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The Future of Laboratory Services in West Africa

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The Future of Laboratory Services in West Africa: An Overview

Laboratory services in West Africa are undergoing a transformation with the adoption of digital technologies in in-vitro diagnostics (IVD). The integration of software, algorithms, and applications has revolutionised data collection, storage, plus analysis.

Regional efforts, led by Africa Centres for Disease Control and Prevention (Africa CDC), have introduced frameworks to modernise laboratory systems. Collaborations with key partners, including the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and the African Society for Laboratory Medicine (ASLM), aim to enhance diagnostic services.

The West Africa IVD market is forecasted to grow at a compound annual growth rate (CAGR) of 4.22% from 2024-2032, driven by rising chronic diseases, the need for early diagnosis, and increased use of IVD tests in clinical trials.

The merger of WHX Lagos & WHX Labs Lagos 2025 will create the region's most comprehensive healthcare and laboratory event. This landmark exhibition and conference will attract over 7,000 healthcare and laboratory professionals and feature more than 500 exhibitors from around the globe.

Digital Diagnostic Innovation and Automation in Improving Laboratory Services

Artificial Intelligence (AI) is transforming public health surveillance and disease control worldwide. In West Africa, where resources along with infrastructure are limited, AI offers opportunities for faster disease detection as well as response. Traditional methods often fall short in managing complex health challenges, making AI a critical tool for accurate diagnosis and timely treatment.

AI-driven tools like genomic sequencing are advancing personalised medicine.

In Ghana, digital X-ray equipment and CAD4TB, supported by the Ghana Health Service and WHO, have improved TB screening efforts, which showcases the impact of technology in healthcare.

Current State of Laboratory Services in West Africa

West Africa's laboratories are evolving from diagnostics to preventive healthcare. Rise in healthcare demands, technological progress, together with demographic changes drive this growth, particularly in Nigeria and Ghana. The growing population and increase in chronic diseases, alongside government investment, are reshaping the sector.

Local manufacturing and decentralised lab systems can improve outbreak responses in resource-limited settings. Investments in bioinformatics and skilled personnel are vital for sustainable progress.

Importance of Modernising Labs to Meet Growing Demands

West African labs need strategies beyond crisis response for long-term success. While progress has been made in disease control, general services remain fragmented. National lab systems struggle to implement Laboratory Quality Management Systems (LQMS) effectively.

Ghana's efforts in HIV management show the importance of scaling lab services. Antiretroviral therapy (ART) coverage for children was 43.59% in 2022, with prevent mother-to-child transmission (PMTCT) coverage at 84.83%. To meet the 2030 HIV eradication goal, lab services must expand in rural areas. Programmes like the USAID-supported sample referral system aim to improve diagnostic efficiency.

Modernising labs enhance healthcare delivery, strengthens disease control, and supports outbreak responses. It also aligns universal health coverage goals together with the Sustainable Development Agenda.

The Power of Digital Innovation in Labs

The digital revolution is transforming laboratory diagnostics into West Africa. Automation of specimen management, real-time monitoring of instrument functionality, plus advanced laboratory information systems revolutionise test reporting and diagnostics across laboratory networks.

US and West African scientists are collaborating to build a public health network for rapid detection of viral threats. The Sentinel research programme, active in Nigeria along with Sierra Leone, focuses on pathogen surveillance and supports a new genome center at Redeemer's University. This centre, staffed by Nigerian scientists, studies pathogens like Lassa and Ebola with biosafety level 3 facilities.

Digital Innovations and Emerging Technologies

AI is driving progress in healthcare through precise as well as rapid disease diagnosis. In Nigeria, the Federal Medical Centre in Makurdi has established a molecular PCR lab for HIV testing and other diagnostic assays.

At the University of Ghana Medical Centre, Datamaker's AI-powered tool enhances polyp diagnosis during colonoscopy. Similarly, MAI Lab is advancing breast cancer care in Nigeria using AI. MinoHealth AI Labs supports doctors in Ghana with quicker diagnoses, alleviating healthcare demand. These innovations highlight the transformative potential of digital tools in healthcare across the region.

Some Ai Applications in Disease Detection and Prediction

Model	Disease	Country	Application
Machine learning	Cholera	Nigeria	Cholera outbreak risk prediction
Agent-based simulations	Ebola	West Africa	Ebola epidemic dynamics
Machine learning		West Africa	Ebola outbreak prediction
Prognostic models		Liberia, Sierra Leone	Ebola death likelihood prediction
Species distribution models		Central and West Africa	Ebola zoonotic niche mapping
Random Forest	Measles	Ghana	Measles case prediction
Trend analysis		Nigeria	Measles infection trends
Stochastic metapopulation model		Niger	Measles outbreak dynamics
Statistical methods		Guinea	Measles outbreak simulation
State-space model		Niger, Ethiopia, DRC	Measles transmission prediction
Deterministic model		Nigeria	Measles transmission dynamics
Poisson regression, ARIMA		Nigeria	Weather impact on measles incidence
Multivariate time-series models		Cameroon	Spatial dynamics of measles outbreak
Bayesian networks	Tuberculosis	Nigeria	TB diagnosis

The impact of Laboratory Automation

The rapid advancement of technology is driving digital transformation in laboratories. This shift optimises workflows, enhances accuracy, and boosts efficiency, which enables labs to handle larger data volumes while meeting stricter compliance standards. **MMALABS, a Ghanaian diagnostic chain, has launched advanced imaging services in Kumasi, improving patient care. Dr. Stephen John's use of AI-powered ultraportable x-ray machines for TB screening in Nigeria is another example of how technology is enhancing diagnostic capabilities in remote areas.**

Digital transformation in clinical laboratories is enhancing **data integrity and accuracy** through AI-driven analytics and cloud-based solutions. This accelerates sample processing and analysis, reducing human error and improving reproducibility. Real-time updates, task coordination, and issue resolution **improve communication and reduce downtime**. Digital tools streamline resource management, align team efforts, and drive faster decision-making. Laboratory automation also **improve operational efficiency** by enabling data-driven decision-making and predictive analytics for supply management, eliminating operational silos and creating smoother workflow transitions.

Challenges and Solutions to Implement Digital Transformation

Digital transformation in laboratories offers numerous benefits, but it also presents challenges. Significant investments in technology and staff training are essential. Integrating legacy systems with new digital platforms requires careful planning. Change management plays a vital role in fostering a culture of innovation and aligns staff with organisational goals. Additionally, managing the vast amount of data generated by digital systems demands secure, scalable storage together with advanced data analytics.

Technology and Infrastructure

The adoption of AI and digital technologies in laboratory diagnostics across West Africa is key to enhancing patient care. **Startups, like Ghana-based Redbird Health Tech, are transforming healthcare by integration of portable diagnostic devices for chronic disease monitoring in pharmacy retail spaces.** This shift makes medical imaging plus testing more affordable and accessible.

Medical laboratories are essential to personalised medicine, which utilises genetic and molecular profiles to tailor treatments. The pandemic has underscored the importance of rapid diagnostic tests, with laboratories playing a central role in managing outbreaks.

Government Regulatory Frameworks and Policies

AI is gaining momentum across Africa, yet policies along with regulatory frameworks remain in early stages. To integrate AI effectively, African nations require strong, forward-thinking policies aligned with ethical values.

- Ghana launched its National Artificial Intelligence Strategy 2023-2033 in October 2022, promoting responsible AI adoption for sustainable growth.
- Nigeria unveiled its draft National Artificial Intelligence Strategy (NAIS) in August 2024, guiding AI towards national goals such as job creation, social inclusion, and sustainable development.

AI Regulation Framework in West African Region

Country	Dedicated AI legislation	Dedicated AI legislation	Has a national AI strategy	Has a policy or draft policy on AI	Expert body on AI has been established
Senegal	✕	✓	✕	✕	✕
Benin	✕	✓	✓	✕	✓
Nigeria	✕	✓	✕	✕	✓
Cabo Verde	✕	✓	✕	✕	✕
Ghana	✕	✓	✕	✕	✕
The Gambia	✕		✕	✕	✕
Togo	✕	✓	✕	✕	✕
Burkina Faso	✕	✓	✕	✕	✕
Mali	✕	✓	✕	✕	✕
Guinea	✕	✓	✕	✕	✕
Niger	✕	✓	✕	✕	✕
Guinea-Bissau	✕	✕	✕	✕	✕
Liberia	✕	✕	✕	✕	✕

✓ Indicates Yes ✕ Indicates No  Indicates Particial

Source: lawyershub.org

AI regulation in Africa remains slow, with no dedicated AI laws in place. However, governance is gaining traction as countries begin to develop their own legal and policy frameworks. West Africa is making progress with strategies and standards focused on AI's role in sustainable development. The Economic Community of West African States (ECOWAS) is fostering dialogue on digital transformation, harmonising data protection laws, promoting infrastructure, and driving innovation. Collaboration at national, regional, and continental levels is essential for effective AI implementation, avoiding fragmented regulations that could hinder market growth and legal clarity.

West African Skills Labs' Training and Upskilling Initiatives

Training laboratory technicians in West Africa aims to improve efficiency in sample collection, transportation, handling, and processing, reducing diagnostic turnaround times. However, the region faces challenges in training nurses as well as midwives, with limited educational materials and clinical equipment.

- The Classroom to Care (C2C) project seeks to enhance health worker training by providing health institutions with resources, modern materials, and curricula adapted to local needs.
- ASLM, Africa CDC, and BSBS hosted the first Bio-risk Management course in Senegal, certifying 16 participants from nine countries as Level 1 professionals.
- WHO, NPHIL, and the Ministry of Health held a training on genomic sequencing together with bioinformatics in Liberia, including a two-week intensive and a one-week practice session.
- Nigeria signed agreements with Siemens Healthineers, Tanit Medical Engineering, and Abbott Laboratories to enhance healthcare access, focusing on ultrasound assembly, training, and diagnostics.

Investments, International Funding/Grants and partnerships

Investing in digital tools plus data management systems can improve service delivery, data sharing, and policymaking. Strategic alignment of donor funding with national health priorities is key to sustaining laboratory networks. Donors should focus on broader investments, shifting from disease-specific funding to strengthening overall laboratory systems.

- The West African Health Organization (WAHO) and the African Society for Laboratory Medicine (ASLM) signed a second cooperation agreement, funded by Germany's KfW Development Bank, to improve quality management systems in 15 ECOWAS countries.
- Africa CDC launched two projects, IGS and DETECT, co-funded by the European Union, to enhance Africa PGI 2.0 capacity for outbreak detection and data sharing.
- Grand Challenges Senegal and Grand Challenges Canada issued a funding call in December 2024 to improve health systems and address health issues in Senegal as well as the ECOWAS region.
- The United Nations Development Programme (UNDP), Ghana Health Service (GHS), and Japan's government established mobile laboratories to support public health emergencies.
- Collaboration with GHPP LabTrain at BfArM strengthens laboratory capacities in West Africa, improving infrastructure, quality management systems, and training for analysts.

Key Accomplishment (U.S. CDC's Country Fact Sheet, November 2024)

Country	Data & Surveillance	Laboratory	Workforce & institutions
Benin	› Evaluation of surveillance systems › Data analysis for various diseases › Assessment of care and treatment for severe malaria in children under 5	› Provides training, reference testing, and reagents for measles, rubella, and polio detection	› Supported 99 public health professionals from Frontline FETP
Burkina Faso	› Supports antimicrobial detection and surveillance › Operates national AMR reference lab and 22 sentinel sites	› Provided reagents for dengue, zika, chikungunya detection since 2018	› Supported over 360 FETP graduates › Enhanced Field Epidemiology Training Program
Ghana	› Established at least one influenza sentinel site in Ghana's 16 regions	› Implemented an innovative national system for blood and specimen transport Centralised laboratory processing	› Supported 400 FELTP participants › Conducted over 100 outbreak investigations › Identified meningitis, cholera, yellow fever, influenza, measles, rubella, anthrax
Nigeria	› EEstablishjed automatic biometric identification system in Nigeria › Supported HIV data deduplication efforts	› Developed core laboratory diagnostic capacities for mumps, yellow fever, measles, Lassa fever, cholera, and cerebrospinal meningitis	› Established the National HIV Clinical Mentorship Program › Attended 34 national and 315 state mentors
Sierra Leone	› Established an electronic case-based disease surveillance system. › Over 1,300 health facilities use the system › 90% report timely priority disease data	› Enhanced disease detection and diagnosis › Addressed COVID-19, Ebola, yellow fever, cholera, influenza	› Supported 500 public professionals through FETP › Resulted in 1 FETP-trained epidemiologist per 200,000 people

Future Directions

AI and machine learning revolutionises public health in sub-Saharan Africa, especially in West Africa, where they enhance efficiency as well as accuracy of laboratory services. These technologies are already improving disease detection, from infectious diseases like tuberculosis, HIV, cholera, and malaria, to enabling timely interventions along with better management of health conditions. By analysing complex data from health records, social media, and environmental sensors, AI / ML enable targeted screening, personalised treatment plans, and efficient resource allocation.

The future of laboratory diagnostics in West Africa looks promising. With investments in quality management systems and the establishment of partnerships such as the cooperation between WAHO, ASLM, together with Germany's KfW Development Bank, significant improvements in lab infrastructure and training are already underway. The collaboration between the UNDP, Ghana Health Service, and Japan has also enhanced emergency preparedness with mobile laboratories. Moreover, initiatives like the Classroom to Care (C2C) project and the training programmes supported by Africa CDC together with WHO ensure that the region is strengthening its workforce to meet future healthcare demands. These efforts will contribute to more robust, responsive healthcare systems in West Africa, capable of managing both infectious and non-communicable diseases effectively.

With all these developments, the region is poised for innovation along with sustainable healthcare growth. The upcoming Medic West Africa and Medlab West Africa trade fair, scheduled for April 23-25, 2025, will be a significant event, showcasing the latest advancements in diagnostic technologies and healthcare solutions. This gathering of local plus international manufacturers will add great value to the sector, providing cutting-edge tools and fostering collaboration to further enhance West Africa's healthcare landscape.

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Where healthcare and laboratory innovation drives progress in West Africa

For more than a decade, Medlab West Africa has been the go-to event for laboratory professionals, manufacturers, and distributors across West Africa. Now, as WHX Labs Lagos, we're taking it even further-offering greater opportunities, wider reach, and stronger industry connections as part of WHX, the world's leading network of healthcare and laboratory events.

In 2025, WHX Labs Lagos will be co-located with WHX Lagos, creating a powerful, unified platform that brings together the laboratory and healthcare sectors under one roof. This integration opens new avenues for collaboration, encourages innovation, and ensures a richer experience for every attendee-whether you're looking to expand your business, explore new partnerships, or discover the latest in healthcare and lab technology.

As West Africa's most influential healthcare and laboratory event, WHX Labs Lagos & WHX Lagos are more than just exhibitions-they're where manufacturers, distributors, and medical professionals come together to build relationships, gain industry insights, and explore the innovations shaping the future of diagnostics and treatment in the region.

Join us from 2-4 June 2025 at Landmark Centre, Lagos, Nigeria, for an expanded and dynamic experience.

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