The Sub-Saharan African Medical School Study: Data, Observation, and Opportunity

By

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ABSTRACT

Modest outputs of graduates by relatively few medical schools and chronic emigration contribute to low physician presence in Sub-Saharan Africa (SSA). The Sub-Saharan African Medical School Study (SAMSS) examined the challenges, innovations, and emerging trends in medical education in SSA.

SAMSS identified 168 medical schools and achieved a 72% survey response rate of the 146 schools surveyed. The Study found that countries are prioritizing medical education scale up as part of health system strengthening, and identified many innovations in pre-medical preparation, the use of expatriate faculty, and creative use of scarce research support. SAMSS also noted ubiquitous faculty shortages, weak scholastic infrastructure, and limited accreditation. Trends observed include the growth of private medical schools, community-based education, and international partnerships, and the benefit of research for faculty development.

Ten recommendations provide guidance for efforts to strengthen medical education in SSA.

BACKGROUND

Health in Africa matters as an issue of human equity and as a precursor to poverty reduction and human development. Africa suffers 24% of the world's burden of disease, but has only 3% of the world's health workforce[1]. The Joint

Learning Initiative[2] and the 2006 World Health Report[1] called attention to the particularly severe shortages of human resources for health in Africa. Early responses to the recognition of this problem included calls for increased production of community health workers,[3] and non-physician clinicians,[4] and task shifting to make more effective use of available cadres.[5] More recently, attention has turned to the question of the education and retention of medical doctors in Africa, not because doctors will solve the vast unmet health needs of the continent, but in the belief that no health system can function well without an adequate corps of doctors to participate in clinical and public health work, management, education, and policymaking.[6] Sub-Saharan Africa (SSA) has an estimated 145,000 physicians[7] (one twentieth the 2,877,000 practicing physicians in Europe) -- to serve a population of 821 million (greater than Europe's).[8] As a whole, SSA has a physician-to-population ratio of 18/100,000, compared to countries such as India (60/100,000), Brazil (170/100,000), and France (370/100,000).[8] Africa's poorest countries face even greater physician shortages.

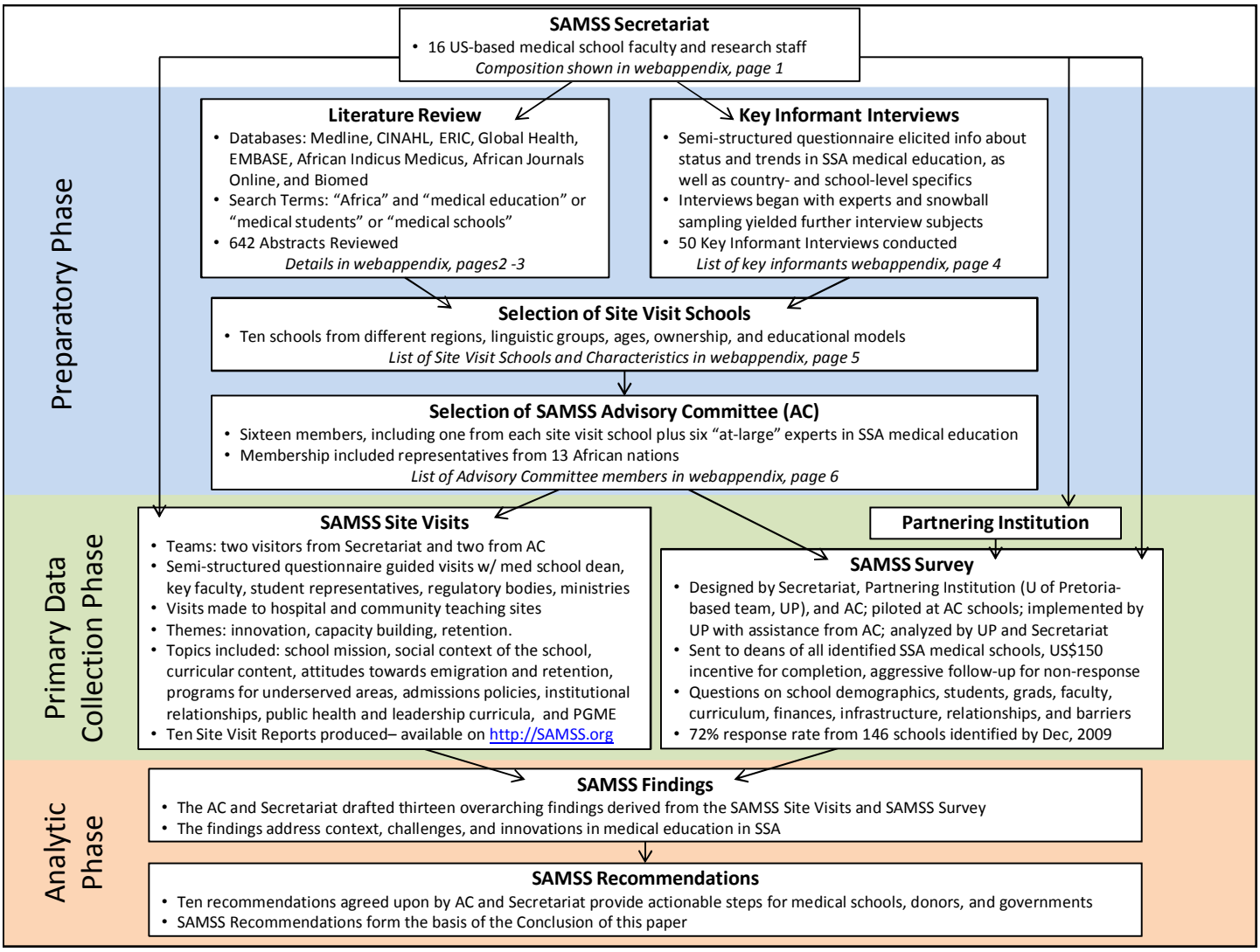
The very low physician-to-population ratios in SSA countries result from a number of factors, including a modest output of students by a small number of medical schools and emigration of many graduates to other countries or continents. *(*The term "medical school" refers to medical schools and colleges of medicine*.)* Any continental effort intended to improve health system functioning in

SSA must consider options for increasing both the productivity of medical schools and the retention of their graduates within their countries.

National and international interest in regard to strategic investment in medical education in SSA has been building, but little is known about the status of medical schools or trends within medical education on across the continent. For example, when SAMSS initially reviewed all available medical school databases (WHO, IIME, FAIMER, and WFME) in 2008, a total of 103 schools were identified; however, SAMSS has identified 168 schools operating in SSA. This lack of pan-African data and perspective is a major problem for African governments and donor organizations seeking to address physician workforce shortages.

The Sub-Saharan African Medical School Study (SAMSS) addressed this knowledge gap by developing an information base regarding the status of, trends in, and prospects for African medical education for educators, policy makers, and international organizations. Panel 1 outlines the structure, participants, and sequence of activities that comprised SAMSS.

Panel 1: SAMSS Structure and Methods



FINDINGS

Of 168 total medical schools, 146 were identified before the December, 2009 close of the SAMSS Survey period. The survey achieved a 72% response rate from those schools. (All identified schools are shown in webappendix pages 7-11.) Countries with larger populations ($p<0.001$) and greater land masses ($p<0.001$) were seen to be likely to have more medical schools than smaller

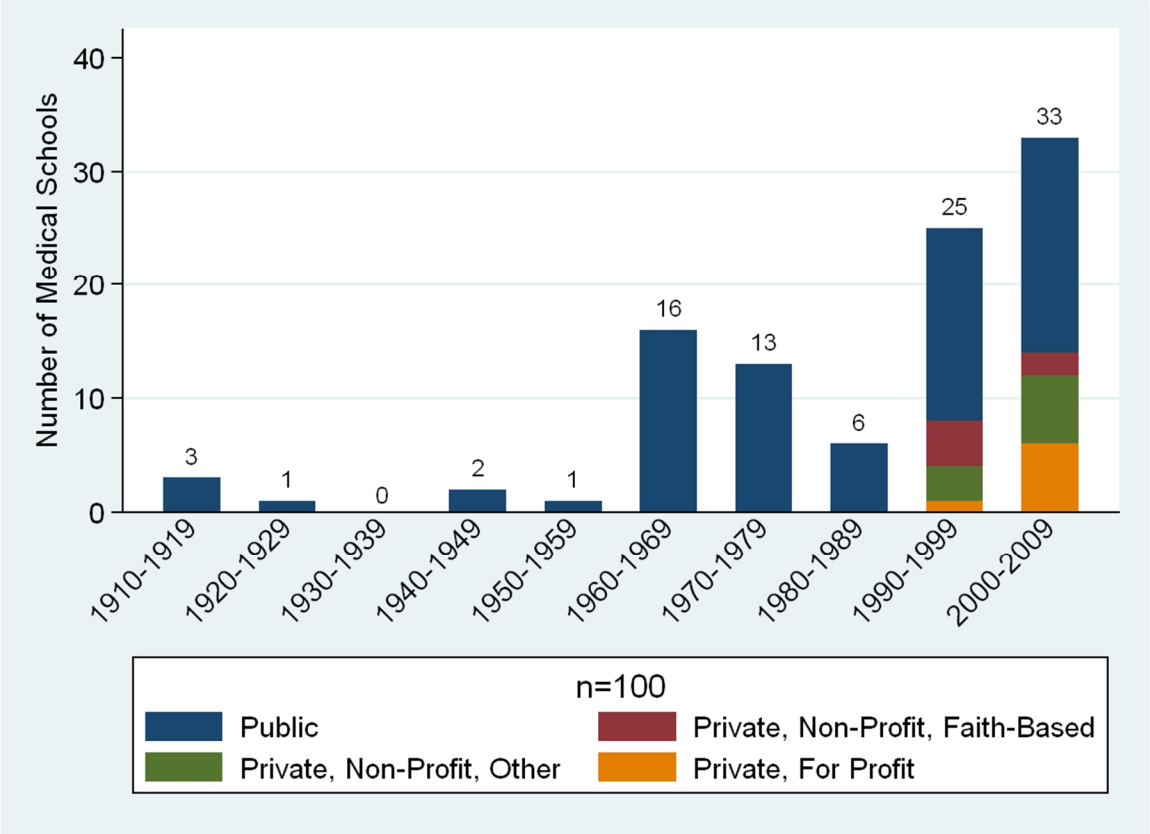
countries, but no significant correlation was found between a country's GDP per capita, region of Africa, or national language and its number of medical schools in multiple linear regression. Survey respondents and site visited institutions represented all regions of SSA and all major language groups. The data collected in SAMSS Site Visits and the SAMSS Survey are synthesized in the following 13 Findings.

1) Many countries are scaling up medical education as part of health sector strengthening.

A number of national governments are investing heavily in human resources for health, producing health sector strategic plans that include increases in the health care workforce. Medical education is essential to the development of the health care workforce and an integral part of human resource plans. Of current schools, only seven survey respondents were founded before 1960 and another 29 during the independence decades (1960-1979). The 1980s saw little growth but 58 responding schools have been opened since 1990 (Figure 1).

Many medical schools are expanding enrollments. More than 75% of survey-responding schools (59 of 78) reported increases in the number of students in their first year classes compared to five years ago. Fifty three percent (56 of 105)

Figure 1: Sub-Saharan African Medical School Founding Dates

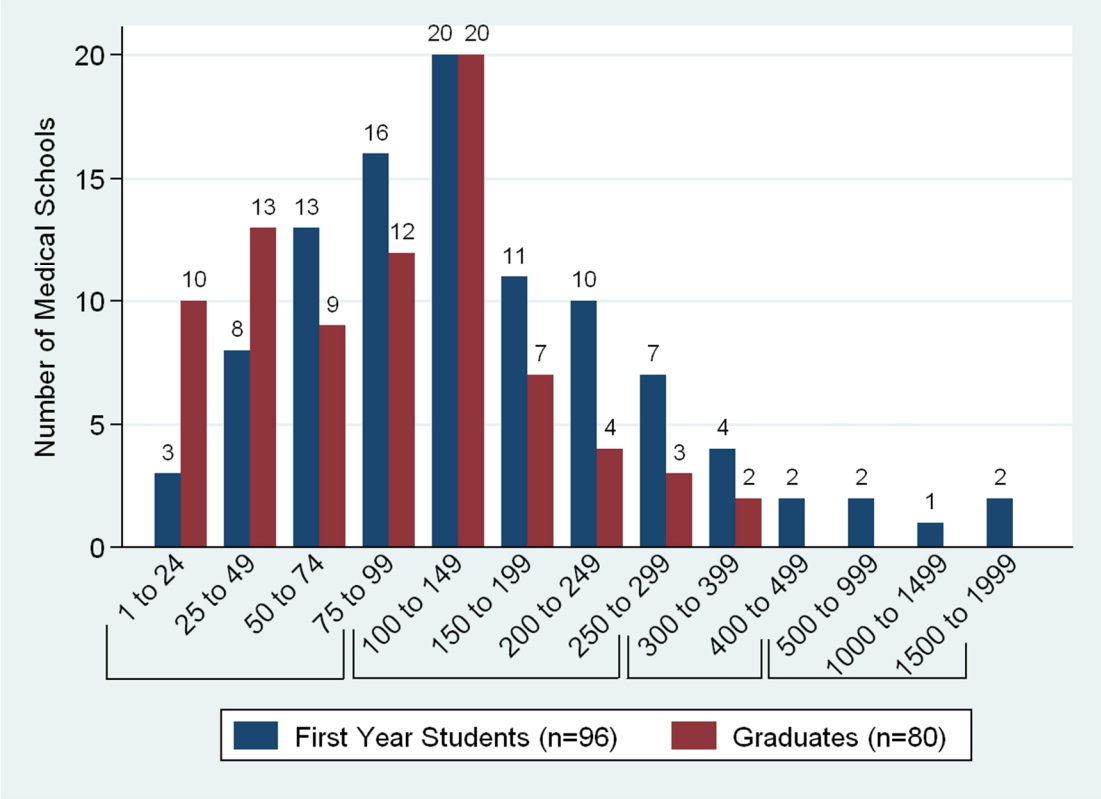


report plans to increase in the next five years, with 59% of respondents (57 of 96) mandated to increase enrollment, generally from ministries of health or education. The current total enrollment of first year students in 96 responding schools is 18,349. The number of graduates in responding schools is 7,861 (2008) (Figure 2). These graduates represent the output of the 105 responding of 168 total schools. Many of the non-responding schools are private and/or new, characteristics that would imply fewer average graduates for the 63 non-

responding schools than the responding schools. This data suggests an estimated 10,000 to 11,000 annual graduates from SSA medical schools.

Differences between enrollment and graduation figures are primarily due to the opening or expansion of schools. A few universities admit large numbers of students before paring down the student body in the second year. Seventy percent of responding schools (59 of 84) reported that at least 80% of first year students graduate.

Figure 2: Sub-Saharan African Medical Schools' First-Year Enrollment and Graduate Numbers (2008)



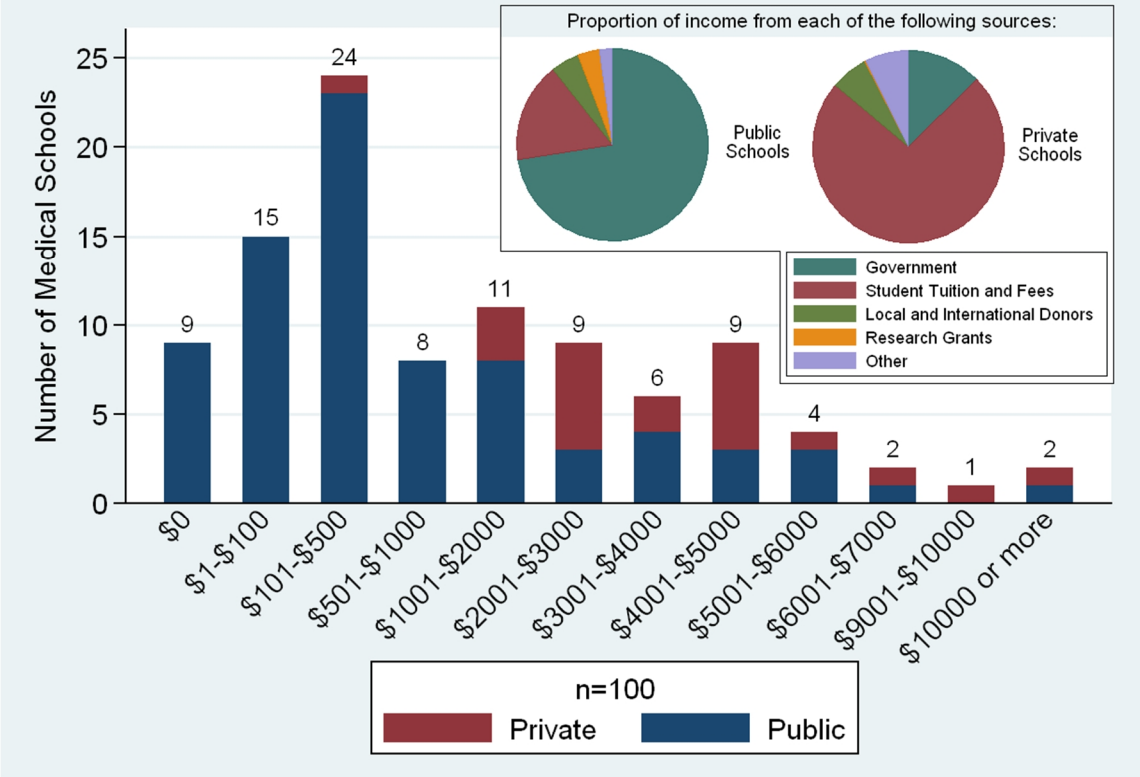
* n varies because some medical schools have not yet graduated doctors.

The Ethiopian government is investing heavily in a workforce scale-up plan based on a “flood and retain” strategy. The Ministry of Education mandated all medical schools expand their class sizes. Thus, Jimma University’s first year enrollment for 2009 grew from 200 to 250, and is expected to reach 350 for the incoming class of 2011. The government supports this “flooding” by investing in physical infrastructure including construction of a new teaching hospital at Jimma.

Hubert Kairuki Memorial University (HKMU) in Tanzania exemplifies private sector scale up, expanding from an initial intake of 25 first-year medical students in 1998 to 70 per year today. The government has assisted by providing student loans and grants to private school students, enabling more students to afford tuition fees.

For all SSA medical schools, including private schools, fees vary widely. Nine percent of respondent schools offer free tuition and 47% charge $1,000 USD or less, while 9% charge more than $5,000 USD. Private schools derive the majority of their income from tuition; public schools receive the majority of operating budgets from the government (Figure 3).

Figure 3: Tuition Costs and Sources of Income in Sub-Saharan African Medical Schools



Respondents were asked to identify the three greatest needs for scaling up the quality and quantity of their graduates in an open-ended question. A summary of responses is included in the webappendix, page 16. Faculty-related issues were most commonly identified as key to improving the quality of graduates (35 of 94 'first' answers). Infrastructure issues were seen most frequently as essential to improving the quantity of graduates (37 of 94 'first' answers). Curricular issues were viewed as impacting quality, while improvements in clinical sites were seen as helping with quantity. Budgetary issues were referred to in response to both questions.

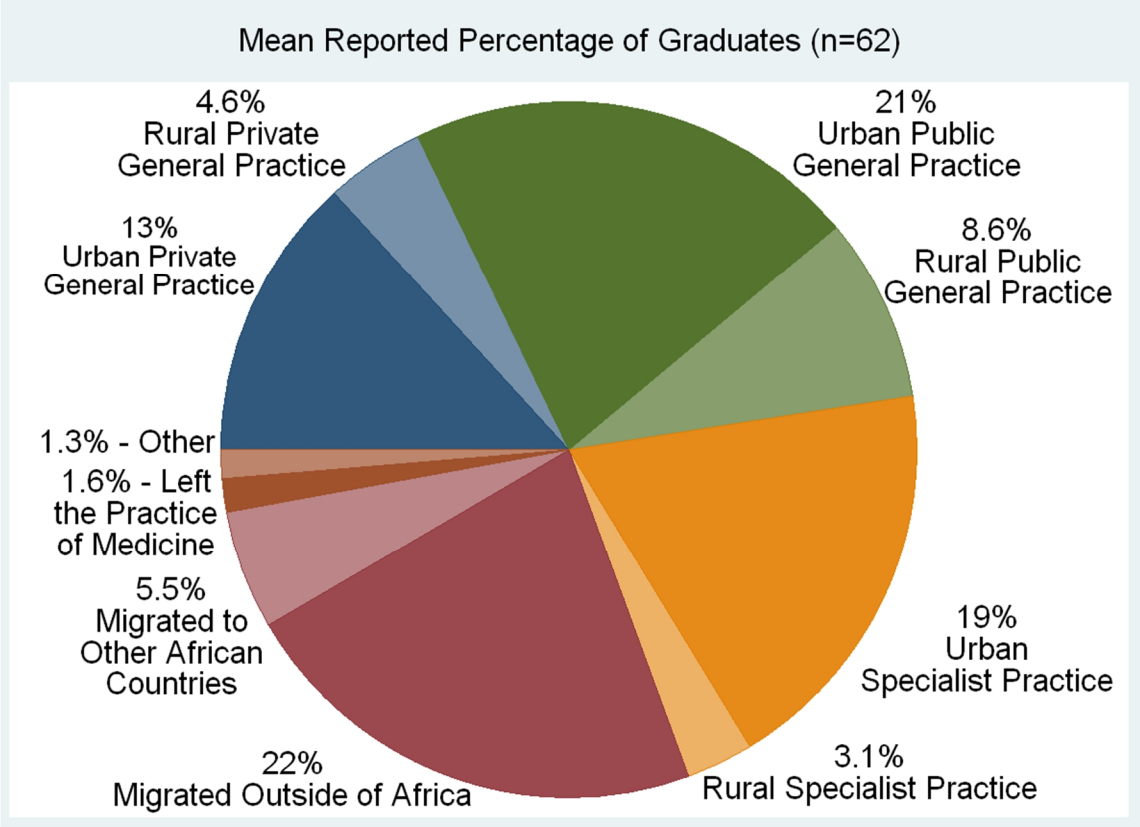
2) The status of the country's health system affects medical education and physician retention.

When civil society is in disarray and governance is compromised, medical education and retention of physicians will be compromised. Ibadan graduates tend to forgo employment in Nigeria's large and crucial network of secondary hospitals due to poor pay, poor working conditions, and shortages of supplies, support personnel, and equipment.

Evaluating retention strategies has been challenging because of most health systems' limited ability to track medical school graduates. The majority (81%, 47 of 58) of survey respondents whose schools have graduated doctors report no established tracking systems. Figure 4 shows the location of medical school graduates five years after graduation as estimated by the 62 schools responding to this survey question. The percentage of graduates estimated to be in rural general practice five years after graduation was positively correlated with the existence of a compulsory service program ($p<0.05$), a moderate number of PGME programs ($p<0.05$), and French as a language of instruction ($p<0.05$) by multiple linear regression. There was no significant correlation found with GDP, the existence of a targeted recruitment program for rural students, percentage of national population in rural areas, or use of CBE. Many schools and nations are working to address emigration. National service is required from graduates in Mozambique, South Africa, Ethiopia, and Nigeria for the purpose of realizing

some clinical service from all graduates, though enforcement of these requirements is variable.

Figure 4: Estimated Location of Sub-Saharan African Medical School Graduates Five Years After Graduation



3) Shortages of medical school faculty are endemic, problematic, and made worse by "brain drain."

Almost every site-visited school suffers some degree of faculty shortage in both basic and clinical sciences. The total number of teaching staff (salaried full-time

or part-time, and volunteer) at most survey-responding schools (51 of 98) is fewer than 100; about half have between 52 (25^{th} percentile) and 147 (75^{th}) teaching staff. Limited salaries and career options, heavy teaching loads, limited space, growing enrollment, lack of equipment and support staff are prime barriers to retaining faculty. Shortages “stretch” current faculty and promote emigration or relocation to private and NGO opportunities. Faculty who are well trained and specialty credentialed are prime candidates to be recruited outside the country, resulting in the loss of both clinicians and the multiplier power of teachers.

Academic salaries severely limit faculty recruitment and retention. In many universities, clinical staff is paid on the same scale as other university professors, which is lower than that of public sector doctors set by Ministries of Health. Research opportunities are often limited while teaching responsibilities are large. At Gezira, the lack of basic scientists means clinicians frequently must teach basic science to medical students. Many schools rely on expatriate faculty. The founding faculty of WSU-South Africa came from Uganda, Cuba and Nigeria.

Some schools have initiated creative strategies to retain faculty, such as HKMU, where incentives such as housing and communications allowances, telephone air time, and seminar participation are provided. Catholic University has made a targeted effort to train and promote Mozambican faculty. Today over half their faculty are Mozambicans, though they remain dependent upon expatriates as well. At WSU, the shortage of clinical faculty is relieved largely by partnerships

with clinicians at local hospitals who are employed by the provincial Department of Health but obliged by their contracts to participate in teaching.

Faculty loss at surveyed schools was significant, with a median 10% of staff from five years ago no longer with the schools and half of schools losing between 5.6% (25^{th} percentile) and 18% (75^{th}) of teaching staff in five years. The greatest reason given for faculty loss was emigration (webappendix, page 13). The percentage of faculty positions vacant was lower in countries with a higher GDP per capita (PPP) ($p<0.01$), and higher in public medical schools ($p<0.05$) by multiple linear regression. The majority of respondents (80 of 100) believed that doctor retention in their country is a problem, but only 51% (51 of 100) listed any university-level steps taken to address the problem, most commonly salary increases or bonuses (20 respondents), strengthening PGME programs (13), and CBE (9).

4) Problems with medical education infrastructure are ubiquitous and limiting.

Deficiencies in physical infrastructure are endemic. At Jimma, power, water and telecommunications are unreliable, jeopardizing training and innovation. At Ibadan, informants expressed concern about daily power outages. Departments must purchase generators for clinical and teaching functions. At Catholic University (Mozambique), challenges include a lack of computers, limitations in

internet connectivity, and the absence of student hostels. Inadequate student housing near clinical sites is a problem at WSU and Mali.

The experience of the College of Medicine in Malawi is a good example of the role of partnerships in improving infrastructure. Assisted by funds from Sweden, Norway, and the Global Fund, the school has constructed and enhanced lecture halls, libraries, hostels, computer facilities, offices, and recreational areas. These improvements accommodate larger class sizes and a growing faculty.

The SAMSS survey considered both the quality and quantity of certain physical and communications resources. Multiple linear regression explored relationships between six summary “resource scores” (scores for buildings, libraries, labs, clinical sites, internet, and advanced ICT) and various national and institutional factors (detailed explanation in webappendix pages 14-15). Higher GDP was associated with higher scores for five of the six resources, older schools had better scores for four, and public schools rated their resources as worse in three indicators. Schools charging higher tuitions reported better advanced ICT resources.

5) Insufficient coordination between ministries of education and health can be a barrier to medical schools' ability to increase health workforce capacity.

Coordination between Ministries of Health (MOH) and Ministries of Education (MOE) was a problem in virtually all countries visited. The MOE generally provides funds for medical schools while the MOH is the principal employer of school graduates. In many countries, coordinated planning regarding budgets, priorities, and outcomes between ministries of health and education is minimal, contributing to inappropriate curricula and the graduation of doctors who cannot find employment in the country. In Mali and Sudan, the annual number of medical graduates significantly exceeds the in-country capacity to hire new physicians, despite the need for health services.

Overall, MOEs appear to be more involved in setting medical school priorities than MOHs. Sixty-nine percent (69 of 100) of survey respondents report MOEs either contribute significantly or are primary drivers of priorities compared to 49% (49 of 101) reporting MOHs are significant or primary contributors. One survey respondent mentioned that an important innovation had been the transfer of supervision of the school from the MOE to the MOH.

6) Accreditation and quality measurement are important developments for standardizing medical education and physician capabilities.

Various levels of accreditation and certification were noted in the site visited countries. In Ethiopia, there is no official continuous accrediting body for medical schools. Accreditation is granted only when an institution is initially founded. However, many schools report progress in accrediting institutions and evaluating graduates. In Mozambique, the newly formed Medical Council plans to develop accreditation standards for medical schools and external examinations for medical students. The Tanzanian Commission for Universities visits teaching institutions once before accreditation and then every four years. The Malawi Medical Council uses guidelines from the Southern African Development Community for accreditation and quality assurance purposes.

7) Educational planning focused on national health needs is improving the ability of medical graduates to meet those needs.

Schools are increasingly emphasizing “community oriented,” “relevant,” or “nationally focused” medical education. Many of the site visited schools are developing curricula around national priority health problems, and using rural and community based experiences to enhance their programs. Although some initiatives are undertaken by the schools alone, many are set in the context of government priorities and national service programs.

In Malawi, the curriculum is designed to immerse students in local health issues. The curriculum focuses on the most common diseases and health conditions in Malawi and the sub-region. At Gezira, community based courses comprise 25% of studies and many courses are conducted at field sites including district hospitals, community health centers, clinics, and patients' homes. The Catholic University is incorporating management training for students, recognizing that some graduates will be serving in administrative positions as regional health officers or hospital chief medical officers after graduation.

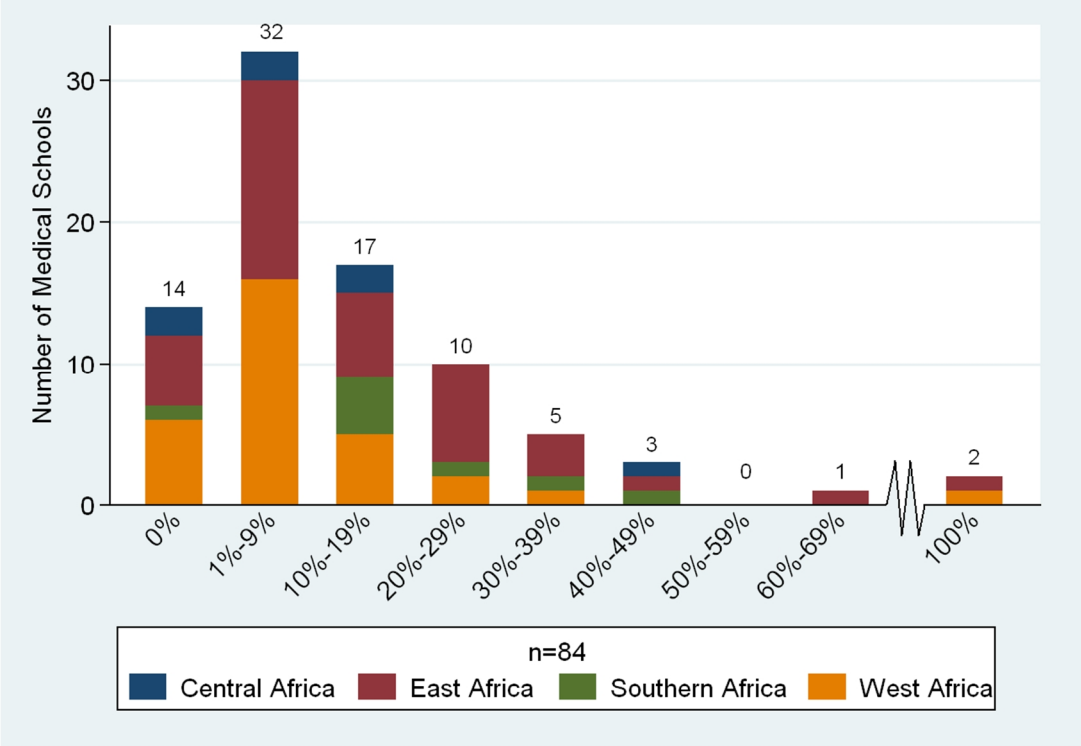
8) Beyond the creation of new knowledge, research is an important instrument for medical school faculty development, retention, and infrastructure strengthening.

Many schools reported that research promoted staff recruitment and retention and attracted external partners. Older schools with stronger research portfolios continue to develop research programs using established sources of funding, providing some margin to train young faculty. However, while well established schools experience success in garnering research support, newer, smaller schools face a conundrum. These schools often have younger faculty who lack the training and mentorship to bid successfully for research grants. In addition, staff shortages at many schools increase the teaching load, limiting time available to pursue research.

The University of Mali has purposefully built its research capacity over 30 years. Initial faculty cohorts were sent abroad for graduate training, and returning graduates were guaranteed support. Current research faculty teach at the medical school, benefitting both the staff and the students. The University of Malawi collects 10% indirect costs from all research grants to create a financial base to support research. Their Research Support Centre assists faculty in grant writing, research design, and grant administration. This further develops research capacity at the College and allows the Centre to sponsor new labs and augment research faculty salaries.

Despite these examples, at the majority of SSA medical schools, fewer than 10% of faculty are involved in sponsored research (Figure 5). The percentage of faculty involved in grant supported research was compared with a series of potential predictive variables by multivariable linear regression. While many universities provide several types of research support (webappendix page 13), only two types (provision of strengthened institutional research tools such as research or ethics committees ($p<0.001$), and the provision of funded research time ($p<0.05$)) were significantly correlated with an increased percentage of faculty involved in grant-supported research by multiple linear regression. The presence of research training programs (internal or external) was not. Linguistic variation was observed, with schools using English as a language of instruction having faculties more likely to participate in research ($p<0.05$) and Arabic speaking faculties being less likely to do so ($p<0.05$).

Figure 5: Faculty Involvement in Grant Supported Research in Sub-Saharan African Medical Schools by School



9) Impressive curricular innovations are occurring in many schools.

Survey respondents reported a number of non-traditional teaching methods used in SSA medical schools, including community based education (CBE), problem based learning (PBL) and multi-disciplinary team-based learning (TBL) (webappendix page 11). These three educational methods tended to be implemented together. Institutions using a higher degree of any of these instructional methods during the preclinical years were more likely to use the other methods during these same years ($p<0.001$) and institutions using more

TBL during clinical years were likely to use more PBL and CBL during this same period also ($p<0.001$) by Pearson's correlation coefficient.

Structured community exposure and CBE provide students with experiences working with underserved populations and improve graduates' preparation to deal with national health problems. At Jimma University, CBE is central to the educational mission starting with a community based training program. Medical students shuttle to community sites following a prescribed progression of tasks including data collection, community diagnosis, analysis, and preparation of a plan for an intervention on local problems. At the College of Health Sciences at Makerere University a new curriculum includes regular exposure to patients in rural communities throughout medical school. At Gezira, community orientation pervades the curriculum, providing an organizing principal for medical students, faculty, and graduates. A sense of social accountability is present in all aspects of education and the school's community oriented mission is prominently displayed at the entrance to the medical school building. Faculty members in oncology, nephrology, and pediatrics commented to the site visit team on the ongoing influence of community oriented principles in their work.

10) Post-graduate medical education is an important element of a national health system development strategy.

Among 96 survey respondents who reported about their postgraduate programs, 58 reported that clinical PGME programs were offered, and 47 reported the

number of graduates per year from those programs. Those 47 programs included a total of 1,909 seats for clinical postgraduate programs, representing available seats for less than 25% of the 7,861 total graduates reported to SAMSS. The most commonly offered postgraduate programs were in Internal Medicine (13.8% of reported PGME seats), Obstetrics and Gynecology (12.9%), Pediatrics (12.5%), Surgical Sub-Specialties (11.2%), and General Surgery (11.1%).

Makerere and Ibadan Universities have well developed systems of PGME. Other schools offer less PGME, often pediatrics, surgery and obstetrics/gynecology, while a few have no post-graduate programs. By increasing PGME programs schools have been able to retain more graduates, and to hire some of the newly trained graduates as faculty. Some schools implement “sandwich PGME programs” where residents pursue PGME at home but spend a period of time during training at a regional or international program. The “sandwich” principle is intended to provide exposure to clinical work abroad while mitigating the tendency of doctors to remain abroad when all of their training is done elsewhere[26].

11) Variability in secondary school quality creates challenges in medical school admissions.

Sound secondary education systems are prerequisites to success in medical school, but the quality of secondary education is not strong in many countries. As a result, many schools have developed preparatory or recruiting programs for

disadvantaged students. The Catholic University, HKMU, and the College of Medicine in Malawi have implemented “preparatory” years to assist students in meeting the demands of formal medical education. WSU has established quotas by race to reflect the demographics of South Africa and evaluates applicants using a scoring system that includes motivation and commitment to service. Additionally, the first term curriculum provides language instruction, computer training, basic science remediation, and a focus on study skills. A peer mentoring program helps students adjust to campus life.

12) Private medical schools hold promise for adding to physician capacity development.

Despite challenges, private medical schools represent an area of innovation and growth in SSA medical education. The first private medical schools opened in the 1990s and private schools now constitute 21% (22 of 105) of all responding schools (Figure 1). An online search suggests that one third (21 of 63) of non-responding schools are privately owned, which would mean that 25.6% (43 of 168) of currently operating medical schools are private schools. Supporters argue that the “privatization” of medical education is in keeping with global trends in education while detractors counter that this movement is largely commercial and inevitably inequitable.

Two of the ten site visited schools were private institutions. HKMU is a not-for-profit institution founded in 1997 which has earned a reputation for graduating

high quality physicians. HKMU partners with public district hospitals to provide students with additional clinical teaching sites. The Catholic University (Mozambique) is a faith-based, not-for-profit school founded in 1995. The University is a model of successful collaboration with the government of Mozambique, the Catholic Church, and a number of international organizations.

13) International partnerships are an important asset for many medical schools.

The overwhelming majority of SSA medical schools, including all schools visited, are engaged in collaborations locally and internationally, primarily with institutions in Europe, North America, and Africa (webappendix, page 14).

The University of Mali cooperates with the French government, which has assisted them with programs in community health practice and public health training, Mali has also developed research collaborations with European, North American, and other African universities. Makerere University has a long history of collaboration with foreign academic and non-profit organizations. These linkages have contributed to the school's research capabilities and training programs. The University of Malawi exemplifies a "South to South" collaboration with its involvement in joint training programs through the Southern Africa Human Capacity Development Coalition.

DISCUSSION

SAMSS found a remarkable growth in medical education in Sub-Saharan Africa over the last two decades that began well before the recent attention by the international community to the massive shortage of health workers in the region. The decision of many countries to invest in building new medical schools and expanding current ones, young people's intense interest in the study of medicine, and the emergence of private medical education are all evidence of this movement. The obstacles to scale-up, however, remain substantial. Without larger and more stable health workforces, there is little likelihood of stemming the AIDS epidemic or realizing the Millennium Development Goals in Africa. Many international organizations (including PEPFAR, WHO, World Bank, the Global Fund, bilateral aid agencies, and philanthropies) have reached this conclusion. The current global attention being paid to health workforce scale-up makes this a propitious time for medical education in SSA.

The omnipresent lack of faculty and the general disrepair of campus infrastructure are among the most prominent findings documented by SAMSS. These are hardly surprising to anyone familiar with medical education in the region. Basic science and clinical faculty are in short supply everywhere, severely limiting quality educational scale-up. Marked deficiencies are often present in laboratories, libraries, classrooms, lecture halls, and hostels. The deficit in information technology and bandwidth is particularly problematic, denying students the possibility of leapfrogging older learning methods to avail

themselves of the rapidly advancing world of Web-based learning. SAMSS documented the consistency and magnitude of these problems, establishing a baseline from which to pursue scale up.

The confluence of global attention and clearer specification of impediments facing the expansion of medical education create a moment of opportunity. National authorities and international partners working together with medical colleges have the possibility of creating new, collaborative investment strategies, developing long term commitments for conjoint funding using mechanisms such as endowment funds for faculty enhancement, dedicated funds for physical plants and computer needs, or umbrella funding to support partnerships between universities, North-to-South or South-to-South.

An unforeseen aspect of SAMSS was the opportunity it afforded African medical education leaders to meet and work with one another. Twice before (in the 1960s and the 1990s) an African Medical Schools Association (AMSA) was initiated but not sustained. Recently, most medical education policy in Africa has centered on programs and issues within countries with little occasion to discuss common problems and solutions between countries. The opportunity afforded by SAMSS for educational leaders to visit elsewhere in Africa to compare programs and policies proved enormously instructive and energizing. A revitalized AMSA would be in a position to play important roles in the expansion of SSA medical education including data collection on existing programs, documentation of “best

practices", promotion of accreditation and certification initiatives, and updates on current and developing medical schools.

SAMSS also noted an important evolution in the role of post graduate medical education in SSA. PGME positions are not plentiful in most African countries. Many African medical graduates seeking advanced training travel to Europe and North America, and many do not return. To train more graduates in basic specialties and to stem the emigration of young graduates, many countries are now opening and expanding PGME. This trend will be essential to building sustainable, quality physician cadres in every country and enhancing the ranks of medical school faculties.

SAMSS was not modeled on any previous study but succeeded in crafting a data gathering strategy that is unique and potentially applicable to studies of other geographical areas in which information about health professional education is not well developed. The key characteristics of the study structure were:

1. Literature review and key informant interviews to establish baseline knowledge.
2. Appointment of an advisory board of educators and policy leaders from the area of study to provide perspective, advice, findings analysis, and conclusion framing.

3. Data gathering using qualitative (structured site visits) and quantitative (survey) instruments, both involving primary participation by the advisory board.
4. Inclusive (advisory board and secretariat) engagement in analysis, writing, editing, and publishing.

The products of the SAMSS exercise include substantial networking and leadership development within the advisory committee; a “report-out” meeting of 100 stakeholders in Dar-es-Salaam; an ongoing website focused on medical education in SSA; a comprehensive final report; and several articles in peer reviewed journals.

STUDY LIMITATIONS

There were a number of limitations in the conduct of this study. The literature concerning medical education in Africa was overwhelmingly in English. Articles written in French were less numerous and in Portuguese and Arabic rare. Although attempts were made to identify more non-English articles with the assistance of SAMSS Advisory Committee members, the results were limited. The preponderance of Anglophone Advisory Committee members and staff also limited the study’s use of non-English sources of information. Of the ten site visited schools, two (in Mali and Cote d’Ivoire) were French speaking (one less than population parity would warrant), six were Anglophone, one Lusophone, and one Arabic-speaking. The Francophone shortfall occurred despite multiple

attempts to establish contacts with schools in the Democratic Republic of the Congo, Senegal, and Cameroon. Similarly, the survey responses revealed some regional underrepresentation, with lower response rates in countries such as the Democratic Republic of the Congo, Angola, and Sudan. Twenty-two schools were not surveyed because they were founded or identified after the study was completed.

Survey limitations included the subjective nature of a number of questions, unanswered questions in surveys of some individual schools, and inconsistently answered questions from schools within the same countries. Questions such as the proportion of income from various sources, reasons for staff loss, and graduates' emigration and practice choices were usually estimates by respondents rather than data-based answers. Recognizing the absence of established regional standards of educational quality, neither the survey nor site visits evaluated graduate competencies.

Unanswered questions within returned surveys proved problematic. Some questions were understandably omitted by certain schools, such as questions about graduates from schools that had yet to graduate students. When questions were left unanswered without explanation, attempts were made to contact respondents to complete questionnaires. The number of responses to each relevant question (n) is reported for each finding. In some cases, inconsistent answers pertaining to national requirements were found among schools in the

same countries. For example, eight countries with multiple schools responding gave inconsistent answers regarding whether a compulsory service requirement exists in their country.

CONCLUSIONS: SAMSS RECOMMENDATIONS

SAMSS research looked carefully at the workings of African medical schools during two years of investigations. The SAMSS team has asked and answered many questions about medical education in SSA. Additionally, all members of the Advisory Committee and many members of the Secretariat had the experience of site visiting one or more schools. Advisory Committee members felt that the perspectives they had developed in this work warranted collective recommendations about actions that should be taken to promote and improve medical education and, in turn, population health in SSA. A set of recommendations was drafted, circulated to all SAMSS participants, discussed, modified, and ratified at a SAMSS meeting in Dar es Salaam on April 16, 2010.The recommendations are as follows:

1) Launch Campaigns to Develop Medical School Faculty Capacity Including Recruitment, Training, and Retention

2) Ramp up investment in Medical Education Infrastructure

3) Institute Structures to Promote Inter-Ministerial Collaboration for Medical Education

4) Fund Research and Research Training at Medical Schools

5) Promote Community Oriented Education Based on Principles of Primary Health Care

6) Establish National and Regional Post-Graduate Medical Education Programs to Promote Training, Excellence, and Retention

7) Establish National or Regional Bodies Responsible for Accreditation and Quality Assurance of Medical Education

8) Increase Donor Investment in Medical Education Aligned with National Health Needs

9) Recognize and Review the Growing Role of Private Institutions in Medical Education

10) Revitalize the African Medical Schools Association

Contributors

All authors participated in the design, research, and writing of this manuscript, and have seen and approved the final version.

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