

Bridging Digital Health Literacy Gaps in South Africa's Community Health Centers: A Scoping Review on the Role and Capacity of Community Health Workers

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Abstract: Digital health technologies are crucial for improving healthcare access, patient engagement, and health outcomes. However, their success depends on the digital health literacy of users, which remains a significant barrier in South Africa. Community Health Workers (CHWs), as part of Ward-Based Primary Healthcare Outreach Teams (WBPHCOTs), play a crucial role in bridging these gaps by serving as intermediaries between formal health systems and communities. This paper presents a scoping review to examine the role of CHWs in improving digital health literacy and supporting the effective implementation of digital health interventions within Community Health Centers (CHCs). Findings reveal that CHWs face challenges, including limited digital skills, poor connectivity, system complexity, and resistance to digital adoption. Despite these barriers, they actively mitigate challenges through peer mentoring, patient education, and adaptive workflows. Drawing on international case studies, the review highlights strategies such as continuous digital literacy training, culturally adapted tools, mentorship programs, and sustained technical support to enhance CHW effectiveness. Strengthening CHW capacity can close the digital divide, improve data quality, and ensure equitable healthcare delivery. This paper recommends targeted investments in CHWs and digital infrastructure to optimise South Africa's digital health ecosystem and improve primary healthcare outcomes.

Keywords: Community Health Workers, Digital health literacy, Digital Health Intervention

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Introduction

Digital health technologies are transforming healthcare delivery globally by improving access, improving patient engagement, and improving health outcomes. In South Africa, these technologies, including mobile

health applications, electronic health records, and data management systems, offer significant potential to enhance communication between healthcare providers and communities while streamlining service delivery (Yuen et al., 2024; Sulistya Azahra, Pirdaus & Prabowo, 2024). However, the effectiveness of these interventions depends on the digital health literacy of users, defined as the ability to locate, understand, evaluate, and apply health information from digital sources. High levels of digital literacy are critical for informed health decision-making, combating misinformation, and promoting equitable healthcare (Yuen et al., 2024; Sulistya Azahra, Pirdaus & Prabowo, 2024). Despite widespread adoption of digital health systems, disparities in access and digital literacy persist, particularly in rural and underserved communities where socio-economic barriers and limited infrastructure constrain the use of information and communication technologies (Mwansa, Ngandu & Mkwambi, 2025). Vulnerable populations, including the elderly and residents in remote areas, are disproportionately affected, exacerbating existing health inequities (Aboye, Simegn & Aerts, 2024).

CHWs, embedded within South Africa's Ward-Based Primary Healthcare Outreach Teams (WBPHCOTs), serve as critical intermediaries between formal health systems and communities (Murphy et al., 2020). Their roles, range from formal health aides to volunteer peer educators, include delivering health education, facilitating access to care, and promoting community engagement (Rodrigues et al., 2022). Emerging research shows that CHWs recognise the potential of digital tools to enhance their impact, despite challenges such as high device costs, limited connectivity, and varying levels of digital literacy (Blondino et al., 2024).

CHCs, which act as primary hubs for healthcare delivery, increasingly rely on digital systems such as the Health Patient Registration System (HPRS), District Health Information System 2 (DHIS2), and mHealth applications to manage patient data and service delivery (Wright, O'Mahony & Cilliers, 2017; Mekebo et al., 2022). However, limited digital literacy among CHWs can hinder effective use of these systems, affecting data quality and service efficiency. Strengthening digital competencies among CHWs through training, mentorship, and access to culturally adapted tools is essential to bridging these gaps, enhancing service delivery, and promoting equitable healthcare outcomes across South Africa (Eggum & Aslam, 2024).

Problem statement

Despite the rapid growth of digital health technologies in South Africa, significant gaps persist in their use within CHCs due to varying levels of digital health literacy among CHWs and staff. While systems such as the HPRS, mHealth applications, and disease-specific registers have been implemented, CHWs often face limited access to devices, poor connectivity, low digital skills, and high administrative workloads. These challenges hinder effective service delivery, reduce data quality, and exacerbate health disparities, particularly between urban and rural areas.

Understanding how digital health literacy gaps impact CHW performance is crucial for optimising primary healthcare delivery. This study aims to synthesise existing evidence on the role of CHWs in enhancing digital health literacy and supporting digital health interventions. By identifying strategies to strengthen CHW capacity,

the review seeks to inform policymakers and healthcare stakeholders about targeted investments and interventions that can close the digital divide and improve healthcare equity in South Africa.

Methodology

This study employed a scoping review methodology, which is well-suited for mapping existing literature on broad and emerging topics. Unlike systematic reviews, which focus on synthesising evidence from all published and unpublished studies on a narrowly defined question, a scoping review is designed to identify knowledge gaps, examine how research is conducted, and provide an overview of the current evidence base (Peters et al., 2020). This approach was appropriate given the evolving nature of digital health systems and their impact on CHWs in South Africa.

The review aimed to explore how CHWs contribute to bridging digital health literacy gaps within Community CHCs. A structured search strategy was applied across multiple academic databases, including IEEE Xplore, ScienceDirect, Google Scholar, and Scopus, to ensure comprehensive coverage of relevant literature. Boolean operators and keywords such as “digital health,” “community health workers,” “digital literacy,” and “South Africa” were used to refine the search. A total of 98639 articles were identified and screened using predefined eligibility criteria, as outlined in Table 1.

Table 1. Eligibility Assessment Questions for Inclusion

No	Eligibility assessment question	Response
1	The study is written in English	Include
2	Addressed digital health interventions implemented in South Africa	Include
3	Discussed the role of CHWs in bridging digital health literacy gaps	Include
4	Explored strategies to optimise CHWs’ roles in closing these gaps within CHCs	Include
5	Does the title of the article suggest relevancy to the record?	Include
6	Is the article relevant with reference to the abstract?	Include

The screening process involved a two-step assessment:

Title and abstract screening to exclude non-relevant studies.

Full-text review to evaluate relevance against the research objectives.

Only articles that met the following conditions were included:

This rigorous process ensured that the review focused on high-quality, contextually relevant evidence, enabling a clear understanding of current digital health interventions, challenges, and opportunities for strengthening CHW involvement in digital transformation. The screening process identified a total of 22 articles that were deemed eligible for inclusion in the study, and these are presented in the results section.

Literature Review

This section examines digital health interventions in South Africa, focusing on their implementation at national and provincial levels and their implications for CHWs. It highlights the complexity of digital systems embedded in CHCs and the dual role these tools play in either bridging or widening digital health literacy gaps among CHWs. International case studies also provide comparative insights into how CHWs in other contexts have addressed digital health literacy challenges, offering lessons for optimising South Africa's digital health strategies.

Digital Health Interventions in South Africa (Nationally and Provincially)

Nationally, South Africa has deployed a comprehensive suite of systems across maternal and child health, youth engagement, referrals, disease management, laboratory integration, pharmaceutical supply chains, immunisation campaigns, and health information reporting (Jahan, 2020; Kachimanga et al., 2024; Agency, 2022; Dimagi, 2020). Maternal and youth-focused platforms include MomConnect, delivering SMS-based health information and appointment reminders to pregnant women (Jahan, 2020; Kachimanga et al., 2024), and B-Wise, a youth-centred platform providing sexual and reproductive health, HIV/TB, wellness, and mental health resources (Agency, 2022). For frontline operations, the WBPHCOT mHealth system, built on CommCare, enables CHWs to register households, monitor clients, and manage care, while educational video pilots enhance maternal and child health awareness despite persistent digital health literacy barriers among some CHWs (Dimagi, 2020; Greuel et al., 2023). Referral pathways are strengthened through Vula Mobile, linking CHWs and primary care staff to specialists, reducing patient travel and improving case management (Gloster, Mash & Swartz, 2021; Steyn, Mash & Hendricks, 2022). Campaign-level systems such as the Electronic Vaccination Data System (EVDS, 2021) support client registration and vaccine coverage tracking (Hofisi & Chigova, 2021; Rahmadhan & Handayani, 2023), while the Health Patient Registration System / Patient Master Index (HPRS/PMI, 2021) underpins a “one-patient-one-record” approach (National Department of Health, 2021).

Disease surveillance and management are facilitated by electronic registers such as TIER.Net for HIV and TB monitoring (Murphy et al., 2022; Digital Square, 2022) and EDRWeb for drug-resistant TB (Masuku et al., 2020; Kansiime et al., 2024), with CHWs contributing household and clinic-level data. Laboratory processes are digitised through Labtrak, enabling indirect CHW interaction for timely test requests and results (Mabumbe, 2024). Pharmaceutical management is supported through the Stock Visibility System (SVS, 2014) for medicine tracking (Global Health Supply Chain Program, 2020; VillageReach, 2024), RxSolution for inventory control and dispensing (Management Sciences for Health, 2020; Mash et al., 2022), and CCMDD/SyNCH (2016) for chronic medication enrolment, adherence monitoring, and decentralised distribution (Lewis et al., 2023). At the health information level, District Health Information System 2 (DHIS2) consolidates CHW-collected data for reporting and programme monitoring (Mekebo et al., 2022; Thomas et al., 2025), while the Western Cape Provincial Health Data Centre (PHDC, 2012) integrates patient-level records to support longitudinal care (Boulle et al., 2019).

Table 2. Overview of the provinces in which these systems are implemented within CHCs

Digital Health Intervention	WC	GP	KZN	EC	FS	LP	NW	MP	NC	CHW Interaction
PHDC (Provincial Health Data Centre)	✓	✗	✗	✗	✗	✗	✗	✗	✗	Indirect: CHW data feeds into PHDC via mHealth/other systems
Vula is documented in local workflows	✓	✓	✓	✓	✓	✓	✓	✓	✓	Indirect/Direct: depends on local policy
Patient file digitisation (cloud)	✗	✓	✗	✗	✗	✗	✗	✗	✗	Indirect: CHWs benefit from quicker record retrieval
HIV performance dashboards	✗	✓	✗	✗	✗	✗	✗	✗	✗	Indirect: informs CHW targeting, but no direct use
HPRS large-scale provincial adoption stats	✗	✓	✓	✓	✓	✓	✓	✓	✓	Indirect: same as above for HPRS
Provincial formulary-aligned CCMDD/SyNCH	✓	✓	✓	✓	✓	✓	✓	✓	✓	Indirect: CHWs support patient adherence and collection coordination

As demonstrated in Table 2, the implementation of health data systems in South Africa demonstrates significant variability across provinces. The Western Cape and Gauteng are at the forefront, utilising advanced integration and cloud-based systems to enhance healthcare delivery. In contrast, provinces such as KwaZulu-Natal and the Eastern Cape face considerable connectivity challenges, particularly in rural and underserved areas. The Free State has shown notable progress in the adoption of the HPRS, while most other provinces continue to rely primarily on national platforms. Additionally, CHWs directly or indirectly interact with the systems by fulfilling a wide range of functions, including patient registration and health education. However, their effectiveness is often hindered by challenges such as limited digital health literacy, inadequate training opportunities, and persistent connectivity issues. Digital health tools, such as MomConnect and DHIS2, have proven valuable in enhancing CHW efficiency and service delivery. Nonetheless, the long-term success of these tools relies on sustained institutional support, equitable access to technology, and comprehensive capacity-building initiatives aimed at strengthening the digital health workforce.

South Africa's CHCs have adopted various digital health technologies, with this paper focusing on key systems due to their national relevance and direct use by CHWs. The selected systems, as demonstrated in the table above, serve as essential infrastructures for primary healthcare delivery at the community level, chosen for three main reasons. Firstly, strategic alignment with national health priorities is crucial for South Africa's digital health strategy. These systems support key public health programs, including maternal and child health, HIV/TB management, immunisation, chronic medication distribution, and health data reporting. Their role is vital for meeting national targets, improving disease surveillance, and promoting accountability through data-driven

decision-making. Secondly, CHWs directly interact with mHealth platforms like WPHCOT for household registrations and patient referrals through Vula Mobile, and indirectly through systems like DHIS2 or PHDC. This role makes CHWs crucial for digital health implementation, highlighting the importance of addressing digital health literacy challenges. Thirdly, these platforms span multiple provinces and demonstrate different levels of digital health maturity, from advanced integration in the Western Cape to emerging use in rural areas. This study provides a representative view of the digital landscape while recognising the existence of pilot programs at the facility or district levels. Many digital systems have been developed, but many are context-specific or limited in geographic reach, making them less suitable for national-level analysis. This selection balances practicality and focus, addressing the digital health literacy challenges faced by CHWs while considering South Africa's diverse digital health ecosystem.

International case studies of the Role of Community Health Workers in Bridging Digital Health Literacy Gaps: lessons learned for South Africa International experience shows that CHWs can effectively address digital health literacy gaps and enhance primary healthcare delivery. In Rwanda, the Community Health Worker Digital Platform (RapidSMS) allowed CHWs to track maternal and child health data in real time using basic mobile phones (Hategeka, Ruton & Law, 2019). This program significantly improved health outcomes and reduced maternal mortality, highlighting that structured training enables CHWs to become effective data reporters. In South Africa, this emphasises the importance of mobile-friendly digital training for managing community health data in low-connectivity areas.

In India, Accredited Social Health Activists (ASHA) used mobile apps for maternal health tracking, immunisation reminders, and COVID-19 contact tracing (Charanthimath et al., 2021). Despite challenges like low digital health literacy and infrastructure issues, ongoing peer mentoring and localised interfaces boosted adoption. For South Africa, the key takeaway is the importance of continuous support, mentorship, and cultural adaptation of digital tools to ensure sustained usage. Ethiopia's Health Extension Workers implemented the electronic Community Health Information System (eCHIS), replacing paper registers with tablets for real-time documentation (Bogale et al., 2023). Initial issues included technical breakdowns, internet access problems, and low digital skills. However, improved maintenance support and local troubleshooting teams enhanced performance. This case emphasises the importance of ongoing technical support and decentralised problem-solving to maintain confidence and prevent digital burnout among Community Health Workers in South Africa. In Malawi, smartphone mHealth tools helped CHWs diagnose and manage childhood illnesses in remote areas, using decision-support algorithms and reporting systems (Kachimanga et al., 2024). Initially, older CHWs struggled, especially those with limited education, but pairing them with digitally skilled younger peers improved adoption. This suggests that in South Africa, intergenerational pairing and targeted support for older CHWs can bridge digital health literacy gaps and enhance system uptake.

International experiences show that CHWs can drive digital transformation in primary healthcare when they receive structured training, ongoing technical support, locally adapted tools, and peer learning. Applying these insights can enhance CHWs' abilities in South Africa, bridge digital health literacy gaps, and improve

efficiency, accuracy, and equity in community health services.

Results

To summarise the roles of CHWs in addressing digital health challenges in South Africa, Table 3 outlines the main obstacles faced in key digital health systems, the strategies employed by CHWs to overcome these challenges, and recommendations for enhancing their effectiveness. The table emphasises CHWs as frontline implementers and problem-solvers, ensuring continuity of care, data integrity, and effective service delivery despite limitations in technology, infrastructure, and workflows.

Table 3. Challenges of digital health literacy and the recommended solutions

Digital Health Systems Affected	Current CHW Mitigation	Recommendations to Fully Eliminate the Challenge Using CHWs	Authors
Challenge			
Limited digital literacy, especially among older CHWs	WBPHCOT mHealth, educational video pilots, Vula Mobile, TIER.Net, EDRWeb	Participate in training, peer mentoring, on-the-job learning, and intergenerational support (pairing with younger tech-savvy CHWs)	Implement continuous structured digital health literacy programs; integrate mentorship schemes; use simplified, mobile-friendly interfaces and culturally adapted tools (Dimagi, 2020), (Greuel et al., 2023), (Kachimanga et al., 2024), (Schneider et al. (2021)
Connectivity and network issues	MomConnect, B-Wise, WBPHCOT mHealth, EVDS, HPRS/PMI	Use offline functionality, SMS-based reporting, or paper backups; plan visits around connectivity availability	Advocate for offline-capable tools, expand local network infrastructure, provide data subsidies or portable hotspots, and establish community-based troubleshooting support (Jahan, 2020), (Agency, 2022), (Hofisi & Chigova, 2021), (NDoH, 2021)
System complexity and usability	HPRS/PMI, TIER.Net, EDRWeb, Labtrak, DHIS2	Support peers in navigation, translate outputs into actionable tasks, provide feedback to supervisors, share informal troubleshooting strategies	Involve CHWs in system design and usability testing; simplify interfaces; provide ongoing refresher training and real-time helpdesk support (Murphy et al., 2022), (Masuku et al., 2020), (Mabumbe, 2024), (GHSC,2020).
High administrative workload and multiple reporting	DHIS2, EVDS, SVS, RxSolution, CCMD/SYNCH	Prioritise critical tasks, combine service delivery with reporting, streamline household visit workflows	Integrate systems to reduce duplication; automate routine reporting; assign dedicated CHW roles for data management; balance workloads through staffing (Lewis et al., 2023), (Thomas et al., 2025), (Hofisi & Chigova, 2021)

Digital Health Systems Affected Challenge	Current CHW Mitigation	Recommendations to Fully Eliminate the Challenge Using CHWs	Authors
requirements		adjustments	
Data accuracy HPRS/PMI, and TIER.Net, EVDS, completeness DHIS2 issues	Verify patient information during visits, cross-check records, follow up with clients, escalate complex cases	Standardise data entry protocols; implement supervisory audits; use real-time feedback and validation within digital tools; incentivise accurate reporting	(Boulle et al., 2019), (Thomas et al., 2025), (Kirk et al., 2020)
Patient or peer resistance to digital adoption	MomConnect, B-Wise, WBPHCOT mHealth	Act as advocates and role models, educate clients and colleagues, assist with registration and system use	Conduct structured community engagement campaigns; provide incentives for adoption; co-create culturally relevant content; ensure CHWs are trained to support behavioural change
Technical breakdowns or system downtime	EVDS, HPRS/PMI, Vula Mobile, TIER.Net, EDRWeb	Maintain paper backups, report issues, provide temporary workarounds to continue services	Train CHWs in basic troubleshooting; establish rapid-response IT support; schedule regular maintenance; integrate contingency workflows to maintain service continuity
			(Kansiime et al., 2024), (Rahmadhan & Handayani, 2023)

The table highlights evidence from various digital health initiatives in South Africa, such as MomConnect and TIER.Net, emphasising the crucial role of CHWs in direct tasks (like patient monitoring) and indirect contributions (like data reporting). By documenting current strategies and recommendations, it offers a framework to optimise CHW engagement, enhance digital health literacy, and improve the effectiveness of primary healthcare digital interventions.

Discussion

This scoping review emphasises the vital role of CHWs in improving digital health literacy within South Africa's CHCs. While CHWs engage with various digital health tools like WBPHCOT mHealth and MomConnect, they face significant challenges such as limited digital literacy, poor connectivity, complex systems, heavy workloads, and technical issues. If these obstacles remain unresolved, they could undermine primary healthcare delivery and the quality of health data needed for informed decision-making. CHWs actively engage with digital tools, using peer mentoring and support to overcome operational challenges. Case studies from Rwanda, India, Ethiopia, and Malawi highlight the importance of structured training, culturally adapted tools, mentorship, and ongoing technical support for successful digital adoption. These insights are especially relevant to rural and underserved areas of South Africa, where digital infrastructure is inconsistent.

This review highlights a gap in integrating CHWs into the design and evaluation of digital health interventions. While essential for implementation, their insights are often overlooked, limiting the relevance and usability of digital solutions. Enhancing CHWs' digital health literacy skills can improve technology uptake, patient engagement, data quality, and overall health service efficiency. The findings emphasise that CHWs can promote health equity by providing tailored digital health literacy support to vulnerable populations. This helps reduce disparities caused by socioeconomic and infrastructural inequalities, positioning CHWs as key players in achieving South Africa's digital health strategy goals of enhanced service delivery, disease surveillance, and health outcomes.

Conclusion

Effectively addressing digital health literacy gaps among CHWs requires strategies that are tailored to account for factors such as age, geographic location, resource availability, and mental health. This must be complemented by simplified, user-friendly technology, continuous and context-sensitive training, on-the-job support, and strong organisational reinforcement. Implementing these measures enables CHWs to engage confidently and efficiently with digital health interventions, ensuring both high-quality service delivery and the integrity of health data. South Africa must recognise the critical role of CHWs and leverage evidence-based solutions and lessons from international experiences to empower this workforce. Doing so will not only strengthen the sustainability of digital health interventions but also enhance healthcare delivery, bridge the digital health literacy gap, and generate lasting impact for communities across the country.

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