

REPRINT (*Acad Med* 2014;89:S40-S44.)

ETHIOPIAN MEDICAL SCHOOLS' RAPID SCALE-UP TO SUPPORT THE GOVERNMENT'S GOAL OF UNIVERSAL COVERAGE

Milliard Derbew, MD, Netsanet Animut, MSc, Zohray M. Talib, MD, Sinit Mehtsun, MSc,
Ellen K. Hamburger, MD

In 2003, Ethiopia declared it would pursue the goal of universal primary health coverage. In response to the critical shortage of human resources for healthcare, the government decided to rapidly increase the training of health workers to provide basic services, including health education, disease prevention, and family health services primarily to rural areas. This approach, which became known as the “flooding strategy,” was extended in 2005 to include medical doctors. Between 2003 and 2009, the number of universities and health science colleges grew from five to 23 and the original five medical schools were given a mandate to increase their annual enrollment by three to four times. This article describes how the “flooding strategy” strained and threatened the quality of the Ethiopian medical education system and how Addis Ababa University (AAU) responded by leveraging a timely grant through the Medical Education Partnerships Initiative (MEPI) to support the establishment of a consortium of four Ethiopian medical schools (MEPI-E). The consortium goals are to address the new demands by (1) maintaining and improving the quality of education through innovation and efficient use of resources; (2) developing and implementing new strategies to build human capacity and promote faculty retention; and (3) increasing locally relevant research and bioethics capacity. Implementation of program began in May 2011. Although it is still underway, MEPI-E has already catalyzed the development of a national network of medical schools, enabling unprecedented collaboration to respond to the increased demands on the Ethiopian medical education system.

Like many countries in Sub-Saharan Africa, Ethiopia faces a critical shortage of human resources for health as well as a mal-distribution of healthcare workers between rural and urban areas. Although 82 percent of the population resides in rural and remote areas of the country, the majority of health workers practice in urban areas. The World Health Organization considers a health worker ratio per 1,000 population of 2.3 to represent a crisis (1). However, Ethiopia's ratio is far less, at 0.247 (2). To achieve the Millennium Development Goals (3) set for 2015 of reduction in infant mortality, improved maternal health, and better outcomes for prevalent infectious diseases, Ethiopia recognized it needed to boldly address its serious deficiency in number of healthcare workers per population. The Ethiopian government in 2003 adopted a “flooding strategy” to substantially increase the number of trained health professionals. The plan initially called for the training of 5,000 health officers by 2009 through accelerated training programs in selected hospitals and health science colleges. The goal was to ensure universal primary health service coverage by 2020. Estimates of need took into account health service locations, current and projected staffing levels, and population and economic growth projections. Although the “flooding” focus was initially to train and appoint basic health services, in 2005 the strategy was extended to include medical doctors to address the country's critical shortage of physicians (4).

To this end, the number of universities and health science colleges grew from five in 2003 to 23 in 2009 (5), and the five established medical schools were given a mandate to increase annual enrollment by three to four times (6). Most of the 18 new schools opened in affiliation with existing district hospitals and were staffed by clinicians but with no trained faculty or learning resources. Following the implementation of the strategy in 2005, annual medical school enrollment increased from 250 to 1,400 in 2010 (7), with the goal of graduating 10,000 doctors by 2020 (2). The government strategy relied heavily on Addis Ababa University (AAU) to increase its intake at the undergraduate and graduate levels with the expectation that AAU graduates would fill faculty positions at other medical schools and provide specialty care throughout the country. AAU itself, however, entered this rapid scale-up with a deficit of faculty. Indeed, retention of physicians in academia had been a challenge for decades; between 1991 and 2011, there was a 92.8% turnover rate as 120 faculty members left AAU's medical school (8). Primary barriers to

retention included a lack of opportunities for career advancement through research, which was exacerbated by weak research infrastructure, and excessively demanding working conditions, which were worsened by the surge in enrollment. Similarly, retaining in-country trained physicians and strengthening health services in rural areas have been challenges because many graduates left the country to work elsewhere, while many of those who stayed migrated to Ethiopia's urban areas. Between 2004 and 2009 the five existing medical schools increased their enrollment three- to four-fold, yet these efforts were futile as the country lost nearly all the additional graduates to other countries or to urban areas within Ethiopia (9).

This article describes how the "flooding strategy" strained the Ethiopian medical education system, which threatened the quality of education and magnified faculty shortages, and how AAU responded by leveraging a timely U.S. government grant through the Medical Education Partnership Initiative (MEPI). This paper highlights the goals, activities, and early findings of Ethiopia's MEPI program as well as the strategies used to ensure that these efforts will be sustained beyond the grant period.

Ethiopian Medical School Challenges:

The massive increase in student enrollment put a strain on teachers, learning resources, and infrastructure of an already over-burdened medical education system. At AAU, for example, the computer-to-student ratio and textbook-to-student ratio were estimated to be 1:20 and 1:15, respectively. Students routinely waited for hours at the library to use a textbook for a few hours. With the addition of the new but poorly resourced medical schools, the country's medical education system found itself bursting at the seams with students, staffed by over-stretched faculty, and at risk of producing inadequately trained doctors.

Addressing the Challenge: The MEPI-E Consortium:

Establishing the Consortium:

In response to the MEPI request for applications in 2010, the AAU College of Health Sciences contacted eight Ethiopian medical schools to establish a consortium; three schools (Hawassa and Haramaya Universities and the Defense College of Health Sciences) opted to join the consortium. The four schools, in consultation with U.S. partners-Johns Hopkins University (JHU), Emory University, University of California San Diego, and University of Wisconsin-Madison to identify the major barriers to providing quality medical education in Ethiopia and to establish goals for the MEPI grant. The schools in the consortium, despite variations in location and size, all faced similar challenges of limited faculty, infrastructure, learning resources, and clinical sites. All were struggling to accommodate increasing class sizes (Table 1).

The overarching goals for the MEPI consortium were to create an academic environment that trains, retains, and rewards productive faculty. Specifically, the consortium sought *to ensure quality medical education* despite the large class sizes by improving efficiencies in teaching and updating pedagogical methods; *to retain faculty and promote retention of doctors in rural areas* by improving the academic work environment and tailoring the curriculum to focus on regional needs; and *to enhance research and bioethics capacity*, creating opportunity for faculty career advancement and promoting locally driven, regionally relevant research. Since receipt of the grant award in September 2010, the MEPI-Ethiopia (MEPI-E) consortium schools have initiated activities aimed at achieving these goals.

Implementing MEPI-E Activities: MEPI-E began implementing its activities in 2011 (Figure 1). The project used three strategies to ensure sustainability: infrastructure investment, faculty and staff training, and stakeholder engagement. Representatives from the Ministries of Education and Health were engaged to play a leadership role in the planning and oversight of MEPI-E, thus enabling harmonization of government and university priorities. To maintain quality in the face of increasing numbers, MEPI-E implemented innovations to support high-quality teaching and to increase the availability of learning resources, as described below.

Expanding access to resources. With students already struggling to find learning resources, the larger class sizes created a crisis. Although AAU initially purchased additional textbooks, it soon became clear that the magnitude of the problem required a more innovative solution. AAU's leadership decided to invest in establishing infrastructure to support an eLearning program. Installation of wired and wireless Internet and establishment of a computer lab for faculty and students were the first steps in this process.

Working with the U.S. partners, a digital library and a learning management system were adopted. The Modular Object-Oriented Dynamic Learning Environment (Model) learning management system has been implemented, and it is providing students with unprecedented access to learning materials and enabling faculty to share teaching materials and ease the burden of examination scoring. AAU used MEPI funding to purchase e Granary (a digital library) and supplemented this with recorded lectures and locally generated course materials. Within the first six months, 800 undergraduate students had been trained on use of the digital library. To support sustainability, the university agreed to take over management of the information technology (IT) infrastructure, which allowed MEPI-E to focus on building capacity within the medical school in content development and faculty engagement.

Developing simulation capacity. Access to clinical learning opportunities was constrained because of inflated student-to-patient ratios. Patient beds could be surrounded by two dozen students with little opportunity for more than one to practice clerking, examination, or procedural skills. Recognizing this, the AAU team chose to use MEPI funds to expand the use of simulation in the undergraduate curriculum through increasing the capacity of an existing simulation center by adding supplies and providing training and compensation for faculty, and establishing a new simulation center for undergraduate students, which will accommodate up to 50 students.

Addressing faculty retention. MEPI-E invested heavily in enhancing career pathways for faculty through professional development and improving the teaching and learning environment. MEPI-E provided funds to compensate faculty who put more hours into small-group teaching during the evening and weekends. This enabled the medical school to cope with the increase in class sizes and provided opportunities for students to interact with faculty. To advocate for long-term funding to support faculty training and small-group learning, funds were allocated for ongoing evaluation of these activities on student performance, student attrition, and satisfaction of faculty and students on the learning environment.

Improving Rural Retention. For decades Ethiopia has struggled to retain physicians to work in rural areas, and the flooding strategy alone was unlikely to reverse this trend. Recognizing the role of positive community-based experience during undergraduate education for retention, MEPI-E invested in three key areas to strengthen community-based experiences: curricular enhancements, infrastructure improvements, and research support to community-based physicians.

1. *Curricular enhancements.* MEPI funding was used to revise the curriculum to become an interdisciplinary experience for students in medicine, nursing, laboratory technology, and pharmacy.

2. *Infrastructure improvements.* The six-week rural rotations required students to stay in remote areas, but with the growing class sizes, the infrastructure for accommodation and transportation proved to be insufficient. MEPI-E provided funding to expand the numbers of sites, improve living conditions, and provide on-site Internet. In an effort to encourage and support community-oriented research efforts, MEPI funds were also used to support student research projects during their community rotations.

3. *Research support for rural practitioners.* MEPI-E engaged in a program to provide research training and support to rural physicians with the dual aims of incentivizing rural physicians to stay in practice and promoting locally driven and locally relevant research. Forty-one physicians were trained in the first two rounds of this initiative, with 13 research proposals garnering support. Examples of early research projects developed from this collaboration include the following: (1) magnitude of disability among leprosy patients after the initiation of multi-drug therapy; (2) prevalence of anemia and its associated factors among pregnant women attending antenatal clinic; and (3) assessment of factors influencing male partner involvement in the prevention of mother-to-child HIV transmission.

Enhancing Research and Bioethics Capacity: Research output at AAU prior to the MEPI grant was constrained by limited faculty time and lack of expertise in research methods. The few faculty who pursued research projects administered them through professional associations because of a lack of research support infrastructure. For the newer schools in the consortium, research capacity needed to be built from the ground up. Given that research and publication are essential for career development, satisfaction, and retention of faculty, MEPI-E chose to build research capacity by providing faculty and student training in research methods and by establishing and strengthening the research support infrastructure within the consortium schools.

Research methodology training. Prior to MEPI, opportunities for research-related professional development were limited at AAU and the consortium schools. Training courses were basic, not offered consistently, and largely dependent on external funding. With the help of U.S. partners, a diploma program in research methods was established in 2012; to date it has been attended by 33 faculty members. In addition, basic and advanced research training sessions were offered and attended by 836 faculty and graduate students during the past two years. Prior to MEPI, dedicated travel budgets for faculty to present their research at international conferences did not exist, particularly for junior faculty. Recognizing this, MEPI-E funded 18 faculty members to present their research at international conferences. To cultivate a research culture among medical students, MEPI-E facilitated 10 undergraduate student research projects, in which students were paired with senior faculty.

To enhance institutional research management capacity, MEPI-E established an Office of Research Administration to assist faculty and graduate students in grant writing and management. Clinical Epidemiology Units (CEU) were established at the MEPI-E consortium schools to train and assist faculty to conduct clinical research. To ensure sustainability, MEPI-E established a plan to transition leadership from the international partners to the CEUs. MEPI-E developed a program to set up institutional review boards at each consortium school, to provide technical support to train faculty on research ethics, and to establish policies and procedures to support research.

Collaboration through MEPI. Prior to the MEPI-E consortium, there had been virtually no collaboration or coordination among the Ethiopian medical schools. There were no opportunities to synchronize government health workforce planning with the resources of the medical education system. The MEPI-E consortium demonstrated the efficiencies of collaborative activities. Many workshops were held centrally at AAU and attended by faculty from all of the consortium schools. Some of the schools lacked faculty in specific areas, and MEPI funding supported faculty exchanges to fill those critical deficits. The consortium made decisions on resource allocation through a council, with representation from all schools and the government. This important aspect of shared decision-making allowed the government to play an active role in designing strategies to address the challenges imposed by its flooding strategy.

Catalytic effect of the MEPI network: Recognizing the benefits of collaboration, the MEPI-E leadership decided to expand their efforts and establish a partnership with the growing number of medical schools in the country. In July 2011 MEPI-E convened a meeting to establish the Network of Ethiopian Medical Schools (NMSE). The network includes all public and private medical schools and representatives from the Ministry of Health and has the mission of promoting collaboration between schools and the government. The NMSE created nationwide faculty and learning resources. Perhaps the most beneficial aspect of the NMSE has been the influence of all the schools engaging with the Ministries of Education and Health with a unified voice. The collaboration has provided a common platform to discuss the challenges imposed by the rapid scale-up and a mechanism to develop national strategies to address subsequent issues. As an example, in response to concerns over the quality of graduates from some of the medical schools, the NMSE council has raised the issue of introducing national medical school exit examinations.

Implications for Global Medical Education: The critical shortage in human resources for health is a global phenomenon but is particularly pronounced on the African continent. The ambitious plan of the Ethiopian government to produce more doctors by rapidly scaling up enrollment in medical schools is a strategy few other countries have tried. The initial impact of the "flooding strategy" put a strain on students, faculty, and institutions, all of which were already under-resourced. The MEPI grant provided a timely source of funding and stimulated vital partnerships among medical schools and with government stakeholders to create a national dialogue on health workforce training needs. These partnerships are anticipated to last well beyond the grant period and could prove critical in sustaining efforts to ensure that physicians graduating from Ethiopian medical schools can provide high-quality care throughout the country. As the enrollment flooding continues, and AAU continues to evaluate the impact of the MEPI-E interventions in supporting students, faculty, and institutional growth, the results could inform the global health workforce community. The balance between quantity and quality in the production of health workers is a delicate problem without a clear answer. Addressing Ethiopia's government-mandated massive scale-up through external (MEPI) and internal (in-country medical schools) support could prove to be a creative solution to a widespread problem. It is also important to properly evaluate the outcomes this new model of health workforce expansion and adapt it as needed for other countries struggling to identify strategies to meet major gaps in their health workforce.

ACKNOWLEDGMENTS

NONE. *Funding/Support:* Funding for this work came from the Office of the U.S. Global AIDS Coordinator (OGAC) and the Health Resources and Service Administration (HRSA) under the terms of the following: MEPI Coordinating Center (6 UC3HA21113-04-01#) and Addis Ababa University (T84HA21124). *Other disclosures:* None. *Ethical approval:* Not applicable. *Disclaimers:* None. Previous presentations: None.

Table 1: MEPI-E Consortium Medical School Characteristics, 2012

Consortium School	Location	Year Established	# Undergrad Students	# Postgrad Trainees	# Faculty
Addis Ababa University College of Health Sciences	Addis Ababa	1964	1297	*526	239
Defense University College	DebreZeit	2007	58	-	9
Haramaya University School of Medicine	Dire Dawa	2007	902	-	94
Hawassa University	Hawassa	2003	1026	71	124

CHALLENGE

Increased student enrollment:

Inadequate textbooks and learning material
Large student teams on the wards limiting opportunities for hands on clinical training
Stressful & crowded learning environment
Schools working in silos despite similar constraints

MEPI-E RESPONSE

Improvements to Ensure Quality Graduates

- Established an eLearning program, including providing devices and digital textbooks, installing a learning management system and improving internet access
- Developed simulation capacity
- Implemented small group learning
- Began training medical students in communication skills, peer counseling & recognition of signs of depression & substance abuse
- Established the Network of Medical Schools in Ethiopia (NSME)

Retention challenges – limited faculty in academia and mal-distribution of doctors in-country:

Extreme faculty shortage /over-extended faculty
Career path for faculty not well-defined
Graduates not working in underserved areas

Programs to Promote Retention

- Provided advanced training and support for faculty professional development
- Strengthened multidisciplinary community based training for students at rural sites
- Collaborated with the Ethiopian Medical Association (EMA) to provide research support for rural physicians

Weak institutional research capacity and inadequate research support for faculty

Poor research output from AAU
Career paths based on research rely heavily on external support

Support for Research

- Institutionalized research methods training for faculty, residents and students
- Supported grants management, research assistance and Internal Review Board (IRB) capacity building

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