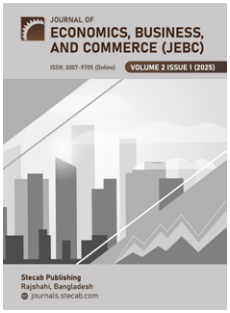

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Review Article

Digital Transformation in Healthcare Business: Telemedicine, AI & Fintech in Nigeria vs High-Income Economies

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ABSTRACT

Digital health innovations accelerated globally in the post-COVID era, presenting opportunities and challenges for low- and middle-income countries like Nigeria. Nigeria's recent health reforms and digital infrastructure policies signal intent to leapfrog persistent healthcare gaps. Using a socio-technical "rail–bed–app" lens (digital infrastructure ⟶ platforms ⟶ application layer) and an equity framework, we reviewed literature (2014–2025) on telemedicine, artificial intelligence (AI), and health-fintech in Nigeria versus high-income comparators (USA's Kaiser Permanente, UK's NHS, Germany, and Singapore). Nigeria's telemedicine uptake remains nascent, constrained by infrastructure and regulatory gaps, whereas HICs scaled virtual care broadly during COVID-19. Nigeria's emerging AI health startups show promise but face regulatory and workforce challenges; HICs benefit from structured AI oversight (EU AI Act 2024) and extensive clinical integration. In health-fintech, Nigeria's mobile micro-insurance schemes aim to expand coverage but struggle with trust and low enrollment, whereas HICs leverage mature open-banking ecosystems (PSD2 in the EU) to drive innovative payment models. Nigeria's policy momentum is narrowing the intent–impact gap in digital health, yet enforceable standards, inclusive financing mechanisms, and strengthened governance are needed to ensure sustainable and equitable health outcomes.

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1. INTRODUCTION

Global healthcare is undergoing an accelerated digital transformation, a trend catalyzed by the COVID-19 pandemic. Telemedicine, once a niche, became mainstream in many countries during 2020–2021 as lockdowns forced healthcare delivery online (QualityWatch, 2020). For example, a national survey in 2021 found 37% of U.S. adults had used telehealth in the past year (Raj & Iott, 2024), a sharp rise from under 10% in 2019 (Zboswell, 2019). Artificial intelligence (AI) and data analytics are increasingly embedded in healthcare, from AI-assisted diagnostics to predictive population health models, with the U.S. FDA authorizing over 600 AI-driven medical devices by 2023 (Aboy *et al.,* 2024). Health-fintech innovations, spanning mobile health insurance, digital payments, and health savings platforms, are similarly disrupting traditional healthcare financing. High-income economies (HIEs) have pioneered many of these advances, but questions remain about how low- and middle-income countries can adapt and benefit from them.

Nigeria provides a compelling case study of digital health adoption in an emerging economy context. The country faces longstanding health system challenges (limited access, workforce shortages, inequities), yet recent reforms indicate a strategic pivot toward digital solutions. The National Health Insurance Authority (NHIA) Act of 2022 made health insurance mandatory for all Nigerians (McCall, 2024), aiming to dramatically expand coverage. Complementing this, Nigeria enacted the Nigeria Data Protection Act (NDPA) in 2023 to strengthen data privacy, and the National Information Technology Development Agency (NITDA) in 2025 released Draft Technical Standards for Digital Public Infrastructure (DPI) to guide interoperable digital services (Anthony, 2025). These policies form part of Nigeria's "Digital Health" roadmap, emphasizing innovation and private-sector engagement to improve health outcomes. Against this backdrop, how are digital health business models in Nigeria evolving, and how do they compare with those in more developed settings?

To analyze this, we adopt two conceptual lenses. First is a socio-technical "rail–bed–app" model, which views digital transformation in layers: robust infrastructure ("rail") is the foundation enabling platform ecosystems ("bed"), upon which user-facing applications ("app") can flourish. In healthcare, this terminology translates to underlying elements like broadband connectivity, electronic health records, and identity systems (infrastructure); integrative platforms such as telehealth portals or AI analytics engines (platform); and the visible service layer, like virtual consultations or mobile insurance apps (application). This layered model helps dissect where gaps exist (e.g., if "rails" like internet or data standards are weak, "app" innovations may stall (Ezeonwumelu *et al.,* 2022)).

Second, we apply an equity lens using the PROGRESS-Plus framework (McCollum *et al.,* 2016). PROGRESS-Plus highlights dimensions of disadvantage—Place of residence (urban/rural), Race/ethnicity, Occupation, Gender, Religion, Education, Socioeconomic status, Social capital, plus factors like disability and age—that can lead to health disparities. By examining Nigeria's digital health trajectory through this lens, we assess who benefits or is left behind. For instance, telemedicine might disproportionately serve urban, educated users unless deliberate efforts ensure rural connectivity and digital literacy. Nigeria's gender digital divide is notable: only ~20% of Nigerian women use the internet versus 37% of men, raising concerns that digital health tools could exacerbate gender inequities without corrective policies (USAID, 2023).

Despite burgeoning literature on digital health, a clear gap exists in comparative analyses of tech-driven business models across different health systems. Prior studies often focus on clinical outcomes or single-country case reports, with limited attention to how business and delivery models (e.g., telehealth payment schemes, AI integrations, fintech insurance products) succeed or falter in varying contexts. Little has been written juxtaposing Nigeria's experiences with those of high-income exemplars, especially through a socio-technical and equity-oriented business lens. This narrative review addresses that gap by synthesizing evidence on telemedicine, AI, and health-fintech innovations in Nigeria and comparing them with selected high-income economies. Through this comparative approach, we derive insights on best practices, context-specific hurdles, and strategic opportunities to foster sustainable and inclusive digital transformation in the healthcare business. Ultimately, we seek to inform policymakers, health entrepreneurs, and stakeholders on how Nigeria can adapt and scale digital health innovations to improve health outcomes while ensuring equitable access.

2. LITERATURE REVIEW

2.1. Telemedicine (global evolution): Telemedicine, defined as remote clinical consultation via telecommunications, has transitioned from experimental to essential in the past decade. Early telehealth programs often targeted rural outreach and specialist consultations, but adoption was slow pre-2020 due to regulatory, reimbursement, and cultural barriers (Zboswell, 2019). The COVID-19 pandemic was a watershed moment: in 2020, many countries saw 50–100-fold surges in telemedicine use within months (USAFacts, 2023). Health systems rapidly scaled phone and video consultations to maintain care during lockdowns. In the U.S., major networks like Kaiser Permanente reported that over half of patient encounters were being conducted virtually by mid-2020 (Boyle, 2017). The UK's National Health Service (NHS) similarly shifted most primary care visits to teleconsultations during the pandemic peak (QualityWatch, 2020). Post-pandemic, telemedicine is settling into a hybrid model, combining virtual and in-person care across many high-income settings. Globally, evidence suggests telemedicine can improve access and patient satisfaction without compromising outcomes, provided infrastructure and integration challenges are addressed (Ezeonwumelu *et al.,* 2022). The paper sets the stage to compare Nigeria's telehealth uptake with more mature implementations.

2.2. Artificial intelligence in healthcare (global evolution) AI has been progressively woven into healthcare workflows over the last decade. Pioneering applications included diagnostic support (e.g., image analysis for radiology and dermatology) and predictive analytics (e.g., risk scoring for hospital readmission). As computational power and datasets grew, machine learning—especially deep learning—yielded

impressive results, such as algorithmic detection of diabetic retinopathy matching ophthalmologists' accuracy. By 2018, the U.S. FDA began approving the first AI-driven diagnostic tools, and by 2023 had authorized 690+ AI-based medical devices (Aboy *et al.*, 2024). High-income countries launched initiatives to govern and leverage AI in health (e.g., the UK's NHS AI Lab and the EU's comprehensive AI Act in 2024, which classifies medical AI as "high-risk," requiring stringent oversight). The convergence of AI with big data and the Internet of Things (IoT) (e.g., wearable sensors) is enabling more personalized and preventive care models. Yet globally, challenges remain in algorithm bias, explainability, liability, and the digital divide in AI benefits. These global trends frame how a country like Nigeria, with nascent AI capacity, might navigate adoption versus regulation.

2.3. Health-fintech and digital health financing (global evolution)

The intersection of fintech (financial technology) and health has given rise to novel models for financing and delivering care. In high-income contexts, this includes app-based insurance products, integrated billing and electronic payment systems, and platforms for health expense crowdfunding. Europe's Payment Services Directive 2 (PSD2) in 2018 catalyzed open banking ecosystems (Hugo Balfour, 2020), allowing fintech startups to securely access financial data and enabling innovations like automatic insurance claim payouts and patient-facing cost transparency tools. In the U.S., private insurtech companies (e.g., Oscar Health) have attempted to disrupt traditional insurers using digital-first strategies, while big tech firms integrate wellness and payments (e.g., Apple's health records and payment apps). In emerging markets, health-fintech often focuses on inclusion: mobile money and microinsurance schemes to reach unbanked and uninsured populations. For example, Kenya's M-TIBA platform (linked to M-Pesa mobile money) facilitates savings and spending earmarked for healthcare. India leveraged its digital ID and payments infrastructure (IndiaStack) to deliver insurance benefits at scale. These global experiences with health fintech highlight key factors, regulatory frameworks, consumer trust, and tech infrastructure, that influence success, providing a backdrop for evaluating Nigeria's approach to digital health financing.

3. METHODOLOGY

3.1. Search strategy

We conducted a narrative literature review to capture both academic and grey literature on digital health business models in Nigeria and comparators (2014 to March 2025). Searches were performed in academic databases (PubMed, Scopus) using terms such as "Nigeria telemedicine," "digital health Nigeria," "AI healthcare Nigeria," and "health insurance fintech Nigeria" in combination with "high-income", "United States," "UK," "Germany," and "Singapore." This was supplemented with targeted searches for policy and industry reports from Nigerian agencies (e.g., Central Bank of Nigeria (CBN), NITDA, Federal Ministry of Health) and global bodies (WHO, World Bank). We also scanned conference proceedings and news outlets for relevant developments (e.g., Nigeria's tech press for startup news, international press for case studies from Kaiser Permanente, NHS, etc.). Snowballing techniques (following citations in key sources) were used to broaden coverage.

3.2. Inclusion criteria

We included sources in English that provided data or analysis on telemedicine, AI, or health-fintech in a comparative or policy context. Priority was given to sources published in the last decade (2014–2025) to reflect current technology and regulatory landscapes. Both peer-reviewed studies and high-quality grey literature (policy briefs, industry analyses) were included to capture real-world implementation insights. We excluded highly speculative opinion pieces without data, as well as purely technical AI papers lacking health system context.

3.3. Quality and credibility assessment

Each source was labeled with a credibility flag – High (H), Medium (M), or Low (L), after assessment. High (H) sources include peer-reviewed journal articles, official government or multilateral reports, and well-established statistical databases. Medium (M) sources include reputable news articles, industry white papers, and reports from NGOs or think tanks—valuable for up-to-date insights but potentially with some bias or limited peer review. We sparingly use low (L) sources, such as anecdotal reports or informal blog posts, but only include them if they provide unique context and interpret them cautiously. For transparency, we annotate key data points in the text with these credibility tags (e.g., a statistic from a peer-reviewed study might be cited as (H) after the reference).

3.4. Data synthesis

We synthesized findings thematically, aligning with our Results sub-sections (Telemedicine, AI, Health-Fintech). Within each theme, we first present Nigeria's status (adoption level, policies, business models), followed by comparative insights from HICs, analyzing differences in infrastructure (the "rail"), platform ecosystems (the "bed"), and application delivery (the "app"). We highlight equity implications throughout.

4. RESULTS AND DISCUSSION

4.1. Telemedicine

Nigeria's telemedicine adoption: In Nigeria, telemedicine is still in an early adoption phase, despite the technology being available for over a decade. Before the COVID-19 pandemic, usage was minimal; for instance, a 2019 survey at a tertiary hospital in southwest Nigeria found only ~47.6% of physicians had ever practiced telemedicine (Iliyasu *et al.,* 2024). Knowledge and readiness were also limited; approximately one-third of Nigerian healthcare professionals had good knowledge of telemedicine, though most had positive attitudes towards it (Olufunlayo *et al.,* 2023; Umeokonkwo, 2025). The pandemic, however, served as a catalyst. During the 2020 lockdowns, some Nigerian hospitals and startups rapidly implemented teleconsultation services. A cross-sectional 2021 online survey reported that 63% of Nigerian healthcare consumers had received care via telemedicine and 90% of providers had delivered telemedicine, figures that suggest latent demand when barriers (like movement) are removed (Ezeonwumelu *et*

al., 2022). Yet such optimistic statistics likely reflect a skewed sample (urban, internet-connected users). Other analyses underscore that telehealth uptake in Nigeria "has yet to gain traction" due to fundamental challenges. Key barriers include: infrastructure gaps (only ~40% internet penetration and erratic electricity in many regions), socio-cultural norms (preference for in-person care and lower digital literacy among older and rural populations), and policy ambiguity. Notably, Nigeria currently lacks dedicated telemedicine legislation; there is no special licensing regime for telehealth platforms (Ozofu 'Latunde & Kelechi Ibe, n.d.). Instead, providers depend on general medical practice codes, as the Medical and Dental Council's Code of Ethics only briefly mentions telemedicine, which results in a lack of clear guidance on tele-prescribing, patient consent via telehealth, or cross-border consultations. This regulatory grey zone leaves both patients and clinicians unsure about liability and quality standards in virtual care.

High-Income contrasts: High-income countries entered the COVID era with more telemedicine infrastructure and have since normalized virtual care to varying extents. In the United States, telemedicine use exploded by ~766% in early 2020 across health systems (Shaver, 2022). Kaiser Permanente (a large U.S. integrated system) was particularly well-prepared, having invested in telehealth for years; as early as 2016, Kaiser's CEO noted 52% of all patient "visits" were conducted digitally (through video, phone, or secure messages) ("Virtual/ Telehealth Visits," n.d.). Kaiser's model, which capitalized payment, encouraged virtual visits to reduce costs and increase convenience, while robust EHR-tethered telehealth platforms facilitated this effort. By contrast, traditional fee-for-service providers in the U.S. needed emergency policy changes in 2020 (e.g. Medicare and private insurers temporarily paying for telehealth at parity with in-person visits) to overcome payment disincentives. Payment models thus played a decisive role: Nigeria has predominantly out-of-pocket healthcare spending (over 70–80% of patients pay cash (McCall, 2024), so telemedicine in Nigeria often operates on direct-pay or subscription models. During the pandemic, some Nigerian telehealth startups (e.g., Mobihealth, Tremendoc) offered paid plans for virtual doctor access. However, without insurance integration, these services cater to those who can afford extra fees, limiting equitable uptake. In high-income countries like the U.S. and Germany, insurance coverage for telemedicine has expanded; for example, Germany's public insurers started reimbursing video consults after 2018 legal reforms, and usage jumped >50% from 2019 to 2021 (Rahul Gotadkis, 2025). The UK's NHS, being tax-funded, simply treats teleconsultations as part of normal care: General Practitioners are salaried or capitated, so phone/video appointments are considered equivalent alternatives to face-to-face visits in primary care. Indeed, by June 2020, 95% of UK GP practices were providing remote consults (QualityWatch, 2020), a stark contrast to pre-pandemic, when about 75% of consultations were in-person. After COVID, NHS England settled into a hybrid approach; by late 2021, about 30% of GP consultations remained remote (mostly telephone), balancing efficiency with patient preference (Royal College of General Practitioners, 2021).

Licensure and Liability: Telemedicine's cross-border nature raises licensure and malpractice issues. In Nigeria, a doctor licensed by the Nigerian Medical Council can practice anywhere nationally (no state-specific licenses), which is a relative advantage over the U.S. model. However, if a Nigeria-based platform engages foreign doctors (e.g., a UK specialist consulting via telemedicine with a patient in Nigeria), current regulations provide little clarity—technically the foreign doctor should be locally licensed. Enforcement is lax, but its implementation could become contentious if a bad outcome occurs. By contrast, the United States historically restricted telemedicine across state lines (each state has its medical licensing board). The pandemic saw many states temporarily relax these rules (through emergency compacts), and efforts are ongoing to establish interstate licensure compacts for telehealth. Malpractice liability in telemedicine follows the same principles as in-person care in most jurisdictions: clinicians are expected to meet the standard of care. The UK's General Medical Council has issued guidelines that doctors must ensure the same quality in remote advice as in person. Nigeria has yet to issue equivalent detailed guidance. This absence puts both doctors and patients in a precarious position—uncertainty over whether a misdiagnosis via WhatsApp consult would be judged differently than one in a clinic. Legal scholars in Nigeria have called for clearer frameworks, noting telemedicine is "still in early stages…yet to be regulated" (Agbeyangi & Lukose, 2025). Concerns about liability and patient safety may dampen provider enthusiasm to offer remote services, especially among older clinicians who are less comfortable with technology, until Nigeria enacts telehealth-specific regulations or at least official guidelines, as India did in 2020.

Equity Considerations: The impact of telemedicine on equity can have both positive and negative consequences. On one hand, virtual care can bridge geographic gaps, bringing specialist advice to remote areas (teleradiology and teledermatology projects in Nigeria's northern regions have shown success in the pilot phases). It can also benefit those who face mobility challenges or social stigma in seeking in-person care. On the other hand, telehealth can exacerbate the digital divide. Nigeria's rural communities, roughly 48% of the population, often lack reliable internet; even mobile phone ownership is lower in rural and low-income groups (Ubalaeze *et al.,* 2024). Women, the elderly, and individuals with disabilities also face barriers to accessing or using digital platforms. Without deliberate inclusion strategies, telemedicine may primarily serve the urban middle class who have smartphones and speak English (since most platforms operate in English). High-income countries also observed telehealth inequities: in the U.S., early data showed lower telehealth use among the elderly and minority groups, partly due to tech access and literacy issues (Rivera *et al.,* 2021). The NHS had to ensure that remote consultations did not sideline those with hearing or vision impairments or those not fluent in technology; thus, many clinics kept options for patients to walk in or call a receptionist to set up visits. For Nigeria, an equity lens suggests implementing telemedicine in local languages, offering low-tech options (like audio-only consults for those without internet), and partnering with community health workers to extend digital services. Encouragingly, some Nigerian startups are experimenting with

USSD-based telehealth triage (text/SMS-based advice) to reach users without smartphones (TechPoint, 2023). These efforts need scaling.

Business Model Impacts: The comparative landscape reveals how telemedicine's success ties to underlying business and financing models. In Nigeria, the business model for telehealth is still evolving: we see direct-to-consumer models (patients pay per consult or via subscription), B2B models (companies like Reliance HMO include telemedicine in their insurance plans for enrollees), and public-sector pilots (some state governments integrating telemedicine in primary care facilities). Lack of widespread insurance reimbursement means most telehealth ventures rely on out-of-pocket revenue (Ubalaeze *et al.*, 2024), which is inherently limited in a country where ~40% live below the poverty line. High-income contexts showcase alternatives: Kaiser Permanente effectively "internalizes" telehealth costs, using it to deliver value under a fixed budget (capitation). The NHS uses telehealth to reduce strain on hospitals (cost-saving for the system, with no charges to patients). Germany and Singapore have started to include telemedicine in standard fee schedules. Germany's e-health law of 2017, for example, enabled doctors to bill for video consults, incentivizing uptake (Hüer et al., 2025). These models underscore that integrating telemedicine into mainstream payment (insurance or public funding) is crucial for scale. Nigeria's NHIA 2022 could be game-changing here: if the new national scheme and state-supported health insurance (like Lagos' Ilera Eko) choose to cover teleconsultations as a benefit, it would create a sustainable funding stream and encourage both patients and providers to utilize telemedicine (Lagos Ministry of Health, 2024). Additionally, clarity on provider payment (e.g., will telemedicine follow fee-for-service or bundled payments?) will influence how enthusiastically providers offer virtual services.

In summary, Nigeria's telemedicine journey is at a crossroads. The pandemic proved feasibility and hinted at demand, but to transition from ad hoc uptake to routine practice, Nigeria must strengthen its digital "rails" (broader internet coverage, power supply, data security) and "bed" (regulatory frameworks, payment integration). High-income experiences show that telemedicine can become an entrenched part of healthcare but also warn that without supportive policy (licensure reciprocity, reimbursement, quality standards) and attention to equity, its benefits might not be fully realized. Nigeria's emerging policies (e.g., a draft telehealth guideline reportedly under development by the Federal Ministry of Health) and the wider digital transformation agenda need to explicitly incorporate telemedicine standards. Doing so will help bridge the intent–impact gap: Nigeria's intent to digitize health care versus the on-ground impact, which, so far, remains limited to pilot projects and urban private services.

4.2. Artificial intelligence (AI)

Nigeria's AI Use Cases in Health: Nigeria's foray into AI in healthcare is nascent but notable in pockets. Perhaps the most prominent example was 54gene, a Nigerian-founded genomics and health-tech startup. Launched in 2019, 54gene built a biobank of African genetic data and applied AI-driven analytics to discover disease associations and potential drug targets (Walt, 2022). It attracted significant global investment (over $45 million (H)) and collaborators, positioning Nigeria on the map of precision medicine. By 2022, 54gene had opened a genomics sequencing lab in Lagos (Jackson, 2021), showcasing how AI and advanced biotech could flourish in West Africa. However, the company's trajectory also illustrated challenges: by late 2022, 54gene reportedly faced financial difficulties and went into restructuring, highlighting the volatile environment for high-tech health startups in emerging markets (Kene-Okafor, 2022). Beyond 54gene, other local AI applications include: AI-powered diagnostics for medical imaging (e.g., research pilots using algorithms to detect tuberculosis on chest X-rays in Nigerian hospitals), chatbots for patient triage (some telehealth apps integrate simple AI chat symptom-checkers), and AI in operational management (e.g., predicting patient load or optimizing ambulance routes in Lagos traffic). The federal government and academia are slowly engaging with AI—for instance, a partnership was announced in 2021 to use AI for polio and COVID-19 surveillance (M). However, widespread implementation is limited by skill gaps (few Nigerian healthcare facilities have data scientists on staff) and by data quality issues (AI thrives on large, robust datasets, yet Nigeria's health data are often fragmented and of variable quality). A telling indicator is a recent survey of radiologists in Nigeria: only 12% had good knowledge of AI in radiology, though 60% had positive perceptions of AI's potential (Akinmoladun *et al.,* 2022). This finding suggests enthusiasm exists, but expertise and training are lagging.

High-Income Regulatory Comparisons: In stark contrast, high-income regions are formalizing AI governance rapidly. The European Union's AI Act of 2024 is a landmark: it categorizes AI systems by risk, with "high-risk" systems (including most healthcare AI that could impact patient safety) subject to rigorous requirements (Aboy *et al.,* 2024; Julia Apostle, 2024). Under the AI Act, any AI system used for diagnosis or treatment in the EU will need to meet standards for risk management, transparency (users must be informed they are interacting with AI), human oversight, accuracy, and cybersecurity. Providers of AI systems will have to undergo conformity assessments before marketing in the EU (Aboy *et al.*, 2024). This proactive, precautionary approach aims to preempt harms (much as GDPR did for data privacy). The EU Act even hints at AI literacy requirements, expecting that users (e.g., healthcare professionals) receive adequate training to use AI tools competently. Meanwhile, the United States has taken a more sector-specific and light-touch approach so far. There is no omnibus AI law in the U.S.; instead, agencies like the FDA handle medical AI under existing medical device frameworks. The FDA has issued guidance for AI/ML-based Software as a Medical Device (SaMD), including an "action plan" outlining how to regulate adaptive algorithms that learn over time (Health, 2025). By 2023, the FDA had cleared hundreds of AI-based medical tools, treating them akin to medical devices requiring evidence of safety and efficacy (Aboy *et al.*, 2024). The FDA emphasizes Good Machine Learning Practice (GMLP) guidelines and expects manufacturers to address bias and robustness in their submissions. Additionally, U.S. professional bodies (e.g., the American Medical Association) have published

ethics guidelines for AI, stressing that AI should augment, not replace physician judgment, and that liability ultimately remains with clinicians (H). The UK's NHS has been investing in AI through its NHSX unit and an AI ethics framework but relies partly on EU laws (until recently) and developing its own post-Brexit regulatory stance. Singapore offers a hybrid example: it has no specific AI law yet, but its Ministry of Health issued governance guidelines for AI in healthcare (2021), and the country's broader AI strategy (the "Model AI Governance Framework") provides voluntary but detailed guidance on transparency, accountability, and human-centric AI (PDPC, n.d.). Singapore's Health Sciences Authority (HSA) has adapted medical device regulations to cover AI, ensuring that AI software is evaluated before use in clinics (HSA, 2018).

For Nigeria, these international regulatory trends are instructive. The EU model suggests that to access global markets (or collaborate internationally), Nigeria's AI solutions might eventually need to meet stringent standards—implying that Nigeria's regulators should begin capacity-building to evaluate AI systems for safety and bias. The U.S. model shows an emphasis on innovation with responsibility largely on practitioners and existing laws – a path of less initial regulatory burden but potential post-hoc issues (some argue the U.S. has been too lax, leading to unproven AI tools proliferating in some areas). Nigeria might seek a balance: allowing innovation via sandboxes or pilot approvals, but with a clear roadmap to eventual comprehensive regulation. Importantly, Nigeria could adapt existing laws (like the Medical and Dental Council guidelines) to clarify how the use of AI fits into medical practice standards. For example, requiring that clinicians using AI for diagnosis should inform patients and document AI input as part of the record (ensuring traceability) or stating that ultimate responsibility lies with the human provider unless the AI system was used outside its intended scope. Provisions like these would encourage responsible use.

Workforce and capacity: The infusion of AI into healthcare raises questions about workforce readiness and roles. In high-income settings, there is both excitement and anxiety among health professionals—radiologists famously wondered if "AI will replace us" when deep learning first showed impressive image-reading ability. By now, consensus in HICs is that AI will augment rather than replace clinicians in the foreseeable future, handling repetitive tasks and flagging findings while humans focus on complex decision-making (BusinessDay, 2025). That said, workforce training is a priority. Many U.S. and European medical schools have introduced basics of data science and AI into curricula, and hospitals are running workshops to familiarize staff with AI tools' functioning and limitations. In Germany, for instance, professional associations like the German Radiology Society have held AI training sessions to upskill radiologists (ESR Connect, 2025). Singapore's health ministry has a program for "Healthcare AI Workforce Augmentation" to ensure clinicians can work effectively with AI (Jalelah Abu Baker, 2023). Nigeria's health workforce, in contrast, has fewer opportunities for such training. The earlier statistic—only 12% of Nigerian radiologists felt they had good AI knowledge (Akinmoladun *et al.,* 2022), highlights a capacity gap. If AI tools (say an algorithm to read chest X-rays for TB) were deployed tomorrow in Nigeria's hospitals, many staff might not fully trust or understand the results. Such ignorance could lead to underutilization or mistakes (either over-relying on AI or ignoring useful alerts). Bridging this gap requires

Cross-sector collaboration: training programs developed by tech companies, academic partnerships (perhaps with foreign institutions), and government-supported workshops. Encouragingly, Nigeria's tech community has started some initiatives (e.g., Data Science Nigeria, an NGO, conducts bootcamps and projects on AI in various fields, including health). To truly benefit from AI, Nigeria will need not just data scientists but also "translator" roles—clinicians with data expertise who can guide AI integration in hospitals.

Liability and Ethical Concerns: A lingering question is how to handle errors or biases in AI. Consider a hypothetical AI system for skin cancer detection that's less accurate on darker skin tones because it was trained mostly on lighter-skinned images—a known issue in dermatology AI. If deployed in Nigeria (where most have darker skin), this bias could lead to misdiagnoses disproportionately for certain ethnic groups—an equity problem violating the PROGRESS-Plus principle of fairness across Race/Ethnicity. High-income discourse has tackled this; the EU AI Act will require bias risk assessments, and the FDA expects performance reported by demographic subgroups. Nigeria's policy should similarly mandate that AI systems used in healthcare are evaluated on local population data. If an imported AI tool underperforms on Nigerian patients, there should be either a bar on its use or a requirement for local retraining. Regarding liability, if an error caused by AI occurs and there are no specific laws in place, Nigeria would address it under general tort or malpractice law. This approach is workable but might not adequately cover scenarios like a software bug unknown to the clinician. One proposal by legal experts is to require AI vendors to carry indemnity insurance or be part of liability claims in healthcare (Ozofu 'Latunde & Kelechi Ibe, n.d.). As Nigeria brings in more AI (likely through imported solutions in radiology or patient monitoring), establishing clear accountability will be vital to maintain trust.

Opportunities: Despite challenges, AI holds immense potential for Nigeria's health system. It could help mitigate workforce shortages (e.g., Nigeria's doctor-patient ratio is low; AI triage or decision support could extend doctors' reach). It could enhance data-driven policymaking, identifying disease hotspots, or optimizing supply chains (AI in logistics to ensure medications and vaccines are distributed efficiently). A compelling business case is emerging in areas like teleradiology: Nigerian hospitals without enough radiologists could use AI to screen images and prioritize which need urgent human review, effectively triaging diagnostics (Opinion, 2025). Entrepreneurs in Nigeria are also eyeing AI in telemedicine, for instance, incorporating AI symptom checkers that automate part of the history-taking process, allowing doctors to handle more patients (Yomi Kazeem | Salient, 2022). However, to realize these gains, Nigeria must build the "rail and bed" for AI: improved digital infrastructure for data (broadband, cloud computing access), data governance frameworks so that local data can be collected and used ethically to train AI—current patient consent practices may need to evolve to allow secondary use

of data for AI development (Mondaq, 2025), and partnerships that transfer knowledge. International collaborations, such as with universities or companies from the UK, US, or Singapore, can accelerate learning. The business environment for AI in Nigeria will also improve if the government signals support, for example, incorporating AI into its health strategy, funding pilot projects (through grants or innovation challenges), and ensuring any regulations are enabling (not unduly burdensome on startups).

Nigeria stands at an early stage regarding AI in healthcare, analogous to where some high-income countries were, perhaps 6–8 years ago. By studying those countries' journeys (their successes in deploying AI for efficiency and their pitfalls, such as algorithmic bias incidents), Nigeria can proactively adapt. The comparative insight is clear: strong governance (like the EU's structured approach) combined with fostering innovation (like the U.S. and Singapore's emphasis on sandboxes and industry-led solutions) is a dual strategy. Nigeria's draft AI policy is a positive beginning; the key will be in implementation—moving from high-level principles to concrete guidelines for AI developers and users in the health sector. As that happens, Nigeria's large population and health needs make it a prime candidate for AI solutions that, if done right, could significantly improve care delivery and health outcomes.

4.3. Health-fintech

Nigeria's health-fintech innovations: Financing healthcare is arguably Nigeria's biggest health system challenge, with out-of-pocket expenditure causing many to forgo care or face financial hardship. In this context, health-fintech innovations aim to improve affordability, access, and efficiency. A flagship example is "Ilera Eko," the Lagos State health insurance scheme (Lagos Ministry of Health, 2024), which leverages digital platforms for enrollment and micro-premium payments. Ìlera Èkó (Yoruba for "Health of Lagos") is a social health insurance program intended to cover Lagos's 20+ million residents via affordable plans (Motherboard, 2025) The scheme embraced fintech approaches: residents can sign up via a mobile app or USSD code, pay premiums through digital channels (no cash accepted) (Instagram, 2024), and access an integrated care network of public and private providers. In theory, this digital facilitation should streamline enrollment and reduce administrative costs. However, uptake has been slow—as of July 2023, only approximately 780,000 people (≈3% of Lagos's population) had enrolled (Motherboard, 2025), despite a state mandate that all residents join. The situation highlights that technology alone doesn't guarantee adoption; consumer trust and awareness are critical. Many Lagosians were either unaware of the scheme or unsure how claims would work. There were even reports of fraudsters attempting to collect premiums into private accounts, prompting the government to issue warnings (Lagos State Gov, 2025), a scenario that could erode trust. On the positive side, Lagos has now trained hundreds of local agents with digital tools to sign up citizens in communities (bridging the physical-digital gap) (Motherboard, 2025). Other Nigerian states are watching Lagos's experiment as they implement their own State Health Insurance schemes under the NHIA Act mandate.

Beyond insurance, Nigerian startups are blending fintech and health in other ways. Mobile wallets for health savings have emerged, allowing individuals to set aside small amounts for health needs (sometimes with matching contributions or bonuses). For example, some platforms let users top-up a "health wallet" via phone, which can only be spent at partner clinics or pharmacies (ensuring funds are used for health). Microcredit for healthcare is another innovation, where fintech companies analyze mobile phone data and other proxies to provide small loans specifically for medical procedures or emergencies (SCBF, n.d.). The idea addresses the common issue of liquidity—patients delaying care because they don't have lump sum cash. One startup piloted a "buy now, pay later" for surgeries in Nigeria, effectively an installment payment plan facilitated by fintech risk scoring (Fintech Futures, 2025). Additionally, telemedicine apps with integrated payment have become a model: companies bundle teleconsultation services with digital payment and sometimes medication delivery, often on a subscription basis. These integrative models mimic what exists in countries like India (e.g., Practo or Apollo 24/7 apps offering consults and e-pharmacy with digital pay) and are gaining traction among Nigeria's urban tech-savvy population. The Central Bank of Nigeria (CBN) has been a proactive regulator in the fintech space, which indirectly boosts health-fintech. The CBN launched a regulatory sandbox in 2023–2024, accepting several health-focused fintech innovations for testing (M). By 2025, the CBN plans to expand this sandbox and fully implement an Open Banking framework (Olisah, 2024). Open Banking (the secure sharing of financial data via APIs with customer consent) can enable health-fintech apps to, for instance, verify income for insurance subsidies or auto-deduct micro-premiums from bank accounts. Nigeria would be one of the first African countries to operationalize open banking guidelines, following the lead of the UK/EU. The CBN Governor in late 2024 emphasized these steps as key to financial inclusion and innovation (Olisah, 2024). Indeed, "fin-inclusion" and "health-inclusion" often coexist: a population with digital financial access finds it easier to integrate into digital health financing schemes.

Comparative insights—payment systems and regulation: High-income economies have more mature **digital financial infrastru**cture, which their health systems increasingly leverage. In the European Union, the PSD2 directive (2018) standardized open banking APIs (Hugo Balfour, 2020). This has spurred a wave of health-fintech services: for example, apps that consolidate a patient's out-of-pocket receipts and automatically submit claims to their insurer or platforms that compare prices for elective procedures and facilitate financing. A critical lesson from PSD2 is the emphasis on security and consumer protection—strong customer authentication (two-factor verification) is mandatory. The initiative has helped build trust in online financial transactions. Nigeria's parallel effort (Open Banking Guidelines, 2023) similarly mandates data privacy and security standards, aiming to reassure users that linking their bank information to a health app won't lead to misuse.

In the UK, although the NHS is largely free at the point of care, fintech has found roles in ancillary services and private

sector add-ons. The NHS app now integrates payment for things like prescriptions or certificates digitally (for those who pay), and open banking has enabled some intriguing projects like automated checking of eligibility for waived fees (NHS England, n.d.). The UK also has seen insurtech targeting supplemental insurance (dental, private GP services) that uses AI underwriting and easy mobile claims. Regulatory-wise, the UK's Financial Conduct Authority (FCA) encourages innovation through sandboxes like Nigeria's CBN approach. The difference is scale and enforcement: in the UK, any fintech handling health insurance must be licensed and meet capital requirements, which protects consumers from fly-by-night schemes. Nigeria's insurance regulator (NAICOM) is still developing its insurtech regime; with NHIA's expansion, we expect more collaboration to license and supervise digital health insurance products.

In Germany, by virtue of mandatory insurance for all, health-fintech focuses on efficiency and user experience rather than basic access. German insurers have apps through which citizens can scan medical bills for reimbursement, track their health spending, or get nudges for preventive care (some funds even financially reward healthy behaviors via their apps). Germany's strong data protection (GDPR and national laws) and a culture of trust in statutory insurers mean that usage of these digital tools is high, but Germany is also known for still using a lot of paper in healthcare, so it's a mixed picture (Richter & Silberzahn, 2020). Interestingly, Germany introduced digital health vouchers: doctors can prescribe approved health apps (e.g. diabetes management) and statutory insurance pays, a cutting-edge integration of fintech (payment) with digital health service delivery. Nigeria could emulate aspects of this innovation by, say, integrating approved telemedicine or health apps into NHIA benefit packages, thereby leveraging fintech to pay for digital services.

Consumer trust and behavior: A recurring theme is trust. High-income contexts have experienced skepticism, particularly regarding privacy concerns that arose when big tech companies entered the health sector, such as during Google's partnership with the NHS, which faced backlash in 2016 for sharing data without patient consent (BBC News, 2017). Over time, clearer rules and demonstrated benefits have assuaged some fears. In Nigeria, trust is a crucial issue; historically, the level of trust in insurance has been low, as evidenced by the NHIS, which operated for two decades but never enrolled more than 10% of Nigerians due to mismanagement scandals (McCall, 2024). Fintech offerings could either increase trust (through transparency, e.g., apps that let users see exactly what coverage they have and how to claim) or further spook users (news of any breach or fraud could set back adoption severely). It is vital that early implementations like Ilera Eko are well-governed—timely claim payouts, good customer support, visible government backing—to build credibility. A positive sign: nigeria's infrastructure concession regulatory commission (ICRC) in 2023 approved a Public-Private Partnership to upgrade the NHIA ICT infrastructure (NHIA, 2024), which will include a unified ICT platform for all health insurance transactions nationwide. If executed, the project could reduce incidents of fraud and improve data for decision-making, thereby enhancing trust over time.

Open banking and innovation: By comparing timelines, Nigeria is about 5–7 years behind in open banking implementation relative to the EU/UK. However, the delay can be an advantage—Nigeria can learn from others' mistakes and successes. For instance, after PSD2, European banks complained about "unfair" scenarios where big tech companies accessed bank data (with user permission) but didn't have to reciprocate data sharing (Deloitte, n.d.). Regulators are currently contemplating ways to expand open banking to encompass "open finance" and establish a fair and equitable environment. Nigeria can design its framework to avoid such friction by involving not just banks but also telcos and fintechs from the start (given telcos run mobile money in Nigeria). Another advantage Nigeria has a young, mobile-first population—adopting smartphone payments and fintech services rapidly. Nigeria boasts a thriving fintech sector with tens of millions of mobile money users, earning Lagos the nickname "Africa's Silicon Valley." The situation bodes well for health-fintech uptake if solutions are user-friendly and meet a felt need.

Risks: Health-fintech is not without risks. Cybersecurity is a big one—health and financial data combined are a juicy target for hackers. In the U.S., healthcare has seen massive data breaches affecting insurance and hospital systems. Ensuring robust cybersecurity in Nigeria's nascent digital health finance platforms are non-negotiable (especially under NDPA 2023 requirements—data controllers must secure data against breaches). The CBN's fintech guidelines include provisions for cybersecurity, and collaborating with Nigeria's Computer Emergency Response Team (ngCERT) could enhance threat monitoring efforts. Another risk involves financial harm to consumers: microinsurance or credit products can backfire if they are not designed responsibly. High-interest healthcare loans can worsen a patient's financial strain if they are unable to repay them—similar to medical debt in another form. Regulators (NHIA, CBN, NAICOM) should set consumer protection rules, like caps on interest for health loans or minimum coverage standards, so that microinsurance actually covers essential health needs. In high-income countries, there are often ombudsman services or guarantees for insurance products; Nigeria might consider setting up a health insurance ombudsman under NHIA to handle complaints and ensure fairness.

Equity and inclusion: The equity lens is crucial in fintech as well. Digital financial services often initially reach those who are already relatively privileged (literate, urban, with bank accounts). Nigeria has a gender gap in financial inclusion; e.g., men are 20% more likely to have a bank account than women (World Bank, n.d.). Without targeted measures, health-fintech could mirror these gaps—for instance, urban men using health savings apps while rural women remain in cash-based informal practices. To counter this, Nigeria's strategies could include subsidizing smartphones or data for health purposes (perhaps through a Universal Service Provision Fund initiative), designing ultra-simplified interfaces for low-literacy users (voice-based instructions in local languages for insurance info), and leveraging community structures (like cooperative societies or religious groups) to promote and co-guarantee health-financial products. One promising model is using traditional

savings groups ("esusu" or cooperative thrift societies common in Nigeria) to collectively purchase health cover via fintech platforms. This blends trust in familiar community systems with the efficiency of digital.

Comparatively, Singapore offers an interesting case: it achieves near-universal health coverage through mandatory medical savings accounts (Medisave) and insurance (MediShield), all managed digitally. Every Singaporean's contributions and usage can be tracked online, and payouts to hospitals are largely cashless through government systems. This is an ultimate example of digital integration of health financing, but it sits on decades of policy evolution and high public trust in governance. Nigeria's context differs greatly, yet the direction is similar in intent—to get to UHC using a mix of public funds and private contributions facilitated by technology.

Business models in HIC vs. Nigeria: In high-income settings, health-fintech companies often generate revenue via commissions, value-added services, or data analytics (e.g., a wellness app might be free to users but charge insurers for insights on customer health). In Nigeria, pure data-play models are tough because the market is smaller and trust in data usage is lower. Thus, Nigerian health-fintechs typically have more straightforward revenue: subscription fees, transaction fees, or interest spreads on credit. Over time, as adoption increases, we may see more sophisticated models, including possibly "freemium" models (basic services free, premium features paid) or cross-subsidies (using revenue from one segment to support another—for instance, a fintech might profit from urban clients and use part of the margin to fund rural outreach, maybe as part of corporate social responsibility but integrated into the model).

In summary, Nigeria's health-fintech scene is vibrant, although it is still in its early stages of development. It faces the paradox of needing people to use it to prove its value, yet people will only use it if they trust it and see value, a classic chicken-and-egg problem. Learning from abroad suggests starting with strong regulatory frameworks (to ensure safety and trust) and demonstrating quick wins (like fast, hassle-free claim reimbursements or loan approvals for medical care when needed) will help build momentum. The ongoing reforms (CBN's sandbox, NHIA's digital push) are positive signals. Within a few years, if executed well, Nigeria could move from having <5% of the population using digital health financing tools to a much larger share, especially as smartphone penetration rises. Cross-cutting support, like improving digital literacy and protecting consumers, will be essential to ensure this transformation benefits all segments of society and not just a tech-savvy few.

4.4. Cross-cutting themes: infrastructure, governance, workforce

Across telemedicine, AI, and health-fintech, several cross-cutting factors emerge as determinants of success or failure:

Digital infrastructure ("Rail"): Foundational infrastructure such as reliable electricity, broadband connectivity, and digital identity systems underpin all digital health endeavors. Nigeria has made progress (e.g., ~70% 4G network coverage in cities), but rural broadband access and electricity remain inadequate in many areas (Ubalaeze *et al.,* 2024). High-income comparators enjoy near-ubiquitous connectivity and can focus on higher-level innovation, whereas Nigeria must often solve basic infrastructure issues concurrently with deploying new tech. Continued investment in fiber-optic networks, expansion of 4G/5G to rural areas, and initiatives like solar power for health facilities are critical enabling steps. Singapore's high health IT adoption, for example, is linked to its nationwide broadband and unique ID (SingPass) that allows secure access to e-health records, Nigeria's parallel might be the National Identity Number (NIN) system and improving internet backbone.

Governance and intersectoral coordination: Effective governance, including clear regulations, standards, and coordination between health and tech agencies, is a common success factor. In Nigeria, governance gaps (siloed agencies, outdated laws) have slowed digital health integration. Strengthening the role of the Federal Ministry of Health's eHealth division could improve cross-sector alignment. The experience of the NHS in the UK shows the value of central coordination (NHSX and NHS Digital set interoperability standards and procurement frameworks nationally). Germany's case highlights that strong data protection oversight (governance of privacy) can build public trust to adopt digital tools (Mondaq, 2025). Nigeria's recent NDPA 2023 and planned health data governance guidelines need robust enforcement to ensure data sharing in healthcare is done securely and with consent—this will showcase everything from telemedicine consultations to AI datasets.

Human resources & workforce capacity: No digital transformation can succeed without human capacity to implement and use the technology. Nigeria's health workforce is overstretched and also experiencing "brain" drain", many doctors and nurses emigrate to the UK, US, etc. Supporting the remaining workforce to adopt new tools is essential. Training programs, continuous professional development on digital health, and developing new roles (like telehealth coordinators or clinical data analysts) are crucial. High-income systems invest significantly in change management for new tech (e.g., months of training when a new EHR system is introduced). Nigeria should emulate this by allocating budget and time for training whenever a new digital solution is rolled out (for instance, when a state launches telemedicine, ensure all participating clinicians get structured training). Moreover, leveraging Nigeria's youthful population by integrating digital health topics into medical, nursing, and public health curricula will create a pipeline of tech-savvy health professionals.

Funding and sustainability: Cross-cutting is the question of how these innovations are financed and sustained. Pilot-itis (many small pilots that fizzle out due to funding or integration issues) has been a problem in digital health globally. Nigeria will need to move from donor or grant-funded pilots to scalable programs funded through government budgets, insurance reimbursement, or sustainable business models. Kaiser Permanente's sustained telehealth is underwritten by its business model; NHS's digital programs are part of government funding allocations. Nigeria's government should consider dedicated funding lines for digital health in its health budgets (e.g., a percentage of the health budget reserved for health ICT and innovation). Public-private partnerships can also help (as

with the NHIA's ICT upgrade PPP). Without reliable funding, even the best ideas (like an AI project or mobile health service) cannot survive long-term.

Each of these cross-cutting domains; infrastructure, governance, workforce, and financing, forms part of the "ecosystem readiness" for digital health. As expected, Nigeria currently trails on most axes, but its trajectory is upward with recent reforms. Bridging the gaps will require holistic approaches, as detailed in the following recommendations.

4.5. Policy & business recommendations (smart actions)

Drawing on the comparative insights, we propose ten SMART (Specific, Measurable, Achievable, Relevant, Time-bound) actions to accelerate Nigeria's digital transformation in healthcare. These are grouped by stakeholder level—federal government, state governments, and private sector, reflecting the multi-tier responsibility in Nigeria's health system:

Federal actions: (Lead: Federal Ministry of Health, Federal Ministry of Communications & Digital Economy, NHIA, NITDA)

4.5.1. Establish national telehealth standards, to be completed by Q4 2025

Develop and enforce telemedicine practice guidelines through the Medical and Dental Council of Nigeria (MDCN). The guidelines should define licensing requirements for telehealth providers, standardize e-consent procedures, and clarify malpractice liability in virtual care.

Measure: Guidelines published and adopted by all 36 states; >70% of tertiary hospitals offering teleconsultation services in compliance by 2026.

4.5.2. Expand digital infrastructure for health (target 2025–2027)

In partnership with the Ministry of Communications, prioritize broadband and power supply improvements for healthcare facilities. For example, ensure that 100% of tertiary hospitals and 70% of primary health centers have reliable internet and backup electricity within 3 years (up from baseline X%).

Measure: Inventory audit of facilities' connectivity shows >=70% meeting minimum bandwidth by 2027.

4.5.3. Inclusive digital health financing (NHIA, 2025 onward)

Integrate digital health services into the National Health Insurance Scheme benefits. Concretely, NHIA should cover telemedicine consultations and approved digital therapeutics by 2025, with reimbursement codes and tariffs set. Introduce a subsidy for low-income enrollees to access smartphones or data for health app usage.

Measure: NHIA claims data indicates that at least 10% of outpatient visits will be managed via telehealth by 2026; the annual survey shows an increase in insurance uptake among underserved groups, with a target of +20% rural enrollment.

4.5.4. AI in health task force & sandbox

Create a multi-stakeholder health AI task force (regulators, clinicians, and AI experts) to develop an interim framework for AI ethics and approval in healthcare. Launch an AI sandbox program allowing local startups and hospitals to pilot AI solutions (e.g., diagnostics) under regulatory supervision.

Measure: At least 5 pilot AI solutions in the sandbox by 2025; publish an AI in Health guideline (with bias testing and validation requirements) by 2026.

State-level actions: (Lead: State Ministries of Health, State Health Insurance Agencies, State Governments)

4.5.5. Localize and promote telehealth (2025–2026)

Each state should adapt the national telehealth guidelines to local context and partner with telecom companies to establish Telehealth Hubs in underserved areas (e.g., a telemedicine suite at a rural clinic linking to urban specialists).

Measure: By the end of 2026, at least 20 states should have functional telehealth hub programs, with utilization statistics reported (e.g., number of tele-consults per month) and patient satisfaction >80%.

4.5.6. Scale mobile micro-insurance enrollment (ongoing)

State health insurance schemes (like Ilera Eko in Lagos) must intensify digital enrollment drives. Use community health extension workers and local influencers to educate and sign up residents via mobile platforms. Set a target to double enrollment in state insurance schemes within a year. Measure: Lagos enrolling from 780k to 1.3 million by mid-2024; similar 100% growth targets for other states' schemes, monitored via scheme dashboards (Obokoh, 2024).

4.5.7. Digital literacy & inclusion programs (2025–2027)

States will implement digital health literacy campaigns specifically targeting women, rural dwellers, and the elderly. For example, a *"Digital Health for All"* initiative can train citizens on using health apps/telemedicine at primary care centers. Include distribution of simplified user guides in local languages.

Measure: By 2027, conduct trainings in all 774 LGAs (local government areas), reaching at least 500,000 citizens (with >50% women participants). Evaluate impact via pre/post knowledge surveys showing 30% improvement in digital health literacy in target communities.

Private sector actions: (Lead: Healthcare providers, Startups, Telecom/IT companies, Insurance Companies)

4.5.8. Innovate for low-connectivity settings (2025+):

Health-tech startups should design "offline-first" solutions (e.g., telemedicine via SMS, AI tools that can run on low-end devices) to reach users beyond smartphones. Telecom companies can provide support by zero-rating data for specific health services, meaning that users do not incur charges for data when accessing approved health apps or websites.

Measure: At least 3 major telehealth platforms implement SMS/USSD functionality by 2025; telecoms announce zero-data access for key health services (monitored by user uptake numbers).

4.5.9. Workforce upskilling partnerships (2025)

Private hospitals and tech firms to collaborate on training

healthcare workers in digital skills. For instance, a partnership could establish a Digital Health Fellowship for doctors/nurses (a 3-6 month program with hands-on tech exposure). Also, professional associations (NMA, nursing association) should include digital health modules in their Continuous Professional Development.

Measure: By 2026, at least 500 healthcare workers receive certified training in telemedicine/AI tools; hospitals report increased staff proficiency (target: >80% of staff comfortable using hospital's digital systems).

4.5.10. Public-private innovation fund (launch 2025)

Leading banks, insurers, and private investors in Nigeria's tech ecosystem should create a Digital Health Innovation Fund (with government seed support) to provide grants or equity to promising health-tech startups focused on Nigerian healthcare challenges. Ensure part of the fund is earmarked for solutions improving equity (e.g., maternal health in rural areas, assistive tech for disabilities).

Measure: $X million fund established by 2025, funding at least 10 startups by 2026; track outcomes such as number of beneficiaries reached by funded solutions (target: 1 million Nigerians by 2027 through all funded projects).

These ten recommended actions are interlocking: federal policy and standards create an enabling environment, states adapt and implement on the ground, and the private sector drives innovation and service delivery. The actions are SMART; for instance, specific and measurable targets include doubling insurance enrollment or training 500 workers, which will enable accountability and progress tracking. Achieving them will require political will, resources, and coordination. But if executed, Nigeria could rapidly build on its current momentum to deliver a digitally transformed, inclusive health system.

5. CONCLUSION

This narrative review has explored the digital transformation of healthcare business in Nigeria, in comparison with selected high-income economies, through the domains of telemedicine, artificial intelligence, and health-fintech.

5.1. Where things stand

We found that Nigeria is making major advances toward intent via progressive policies like the NHIA 2022 for universal coverage and draft strategies for digital public infrastructure and AI ethics. However, an intent–impact gap persists: the on-ground impact in terms of improved health access and outcomes remains limited so far. Key barriers identified include infrastructural deficits (e.g., patchy internet in rural clinics hindering telehealth), regulatory and governance lags (e.g., absence of comprehensive telemedicine laws or clear AI oversight, leading to stakeholder hesitancy), and inequities in digital access (gender, rural-urban divides in technology usage) (USAID, 2023).

5.2. Where it needs to go

Nigeria needs to translate its strategies into action with enforceable standards and accountable implementation. This means finalizing and enforcing guidelines for telehealth practice, operationalizing data protection in every health ICT deployment, and updating medical curricula and training to include digital competencies. On the financing side, inclusive mechanisms are needed so that digital health doesn't exacerbate inequity: for example, ensuring that poor and vulnerable populations benefit from innovations like mobile insurance through subsidies or free basic services. The recommended SMART actions, if pursued, would address many of these needs—they emphasize not just high-level policy but also concrete targets like infrastructure coverage, training numbers, and service uptake among marginalized groups.

Governance reforms are also pertinent. A recurring recommendation is improved coordination—digital health sits at the intersection of health, finance, and technology sectors, so joint efforts (e.g., health and telecom regulators co-designing telemedicine data standards, or CBN and NHIA aligning on mobile payments for insurance) will be necessary. Establishing formal interagency working groups or councils on digital health could institutionalize this collaboration.

In conclusion, Nigeria stands at an inflection point where it can leverage digital tools to leapfrog some health system bottlenecks, much as mobile banking leapfrogged traditional banking constraints. By learning from others and tailoring solutions to local realities, Nigeria can indeed narrow the gap between its bold digital health ambitions and tangible health improvements on the ground. The coming years (through 2030) will be decisive. If the recommended measures are implemented, we anticipate that Nigeria's digital health innovations will not only expand in number but also in inclusivity and impact, driving progress towards universal health coverage and better health outcomes for all Nigerians.

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