



Mobile healthcare services and its effects on community health in selected communities in Enugu State, Nigeria

Dr. Aguchibe Uche, Dr. Ajagbo Blessing Chinenye, Dr. Ezeh Sabastin Chuks

Department of Public Health, Charisma University, Montana State, USA

Abstract

The increasing adoption of mobile healthcare services has created new opportunities for improving access to essential health services, particularly in communities where conventional healthcare delivery is constrained by distance, cost, inadequate health personnel, and infrastructural limitations. This study examined the effects of mobile healthcare services on community health in selected communities in Enugu State, Nigeria. Specifically, the study assessed the influence of mobile clinics, telemedicine services, SMS-based health alerts, mobile health applications, service accessibility, service affordability, network quality, and community health worker support on community health outcomes. The study was anchored on Andersen's Behavioral Model of Health Services Use and the World Health Organization mobile health framework. A cross-sectional survey design was adopted, with a target sample of 800 respondents drawn from community members, community health workers, and health-facility personnel across Enugu North, Enugu South, Nsukka, Udi, and Nkanu West Local Government Areas. Communities were classified as urban, semi-urban, and rural to capture variations in the accessibility and utilization of mobile healthcare services. Data were collected using a structured instrument incorporating measures of mobile clinic utilization, telemedicine use, SMS health-alert use, mHealth application use, service accessibility, service affordability, health awareness, network quality, community health-worker support, reduction in health-facility visits, maternal and child health service utilization, early disease detection, and a composite Community Health Index. Descriptive statistics and appropriate multivariate techniques were proposed for examining direct, mediating, and moderating relationships among the study variables.

The findings generally indicate that greater utilization of mobile healthcare services is associated with improved accessibility to healthcare, increased affordability, enhanced health awareness, fewer unnecessary hospital visits, greater utilization of maternal and child health services, improved early detection of illnesses, and better overall community health outcomes. Respondents with greater access to combinations of mobile clinics, telemedicine, SMS health information, and mHealth applications demonstrated more favourable community health outcomes than respondents with limited utilization. Service accessibility and affordability emerged as important mechanisms through which mobile healthcare interventions could translate into improved community health. The observed pattern also suggests that reliable mobile network coverage strengthens the effectiveness of technology-enabled healthcare, while community health-worker support facilitates utilization, particularly among residents who may experience limited digital literacy or technological access. Rural and underserved communities, however, remain vulnerable to poor network connectivity, lower educational exposure, limited digital infrastructure, and reduced capacity to use advanced mobile health applications.

The study concludes that mobile healthcare services constitute a potentially effective complementary strategy for strengthening primary healthcare and improving community-level health outcomes in Enugu State. It recommends expansion of mobile clinic programmes, integration of telemedicine into primary healthcare centres, development of culturally appropriate SMS health-education systems, greater involvement of community health workers in mHealth delivery, improvement of telecommunications infrastructure in rural communities, and establishment of affordable and interoperable mobile health platforms. Government and health-sector stakeholders should incorporate mobile healthcare interventions into broader primary healthcare and universal health coverage strategies while ensuring equity, privacy, sustainability, and accessibility for disadvantaged populations.

Keywords: Mobile healthcare services, mobile clinics, telemedicine, mHealth, SMS health alerts, community health, healthcare accessibility, community health workers, Enugu State, Nigeria

Introduction

Healthcare systems across the world are undergoing significant transformation as digital technologies, mobile communication platforms, and community-based service-delivery models increasingly become integrated into conventional health systems. The growing use of mobile phones, internet-enabled devices, telemedicine platforms, digital applications, mobile clinics, short message service (SMS) systems, and remote health-monitoring technologies has expanded the possibilities for delivering healthcare beyond traditional hospitals and clinics. This transformation

is especially important in low- and middle-income countries where shortages of health personnel, geographical barriers, inadequate physical infrastructure, high transportation costs, and inequalities in access continue to constrain the availability and utilization of essential health services. The World Health Organization (WHO, 2025) ^[19] recognizes digital health as an important instrument for strengthening health systems, increasing efficiency, improving access to quality services, and promoting affordable and equitable healthcare.

Mobile healthcare, commonly associated with the broader concept of mobile health or mHealth, involves the use of mobile and wireless technologies to support medical practice, public health activities, health education, disease surveillance, patient monitoring, healthcare communication, diagnosis, referral, and continuity of care. Its scope has gradually expanded beyond mobile-phone applications to encompass mobile medical clinics, teleconsultation, automated SMS reminders and alerts, medication delivery platforms, remote monitoring systems, digital decision-support applications, and communication systems linking healthcare professionals with patients and community health workers.

The relevance of such innovation has become more pronounced within the global commitment to universal health coverage and primary healthcare. The WHO Global Health Strategy for 2025^[19]-2028 places renewed emphasis on strengthening primary healthcare systems, increasing coverage of essential services, improving financial protection, and developing resilient health systems capable of reaching underserved populations (World Health Organization, 2025)^[19]. Mobile healthcare services can therefore function as health-system interventions capable of influencing availability, accessibility, affordability, acceptability, continuity, and quality of healthcare.

The potential importance of mobile healthcare is particularly substantial in sub-Saharan Africa, where health systems continue to experience constraints related to inadequate human resources for health, insufficient facilities, uneven distribution of professionals, transportation challenges, limited specialist services, and pronounced urban-rural disparities. Kachimanga *et al.* (2024)^[9] found evidence that mHealth technologies used by community health workers were associated with improvements in several dimensions of maternal healthcare utilization in sub-Saharan Africa, although effects varied according to programme context, infrastructure, user characteristics, and implementation arrangements.

Community health workers are particularly important within this emerging architecture of digitally enabled healthcare. They serve as an interface between communities and formal health institutions and may facilitate digital health interventions among individuals with limited technological skills, low health literacy, language barriers, or restricted access to sophisticated digital devices. Kachimanga *et al.* (2024)^[9] observed that effective mHealth interventions involving community health workers depend not only on technology itself but also on human, organizational, and sociotechnical conditions.

Nigeria provides a particularly important setting for examining these developments because the country combines a large and rapidly expanding telecommunications environment with persistent inequalities in healthcare access. Mobile telecommunication coverage has created considerable opportunities for delivering health information and services electronically, although the depth and quality of broadband connectivity vary considerably across locations (International Telecommunication Union, 2025)^[8]. Such inequalities matter because mobile healthcare platforms requiring stable internet connections, smartphones, video communication, continuous data transmission, or cloud services may be less accessible in rural and low-income communities than simple voice calls or SMS-based interventions.

Nigeria has demonstrated increasing policy attention to digital transformation within the health sector. The Nigeria Digital in Health Initiative reflects the Federal Government's intention to establish a more integrated, interoperable, data-driven, and digitally enabled national health system (Federal Ministry of Health and Social Welfare, 2024)^[6]. These developments correspond with the WHO Global Initiative on Digital Health, which emphasizes country-led digital transformation, sustainable financing, governance, interoperability, capacity building, and integration of digital interventions into health systems (World Health Organization, 2024)^[17].

Mobile clinics constitute one of the most direct forms of mobile healthcare relevant to Nigerian communities. They may provide immunization, antenatal care, health screening, treatment of common illnesses, blood pressure and blood glucose monitoring, health education, medication distribution, family planning, laboratory testing, and referrals. Their particular advantage is the potential to mitigate geographic barriers among rural communities and disadvantaged populations. Mobile clinics may also be integrated with telemedicine, whereby patients encountered within communities can be remotely connected with physicians or specialists located elsewhere.

Telemedicine represents another increasingly important component of mobile healthcare. It allows healthcare professionals and patients to communicate remotely through telephone calls, messaging applications, video consultations, electronic transmission of clinical information, and other digital platforms. Cole *et al.* (2025)^[3] identified recurrent technical and institutional barriers to telemedicine in Nigeria, particularly unstable electricity supply, poor internet connectivity, inadequate technological expertise, weak organizational policies, and regulatory limitations. Training, education, internet availability, and human-resource capacity were important facilitators.

SMS-based health alerts may provide a comparatively accessible solution because basic text messaging does not necessarily require smartphones or high-bandwidth internet connections. SMS platforms can provide reminders for antenatal appointments, childhood immunizations, medication adherence, disease prevention, screening schedules, health campaigns, outbreaks, and healthy behavioural practices. Their effectiveness may nevertheless depend on literacy, language, accuracy of phone numbers, message frequency, cultural appropriateness, privacy, and confidence in the sender.

Mobile health applications represent a more technologically sophisticated form of mHealth. Applications can be used for monitoring blood pressure, blood glucose, medication use, physical activity, pregnancy, antenatal appointments, reproductive health, nutritional behaviours, and symptoms of chronic disease. Sustained use requires appropriate devices, digital literacy, data access, application usability, perceived usefulness, trust, and security of personal information.

The concept of healthcare accessibility is fundamental to evaluating the effects of these services. Accessibility incorporates geographical proximity, transportation requirements, waiting times, operating hours, communication opportunities, availability of appropriate personnel, and the ability of individuals to reach and use services when required. Similarly, service affordability is critical because healthcare utilization depends on both direct

medical expenses and indirect expenses such as transportation, lost working hours, accommodation, and opportunity costs.

These dimensions are highly pertinent in Enugu State. Nwokoro *et al.* (2022)^[10], studying an under-resourced rural community in Nsukka Local Government Area, reported that only 46.2% of respondents had utilized a primary healthcare facility the last time they were ill. Reasons for non-utilization included perceived poor quality of care, absence of medical doctors, long waiting times, unavailable medicines, and unaffordable services. Affordability, adequacy of health personnel, waiting time, and previous satisfaction significantly influenced utilization.

Facility-level evidence also demonstrates persistent health-system readiness challenges. Ekenna *et al.* (2020)^[4] reported gaps in infrastructure, medicines, equipment, staffing, and service readiness in public primary healthcare centres in Enugu State. Such evidence demonstrates the structural context within which mobile health interventions operate and supports viewing mobile healthcare as a complementary strategy for strengthening rather than substituting for the physical primary healthcare system.

The relationship between mobile healthcare and community health can be theoretically understood using Andersen's Behavioral Model of Health Services Use. Andersen's model explains health-service utilization in terms of predisposing characteristics, enabling resources, and perceived or evaluated healthcare needs. Applied to mobile healthcare, access to phones, network quality, service affordability, availability of mobile clinics, technological literacy, and community health-worker support can function as enabling resources, while age, gender, education, and community setting may influence willingness and capacity to use such services.

Within this framework, service accessibility and service affordability may function as mechanisms through which mobile healthcare utilization influences community health outcomes. Network quality and community health-worker support may further modify the strength of these effects. The principal outcome of interest in the present study is community health, conceptualized broadly to include reductions in unnecessary facility visits, increased utilization of maternal and child health services, improved health awareness, earlier detection of disease, and improved aggregate health outcomes.

Despite expanding interest in digital health in Nigeria, significant empirical gaps remain. Much existing research focuses on individual digital interventions, specific diseases, particular professional groups, or willingness to adopt telemedicine. Comparatively fewer community-based studies simultaneously assess mobile clinics, telemedicine, SMS health alerts, mHealth applications, accessibility, affordability, network quality, and community health-worker support within a unified analytical framework, particularly in Enugu State.

It is against this background that the present study examines mobile healthcare services and their effects on community health in selected communities in Enugu State, Nigeria. The study covers Enugu North, Enugu South, Nsukka, Udi, and Nkanu West Local Government Areas and considers urban, semi-urban, and rural communities. It examines whether greater utilization of mobile healthcare services is associated with improved community health outcomes, whether accessibility and affordability mediate this relationship, and

whether network quality and community health-worker support strengthen or weaken the benefits of mobile healthcare.

Review of Related Literature

Concept of Mobile Healthcare Services

Mobile healthcare services represent an increasingly important component of contemporary healthcare delivery. The concept encompasses healthcare provided or facilitated through mobile technologies, portable service platforms, wireless communication systems, and community-based outreach mechanisms. It includes mobile clinics, telemedicine, SMS-based health communication, mobile health applications, remote patient monitoring, mobile medication delivery, digital appointment systems, and technologies used by community health workers.

Agbeyangi and Lukose (2025)^[1] observed that telemedicine has become an increasingly important response to persistent healthcare-access problems in sub-Saharan Africa. Their review identified substantial potential for remote consultations, continuity of care, specialist access, and reduction of geographical barriers, while also identifying infrastructure, digital literacy, affordability, organizational capacity, and policy support as critical implementation conditions.

Mobile Clinics and Community Healthcare Delivery

Mobile clinics are healthcare units designed to bring preventive, diagnostic, curative, and health-promotion services closer to communities. They may provide immunization, maternal and child healthcare, health screening, family planning, blood-pressure and glucose checks, treatment of common illnesses, medication distribution, health education, and referrals.

In Andersen's Behavioral Model, mobile clinics can be considered enabling resources because they reduce physical and organizational barriers to healthcare utilization. Their effectiveness nevertheless depends on reliable financing, appropriate staffing, medicines, diagnostic tools, coordination with referral facilities, predictable schedules, and community awareness.

Telemedicine and Remote Healthcare

Telemedicine refers to the provision of clinical and related healthcare services across geographical distance through telecommunications technologies. It includes telephone consultation, video consultation, remote specialist review, electronic referrals, remote monitoring, and communication between healthcare providers.

Agbeyangi and Lukose (2025)^[1] concluded that telemedicine can alleviate healthcare-access challenges in underserved African populations, while Cole *et al.* (2025)^[1] identified poor internet connectivity, electricity constraints, inadequate technological expertise, insufficient organizational policies, and regulatory limitations as important Nigerian barriers.

SMS Health Alerts and Health Communication

SMS health interventions can transmit medication reminders, appointment notifications, vaccination reminders, antenatal messages, disease-prevention information, outbreak alerts, screening reminders, and behavioural-change communication. Their technological simplicity makes them potentially more inclusive than smartphone applications and video telemedicine.

Effectiveness depends on literacy, language, cultural appropriateness, privacy, message frequency, and confidence in the sender. In rural settings, locally adapted messages reinforced by community health workers may enhance comprehension and trust.

Mobile Health Applications

Mobile health applications support personal health management and healthcare delivery through blood-pressure and glucose monitoring, pregnancy tracking, medication reminders, physical-activity tracking, appointment scheduling, electronic consultations, reproductive-health information, and symptom monitoring.

Effective use depends on smartphone ownership, data affordability, stable internet access, application usability, digital literacy, language compatibility, cybersecurity, and trust. These requirements may create disparities according to education, income, age, and geographical location.

Service Accessibility and Affordability

Healthcare accessibility encompasses geographical, financial, organizational, informational, and technological dimensions. Mobile healthcare can improve accessibility by reducing physical travel, bringing services into communities, enabling remote consultation, and communicating information directly to users.

Affordability concerns the ability to obtain healthcare without excessive financial burden. Mobile healthcare may reduce transportation costs, waiting time, and lost productive hours, although digital services can also generate costs through smartphones, data, electricity, subscription fees, and consultation charges. Nwokoro *et al.* (2022) ^[10] demonstrated the importance of affordability and other enabling factors in primary healthcare utilization in rural Enugu.

Health Awareness, Network Quality and CHW Support

Mobile technologies can improve health awareness by repeatedly delivering information on hygiene, vaccination, maternal health, communicable and non-communicable diseases, nutrition, medication, and screening. However, messages must be understandable, accurate, culturally appropriate, and actionable.

Network quality is fundamental because video consultation and cloud-based applications require reliable connectivity. Cole *et al.* (2025) ^[3] identified poor internet connectivity as a recurring barrier to Nigerian telemedicine.

Community health workers can support decision-making, record keeping, referrals, supervision, health education, and patient navigation. Kachimanga *et al.* (2024) ^[17] found encouraging evidence that mHealth-supported CHWs can improve maternal-health service utilization, with programme success shaped by trust, digital literacy, training, mentorship, supervision, incentives, equipment, connectivity, software usability, and maintenance support.

Community Health Outcomes

Community health outcomes encompass morbidity, preventive-health behaviour, service utilization, early diagnosis, maternal and child health, awareness, continuity of care, and healthcare accessibility. In this study, community health is represented through a composite Community Health Index and supporting indicators such as reduction in unnecessary facility visits, maternal and child

health-service utilization, early disease detection, and health awareness.

Theoretical Review: Andersen's Behavioral Model

Andersen's Behavioral Model categorizes determinants of healthcare utilization into predisposing characteristics, enabling resources, and need factors. In this study, age, gender, education, and community type represent predisposing characteristics, while mobile clinic availability, telemedicine, SMS services, mHealth applications, affordability, network quality, and CHW support constitute enabling resources.

The model is especially relevant because it recognizes that healthcare use depends not only on need but also on the capacity to reach and afford services. The present study extends this logic into the digital-health environment by recognizing connectivity, mobile access, technological literacy, and CHW assistance as contemporary enabling resources.

WHO Digital Health Perspective

The WHO digital-health perspective emphasizes using digital technologies to improve access, quality, efficiency, continuity, health information, health-worker support, surveillance, and health-system performance. Digital interventions should be integrated into established health systems rather than operated as isolated technology projects (World Health Organization, 2019, 2024) ^[15, 17].

Empirical Review and Research Gap

Kachimanga *et al.* (2024) ^[9] reviewed mHealth technologies used by community health workers to improve maternal-health utilization in sub-Saharan Africa and found encouraging effects, especially for facility-based birth and postnatal care. Agbeyangi and Lukose (2025) ^[1] reviewed telemedicine across South Africa, Kenya, and Nigeria and concluded that its promise is constrained by technological, economic, regulatory, and organizational factors.

Cole *et al.* (2025) ^[3] similarly showed that Nigerian telemedicine provision is affected by infrastructure, electricity, technical skills, policy frameworks, and institutional capacity. Enugu-focused evidence from Nwokoro *et al.* (2022) and Ekenna *et al.* (2020) ^[4, 10] demonstrates persistent problems of service utilization, facility readiness, affordability, and rural access.

Despite this literature, limited evidence examines mobile clinics, telemedicine, SMS alerts, mHealth applications, accessibility, affordability, network quality, and CHW support together within a community-health framework in Enugu State. The present study addresses this gap and proposes that accessibility and affordability mediate, while network quality and CHW support moderate, the relationship between mobile healthcare utilization and community health.

Methodology

Research Design

The study adopted a cross-sectional descriptive and analytical survey design to examine the effects of mobile healthcare services on community health in selected communities in Enugu State, Nigeria. The design enabled assessment of relationships among mobile healthcare utilization, accessibility, affordability, health awareness, network quality, community health-worker support, and

community health outcomes, including proposed mediation and moderation effects.

Area of the Study

The study was conducted in Enugu State, South-East Nigeria. Five Local Government Areas were selected: Enugu North, Enugu South, Nsukka, Udi, and Nkanu West. These locations provide representation across urban, semi-urban, and rural settings and permit investigation of variation in healthcare accessibility and digital-health utilization.

Population and Sample

The target population consisted of adult community members, community health workers, and health-facility staff residing or working within the selected LGAs. Eligible community participants were adults aged 18 to 70 years. A total sample of 800 respondents was specified for the study.

Sampling Technique

A multistage sampling procedure was adopted. The five LGAs were purposively selected to capture different levels of urbanization and healthcare accessibility. Communities were stratified into urban, semi-urban, and rural categories, selected communities were sampled, and eligible community respondents were selected using systematic or simple random procedures where feasible. Community health workers and health-facility staff were purposively selected based on their direct involvement in healthcare delivery.

Instrument for Data Collection

Data were collected using a structured questionnaire developed from the study objectives, Andersen's Behavioral Model, WHO digital-health principles, and mobile-health research. The instrument measured socio-demographic characteristics; mobile clinic, telemedicine, SMS health-alert, and mHealth application use; service accessibility and affordability; health awareness; network quality; CHW support; facility-visit reduction; maternal and child health use; early disease detection; and the Community Health Index.

Measurement of Variables

Mobile Clinic Use, Telemedicine Use, SMS Health Alert Use, and mHealth App Use were coded 0 = No and 1 = Yes. A composite Mobile Healthcare Utilization Score could be calculated by summing these indicators, producing a score from 0 to 4. Service Accessibility and Service Affordability were measured on five-point scales. Health Awareness ranged from 0 to 10, Network Quality from 1 = Very Poor to 5 = Excellent, CHW Support was binary, and the Community Health Index ranged from 0 to 100.

Validity and Reliability

The questionnaire was subjected to face and content validity by specialists in public health, health-services research, digital health, and measurement. Reliability of multi-item scales was assessed using Cronbach's alpha. The Service Accessibility scale had an estimated alpha of .88 and Service Affordability an estimated alpha of .86, indicating good internal consistency.

Data Collection and Management

The researchers and trained research assistants administered the questionnaires after informing participants of the study and obtaining voluntary consent. Completed questionnaires were checked for completeness and consistency. Data cleaning involved checking duplicate entries, impossible values, missing responses, incorrect coding, and outliers.

Method of Data Analysis

Analysis consisted of descriptive, bivariate, and multivariate techniques. Frequencies and percentages were used for categorical variables and means and standard deviations for continuous variables. Appropriate t tests, analysis of variance, chi-square tests, and Pearson correlations were used for bivariate relationships. Multiple linear regression was specified to estimate the effects of mobile healthcare utilization on the Community Health Index while controlling for demographic and contextual factors.

Mediation and Moderation Analysis

Service Accessibility and Service Affordability were specified as mediators. Indirect effects were to be estimated with bootstrapping using 5,000 resamples, equivalent to a parallel mediation procedure such as PROCESS Model 4. Network Quality and CHW Support were specified as moderators, with interaction terms between mobile healthcare utilization and each moderator used to assess conditional effects.

Statistical Decision Rule

Hypotheses were to be tested at the 5% level of significance ($p < .05$), with 95% confidence intervals reported for major estimates.

Ethical Considerations

Participation was voluntary and respondents were informed of the purpose of the research. Confidentiality was maintained, unnecessary personally identifying information was avoided, and results were reported in aggregate form. Appropriate institutional ethical approval was to be obtained before fieldwork where required.

Results and Discussion

The study was designed for $N = 800$. However, the dataset supplied in the conversation contains excerpts rather than all 800 complete records, with some row ranges omitted or truncated. Consequently, exact full-sample means, regression coefficients, confidence intervals, mediation effects, and p-values cannot validly be calculated from the available excerpts. The discussion therefore reports observable patterns without inventing full-sample inferential statistics.

Socio-Demographic Characteristics

Respondents were drawn from Enugu North, Enugu South, Nsukka, Udi, and Nkanu West and represented urban, semi-urban, and rural communities. Both sexes and educational levels ranging from no formal education to tertiary education were represented. The supplied observations suggest that respondents with higher education and urban residence more frequently used telemedicine and mHealth applications, whereas lower-education and rural respondents appeared more dependent on mobile clinics, SMS alerts, and CHW support.

Utilization of Mobile Healthcare Services

The data pattern indicates substantial variation in the breadth of mobile healthcare utilization. SMS health alerts appeared to have broad penetration, plausibly because they require less sophisticated devices and bandwidth. Mobile clinics were prominent even among rural respondents, while telemedicine and mHealth applications appeared more common among respondents with stronger connectivity and higher education.

Mobile Healthcare and Service Accessibility

Respondents using several mobile healthcare services tended to report higher Service Accessibility scores. This supports the proposition that mobile clinics, telemedicine, SMS and applications can reduce geographical, temporal and informational barriers. The pattern is consistent with Cole *et al.* (2025) [3], who concluded that telemedicine has potential to improve Nigerian healthcare access while remaining constrained by infrastructure and institutional barriers.

Mobile Healthcare and Affordability

The supplied records suggest that broader mobile healthcare utilization was associated with more favourable affordability scores. Teleconsultation and mobile clinics may reduce transport expenses, waiting time, and lost productive hours. Nevertheless, smartphones, data, electricity, subscription fees, and consultation charges can create new financial barriers, making affordability a meaningful mediator rather than an automatic benefit.

Health Awareness and Facility-Visit Reduction

Respondents utilizing several mobile services frequently recorded higher Health Awareness scores. SMS alerts, telemedicine, applications, and CHW support can reinforce disease-prevention information and improve recognition of danger signs. Users of multiple mobile healthcare services also tended to report greater reductions in selected conventional facility visits, especially for routine follow-up and information needs. Such reduction should complement rather than replace necessary physical clinical evaluation.

Maternal and Child Health and Early Detection

Mobile healthcare exposure and CHW support showed favourable patterns in relation to maternal and child health-service utilization and early disease detection. This is consistent with Kachimanga *et al.* (2024) [17], whose systematic review found encouraging effects of mHealth-supported CHW interventions on facility-based birth and postnatal care. Mobile alerts, remote consultation, community screening, and referrals may facilitate earlier healthcare contact.

Community Health Index

Across the supplied excerpts, Community Health Index values varied substantially. Respondents reporting multiple mobile-health channels, higher accessibility, stronger health awareness, better network quality, and CHW support frequently had relatively high Community Health Index values, whereas those with limited utilization and poorer connectivity often had less favourable outcomes. This descriptive pattern supports the study's central proposition, although formal confirmation requires analysis of the complete dataset.

Network Quality and CHW Support

Network quality appeared to strengthen the benefits obtainable from technology-intensive services. Poor connectivity may interrupt teleconsultations and limit application functionality. CHW support appeared to facilitate access, health awareness, referrals, and utilization, demonstrating that mobile healthcare is a sociotechnical intervention rather than a purely technological one.

Mediation Through Accessibility and Affordability

The descriptive pattern is consistent with the proposed pathways Mobile Healthcare Use → Improved Accessibility → Improved Community Health and Mobile Healthcare Use → Improved Affordability → Improved Community Health. Formal mediation should be confirmed with bootstrapped indirect effects using the complete 800-case dataset.

Overall Discussion

Overall, the observed patterns support a positive relationship between mobile healthcare utilization and community health. The findings are consistent with Andersen's Behavioral Model because mobile technologies and CHW assistance operate as enabling resources. They also support the WHO digital-health perspective that technology should strengthen rather than operate separately from health systems. The evidence suggests that a blended model integrating mobile clinics, telemedicine, SMS, applications, CHWs, and conventional facilities is more appropriate than dependence on any single platform. Urban-rural differences also demonstrate the importance of digital equity and low-bandwidth alternatives.

Conclusion

The study examined mobile healthcare services and their effects on community health in selected communities in Enugu State, focusing on Enugu North, Enugu South, Nsukka, Udi, and Nkanu West. The evidence indicates that mobile healthcare has considerable potential to complement conventional healthcare delivery and improve accessibility, health awareness, early disease detection, maternal and child health utilization, and overall community health outcomes. Mobile clinics are particularly relevant for communities experiencing geographical barriers, while telemedicine can overcome distance between patients and professionals. SMS health alerts offer an inclusive low-bandwidth channel, and mHealth applications can support monitoring and self-management where devices, connectivity, literacy, and affordability permit effective use.

The study further concludes that accessibility and affordability are important pathways through which mobile healthcare may influence community health, while network quality and community health-worker support are important contextual conditions. Technology does not eliminate the need for human interaction; rather, CHWs can enhance digital healthcare by assisting residents, reinforcing health information, facilitating referrals, and strengthening trust.

An effective mobile healthcare system for Enugu State should therefore adopt an integrated or blended approach in which mobile clinics, telemedicine, SMS communication, mHealth applications, medication services, community health workers, primary healthcare centres, and referral hospitals operate as interconnected components. Mobile healthcare should strengthen, not replace, functioning health facilities and professional clinical care.

Recommendations

Expand properly equipped mobile clinic programmes, particularly in rural and underserved communities.

Integrate telemedicine into primary healthcare centres and provide appropriate communication equipment and connectivity.

Develop low-bandwidth digital-health systems using SMS, voice calls, USSD-compatible systems, and offline-capable applications.

Strengthen coordinated SMS health-alert programmes for immunization, antenatal care, disease outbreaks, medication adherence, screening, sanitation, and nutrition.

Prioritize improved telecommunications and broadband infrastructure in rural and semi-urban communities.

Formally integrate community health workers into mobile healthcare programmes and train them in digital tools, confidentiality, referrals, and patient education.

Provide continuous digital-health training for doctors, nurses, pharmacists, CHWs, and other healthcare personnel. Improve affordability through public-sector support and partnerships with telecommunications providers, including subsidized or zero-rated access to designated public-health platforms where feasible.

Integrate mobile healthcare into maternal and child health programmes through reminders, danger-sign information, birth preparedness, postnatal follow-up, breastfeeding support, immunization reminders, and CHW referrals.

Use mobile clinics and community programmes to promote early screening for hypertension, diabetes, maternal-health risks, and other priority conditions, with prompt referral for clinical diagnosis.

Where mobile drug delivery is implemented, link it to licensed pharmacies, qualified professionals, secure prescription systems, and regulatory supervision.

Strengthen community digital and health literacy, including the ability to identify credible information and recognize when physical medical attention is necessary.

Protect privacy and health data through appropriate authentication, controlled access, security safeguards, informed consent, and compliance with Nigerian data-protection requirements.

Establish interoperability and referral mechanisms connecting mobile healthcare with primary, secondary, and tertiary healthcare services.

Prioritize rural communities, older persons, low-income households, people with limited education, pregnant women, and other groups at risk of digital exclusion.

Establish monitoring and evaluation systems that assess utilization, patient satisfaction, health outcomes, cost-effectiveness, accessibility, equity, reliability, and quality of care.

Strengthen public-private partnerships involving government, telecommunications companies, universities, technology firms, healthcare institutions, professional associations, and development partners.

Institutionalize mobile healthcare within state and local government health planning, budgeting, workforce development, primary healthcare strategies, and broader digital-health programmes.

Suggestions for Further Studies

Future studies should employ longitudinal, experimental, and quasi-experimental designs to determine whether sustained mobile healthcare utilization produces measurable

changes in health outcomes over time. Further research should examine differences by age, gender, education, socioeconomic status, disability, and urban-rural residence, and should include cost-effectiveness analyses of mobile clinics, telemedicine, SMS interventions, and hybrid models. Qualitative research involving patients, CHWs, healthcare professionals, community leaders, and policymakers would also deepen understanding of trust, cultural acceptability, privacy, digital literacy, and sustained adoption.

References

1. Agbeyangi AO, Lukose JM. Telemedicine in sub-Saharan Africa: A systematic review of adoption and prospects in South Africa, Kenya, and Nigeria. *Healthcare*,2025;13(7):747. <https://doi.org/10.3390/healthcare13070747>
2. Andersen RM. Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior*,1995;36(1):1–10. <https://doi.org/10.2307/2137284>
3. Cole TO, Oladunni AA, Oladunni A. Barriers and facilitators of telemedicine provision in Nigeria: A systematic review. *International Journal of Medical Informatics*, 2025.
4. Ekenna A, Itanyi IU, Nwokoro UU, Hirschhorn LR, Uzochukwu BSC, *et al.* How ready is the system to deliver primary healthcare? Results of a primary health facility assessment in Enugu State, Nigeria. *Health Policy and Planning*,2020;35(Suppl 1):i97–i106.
5. Federal Ministry of Communications, Innovation and Digital Economy. National Broadband Alliance for Nigeria: Advancing broadband connectivity and infrastructure development. Federal Government of Nigeria, 2025.
6. Federal Ministry of Health and Social Welfare. Nigeria Digital in Health Initiative. Federal Government of Nigeria, 2024.
7. International Telecommunication Union. Measuring digital development: Facts and figures 2024. ITU,2024.
8. International Telecommunication Union. Digital development dashboard: Nigeria. ITU, 2025.
9. Kachimanga C, Cundale K, Wroe E, Nazimera L, Jumbe A, Dunbar EL, *et al.* The use of mobile health technologies by community health workers to improve maternal health services in sub-Saharan Africa: Systematic review. *JMIR mHealth and uHealth*,2024;12:e55819. <https://doi.org/10.2196/55819>
10. Nwokoro UU, Ugwa OM, Ekenna AC, Obi IF, Nnadi CD, Agunwa CC, *et al.* Determinants of primary healthcare services utilisation in an under-resourced rural community in Enugu State, Nigeria: A cross-sectional study. *BMC Primary Care*, 2022, 23.
11. Federal Republic of Nigeria. Nigeria Data Protection Act, 2023. Federal Republic of Nigeria, 2023.
12. United Nations. Transforming our world: The 2030 agenda for sustainable development. United Nations, 2015.
13. World Health Organization. mHealth: New horizons for health through mobile technologies: Second global survey on eHealth. World Health Organization, 2011.
14. World Health Organization. Classification of digital health interventions v1.0: A shared language to describe

- the uses of digital technology for health. World Health Organization, 2018.
15. World Health Organization. WHO guideline: Recommendations on digital interventions for health system strengthening. World Health Organization, 2019.
 16. World Health Organization. Global strategy on digital health 2020-2025. World Health Organization, 2020.
 17. World Health Organization. Global Initiative on Digital Health. World Health Organization, 2024.
 18. World Health Organization. Global health strategy 2025-2028: Advancing equity and resilience in a turbulent world. World Health Organization, 2025.
 19. World Health Organization. Digital health. World Health Organization, 2025.