Journal of Innovative Research in Health Sciences, 2(1), 2026, 1-12

Reviews Article

Determinants of mHealth Usability and Adoption in Maternal and Child Health and Nutrition Programs in Low and Middle-Income Countries

Intan Wahyu Prabandari[1]*, Abid Famasya Abdillah[2]

[1]Puskesmas Pule, Trenggalek, Indonesia
[2]Trustmedis Center for Health Innovation, Indonesia

*Corresponding author:
Name: Intan Wahyu Prabandari
Address: Jl. Raya Krajan, Pule, Trenggalek
Email address: intanwah@gmail.com

Abstract
Mobile health, or mHealth, interventions are increasingly used to support maternal, newborn, and child health and nutrition programs in low and middle-income countries. Mobile phones, short message service, voice calls, messaging platforms, and mobile applications may improve antenatal care attendance, immunization timeliness, breastfeeding practices, nutrition knowledge, and health-service utilization. However, many interventions remain limited to pilot implementation, experience declining use, or fail to become integrated into routine service delivery. This narrative review examines determinants influencing the usability, acceptability, adoption, implementation, and scale-up of mHealth interventions in maternal and child health and nutrition programs. A targeted literature search was conducted using PubMed, Google Scholar, reference-list screening, and selected institutional and government sources. Evidence was synthesized narratively and organized across individual, technological, organizational, and health-system levels. The reviewed evidence indicates that mHealth use is influenced by device access, digital literacy, perceived usefulness, trust, social influence, facilitating conditions, usability, privacy, connectivity, training, workflow integration, interoperability, governance, and financing. Findings concerning individual determinants vary across studies. For example, app quality was a strong predictor of intention to use in one developing-country study, but this finding should not be generalized across all settings. More recent evidence among health workers indicates that trust and facilitating conditions are also important determinants of behavioral intention and actual use. mHealth programs should therefore be designed as components of health-service delivery rather than as stand-alone applications. Human-centered design, equitable access, provider support, privacy safeguards, workflow integration, and alignment with national health-information architecture are necessary for sustained and scalable implementation.
Keywords: *mHealth, usability, adoption, maternal health, child health, nutrition, low and middle-income countries*

Introduction

Mobile health, commonly referred to as mHealth, has become an important strategy for supporting maternal, newborn, and child health and nutrition programs in low and middle-income countries (LMICs). mHealth interventions include short message service reminders, voice calls, interactive messaging, mobile applications, digital decision-support tools, and mobile data-collection systems. These interventions may be used by pregnant women, mothers, caregivers, community health workers (CHWs), and frontline healthcare providers [1–4]. Recent systematic reviews indicate that mHealth interventions may improve selected maternal and child health outcomes, particularly antenatal care attendance and immunization timeliness. However, evidence concerning facility delivery, overall immunization coverage, infant feeding practices, and longer-term

ISSN: 3123-3708

health outcomes remains mixed and dependent on the intervention and implementation context[1,2].

The success of mHealth interventions is not determined only by whether messages or applications are delivered. Many interventions remain small pilot projects, experience declining use, or fail to become part of routine service delivery. Long-term implementation in LMICs is influenced by infrastructure, electricity, network availability, organizational capacity, financing, governance, and intervention design [5–7].

These determinants are particularly relevant to maternal and child health and nutrition programs because intended users frequently include women, caregivers, and health workers operating in resource-constrained settings. A technically sophisticated application may have limited practical value when users share phones with household members, have limited digital literacy, cannot afford mobile data, lack confidence in the information source, or experience unreliable connectivity [1,8,9]. Similarly, provider-facing tools may have limited adoption when they duplicate paper documentation, increase workload, require repeated data entry, or are not connected to routine supervision and reporting systems [8,10].

Indonesia provides an important example of these challenges. Digital health interventions increasingly operate within a broader ecosystem involving facility-level information systems, electronic medical records (EMR), referral processes, national health-insurance administration through BPJS Kesehatan, and national health-data exchange through SATUSEHAT. Official SATUSEHAT documentation describes a historically fragmented environment involving numerous applications, duplicate data collection, inconsistent metadata, and limited interoperability [11,12]. At the implementation level, developers integrating facility systems with SATUSEHAT have reported challenges involving server performance, selection of Fast Healthcare Interoperability Resources (FHIR) profiles, and mapping local electronic medical record data to standardized terminology [14]. These findings illustrate why adoption should be assessed not only at the interface level but also in relation to technical capacity, workflow fit, and health-system integration.

Beyond system-level integration, user-level determinants also remain relevant in Indonesia. In a study of telemedicine users in Java, effort expectancy, performance expectancy, and social influence were positively associated with individual belief, while perceived usefulness and perceived ease of use contributed to behavioral intention [13]. These findings suggest that perceived benefit, usability, social influence, and trust-related beliefs may shape digital-health adoption in Indonesia. However, the findings should be interpreted cautiously because the study focused on existing telemedicine users and the sample was predominantly young.

This review therefore examines the factors that make mHealth interventions usable, acceptable, adoptable, and scalable in maternal and child health and nutrition programs in LMICs. It focuses on individual, technological, organizational, and health-system determinants rather than asking only whether mHealth interventions produce positive outcomes.

Methods

Review design

This article was conducted as a narrative literature review. A narrative approach was selected because the review aimed to integrate evidence from heterogeneous sources, including systematic reviews, intervention studies, cross-sectional adoption

ISSN: 3123-3708

studies, implementation research, institutional guidelines, and government documentation. The review was not designed as a systematic review or meta-analysis. Its structure and reporting were informed by relevant domains of the Scale for the Assessment of Narrative Review Articles (SANRA), particularly the clear statement of the review objective, description of the literature search, appropriate referencing, and evidence-based presentation of conclusions [15].

Literature Search

The literature search was updated on 23 June 2026. Publications were identified through targeted searches of PubMed and Google Scholar, backward screening of references from key systematic reviews, and searches of selected World Health Organization and Indonesian Ministry of Health sources. Search terms were used individually and in combination and included:

- “mHealth” OR “mobile health” OR “digital health”
- “maternal health” OR “newborn health” OR “child health” OR “child nutrition”
- “usability” OR “acceptability” OR “adoption” OR “intention to use”
- “implementation” OR “sustainability” OR “scale-up”
- “community health worker” OR “frontline health worker”
- “interoperability” OR “health information system”
- “low and middle-income countries” OR “LMICs”, and
- “Indonesia” OR “SATUSEHAT.”

Priority was given to publications issued from January 2016 to June 2026, while older sources could be considered when they provided relevant conceptual or methodological evidence.

Eligibility criteria

Sources were included when they:

1. Examined mHealth or closely related digital-health interventions
2. Addressed maternal, newborn, child health, nutrition, community health work, or health-system implementation relevant to these programs
3. Were conducted in LMICs or synthesized evidence applicable to LMIC settings
4. Reported determinants, barriers, facilitators, usability factors, adoption factors, implementation conditions, sustainability, or interoperability
5. Were published in English as peer-reviewed research, systematic reviews, narrative reviews, guidelines, or relevant official documents.

Sources were excluded when they:

1. Focused exclusively on high-income settings without clear relevance to LMIC implementation
2. Did not involve mobile or digitally mediated health-service delivery
3. Did not report findings relevant to usability, adoption, implementation, or sustainability
4. Consisted only of opinion or promotional material without an identifiable evidence base.

Evidence synthesis

ISSN: 3123-3708

The selected evidence was synthesized narratively. Findings were grouped into four determinant levels: individual and social determinants; technological and usability determinants; organizational and workflow determinants; and health-system, infrastructure, governance, and financing determinants.

Quantitative results were reported when available. A meta-analysis was not performed because the included sources differed substantially in population, intervention type, study design, outcome definition, and analytical approach.

Determinants of mHealth Usability and Adoption

Individual and social determinants

Mobile phone access and ownership are foundational determinants of mHealth use but are insufficient on their own. Some studies have found that women with access to mobile phones have greater utilization of antenatal, postnatal, neonatal, and immunization-related services. However, these associations may be partly explained by education, household wealth, urban residence, and other socioeconomic factors [1]. Phone ownership should therefore not be interpreted as an isolated determinant. Meaningful access may also depend on affordability, digital literacy, gender norms, privacy, phone sharing, and household control over technology [1,9]. A woman may technically have access to a household phone but still be unable to receive confidential messages, access the device consistently, or independently act on the information received.

Education and digital literacy also influence whether users can understand, navigate, and benefit from an intervention. Users may be less likely to engage with digital health services when instructions are difficult to understand, interfaces are unfamiliar, or content is not provided in an accessible language and format. Perceived usefulness, performance expectancy, trust, social influence, and facilitating conditions are repeatedly examined in technology-adoption research[4,16,17]. These factors describe whether users believe that a technology will provide practical benefits, whether people around them support its use, whether the service appears reliable, and whether sufficient resources and support are available.

Evidence from Indonesia also indicates that technology-acceptance and trust-related factors influence telemedicine adoption. Among telemedicine users in Java, effort expectancy, performance expectancy, and social influence were positively associated with individual belief, while perceived usefulness and perceived ease of use contributed to behavioral intention [13]. However, these findings were obtained from a predominantly young sample of existing telemedicine users and may not be directly generalizable to maternal and child health populations.

Technological and usability determinants

Usability should be treated as a human-centered design process rather than only as a satisfaction score measured after implementation. Human-centered design involves understanding the context of use, identifying user requirements, developing appropriate solutions, and testing those solutions with intended users and relevant stakeholders [18]. In low-resource environments, important design considerations include low-bandwidth operation, offline functionality, simple navigation, compatibility with basic or older devices, readable text, local-language content, and limited dependence on continuous mobile data [6,8,9]. Voice-based or audiovisual content may be useful when users have

ISSN: 3123-3708

limited literacy, although such formats may require additional bandwidth and privacy considerations.

Perceived reliability is also relevant. Users may disengage when messages arrive late, applications fail repeatedly, data disappear, or health information appears inconsistent [4]. Trust in the technical system is closely related to trust in the institution providing the service and confidence that personal information will be protected.

App quality was identified as a strong predictor of intention to use in the study by Alaiad et al [16]. However, this finding was derived from a specific developing-country study and should not be interpreted as evidence that app quality is universally the strongest determinant across all mHealth interventions or LMIC settings. App quality is better understood as one potentially important determinant whose effect may vary according to population, purpose, infrastructure, and implementation model.

Privacy and security concerns may reduce adoption, especially in maternal, reproductive, adolescent, and child health services. Shared-device use may expose sensitive messages to spouses, relatives, or other household members. Programs should therefore consider message wording, notification visibility, consent, authentication, data minimization, and procedures for managing unauthorized access.

Organizational and workflow determinants

For CHWs and frontline healthcare providers, organizational determinants are often decisive. mHealth tools may support data submission, surveillance, counseling, referral, growth monitoring, clinical decision support, performance monitoring, and supervision [8,10]. However, implementation may be constrained by limited training, inadequate technical support, demotivation, increased workload, device shortages, and uncertainty regarding data responsibility.

A 2025 systematic review and meta-analysis of health workers' adoption of digital health technology in LMICs found that performance expectancy was the most frequently reported facilitator, while lack of facilitating conditions was the most frequently reported barrier. Trust showed a relatively strong association with behavioral intention, while facilitating conditions were associated with actual use [17]. These findings support the need for an enabling implementation environment rather than relying solely on the perceived attractiveness of an application.

Training should not be treated as a single orientation session before launch. Users may require initial instruction, supervised practice, refresher training, accessible technical assistance, and clear procedures for resolving errors. Training should also reflect the actual tasks performed by users rather than focusing only on application features. Workflow integration is also equally important. Provider-facing tools may be more sustainable when they replace or simplify existing work, support routine clinical and reporting tasks, and produce information that is useful to providers and supervisors [6,8,10]. In contrast, tools that require duplicate documentation across paper records, local applications, and national platforms may increase workload and encourage incomplete or delayed data entry.

Health-system, infrastructure, governance, and financing determinants

At the health-system level, connectivity, electricity, device availability, technical support, interoperability, governance, and financing influence whether mHealth programs can move beyond pilot implementation [5,6,9]. The World Health Organization emphasizes that digital interventions are not substitutes for functioning health systems.

ISSN: 3123-3708

Digital tools require appropriate governance, organizational readiness, implementation support, and integration with broader service delivery [7]. Interoperability is particularly important when mHealth applications collect information that is also required by electronic medical records, referral systems, insurance processes, or national reporting platforms. Isolated systems may create duplicate data entry and fragmented patient records. Integrated systems may reduce repeated documentation and make collected information more useful for clinical care, program management, and policy decisions.

In Indonesia, SATUSEHAT is intended to support standardized health-data exchange across health facilities and other stakeholders [11,12]. Its interoperability guidance includes maternal and child health-related use cases such as antenatal care, intranatal care, postnatal care, nutrition, immunization, neonatal care, maternal and perinatal death reporting, child illness management, referrals, and BPJS claims.

Nevertheless, national interoperability does not occur automatically after publishing a technical standard. An Indonesian study of SATUSEHAT integration identified practical problems involving servers, FHIR profile selection, terminology mapping, technical resources, and developer support [14]. These findings indicate that interoperability requires not only standards but also implementation capacity, documentation, testing tools, technical assistance, and coordination among facilities, vendors, and government institutions.

Sustainable financing is another major determinant. Programs dependent on short-term project grants may struggle to maintain devices, telecommunications costs, cloud infrastructure, technical support, software updates, and training after the initial implementation period. Governance and financing arrangements should therefore be considered before large-scale deployment rather than after pilot funding ends.

Table 1. Recurrent Determinants of mHealth Usability and Adoption

Determinant	Level	Key evidence	Direction	Interpretation
Mobile phone access and ownership	Individual	Associated with service utilization, but partly related to socioeconomic advantage [1]	Generally positive but unequal	Necessary but insufficient for equitable access
Digital literacy and education	Individual	Recurrent determinant in adoption and implementation studies [1,8,9]	Positive when adequate	Important source of digital inequality
Perceived usefulness or performance expectancy	Individual	Associated with intention to use in adoption studies and reviews [4,16,17]	Generally positive	Users must perceive practical benefit
Effort expectancy or ease of use	Individual and technological	Significant in some studies but not others [4,16]	Mixed	Effect varies by setting and population
Social influence	Social	Trust-related beliefs are associated with behavioral intention, although their role and pathways differ across studies [4,13,16]	Generally positive	Family, peers, providers, and institutions may influence use
Trust and perceived reliability	Individual and technological	Associated with behavioral intention and service adoption [4,13,17]	Positive when present	Includes trust in technology, information, and provider

ISSN: 3123-3708

App quality	Technological	Strong predictor in one developing-country study [16]	Positive in that study	Should not be generalized across all settings
Human-centered and accessible design	Technological	Supported by design and implementation literature [8,18]	Positive	Requires testing with intended users
Privacy and security concerns	Individual and governance	Tools sustained when supporting routine tasks vs. duplicating paper systems [9,16]	Negative	Especially important with shared devices and sensitive content
Training and supervision	Organizational	Provider adoption depends on technical support, training, and facilitating conditions [8,10,17]	Positive when adequate	Ongoing support is preferable to one-time training
Workflow integration	Organizational	Tools may be more sustainable when supporting rather than duplicating routine tasks [6,8,9]	Positive	Parallel reporting may increase workload
Connectivity, electricity, and device costs	Infrastructure	Recurrent implementation barriers in low-resource environments [5,8,9]	Negative when inadequate	Supports offline-first and low-resource design
Interoperability and standardized data exchange	Health system	Integration may reduce fragmentation and repeated reporting [6,7,11,13]	Positive when functional	Standards require local implementation capacity
Governance and sustainable financing	Health system	Long-term implementation requires governance and continued investment [5–7]	Positive when adequate	Necessary to avoid pilot-only implementation

Quantitative Evidence on Significant Determinants

Several studies provide quantitative evidence on factors associated with intention to use, adoption, actual use, or intermediate maternal and nutrition outcomes. However, these studies differ in population, technology, model, and outcome definition. Their coefficients should therefore be interpreted within their specific contexts rather than ranked directly across studies.

Alam et al. examined mHealth-service adoption in Bangladesh using an extended Unified Theory of Acceptance and Use of Technology model. Performance expectancy, social influence, facilitating conditions, and perceived reliability positively influenced behavioral intention. Effort expectancy and price value were not significant predictors in their model [4].

A laiad et al. investigated determinants of mHealth adoption in a developing-country setting. Performance expectancy ($\beta = 0.37$, $p < 0.001$), effort expectancy ($\beta = 0.07$, $p < 0.05$), perceived health threat ($\beta = 0.18$, $p < 0.05$), app quality ($\beta = 0.39$, $p < 0.001$), and life-quality expectancy ($\beta = 0.12$, $p < 0.01$) positively predicted intention to use. Social influence was also significant [16]. App quality had the largest reported standardized coefficient in that particular study, but it should not be interpreted as the strongest determinant in all LMIC populations.

The more recent systematic review and meta-analysis by Wang et al. included 36 publications concerning health workers' adoption of digital health technology in LMICs, with 20 studies included in the meta-analysis. Performance expectancy was the most frequently reported facilitator, while lack of facilitating conditions was the most frequently reported barrier. Trust was associated with behavioral intention ($r = 0.53$; 95%

ISSN: 3123-3708

confidence interval: 0.18 to 0.76), and facilitating conditions were associated with actual use (r = 0.42; 95% confidence interval: 0.27 to 0.55) [17]. These findings suggest that provider adoption is influenced by both confidence in the technology and the availability of organizational and technical support.

Nutrition-focused intervention evidence also demonstrates the potential value of accessible mobile communication. In Sri Lanka, a mobile phone-based nutrition education intervention among pregnant and nursing mothers reported improvements in nutrition knowledge or awareness ($t = -18.70$, $p < 0.01$), attitude ($t = -2.00$, $p < 0.05$), breastfeeding practices ($t = -5.65$, $p < 0.01$), and minimum dietary diversity ($\chi^2 = 18.18$, $p < 0.01$) [3]. Social norms and behavioral intentions did not improve significantly. Mobile education may therefore improve knowledge and selected practices without necessarily changing deeper motivational or social factors.

Systematic-review evidence suggests that mobile phone access or mHealth exposure is frequently associated with greater use of antenatal, delivery, postnatal, neonatal, and immunization services [1,2]. However, some associations weaken after adjustment for education, wealth, residence, and other socioeconomic factors. Mobile access is therefore partly intertwined with broader digital and social inequality.

Taken together, the quantitative evidence indicates that adoption is shaped by multiple interacting determinants. Perceived usefulness, trust, social influence, app quality, and facilitating conditions may influence behavioral intention, while infrastructure, training, workflow fit, and organizational support affect whether intention develops into actual and sustained use.

Discussion

This narrative review indicates that mHealth usability and adoption are shaped by determinants operating across individual, technological, organizational, and health-system levels. No single determinant is sufficient to explain implementation success. A simple interface cannot compensate for unreliable connectivity, and strong technical infrastructure cannot guarantee use when the intervention has little perceived value or does not fit routine work.

At the individual level, phone access, education, digital literacy, affordability, privacy, trust, and social influence affect whether intended users can and will engage with an intervention. These factors also have important equity implications. Programs delivered only through smartphones or continuous mobile data may disproportionately exclude households with fewer financial resources, lower digital literacy, or shared-device use.

At the technological level, usability requires more than an attractive interface. Applications should function under the actual conditions in which they will be used. This may require low-bandwidth operation, offline data capture, understandable language, accessible content, and compatibility with lower-cost devices. Human-centered design can help identify these requirements before large-scale development [18].

Claims regarding the relative importance of individual adoption factors should be made cautiously. The finding that app quality was a strong predictor came primarily from one study [16]. It supports attention to application quality but does not establish app quality as the strongest determinant across LMICs. By contrast, the systematic review by Wang et al. indicates that trust, performance expectancy, and facilitating conditions recur across provider-adoption studies [17].

Intention to use should also not be treated as equivalent to actual use, sustained use, or improved health outcomes. A user may express positive intentions during a

ISSN: 3123-3708

survey but discontinue use because of cost, connectivity, workload, privacy concerns, or lack of support. Future evaluations should distinguish among initial uptake, behavioral intention, active use, continued use, discontinuation, and clinical or public-health outcomes.

For CHWs and frontline providers, a workflow-first approach is particularly important. Digital tools may improve data collection, reporting, supervision, and decision support, but they may also increase workload when introduced alongside existing paper and electronic systems [8,10]. Programs should identify which current tasks will be replaced, simplified, or improved by the intervention. The value of data collection should also be visible to frontline users rather than benefiting only managers at higher administrative levels.

Training and technical support are necessary, but should not be used to compensate for poorly designed systems. Training should address realistic tasks, common errors, connectivity interruptions, data correction, privacy, and escalation procedures. Supervisors and technical-support teams should also have sufficient capacity to respond when users encounter difficulties.

At the health-system level, sustainability depends on governance, financing, interoperability, and institutional ownership. Short-term pilot funding may demonstrate feasibility without ensuring continued operation [5,6]. Programs should account for recurrent expenses, including devices, telecommunications, hosting, software maintenance, technical support, security, and refresher training. Interoperability is particularly relevant in Indonesia. SATUSEHAT creates a national direction for standardized health-data exchange, including maternal and child health use cases [11,12]. However, the study by Heryawan et al. identified three primary technical pain points for developers integrating with Indonesia's national platform: FHIR server issues, terminology mapping, and FHIR profile selection [14]. Beyond these specific technical challenges, the study concluded that sustainable interoperability also requires strengthening broader implementation capacity, including better technical resources, developer documentation, and coordination.

mHealth programs in Indonesia should therefore be evaluated not only according to user satisfaction or number of registrations. Evaluation should also consider whether the intervention reduces or increases documentation burden, connects with electronic medical records, supports referrals, aligns with BPJS Kesehatan processes where relevant, and exchanges information appropriately through SATUSEHAT.

Limitations of the Review

This review has several limitations. First, it was conducted as a narrative review and did not use a prospectively registered systematic-review protocol. It did not include formal duplicate screening, a PRISMA study-selection process, or standardized risk-of-bias appraisal. Second, the review prioritized English-language publications and may not have captured relevant studies published in other languages or in local journals that were not indexed in the databases searched.

Third, the included evidence was heterogeneous. Studies examined different populations, technologies, health conditions, implementation settings, and outcomes. Findings concerning intention to use cannot be assumed to apply directly to actual use, sustained use, or maternal and child health outcomes. Fourth, some determinants were supported by a limited number of studies. In particular, conclusions regarding app quality

ISSN: 3123-3708

and specific technology-acceptance constructs should be interpreted as context-dependent rather than universal.

Finally, the Indonesian discussion uses both peer-reviewed research and official implementation documentation. Official documents are appropriate for describing current national architecture and intended workflows, but they do not independently demonstrate successful implementation or improved health outcomes.

Conclusion

This review identifies four interrelated conditions that influence whether mHealth interventions in maternal and child health and nutrition programs are usable, acceptable, adoptable, and scalable.

First, usability depends on simple navigation, accessible language and content, low-bandwidth or offline operation, compatibility with affordable devices, reliable performance, and design processes involving intended users. Second, acceptability depends on whether users perceive the intervention as useful, trustworthy, reliable, culturally appropriate, and protective of personal information. Family influence, provider endorsement, and confidence in the organization delivering the service may also affect acceptance.

Third, adoption and sustained use depend on equitable phone access, digital literacy, affordability, training, supervision, facilitating conditions, and integration with routine tasks. Intention to use should not be considered equivalent to actual or continued use. Fourth, scale-up and sustainability depend on organizational readiness, stable financing, technical support, governance, interoperability, and integration with routine health-information systems, referral pathways, and national digital-health infrastructure. In Indonesia, this includes practical alignment with facility electronic medical records, relevant BPJS Kesehatan processes, and SATUSEHAT-based data exchange.

Successful mHealth implementation therefore requires more than an effective message or technically functional application. Programs should combine human-centered design, equitable access, privacy protection, provider support, workflow integration, and sustainable health-system architecture. Future evaluations should report sustained use, discontinuation, implementation costs, equity differences, workflow effects, and system integration in addition to intention to use and short-term health outcomes.

Funding

No funding support was received.

Conflict of Interest

The authors declare no conflict of interest.

References

1. De P, Pradhan MR. Effectiveness of mobile technology and utilization of maternal and neonatal healthcare in low and middle-income countries (LMICs): a systematic review. BMC Womens Health. 2023;23:664. doi:10.1186/s12905-023-02825-y
2. Knop MR, Nagashima-Hayashi M, Lin R, Saing CH, Ung M, Oy S, et al. Impact of mHealth interventions on maternal, newborn, and child health from conception to 24

ISSN: 3123-3708

months postpartum in low- and middle-income countries: a systematic review. BMC Med. 2024;22:196. doi:10.1186/s12916-024-03417-9

3. Peiris DR, Wijesinghe MSD, Gunawardana BMI, Weerasinghe WMPC, Rajapaksha RMNU, Rathnayake KM, et al. Mobile phone-based nutrition education targeting pregnant and nursing mothers in Sri Lanka. Int J Environ Res Public Health. 2023;20(3):2324. doi:10.3390/ijerph20032324
4. Alam MZ, Hoque MdR, Hu W, Barua Z. Factors influencing the adoption of mHealth services in a developing country: a patient-centric study. Int J Inf Manage. 2020;50:128–43. doi:10.1016/j.ijinfomgt.2019.04.016
5. Kaboré SS, Ngangue P, Soubeiga D, Barro A, Pilabré AH, Bationo N, et al. Barriers and facilitators for the sustainability of digital health interventions in low and middle-income countries: a systematic review. Front Digit Health. 2022;4:1014375. doi:10.3389/fdgth.2022.1014375
6. McCool J, Dobson R, Whittaker R, Paton C. Mobile Health (mHealth) in Low- and Middle-Income Countries. Annu Rev Public Health. 2022;43:525–39. doi:10.1146/annurev-publhealth-052620-093850
7. World Health Organization. WHO guideline: recommendations on digital interventions for health system strengthening [Internet]. Geneva: World Health Organization; 2019 [cited 2026 Jun 24]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK541902
8. Kansiime WK, Atusingwize E, Ndejjo R, Balinda E, Ntanda M, Mugambe RK, et al. Barriers and benefits of mHealth for community health workers in integrated community case management of childhood diseases in Banda Parish, Kampala, Uganda: a cross-sectional study. BMC Primary Care. 2024;25:173. doi:10.1186/s12875-024-02430-4
9. Kruse C, Betancourt J, Ortiz S, Valdes Luna SM, Bamrah IK, Segovia N. Barriers to the use of mobile health in improving health outcomes in developing countries: systematic review. J Med Internet Res. 2019;21(10):e13263. doi:10.2196/13263
10. Abreu FDL, Bissaco MAS, Silva AP, Boschi SRMS, Scardovelli TA, Santos MF, et al. The use and impact of mHealth by community health workers in developing and least developed countries: a systematic review. Research on Biomedical Engineering. 2021;37(3):563–82. doi:10.1007/s42600-021-00154-3
11. Kementerian Kesehatan Republik Indonesia. Panduan Interoperabilitas [Internet]. 2026. Available from: https://satusehat.kemkes.go.id/platform/docs/id/interoperability/
12. Kementerian Kesehatan Republik Indonesia. Apa itu SATUSEHAT? [Internet]. 2026. Available from: https://satusehat.kemkes.go.id/platform/docs/id/playbook/introduction/
13. Soelasih Y, Sumani, Efendi. Consumer trust in telemedicine in Indonesia. Health Informatics J. 2025 Apr 1;31(2). doi:10.1177/14604582251345328 PubMed PMID: 40406860.
14. Heryawan L, Mori Y, Yamamoto G, Kume N, Lazuardi L, Fuad A, et al. Fast Healthcare Interoperability Resources (FHIR)–Based Interoperability Design in Indonesia: Content Analysis of Developer Hub's Social Networking Service. JMIR Form Res. 2025 Apr 21;9:e51270–e51270. doi:10.2196/51270
15. Baethge C, Goldbeck-Wood S, Mertens S. SANRA—a scale for the quality assessment of narrative review articles. Res Integr Peer Rev. 2019 Dec 26;4(1):5. doi:10.1186/s41073-019-0064-8
16. Alaiad A, Alsharo M, Alnsour Y. The determinants of M-health adoption in developing countries: an empirical investigation. Appl Clin Inform. 2019;10(5):820–40. doi:10.1055/s-0039-1697906

ISSN: 3123-3708

17. Wang M, Huang K, Li X, Zhao X, Downey L, Hassounah S, et al. Health workers' adoption of digital health technology in low- and middle-income countries: a systematic review and meta-analysis. Bull World Health Organ. 2025 Feb 1;103(02):126-135F. doi:10.2471/BLT.24.292157
18. Göttgens I, Oertelt-Prigione S. The application of human-centered design approaches in health research and innovation: a narrative review of current practices. JMIR Mhealth Uhealth. 2021;9(12):e28102. doi:10.2196/28102

ISSN: 3123-3708