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Review Article

# Digital Support as an Innovative Strategy for HIV Self-Testing and Counselling: A Systematic Review

**Bukhari Abubakar Adam**[1, 2, *], **Auwal Idris Kabuga**[3, 4]

[1]Institute of Public Health, University of Porto, Porto, Portugal

[2]Department of Public Health, Faculty of Medicine, Firat University, Elazığ, Turkey

[3]Department of Medical Microbiology, Aminu Kano Teaching Hospital, Kano, Nigeria

[4]Department of Medical Microbiology and Parasitology, Bayero University Kano, Kano, Nigeria

## Abstract

*Background:* HIV remains a major global public health challenge, and sub-Saharan Africa carries a disproportionate share of the burden. HIV self-testing (HIVST) has emerged as an important strategy to expand access to testing, and digital technologies such as websites, mobile applications, social media, telehealth and SMS platforms increasingly support HIVST and counselling. *Objectives:* To evaluate the acceptability, feasibility, testing uptake, linkage to care, and behavioural outcomes of digital support interventions for HIVST and counselling. *Methods:* A systematic review following PRISMA 2020 guidelines searched PubMed/MEDLINE, Scopus, Web of Science, Embase, CINAHL, Academic Search Premier and the Cochrane Library, supplemented by WHO and UNAIDS grey literature, for studies published January 2010-December 2025. Eligible studies evaluated digital interventions supporting HIVST and counselling and reported quantitative outcomes. Methodological quality was assessed using the Cochrane Risk of Bias Tool and Newcastle-Ottawa Scale. Findings were synthesised narratively due to heterogeneity. *Results:* Of 120 records identified, 32 studies were included. Website-based interventions were most common; willingness to use ranged from 61-79% and ease of use exceeded 90%. Kit return rates ranged 55-98% and linkage to care 53-100%. Social media and mobile application interventions achieved satisfaction above 90% and increased uptake among first-time testers, with linkage to confirmatory testing and treatment reaching 80-100% among reactive individuals. *Conclusions:* Digital support interventions are acceptable, feasible and effective in strengthening HIVST and counselling, particularly among key populations. Addressing digital literacy, connectivity and data-security barriers, and integrating digital tools with existing health systems, will be important for sustaining progress toward the UNAIDS 95-95-95 targets.

## Keywords

HIV Self-testing, Digital Health, Telehealth, Counselling, Linkage to Care, Systematic Review

## 1. Introduction

Human immunodeficiency virus (HIV) remains one of the most significant public health challenges worldwide, with sub-Saharan Africa bearing the greatest share of the burden. UNAIDS estimated that approximately 39.9 million people

*Correspondence: Bukhari Abubakar Adam (comr_bukhari@yahoo.com)

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were living with HIV globally in 2024, and persistent disparities in access to prevention and treatment continue to threaten the achievement of global HIV targets [1]. The World Health Organization (WHO) and UNAIDS have intensified efforts toward the 95-95-95 targets, yet gaps in testing uptake, stigma, limited healthcare access, and socioeconomic inequality continue to hinder progress, particularly among key and vulnerable populations [1, 2].

HIV self-testing (HIVST) has emerged as a person-centred approach that complements facility-based testing by offering a convenient, confidential and accessible means of determining HIV status, thereby increasing uptake among populations reluctant to test in conventional settings. WHO guidelines now emphasise integrating HIVST into national HIV programmes to expand testing coverage and improve early diagnosis [2].

The COVID-19 pandemic accelerated adoption of digital health technologies and underscored the value of remote healthcare delivery in maintaining continuity of HIV prevention and testing services during disruptions to in-person care [3]. Consequently, mobile applications, websites, telehealth services, social media platforms, chatbots and SMS interventions have become increasingly important in supporting HIVST and counselling [1, 3]. These digital tools can enhance HIVST by providing real-time instructions, pre- and post-test counselling, linkage to care, and behavioural support, while improving user engagement, privacy and convenience [2].

Digital health interventions apply information and communication technologies to promote healthy behaviours, expand access to care and enhance outcomes; advances in mobile technology, connectivity and artificial intelligence have accelerated their global adoption [3, 4]. Within HIV prevention specifically, such platforms have been increasingly integrated into HIVST programmes to deliver educational material, result-interpretation guidance and linkage to confirmatory testing, particularly among key populations who may be reluctant to attend conventional facilities [2]. However, these advances also raise concerns about data security, confidentiality, ethical considerations and equitable access to technology [3].

Given the rapidly expanding evidence base and the heterogeneity of digital modalities being tested, a systematic synthesis is needed. This review aimed to evaluate the role and effectiveness of digital support interventions in enhancing HIV self-testing and counselling, with emphasis on acceptability, feasibility, testing uptake, linkage to care, and behavioural outcomes.

# 2. Methods

## 2.1. Study Design

This systematic review synthesised available evidence on digital support interventions for HIVST and counselling, conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines [4].

## 2.2. Search Strategy

A comprehensive search was conducted across PubMed/MEDLINE, Scopus, Web of Science, Embase, CINAHL, Academic Search Premier and the Cochrane Library, supplemented by manual searches of reference lists and grey literature from WHO, UNAIDS and national public health agencies. The search covered studies published between January 2010 and December 2025, combining Boolean operators with terms including “HIV self-testing,” “HIVST,” “digital health,” “mobile health,” “mHealth,” “eHealth,” “telehealth,” “online counseling,” “digital intervention” and “linkage to care,” adapted to each database’s indexing requirements.

## 2.3. Eligibility Criteria

Studies were included if they evaluated a digital technology (mobile application, website, social media platform, chatbot, telehealth system, SMS service or similar) supporting HIVST and/or counselling; reported quantitative outcomes on uptake, acceptability, feasibility, linkage to care, counselling outcomes or behavioural change; used a randomised, quasi-experimental, cohort, cross-sectional or other observational design; and were published in English. Studies were excluded if HIV self-testing was not a major intervention component, if digital tools were used only for recruitment rather than delivery, if only qualitative outcomes were reported, or if they were reviews, editorials, commentaries, conference abstracts, protocols or modelling studies.

## 2.4. Study Selection and Data Extraction

Records were imported into reference-management software and screened for duplicates. Titles and abstracts were screened against the eligibility criteria, followed by full-text review of potentially eligible articles; disagreements were resolved by discussion and consensus. A standardised extraction form captured author/year, country and setting, design, participant characteristics, intervention type, HIVST modality, counselling approach, outcome measures, and main findings.

## 2.5. Quality Assessment

Randomised controlled trials were appraised with the Cochrane Risk of Bias Tool; observational studies were appraised with the Newcastle-Ottawa Scale, and studies were categorised as low, moderate or high risk of bias.

## 2.6. Data Synthesis

Given heterogeneity in interventions, populations and outcome measures, findings were synthesised narratively and organised by type of digital intervention and by outcome domain

(acceptability, feasibility, uptake, linkage to care, and counselling effectiveness).

### 2.7. Ethical Considerations

As this review synthesised previously published, de-identified data, institutional ethical approval was not required.

## 3. Results

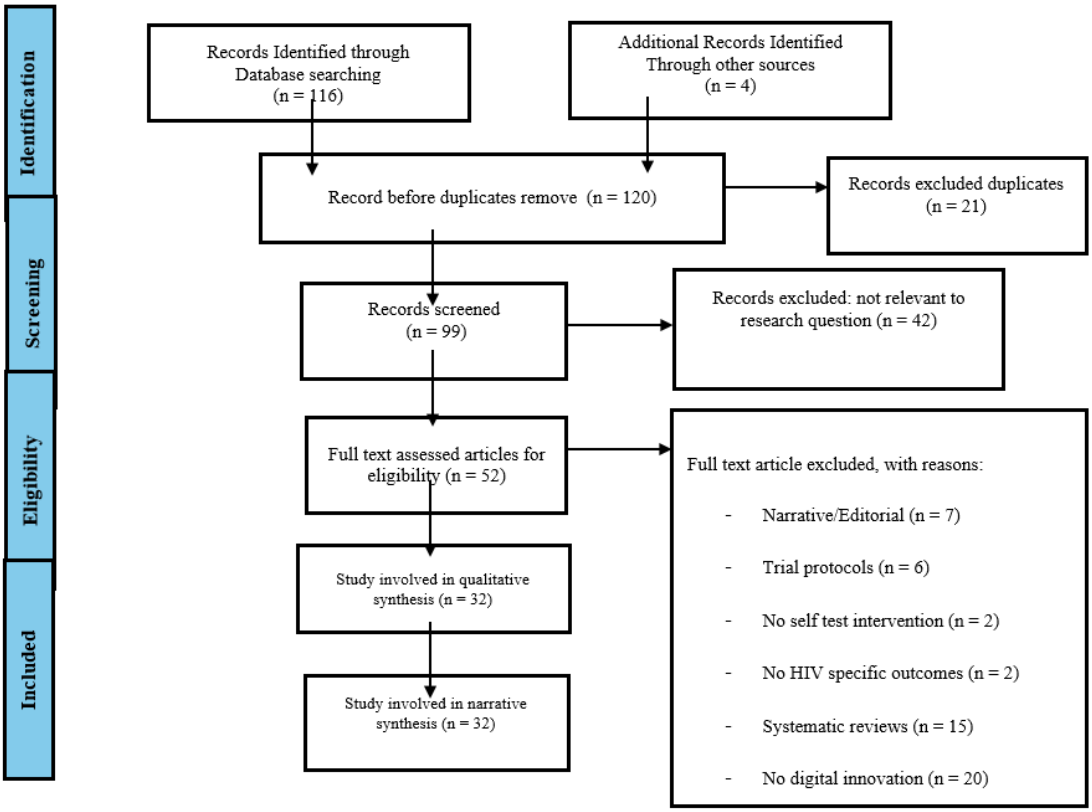



***Figure 1.*** *Study selection. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram.*

### 3.1. Study Selection

A total of 120 records were identified (113 through database searching and 7 from grey literature/other sources). After removal of duplicates, 99 records underwent title/abstract screening; 52 full-text articles were assessed for eligibility, and 32 studies met the inclusion criteria and were retained for narrative synthesis (Figure 1). Studies excluded at full-text review were mainly reviews, editorials, trial protocols, or studies lacking an HIVST component or a digital intervention.

### 3.2. Characteristics of Included Studies

Included studies spanned diverse regions and populations (Table 1). Asia contributed the largest share of studies (37%), followed by North America (28%), Europe (24%), Africa (7%) and South America (4%). Observational designs predominated (72%), while randomised controlled trials accounted for 28%. Men who have sex with men (MSM) were the predominant study population (83%); other populations included ethnic minorities, transgender youth, female sex workers, male truck drivers, and users of online sexual-health services.

### 3.3. Digital Modalities

Website-based interventions were the most frequently evaluated approach, accounting for more than half of included studies, and incorporated online ordering systems, result-reporting platforms, video-based counselling, chatbot-assisted communication and linkage-to-care mechanisms. Social media and mobile-application-based interventions accounted for approximately one-third of studies and used established networking platforms to promote HIVST and increase engagement among populations at elevated HIV risk. The remaining studies evaluated SMS technologies and digital vending machines.

### 3.3.1. Website-based Interventions

Website-based interventions showed consistently high acceptability: willingness to use ranged from 61% to 79%, and ease of use exceeded 90% in several studies, particularly among MSM, transgender women and first-time testers [6-8]. Randomised evidence indicated that home-based HIVST combined with online counselling and real-time support significantly increased testing uptake compared with conventional promotion alone [9]. Newly diagnosed HIV infections ranged from approximately 1.9% to 2.2%; kit return rates ranged from 55% to 98%; and linkage-to-care outcomes (confirmatory testing, referral, post-test counselling, and treatment initiation) ranged from 53% to 100% [5, 6, 10]. Some studies reported difficulty maintaining continuity of care among individuals with reactive results who relied solely on online platforms [10].

### 3.3.2. Social Media and Mobile-application Interventions

These interventions achieved satisfaction rates above 90% in several studies, with participants citing privacy, convenience and anonymity as key advantages [11, 12]. Digitally supported approaches reached substantial numbers of first-time testers (9-51% of participants), and newly diagnosed HIV infections ranged from 4% to 11% [12, 13].

Linkage to confirmatory testing and treatment initiation reached 80-100% among individuals with reactive results, and secondary-distribution strategies delivered through social media achieved favourable kit-return and linkage-to-care outcomes [14, 15].

***Table 1.*** *Characteristics of included studies (n = 32).*

| Characteristic | Category | Proportion |
|---|---|---|
| Region | Asia | 37% |
| | North America | 28% |
| | Europe | 24% |
| | Africa | 7% |
| | South America | 4% |
| Study design | Observational | 72% |
| | Randomised controlled trial | 28% |
| Predominant population | Men who have sex with men | 83% |
| | Other key/underserved populations | 17% |
| Digital modality | Website-based | >50% |
| | Social media / mobile application | ~33% |
| | SMS and digital vending machines | Remainder |

## 4. Discussion

This systematic review indicates that digital support interventions — web-based platforms, mobile applications, social media interventions, SMS technologies, telehealth systems, and digital vending machines — are increasingly important for enhancing HIV self-testing and counselling across diverse populations and settings. These findings are consistent with recent evidence that digital health technologies can play a central role in achieving global HIV prevention and treatment targets [1, 2].

The consistently high acceptability observed across included studies suggests that digitally supported HIVST is well received, particularly among key populations such as MSM and transgender individuals, and among people experiencing stigma or limited access to conventional services. Privacy, convenience, anonymity and flexibility were repeatedly identified as major advantages, echoing prior evidence that digital platforms can reduce stigma-related barriers and increase uptake among underserved populations [2].

Website-based interventions — including online counselling, virtual support and chatbot-assisted platforms — showed favourable outcomes for testing uptake and linkage to care. Integrating digital counselling with HIVST gives users imme-

diate access to information and support while promoting continuity of care after a reactive result. However, several studies reported lower linkage-to-care rates among individuals relying exclusively on online services, underscoring the importance of pairing digital interventions with existing healthcare infrastructure [10]. Hybrid models that combine digital support with facility-based services may therefore offer a more sustainable approach to HIVST-linked care [16, 17].

Social media platforms and mobile applications were also effective for reaching hard-to-reach populations, enabling targeted health communication, peer engagement and community-based delivery, including direct kit distribution and remote counselling. This is consistent with evidence that digital platforms can substantially increase uptake among first-time testers and populations with historically low healthcare utilisation [5].

The COVID-19 pandemic accelerated adoption of digital healthcare solutions and demonstrated the value of remote service delivery for maintaining continuity of HIV prevention and treatment during disruptions to routine care [3]. Many countries have since continued integrating digital technologies into HIV programmes as part of broader efforts to strengthen health-system resilience.

Counselling remains essential to HIV prevention and risk reduction. Behavioural approaches such as motivational interviewing, client-centred counselling, and information-motivation-behavioural-skills models have demonstrated effectiveness in promoting safer sexual behaviour and improving treatment adherence [18-20]. Embedding these approaches within digital platforms, informed by established frameworks for developing and evaluating digital behaviour-change interventions, offers a promising avenue for expanding access to counselling while preserving confidentiality and convenience [20, 21].

Several challenges temper these promising findings. Confidentiality, cybersecurity, digital literacy, internet access, and inequities in technology access may limit effectiveness, particularly in low-resource settings. The predominance of observational designs among included studies limits causal inference, and heterogeneity in intervention design, outcome measures and populations complicated direct comparison across studies.

### 4.1. Strengths and Limitations

This review synthesised evidence across diverse regions and populations and followed PRISMA 2020 methodology, enhancing transparency and reproducibility; it also captured a broad range of digital modalities relevant to policymakers and programme managers. Limitations include restriction to English-language publications, which may have introduced language bias and excluded relevant non-English evidence, notably from African and other low- and middle-income settings; the exclusion of qualitative studies, which limited insight into user experience and contextual barriers; the predominance of observational designs, which are susceptible to selection bias and confounding; and substantial heterogeneity that precluded meta-analysis, so findings were synthesised narratively.

### 4.2. Implications

These findings support integrating digital support technologies into HIV self-testing and counselling programmes, particularly through hybrid models that connect digital tools with facility-based services. Equitable implementation requires attention to infrastructure, privacy, cybersecurity, data protection, and digital literacy.

## 5. Conclusion

Digital support interventions are acceptable, feasible, and effective tools for strengthening HIV self-testing and counselling, improving accessibility, confidentiality, testing uptake and linkage to care, particularly among key populations. Addressing barriers related to digital literacy, connectivity, and equitable technology access, and integrating digital innovations with existing health systems, will be important for sustaining progress toward the UNAIDS 95-95-95 targets and the goal of ending HIV/AIDS as a public health threat by 2030.

## 6. Recommendations

Governments and health systems should consider integrating digital support technologies into national HIVST and counselling programmes, expanding mobile, web-based, telehealth and social-media interventions to reach underserved populations, and prioritising hybrid models that pair digital tools with facility-based linkage to strengthen continuity of care. Investment in digital infrastructure, cybersecurity, data protection and digital-literacy initiatives will be important for equitable scale-up, particularly in low-resource settings such as sub-Saharan Africa, where the included evidence base remains comparatively thin. Future research should prioritise robust randomised designs, mixed-methods approaches that capture user experience, and evaluation of long-term effectiveness, cost-effectiveness and sustainability across diverse healthcare settings.

## Abbreviations

| | |
|---|---|
| HIV | Human Immunodeficiency Virus |
| AIDS | Acquired Immunodeficiency Syndrome |
| HIVST | HIV Self-testing |
| PRISMA | Preferred Reporting Items for Systematic Reviews and Meta-Analyses |
| MSM | Men Who Have Sex with Men |
| mHealth | Mobile Health |
| eHealth | Electronic Health |
| SMS | Short Message Service |

| | |
|---|---|
| WHO | World Health Organization |
| UNAIDS | Joint United Nations Programme on HIV/AIDS |
| CINAHL | Cumulative Index to Nursing and Allied Health Literature |

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## Author Contributions

**Bukhari Abubakar Adam:** Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing

**Auwal Idris Kabuga:** Resources, Supervision, Validation, Writing – review & editing

## Conflicts of Interest

The authors declares no conflicts of interest.

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