWs were targeted for interview per health facility giving a total of 200 VHWs.

Selection of key informants

A total of 200 VHWs were interviewed. Ninety-one key informants were interviewed, comprising directors, deputy directors (Nursing Services, Health Information, Information and Technology), monitoring and evaluation officers in the Ministry of Health and Child Care, Village Health Workers Coordinator, Provincial Health Information Officers, Provincial Information Technology Officers, District Health Information Officers, nurse managers, and nurses in charge of health facilities. Key informants were purposively selected at national, provincial and district levels because of their involvement in the implementation of the pilots for harmonized paper registers and digital tools. Most key informants were interviewed at health facility level as this is where the implementation was occurring. The number of key informants at each higher level became less as their direct contact with the work is limited. Information Technology Officers were included as they were responsible for the digital tool and software functionality.

Data collection

Data collection was done between 01 February and 31 March 2024. An interviewer who administered VHW survey questionnaire was used to collect data on harmonization of reporting and use of reporting tools, on types of tools used for data collection, training, availability and use of digital devices where applicable, facilita-

tors, and barriers to reporting using revised VHW tools and digital devices. The same questionnaire was used but with skip patterns so that so that those VHWs not using digital devices only answered relevant questions related to use of paper forms. The questionnaire was translated and administered in the local language for the area. One questionnaire was used, but VHWs answered questions applicable to the broad intervention specific to that district paper or digital.

A key informant interview guide was used to collect information on infrastructure, equipment, capacity building, availability of funding, stakeholder collaboration, digitalization and harmonization of CHIS. Six key informant interviews were conducted at national level (5 at the MOHCC Head Office and 1 with an implementing partner organization), fourteen (14) at the provincial level, twenty (20) at the district level and fifty-one (51) at health facilities.

Key informants were asked about their perspectives on the current state of CHIS implementation in their areas. Trained research assistants conducted in-depth interviews with the key informants to collect in-depth information on the use of the harmonized register and digital health intervention implementation and challenges in the four provinces.

A focus group discussion guide translated to local languages was used to conduct a total of six focus group discussions (FGDs) at health facility level with VHWs with an average of 14 VHWs per group. Nurses at the health facility were advised to invite 12 to 15 VHWs among those trained on CHIS for the focus group discussions. FGDs were conducted with VHWs who made it on the date and time for the activity. FGDs elicited VHW knowledge on CHIS and reporting tools, perspectives and experiences in collecting community health information as well as gathering their recommendations in improving the system. Focus groups were audio recorded, and one of the research assistants took detailed notes. One focus group discussion was conducted in each district.

A checklist was used to assess the digital health interventions (DHIs) (hardware and software), number of indicators monitored, completeness and costs. The KII guide for policy level and frontline key informants was administered in English without translation.

Data collection procedures

Interviews

We conducted interviews with 200 VHWs using an interviewer administered questionnaire. VHW were visited at their homes by trained research assistants (RA). The RA introduced themselves, explained the purpose of their visit and asked for a private place to conduct the interview. The RA administered informed consent and proceeded to conduct the interview completing the questionnaire on a tablet.

Key informant interviews

Key informants were interviewed at their workplace by the RA. The trained RA obtained an appointment with the key informant for an interview. At the appointed times, the RA met with the key informant and obtained signed informed consent and proceeded to conduct the interview. The RA also obtained permission to record the interview. One assistant would ask questions while the other would take notes of the proceedings.

Focus group discussions

Focus group discussions (FGDs) were conducted at a convenient place at the health facility where the VHWs reported. The nurse in charge of the facility reached out to 12-15 VHWs asking them to come to the facility for the focus group discussion stating the date and time. In total, 6 FGDs were held with a total of 88 participants. At the appointed times, the RA met with the VHWs and first obtained signed informed consent from each of the participants and proceeded to conduct the focus group discussion. The participants were informed that the proceedings would be audiotaped before the session. One assistant asked questions while the other took notes of the proceedings in case there was a problem with the recording.

Data analysis

Quantitative data analysis

Quantitative data were analyzed using EPI Info 7.2 software. The key areas covered were completion and timeliness of submission of monthly reports, availability of the harmonized VHW register, perceptions on use of paper or digital devices for reporting, training, data use, and any challenges in data collection and reporting. Descriptive statistics were generated for independent variables using proportions (with 95% confidence intervals) means (with standard deviation) and medians (with interquartile range) as applicable. The data were presented in tables and graphs.

Qualitative data analysis

The recorded KIs and FGDs were transcribed and translated verbatim manually in a single step. Interview transcripts were coded, with draft themes reviewed manually and cross checked by members of the research team at each stage of the iterative process. All the data collected were analysed using thematic content analysis [12]. Codes were developed during data collection for both KIIs and FGDs. The coding was agreed by the team. Analysis of data for both FGDs and KIIs were conducted as follows:

A coding frame was developed during data collection. Handwritten notes were taken during the FGDs using the local vernacular language. Local language transcripts were concurrently transcribed and translated into English. The theme list used in data collection was used to code relevant statements in each transcript. Eleven transcripts from all the FGDs and 8 KIIs were manually coded using the thematic guides for the different sub-

groups with similar themes running through. Verbatim transcripts were read and re-read to gain a full understanding of the whole and get the underlying meaning of the data by the team lead. The 2nd investigator went through the same verbatim transcripts reading and re-reading them again to gain a full understanding of the whole and get the underlying meaning of the data.

Some sub-themes emerged, and this necessitated recording to elucidate the emerging sub themes. Transcripts from each KIIs and FGDs were rearranged and grouped. Summaries were made of each theme of patterns and similarities and differences in perceptions, practices and attitudes were noted. The summaries were examined to develop tentative interpretations of how themes interact, reinforce and or mitigate each other for individuals and groups. The themes were then combined to create a story. Verbatim quotes were used in the presentation of findings in some sections of the report where possible.

See Table 1 for a summary of the participants in each of the data collection methods disaggregated by province.

Ethical considerations

Permission was obtained from the Ministry of Health and Child Care (MOHCC). Ethical approval was obtained from the Joint Research Ethics Committee of the University of Zimbabwe (JREC/330/2023) and the Medical Research Council of Zimbabwe (MRCZ/A/3129). Written informed consent was obtained from all the study participants.

The confidentiality and privacy of all participants was observed through using codes on all records. Names and addresses of individuals who participated in the study did not appear in any of the documents. For electronic data, all identifier data was kept as an encrypted file, accessible only to authorized user accounts. Hard copies of questionnaires were stored and maintained in a locked filing cabinet in the Department of Global Public Health and Family Medicine at the University of Zimbabwe (UZ). No costs were incurred by both VHWs and health care providers.

Table 1. Number of respondents by category and data collection method used across the four provinces, 2024.

Data collection method	Type of respondents	Total	Manicaland	Mashonaland West	Matabeleland South	Midlands
Key informant interviews	Health workers	78	28	20	17	13
FGDs	VHWs	88	30	29	15	15
Interviewer administered questionnaire	VHWs	200	80	60	39	21

RESULTS

Socio-demographic characteristics of the participants

Out of the total of 200 village health workers (VHWs) interviewed individually, 166 were female (83%), with a median age of 49 years (Q1=43, Q3=55), ranging from 28 to 71 years, of whom one tenth (11%) were aged 60 years and above. The median years in service of the VHWs was 10 years (Q1= 7; Q3=14) with a range of 1 to 40 years. The majority (85.5%) of VHWs had attained a secondary level of education. There were no striking differences in median age, sex and educational level of the village health workers across the four provinces (Table 2).

Existing community health information systems reporting in Manicaland, Midlands, Matabeleland South, and Mashonaland West provinces

In the four provinces assessed there were indications of initiatives to standardize reporting at community level using the harmonized VHW register and the VHW summary monthly reporting form.

The multiplicity of VHW registers with the accompanying workload in managing them was one of the main reasons for the need to harmonize reporting tools among programmes. On average, each VHW used 4 registers for reporting, the number ranging from 1 to as many as 16. In Midlands Province and Matabeleland South Province where the revised VHW register had been introduced, the VHWs were using an average of only 1 or 2 registers respectively. Although the revised VHW registers were available in 8 out of the 9 districts where the survey was done, the proportions of VHWs who had these registers varied widely among the districts.

To some extent, digital tools have already been in use for data compilation and reporting in the country. In Mashonaland West and Manicaland Provinces (n=140) where the digital tool had been introduced, the majority eighty-five (60.7%) of the VHWs interviewed reported that they were using paper-based tools for data collection and reporting, while the rest (39.3%) used both digital and paper-based tools. In Midlands Province and Matabeleland South Province, none of the VHWs were using digital tools as digital reporting platforms that had not yet been introduced in those two provinces. Although mobile phones are widely used in the country, less than half of the VHWs 79 (39.5%) interviewed reported having a suitable digital device (smartphones/tablet) to use for their work. The devices were mainly provided by the MOHCC (53%) with support from partners, and almost

two fifths (39%) of the VHWs were using personal devices for work. Notwithstanding the limited availability of suitable mobile devices among 39.5% of the VHWs interviewed, their use is still suboptimal. The commonest applications used on mobile devices were the generic ones, i.e., SMS, voice, and WhatsApp. Other applications were less commonly used, like RapidPro (11%), KoboCollect (5%) and ODK (2%). Among the 140 VHWs, only 34 (24.3%) had reporting software installed on their devices, of whom 28 were from Manicaland Province and 6 from Mashonaland West Province. Nearly half (47.1%) of the VHWs used their digital device for communicating with the health facility whilst a third (34.7%) reported use of the device for submitting reports. A quarter (25.0%) used the device for client referral and only 17.1% used their device to enter data (Figure 2).

Table 2. Socio-demographic characteristics of the interviewed VHWs in the study sites, Zimbabwe, 2024.

Variable	Frequency (%)	Manicaland	Mashonaland West	Matabeleland South	Midlands
Age					
21-29	2 (1.0)				
30-39	24 (12.0)				
40-49	76 (38.0)				
50-59	76 (38.0)				
≥60	22 (11.0)				
Median age	49 (Q1= 43; Q3=55)	49 (Q1= 44; Q3=55)	50 (Q1= 45; Q3=56)	49 (Q1= 43; Q3=55)	44 (Q1= 42; Q3=52)
Median years in service	10 (Q1= 7; Q3=14)	10 (Q1= 7; Q3=17)	10 (Q1= 4; Q3=19)	10 (Q1= 8; Q3=13)	9 (Q1= 8; Q3=14)
Sex					
Male	34 (17.0)	9 (11)	11(18)	5 (13)	9(43)
Female	166 (83.0)	71(89)	49 (82)	34 (87)	12 (57)
Education level					
Primary	29 (14.5)	13 (16)	7 (13)	5 (13)	4 (19)
Secondary	171 (85.5)	67 (84)	53 (88)	34 (87)	17 (81)

Overall, the majority of the VHWs was still using the old form of the VHW register and the summary forms (Table 3).

Key Informants at the national level reported that the Ministry of Health and Child Care was testing various tools and applications to be used in digital devices, such as:

- ODK/Go.Data: Case Investigations and Contact tracing linked with PowerBI & SiSENSE
- Impilo & DHIS2: Surveillance at Points of Entry, and Quarantine facilities & Treatment Centres. Impilo was recently customized to community level where the Front End is the user's gateway to the system that provides a user-friendly interface to enable VHWs to capture all processes during service delivery that will be saved locally on the mobile application while in the field. Its main technology is Android/Kotlin
- SENAITE: Managing laboratory requests, processing of specimens and results.
- RapidPro: SMS-based reporting of selected community indicators and alerts by community health workers.
- ArcGIS Online: For Geo Spatial Analysis.

Facilitators and barriers to the implementation of harmonized reporting registers and reporting forms by village health workers in selected districts within these provinces

One of the key barriers to the submission of reports by VHWs is long distance to the health facility, as mentioned by both the VHWs and health facility staff. The median traveling distance was 5.0 km which is within the acceptable walking distance. However, 46 VHWs (23%) had to travel between 6-10 km while 36 VHWs (18%) needed to travel more than 10 kilometers to report. Almost two thirds (66.5%) of the VHWs walk to the health facility to report, whilst a quarter (26%) had bicycles. Lack of transport was reported by 115 (55%) of the VHWs interviewed.

Other barriers related to access included hard to reach facilities whereby VHWs traveled 36-40 kms. In some districts, the terrain is difficult to traverse.

The major barriers to the implementation of harmonized reporting registers reported by VHWs were distance to health facilities, lack of transport, lack of training on data collection and airtime (phone credit) (Table 4).

Other barriers mentioned during key informant interviews include non-availability and high costs of transport, non-reimbursement of travel costs and difficult

terrain. Barriers related to incentivization, and inadequate facilitation included inadequate and inconsistent disbursement of allowance in general, shortage of data collection tools and registers, numerous indicators, and data elements to be reported.

Although the majority 175 (87.5%) of the VHWs interviewed were trained in using the VHW register and reporting forms, the key informants noted inconsistency in the availability of reporting tools.

> *"It's good that we are using this system (CHIS), it shows we are moving with times. I wish the tools for use were always available so that our work is not affected…today we have registers, the following month no registers and you have to improvise."* (KII 42, district level, Insiza district)

Table 3. Multiplicity of registers used by VHWs across the four provinces, Zimbabwe, 2024.

Province	District	Proportion of VHW who had the revised register (%)
Mashonaland West	Chegutu	21/40 (52.5)
	Mhondoro	3/20 (15)
	Total	24/60 (40)
Matabeleland South*	Insiza	1/20 (5)
	Mangwe	19/19 (100)
	Total	20/39 (51.3)
Midlands*	Gokwe South	21/21 (100)
Manicaland	Makoni	10/20 (50)
	Mutasa	0/20 (0)
	Buhera	8/20 (40)
	Nyanga	5/20 (25)
	Total	23/80 (28.8)
National		88/200 (44%)

*Provinces and districts where revised VHW tools were already introduced

Table 3 shows the proportion of VHWs trained on CHIS by province and district. Of the VHWs participating in the study, the least number trained in CHIS tools was in Mhondoro Ngezi, while four districts reported all VHWs participating had received training.

Of the 175 (87.5%) that were trained, 78.3% were trained on the utilization of the paper based revised VHWs register while 51.4% (n=140) were trained on the digital revised VHWs tools in the two northern provinces. The topics covered were on the roles of VHWs in data collection and reporting and the completion of the revised VHW register, data analysis and use at community level.

Facilitators and barriers to implementing digital reporting tools by village health workers in selected districts within Manicaland and Mashonaland West provinces

Seventy-eight out of 140 VHWs (55.7%) who had a smartphone or other digital device to perform their duties, 16 (20.5%) reported that they shared the device with other colleagues. The majority of the VHWs with a digital device reported reliable network in their area, but only 18.9% had airtime/data to conduct their work. Of the 78 VHWs that had digital devices, 34 (43.6%) had a reporting software installed on their device. The proportion of VHWs reporting any software or application installed ranged from 5.9% to 35.3% across Manicaland and Mashonaland West Provinces. Out of the 78 study participants who indicated that they had mobile devices, 65 (83.3%) had reliable network available to enable their work. The availability of reliable network was high, with 8/10 of the VHWs interviewed reported reliable network in Makoni and Mhondoro Districts, for instance.

Table 4. Barriers to the implementation of harmonized reporting registers and reporting forms by village health workers in selected districts within the provinces.

Challenges to data collection and reporting	Matabeleland South (n=39)	Midlands (n=21)	Manicaland (n=80) %	Mashonaland West (n=60) %
Distance to health facility	28 (71.8)	11	54 (67.5)	22 (36.7)
Erratic power supply	0	0	44 (55.0)	2 (3.3)
Lack of data collection tools	12 (30.8)	3	23 (28.8)	13 (21.7)
Lack of training on data collection	30 (76.9)	10	49 (61.3)	21 (35.0)
Lack of transport	31 (79.5)	4	61 (76.3)	38 (63.3)
No airtime	38 (97.4)	18	66 (82.5)	27 (45.0)
Poor mobile network	18 (46.2)	5	33 (41.3)	8 (13.3)
Repair/replacement of device	0 (0)	0	44 (55.0)	4 (6.7)

Despite relatively good networks, only a minority of VHWs (19.2%) reported having airtime to support their work. Airtime was rarely provided, and only a few VHWs reported receiving airtime once per year. The majority 40 of the VHWs (51.3%) reported that their area mobile network had good connectivity, averagely good connectivity was reported by 40.5% of the VHWs, and only seven (8.9%) of the VHWs reported poor network. The commonest network service provider was Econet (with 100% of VHWs having access), followed by NetOne at 90%, then Telecel with only 10% accessi-

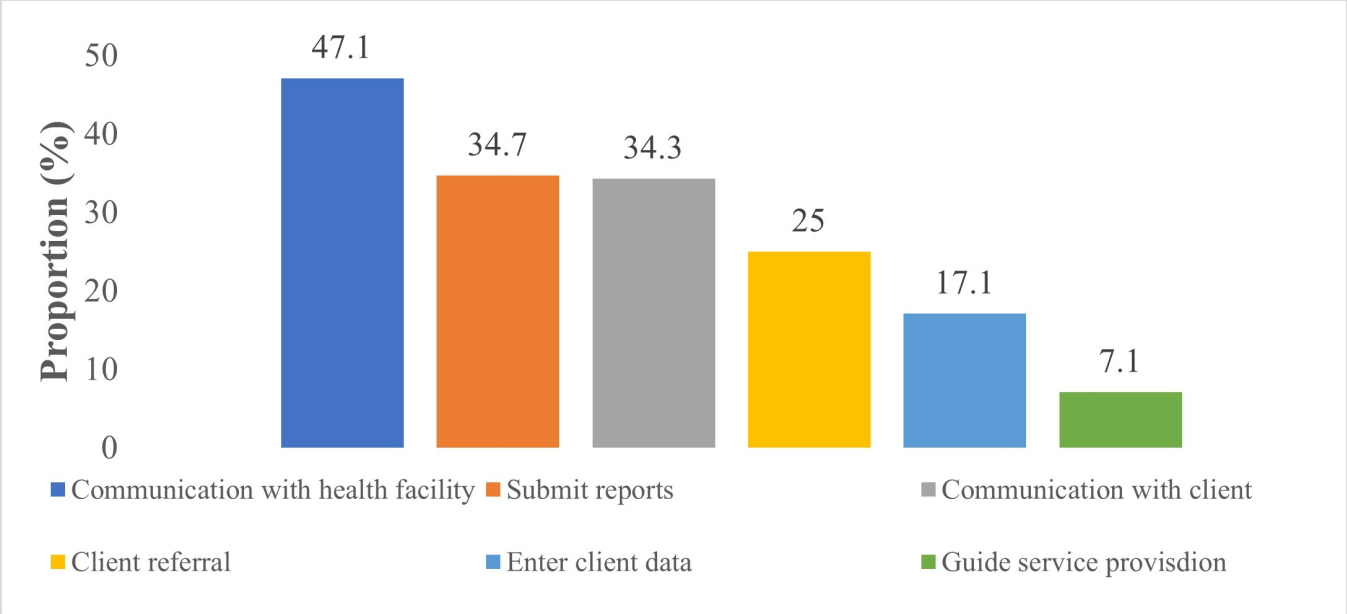

Figure 2. Activities for which VHWs use the mobile devices in their work; Manicaland and Mashonaland West provinces, Zimbabwe, 2024.

bility). None of the VHWs were using foreign networks. Slightly more than half (52.6%) of the VHWs using a device reported that they were unable to work without mobile network services.

There were mixed feelings among the VHWs on the utility of the digital devices. Of the 72 VHWs who reported a change in their workload owing to use of digital devices, 26.3% reported a decrease in workload since they started using the digital device whereas 45.8% reported an increase in their workload. Over a quarter (27.9%) reported no change in workload as a result of using digital device ((Figure 3).

> "*In my opinion, using the phone makes my work faster and lighter compared to paper-based data collection. At the same time, I have heard other VHWs complain that phones are cumbersome to use.*" (FGD 2, VHW 10, Makoni district)

The majority (82.3%) of the 78 VHWs who had access to digital devices felt confident using them for reporting. In most districts, almost all VHWs interviewed expressed confidence in the use of digital devices for reporting, for example, in Mhondoro, 6/6 and Nyanga 19/20. A number of challenges in using digital devices for data collection and report submission was cited by the VHWs, including lack of registers/reporting forms, distance to the health facilities, poor mobile networks, erratic power supply, lack of access to solar charging, and malfunctioning devices without replacement (Figure 4).

> "*It is not so difficult to use the phone or tablet for reporting. What is important is to have the report forms on the device. You can collect data onto the form while you are offline and only connect to submit the information.*" (FGD 5, VHW 6, Mhondoro Ngezi district)

In Manicaland, 75% of VHWs reported that they were able to transmit reports to the health facility on time whereas in Mashonaland West, 55% were able to transmit on time. Nineteen (19) VHWs out of 80 (23.7%) in Manicaland and 4 VHWs out of 60 (6.6%) in Mashonaland West could not report on time. The challenges reported in Manicaland were distance to the health facility (10/19), lack of registers (15/19), lack of training (17/19), lack of airtime (18/19) whereas in Mashonaland West 3 out of 4 cited distances to the reporting health facility as a challenge. Data transmission upon completion of report was real-time if network and airtime were available in the VHW's area of work. The main challenges related to data transmission were erratic power supply, poor network connectivity and lack of airtime/data for data transmission.

> "*The major challenges in transmission of data are the frequent power cuts that also affect network connectivity and lack of data. It's a long since we last got support for data or airtime.*" (FGD 3, VHW 8, Nyanga district)

Most of the VHWs (63.5%) preferred to use a smartphone/tablet for reporting to the health facility whilst 33% preferred both paper and digital reporting. On a small proportion (3.5%) preferred the paper type of reporting.

Only a minority of VHWs, 10.7% (15/140), reported having airtime to support their work. Airtime was rarely provided with the few VHWs reporting receiving airtime once per year.

The use of RapidPro SMS for reporting by VHWs presented some challenges owing to the character limits on the existing SMS function on their cellphones. A VHW described some difficulties in reporting via SMS:

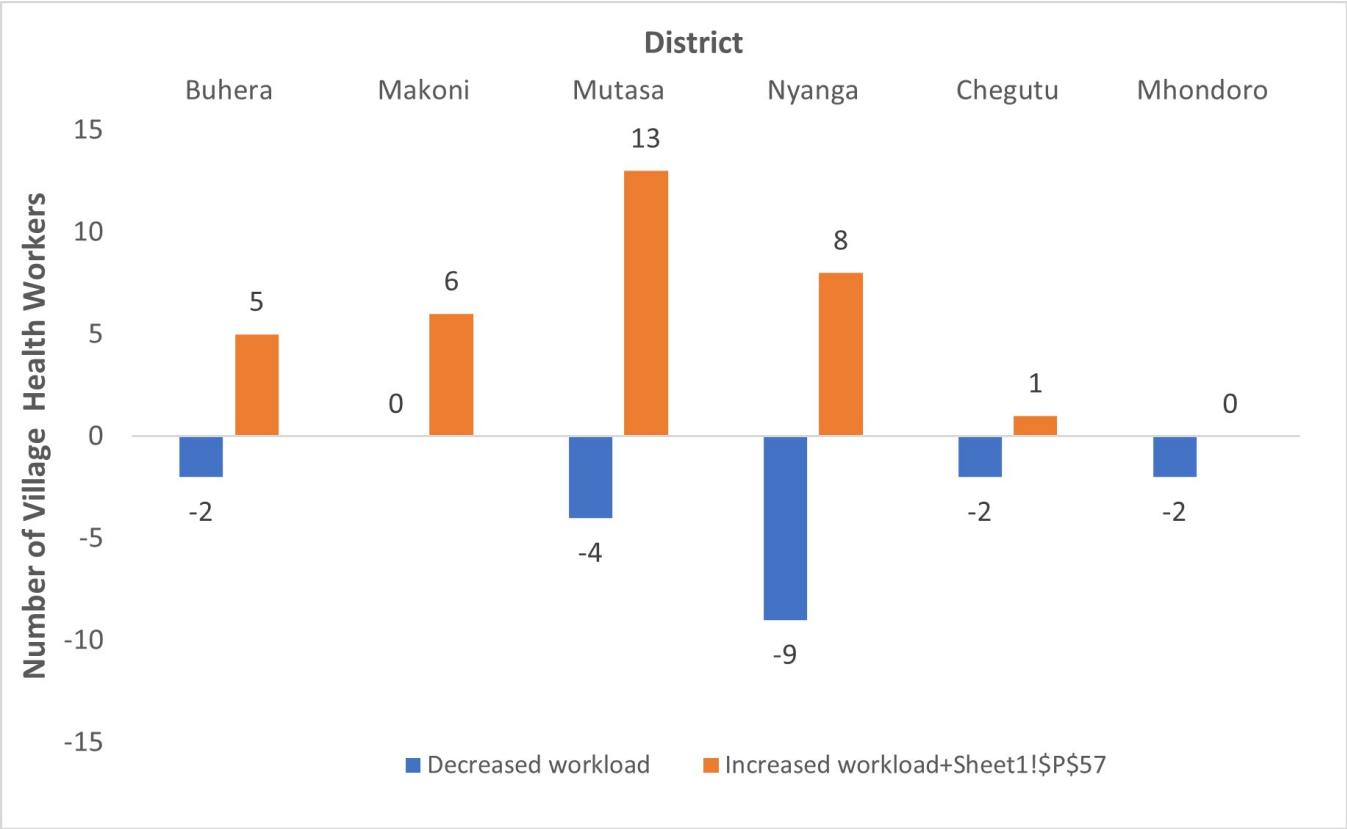

Figure 3. Reported change in workload due to use of digital devices among village health workers.

> *"I use text messages when reporting and it's quite a task because I can't type long paragraphs, there is a specific number of letters that should be typed. So, if I have a lot to report it means I have to send a number of texts."* (FGD2, VHW 4, Makoni district)

Availability of electricity was reported as affecting stability of the CHIS. Facilities located in Chegutu were the most severely affected by blackouts evidenced by the electricity reporting coverage.

> *"The CHIS is also affected by the power cuts…the load shedding. Data flow is done from the community to the facility, then it goes to district where it is uploaded into the DHIS 2 system. The VHWs capture data on the form using SMSs and it is uploaded into the DHIS 2, software (CMHIS DHIS2). The power cuts affect the flow of data."* (KII 12, District level, Chegutu district)

In order to address these constraints, the MOHCC has deployed internet-based legworks in areas such as Chegutu and Nyanga and is currently installing solar back-up in health institutions. In addition, it was reported that 73% of the facilities had functional backup generators. Among other enablers were power banks and/or portable solar chargers issued to VHWs together with digital devices.

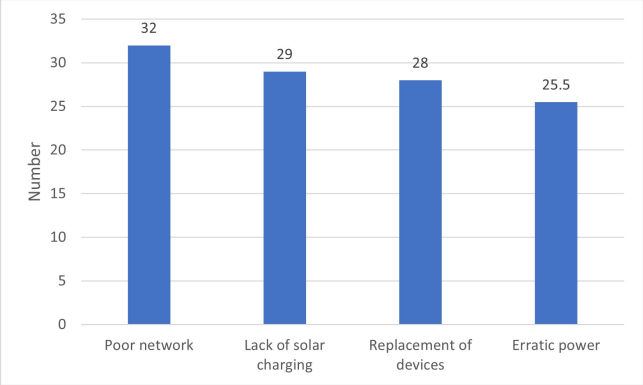

Figure 4. Reported barriers to using digital tools by village health workers, Manicaland and Mashonaland West provinces, 2024.

Gaps in the implementation of CHIS

A few gaps were observed in the implementation of the CHIS. The employment status of VHW is on a volunteer basis where data collection and reporting could be perceived as extra work non-remunerated. Healthcare workers were concerned that this might result in poor performance by the VHWs including reporting and data quality.

> *"Then there is also the issue of village health workers. We are having problems working with them because being a VHW is voluntary right? So now they feel like they are putting in more effort and yet they are not gaining anything. At times there*

is no cooperation from the village health workers, and we fail to meet our targets…now you can imagine what happens with the CHIS." (KII 23, Health facility in charge, Gokwe South district)

There were gaps in providing the necessary resources for VHWs to collect data and report as guided. Important tools such as the reporting registers, forms, digital devices and airtime were inadequate. Use of personal devices and own airtime was described as a demotivator.

"*We haven't received the tablet for use in data entry, but I am using my phone. At least it's a smartphone so am able to do most of the stuff.*" (FGD 6, VHW 7, Mutasa district)

A significant number of VHWs were using personal devices for reporting which may compromise both availability, transmission, and security of data.

"*Not all VHWs have mobile devices, and this affects completeness of reporting. Those with mobile devices might report on time while those who use paper-based reporting are having challenges getting the reports to the clinic.*" (KII 31, District level, Chegutu district)

One VHW expressed her fears about confidentiality of information when personal devices are used as the device is accessible to family members.

"*I have been using my phone all along…my only fear is that it may get lost or stolen. plus, people at home may just scroll through and see some confidential information.*" (FGD 3, VHW 8, Nyanga district)

Some VHWs found the use of smartphones (digital devices) challenging. One key informant noted this particularly among the older VHWs and said:

"*Not everyone is competent to use smartphones. This is due to the variation in age and literacy among the VHWs. The younger VHWs are generally better with technology compared to their older, less educated counterparts.*" (KII 45, Provincial level, Manicaland province)

VHWs using the digital platform to report found the availability of network particularly challenging as their reports are usually late.

"*Network is not reliable for those who are using the digital platform to report.*" (KII 9, District level, Mhondoro Ngezi district)

Weaknesses in coordinating the planning and implementation of activities by key departments in the MOHCC were found to be affecting the operation of VHWs in fulfilling CHIS objectives. These weaknesses also relate to implementing partners and NGOs working in community health.

"*It is important to engage various stakeholders to harmonize approaches that can enhance performance and sustainability like this CHIS. Our donors have different interests, some are into prevention, some rehabilitation. Even the health issues of focus are different. However, because it's the same person spearheading activities in communities, regular collaboration is inevitable.*" (KII 48, National level)

Table 5. Analysis of completeness and timeliness of submission of data by VHWs in DHIS2, 2022-2024.

	Completeness		Timeliness
Province	**2022**	**2023**	**2023**
Mashonaland West	54.6	67.4	39.9
Midlands	32.3	49.8	17.2
Manicaland	93.9	96	82.2
Matabeleland South	70.9	79.1	81.9

Performance of the village health workers in reporting and data use in selected districts within participant provinces

The majority of VHWs (87.5%) reported that they made use of data collected and submitted to the health facilities, mainly for client referrals, monitoring service delivery, surveillance, contact tracing, commodity supply chain management and resource mobilization. Only a minority of VHWs reported using data collected to inform health education activities. Most of the VHWs (95.5%) reported attending meetings with other VHWs and their supervisors in the previous 90 days where data and performance were reviewed.

The majority of the VHWs (95.5%) reported completing their registers regularly and submission monthly. However, only 60% of the monthly reports to the health facilities were submitted on time. Only 23% of the VHWs were required to submit weekly reports, mainly to the malaria control districts, of which all were submitted on time. This summary of the completeness and timeliness of VHW reports in DHIS2 provides proxy indication of the performance of CHIS. Manicaland and Matabeleland South provinces performed well, while Mashonaland West and Midlands provinces did not (Table 5).

Nurses in charge at most of the facilities visited in the 4 provinces mentioned that VHWs were not adequately supervised on use of digital reporting tools. In Mhondoro and Gokwe districts, the nurses in charge indicated that there was little data validation being done as the nurse in charge is facility based with minimum contact with the community level. Furthermore, the revised VHW reporting tool has too many indicators and poses a challenge on the workload of the VHW thus compromising data quality (completeness and validity).

> "*Although digitalization of VHW reporting provided a great opportunity for improved data quality, a good number of VHWs are less versed in the use of digital tools.*" (KII 2: District level, Makoni district)

DISCUSSION

Overall, Zimbabwe's Ministry of Health and Child Care was successful in designing the community health information system integrated with country's flagship "Impilo" with data now disaggregated at the lowest level of the health system (ward and village level) with more work remaining to fully operationalize the system to fully interface with the users. Compared to the other LMICs, Zimbabwe is considered the country with one of the commendable conditions in terms of the enabling environment for the establishment and rollout of digital Community Health Information System linked to the national HIS. Among the enablers such as the alignment of the Health Information Enterprise architecture with national strategies, good internet connectivity, and a dedicated network of well-educated community health workers, are indeed critical for the successful implementation of CHIS. Having data disaggregated at the ward and village levels is crucial for effective community health planning and service delivery, especially in marginalized communities where access to healthcare may be limited. Evidence demonstrates that the commitment and reliability of the Village Health Workers are key to the success of the CHIS, as they play a vital role in collecting, analysing, interpreting, and reporting health data at the grassroots level.

Our findings indicated that most districts used mainly paper-based tools for data collection and reporting with none of the VHWs using digital platforms only. This is consistent with evidence from Mali and many other countries, where community health workers continued to use paper-based systems because of challenges with human resources and logistics [2,11]. There is still widespread use of multiple registers and improvisation of the registers in the country when not available. There are various explanations to the findings of the exploratory work done. The Ministry of Health and Child Care is still in a transition period where old and revised data collection tools are still in use as there were no deliberate efforts to decommission the old data collection and reporting tools. Similarly, in the pilot provinces for digitization of VHWs reporting tools, both paper and digital reporting were adopted, and it is expected that VHWs will report using both options.

This assessment demonstrates partial success in the efforts of the MOHCC in implementing the harmonised VHW reporting tools with the revised VHW register and monthly summary reporting tools now in use in some pilot districts included in the assessment. In the non-pilot districts, there was variation in the availability of the revised VHW register and VHW aggregate data reporting tool. The non-availability of the revised tools could be attributed to poor coordination, ineffective communication channels between national and subnational levels, delays in printing and distribution of tools by national level, signifying the negative impacts of the centralized health system. It also reinforces the need for detailed planning for resources before rolling out [16]. Information gathered from key informant interviews indicated that there were insufficient resources within the MOHCC for capacity building of VHWs let alone ensuring availability of data collection tools. The lack of a sustainable funding source is a major threat to CHIS that MOHCC and its partners need to consider in the short and long term. Current support from the traditional funding partners for the Community Health Program including the Health Development Fund and Global Fund had no funding earmarked for the printing and distribution of the registers and summary reporting forms for VHWs. This lack of prioritization contributed significantly to the inherent gap reported in implementation of CHIS. This indicates the need to have ring fenced funding within MOHCC and funding partners to ensure availability of the registers and summary reporting forms for VHWs for effective implementation of CHIS. Moreover, lack of consistent remuneration of VHWs remains a threat to sustained quality data collection and reporting.

Regarding the availability and use of digital devices in pilot districts, less than half of the VHWs had digital devices provided by the pilot and appropriate software for data collection and reporting. This could reflect challenges in piloting the digital reporting systems for CHIS which could be considered planning the implementation for roll out of the digitization of CHIS to other districts. The issues on procurement of the devices, installation of software among others should be considered for the success of this initiative to enable implementation at scale.

About two-fifths of the VHWs were using personal devices for reporting but without financial support. Cost of mobile phone services could be a barrier to use. Non reporting could be associated with these costs that VHWs have to bear. Where CHIS pilots include personal phone use, cost of mobile phone service should be considered as an approach to sustain digital device use, thus remove it from being a barrier. Wallis et al. suggested a similar approach to improve digital device use and take care of the financial barrier to device use [16].

While the VHWs expressed confidence in the use of the registers and reporting tools, poor coordination affected program implementation as some VHWs missed training and there were significant delays between training and availing of the revised registers and in some cases the devices. This delay has negative implications for the CHIS as the VHWs might have plausibly forgotten how to use the reporting tools necessitating retraining. Following training, participants should have received the necessary resources, i.e. airtime, stationery

and allowances to enable them to report effectively. Ejeta et al (2020) in Ethiopia noted that a plan for provision of resources was an area that needed improvement if CHIS is to reach scale [17].

Specialized training provided to CHWs on data aggregation and use of calculators significantly improved data quality in Malawi using a lot quality assurance sampling methodology [12]. Other studies in South Africa, Uganda and Myanmar also reported data quality improvement with the use of digital devices [18-21]. To maintain high data quality requires regular support and supervision from health facility staff, which was not evident in our study. Several studies have reiterated the importance of regular supportive supervision in improving data quality [22-24].

VHWs had mixed feelings regarding workload and work environment which could be demotivating and have a negative effect on adoption of digital tools in CHIS. Where VHWs felt the digital device increased their workload, its adoption and use are negatively affected. Non-payment of allowances or delays in receipt of allowances feature regularly in meetings with VHWs although they continue to work within their communities. It might be important to explore different payment or compensation models that are context specific to maintain their motivation to work [25].

A key barrier for revised paper-based reporting was distance to the facility coupled with difficult terrain. A further complication arises as no reimbursement of fares is available. This out-of-pocket expenditure becomes a burden on VHW and affects reporting.

Conclusions and recommendations

This assessment provides baseline documentation of the current state of the implementation of the CHIS in nine districts on two key aspects: harmonization of the VHW reporting tools and digitization of reporting. The revised VHW register, and standardized reporting form has been deployed to varying extents to the districts and health facilities. However, there are still a few issues to be addressed as the revised register was reported to be still burdensome to use owing to the large number of data elements required, small font size as well as being difficult to carry around owing to its size. Digitization of VHW reporting is still in the early stages and is hampered by resource constraints such as provision of digital devices with appropriate standard software and adequate airtime/data for reporting. Whilst capacity building for VHW reporting has largely taken place, the time lag between training and deployment of reporting tools has been long which has resulted in non or ineffective use of these tools. It appears suboptimal coordination of training, deployment of tools and supportive supervision of VHWs affected both harmonization of reporting and the use of digital tools where these were expected to be used. Other threats to implementation of the CHIS were disincentives such as inconsistent disbursement of VHW allowances, shortages of reporting tools, stationery, lack of airtime and digital devices as well as insecurities associated with use of personal devices for reporting.

This assessment ought to be interpreted alongside its limitations. Most of the findings are self-reported as there was minimal direct observation conducted that could introduce bias. Only 9 districts with a small sample of VHWs participated in this assessment owing to resource constraints thus limiting generalizability of our findings to other VHWs in other provinces and districts. Although generalizability is limited, the findings offer useful lessons for other similar settings.

DECLARATIONS

AI utilization

None declared.

Competing interests

The authors have no competing interests to declare. The work solely represents the views of the authors. It does not represent the views of University of Zimbabwe, Ministry of Health and Child Care or UNICEF.

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Author contributions

MG, GS, MT, STZ: conceptualization, data collection and analysis, writing–original draft. SO: collected the key informant data. GM, TPJ, GS, RM, ASMS and AC: contributed to the design and supervised the study. AC, GS, TPJ, STZ, GM, MG, NH, HB, ASMS, RM, and MT revised the document for important intellectual content and read and approved the final article.

Data availability

Data can be made available upon request.

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ORCIDs

Addmore Chadambuka 0000-0003-2407-1172
Gerald Shambira 0000-0003-1256-7912

Tsitsi P Juru 0000-0002-3570-2331
Simukai T Zizhou 0000-0003-3318-4590
Gibson Mandozana 0009-0001-2713-5074
Meggie Gabida 0009-0004-7096-2317
Remy Mwamba 0000-0001-6730-8884
Mufuta Tshimanga 0000-0002-5525-3318

ABSTRACT IN SPANISH

Facilitadores y barreras para la implementación de herramientas digitales y la armonización de los instrumentos y registros de notificación utilizados por los promotores de salud: la experiencia de Zimbabue

Introducción: El Sistema de Información de Salud Comunitaria (SISC) de Zimbabue ha pasado de un modelo centralizado a uno descentralizado, utilizando herramientas armonizadas en formato papel y digital. Estas herramientas buscan reducir la carga de trabajo, mejorar la calidad de los datos, apoyar la presentación oportuna de informes y fomentar el uso de datos. A pesar de este cambio, existe poca documentación sobre la adopción de estas herramientas. Este estudio exploró el uso de registros digitales y armonizados en papel por parte de los promotores de salud comunitarios (PSC), identificando barreras y facilitadores clave en cuatro provincias.

Métodos: Se realizó un estudio de métodos mixtos en dos regiones. En el sur (Midlands y Matabeleland South) se evaluaron herramientas en papel armonizadas; en el norte (Manicaland y Mashonaland West), herramientas digitales. Las provincias se seleccionaron según su etapa de implementación. Se encuestó a 200 PSC para recopilar datos sobre el uso de herramientas, capacitación, acceso a dispositivos y desafíos en la presentación de informes. Informantes clave aportaron información adicional sobre infraestructura, equipos, financiamiento, formación, coordinación entre actores y el progreso general de la digitalización y armonización del SISC.

Resultados: La mayoría de los PSC (83%) eran mujeres, con una mediana de 10 años de servicio. El 72.5% usaba herramientas en papel, mientras que el resto utilizaba sistemas mixtos. Los distritos con pilotos digitales reportaron un uso combinado. La disponibilidad de registros revisados varió según el distrito. Menos de la mitad utilizaban herramientas digitales de forma constante. Las principales barreras incluyeron la distancia a los centros de salud, falta de capacitación, escasez de herramientas y mala conectividad de red. La puntualidad y completitud en los informes fueron más altas en Manicaland y más bajas en Midlands. Los informantes clave señalaron deficiencias de recursos que afectaban la recopilación y el reporte de datos.

Conclusión: La implementación de herramientas armonizadas y digitales enfrentó desafíos debido a la falta de coordinación y recursos esenciales. Los retrasos entre la capacitación, la distribución de registros, la entrega de formularios y la instalación del software dificultaron el despliegue del SISC. Sin embargo, factores facilitadores incluyeron la disposición de los PSC a adoptar ambos sistemas, la supervisión constante del personal de salud y una conectividad de red generalmente buena en las áreas evaluadas.

Palabras clave: Promotores de salud, comunidad, sistema de información, harmonizadas, digitales.

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