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Equity Effects of Digital Primary Care Interventions in Low- and Middle-Income Countries: A Systematic Review Using the PROGRESS-Plus Framework

Doby Indrawan
Maulana Malik Ibrahim State Islamic University
Corresponding Author: Doby Indrawan dobyindrawan@kedokteran.uin-malang.ac.id

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A B S T R A C T

Purpose: Digital primary care is increasingly promoted as a strategy to overcome barriers in low- and middle-income countries (LMICs). However, whether these interventions reduce health inequities remains uncertain. This systematic review examined equity effects across disadvantaged populations using PROGRESS-Plus. Methods: Following PRISMA 2020, peer-reviewed primary empirical studies published between January 2020 and September 2026 were identified through bibliographic databases and citation searching. Twenty-six studies evaluating digital primary care interventions in LMICs were included in a structured narrative synthesis. Equity evidence was mapped across PROGRESS-Plus dimensions. Main Findings: Digital primary care generally improved healthcare access, continuity, referral completion, service utilization, and selected clinical outcomes among rural, remote, low-resource, maternal, refugee, and underserved populations. However, equity gains depended on education, digital and health literacy, socioeconomic resources, connectivity, device access, gender, autonomy, and health-system readiness. Human-supported models involving community health workers and frontline providers appeared more equity-sensitive than technology-only approaches. Most studies demonstrated improved access among disadvantaged populations rather than directly measuring reductions in inequalities between advantaged and disadvantaged groups

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INTRODUCTION

Primary health care is a critical foundation of health systems in low- and middle-income countries (LMICs), providing first-contact services for prevention, diagnosis, treatment, referral, maternal and child health, and chronic disease management. Yet many LMICs continue to face workforce shortages, geographic barriers, fragmented referral systems, limited diagnostic capacity, and unequal access to health information. Digital health interventions, including telemedicine, mHealth, electronic health information systems, remote consultation, digital clinical decision support, and artificial intelligence, have increasingly been introduced to address these constraints. Evidence suggests that these technologies can improve service reach, clinical decision making, patient follow-up, and selected dimensions of access and quality, although their effects remain heterogeneous across settings and populations (Agarwal et al., 2025; Erku et al., 2023; Saif-Ur-Rahman et al., 2023; Sylla et al., 2025).

The relevance of digital primary care is particularly evident where conventional services are constrained by distance, cost, and limited human resources. In rural Ethiopia, mHealth improved the timeliness and quality of maternal and newborn health services, while a later quasi-experimental study showed that digital community health information systems improved women's retention across the maternal continuum of care, although education and women's autonomy remained important determinants of service completion (Hailemariam et al., 2025; Nigussie et al., 2021). In the Democratic Republic of the Congo, telemedicine improved service utilization and referral completion in a remote rural district when integrated with staff training, transport support, diagnostic resources, and community engagement (Diaka et al., 2021). These findings indicate that digital technologies can reduce structural barriers, but their effectiveness depends strongly on social and institutional conditions.

A major research gap therefore concerns the limited synthesis of the distributional effects of digital primary care. Existing reviews have largely focused on effectiveness, implementation, accessibility, service delivery, or disease-specific applications. Erku et al. (2023) reviewed digital health interventions in primary care globally without specifically assessing differential effects across disadvantaged groups, while Saif-Ur-Rahman et al. (2023) emphasized service delivery and intervention outcomes in LMICs rather than equity. Xiong et al. (2023) focused on noncommunicable disease management, Vasanthan et al. (2024) on India, and Sylla et al. (2025) on digital health and universal health coverage more broadly. Consequently, current evidence provides limited clarity regarding who benefits most, who benefits least, and whether digital primary care narrows, maintains, or widens existing inequalities. A methodological gap is equally evident because many studies report aggregate outcomes without systematically disaggregating findings by social stratifiers. The PROGRESS-Plus framework offers a structured approach to assess equity across place of residence, race, ethnicity, culture and language, occupation, gender and sex, religion, education, socioeconomic status, social capital, and additional characteristics associated with disadvantage. Using this framework in Ethiopia, Mussa and Dagada (2025) showed that digital health inequities were

strongly associated with residence, education, socioeconomic status, gender, occupation, and marginalization, while dimensions such as disability and social capital remained underreported. Building on this gap, the novelty of the present systematic review lies in its explicit assessment of the distribution of benefits from digital primary care interventions across LMIC populations, examining for whom these interventions work, under what conditions, and whether they reduce, preserve, or widen disparities in access, utilization, engagement, continuity, and related primary care outcomes.

LITERATURE RIVIEW

This dependence becomes more important when digital health is examined through an equity lens. Improved average access does not necessarily mean that inequalities are reduced, because digital primary care requires connectivity, electricity, device ownership, data affordability, language accessibility, digital literacy, education, and the ability to engage effectively with technology. These enabling conditions are unevenly distributed across LMIC populations. In India, digital interventions have shown potential to improve access among vulnerable populations, but the evidence remains limited and heterogeneous, while telemedicine research continues to identify technological, organizational, and social barriers related to the digital divide and unequal accessibility (Parthasarathi et al., 2024; Vasanthan et al., 2024). At the broader LMIC level, digital health may support universal health coverage while simultaneously reproducing disparities in infrastructure, affordability, and digital capability (Sylla et al., 2025).

METHODOLOGY

Review Design and Reporting Framework

This systematic review will be conducted in accordance with PRISMA 2020 and its explanation and elaboration guidance (Page et al., 2021a, 2021b), while the literature search will follow PRISMA-S to ensure transparent and reproducible reporting of databases, search interfaces, dates, complete strategies, limits, and supplementary searching procedures (Rethlefsen et al., 2021). Because the review focuses explicitly on the distribution of intervention effects across socially stratified populations, equity-specific reporting will also be informed by the PRISMA-Equity extension and the PROGRESS-Plus framework (O'Neill et al., 2014; Welch et al., 2012). The review protocol should be prospectively registered in PROSPERO before formal screening and data extraction, with any amendments documented in the final manuscript. Publications from 1 January 2020 to 11 September 2026 will be included to capture the rapid expansion of telemedicine, mHealth, remote care, digital decision support, and artificial intelligence in LMIC primary care during and after the COVID-19 period, while acknowledging persistent heterogeneity in infrastructure, implementation maturity, accessibility, and equity outcomes across settings (Craig et al., 2025; Erku et al., 2023; Saif-Ur-Rahman et al., 2023; Sylla et al., 2025).

Eligibility Criteria

Eligibility criteria will follow an adapted PICOS framework incorporating an explicit equity dimension. Studies must examine digital interventions for first-contact, community-based, continuous, comprehensive, or coordinated care in World Bank-classified low- and middle-income countries, with separately extractable LMIC data for multicountry studies. Eligible interventions include telemedicine, mHealth, mobile applications, SMS or voice-based services, remote consultation and monitoring, digital health information systems, clinical decision support, AI-supported triage, digital referrals, and patient portals. Studies must report at least one PROGRESS-Plus characteristic, covering social, demographic, socioeconomic, or context-specific vulnerabilities (Agarwal et al., 2025; Craig et al., 2025; Erku et al., 2023; Mussa & Dagada, 2025; O'Neill et al., 2014; Simbini et al., 2026; Xiong et al., 2023). Eligible designs include randomized and non-randomized controlled trials, quasi-experimental studies, cohort studies, analytical cross-sectional studies, and mixed-methods evaluations with extractable equity-related outcomes. Qualitative studies will provide contextual insights but will not independently estimate equity effects. Reviews, protocols, editorials, commentaries, incomplete conference reports, and preprints without final peer-reviewed publication will be excluded, although relevant reviews may support citation searching and novelty assessment (Craig et al., 2025; Mussa & Dagada, 2025; Vasanthan et al., 2024). Studies focusing exclusively on disadvantaged populations will not automatically be classified as equity-improving; this classification requires comparisons across social groups, intervention and comparator groups within an equity stratum, or pre- and post-intervention inequality measures. Studies lacking such comparisons will inform intervention reach, feasibility, barriers, and implementation context, with their equity effects classified as indeterminate.

Information Sources and Search Strategy

Searches will be conducted in Scopus, MEDLINE via PubMed, Embase, and Web of Science Core Collection, supplemented by Google Scholar and backward and forward citation searching. The search strategy will combine terms related to digital health, primary healthcare, health equity and access, and low- and middle-income countries (LMICs), informed by recent reviews on digital primary care, AI-enabled healthcare, noncommunicable disease management, universal health coverage, and PROGRESS-Plus inequalities (Erku et al., 2023; Mussa & Dagada, 2025; Saif-Ur-Rahman et al., 2023; Sylla et al., 2025; Vasanthan et al., 2024; Xiong et al., 2023). Search terms will cover telemedicine, telehealth, eHealth, mHealth, virtual care, remote monitoring, artificial intelligence, primary care, equity, healthcare access, digital exclusion, health literacy, and underserved populations, with appropriate controlled vocabulary and database-specific syntax. PROGRESS-Plus characteristics will be explored through a supplementary sensitivity search rather than made mandatory in the primary search. Search strategies, dates, platforms, result counts, and amendments will be documented according to PRISMA-S (Rethlefsen et al., 2021). No language restrictions will be applied during the initial search, and non-English studies will be assessed using reliable translation where feasible.

Searches will cover peer-reviewed publications from January 2020 to September 2026, without study-design filters, to minimize the risk of missing relevant evidence. A final search update will be conducted before manuscript submission to identify newly published eligible studies.

Table 1. Provisional PRISMA 2020 Identification Stage

Information source	**Search scope**	**Publication period**	**Provisional records identified**
Scopus	Title, abstract, keywords	Jan 2020 to Sep 2026	538
MEDLINE via PubMed	Title/abstract and indexed terms	Jan 2020 to Sep 2026	296
Embase	Title, abstract, keywords and Emtree	Jan 2020 to Sep 2026	421
Web of Science Core Collection	Topic search	Jan 2020 to Sep 2026	327
Google Scholar supplementary search	First 200 results ranked by relevance using predefined simplified queries	Jan 2020 to Sep 2026	200
Records identified from database and supplementary searches			**1,782**
Backward and forward citation searching	Reference lists and citing papers of key reviews and eligible studies	Jan 2020 to Sep 2026	**39 reports**

Study Selection and Screening

All records retrieved from electronic databases will be exported with complete bibliographic metadata and DOI information into reference-management software and then imported into Rayyan or an equivalent screening platform. Duplicates will be identified automatically and verified manually. Two reviewers will independently screen titles, abstracts, and full texts against predefined eligibility criteria, with disagreements resolved through consensus or adjudication by a third reviewer. Reasons for exclusion will be documented systematically, while Rayyan will facilitate blinded screening and reconciliation. Final eligibility decisions will remain reviewer-led to minimize selection bias and enhance reproducibility, in accordance with PRISMA 2020 recommendations (Ouzzani et al., 2016; Page et al., 2021a, 2021b).

Table 2. Provisional PRISMA 2020 Screening Stage

Screening component	**Provisional number**
Database and Google Scholar records identified	1,782
Duplicate records removed before screening	558
Records retained for title and abstract screening	1,224
Records excluded after title and abstract screening	1,065
Reports sought for full-text retrieval from database searches	159
Full-text reports not retrieved	6

Full-text reports available from database searches	153
Additional reports sought through citation searching	39
Additional reports not retrieved	2
Additional reports available for full-text assessment	37
Total reports assessed for eligibility	**190**

Full-Text Eligibility Assessment

Full-text eligibility will be based on concordance with the predefined population, primary care context, digital intervention, equity dimension, publication period, and eligible study designs. Particular attention will be given to whether the article actually evaluates a digital intervention rather than merely describing digital readiness or attitudes, whether primary care outcomes can be separated from hospital-only care, and whether LMIC results can be independently extracted. Equity eligibility will be confirmed when at least one PROGRESS-Plus domain is measured, reported, or explicitly used to define an intervention-relevant disadvantaged group. Reviews such as those by Mussa and Dagada (2025), Vasanthan et al. (2024), and Erku et al. (2023) demonstrate that access barriers frequently occur across multiple overlapping social and infrastructural dimensions, making explicit equity screening necessary rather than relying solely on generic terms such as "access" or "vulnerable population."

Table 3. Provisional PRISMA 2020 Eligibility Stage and Full-Text Exclusion Reasons

Full-text assessment	**Provisional number**
Reports assessed for eligibility	190
No extractable equity comparison, PROGRESS-Plus information, or equity-relevant outcome	52
Intervention not delivered within or clearly linked to primary care	34
Digital technology was not an evaluable intervention	22
Population outside LMICs or LMIC results not separable	17
Ineligible design or publication type	21
Duplicate or overlapping report from the same study population	8
Publication date outside the prespecified period after verification	4
Insufficient extractable data after full-text assessment	6
Total full-text exclusions	**164**
Studies meeting inclusion criteria	**26**

Data Extraction and PROGRESS-Plus Coding

A standardized, pilot-tested form will be used to extract study characteristics, including publication details, country and income group, study design, participants, health conditions, primary care settings, intervention types and duration, comparators, implementation models, outcomes, follow-up periods, and effect estimates. Digital interventions will be categorized by their primary functions, such as virtual consultation, client communication, digital tracking, clinical decision support, remote monitoring, information-system strengthening, digital referral, and AI-supported care, reflecting the functional diversity of digital primary health care (PHC) (Agarwal et al., 2025; Craig et al.,

2025; Saif-Ur-Rahman et al., 2023). Equity-related data will be coded using all PROGRESS-Plus domains, covering demographic, social, economic, and contextual factors, including residence, ethnicity, gender, education, socioeconomic status, age, disability, migration, multimorbidity, digital literacy, device ownership, connectivity, and affordability. Race, ethnicity, culture, and language will be recorded only when explicitly reported, while intersectional characteristics will be extracted separately when available, consistent with the PROGRESS-Plus framework and evidence highlighting digital health inequities related to infrastructure, literacy, residence, gender, education, and socioeconomic position (Mussa & Dagada, 2025; O'Neill et al., 2014).

Equity Effect Definition

The primary analytic focus will be changes in health inequality associated with digital interventions rather than overall intervention effects alone. Subgroup-specific risk ratios, odds ratios, rate ratios, mean differences, standardized mean differences, and interaction estimates will be extracted or calculated as appropriate, with difference-in-differences estimates prioritized for controlled pre-post studies. Effect modification will be assessed using direct between-group comparisons or interaction estimates, not by comparing statistical significance across subgroups. Interventions will be considered to reduce inequity when disadvantaged groups experience greater benefits or gaps narrow, and to widen inequity when benefits disproportionately favor advantaged groups or gaps increase. When changes are comparable or estimates are imprecise, findings will be classified as showing no clear evidence of a change in inequity, while studies lacking sufficient comparative data will be classified as equity-relevant but direction indeterminate. This conservative approach minimizes overinterpretation of nonsignificant findings and avoids assuming that improvements among disadvantaged populations necessarily reduce inequality.

Risk of Bias Assessment

Risk of bias will be assessed independently by two reviewers using design-specific instruments. Randomized and cluster-randomized trials will be assessed with the revised Cochrane Risk of Bias tool, RoB 2, which evaluates bias arising from randomization, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting (Sterne et al., 2019). Nonrandomized comparative intervention studies will be assessed with ROBINS-I, with particular attention to confounding, intervention classification, participant selection, deviations from intervention, missing data, measurement, and selective reporting (Sterne et al., 2016). Analytical observational studies not appropriately covered by ROBINS-I will be appraised using relevant JBI critical appraisal criteria (Aromataris & Munn, 2020). Disagreements will be resolved by consensus or third-reviewer adjudication, and risk-of-bias judgments will be incorporated into sensitivity analyses rather than collapsed into an arbitrary numerical quality score.

Data Synthesis and Statistical Analysis

Clinical, methodological, and equity heterogeneity will be assessed before quantitative synthesis, and meta-analysis will be undertaken only when at least three studies are sufficiently comparable in population, intervention function, PROGRESS-Plus stratifier, and outcome. Random-effects models will be used to account for expected between-study heterogeneity across LMIC settings, with binary outcomes summarized as risk ratios or odds ratios, continuous outcomes as mean differences or standardized mean differences, and rate outcomes as rate ratios, all with 95% confidence intervals. Where possible, equity effects will be synthesized using interaction estimates that directly compare effects across social strata. Statistical heterogeneity will be described using I2I^2 and between-study variance, while subgroup analyses will examine intervention modality, income group, world region, rural versus mixed setting, PROGRESS-Plus domain, clinical area, study design, and patient-facing versus provider-facing technologies. Sensitivity analyses will assess the influence of high-risk-of-bias, nonrandomized, and indirectly measured equity studies, and publication bias will be explored when at least ten comparable studies are available. When meta-analysis is inappropriate, findings will be synthesized narratively in accordance with the SWiM guideline, grouping studies by intervention type, primary care function, PROGRESS-Plus domain, and direction of equity effect, while integrating effect estimates, confidence intervals, sample sizes, risk-of-bias judgments, and contextual factors rather than relying on statistical significance alone (Campbell et al., 2020).

Certainty and Interpretation of Evidence

The certainty of evidence for the major equity outcomes will be assessed by considering risk of bias, consistency, directness, precision, and potential publication bias. Greater weight will be placed on direct estimates of differential intervention effects across PROGRESS-Plus strata than on studies that merely report the presence of disadvantaged populations. Conclusions will therefore distinguish evidence that a digital intervention improves average primary care outcomes from evidence that it actually reduces inequality. This distinction is central to the review because recent LMIC literature consistently indicates that digital health can improve access and service delivery while simultaneously remaining constrained by unequal connectivity, affordability, infrastructure, and digital literacy (Craig et al., 2025; Erku et al., 2023; Mussa & Dagada, 2025; Sylla et al., 2025).

Table 4. Provisional Prisma 2020 Inclusion Stage

Inclusion outcome	Provisional number
Studies included in the systematic review	**26**
Studies included in structured narrative equity synthesis	**26**
Studies eligible for one or more meta-analyses	To be determined after assessment of clinical and statistical homogeneity
Studies contributing only contextual equity evidence	To be determined during extraction

Studies contributing direct comparative equity-effect estimates	To be determined during extraction

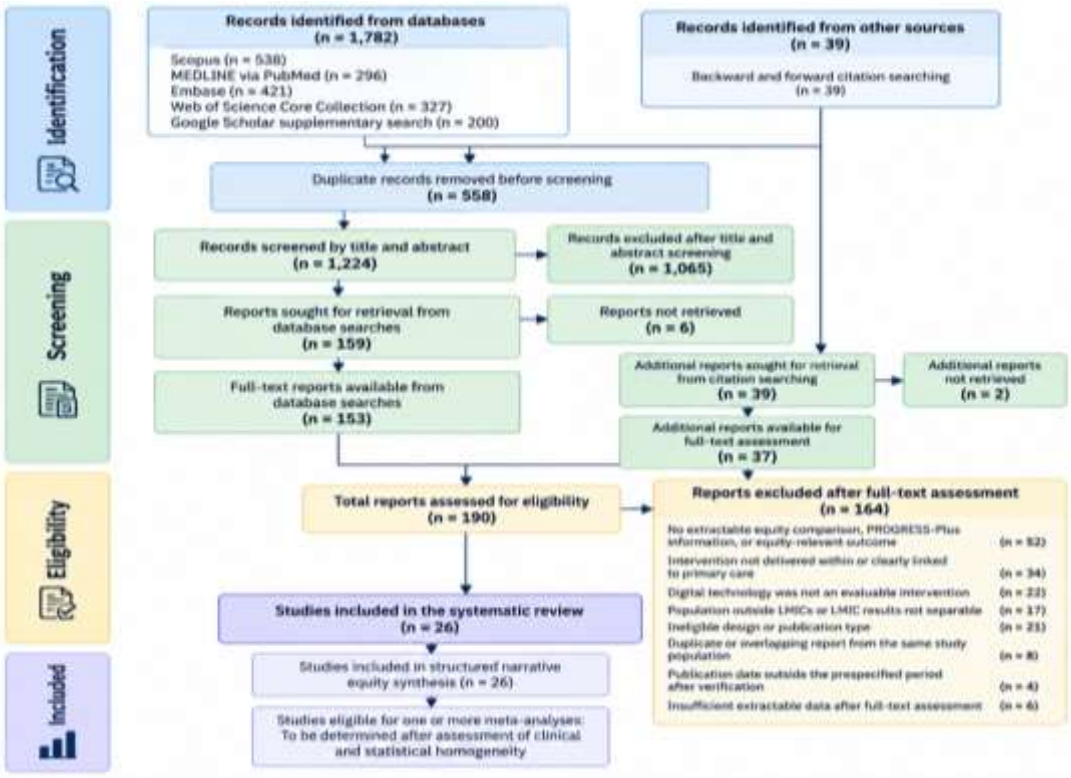


Figure 1. PRISMA 2020 Flow Diagram for Study Identification, Screening, Eligibility, and Inclusion in the Systematic Review of Equity Effects of Digital Primary Care Interventions in Low- and Middle-Income Countries Using the PROGRESS-Plus Framework

RESULT

Theme 1. Conditional Equity Gains from Digital Primary Care: Access Expansion Shaped by Social and Health-System Readiness

Across the included LMIC studies, digital primary care generally expanded access where conventional services were constrained by distance, workforce shortages, referral difficulties, or limited specialist availability. Virtual clinics, telemedicine, mHealth, digital decision support, and digitally enabled community health programmes improved service utilization, referral continuity, maternal care engagement, disease management, or frontline service delivery among rural, tribal, remote, refugee, and other underserved populations (Angrish et al., 2020; Choudhury et al., 2021; Diaka et al., 2021; Hickey et al., 2025; Nigussie et al., 2021). In northwest Ethiopia, digitalization of the community health information system increased complete maternal continuum-of-care retention from 10.6% to 32.5%, although education and women's decision-making autonomy remained important determinants of retention (Hailemariam et al., 2025). These findings indicate that digital primary care can reduce spatial and organizational barriers, but access expansion does not occur independently of existing social disadvantage.

The equity potential of digital primary care was strongest when technology was embedded within human-supported and organizationally prepared delivery models. Community health workers, health extension workers, primary care staff, and local facilitators frequently acted as intermediaries between digital platforms and populations with limited digital capability, while digital tools supported referral, communication, screening, clinical decisions, and treatment monitoring (Källander et al., 2023; Ngabonziza et al., 2026; Nigussie et al., 2021; Wagaba et al., 2023). Conversely, weak internet connectivity, unreliable electricity, limited smartphone availability, inadequate training, insufficient technical support, workload, and weak organizational commitment constrained implementation and uptake (Baykemagn et al., 2024; Hailemariam et al., 2023). Digital primary care therefore functioned less as an autonomous technological intervention than as a component of a broader sociotechnical primary care system whose equity effects depended on both user capability and health-system readiness.

Table 5. Empirical Evidence Supporting Theme 1: Conditional Equity Gains from Digital Primary Care

Author	Title and Year	Country	Aim	Methodology	Finding	Journal
Angrish et al.	*How effective is the virtual primary healthcare centers? An experience from rural India* (2020)	India	To assess whether virtual primary care could extend healthcare services to rural and hard-to-reach populations.	Cross-sectional implementation study using convenience sampling and 800 virtual consultations.	Virtual clinics connected rural patients and local health workers with urban physicians and demonstrated feasibility and acceptance in settings with limited physician availability.	*Journal of Family Medicine and Primary Care*
Choudhury et al.	*Mobile health technology to improve maternal health awareness in tribal populations : Mobile for mothers* (2021)	India	To evaluate whether an mHealth intervention could improve maternal health awareness among tribal pregnant women.	Quasi-controlled intervention involving two socio-demographically comparable tribal villages.	mHealth substantially improved maternal health awareness, including knowledge of tetanus vaccination and iron supplementation, despite low-literacy conditions.	*Journal of the American Medical Informatics Association*
Nigussie et al.	*Using mHealth to Improve Timeliness and*	Ethiopia	To strengthen community-level maternal and newborn service quality	Implementation and process evaluatio	mHealth facilitated real-time information exchange, referral, client	*Global Health: Science and Practice*

	Quality of Maternal and Newborn Health in the Primary Health Care System in Ethiopia (2021)		and coordination through mHealth.	n of smartphone and tablet-based applications for health extension workers, supervisors, and midwives.	tracking, defaulter tracing, and communication across the maternal continuum of care.	
Diaka et al.	*Leveraging smart glasses for telemedicine to improve primary healthcare services and referrals in a remote rural district, Kingandu, DRC, 2019–2020* (2021)	Democratic Republic of the Congo	To improve PHC services and hospital referral completion in a remote rural district.	Real-world intervention combining smart-glasses telemedicine, diagnostics, transport support, community engagement, and staff training.	Telemedicine was associated with increased health-centre use and improved referral completion despite major geographic access barriers.	*Global Health Action*
Källander et al.	*Improving community health worker treatment for malaria, diarrhoea, and pneumonia in Uganda through inSCALE community and mHealth innovations* (2023)	Uganda	To determine whether mHealth-supported CHWs could improve appropriate treatment of common childhood illnesses.	Cluster randomized controlled trial across 39 sub-counties involving 3,167 CHWs.	mHealth support improved aspects of appropriate childhood illness treatment within community-level primary care.	*PLOS Digital Health*
Hailemariam et al.	*Individual and contextual level enablers and barriers*	Ethiopia	To identify individual and contextual factors influencing eCHIS	Exploratory qualitative study using in-depth	Network and electricity limitations, workload, leadership, resources,	*BMC Health Services Research*

	determining electronic community health information system implementation in northwest Ethiopia (2023)		implementation in rural primary care.	and key-informant interviews, interpreted through CFIR.	institutionalization, and digital literacy shaped implementation success.	
Wagaba et al.	*Does mHealth influence community health worker performance in vulnerable populations?* (2023)	Uganda	To assess CHW performance and factors associated with mHealth use in a multinational refugee settlement.	Mixed-methods comparative study involving 300 CHWs, focus groups, interviews, and multivariable analysis.	CHW performance was associated with education, occupation, workload, incentives, and mHealth use, while users preferred mHealth over paper systems.	*PLOS Global Public Health*
Baykemagn et al.	*Acceptance of mobile application-based clinical guidelines among health professionals in Northwestern Ethiopia* (2024)	Ethiopia	To assess uptake of mobile primary healthcare guidelines and identify associated factors.	Mixed-methods cross-sectional study among 403 health professionals.	Only about 28% had used mobile guidelines. IT support, knowledge, previous app exposure, perceived usefulness, ease of use, smartphone access, training, and supervision influenced uptake.	*DIGITAL HEALTH*
Hailemariam et al.	*Digitalizing the community health information system improved women's retention on the maternal continuum of care pathway in northwest*	Ethiopia	To determine the effect of eCHIS on maternal continuum-of-care retention.	Pre-post quasi-experimental study involving 830 women.	Full continuum retention increased from 10.6% to 32.5%; education and healthcare decision-making autonomy remained significant determinants of retention.	*PLOS ONE*

	Ethiopia (2025)					
Hickey et al.	*Community health worker-facilitated telehealth for moderate-severe hypertension care in Kenya and Uganda* (2025)	Kenya and Uganda	To compare CHW-facilitated home telehealth with clinic-based hypertension care.	Randomized controlled trial involving 200 adults with moderate-to-severe hypertension.	CHW-facilitated telehealth improved hypertension care and retention while reducing the need for repeated facility visits among geographically underserved populations.	*PLOS Medicine*
Ngabonziza et al.	*Implementation and evaluation of a community health workers-led digital integrated diseases screening system to provide healthcare for patients at community level in Rwanda* (2026)	Rwanda	To evaluate an integrated digital disease-screening model embedded in community health services.	Pre-post effectiveness-implementation study involving 3,060 community participants.	Digital CHW-led screening supported community-level management and reduced unnecessary referral while extending healthcare closer to underserved populations.	*eBioMedicine*

Analytical Interpretation of Theme 1

Place of residence is the most prominent source of disadvantage and the most consistently addressed PROGRESS-Plus dimension. Digital health technologies can improve equity for rural and geographically isolated populations by reducing travel, connecting peripheral facilities with clinicians, and extending care to households and communities. However, these benefits depend not only on technology but also on support from community health workers and primary care staff, who help patients overcome barriers related to digital literacy and access to specialized care (Diaka et al., 2021; Hickey et al., 2025; Källander et al., 2023; Ngabonziza et al., 2026; Nigussie et al., 2021). Equitable implementation also requires reliable infrastructure, adequate resources, institutional support, digital skills, training, and supervision, as demonstrated by digital health initiatives in Ethiopia (Baykemagn et al., 2024; Hailemariam et al., 2023). Furthermore, persistent differences associated with education and women's autonomy in healthcare decision-making indicate that digitalization alone cannot eliminate health inequalities (Hailemariam et al.,

2025). Therefore, equitable digital health outcomes depend on the interaction between technology, user support, social determinants, and primary healthcare system capacity.

Novelty and Contribution

The principal contribution of this theme is to move beyond the conventional conclusion that digital health "improves access." The synthesis identifies a more specific mechanism: digital primary care appears most capable of producing equity gains when access-expanding technology is combined with human mediation and adequate health-system readiness. By mapping these conditions through PROGRESS-Plus, this review shows that geographic disadvantage can be reduced while educational, gender-related, infrastructural, and digital-capability barriers continue to influence who benefits. This conditional-equity model provides a more policy-relevant interpretation than effectiveness alone because it identifies the organizational and social requirements under which digital primary care can plausibly contribute to equitable universal health coverage.

Theme 2. The Equity Evidence Gap: Improved Access Does Not Necessarily Mean Reduced Inequality

The evidence showed a persistent distinction between improving access for disadvantaged populations and reducing inequality between social groups. Several interventions produced measurable gains among rural, tribal, low-resource, refugee, or otherwise underserved populations, including improved health literacy, treatment access, service utilization, and health-worker performance (Choudhury et al., 2021; Garner et al., 2020; Gupta et al., 2021; Wagaba et al., 2023). However, most studies recruited disadvantaged populations without an advantaged comparison group or without estimating interaction effects across social strata. Consequently, positive within-group outcomes demonstrate expanded reach but cannot establish whether the underlying equity gap narrowed, remained unchanged, or widened.

PROGRESS-Plus mapping further exposed an important measurement imbalance. Place of residence, sex or gender, age, education, occupation, and socioeconomic characteristics appeared repeatedly, while disability, ethnicity, language, migration, social capital, religion, and intersectional disadvantage were less systematically incorporated as effect modifiers. A small subset of studies moved closer to genuine equity analysis by testing subgroup differences or identifying differential utilization patterns. For example, the Chinese rural hypertension trial formally examined interaction effects by sex and age, Nigeria's digital training study reported variation by sex and location, and India's eSanjeevani analysis disaggregated utilization by age, gender, geography, and delivery model (Hicks et al., 2021; Sood et al., 2025; Yuting et al., 2023). Nevertheless, systematic measurement of **changes in between-group inequality** remained uncommon.

Table 6. Empirical Evidence Supporting Theme 2: The Equity Evidence Gap

Author	Title and Year	Country	Aim	Methodology	Finding	Journal
Garner et al.	*Effectiveness of an mHealth application to improve hypertension health literacy in India* (2020)	India	To assess whether an mHealth application improved hypertension literacy among vulnerable populations and examine relationships with sociodemographic characteristics.	Quantitative single-arm pretest-posttest interventional and correlational study in a resource-limited setting.	Health literacy improved after the intervention and was examined in relation to sociodemographic factors, but the study did not estimate a change in inequality between disadvantaged and advantaged groups.	*International Nursing Review*
Gupta et al.	*Comprehensive Community Screening of Otological Patients by Trained Technicians Using a Telemedicine Device* (2021)	India	To evaluate tele-otology for community screening and treatment linkage among underserved populations.	Retrospective programme evaluation involving 810,746 people across rural and urban-slum populations.	Tele-otology substantially expanded screening reach, while travel and financial constraints remained major barriers. The design demonstrated access among disadvantaged populations rather than a formal reduction in social inequality.	*Ear, Nose & Throat Journal*
Choudhury et al.	*Mobile health technology to improve maternal health awareness in tribal populations : Mobile for*	India	To test whether mHealth could improve maternal health awareness among tribal pregnant women.	Quasi-controlled intervention conducted in two socio-demographically similar tribal villages.	Maternal health awareness increased substantially, demonstrating effectiveness in a marginalized population,	*Journal of the American Medical Informatics Association*

	mothers (2021)				but no non-tribal comparator was included to determine whether ethnic inequality narrowed.	
Hicks et al.	*Acceptability and Potential Effectiveness of eHealth Tools for Training Primary Health Workers From Nigeria at Scale* (2021)	Nigeria	To assess feasibility, acceptability, and potential effectiveness of digitally delivered training for frontline PHC workers.	Mixed-methods uncontrolled pre-post study involving 328 health workers across three states.	Knowledge increased by approximately 17 percentage points, with variation by sex and location. The study identified socially patterned effects but was not designed to estimate a formal equity gap.	*JMIR mHealth and uHealth*
Yuting et al.	*Effectiveness of a mHealth intervention on hypertension control in a low-resource rural setting* (2023)	China	To evaluate whether a smartphone and wearable-based intervention improved hypertension outcomes in low-resource rural populations.	Parallel-group randomized clinical trial with 148 randomized participants and prespecified subgroup analyses.	The intervention improved several clinical and behavioral outcomes. Interaction analyses examined sex, age, and clinical characteristics, representing stronger equity methodology, although socioeconomic inequality was not directly estimated.	*Frontiers in Public Health*

Wagaba et al.	*Does mHealth influence community health worker performance in vulnerable populations?* (2023)	Uganda	To assess CHW performance and factors associated with mHealth use in a multinational refugee settlement.	Mixed-methods comparative study involving 300 CHWs.	Education, occupation, workload, incentives, and mHealth use were associated with performance. The study captured several PROGRESS-Plus dimensions within a vulnerable refugee context but did not compare the refugee population with a non-refugee population.	*PLOS Global Public Health*
Baykemagn et al.	*Acceptance of mobile application-based clinical guidelines among health professionals in Northwestern Ethiopia* (2024)	Ethiopia	To determine uptake of mobile primary care guidelines and factors associated with their acceptance.	Mixed-methods cross-sectional study among 403 health professionals.	Only about 28% had used mobile guidelines. IT support, knowledge, prior app exposure, ease of use, training, supervision, and smartphone access shaped adoption, identifying mechanisms of digital exclusion rather than directly measuring an equity effect.	*DIGITAL HEALTH*
Hailemariam et al.	*Digitalizing the community health information system*	Ethiopia	To determine the effect of eCHIS on maternal continuum-	Quasi-experimental pre-post study involving 830 women.	Retention increased from 10.6% to 32.5%, but education and women's	*PLOS ONE*

	improved women's retention on the maternal continuum of care pathway in northwest Ethiopia (2025)		of-care retention.		healthcare decision-making autonomy remained independently associated with retention, indicating persistent social gradients after digitalization.	
Sood et al.	*Adoption and utilization of India's eSanjeevani national telemedicine service* (2025)	India	To examine national telemedicine adoption and utilization patterns across population groups and geographic areas.	Observational analysis of more than 163 million consultations using national programme data.	Utilization differed by age, gender, state, and platform type. The study offered strong distributional evidence but did not establish whether pre-existing social inequalities narrowed following programme introduction.	*Oxford Open Digital Health*

Analytical Interpretation of Theme 2

The synthesis reveals a methodological gap in the evidence: studies often assess whether digital primary care benefits disadvantaged populations rather than whether it reduces health inequalities. Although studies by Choudhury et al. (2021), Gupta et al. (2021), and Wagaba et al. (2023) demonstrate benefits for vulnerable groups, they do not establish that inequalities have declined. Stronger evaluations, such as those by Yuting et al. (2023), Hicks et al. (2021), Hailemariam et al. (2025), and Sood et al. (2025), highlight differences in outcomes across demographic and geographic groups, showing that overall effectiveness does not necessarily translate into greater equity. Furthermore, the limited and inconsistent assessment of PROGRESS-Plus dimensions, including disability, language, ethnicity, religion, migration, and intersecting disadvantages, restricts a comprehensive understanding of health equity.

Novelty and Contribution

The novelty of this review lies in distinguishing access expansion, distributional variation, and demonstrable inequality reduction as analytically different outcomes. Rather than classifying an intervention as equitable merely

because it reaches a vulnerable population, the PROGRESS-Plus synthesis evaluates whether studies contain the comparisons necessary to determine who benefits, whether benefits differ across social strata, and whether disparities actually narrow. This reveals an important evidence gap: digital primary care in LMICs has a growing evidence base for improving access, but a much weaker evidence base for demonstrating reductions in inequality. The review therefore shifts the research agenda from digital access for disadvantaged populations toward explicit measurement of digital health equity, including interaction analyses, absolute and relative inequality measures, and intersectional PROGRESS-Plus assessment.

DISCUSSION

This systematic review indicates that digital primary care interventions in LMICs can substantially expand access, particularly for rural, remote, low-resource, maternal, refugee, and other underserved populations, but improved access should not be equated automatically with improved equity. Telemedicine, mHealth, digital decision support, and community-based digital platforms reduced distance, transport, referral, and workforce barriers, yet their benefits remained shaped by education, digital and health literacy, connectivity, device access, gender, socioeconomic resources, and organizational capacity. This pattern is consistent with the inverse care law and the digital inverse care law, which suggest that populations with the greatest need may receive the least benefit when access to enabling resources is unequally distributed (Cookson et al., 2021; Davies et al., 2021; Sieck et al., 2021).

The findings support a multilevel interpretation of digital health equity rather than one centered solely on individual users. Digital inclusion depended not only on patient willingness or skills but also on policy, infrastructure, organizational readiness, workforce capacity, and intervention design. This is consistent with the multilevel digital health equity framework proposed by Lyles et al. (2023), which emphasizes interactions among individuals, communities, health systems, and policy environments. Evidence from Ethiopia similarly showed that mobile guideline use and eCHIS implementation were influenced by IT support, training, smartphone access, workload, leadership, electricity, and network reliability (Baykemagn et al., 2024; Hailemariam et al., 2023). Wilson et al. (2024) likewise identified infrastructure, accessible design, connectivity, devices, digital education, and human assistance as critical conditions for equitable digital health.

A particularly important finding was the role of human mediation. Digital interventions appeared more equity-sensitive when embedded within community health workers, health extension workers, or primary care staff rather than delivered as stand-alone self-service technologies. These intermediaries supported navigation, communication, referral, screening, and clinical follow-up, thereby reducing the burden placed on users with limited digital literacy or weak access to devices. This interpretation aligns with Shaw et al. (2024), who argued that equitable digital health must address not only service availability but also patients' abilities to perceive need, seek care, reach services,

and engage with them. The CHW-facilitated telehealth trial in Kenya and Uganda illustrates this mechanism, as the digital intervention was integrated into an existing community-based care relationship rather than functioning independently (Hickey et al., 2025).

The review also demonstrates that digital interventions cannot independently eliminate structural disadvantage. In northwest Ethiopia, digitalization of the community health information system improved maternal continuum-of-care retention, yet education and women's healthcare decision-making autonomy remained significant determinants of service retention after implementation (Hailemariam et al., 2025). This finding is consistent with Mussa and Dagada (2025), who identified residence, education, socioeconomic position, gender, occupation, and infrastructure as recurring sources of inequity in Ethiopia's digital primary care transformation. Digitalization can therefore change how care is delivered without necessarily changing the underlying social distribution of resources that determines who is best positioned to benefit.

The second major finding is the persistent gap between access expansion and demonstrated inequality reduction. Many included studies showed benefits among rural, tribal, refugee, low-income, or otherwise disadvantaged groups, but relatively few directly tested whether digital interventions narrowed differences between advantaged and disadvantaged populations. This distinction is critical because improvement within a vulnerable group does not establish that the equity gap has decreased. The issue is consistent with Cookson et al. (2021), who emphasized the need for distributional analysis, and with Wang et al. (2025), who found that telehealth equity research often addresses individual access dimensions without comprehensively evaluating changes in health inequality. Future evaluations should therefore report subgroup-specific effects, interaction terms, and both absolute and relative inequality measures.

The PROGRESS-Plus analysis further revealed an important measurement gap. Place of residence, gender, age, education, occupation, and socioeconomic status were examined more frequently than disability, ethnicity, language, religion, social capital, migration, or intersectional disadvantage. This pattern suggests that digital health equity research remains constrained by the dimensions routinely captured in health information systems rather than by the full range of disadvantages that may affect access and outcomes. Wilson et al. (2024) similarly identified underrepresentation of language, religion, limiting conditions, and intersecting vulnerabilities, while Wang et al. (2026) showed substantial inconsistency in how health equity frameworks are applied across digital health studies. More systematic and intersectional measurement is therefore needed to avoid overlooking groups whose exclusion is less visible in routinely collected data.

The principal contribution of this review is to distinguish access expansion, socially patterned benefit, and actual inequality reduction as three analytically different outcomes. This extends previous LMIC digital health reviews that have focused mainly on effectiveness, implementation, service delivery, or universal health coverage (Craig et al., 2025; Saif-Ur-Rahman et al., 2023; Sylla et al., 2025). The findings suggest that digital primary care is most

likely to support equity when it is human-supported, integrated into strong primary care systems, and accompanied by investments in infrastructure, workforce, affordability, and digital capability. The key implication is that digital health policy should move from asking whether technology increases access to asking who benefits, under what conditions, and whether the distribution of access and outcomes becomes more equitable over time.

CONCLUSIONS AND RECOMMENDATIONS

This systematic review found that digital primary care interventions in LMICs can improve access, continuity of care, referral completion, service utilization, and selected clinical outcomes, particularly among underserved populations. However, improved access does not necessarily reduce health inequalities, as equity outcomes depend on digital and health literacy, socioeconomic status, connectivity, device availability, gender, decision-making autonomy, and health-system readiness. Human-supported approaches involving community health workers and primary care staff appear more responsive to equity needs than technology-only interventions. The PROGRESS-Plus analysis also identified evidence gaps, particularly regarding disability, language, ethnicity, migration, religion, social capital, and intersecting disadvantages. Variations in study designs, interventions, populations, and equity measures further limited comparisons and causal interpretation. Future research should incorporate equity objectives from the outset, adopt standardized PROGRESS-Plus reporting, conduct subgroup and interaction analyses, assess both absolute and relative inequalities, and prioritize multicountry and longitudinal studies to establish for whom digital primary care works, under what conditions, and whether it effectively reduces health inequalities over time.

FURTHER STUDY

This research still has limitations, so further studies are needed on the topic of Equity Effects of Digital Primary Care Interventions in Low- and Middle-Income Countries: A Systematic Review Using the PROGRESS-Plus Framework to improve the research.

REFERENCES

Agarwal, S., Chin, W. Y., Vasudevan, L., Henschke, N., Tamrat, T., Foss, H. S., Glenton, C., Bergman, H., Fønhus, M. S., Ratanaprayul, N., Pandya, S., Mehl, G. L., & Lewin, S. (2025). Digital tracking, provider decision support systems, and targeted client communication via mobile devices to improve primary health care. Cochrane Database of Systematic Reviews, 2025(4), CD012925. https://doi.org/10.1002/14651858.CD012925.pub2

Angrish, S., Sharma, M., Bashar, M. A., Tripathi, S., Hossain, M. M., Bhattacharya, S., & Singh, A. (2020). How effective is the virtual primary healthcare centers? An experience from rural India. Journal of Family Medicine and Primary Care, 9(2), 465–469. https://doi.org/10.4103/jfmpc.jfmpc_1124_19

Aromataris, E., & Munn, Z. (Eds.). (2020). JBI manual for evidence synthesis. JBI. https://doi.org/10.46658/JBIMES-20-01

Baykemagn, N. D., Nigatu, A. M., Fikadie, B., & Tilahun, B. (2024). Acceptance of mobile application-based clinical guidelines among health professionals in Northwestern Ethiopia: A mixed-methods study. Digital Health, 10, 20552076241261930. https://doi.org/10.1177/20552076241261930

Campbell, M., McKenzie, J. E., Sowden, A., Katikireddi, S. V., Brennan, S. E., Ellis, S., Hartmann-Boyce, J., Ryan, R., Shepperd, S., Thomas, J., Welch, V., & Thomson, H. (2020). Synthesis without meta-analysis (SWiM) in systematic reviews: Reporting guideline. BMJ, 368, l6890. https://doi.org/10.1136/bmj.l6890

Choudhury, A., Asan, O., & Choudhury, M. M. (2021). Mobile health technology to improve maternal health awareness in tribal populations: Mobile for mothers. Journal of the American Medical Informatics Association, 28(11), 2467–2474. https://doi.org/10.1093/jamia/ocab172

Cookson, R., Doran, T., Asaria, M., Gupta, I., & Mujica, F. P. (2021). The inverse care law re-examined: A global perspective. The Lancet, 397(10276), 828–838. https://doi.org/10.1016/S0140-6736(21)00243-9

Craig, A., Lawford, H., Miller, M., Chen-Cao, L., Woods, L., Liaw, S.-T., & Godinho, M. A. (2025). Use of technology to support health care providers delivering care in low- and lower-middle-income countries: Systematic umbrella review. Journal of Medical Internet Research, 27, e66288. https://doi.org/10.2196/66288

Davies, A. R., Honeyman, M., & Gann, B. (2021). Addressing the digital inverse care law in the time of COVID-19: Potential for digital technology to exacerbate or mitigate health inequalities. Journal of Medical Internet Research, 23(4), e21726. https://doi.org/10.2196/21726

Diaka, J., Van Damme, W., Sere, F., Benova, L., van de Put, W., & Serneels, S. (2021). Leveraging smart glasses for telemedicine to improve primary healthcare services and referrals in a remote rural district, Kingandu, DRC, 2019–2020. Global Health Action, 14(1), 2004729. https://doi.org/10.1080/16549716.2021.2004729

Erku, D., Khatri, R., Endalamaw, A., Wolka, E., Nigatu, F., Zewdie, A., & Assefa, Y. (2023). Digital health interventions to improve access to and quality of primary health care services: A scoping review. International Journal of Environmental Research and Public Health, 20(19), 6854. https://doi.org/10.3390/ijerph20196854

Garner, S. L., George, C. E., Young, P., Hitchcock, J., Koch, H., Green, G., Mahid, Z., & Norman, G. (2020). Effectiveness of an mHealth application to improve hypertension health literacy in India. International Nursing Review, 67(4), 476–483. https://doi.org/10.1111/inr.12616

Gupta, N., Baghotia, K. S., Rabha, M., Sachdeva, S., Sahai, G., Bhatnagar, K., & Ahuja, P. (2021). Comprehensive community screening of otological patients by trained technicians using a telemedicine device: An efficient and cost-effective way to triage patients with ear diseases. Ear, Nose & Throat Journal, 100(3_suppl), 263S–268S. https://doi.org/10.1177/0145561320950992

Hailemariam, T., Atnafu, A., Gezie, L. D., Kaasbøll, J. J., Klein, J., & Tilahun, B. (2023). Individual and contextual level enablers and barriers determining electronic community health information system implementation in northwest Ethiopia. BMC Health Services Research, 23, 644. https://doi.org/10.1186/s12913-023-09629-8

Hailemariam, T., Atnafu, A., Gezie, L. D., Kaasbøll, J. J., Klein, J., & Tilahun, B. (2025). Digitalizing the community health information system improved women's retention on the maternal continuum of care pathway in northwest Ethiopia: A quasi-experimental study. PLOS ONE, 20(3), e0312965. https://doi.org/10.1371/journal.pone.0312965

Hickey, M. D., Owaraganise, A., Ogachi, S., Sang, N., Wafula, E. M., Kabami, J., Sutter, N., Temple, J., Muiru, A., & Chamie, G. (2025). Community health worker-facilitated telehealth for moderate-severe hypertension care in Kenya and Uganda: A randomized controlled trial. PLOS Medicine, 22(6), e1004632. https://doi.org/10.1371/journal.pmed.1004632

Hicks, J. P., Allsop, M. J., Akaba, G. O., Yalma, R. M., Dirisu, O., Okusanya, B., Tukur, J., Okunade, K., Akeju, D., Ajepe, A., Okuzu, O., Mirzoev, T., & Ebenso, B. (2021). Acceptability and potential effectiveness of eHealth tools for training primary health workers from Nigeria at scale: Mixed methods, uncontrolled before-and-after study. JMIR mHealth and uHealth, 9(9), e24182. https://doi.org/10.2196/24182

Källander, K., Soremekun, S., Strachan, D. L., Hill, Z., Kasteng, F., Kertho, E., Nanyonjo, A., Ten Asbroek, G., Nakirunda, M., Lumumba, P., Ayebale, G., Bagorogoza, B., Vassall, A., Meek, S., Tibenderana, J., Lingam, R., & Kirkwood, B. (2023). Improving community health worker treatment for malaria, diarrhoea, and pneumonia in Uganda through inSCALE community and mHealth innovations: A cluster randomised controlled trial. PLOS Digital Health, 2(6), e0000217. https://doi.org/10.1371/journal.pdig.0000217

Lyles, C. R., Nguyen, O. K., Khoong, E. C., Aguilera, A., & Sarkar, U. (2023). Multilevel determinants of digital health equity: A literature synthesis to advance the field. Annual Review of Public Health, 44, 383–405. https://doi.org/10.1146/annurev-publhealth-071521-023913

Mussa, I., & Dagada, R. (2025). Mapping inequities in digital health transformation within Ethiopia's primary health care system using PROGRESS-Plus: Scoping review. Digital Health, 11, 20552076251408535. https://doi.org/10.1177/20552076251408535

Ngabonziza, J. C. S., Suleiman, K., Mohamed, N. S., Rukundo, G., Muremba, M. F., Kagame, J., Mugisha, J. C., Rutebuka, H., Remera, E., Siddig, E. E., Uwamungu, S., Hezagira, E., Mugumya, S., Niyitegeka, B., Byiringiro, J. B., Migambi, P., Gihana, M. W., Girdwood, S., Mazarati, J. B., … Kadam, R. (2026). Implementation and evaluation of a community health workers-led digital integrated diseases screening system to provide healthcare for patients at community level in Rwanda. eBioMedicine, 125, 106168. https://doi.org/10.1016/j.ebiom.2026.106168

Nigussie, Z. Y., Zemicheal, N. F., Tiruneh, G. T., Bayou, Y. T., Teklu, G. A., Kibret, E. S., ... & Betemariam, W. A. (2021). Using mHealth to improve timeliness and quality of maternal and newborn health in the primary health care system in Ethiopia. Global Health: Science and Practice, 9(3), 668-681.

O'Neill, J., Tabish, H., Welch, V., Petticrew, M., Pottie, K., Clarke, M., Evans, T., Pardo Pardo, J., Waters, E., White, H., & Tugwell, P. (2014). Applying an equity lens to interventions: Using PROGRESS ensures consideration of socially stratifying factors to illuminate inequities in health. Journal of Clinical Epidemiology, 67(1), 56–64. https://doi.org/10.1016/j.jclinepi.2013.08.005

Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan: A web and mobile app for systematic reviews. Systematic Reviews, 5, 210. https://doi.org/10.1186/s13643-016-0384-4

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372, n71. https://doi.org/10.1136/bmj.n71

Page, M. J., Moher, D., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … McKenzie, J. E. (2021). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. BMJ, 372, n160. https://doi.org/10.1136/bmj.n160

Parthasarathi, A., George, T., Kalimuth, M. B., Jayasimha, S., Ullah, M. K., Patil, R., Nair, A., Pai, U., Inbarani, E., Jacob, A. G., Chandy, V. J., John, O., Sudarsanam, T. D., & Mahesh, P. A. (2024). Exploring the potential of telemedicine for improved primary healthcare in India: A comprehensive review. The Lancet Regional Health - Southeast Asia, 27, 100431. https://doi.org/10.1016/j.lansea.2024.100431

Rethlefsen, M. L., Kirtley, S., Waffenschmidt, S., Ayala, A. P., Moher, D., Page, M. J., Koffel, J. B., & PRISMA-S Group. (2021). PRISMA-S: An extension to the PRISMA statement for reporting literature searches in systematic reviews. Systematic Reviews, 10, 39. https://doi.org/10.1186/s13643-020-01542-z

Saif-Ur-Rahman, K. M., Islam, M. S., Alaboson, J., Ola, O., Hasan, I., Islam, N., Mainali, S., Martina, T., Silenga, E., Muyangana, M., & Joarder, T. (2023). Artificial intelligence and digital health in improving primary health care service delivery in LMICs: A systematic review. Journal of Evidence-Based Medicine, 16(3), 303–320. https://doi.org/10.1111/jebm.12547

Shaw, J., Abejirinde, I. O. O., Agarwal, P., Shahid, S., & Martin, D. (2024). Digital health and equitable access to care. PLOS Digital Health, 3(9), e0000573. https://doi.org/10.1371/journal.pdig.0000573

Sieck, C. J., Sheon, A., Ancker, J. S., Castek, J., Callahan, B., & Siefer, A. (2021). Digital inclusion as a social determinant of health. npj Digital Medicine, 4, 52. https://doi.org/10.1038/s41746-021-00413-8

Simbini, T., Adimado, E., Adjorlolo, S., Guerrero-Torres, L., Srinivas, P., Zizhou, S., & Zerfu, T. (2026). Digital health interventions in strengthening primary healthcare systems in sub-Saharan Africa: Insights from Ethiopia, Ghana, and Zimbabwe. PLOS Digital Health, 5(1), e0000863. https://doi.org/10.1371/journal.pdig.0000863

Sood, S., Lal, K., Bhatia, M., Kapoor, G., Singh, S., Kaushish, R. K., Bisht, D., Sharma, V. K., Chakraborty, S., Shete, M., Solanki, N. K., Naskar, A., Sharma, M., Subramaniyan, E. U., Waikar, S., & Verma, N. (2025). Adoption and utilization of India's eSanjeevani national telemedicine service. Oxford Open Digital Health, 3, oqaf025. https://doi.org/10.1093/oodh/oqaf025

Sterne, J. A. C., Hernán, M. A., Reeves, B. C., Savović, J., Berkman, N. D., Viswanathan, M., Henry, D., Altman, D. G., Ansari, M. T., Boutron, I., Carpenter, J. R., Chan, A.-W., Churchill, R., Deeks, J. J., Hróbjartsson, A., Kirkham, J., Jüni, P., Loke, Y. K., Pigott, T. D., … Higgins, J. P. T. (2016). ROBINS-I: A tool for assessing risk of bias in non-randomised studies of interventions. BMJ, 355, i4919. https://doi.org/10.1136/bmj.i4919

Sterne, J. A. C., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I., Cates, C. J., Cheng, H.-Y., Corbett, M. S., Eldridge, S. M., Emberson, J. R., Hernán, M. A., Hopewell, S., Hróbjartsson, A., Junqueira, D. R., Jüni, P., Kirkham, J. J., Lasserson, T., Li, T., … Higgins, J. P. T. (2019). RoB 2: A revised tool for assessing risk of bias in randomised trials. BMJ, 366, l4898. https://doi.org/10.1136/bmj.l4898

Sylla, B., Ismaila, O., & Diallo, G. (2025). 25 years of digital health toward universal health coverage in low- and middle-income countries: Rapid systematic review. Journal of Medical Internet Research, 27, e59042. https://doi.org/10.2196/59042

Vasanthan, L., Natarajan, S. K., Babu, A., Kamath, M. S., & Kamalakannan, S. (2024). Digital health interventions for improving access to primary care in India: A scoping review. PLOS Global Public Health, 4(5), e0002645. https://doi.org/10.1371/journal.pgph.0002645

Wagaba, M. T., Musoke, D., Bagonza, A., Ddamulira, J. B., Nalwadda, C. K., & Orach, C. G. (2023). Does mHealth influence community health worker performance in vulnerable populations? A mixed methods study in a multinational refugee settlement in Uganda. PLOS Global Public Health, 3(12), e0002741. https://doi.org/10.1371/journal.pgph.0002741

Wang, S., Killedar, A., Von Huben, A., Norris, S., & Wilson, A. (2026). Evaluation of health equity frameworks in telehealth and digital health: A systematic review and narrative synthesis. Frontiers in Public Health, 13, 1690117. https://doi.org/10.3389/fpubh.2025.1690117

Wang, S., von Huben, A., Sivaprakash, P. P., Saurman, E., Norris, S., & Wilson, A. (2025). Addressing health service equity through telehealth: A systematic review of reviews. Digital Health, 11, 20552076251326233. https://doi.org/10.1177/20552076251326233

Welch, V., Petticrew, M., Tugwell, P., Moher, D., O'Neill, J., Waters, E., White, H., & PRISMA-Equity Bellagio Group. (2012). PRISMA-Equity 2012 extension: Reporting guidelines for systematic reviews with a focus on health equity. PLOS Medicine, 9(10), e1001333. https://doi.org/10.1371/journal.pmed.1001333

Wilson, S., Tolley, C., Mc Ardle, R., Lawson, L., Beswick, E., Hassan, N., Slight, R., & Slight, S. (2024). Recommendations to advance digital health equity: A systematic review of qualitative studies. npj Digital Medicine, 7, 173. https://doi.org/10.1038/s41746-024-01177-7

Xiong, S., Lu, H., Peoples, N., Duman, E. K., Najarro, A., Ni, Z., Gong, E., Yin, R., Ostbye, T., Palileo-Villanueva, L. M., Doma, R., Kafle, S., Tian, M., & Yan, L. L. (2023). Digital health interventions for non-communicable disease management in primary health care in low-and middle-income countries. npj Digital Medicine, 6, 12. https://doi.org/10.1038/s41746-023-00764-4

Zhang, Y., Tan, X., & Wang, Q. (2023). Effectiveness of a mHealth intervention on hypertension control in a low-resource rural setting: A randomized clinical trial. Frontiers in Public Health, 11, 1049396. https://doi.org/10.3389/fpubh.2023.1049396