



STRENGTHENING PUBLIC HEALTH LABORATORIES IN THE WHO AFRICAN REGION: A CRITICAL NEED FOR DISEASE CONTROL

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Despite the progress and efforts being made to strengthen laboratory capacities in the Region, challenges remain. The purpose of this document is to raise awareness on the need to strengthen public health laboratory services and propose actions for building national laboratory capacity.

En dépit des progrès et des efforts réalisés pour renforcer les capacités de laboratoire dans la région, des défis restent à relever. L'objet du présent document est de sensibiliser à la nécessité de renforcer les services de laboratoire de santé publique et de proposer des actions pour développer les capacités des laboratoires nationaux.

Apesar dos progressos e esforços verificados no reforço das capacidades laboratoriais na Região ainda existem desafios. O objectivo deste documento é aumentar a consciência da necessidade de reforçar os serviços dos laboratórios públicos de saúde e propor medidas para a capacitação dos laboratórios nacionais.

Laboratories continue to play a critical role in all disease control and prevention programmes by providing timely and accurate information for use in patient management and disease surveillance. For purposes of case management and disease control and prevention, laboratories can be grouped into two broad categories: clinical laboratories and public health laboratories.¹

Public health laboratories are responsible for providing timely and reliable results primarily for the purpose of disease control and prevention. However, clinical laboratories are responsible for providing accurate diagnosis of ongoing, recent or past infections for appropriate case management. The focus of the clinical laboratory is individual patient care. However, data generated from both types of laboratories are essential for disease surveillance, control and prevention activities.

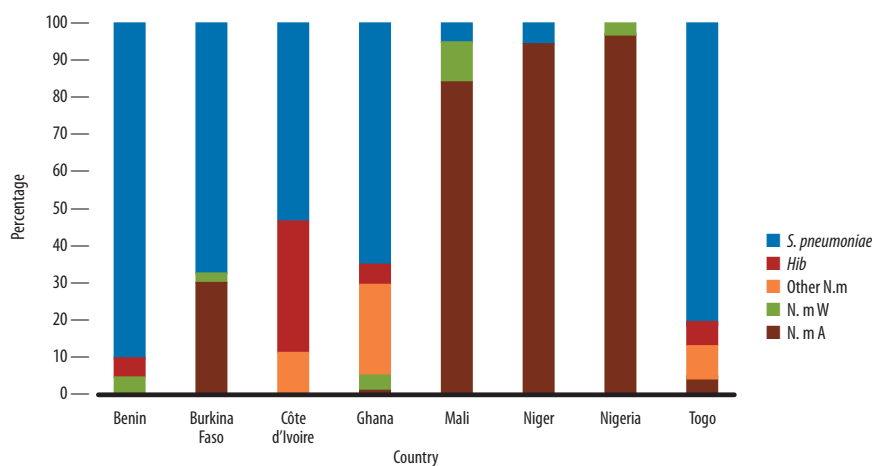
In the African Region, the situation of laboratory services is characterized by inadequate staffing, equipment and supplies. These are the main obstacles to early detection of epidemics such as Ebola, Marburg and both multidrug-resistant and extensively drug-resistant tuberculosis. Functioning public health laboratory systems rely on effective disease surveillance and prevention of major emerging, re-emerging and

Laboratory data on meningitis in West Africa, 2009

Country	Number of cases	Number CSF	<i>N. meningitidis</i>			<i>Hib</i>	<i>S. pneumoniae</i>
			A	W135	Other N.m		
Benin	416	143	0	3	0	3	54
Burkina Faso	4 723	275	36	3	0	0	78
Côte d'Ivoire	287	121	0	0	2	6	9
Ghana	302	76	1	2	16	4	41
Mali	335	53	16	2	0	0	1
Niger	132 449	3 423	1 460	9	8	10	62
Nigeria	56 128	700	434	13	0	0	2
Togo	350	177	2	0	4	3	36
Total	194 990	4 968	1 949	32	30	26	283

Source: Multidisease Surveillance Centre, Ouagadougou, Burkina Faso.

Serotypes of meningitis pathogens isolated in the meningitis belt countries, 2009



endemic communicable and noncommunicable diseases.²

At its forty-eighth session, the WHO Regional Committee for Africa passed Resolution AFR/RC48/R2 urging Member States to evaluate the laboratory component of disease control programmes as the first step towards strengthening disease surveillance.³ Since the adoption of the resolution, a number of capacity-building activities have been implemented.

Subregional and Regional reference laboratories and various Regional laboratory networks were established. External quality assessment schemes were implemented for enteric diseases, meningitis, plague, tuberculosis, malaria, polio, measles, yellow fever, highly pathogenic avian influenza and HIV/AIDS. For clinical laboratories, a scheme has been introduced for haematology and clinical chemistry. Assessment and documentation of national

laboratory systems were conducted. In addition, training of staff on diagnostic techniques, laboratory safety, quality assurance and quality control systems has been provided on a regular basis.

Laboratory-based surveillance of meningitis epidemics has played a significant role in timely outbreak response (see tables, source: countries; data compiled by MDSC). Countries in the meningitis belt provide laboratory data on a weekly basis. Feedback on this data is given to all contributing laboratories. A monthly bulletin (MDSC-Multidisease Surveillance Centre Meningitis Monthly Bulletin) on epidemiological and laboratory data is also issued and shared with countries and partners. The regular analysis of laboratory data allows countries to predict the circulating meningitis serotype and thus select the appropriate vaccine.

The polio laboratory network is linked to an active community-based surveillance system that collects specimens from suspected cases and forwards them to laboratories for processing. Regional laboratories have developed capacity to provide genetic information that is necessary for tracking the spread of viruses. The maps below, based on laboratory surveillance by

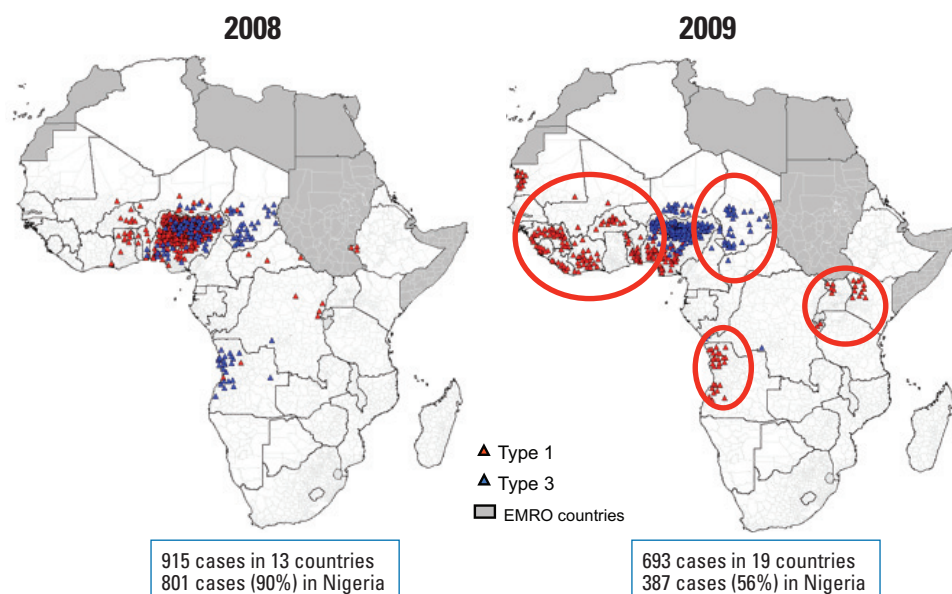
the polio laboratory network, show the distribution of wild poliovirus cases. The lessons learnt from polio have been useful in establishing measles surveillance systems which are integrated with acute flaccid paralysis surveillance in a number of countries.^{4,5}

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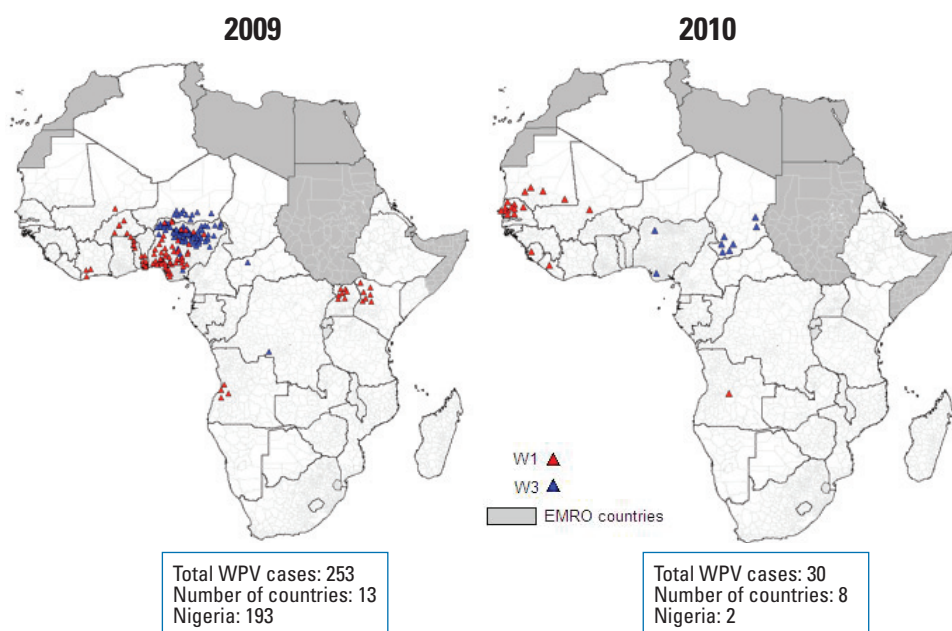
ISSUES AND CHALLENGES

Although progress has been made in strengthening laboratory capacity to support programmes such as poliomyelitis eradication, HIV/AIDS prevention and control, and measles elimination, challenges remain. These include the lack of national policy and strategy for laboratory services, insufficient funding, inadequately trained laboratory staff, weak laboratory infrastructure, old or inadequately serviced equipment, lack of essential reagents and consumables, and limited quality assurance and control protocols. Laboratories are usually given low priority and recognition in

Wild poliovirus distribution in the AFR 2008–2009



Wild Poliovirus cases distribution for 2009–2010 as at 15th of April



most national health delivery systems. The challenge is developing a comprehensive national laboratory policy which addresses the above issues.

Availability and access to quality laboratory services are among

the major challenges contributing to delayed or inappropriate responses to epidemics, disease control and patient management. The result has been continued reliance on empirical patient care, a practice that not only wastes resources but also contributes to

drug resistance. The majority of the estimated 12 million annual deaths in sub-Saharan Africa remain uninvestigated.⁶

Despite the growing threat from emerging and re-emerging pathogens, very few laboratories have capabilities for diagnosing highly infectious diseases such as viral haemorrhagic fever, severe acute respiratory syndrome, chikungunya (a viral illness that is spread by the bite of infected mosquitoes, resembling dengue fever), and the highly pathogenic avian influenza virus, including A/H5N1.⁷ Countries often ship specimens to other regions for confirmation, resulting in delayed responses to outbreaks. The establishment of centres of excellence or public health reference laboratories to provide diagnostic services for these highly infectious diseases remains a major challenge for most countries.

Evaluation of the results of the external quality assessment scheme conducted in the African Region revealed that a number of laboratories have had difficulties in identifying common bacteria such as *Vibrio cholerae* and *Shigella*. The major reasons for such failures in diagnosis were the absence of national quality control systems and the non availability of special culture media, antisera and other essential reagents. Establishing national quality

assessment schemes and providing standard laboratory supplies remain major challenges.

Other challenges include the inadequacy of biosafety and biosecurity equipment and guidelines, poor coordination and inadequate representation of laboratory personnel in public health policy development and implementation.

Most countries are faced with the challenge of establishing laboratory training schools beyond basic training for technicians, thus limiting the level of technology available in countries. In addition, highly-qualified health workers have little interest in laboratory sciences mainly because of poor incentives and working environment. A survey conducted in 2003 through the external quality assessment programme confirmed that few laboratories were supervised by senior microbiologists and pathologists.⁸ In addition, the brain drain experience across the health sector has affected laboratory services.⁹

The availability and maintenance of laboratory equipment remain further challenges. Systematic assessment of laboratory services carried out in connection with integrated disease surveillance and response programmes demonstrated that countries often

do not have the minimum required equipment to provide quality diagnosis. The lack of equipment or the use of substandard or poorly maintained equipment and instruments leads to unreliable laboratory results. 16. Inadequate funding has been identified as a hindrance to quality laboratory services. Even though laboratory partnerships and collaboration have helped sustain and upgrade laboratory services for polio, measles and HIV programmes, countries are not taking advantage of these innovations to strengthen national public health laboratory systems. Hence, there is a need to strengthen partnerships and collaboration to ensure sustainable investment in laboratory services. It is critically important to motivate the laboratory staff to minimize brain drain.

Regular supervision of peripheral laboratories is one strategy for ensuring standard laboratory practices, continuing education and mentoring of laboratory staff. In the African Region, there is weak coordination of laboratories mainly resulting from a lack of formal national networking mechanisms to link all levels. The lack of institutionalized coordination has resulted in unsupervised district and peripheral laboratories with ambiguous quality of testing. Establishing a functioning national laboratory network will

allow countries to overcome the issues highlighted above.

In many countries, the administrative structures of ministries of health only consider laboratories along with pharmacies, radiology and clinical services. Often, more attention is given to essential medicines rather than laboratory services. The challenge is how to advocate for representation of laboratory services at the highest decision-making level.

There are considerable challenges for national public health laboratory services in the African Region. They call for major investments in policy, capacity building and infrastructure development in order to improve patient management as well as disease surveillance, control and prevention. There is need for a combination of complementary measures, actions, strategies and capacity strengthening.

ACTIONS PROPOSED

⇒ *Develop a comprehensive national laboratory policy*

A national laboratory policy should focus on laboratory organization, structure and coordination; staff motivation and retention; integration of services; essential facilities,

equipment and maintenance; biosafety and biosecurity. The policy should also consider staff training requirements, continuing education, career development, laboratory support to national health programmes, minimum essential techniques, standard operating procedures for equipment and technologies by level, and the roles and responsibilities of a national public health laboratory.

⇒ *Formulate a national laboratory strategic plan*

A national strategic plan needs to be prepared to implement the national laboratory policy. Its purpose is to ensure the delivery of effective, efficient, accessible, equitable and affordable quality laboratory services.

⇒ *Establish or strengthen laboratory leadership*

Strong laboratory leadership ensures that the laboratory agenda is a central component of national health systems. The creation of a high-level, decentralized and coordinated structure is the key in enabling public health laboratories to play a significant role in disease control and prevention.

⇒ *Set up a national public health reference laboratory*

There is need to establish well-equipped and sufficiently staffed national public health reference laboratories that will

operate as centres of excellence for laboratory services. The national reference laboratory will coordinate national laboratory networks; diagnose pathogens causing major outbreaks, including handling and shipping highly infectious and dangerous pathogens; provide training and continuing education; provide reference testing; support the setting of laboratory norms and standards; produce reagents, where possible; establish and coordinate the national quality assessment scheme; participate in public health research and policy-making; and use information and communication technology to link laboratories.

⇒ *Strengthen the public health laboratory supply and distribution system*

To ensure continuous laboratory supplies, it is necessary to establish a demand-driven system where laboratories specify and quantify their needs based on standards defined at national level. Existing distribution systems should be strengthened to provide efficient delivery of laboratory supplies.

⇒ *Improve public health laboratory quality assurance systems*

A quality assurance programme is the backbone of quality laboratory performance. Establishing or strengthening laboratory quality assurance programmes will

allow countries to improve the reliability and reproducibility of laboratory results. The national public health reference laboratories of Member States should produce and distribute quality assessment proficiency panels to national laboratories to identify and correct gaps in the quality of laboratory service. Participation in the national external quality assessment scheme should be linked to annual laboratory registration and renewal processes.

⇒ **Strengthen laboratory staff training at all levels**

The laboratory needs for staff training and continuing education should be identified and addressed. This will allow laboratory staff to remain motivated and up-to-date in the available technologies. Countries will need to invest in the necessary infrastructure.

⇒ **Ensure maintenance of laboratory equipment**

Basic training is essential for laboratory technicians to operate laboratory equipment and perform preventive maintenance. Maintenance should be done on a preventive basis rather than a corrective basis. National public health laboratory services should therefore build internal capacity for preventive and curative maintenance; manufacturers should only attend to serious equipment problems.

⇒ **Strengthen laboratory management information systems**

A strong laboratory management information system allows a country to provide regular and accurate data for evaluating and planning quality laboratory services. An ideal laboratory data management system should include collection of appropriate information, analysis and utilization of results at every level, periodic reporting on equipment and supplies, financial resource reports, summary of testing processes, quality assessment reports, and staff inventory.

⇒ **Monitor and evaluate laboratory services**

Establishment and strengthening of monitoring and evaluation systems with targets and measurable indicators will allow countries to improve the delivery of quality laboratory services. Monitoring and evaluation should incorporate laboratory activities such as adherence to standard operating procedures and safety guidelines, quality assessment activities, laboratory performance and workload, and utilization of supervisory tools.

⇒ **Ensure adequate funding for public health laboratory services**

Public health laboratory services should be funded through several mechanisms, including government budgetary provision

and dedicated grants, credit lines and income-generating activities, e.g. charging fees for services provided. Additional funding opportunities for laboratories exist through partnerships like the Global Fund to Fight AIDS, Tuberculosis and Malaria; polio initiatives; Rotary International; and the global highly pathogenic avian influenza networks. Integration of national public health laboratory programmes will ensure sharing and optimal use of available resources. 📌

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