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LABORATORY PROFESSIONALS IN AFRICA: THE BACKBONE OF QUALITY DIAGNOSTICS

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Health, Nutrition and Population (HNP) Discussion Paper

Laboratory Professionals in Africa: *The Backbone of Quality Diagnostics*

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This paper was prepared under the Africa Region Human Resources for Health Program of the World Bank which aims to support governments in the Africa Region to develop and implement national strategies on Human Resources for Health. It represents part of a broader effort to shed light on neglected cadres in health systems on the continent.

Abstract: Laboratories have historically been under supported in developing country health systems resulting in poor quality diagnosis and inadequate disease surveillance. The labor market for laboratory workers in many developing countries is typically characterized by constrained supply (especially amongst well qualified staff), sluggish public sector demand, and relatively low wages. This leads to a high turnover of staff with highly skilled staff finding work in the private sector. Laboratory professionals are predominantly male with relatively limited female labor participation, with potential gender based barriers to advancement. The focus on communicable diseases has meant that funding for broader public health laboratory services has been relatively neglected.

In this paper we present a number of strategies to address these problems based on the outcomes from a literature review and case studies conducted in four African countries. Improved registration and human resource planning are required to establish the scale of the problem and to develop country specific strategies to address skills shortages. More high quality pre-service training is needed to supply the service with suitably skilled professional staff to address the current deficit. Innovative in-service training is essential to maintain competence and collaboration is required with the private sector to utilize their expertise. A clear career structure with transparent promotional opportunities is required to recruit and retain staff in the public sector. The establishment of suitable work environments and regulatory and representative bodies will also support recruitment and retention as well as enhance quality. It is also clear that this cadre has been underrepresented in human resources for health research and more activity in this area will lead to greater understanding of the problems and provide more potential solutions.

Keywords: Neglected cadres, laboratory professionals, quality diagnostics, and laboratories.

Disclaimer: The findings, interpretations and conclusions expressed in the paper are entirely those of the authors, and do not represent the views of the World Bank, its Executive Directors, or the countries they represent.

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LIST OF ABREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AKMLSO	Association of Kenya Medical Laboratory Scientific Officers
ASLM	African Society for Laboratory Medicine
ASCP	American Society for Clinical Pathology
CDC	Centers for Disease Control and Prevention
FBO	Faith-Based Organization
FELTP	Field Epidemiology and Laboratory Training Program
GDP	Gross Domestic Product
HIV	Human Immuno-Deficiency Virus
HR	Human Resource
HRH	Human Resources for Health
KENAS	Kenyan National Accreditation Service
KMLTTB	Kenya Medical Laboratory Technicians and Technologist Board
LQIT	Laboratory Quality Improvement Tools
MeLSAT	Medical Laboratory Association of Tanzania
NGO	Non-Governmental Organization
PPP	Public-Private Partnership
PEPFAR	US President's Emergency Plan For AIDS Relief
RABITEC	Rwanda Association of Biomedical Laboratory Technologist
RESOLAB	West and Central Africa Veterinary Laboratory Network for Avian Influenza and other Transboundary Diseases
SANAS	South African National Accreditation Service
SLIPTA	Stepwise Laboratory Quality Improvement Process Towards Accreditation
SLMTA	Strengthening Laboratory Management Towards Accreditation
TB	Tuberculosis
USAID	United States Agency for International Development
USG	United States Government
WHO	World Health Organization

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This paper was prepared under the Africa Region Human Resources for Health Program of the World Bank which aims to support governments to develop and implement national strategies on Human Resources for Health. The paper also represents part of a broader effort to bring attention to the neglected cadres in health systems in sub-Saharan Africa.

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EXECUTIVE SUMMARY

I. Introduction

Laboratory professionals figure prominently among neglected cadres in health systems across sub-Saharan Africa. There are often insufficient numbers, a skewed distribution, low level of qualifications, and limited career opportunities. Laboratory personnel often work in facilities which are poorly equipped, and do not systematically respect safety and infection control standards. These factors adversely affect the performance of laboratory professionals, who are the backbone of quality diagnostics. As a result, clinicians lose confidence in laboratory services, and often resort to presumptive diagnoses rather than laboratory confirmation. This paper presents the main challenges facing these neglected cadres and outlines policies to enhance their performance and ultimately the quality of clinical care and core public health functions.

II. Context

Laboratories are critical to effective national health systems. Accurate and reliable laboratory services are essential for supporting clinical diagnosis, guiding treatment, and managing the spread of drug resistance. Trained laboratory personnel and well-functioning laboratory systems are also important in helping countries comply with international commitments on establishing integrated disease surveillance systems and alerting neighboring countries of disease outbreaks (International Health Regulations).

Yet in many developing countries laboratories have historically suffered from inadequate infrastructure, limited funding, and lack of skilled personnel. Lack of access to accurate laboratory services can result in misdiagnosis, which in turn leads to compromised patient care, higher costs, and continual transmission of communicable diseases. The inability to provide etiological confirmations during disease outbreaks can lead to delays in responding efficiently to outbreaks and difficulties in controlling or eradicating endemic diseases, elevating risk of disease transmission, and fueling economic costs.

During the past decade there has been a renewed interest in improving laboratory services driven primarily by increased funding for the major communicable diseases. Since the 2008 Maputo Declaration on Strengthening of Laboratory Systems there has been recognition of the broader importance of laboratory services, and of the role of trained and qualified laboratory personnel in providing high quality, timely, reproducible results. This has created a positive funding environment to reverse the previous decades of neglect of laboratory services and laboratory professionals.

III. Labor Market Framework

The paper provides a discussion of the main factors that influence the availability of qualified laboratory personnel. It includes a framework for better understanding the labor market for laboratory professionals which can be applied in different settings to identify

key impediments and policy levers which may be amenable to change. It presents examples and evidence from different countries to illustrate broad trends and key challenges.

The labor market for laboratory workers in many countries in sub-Saharan Africa is typically characterized by constrained supply, sluggish public sector demand, and relatively low wages. The insufficient supply of laboratory professionals stems from the limited capacity of pre-service training institutions, sluggish recruitment, and unattractive wages. Many training institutions across the region suffer from inadequate facilities, shortages of tutors, and funding constraints.

The labor force in most countries is comprised primarily of certificate holders with a relatively smaller number of diploma and degree level staff, particularly in the public sector. There is a skewed geographic distribution with the bulk of the less qualified labor force in rural areas and the most skilled ones in urban facilities. The public sector struggles to recruit and retain staff with higher qualifications that have more attractive opportunities in the private sector. Staff turnover is found to be a key concern in the public sector. Laboratory professionals are predominantly male with relatively limited female labor participation, with potential gender based barriers to advancement.

Public sector demand for laboratory professionals has been historically weak. Laboratory work has not been viewed as a critical profession by health ministries and public sector institutions have been unable to attract highly qualified personnel due to budgetary constraints and other priorities. Government policies to structure the laboratory profession and to develop clear career pathways have been generally inadequate. Job descriptions are not well structured or standardized and there are often inconsistencies between qualifications and salary structures which impede recruitment, retention, and productivity. Performance review processes are not systematically applied to laboratory staff. The main bodies representing laboratory professionals are not sufficiently strong to allow laboratory workers to be adequately represented at the facility and policy levels, and to have a genuine voice in the system.

Private sector institutions (particularly for-profit) have a greater capacity to attract qualified laboratory professionals and are willing and able to offer better working conditions with access to the latest technology, more attractive salary and benefit packages, and innovative incentive schemes. The private sector (faith-based and for-profit organizations) absorbs a higher proportion of degree holders. Private sector organizations play a relatively minor role in pre-service training in most countries even though there are several promising examples of mentorships and placements.

During the past few years there has been an increase in laboratory strategic plans which are beginning to focus attention on this critical pillar of health systems and to raise the visibility of the laboratory profession. Government policies and strategies to upgrade and retrain laboratory workers through high quality, regionally standardized training, to improve work conditions, and to foster closer working relationships with clinical staff

and the private sector are steps in the right direction. Much more needs to be done as noted below.

IV. Policy Recommendations

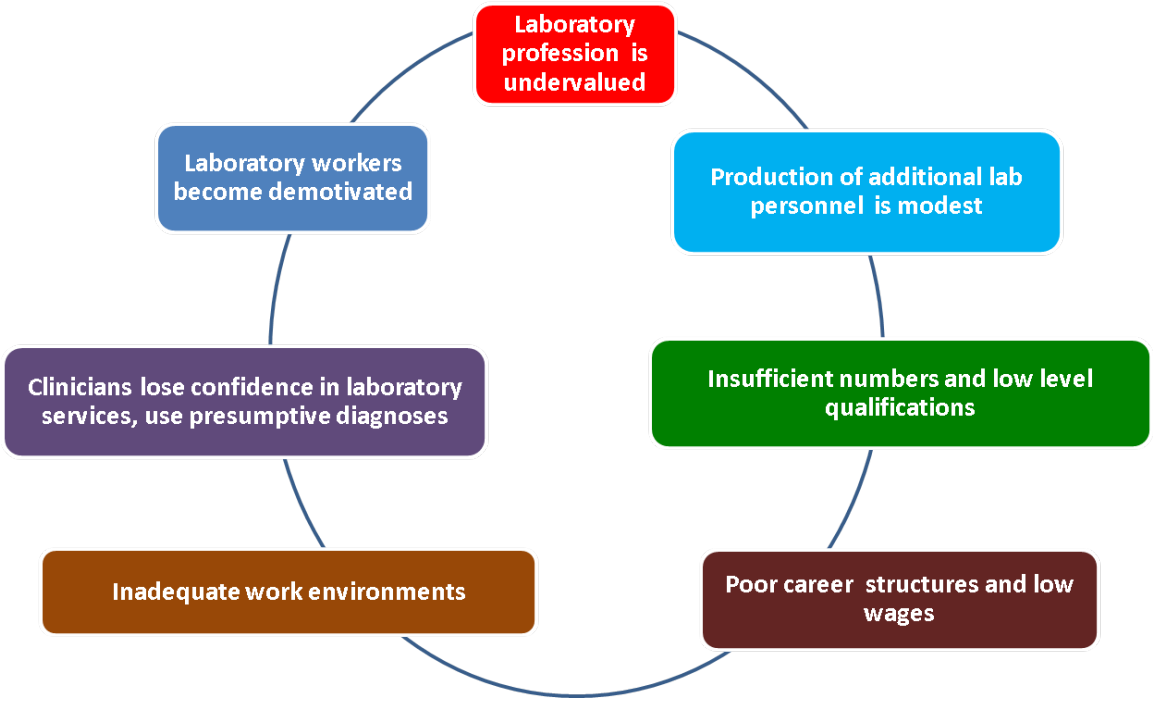
To ensure the most is made of the positive funding environment for laboratories we have identified a series of policy recommendations. These are presented in terms of broad strategic directions and are not intended to be prescriptive. Country plans need to take into account the specific local context to identify the most appropriate combination of strategies taking into account what is financially affordable. The main recommendations are as follows:

- *Expand the output of pre-service training institutions* in order to address the pervasive deficit of qualified laboratory staff and/or use public sector funds to contract private sector training institutions or public sector facilities in neighboring countries.
- *Promote work and competency based in-service training* to ensure that staff skills are up to date and competency is demonstrated. Strategies such as work place based mentorships, e-learning, flexible working hours, and rotational deployment should be used to promote training opportunities, especially for staff in more remote postings.
- *Conduct joint training of laboratory and clinical staff* as this has shown a positive effect on participating clinicians' use of laboratories and could be an important strategy for improving the laboratory-clinician interface.
- *Improve work environments* to ensure that laboratory professionals are well protected and work in safe environments with access to well-maintained equipment.
- *Develop well-structured career paths* for laboratory cadres to increase recruitment and retention, and ensure that job titles and descriptions are well aligned with national requirements.
- *Explore possibilities for greater collaboration with the private sector.* Ministries of Health need to consider innovative ways to leverage financing and technical knowhow of the private sector, such as mentorships, work placements, and training in private facilities.
- *Strengthen human resources planning for laboratory professionals* and ensure that this neglected cadre becomes an integral part of broader HR planning at country level which will assist Ministries of Health to progressively address shortages and skills gaps.
- *Improve registration of laboratory workers* to get a better handle on the number of workers, the skills mix available, and their distribution.
- *Establish or strengthen national regulatory and representative bodies* to improve governance and enhance quality. Proper regulation of laboratory services through activities such as setting and supervising laboratory standards and standardizing and regulating pre- and in-service training will help improve morale and the quality of services. Representative bodies need to be better organized to effectively represent the interests of laboratory professionals and allow them greater voice in the system.
- *Scale up research on issues related to laboratory workers* to inform public policy. Research is needed to better understand the specific labor market situations in different countries and the factors which influence the supply and demand for laboratory cadres as well as the combination of policies and practices which will improve performance of laboratory workers and of public health laboratories.

PART I – INTRODUCTION

1. ***Laboratory professionals figure prominently among neglected cadres in health systems across sub-Saharan Africa***. There are often insufficient numbers, a skewed distribution, low level of qualifications, and limited career opportunities. Laboratory personnel often work in facilities which are poorly equipped, and do not systematically respect safety and infection control standards. These factors adversely affect the performance of laboratory professionals who are the backbone of quality diagnostics.[1] As a result, clinicians can lose confidence in laboratory services, and resort to presumptive diagnoses rather than laboratory confirmation.[2] In return, laboratory staff can become demotivated by the lack of faith in their profession. Breaking this vicious cycle (Box 1) is critical to enhancing performance of laboratory professionals, and ultimately the quality of clinical care and core public health functions.

Box 1: A Vicious Cycle



Source: Authors

[1] Performance is discussed primarily in terms of *competency* (for example, having the right skills and qualifications) and *ability* (for example, operating in a well-equipped and safe working environment). While absenteeism and productivity may also adversely affect performance, these issues are not covered as there is little reliable data and information.

[2] Reyburn, H., et al. 2007.

2. ***This paper provides an overview of the situation of laboratory professionals in sub-Saharan Africa and identifies policies that can enhance their performance***. It is not meant to be an exhaustive analysis of all issues but to illustrate broad trends and main challenges. The paper is primarily descriptive and qualitative. It relies mainly on secondary data. It draws heavily on a scoping study of the literature[3] and on four case studies (*Kenya, Rwanda, Tanzania, and Uganda*) commissioned as part of the World Bank funded *East Africa Public Health Laboratory Networking Project*.[4] The scoping study highlighted the lack of comprehensive information on the subject which reflects in part the limited attention given to this group of health professionals. In total, 30 papers on laboratory professionals in Africa were found in the peer reviewed literature and another 21 in the grey literature, including 14 Human Resources for Health (HRH) Observatory country reports. The country case studies used a common methodological framework and research tools, including participatory methods for ascertaining views and perceptions of key stakeholders and informants.

3. ***Four important caveats and limitations are worth highlighting***. First, there are important data gaps and limitations both in terms of the issues and geographic coverage. Second, the literature search found that studies do not present information in a comparable fashion, hence limiting cross country comparisons. Third, findings from interviews and focus group discussions conducted as part of the case studies must be viewed cautiously as they may not be fully representative. Finally, the paper covers the role or potential of the private sector only in a cursory manner, given the lack of data and information.

4. ***The rest of this paper is divided into three sections***. The next sets the context for the main discussion by describing the importance of laboratories in health systems and the key role of laboratory professionals. The following section proposes a framework for analyzing factors influencing the availability of qualified laboratory workers, and presents examples and evidence from different countries to illustrate broad trends and key challenges. The final section summarizes policies and practices that can enhance the performance of laboratory workers and ultimately the quality of clinical care.

[3] Dacombe, R. 2012.
[4] Nafula, M. 2012.

PART II– CONTEXT

5. ***Laboratory services are an essential component of health systems***. Accurate and reliable laboratory services are critical for supporting clinical diagnosis, guiding treatment, managing the spread of drug resistance, and responding to disease outbreaks. [5] The performance of national and regional networks of laboratories is an important contributor to overall health system efficiency. Tiered networks of well-staffed laboratories are critical to providing a continuum of quality assured services and are essential for disease control activities. Laboratory networks ensure that capacity to diagnose diseases, identify public health threats, and conduct surveillance is done effectively. Appropriately trained and qualified laboratory personnel are critical to well-functioning laboratory systems that provide high quality, timely, reproducible results.

6. ***Historically, laboratories have constituted one of the weakest areas in health systems in sub-Saharan Africa***. Laboratories have suffered from: inadequate infrastructure, limited funding, and lack of qualified human resources. [6] These deficiencies hinder the performance of laboratory health workers and of public health laboratories. In turn, these impediments impede governments' ability to manage the spread of drug resistance, respond to disease outbreaks, and scale up critical programs. Lack of access to accurate laboratory services can result in misdiagnosis, which in turn leads to compromised patient care, higher costs, and continual transmission of communicable diseases. For example, one study in Botswana found evidence of tuberculosis in only 52 percent of patients suspected with TB, underscoring the importance of laboratory confirmation of disease. In Tanzania, 50 percent of patients admitted to hospitals with a clinical diagnosis of severe malaria actually had confirmed blood smear results. [7] A Kala-azar outbreak in Kenya in May-June 2014 underscored the importance of laboratory diagnosis for this disease which has clinical manifestations that are common to numerous illnesses (e.g. fever, weight loss, anemia). [8]

7. ***The inability to provide etiological confirmations during disease outbreaks can lead to delays in responding efficiently to outbreaks and difficulties in containing, controlling or eradicating endemic diseases, elevating risk of disease transmission and fueling economic costs***. The economic impact of the ongoing Ebola outbreak in West Africa is estimated at a US$2.2 billion under a low case scenario for 2014 alone and over three times higher under a high case scenario. [9] The economic costs of other major epidemics have also been associated with high socio-economic and health costs. For example, the Mexican government estimated that the H1N1 outbreak had devastating effects on tourism and economic growth with an estimated loss of roughly .3 percent of GDP or US$2.3 billion. The economic cost of the 2006 Chikungunya

[5] Boillot, F. 2009.
[6] Petti, C., et al. 2006.
[7] Reyburn, H., et al. 2007.
[8] Kanyina, et al. 2014.
[9] The World Bank, October 8, 2014.

epidemic in Mauritius and other Indian Ocean countries was substantial in terms of losses to the tourist industry.

8. ***During the past decade there has been a renewed focus on laboratories with the agenda largely driven by the surge in funding for the three main communicable diseases*** (HIV/AIDS, TB, and malaria). As a result, there has been a boost in training opportunities for laboratory workers, upgrading of facilities, and an introduction of new technologies for prompt and accurate diagnosis, contributing to improved working environments. While a few simple microscopic and kit-based laboratory tests have become widely used at point of care, such as HIV and malaria rapid diagnostic tests, clinical laboratory services remain critical for the accurate and efficient diagnosis and monitoring of most diseases.[10] Moreover, while there have been many positive spillover effects from these disease specific laboratory investments the focus has not been on the broader need to strengthen public health laboratories and to address issues related to the recruitment and retention of laboratory personnel.

9. ***Within the past few years, there has also been a growing recognition of the broader importance of laboratories and several calls for action***. The main regional consensus was embodied in the 2008 *Maputo Declaration on Strengthening of Laboratory Systems* which underscored the importance of putting in place appropriate institutional, policy, and strategic frameworks and called for action to address the broader laboratory human resources agenda. A similar policy statement was made during the 59th meeting of African Ministers of Health which called for strengthening public health laboratories, and tackling the spread of drug resistance to AIDS, TB, and malaria. Furthermore, virtually all countries in sub-Saharan Africa have made important international commitments to establish integrated disease surveillance systems and to alert neighboring countries of disease outbreaks (International Health Regulations[11]) which require well trained laboratory personnel and well-functioning laboratory systems.

10. ***The performance of laboratories tends to be closely related to qualifications of laboratory personnel.*** While most of the empirical evidence comes from developed countries there is growing evidence from resource constrained settings. One study in the United States assessed the accuracy score of a group of laboratories employing only certified medical technologists compared with a group of laboratories employing only noncertified medical technologists. The group employing only certified medical technologists had a mean accuracy score of 95 percent while the group employing only noncertified medical technologists had a mean accuracy score of only 75 percent.[12] A similar study assessed the performance of two groups of laboratories, one employing only American Society of Clinical Pathologists (ASCP) certified technologists and a second group employing no ASCP certified technologists. Significant differences were found for the basic laboratory services, as well as for comprehensive diagnostic immunology, blood banking, hematology, and chemistry with laboratories employing only ASCP certified technologists having a significantly higher probability of achieving 80

[10] Elbireer, et al. March 17, 2011.
[11] World Health Organization. 2005.
[12] Lunz, et al. 1987.

percent accuracy. [13] A comprehensive evaluation of the number, scope, and quality of clinical laboratories in Kampala, the first published survey of its kind in sub-Saharan Africa, found that laboratories which had qualified personnel had higher testing volumes and tended to be of higher quality. Out of the 954 laboratories surveyed in Kampala only 5 percent met or surpassed the lowest quality standards defined by the WHO/AFRO laboratory strengthening quality improvement system towards accreditation. These facilities had one star on the five-point system, and had a higher number of laboratory-specific staff than the remainder. [14] In spite of the essential role of qualified laboratory personnel their numbers and qualifications remain inadequate, as discussed in detail in the next section.

[13] Lunz M.E., B.M. Castleberry, K. James 1992.
[14] Elbireer, et al. May 30, 2013.

PART III – LABOR MARKET FRAMEWORK

11. ***In many countries in sub-Saharan Africa the current labor market for laboratory workers is typically characterized by constrained supply, sluggish public sector demand, and relatively low wages***. These factors are interrelated and contribute to the low number of qualified laboratory professionals. Laboratory work has not been viewed as a critical profession by health ministries, production of additional personnel has been modest, recruitment has been constrained by budgetary ceilings and other priorities, and public sector wages have not been competitive. This section aims to improve understanding of the main factors that influence the supply of and demand for and the performance of laboratory workers and of public health laboratories. Its main value is to use a labor market framework (Box 2) from a publication on the labor market for health workers in Africa, in order to better understand these relationships and to identify policy levers which may be amenable to change. [15] While the quality and reliability of data limits the full application of the framework, information is presented to illustrate broad trends and key challenges.

12. ***Factors that influence the labor market for laboratory professionals*** include: (i) *current number and type* of cadres of laboratory personnel in the public and private sectors as well as those who may be unemployed or working in non-laboratory jobs; (ii) *production of new or better trained workers* (training and education), as measured by the number of graduates from pre-service training institutions; (iii) *attrition* and migration of workers, which is linked to working conditions, incentives, and alternative employment opportunities; (iv) *government willingness and capacity* to recruit these workers; (v) *private sector willingness and capacity* to recruit these workers, in both NGO-administered facilities and private, for profit structures; and (vi) *donor related actions* which influence the demand for these workers either by direct recruitment or indirectly by providing substantial investments in laboratory services. To summarize, from a supply side perspective, pre service training and education, attrition, and migration influence the market by determining the pool of available laboratory workers. From the demand side, the labor market is affected by three main actors (i.e. public, private, donors).

13. ***Governance structures influence the labor market by establishing public policy and setting rules.*** Governments and regulatory authorities have an important role to play in: (i) strengthening strategic planning and conducting rigorous needs assessments; (ii) structuring career development paths; (iii) developing strategies to strengthen retention and recognition; (iv) regulating and accrediting training institutions and laboratories; (v) registering and licensing laboratory professionals; (vi) providing a platform and a voice for representation of laboratory professionals; and (vii) supporting continuing professional development. The next section presents examples and evidence from the literature and the case studies on what is known about these various factors with the main focus on supply side factors as there is a paucity of information on demand.

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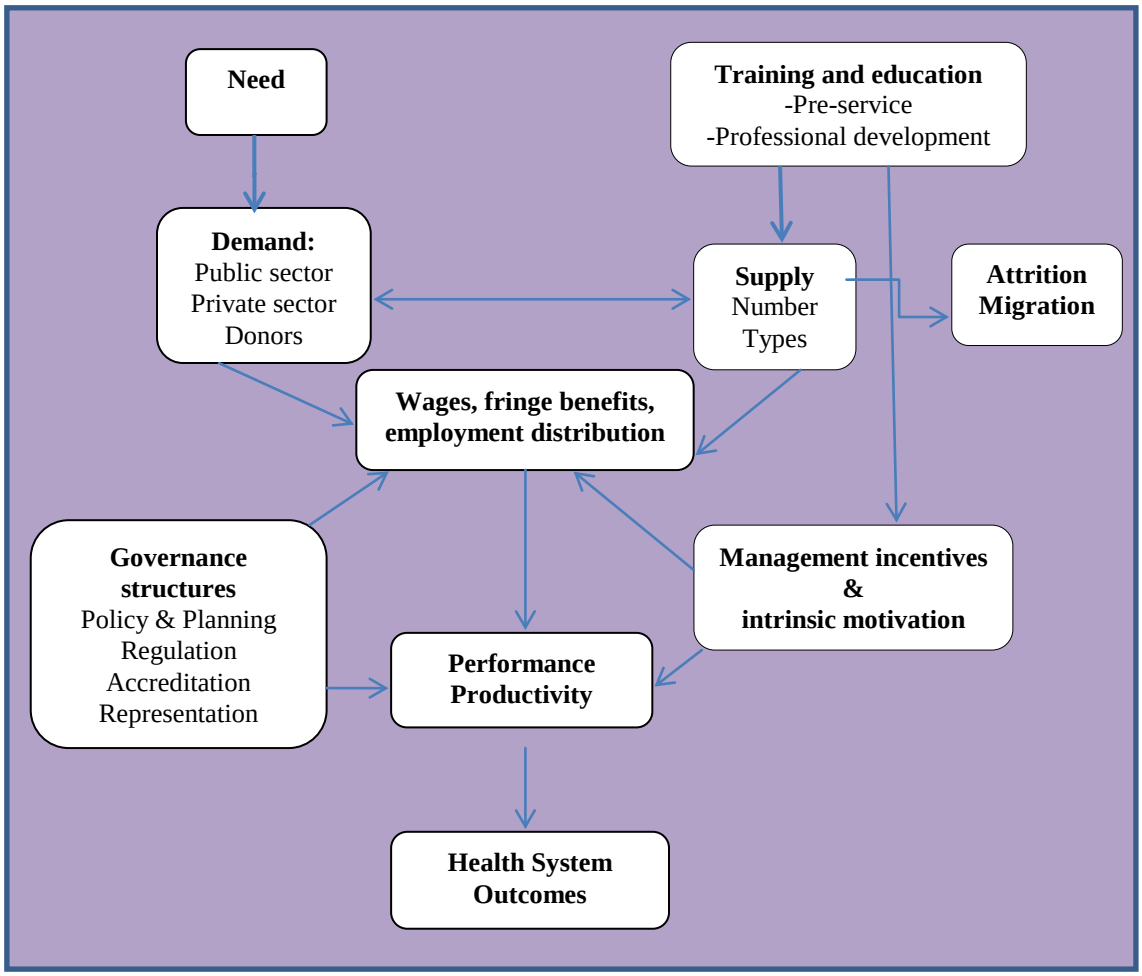
[15] Soucat, et al. 2013.

Box 2: Framework of the Labor Market for Laboratory Professionals



Source: Adapted from Soucat, et al. 2013.

Key Trends and Challenges

14. ***The most comprehensive information on the public sector shows the relative scarcity of highly qualified laboratory personnel and a heavily skewed distribution in favor of urban areas***. [16] Laboratory staffing levels range from 0.01 to 1.3 per 1,000 inhabitants with the majority of countries below 0.1 per 1,000. By contrast, developed countries that have higher levels of automation, requiring fewer technicians have substantially higher laboratory staffing levels (UK: .34 per 1000; US: 2.15 per 1000). In countries with data on trends in staffing over time, the number of laboratory staff remains roughly stable, suggesting limited progress in addressing staffing needs and gaps. For countries where data were available, the majority of personnel were heavily concentrated in urban areas (*Malawi, Ghana, Central African Republic, Mali*) with a few notable exceptions (*Guinea-Bissau, Rwanda*). In most countries certificate

[16] Data from the HRH Observatory give the closest available estimates on the pool of laboratory workers. Given that in some countries many of these workers are not registered or may be unemployed, the HRH Observatory data probably underestimate the total pool of laboratory workers.

holders are the largest group with a relatively smaller number of diploma and degree level staff in the public sector. Several countries have been the subject of more in depth human resources studies which highlight the inadequate number and high unmet need for laboratory professionals (Box 3).

15. ***The demographic profile of the existing supply of laboratory workers can be characterized as predominantly male and moderately young with this pattern particularly strong among the higher-level cadres*** (Annex I). The proportion of female laboratory workers in countries where information is available show very low (*Malawi*: 15 percent; *Ghana*: 20 percent; *Central African Republic*: 8 percent) or moderate (*Kenya*: 36.5 percent; *Rwanda*: up to 47 percent) rates with Congo appearing to be an outlier with females representing 60 percent of the laboratory labor force (Annex I). Women are more strongly represented in the lower cadres, indicating potential gender based barriers to advancement. For countries where data is available, the majority of laboratory staff are under forty years of age: *Malawi* (70 percent), *Ethiopia* (79 percent), *Ghana* (76 percent), *Rwanda* (up to 92 percent), indicating that retirement of personnel is not a major risk in the near future. Kenya is a notable exception with 37 percent under forty years of age.

16. ***The private sector appears to absorb a relatively small share of the overall supply of laboratory workers but a substantial proportion of degree holders***. The HRH Observatory country reports show a significant minority of laboratory workers are employed in the private sector in most of the countries for which data is available (Annex I). However, this data may not capture fully the importance of the private sector in absorbing laboratory workers given the scarcity of information on the private sector. [17] For countries where data is available from the HRH Observatory it is clear that the public sector combined with faith-based organizations (which are closely aligned to the public sector in many countries) represent the lion's share of employed laboratory workers. The private sector appears to absorb a higher proportion of degree holders. For example, in Rwanda close to 61 percent of the bachelor degree holders were employed in the private sector, both for-profit and faith-based organizations. A review of public-private partnerships (PPPs) for laboratory services in four countries in East Africa (Rwanda, Tanzania, Uganda, Kenya) also found that private for-profit sector plays a relatively small role with a few notable exceptions. [18] *Rwanda* has a relatively low number of private for-profit facilities which are heavily concentrated in Kigali. *Tanzania* has a small and rapidly growing private health sector which emerged in the mid-1980s when economic controls against private ownership were relaxed. *Uganda* has a large number of private clinics and laboratories with several successful laboratory medical equipment placement arrangements in place. Human resources in the public laboratory sector are viewed as more trained than their counterparts in the private for-profit sector. *Kenya* has one of the largest private health sectors in the region with the private sector offering more attractive salary packages and exposure to new technology. The

[17] In Van Den Broek and Odona's study of HRH in 15 countries engagement with the laboratory private sector was not mentioned in any national HRH strategic plans but in 80 percent of laboratory strategic plans.

[18] World Bank November 2013.

country has been a pioneer in terms of PPPs with various schemes in place, such as equipment placement contracts, subsidized public pricing of selective equipment for private hospitals, and internships with private training institutions.

Box 3: Inadequate Number and High Unmet Needs for Laboratory Professionals in a Select Group of Countries

-***Zambia***: a World Bank Human Resources for Health assessment reported 480 laboratory technicians with vacancy rates of 80 percent in rural health centers, 25 percent urban health centers and 50 percent in hospitals. The annual attrition rate was 3.5 percent and 32 percent of laboratory staff were in post compared to the 2008 government requirements. 19

-***Tanzania***: laboratory staffing projections using the Quantity, Tasks, Productivity method estimated that by 2015 the country will have up to 30 percent of the required laboratory technicians. 20 A 2006 report on the HRH situation in Tanzania reported similar staffing gaps with 35 percent deficit between approved and filled positions for laboratory staff and a low rate of absenteeism. 21

-***Rwanda***: according to the 2011-2016 Human Resources for Health Strategic Plan there are roughly 980 laboratory professionals working in public health facilities in contrast to a desired number of 2330, with a deficit of nearly 60 percent. 22 Moreover, the National Reference Laboratory 2012 Report revealed that 83 percent of laboratory professionals in public district hospitals and health centers have only A2 level (certificate holders) in contrast to 16 percent which have A1 or A0 levels (degree holders) that comply with government norms. 23

-***Uganda***: focus group discussions conducted as part of the Uganda case study found that the majority of respondents cited concerns with the acute shortages of laboratory personnel in rural areas with many districts not achieving optimum staffing norms. Respondents noted that the greatest shortages are in the public sector, followed by faith based organizations and private for profit facilities.

-***Kenya***: the country is also facing serious shortages of human resources across all cadres of health workers, as documented in the case study. The public sector is estimated to need some 14000 laboratory workers, suggesting it is operating with only 14 percent of the required staff. The shortage in the public sector stems from lack of prioritization, inadequate funding, and bureaucratic employment procedures. In total, Kenya has close to 1500 registered technicians (certificate holders) and roughly 5400 technologists (diploma or degree holders) with an approximate equal number of unregistered laboratory workers. The majority of the country's laboratory workers hold diplomas (76 percent), and the remainder holds certificates (20 percent) or degrees (4 percent), reflecting the relatively more mature labor market with an important growth in degree holders, in comparison to other countries. In total, 3850 laboratory workers are currently employed in the public sector with the remainder employed either in the private sector or unemployed. The distribution appears relatively good with 42 percent in urban areas, 50 percent in mixed areas and 8 percent in the least urban areas.

[19] Herbst, C., et al. 2011.

[20] Kurowski, C., et al. 2007.

[21] Muhondwa, E. and B. Fimbo 2006.

[22] Sebagabo, Muhire B. 2012.

[23] In Rwanda, A0 level staff has a 4-year Bachelor of Biomedical Laboratory Sciences; A1 is a special program to upgrade A2 certificate holders; and A2 is a secondary school program which is being phased out.

17. ***While most African countries have recognized the need to increase the production of qualified laboratory personnel, the annual output of pre-service training institutions remains generally modest.*** The HRH Observatory country reports contain pre-service education data on 11 countries, of which 8 had some information on admissions and graduations with the majority experiencing stable trends (Annex II). The private sector appears to play a relatively minor role in pre-service training in most countries in Africa with a few notable exceptions, such as mentorships. Several countries have been the subject of more in depth reviews that found similar challenges to expanding the throughput of pre-service training institutions, including inadequate training facilities, shortages of tutors, and funding problems (Box 4). Other issues that have emerged in expanding pre-service training programs are delays in absorbing personnel due to shortages of accredited facilities for internships (*Nigeria*)[24] or difficulties in employing degree holders in countries that have been promoting degree rather than diploma programs (*Zambia*). [25]

18. ***The problems highlighted in many countries with lack of distinct roles for diploma and degree holders suggest that training curricula may not be well aligned with the needs of the public sector***. There is little published information on curriculum issues for laboratory courses. However an unpublished study from *Malawi* noted a dichotomy in the Ministry of Health's need for graduates to act as laboratory managers and the desire of students for internationally useful qualifications. [26] This has led to an expansion in the curriculum to include skills with a greater international utility and a change of emphasis in the student intake from experienced laboratory technicians to school leavers. In turn, this has caused some tension in the workplace regarding the role and seniority of school leavers. In the *Uganda* case study some respondents noted that private training institutions, that tended to take weaker students who were not accepted by the public system, should provide foundation courses. In the *Kenya* case study a number of different bodies were involved in providing guidance for curriculum development depending on the type of institution offering the course. This has the potential to lead to a pool of graduates with a differing skill sets.

[24] Ministry of Health, F.M.O. 2008.
[25] Mwanza, J. 2010.
[26] Kasthala, S., S. Kamiza, and I. Bates. 2010.

Box 4: Capacity Constraints in Pre-Service Training in a Select Group of Countries

-***Tanzania***: the main challenges were limited student accommodation; shortage of tutors and inadequate access of tutors to continued professional development; and inadequate infrastructure and insufficient teaching materials. 27 The country has 15 training institutions offering laboratory science qualifications compared with 65 nurse training institutions. Efforts to boost production were also impeded by bureaucratic delays in selecting candidates and challenges in managing the transition from knowledge to competency based curricula. Demand for laboratory training did not appear to be a problem as there were three times as many candidates as available positions.

-***Rwanda*** faces similar issues, including a shortage of qualified lecturers both in public and private higher learning institutions; inadequate training facilities with modern equipment, access to internet for research and learning; and limited infrastructure for practical learning. According to the Kigali Health Institute 2012 Biomedical Laboratory Science Department Report the shortage of lectures is acute with only 9 full time staff in comparison to the required 19 full time staff. Moreover, for the few available qualified laboratory lecturers, turnover is high as they seek more attractive employment opportunities in NGOs. Another impediment to expanding the pool of qualified laboratory professionals has been the cost of training which is beyond the means of most personnel who rely on government funding or private sponsorship.

-***Malawi*** has been facing similar challenges regarding infrastructure and teaching staff but has been making a concerted effort to expand pre service training through government payment of fees with a five-fold increase in diploma holders during 2004-2009.28 As a result, the number of laboratory technicians more than doubled from 160 to 380, exceeding government targets. Malawi also established and funded a national degree program in Medical Laboratory Technology rather than sending students to South Africa.

-***Uganda*** has 27 registered allied health professional training institutions producing qualified laboratory workers, of which 20 provide only certificate training. On average, these institutions produce about 820 graduates annually of which only 18 percent are diploma holders. Key informants noted similar impediments to expanding pre-service training, including shortages of full-time tutors, inadequate number of well-equipped facilities for hands on training, and problems with the duration and quality of training. The two-year diploma and certificate programs are felt to be too short and the content needs revision to include key neglected areas such as customer care and client relations, record keeping, management skills.

-***Kenya*** appears to be relatively well off with 34 registered training institutions and a vibrant private sector which represents 35 percent of the total. Enrollment in public sector training institutions expanded rapidly over the past decade, with a 2.5 fold increase since late 1990s. Interviews with key informants revealed relative satisfaction with physical infrastructure and training materials but dissatisfaction with the availability of computers.

19. ***The supply of workers in the public sector is adversely affected by attrition and migration.*** Low salaries, lack of career opportunities and inadequate work environments contribute to low levels of job satisfaction and high turnover. While most of the data is qualitative in nature concerns with staff turnover are cited in virtually all the case studies (Box 5), highlighting the difficulties of the public sector to retain personnel. This is particularly the case for degree holders who are sought out by the growing private sector which provides more attractive remuneration packages, underscoring the challenges of the government facilities to attract and retain skilled laboratory professionals.

[27] Rao, P., et al. 2010.
[28] O'Neil, M., et al. 2010.

Box 5: Factors Influencing Labor Mobility

-***Kenya***: Interviews with key informants conducted as part of the Kenya case study found that the main reasons for turnover were: (i) low salary levels (92 percent); (ii) lack of career opportunities (73 percent); and (iii) heavy workloads (70 percent). Other factors cited include: governance problems (47 percent) and risk of exposure to disease (45 percent). Focus group discussions and key informants also revealed that in spite of these push factors, in practice many of these laboratory workers, particularly the certificate and diploma holders, do not have tangible alternative employment options.

-***Rwanda***: focus group discussions found that over 70 percent of respondents cited staff turnover as a major issue caused by poor remuneration, inadequate opportunities for continuous training, no clear career development, and the desire of laboratory professionals to change the work environment.

-***Uganda***: concerns over low salaries (96 percent) and lack of a career path (86 percent) were the most cited reasons for staff turnover. Other factors cited during structured interviews were the poor work environments, weak supervisory systems, lack of accommodation in rural areas, and inadequate number of clinicians who drive the workloads of laboratory personnel.

-***Tanzania***, a survey of 36 health facilities found 72 percent of laboratory staff in rural areas was satisfied with their job compared to 48 percent in urban areas (Derua, 2011). 29 The same survey found 64 percent of laboratory staff in rural areas was comfortable with their working conditions whereas in urban areas 45 percent said they were overworked, poorly motivated, and had few training opportunities.

-***Nigeria***: 61 percent reported satisfaction with their workload, 69 percent considered their managers supportive but only 54 percent were satisfied with their remuneration. [30]

20. ***The public sector demand for laboratory workers has been historically weak given the inability of Ministries of Health to recruit personnel, and/or lack of prioritization in broader health policy discussions***.[31] As governments face numerous challenges and financial constraints their main focus has been on addressing human resources shortages of physicians and nurses. Laboratory staffing has not figured prominently in discussions of human resources at national or global levels with these workers being among the neglected cadres in Africa. Even when there is a willingness to recruit more laboratory professionals, governments have not been able to match their aspirations to their capacity to recruit more highly skilled personnel. For example, in *Rwanda*, government hospitals have failed to attract the most qualified laboratory professionals (A0 Biomedical Laboratory Scientists) as salaries in public sector hospitals are less competitive than in private health facilities.

21. ***Private, for-profit sector institutions have a greater capacity to attract qualified laboratory professionals and are willing and able to offer better working conditions with access to the latest technology, more attractive salary and benefit packages, and innovative incentive schemes***. As a result, they are better placed to compete with the public sector for the most qualified professionals. For example, in *Zambia*, the private sector was identified as a significant attraction with laboratory technicians being paid three times as much. The *Uganda*

[29] Derua, Y.A., et al. 2011.

[30] Chirdan, O.O., et al. 2010.

[31] Petti C.A., C.R. Polage, T.C. Quinn, A.R. Ronald, M.A. Sande. 2006.

case study found that the private sector offers more attractive salaries and working conditions which have negatively affected staffing of public sector facilities. In *Kenya*, the private sector has invested in state of the art infrastructure creating an attractive work environment and enhancing retention. The private sector uses innovative performance based payment mechanisms, rendering laboratories one of the most lucrative units in private hospitals. The *Rwanda* case study found that a substantial number of the qualified laboratory professionals tend to leave government health facilities for better paying jobs in private health facilities and non-governmental organizations.

B. Government Policies

22. ***Government policies and strategies to structure the laboratory profession and to develop a clear career path and promotional opportunities for laboratory workers have been generally inadequate***. In countries where information is available, job descriptions are not well structured or standardized; expansion of degree programs is progressing slowly; clear pathways for career development are lacking; there are inconsistencies between qualifications and salary structures; and performance review processes are not systematically applied to laboratory workers. In many countries, career development efforts are impeded by the absence of effective retraining strategies and structured promotional opportunities.

23. ***Strategic planning to systematically assess needs and plan ways to address gaps has not been done in a rigorous manner.*** Few countries have developed and are tracking compliance against staffing norms for laboratory cadres which are important steps towards addressing staffing gaps, and bolstering demand (Box 6). The staffing norms for several countries gleaned from the available literature are presented in Annex III for each tier of the laboratory network corresponding to the WHO definitions (i.e. tertiary corresponds to teaching and central hospital and national reference laboratories, secondary to district hospitals and primary to health centers). Countries that have data on staffing norms at secondary level all require personnel trained to at least diploma level. At primary level the education requirements are more varied between certificates and diplomas. This may be influenced by the type of testing done at primary level in each country and the laboratory facilities available or could be more pragmatically based on available staffing. There is no information available on staffing norms for tertiary facilities, probably due to the diverse nature of these institutions. The scoping study found limited information on whether staffing targets have been met. One notable exception is *Malawi*, where a 2010 evaluation of the country's human resource program found that 70 percent of district hospital laboratories have at least one laboratory technician and health centers are typically staffed by laboratory attendants or microscopists. [32]

[32] O'Neil, M., et al. 2010.

Box 6: Strategic Planning

- In ***Rwanda***, districts have the mandate to identify and fill existing laboratory staff vacancies, conduct performance appraisals, promote and reward staff. However, low human resource management capacity has contributed to delays in recruitment, placement, and promotions. Another major challenge is the budget ceilings on personnel emoluments which limit recruitment of required staff. While the Ministry of Health adopted a policy of upgrading A2 staff (which represents the bulk of the work force), it has faced challenges in offering competitive salaries commensurate with the additional training. Moreover, the top two grades (A0 and A1) receive the same salary in public sector hospitals since public facilities only budget for A1 positions, which can create disincentives to pursue the highest level of qualification (Sebagabo, July 2012).

- In ***Uganda***, individuals who are entrepreneurial and secure long-term training are not reassured re-entry into the public sector which provides a serious disincentive to pursuing professional development, according to key informants. Moreover, laboratory professionals can only move up to the level of principal laboratory technologist as the scheme of service has not yet been revised to accommodate basic degree and masters' degree holders which further limits the career trajectory for these workers.

- In ***Malawi*** the role of laboratory technicians and technologists is practically identical despite technologists having a higher qualification, leading to inconsistencies in advancement and seniority. Representation of laboratory professionals in higher management structures is limited (i.e. laboratories have historically been represented at hospital management level by the pharmacy department) which impedes influence on policy and practice. Even though Malawi has a good range of laboratory cadres with considerable potential for advancement limited direct evidence exists to demonstrate if this occurs in practice.

- In ***Tanzania***, appraisal of laboratory staff has recently been based on an Open Performance Review and Appraisal System which is applied annually by technical supervisors at the place of work. It is not known how effective this has been in improving performance or motivation. Moreover, the progression of laboratory personnel to higher qualifications is not streamlined, as staff with higher national diploma need to undergo the full BSc course before they can progress to masters' level training. The costs of higher education are a major deterrent to laboratory workers obtaining higher qualifications as the full costs have to be met by the individuals. Promotion has been constrained by shortage of funds to pay higher salaries; in some instances, different cadres are in fact paid the same salary.

24. ***During the past few years there has been a growth in laboratory strategic plans which are beginning to focus attention on this critical pillar in health systems and to raise the visibility of the laboratory profession***. The recent focus on laboratory professionals has been triggered by the growth in demand for laboratory work from the three main communicable disease programs (HIV/AIDS, TB, malaria) which require laboratory confirmation. An analysis conducted for the 7th European Congress on Tropical Medicine and International Health reported on laboratory strategic planning for fifteen African countries found that all had health strategic and HIV plans, eight had HRH plans and four had laboratory strategic plans (*Ethiopia, Rwanda, Tanzania, Uganda*).[33] Of these strategic plans, 80 percent of laboratory, 50 percent of HRH and 33 percent of HIV ones included strategies to address laboratory staff shortages which was one of

[33] This report may underestimate the total number of laboratory strategic plans, as several other countries (for example, Kenya, Malawi, Zambia) now have such plans.

the main issues addressed.[34] Plans also addressed pre-service education, recruitment and retention, career development, in-service training, and staff deployment/distribution. While having plans is an important step in the right direction there is little evidence of the extent to which these plans are being implemented.

25. ***Government efforts to promote task shifting remain modest but have been on the rise which is promising given the shortages of laboratory workers and the potential to focus scare resources of trained laboratory cadres on more technically demanding testing areas.*** There is evidence of task shifting from laboratory to non-laboratory cadres for only few diagnostic procedures. This is most prominent and well accepted in HIV diagnosis and has been well documented in the peer reviewed literature. For example, in Lesotho roughly 33 percent of lay counselors perform HIV testing[35], in Namibia where lay counselors perform the testing[36], and in Uganda for unspecified non-laboratory staff.[37] The Uganda study demonstrated that, if properly trained, non-laboratory staff can perform HIV rapid testing as well as laboratory staff. The World Health Organization Task Shifting Global recommendations and guidelines also contain examples of community workers in Malawi, Namibia and Rwanda performing HIV tests.[38] This larger number of papers on HIV task shifting may be due to the relative simplicity of the test and/or the greater levels of attention and HIV/AIDS funding. Task shifting for other diseases has also been documented, including a study brief from Uganda which details use of rapid syphilis tests by midwives[39] and a USAID report from the same country which mentions an unspecified cadre of non-laboratory staff performing sputum smear microscopy[40], as does a study from Zambia. [41] In Malawi there is evidence of laboratory cleaners preparing smears for microscopy. [42]

26. ***Government policies to promote collaboration with the private sector are also on the rise but more needs to be done to translate these intentions into actions.*** The review of PPPs in East Africa noted that while public sector actors acknowledge the benefits of working with the private sector (e.g. *efficiency; coverage; reduced workload; financing*), they also cite concerns with high charges, lack of a pro-poor focus, profit motivation, and risk of monopoly. Private sector actors also recognize potential benefits (e.g. *patient volumes, added revenue, skilled human resources*) but cite frustrations with government bureaucracy and mindset. In many countries broader collaboration is constrained by a historical distrust between the two parties but this situation is changing rapidly. The PPP study documented close to 40 schemes in the four East African countries studied, including five which focus on human resources, whereby the

[34] Van den Broek, A., et. al. 2011.
[35] Cohen, R., et al. 2009.
[36] Coggin, W.L., C.A. Ryan, and C.B. Holmes 2010.
[37] Yao, K., et al. 2010.
[38] WHO, 2008.
[39] Dambisya, Y. 2010.
[40] Bitarakwate, E., et al. 2011.
[41] Coggin, W.L., C.A. Ryan, and C.B. Holmes 2010.

public sector leveraged the technical know-know and expertise and superior technology of the private sector to provide mentorship and training to its employees. For example, in Kenya, the Aga Khan University Hospital provided staff time of senior laboratory professionals, mostly pathologists, to mentor public sector employees, who were expected to cascade the acquired knowledge and skills to their peers in the national and referral hospitals. While the partnership proved useful in terms of improving knowledge and skills its sustainability was dependent on donor funding, underscoring the precarious nature of these PPPs and the need for a more sustainable design with financial reimbursement by the public sector. Many PPPs are informal and small scale, limiting their impact and replicability.

27. ***Continuing professional development courses for laboratory personnel, offered by governments or private sector can generate important benefits in terms of the quality and accuracy of the testing performed.*** Assessments of continuing professional development efforts have documented important benefits from country specific efforts. For example in *Ghana*, pre and post training testing found a considerable improvement in capacity to conduct TB smear microscopy with the concordance of negative and positive results rising from 60 to 99 percent per test.[43] Another training initiative combined with supportive supervision in Ghana found that 24 months after establishing a quality assurance system false positives and negatives decreased from about 15.0 percent and 20.5 percent, respectively to 0 percent.[44] In *Kenya*, one study showed sustained improvements over time in the accuracy of malaria diagnosis from short and longer term training.[45] Another study in *Uganda* found similar improvements in assessment of malaria slides following training.[46] Pre-training didactic test scores were generally low, with an average score of 41 percent. After training, didactic test scores improved significantly, with an average score of 75 percent. Overall, sensitivity in reading malaria slides improved from 84 to 95 percent and specificity rose from 87 to 97 percent after the training.

28. ***One important development in strengthening the performance of laboratory professionals is the expansion in high quality, standardized, regional training programs.*** A number of notable examples are worthwhile mentioning. One of the training programs is the 2-year *Field Epidemiology and Laboratory Training Program* (FELTP) which started in Kenya in 2004 and has expanded to cover 17 countries by 2010.[47] The program trains field epidemiologists and public health laboratory scientists, and aims to provide laboratory managers for public health laboratories. It uses a combination of short didactic lectures and practical work with 20 months of field placement with associated institutions awarding either degrees in applied epidemiology or laboratory management and epidemiology. The program is widely supported by

[42] Manafa, O., et al. 2009.
[43] Addo, K.K., et al. 2012.
[44] Addo, et al. 2006.
[45] Ohrt, et al. 2007.
[46] Kigguni, et al. 2011.
[47] Nsubuga, P., et al. 2010.

numerous partners, including CDC, USAID, and the World Bank. [48] A regional initiative with a broader remit is the Centers for Disease Control supported *African Centre for Integrated Laboratory Training* established in Johannesburg in 2008. The training facility runs courses on HIV, tuberculosis and laboratory quality assurance. In West Africa, the Meriux Foundation supports a regional training program aimed at training professionals participating in the West and Central Africa Veterinary Laboratory Network for Avian Influenza and other Transboundary Diseases (RESOLAB). Another approach launched recently involves a needs assessment of staff prior to training using *Laboratory Quality Improvement Tools* (LQIT), and proposes the selection of staff based on duties they perform rather than seniority. LQIT are then recommended for monitoring training outputs.[49] *Mentorships* which involve hands on, intensive support and assisted supervisions are also been scaled up regionally in both the public and private sectors with promising initial results.

Box 7: Strengthening Laboratory Management Towards Accreditation

- ✓ Links training to quality improvement process (SLPTA)
- ✓ Utilizes an effective combination of group learning backed up by on-site visits
- ✓ Promotes use of intensive mentorships which are being scaled up in parallel
- ✓ Incorporates quality improvement plans which are highly relevant to participants

29. ***A relatively more recent regional training program which may be considered best practice is the Strengthening Laboratory Management Towards Accreditation (SLMTA), which builds capacity in core areas related to laboratory system improvements*** (Box 7). The SLMTA training, officially launched in July 2011 and currently being rolled out regionally, is directly linked to the Stepwise Laboratory Improvement Process Towards Accreditation (SLIPTA) process which aims to instill a culture of continuous quality improvement, and establish a pathway for laboratories to progressively move towards the attainment of five stars based on the level of compliance with the standardized WHO-AFRO checklist, and gradually towards the gold standard ISO15189 accreditation.[50] The training model for this course consists of multiple workshops backed up by intervening site visits. Participants design and carry out quality improvement projects in their own laboratories as part of the assessment. [51]

C. Regulatory Authorities

30. ***Government regulatory and accrediting bodies can play critical roles in ensuring and maintaining quality of laboratory cadres, laboratories, and training institutions, and bolstering demand for high quality laboratory work*** *(Box 8).* Most countries now require registration and licensing of biomedical laboratory science schools before they start to operate.

[48] In the Africa region the Bank is funding two major regional health projects (East Africa Public Health Laboratory Networking Project and West Africa Regional Disease Surveillance Project) which are supporting to scale up this gold standard program.
[49] Marinucci, F., et al. 2011.
[50] Datema, T.A.M., et al. 2011.
[51] Yao, K., et al. 2010.

Lab training schools have to be registered annually as well, and can also be accredited. Many countries have regulatory bodies but little discussion of their roles was found in the literature with a few notable exceptions (e.g. Allied Health Professional Council of Uganda; and Kenya Medical Laboratory Technicians and Technologists Board). Most regulatory bodies require registration and annual licensing of qualified laboratory workers especially amongst those holding a diploma or higher qualification. Laboratories are registered annually by their boards which check on availability of facilities and services. Accreditation is provided by an independent accrediting body and is typically done every three years. In some countries there appears to be some confusion between regulation and accreditation, which are two unique functions that should be conducted separately and not hosted by the same body.

31. ***There is also limited information on national medical laboratory accreditation bodies***. Currently, the *Kenyan National Accreditation Service* (KENAS) is the only national accreditation body to be established within the East African Community region and is collaborating with other countries to increase the number of available assessors. The *South African National Accreditation Service (SANAS)* is the other major accrediting body within the region and has been called on heavily by other African countries to accredit their laboratories. One of the major limitations to laboratories achieving accreditation is the very high cost of obtaining and maintaining accreditation. For example, in the Kenyan Medical Research Institute HIV Research Laboratory in Kisumu the costs of obtaining accreditation were estimated to be roughly $126,000 and over $71,000 to maintain it.[52]

32. ***One important regional initiative towards accreditation is well documented***. The WHO-AFRO supported *Stepwise Laboratory Improvement Process Towards Accreditation* (SLIPTA) initiative is assisting numerous countries in Africa to progressively move towards meeting the ISO15189 or other standards for medical laboratories. Laboratories are graded from 0 to five stars based on the number of points received against a standardized checklist of 110 questions for a total number of 250 points with those attaining five stars considered ready to apply for accreditation. [53] The Global Laboratory Initiative has recently developed and launched a *Stepwise Process towards TB laboratory accreditation* specifically aimed at national level tuberculosis laboratories. [54]

[52] Zeh C.E. et al. 2010.

[53] Datema, T.A.M., et al. 2011.

[54] Datema, T.A.M. 2012. Available from: http://www.gliquality.org/

Box 8: National Regulatory Bodies

-***Rwanda*** has no Laboratory Board or Council for registration and regulation of laboratory staff or laboratories in the country. The national professional association, the Laboratory Association of Rwanda, currently performs the functions of a regulatory body, but has no legal standing or authority in the country.

-***Uganda*** has the Allied Health Professional Council (AHPC) which many stakeholders cite as ineffective as it represents too many professional groups, such as pharmacists, physiotherapists, and laboratory workers. Key stakeholders interviewed argued that the council needs to listen more to the concerns of laboratory workers in order to better represent their interests. Monitoring and enforcement of regulatory issues was assessed as poor 50 percent of the time. Leadership and governance of regulatory bodies were cited as key concerns in the public sector. By contrast, the private sector was considered relatively strong at monitoring performance.

-***Kenya*** has an elaborate regulatory framework with three main bodies. The Kenya Medical Laboratory Technicians and Technologist Board (KMLTTB) was established as an act of parliament in 1999. The functions of the Board are to register and regulate the professional conduct of laboratory technologists and technicians; license and regulate business practices of laboratory technologists and technicians; and approve institutions and courses for training laboratory professionals. The Board has recently been re-gazetted following an enquiry into its management and practices. The Board has been constrained by shortages of personnel to conduct inspections and monitoring registration of laboratory personnel.

33. ***Professional laboratory associations can give a voice to laboratory cadres and enhance their representation at the institutional level***. To date, there have been few national professional associations established, and they are typically poorly funded and reach only a small segment of the laboratory cadres (Box 9). At the regional level, the Federation of African Associations of Medical Laboratory Scientists exists as a representative body. Most recently, the African Society for Laboratory Medicine (ASLM) was established with USG/PEPFAR support to represent the interests of laboratory workers and advance the standards of the laboratory profession. The mission of this relatively young institution, established in March 2011, is to advance laboratory medicine services needed to support preventive medicine, quality patient care, and disease control in Africa. It intends to achieve this through partnerships with governments and relevant organizations.

Box 9: National Professional Associations

-***Rwanda***: in 2006 laboratory professionals in Rwanda formed an association called the "Rwanda Association of Biomedical Laboratory Technologist (RABITEC)" which has few active members, lacks premises, and is not yet legally registered, limiting its ability to influence policy decisions.

-***Uganda***: the country has several professional groups representing the interests of laboratory workers but stakeholders have expressed frustration with the way they perform their role. Structured interviews with laboratory workers found that 64 percent of those surveyed were members of a professional association with the majority belonging to the Uganda Medical Laboratory Technicians Professional Association.

-***Kenya***: the country has a long standing history of professional associations. The Association of Kenya Medical Laboratory Scientific Officers (AKMLSO) is the official registered professional body representing laboratory workers, initially founded in 1964, and with a current membership of about 1800 members at 74 branches nationwide. Focus group discussions conducted as part of the Kenya case study found that only 60 percent of laboratory workers were satisfied with the performance of the association, describing the leadership as an old boys' network, and citing concerns over governance and effectiveness in representing the interests of laboratory workers.

-***Tanzania***: the country has a long-standing professional association, the Medical Laboratory Association of Tanzania (MeLSAT) that holds annual meetings and represents the interests of the medical laboratory profession.

34. ***The Kenya case study found evidence of a combination of strong government policies which are professionalizing laboratory work*** *(Box 10).* Officials have introduced a policy of automatic progression, done sequentially every three years, within three job range groups for laboratory technicians and technologists, depending on their qualification levels with additional discretionary advancement dependent on performance. This combined with the growth in continuing professional development and diploma programs has started to turn the tide for laboratory professionals. According to key stakeholders interviewed there is a new energy and confidence brought on by graduates who are increasingly becoming an integral part of health service delivery teams. Laboratory workers are no longer viewed as "beaten, resigned certificate and diploma holders". There is growing evidence of a new generation of confident, assertive, driven graduates entering the profession. One key informant captured this new trend by noting that the "medical laboratory profession in Kenya is coming of age".

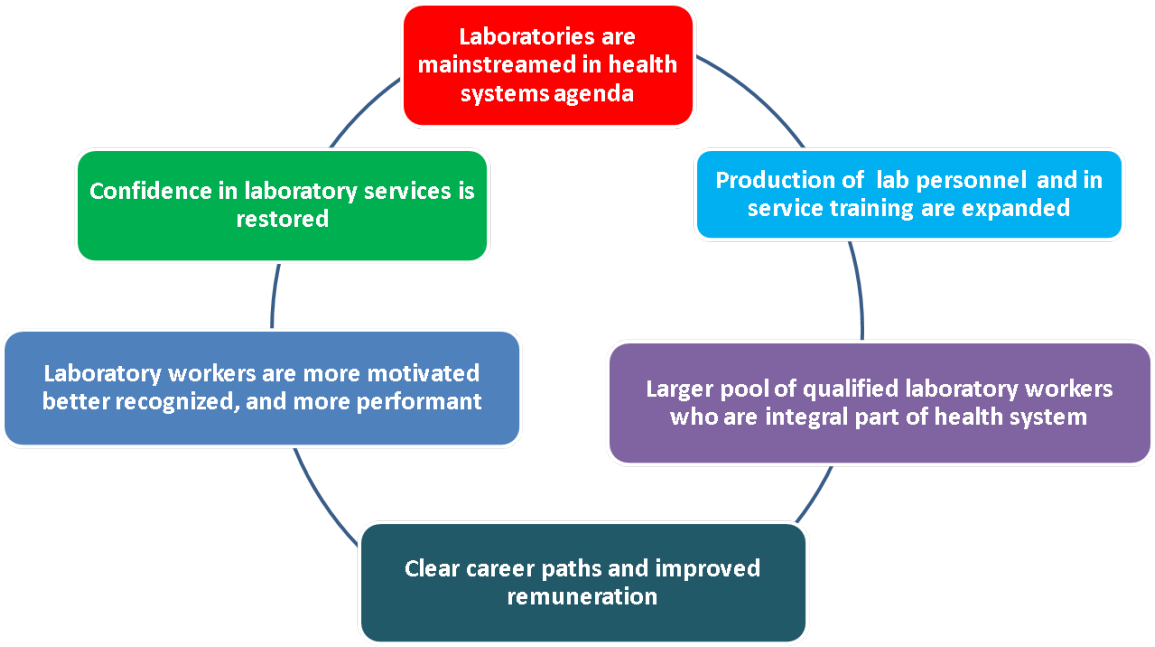
Box 10: Professionalizing Laboratory Work in Kenya

- ✓ Initiated a process of registering laboratory technicians and technologists which enhances recognition
- ✓ Discontinued certificate programs with training institutions offering twice as many diploma programs, thereby expanding the pool of professional workers
- ✓ Revised scheme of service in the public sector, by removing job group barriers
- ✓ Created representative organizations (AKMLSO) and facilitated affiliation with other professional organizations
- ✓ Promoted accreditation of laboratories
- ✓ Established regulatory body (KMLTB) governed by an act of parliament
- ✓ Introduced directive for laboratory workers to take part in ward rounds
- ✓ Mobilized substantial donor support to strengthen laboratory health systems
- ✓ Piloted PPPs to provide short-term internship and mentorship placements for public sector personnel in private sector facilities.

PART IV – STRATEGIC DIRECTIONS

35. This section summarizes the policies and strategies which will contribute to enhancing the performance of laboratory professionals, and ultimately the functioning of laboratory services. The summary draws on the main recommendations from the case studies.[55] These are presented in terms of broad strategic directions and are not intended to be prescriptive. Country plans need to take into account the specific local context to identify the most appropriate combination of strategies that are well integrated into national health and human resources plans and are financially affordable. While there are no blueprints below is a summary of the strategic directions to be considered to break the vicious cycle facing laboratory workers and create a virtuous cycle (Box 11).

Box 11: A Virtuous Cycle



Source: Authors

36. ***Expanding the output of pre-service training institutions is an essential step to building capacity of laboratory services in African countries***. The production of laboratory workers needs to be increased to meet country needs by both upgrading the current pool of laboratory staff and producing additional personnel. The correct mix of qualifications must also be available to ensure an appropriate balance is reached within the laboratory system. This will require increased support for laboratory training institutions to improve physical infrastructure and expand the pool of trainers to accommodate larger number of students. In countries with an

[55] Matu, M., et al. 2013 (unpublished).

active private sector where training institutes exist, innovative public-private partnerships can be considered to leverage access to technical expertise, skills, technology and clinical practices. The introduction of a rural training approach whereby the trainees come from rural areas would enhance rural job uptake and employment and improve retention**.** The shortage of trained tutors could be addressed by hiring regional experts and/or expatriate tutors in the short term with a clear program of mentorship and a well-defined strategy of disengagement.

37. ***Ministries of Health need to prioritize training of laboratory workers in national human resources plans and program resources to cover course fees that are beyond the means of most laboratory personnel***. Authorities need to also plan for the absorption of trained personnel, ensuring a smooth transition between training and entry into the labor market. Finally, a shift towards competency based curricula which have been endorsed by an appropriate national or regional laboratory worker regulatory body needs to be considered, as has been done in Tanzania. The ASLM could act as a regional advisor to national regulatory bodies by assisting to define and maintain minimum standards for each cadre and progressively introduce comparability between national qualifications. While curricula would focus primarily on national needs, regional standardization could facilitate movement of laboratory cadres within regional economic blocks. A regional approach to expanding pre-service training could be considered as there may be cost savings from training some laboratory cadres at established training institutions in neighboring countries within regional economic blocs.

38. ***Improving in-service training opportunities is critical to maintaining a well-qualified laboratory workforce*.** All staff requires regular in-service training and opportunities to access further academic studies to both improve the quality of laboratory services and boost morale. Training and additional qualifications need to be clearly linked to career progression. Training should be based on a clear needs assessment and transparent criteria for selecting trainees need to be introduced. Strategies such as e-learning, flexible working hours, and rotational deployment should be used to promote opportunities, especially for staff in more remote postings. Institutions and funders need to ensure that in-service training models do not disrupt service provision unduly, by relying on work place based training, such as mentorships which have proven to be effective, particularly when conducted in collaboration with private sector actors. Courses need to be designed to maximize learning outcomes, which in many instances in laboratory sciences will emphasize practical, hands on training. Courses need to also include formative assessments. Training programs such as SLMTA, which support the stepwise laboratory improvement process towards accreditation, are promising as they establish a close link between the core competencies required and the skills acquired; provide a means for tracking performance; and complement facility improvements which will result in better working environments. Joint training of laboratory and clinical staff on diagnostics need to be scaled up as this has shown a positive effect on participating clinicians' use of laboratory tests and could be an important additional strategy for improving the laboratory-clinician interface. Finally, continuing professional development standards could be set up by national regulators provided there is capacity to provide the required improvement activities.

39. ***Strengthening human resources planning for laboratory professionals and ensuring that these neglected cadres become an integral part of broader HR planning at country level will assist Ministries of Health to progressively address shortages and skills gaps.*** There is an urgent need to obtain accurate figures on the number of laboratory staff. Improved registration of laboratory workers is one important step that countries can take to get a better handle on the number of workers, the skills mix available and their distribution. This will assist in better understanding the labor market, including the role of the private sector in absorbing laboratory professionals and the number of unemployed laboratory workers who could be recruited. HR and facility surveys are other important sources of information which should systematically cover laboratory workers so that additional information is generated on issues related to motivation, performance, and attrition. Accurate figures from training institutions are also vital to inform public policy in terms of what potential capacity is being developed and the extent to which graduates are being effectively absorbed. Countries also need to set realistic staffing norms for laboratories at different levels of the health care system and to regularly monitor compliance.

40. ***Introducing clear, well-integrated career paths for laboratory workers with well-defined promotion prospects is essential for staff motivation and performance.*** Health ministries need to review current career structures to ensure that all cadres have distinct and complimentary job descriptions which are well aligned with national requirements of their laboratory system. Job titles need to be clearly linked to these job descriptions and the differences between these cadres clearly understood across the health workforce. The feasibility of introducing task shifting needs to be assessed to make more effective use of existing personnel.

41. ***Exploring possibilities for greater collaboration with the private sector.*** Ministries of Health need to consider additional ways to tap the potential of the private sector in their respective countries in order to leverage additional financing and improve access to technical knowhow and new technologies. Favorable policy and legal frameworks for public-private partnerships have already been put in place in most countries. Several innovative and promising PPPs are underway. Much more can be done in terms of mentorships and work placements in private sector institutions; ensuring that private sector personnel benefit from government run training programs; and using public sector funds to buy services of private training institutes.

42. ***Establishing effective national regulatory and representative bodies is critical for strengthening governance, enhancing quality and performance.*** National laboratory regulatory bodies need to be strengthened to effectively carry out their functions, particularly supervision and quality control. In countries where laboratory services do not have their own regulatory body, authorities could consider establishing a dedicated one rather than subsuming these functions into a general health regulatory body, assuming adequate resources are available. This would have the advantage of ensuring a strong focus on the needs of the laboratory service. Proper regulation of laboratory services through activities such as setting and supervising laboratory standards and standardizing and regulating pre- and in-service training will help improve morale and the quality of services. Representative bodies need to be better organized to

effectively represent the interests of laboratory professionals. It is important these organizations have a clear mandate and adequate resources to represent the views of all laboratory cadres at senior policy level.

43. ***Scaling up research on issues related to laboratory workers is important to inform public policy.*** Research is needed to better understand the specific labor market situations in different countries and the factors which influence the supply and demand for laboratory workers. Priority research areas include: determining the measurable effects of different HR strategies to laboratory recruitment and retention; reasons for gender imbalance in higher laboratory cadres; effects of different workplace factors to staff retention; and the relationship of qualifications to performance.

ANNEX I

Laboratory Worker Numbers by Country, Year and Source

Country	HRH Observatory			Other sources		
	Year	Number	Density per 1000 population	Year	Number	Source
Burundi	2009	159	0.02			
Kenya	2010	1221	0.03			
Rwanda	2010	800	0.08			
Uganda	2005	1702	0.06			
United Republic of Tanzania	2007	517	0.01	2009	961	[11]
Algeria	2007	4922	0.14			
Angola	2005	2029	0.14			
Benin	2008	245	0.03			
Botswana	2007	40	0.02			
Burkina Faso	2008	510	0.03			
Cameroon	2010	847	0.04			
Cape Verde	2010	42	0.08			
Central African Republic	2009	40	0.01			
Chad	2009	263	0.02			
Comoros	2009	134	0.18			
Congo	2007	334	0.09			
Côte d'Ivoire	2007	1419	0.07			
Democratic Republic of the Congo	2009	1242	0.02			
Djibouti						
Egypt						
Equatorial Guinea	2005	75	0.15			
Eritrea	2008	251	0.07			
Ethiopia	2009	2823	0.04	2009	2823	[28]
Gabon	2005	276	0.2			
Gambia	2008	89	0.06			
Ghana	2008	213	0.01	2010	923	[6]
Guinea	2009	519	0.05			
Guinea-Bissau	2009	211	0.14			
Lesotho	2005	146	0.08			
Liberia	2008	115	0.03			
Madagascar	2007	Nd				
Malawi	2010	114	0.01	1998 2008 2009 2010	86 .03 .0135 0.0291	[53] HRH country profile
Mali	2008	350	0.03			
Mauritania	2009	111	0.03			
Mauritius	2005	324	0.26			
Morocco						
Mozambique	2006	809	0.04			
Namibia	2010	116	0.05			

Country	HRH Observatory			Other sources		
Niger	2010	Nd				
Nigeria [56]	2008	22683	0.15	2007	12073	[25]
Sao Tome and Principe	2008	198	1.3			
Senegal	2007	Nd				
Seychelles	2005	59	0.74			
Sierra Leone	2008	47	0.01			
Somalia						
South Africa	2005	1968	0.04			
Sudan						
Swaziland	2009	57	0.05			
Togo	2008	451	0.08			
Tunisia						
Zambia	2010	546	0.04	2011 2008 2004	480 698 417	[4]
Zimbabwe	2009	274	0.02			

Source: HRH Observatory; other sources

[56] Laboratory scientists only, 5548 currently registered. 936 laboratory technicians and 7044 laboratory assistants.

Number of Laboratory Workers per 1000 Population by Year

Country	Cadre	2004	2005	2006	2007	2008	2009	2010
Malawi	Technician	0.0135				0.03	0.0291	
Zimbabwe	Worker				0.0262	0.0257	0.0222	
Ghana						0.01		0.04
Swaziland						0.05	0.04*	
Ethiopia	Technician	0.0338					0.0249	
	Technologist						0.011	
Congo			0.13	0.15	0.09			
Gambia	Scientist				0.01	0.01		
	Technician				0.01	0.02		
	Assistant				0.03	0.04		
Guinea-Bissau	Technician	2			1.03 (incl. aux)		0.14	
Benin	Technician					0.03		
Nigeria	Scientist		1.2		0.9	0.15		
	Technician				0.21			
	Assistant				0.5			
Central African Republic	Technician					0.007	0.009	
Rwanda	A0					0.002	0.003	0.002
	A1					0.015	0.016	0.016
	A2					0.057	0.058	0.053
Zambia	Technician						0.04	0.04
Mali	Scientist						0.0	0.0
	Technician						0.2	0.2

Source: HRH observatory country reports

Number of Laboratory Workers Available by Year

Country	Cadre	2004	2005	2006	2007	2008	2009	2010
Malawi	Technician	160	125	178	310	334/473*	380	193*
Zimbabwe	Worker				320	317	274	
Ghana								923
Swaziland							57	
Ethiopia	Technician	2403					1957	
	Technologist						866	
Congo			452	531	334			
Gambia	Scientist				13	15		
	Technician				15	24		
	Assistant				52	60		
Guinea-Bissau	Technician				211(incl. aux)			
Benin	Technician					245		
Nigeria	Scientist				12703			
	Technician				2936			
	Assistant				7044			
Central African Republic						32	40	
Rwanda	A0					18	28	21
	A1					143	165	164
	A2					561	643	615
Zambia	Technician						526	546
Mauritania	Scientist					70		
	Technician					41		
Mali	Scientist						41	28
	Technician						317	386

Source: HRH Observatory

Proportion of Laboratory Workers in Urban and Rural Areas

Country	Cadre	Year	Urban (%)	Rural (%)	Per 1000 pop urban	Per 1000 pop rural
Malawi	-	2008	63	37	0.3	0.04
Ghana	-	2009	70	30	0.06	0.02
Ethiopia	Tech		-	-	0.157	0.03
	Technologist		-	-	0.069	0.013
Congo	-		65.1	34.9	-	-
Gambia	Scientist	2008	73	27	0.02	-
	Tech		67	33	0.03	0.01
	Assistant		52	48	0.05	0.03
Guinea-Bissau	Tech		52.3	47.7		
CAR	-	2005	72	28	0.007	0.003
Rwanda	A0	2010	47.6	42.9	0.001	0.001
	A1		30.5	73.8	0.005	0.012
	A2		14.5	85.5	0.009	0.053
Mali	Scientist	2010	100	0	-	-
	Technician		91.7	7.3	-	-
	Assistant		100	0	-	-

Proportion of Laboratory Workers in Public and Private Service

Country	Type	Year	Public	Faith Based Organizations	Private	Private Not for profit
Malawi	Tech	2008	57.9	16.8	13.6	9.9
Ghana		2010	68.3	13.5	18.2	
Swaziland		2009	33.3	66.6*		
Gambia	Scientist	2008	60	0	40	
	Tech		58	0	42	
	Assistant		83	0	17	
Uganda					11	
CAR		2005	97		3	
Rwanda	A0	2010	28.4	0	71.6	
	A1		67.7	7.8	24.4	
	A2		77.7	14.4	7.9	

*Includes FBO

Source: HRH Observatory country reports

Laboratory Worker Distribution, by Age

Country	Year	Cadre	<30 yrs	31-40yrs	41-50 yrs	51< yrs
Malawi	2008	Workers	33%	39%	25%	3%
Rwanda	2010	A0	14%	36%	18%	32%
		A1	44%	44%	9%	3%
		A2	58%	34%	7%	0%
Ethiopia	2009	Workers	67%	22%	7%	4%
Kenya	2010	Workers	4%	33%	52%	11%
Ghana	2006	Workers	51%	25%	23%	1%

Source: HRH Country Reports

Proportion of Female Laboratory Workers, by Country

Country	Cadre	Female (%)
Malawi		14.8
Ghana		19.7
Ethiopia	Tech	35.1
	Technologist	23.8
Congo		60
Gambia	Scientist	13
	Tech	17
	Assistant	32
Guinea Bissau	Tech & assistant	0.76 ratio men 3 women
Mauritania	Scientist	13
	Tech	29
Nigeria	Scientists	14.3
CAR		8.0
Rwanda	A0	22.2
	A1	38.5
	A2	47.2
Kenya		36.5

Source: HRH Country Reports
Source: HRH Observatory Country Reports

ANNEX II

Pre-service Education

Country	Type	Number of institutions	Graduates					Admissions				
			2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Malawi	Bsc	1	0	0	0	14	18	-	-	-	-	-
	Dip	2	34	35	45	28	113	-	-	-	-	-
Zimbabwe	Dip	1	-	-	25	23	62	-	0	0	25	88
	BSc	1	-	-	25	23	38	-	0	0	0	0
Ghana	-	4	-	18	9	10	-	-	56	54	60	-
Gambia	Cert	0*	14	-	20	-	-	15	-	21	-	-
Benin	BEPC	1	-	-	-	-	-	-	-	-	-	-
Nigeria	-	12	-	-	-	-	-	-	-	-	-	-
CAR	-	1	30	28	21	-	-	56	24	24	-	-
Rwanda	-	1	-	42	53	48	11	-	141	186	190	184
Mali	-	-	-	20	35	45	27	-	38	59	58	56
Zambia	BSc, dip	3	-	77	98	87	76	-	-	120	109	182
Tanzania	MSc, BSc, dip, cert	10	-	-	-	-	130 14 189 90	-	-	-	-	-- 53 172 365

* Qualification obtained through on the job training

ANNEX III

Career Development

Title	Country and Qualification Requirements	Roles and Responsibilities
Medical Laboratory Scientist	Nigeria – BSc or higher national diploma Zimbabwe – BSC Rwanda – BSc	Performance, reading and interpretation of laboratory tests Depending on position, some staff at this level have management responsibilities for their own laboratories, as well as laboratories in the district or region
Laboratory technologist	Malawi –BSc Tanzania – diploma Ethiopia – BSc Kenya – diploma Zimbabwe - diploma	
Laboratory technician	Malawi – diploma Ethiopia – diploma Nigeria – diploma Kenya – certificate Zimbabwe – certificate Benin – diploma Rwanda - diploma	
Laboratory Assistant	Tanzania – certificate Nigeria – certificate Malawi – certificate Zimbabwe – none Rwanda – none	Preparation of reagents and samples for testing
Laboratory Attendant	Tanzania - unknown	
Laboratory Auxiliary	Tanzania - certified	

Staffing Norms by Laboratory Network Tier

Country	Tier of laboratory network		
	Primary	Secondary	Tertiary
Tanzania[11]	1 lab attendant and 1 lab assistant	Headed by lab technologist	No Data
Malawi [2]	2 trained lab technicians	2 trained lab technicians	No Data
Nigeria (HRH plan)	1 laboratory technician	No Data	No Data
Gambia	1 laboratory assistant	No Data	No Data
Uganda	1 laboratory technician 1 laboratory assistant	1 laboratory technologist 2 laboratory technicians 1 laboratory assistant	No Data

Regulatory and Representative Bodies

Country	Regulatory body	Functions	Representative body
Nigeria[25]	Medical Laboratory Science Council of Nigeria	Registers and regulates laboratories and laboratory training institutions, registers	Association of Medical Laboratory Scientists of Nigeria
Kenya [26]	Kenya Medical Laboratory Technicians and Technologists Board	Approves and registers laboratories and laboratory training institutions, registers technicians and technologists	Association of Kenya Medical Laboratory Scientific Officers
Malawi	Medical Council of Malawi	Approve training institutions and set standards for laboratories. Register technicians and assistants.	
Ghana[6]	Allied Health Professions Regulatory Council	Responsible for regulating and registering lab scientists	Ghana Association of Biomedical Laboratory Scientists
Tanzania[27]	Health Laboratory practitioners council and Private Health Laboratories Board	Responsible for regulating and registering lab scientists, technologists and assistants. Approve training institutions	Medical Laboratory Association of Tanzania
Ethiopia[28]	Federal Ministry of Education – Medical and Health Science Training Institution	Accreditation and certification of training institutes, curricula and health professionals	Ethiopian Medical Laboratory Association
Zimbabwe (HRH Ob)	Medical Laboratory and Clinical Scientists Council		
Uganda	Allied Health Professions Council		
Rwanda	None		Rwanda Association of Biomedical Laboratory Technologists (RABITEC)

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Laboratories have historically been under supported in developing country health systems resulting in poor quality diagnosis and inadequate disease surveillance. The labor market for laboratory workers in many developing countries is characterized by constrained supply of well qualified staff, sluggish public sector demand, and relatively low wages. This leads to a high turnover of staff with highly skilled staff finding work in the private sector. Laboratory professionals are predominantly male with relatively limited female labor participation. The focus on communicable diseases has meant that funding for broader public health laboratory services has been relatively neglected.

This paper presents strategies to address these problems based on the outcomes from a literature review and case studies conducted in four African countries. Improved registration and human resource planning are required to establish the scale of the problem and to develop country specific strategies to address skills shortages. More high quality pre-service training is needed to supply the service with suitably skilled professional staff. Innovative in-service training is essential to maintain competence and collaboration is required with the private sector to utilize their expertise. A clear career structure with transparent promotional opportunities, suitable work environments and regulatory and representative bodies will support recruitment and retention of staff in the public sector and enhance quality. It is also clear that this cadre has been underrepresented in human resources for health research and more activity in this area will lead to greater understanding of the problems and provide more potential solutions.

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