Developing a Nursing Database System in Kenya

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Objective. To describe the development, initial findings, and implications of a national nursing workforce database system in Kenya.

Principal Findings. Creating a national electronic nursing workforce database provides more reliable information on nurse demographics, migration patterns, and workforce capacity. Data analyses are most useful for human resources for health (HRH) planning when workforce capacity data can be linked to worksite staffing requirements. As a result of establishing this database, the Kenya Ministry of Health has improved capability to assess its nursing workforce and document important workforce trends, such as out-migration. Current data identify the United States as the leading recipient country of Kenyan nurses. The overwhelming majority of Kenyan nurses who elect to out-migrate are among Kenya's most qualified.

Conclusions. The Kenya nursing database is a first step toward facilitating evidence-based decision making in HRH. This database is unique to developing countries in sub-Saharan Africa. Establishing an electronic workforce database requires long-term investment and sustained support by national and global stakeholders.

Key Words. Kenya, nurse, workforce, database, HRH, HIV/AIDS

Improving the health of the world requires investment in human resources. Human resources for health (HRH) are increasingly recognized as an essential component for overcoming diseases and ensuring global health (Buchan and Calman 2004; Friedman 2004; JLI 2004; Liese and Dussault 2004). To underscore its importance, the World Health Organization (WHO) dedicated the 2006 World Health Day and its accompanying *World Health Report* to the HRH issue and workforce disparities confronting the global community (WHO World Health Day 2006; WHO The World Health Report 2006). In their 5-year review of the Millennium Development Goals (MDGs), the United

Nations Population Fund (UNFPA) has not only recognized the importance of HRH but has determined the health of the world's population to be inextricably linked to the health and migration of its health workforce (UNFPA 2005).

The global health workforce shortage—and especially the global nursing workforce shortage—has been well documented in both lay and scientific media (Buchan and Calman 2004; Chen et al. 2004; Dugger 2004). In the recent UNFPA (2005) document, *International Migration and the Millennium Development Goals*, Dovlo rightly noted that international labor markets must consider health workers as core assets to be protected in order to sustain development in an unfairly globalized world. The awareness of an inadequate health workforce comes at a time when the U.S. Government and other major international donors have developed an ambitious agenda for addressing global health issues. Most prominent among these is HIV/AIDS treatment and care to approximately three million people in sub-Saharan Africa, the region most affected by this disease. In order for these interventions to succeed, increased investments in HRH are required.

The struggles countries face today with providing nursing services are particularly illustrative of global HRH challenges. Although nurses comprise the majority of Africa's health care workforce, many of the continent's countries are experiencing acute nursing shortages. Recent reports document the out-migration of Africa's best-trained nurses and physicians to more

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developed countries––most notably the United States and the United Kingdom (Friedman 2004). This trend, coupled with the impact of HIV/AIDS on Africa's health care workers, has highlighted the need for governments to assess workforce capacity and identify solutions that can effectively redress staffing shortages.

Assessing HRH capacity in developing countries has confounded global organizations and workforce experts alike, mainly due to a dearth of accurate workforce data. Despite widespread agreement that HRH data sources are paltry, especially in developing countries, there are few examples that can document any one country's attempts to grapple with data system enhancements. The lack of reliable systems to monitor key workforce information and trends is widespread, thereby limiting the effectiveness and accuracy of both programmatic and policy-making decisions. Inaccurate and missing workforce information poses enormous challenges at national and global levels (Chen et al. 2004; East Central and Southern African [ECSA] Health Community 2004; Hongoro and McPake 2004; JLI 2004; Nursing Sector Study Corporation 2005). This lack of accurate workforce information impairs HRH management and development, and ultimately hinders progress with global health interventions.

The actual data needed for ongoing HRH surveillance and analysis include information about both the *supply* and the *demand* (or required staffing levels) for health workers. The importance of understanding the actual numbers and types of providers (i.e., physicians and nurses), as well as their education and capabilities was underscored in a report published by the Joint Learning Initiative (JLI), a network of global health leaders vested in HRH issues and supported by major international donors. The JLI (2004) cited the need to build the global workforce knowledgebase and specifically noted that current HRH data collection systems lack international standards. Similarly, a recent overview of the global nursing shortage noted, "The prerequisite for an effective deployment of staff is an information system that enables management and nurses to review patterns of activity and variations in workload, so that they can use informed judgment to make decisions on day-to-day staffing levels. . ." (Buchan and Calman 2005).

The following discussion provides an overview of the database system that was recently developed and is currently operating in Kenya. It explains the collection, computerization, and linkage of supply and worksite-level nursing data and offers a descriptive analysis of Kenya's nursing workforce. This workforce analysis represents the first-ever opportunity for Kenya's decision makers to develop HRH policies in tandem with evidence-based

workforce information. The paper concludes by offering recommendations for overall enhancement of sub-Saharan data systems in HRH.

BACKGROUND

Why the Project Began

In October of 2001, the Lillian Carter Center for International Nursing (LCCIN), Nell Hodgson Woodruff School of Nursing at Emory University hosted the first ever global forum that brought together senior government nursing and human resources leaders along with national nursing organization leaders for the purpose of addressing the global health workforce crisis. During this meeting, HRH challenges confronting African countries were specifically discussed as a major concern (WHO Media Advisory 2001). That event, coupled with a request by Kenyatta University for a nursing assessment, resulted in LCCIN joining the U.S. Centers for Disease Control and Prevention (CDC) in a collaborative consultation with the Kenya Ministry of Health (MOH) and the Kenyan nursing regulatory and licensing body, the Nursing Council of Kenya (NCK). In July 2002, following a joint consultative visit to Kenya, the LCCIN-CDC team concluded that the lack of reliable nursing workforce information seriously impaired the country's ability to develop effective workforce policy decisions and allocate resources appropriately. Subsequent to that visit, LCCIN faculty submitted a proposal for nursing workforce database development through the Association of Schools of Public Health's cooperative agreement with CDC. The proposal was objectively reviewed at CDC and funded by the Office of Global Health in October 2002. While the project's immediate objective was the creation of a computerized database system for Kenya's nursing workforce, the long-term goal was to provide accurate workforce data capable of influencing national HRH policy and program decision making.

Key Stakeholders

Within the first month of activity, the project formed a National Joint Steering Committee (NJSC) designed to provide input and guidance throughout the development of the database. This input was seen as a critical element for ensuring database integration and sustainability of the system within Kenya's HRH infrastructure. NJSC membership included representatives from Kenya's academic training institutions; professional nursing organizations (National Nurses Association of Kenya, NCK); employers/representatives of

the public, private, religious, and nongovernmental organizations (NGO); nursing leaders from all sectors; and international nursing workforce consultants. Kenya's Chief Nursing Officer, the highest-ranking nurse within the MOH, and the NCK Chair codirected committee deliberations thereby ensuring national ownership and buy-in with the project. This committee also created strategic and technical teams to address HRH policy implications and data system issues, respectively. The strategic team, comprised of national and governmental leaders, worked to identify key policy issues or questions that the system would address. Examples of these are included in Table 1. A technical team determined whether the policy questions could be addressed with currently available data and advised the committee on procurement and installation of hardware and software equipment. Composition of the technical team included information technology (IT) experts (networkers, programmers) along with university-based nurse research analysts. Additionally, a Kenyan team consisting of a networker, a database programmer, a data analyst, and an in-country coordinator was selected to manage in-country project operations. They currently function in this capacity and provide critical project support.

Table 1:   Key Policy Issues to be Addressed by the Nursing Workforce Database

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Nurse Demographics
   What is the nurse to population ratio stratified by the province?
   What is the age trend of Kenyan nurses nationally, by region, and by district facility?
   What is the trend of Kenyan nurse mortality by region and district?
   What is the trend of Kenyan nurse interest in out-migration as indicated by outside
      employer's request for verification of licensure?
Nurse Education and Training
   What is the proportion of enrolled (licensed practical nurses) to registered (registered nurse
      [RN] diploma or baccalaureate degree) nurses that have ever been trained and licensed in
      Kenya?
   What is enrollment trend for practical/enrolled training programs compared with registered
      nurse (diploma or degree) training programs?
   Are nursing continuing education topics and opportunities commensurate with nursing care
      responsibilities?
National Workforce Policy
   Based on facility, how many additional nurses are needed to provide adequate HIV/AIDS,
      TB, or malaria treatment and care?
   Based on facility, what additional training is needed for nurses to provide adequate HIV/AIDS,
      TB, or malaria treatment and care?
   What occupational exposures are most common among nurses caring for critically ill patients?

METHODS

The database system consists of two main components: (1) supply data on all nurses maintained at the NCK and (2) MOH and privately employed worksite data on individual nurses at pilot sites.

First Phase

During the first 3 years of project activity (2002–2005), NCK's hard copy registration forms, which are filed on every nurse upon graduation, were transferred into a computerized database. This database, which provides a single source of information for every nurse ever registered from 1960 to the present, has greatly facilitated data access and utility.

NCK Database: Supply Side Data. The NCK is charged with the collection and maintenance of current nursing workforce supply data. In Kenya, nursing licensure is mandatory for every nurse regardless if he or she is an *enrolled nurse* (i.e., entry-level nurses who practice under the supervision of a registered nurse) or a *registered nurse.* Registered nurses by definition are nurses with postsecondary education and specialized training who practice more autonomously and usually hold supervisory responsibilities (Munjanja et al. 2005). All nurses employed by the public and private sector are required to renew their license every 3 years. Nurses maintaining a private practice must renew annually.

Since its inception, the NCK has routinely collected nursing data at the time of licensure and registration (Table 2). Before this project, NCK staff manually transcribed information (collected from school records, examination forms, or licensure renewal applications) onto hard copy records, which were then stored in binders and shelved in large containers, rendering the information impossible to retrieve in a timely fashion and thereby nonfunctional for planning purposes. Project resources enabled the hiring of trained data entry clerks who were tasked with the initial entry of hard copy data into a computerized database specifically designed by the project's programmer. These clerks entered a backlog of records dating from 1960 up to the present 2005, totaling over 44,000 nursing records, which are now recorded in the electronic database system.

As of 2006, NCK staff have been trained and are fully capable of routinely entering licensure and renewal information into the database, thereby ensuring system sustainability. So as to ensure data accuracy, data cleaning is done regularly. Elements of data cleaning include identifying

Table 2:   Nursing Council of Kenya (NCK) Data Fields: Supply Data

Data Collection on Each Nurse
Supply (NCK)
Nurse name
Index number
License number
National identification number
Date of birth
Language fluency
Address
Gender
Nationality
Training qualifications
Major appointments
Professional development
Continuing education
Working status

outliers or missing information, running logical checks, verifying unique identifiers, and randomly verifying at least 1 percent of entered data with corresponding hard copy information. The project analyst is also available to provide periodic data analyses based on the needs of the MOH and the donor agency.

One of the many data fields collected is the index number—a unique identifying number assigned to each nurse when he/she enters nursing school. This number serves as a reference number and ensures an individual's data are not duplicated. This number enables the NCK system to link with data collected from expansion to the worksites by the MOH, thereby providing more accurate information on local workforce dynamics.

Second Phase

This groundwork set the stage for the second phase of workforce database development. In October 2005, the project received additional funding from the President's Emergency Plan for AIDS Relief (PEPFAR) through CDC's Global AIDS Program (GAP). GAP recognized the benefit of investing in a Kenyan database system that could assess capacity for HIV/AIDS service delivery and decided to support a piloted expansion of the system to MOH worksites in Nyanza Province. As a result of this investment, the project has now successfully linked Kenya's national nursing database with MOH

worksite staffing data in one of Kenya's eight provincial jurisdictions. Other activities planned for the near future include integrating continuing education and training data into the system as well as expanding the database to other cadres, such as, physicians and laboratory technologists, and technicians.

Linkage with MOH: Requirement and Utilization Data. Kenya's MOH collects worksite staffing data from every government health facility on a quarterly basis. This data collection encompasses all of Kenya's eight provinces and 72 districts. The information collected includes MOH facility data (district and province), as well as information on individual nurse providers including attrition (Table 3). Historically, these reports are complied at the district level and submitted to their respective MOH provincial office, which in turn transmits the information to the national MOH headquarters in Nairobi.

In 2006, the project began linking the NCK workforce supply data with MOH worksites utilization data. This data linkage was piloted in the Nyanza Provincial Office and Homa Bay District, one of 12 districts comprising Nyanza Province. Nyanza Province was selected as a pilot site because its

Table 3:   Ministry of Health Worksite Data Fields: Staff Returns Data

Data Collection on Each Nurse

Worksite
  Facility name
  Nurse name
  Address
  Index number
  License number
  Passport number
  Language fluency
  Gender
  Nationality
  Marital status
  Date of birth
  Registration number
  Qualifications
  Promotion
  Date of last promotion
  Title
  Years in station
  Last station
  Area of development
  Continuing education

HIV prevalence in adults (15 percent) is higher than any other province in the country including Nairobi Province (Kenya Ministry of Health 2005). As the requirements for HIV/AIDS prevention, care, and treatment services in Nyanza Province are among the most critical in the country, project stakeholders determined that it was important to obtain timely and accurate workforce data at the site of employment for this area. In addition, PEPFAR interventions funded in this province (e.g., Voluntary Counseling and Testing and Preventing Mother to Child Transmission of HIV) necessitate nurse acquisition of new knowledge and skills, information this system is capable of retrieving and which will facilitate program planning in this area.

In order to enable real-time data linkage, project resources financed the installation of satellites and programmed computers at the Provincial Office, the Homa District Office, and Homa Bay's accompanying District Hospital. They also supported the creation of a specially designed workforce program that enables online entry of workforce staffing levels. With this IT infra-structure, data are inputted at the district pilot sites and shared real-time with the MOH headquarters in Nairobi. The immediate availability of accurate staffing information is providing for the first time ever, an accurate profile of the nursing deployment in government facilities. Whereas in the past, the transmission of staffing information had been late, inaccurate, or incomplete, as a result of introducing this system to MOH in Nyanza Province, this process has been streamlined and rendered much more efficient, thereby providing the MOH Headquarters in Nairobi with a timely profile of staffing patterns in one of their more populated provinces.

RESULTS

Stock Data

The term *stock* refers to the current composition of the workforce (JLI 2004). The stock of Kenyan nurses from 1960 through 2005 is 39,280 (Table 4). Over the past 3 years, the nursing stock trends have showed a slight increase. The estimated nursing stock based on national population estimates for 2006 per population is 114.7/100,000, including nurses who are currently working as well as those who are currently qualified but not working. (World Health Organization: World Health Report 2006). As the NCK database does not track nurses by death certificates, out-migration, or retirement, these numbers are approximate. The largest number of Kenya's nurses are in their 30s (12,769) or 40s (12,423). As of February 2006, there were only 5,775 nurses in

Table 4:   Kenyan Nurses by Current Qualifications and Gender, 1960–2005 (Gender Not Indicated = 59)

| Qualification	Female	Male	Unknown	Total
Enrolled	21,111	6,088	46	27,245
Registered	9,287	2,471	12	11,770
BSN*	148	116	1	265
Total	30,546	8,675	59	39,280

*Registered nurse with Bachelor of Science in Nursing.

their 20s. As most nurses (enrolled and registered) receive their training during or immediately following secondary education, these numbers raise questions as to whether there will be adequate numbers of new nurses available to replace those who will retire or leave the workforce in years to come. The data also call into question current Kenyan government policies that require mandatory retirement of all government-employed nurses upon reaching the age of 55 years. Up until now, this policy has been unquestioned and enforced regardless of government rank. Other demographic analyses gleaned from the data (Table 4) indicate that there are more than twice as many enrolled nurses (27,245) as there are registered nurses in Kenya (12,035). As Kenya's nursing leadership has expressed interest in eliminating the enrolled nurse cadre as a means to upgrade professional nursing, these data would suggest considerable investments must first be made to expand registered nurse training or bridging (enrolled nurse to registered nurse) programs before deciding to implement such a recommendation.

Outflow (Migration) Data

Outflow data are synonymous with the term *out-migration* and refers to trained nurses leaving the country (The Nursing Sector Study Corporation 2004). In Kenya, outflow data are currently limited to outside employer's request for proof of a nurse's training and licensure (i.e., verification of qualifications or certificates). These requests are generated after a nurse has conveyed his or her intent to out-migrate to an outside employer, who in turn requests verification of licensure from the NCK. It should be noted the employer's request for verification of nursing licensure does not confirm that a nurse has actually out-migrated; as the nurse may have changed his/her mind even if a job offer has been tendered. However, as this information is currently the only source of outflow data that exists, these data serve as a proxy indicator for out-migration.

Figure 1: Nurses Seeking Out-Migration, by Qualifications, 1999–2004 ($n = 2,998$).
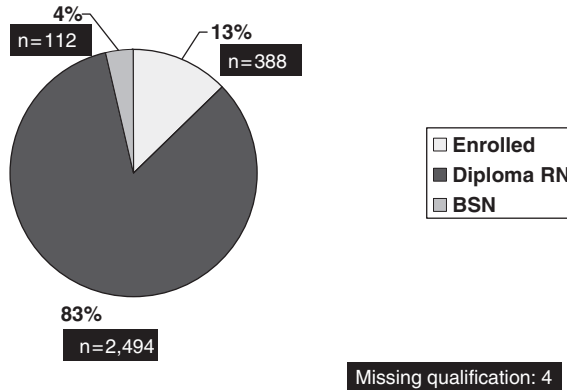
The overwhelming majority of nurses interested in out-migration are those most qualified (Figure 1). Of the nearly 3,000 employer requests for nursing, "verification of certificates" submitted to NCK during 1999–2004, 87 percent of these requests were submitted on behalf of registered nurses, which include nurses with a Bachelor Degree in Nursing Science (BSN). Kenya has recently initiated a Masters Degree nursing education program; however, there are no graduates from this program to date. From 1999 to 2004, a total of 186 BSN-prepared nurses were added to Kenya's nursing stock. During the same years, 112 BSN-prepared nurses sought to out-migrate. The ability of the project's database to analyze the impact of out-migration not only in total numbers but also in terms of workforce skill and potential provides important descriptive information that more fully captures the impact of the current outflow phenomenon.

The intended host country for more than 50 percent of nurses seeking out-migration was the United States. Thirty-eight percent expressed intent to migrate to the United Kingdom. The remaining 11 percent of nurses expressed interest in out-migrating to Australia, New Zealand, Canada, and other African or European countries (Figure 2). In Figure 3, Kenyan nurses' intent to out-migrate for 1999–2004 is broken down by year. The annual fluctuations suggest that apart from the United Kingdom, which reflects an increased trend as a destination host country for out-migration, intention to out-migrate to other countries lacks consistency. Still, over a 5-year period,

Figure 2:   Intended Host Countries of Kenyan Nurses Seeking Out-Migration 1999–2004 ($n = 2,998$).
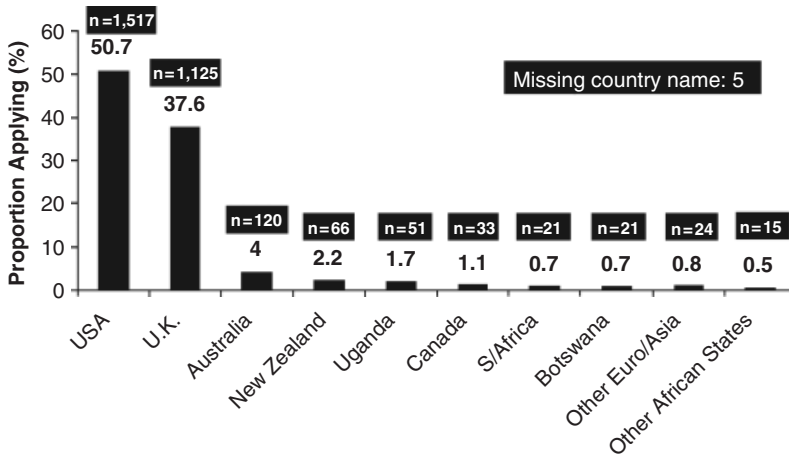
there is a documented increased trend toward the out-migration of Kenyan nurses to more industrialized countries.

DISCUSSION

Strengths and Limitations

The Kenyan nursing database offers several inherent strengths. The system provides national coordination of data collection for the entire nursing profession, a characteristic lacking in industrialized countries, such as the United States and United Kingdom (The Nursing Sector Study Corporation 2004). In the United States, for example, credentialing standards are set by a national regulatory board of practice (e.g., National League for Nursing Accrediting Commission); whereas, maintaining an ongoing nursing data-base falls under the purview of the 50 independent state boards of nursing. By contrast, the Kenyan nursing database collects uniform data on both enrolled and registered nurses at all levels of government. The system's use of a unique identifier, the index number, prevents duplication and helps ensure data accuracy. Once the NCK-worksite linkages are universal, it is anticipated this system will enable more in-depth analysis of HRH work-force dynamics, such as analyses of workforce internal migration

Figure 3: Intended Host Countries of Kenyan Nurses Seeking Out-Migration by Year, 1999–2004 ($n = 2,998$)*.

*Missing included in grand total: 5
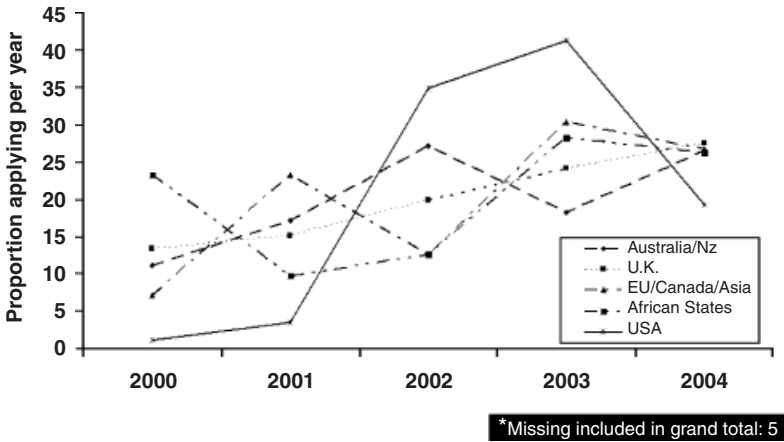
throughout Kenya's province and districts. In addition, the system's ability to reflect postemployment training will provide national planners with information for determining in-service educational needs regarding critical interventions, such as those provided through the PEPFAR initiative. As the system is still in its infancy, the data analyses are primarily descriptive. Nevertheless, the availability of information provides an evidence base for HRH decision makers.

There are limitations with the system. As noted earlier, employer requests for verification of licensure may not accurately reflect nurse out-migration and the reliability of this data source as a proxy indicator for nursing outflow requires further evaluation. Also, to more fully understand workforce dynamics, the current system will need to be nationally linked to an employment HRH information system, which could then be linked to salary and benefits. Additionally, the system needs to provide data on the reasons for nursing resignation or transfer. This information is neither collected by the NCK nor at the MOH worksite. As the project's current thrust is on creating an accurate, electronic system of data currently collected, modifications such as these may be recommended for the future. Additional limitations include instances where incomplete or inaccurate data entry occurs, as in the 59 cases where gender information was omitted (Table 4) or in the two records in which a nurse's age was entered as 15 years, an unlikely occurrence even for enrolled

nurses. Continuous data cleaning is critical in order to ensure integrity of the information.

Recommendations

In 2004 and 2005, the Kenya Workforce Database and Analysis Project presented some preliminary findings at two separate African regional venues. As a result of the first presentation at the 2004 East, Central, and Southern African (ECSA) Health Community Health Ministers Meeting, the participants formally recommended the development of an HRH information system within their respective countries based on the Kenya project (East, Central and Southern African Health Community 2004). Subsequent project presentations occurred in 2005 in collaboration with the ECSA Regional Office who facilitated the convening of a nursing regional meeting to further disseminate project findings. The HRH implications were immediately obvious and resulted in the participants drafting a joint letter to the U.S. Members of Congress requesting assistance to develop nursing database systems in their respective countries. In response, the 2006 U.S. Senate Appropriations Committee drafted specific language requesting CDC " . . . support countries in the ECSA Health Community to develop databases, disseminate health workforce database systems to other health professions, and continue to strengthen the capacity of nurses in Kenya . . . " (United States Senate 2005).

Garnering adequate resources for developing and maintaining HRH database systems is the underlying limitation to further advancement in this area. More often than not, foreign assistance supports categorical database systems to detect and track specific diseases. Unfortunately, disease-specific data systems do not facilitate the kind of broad-based HRH system enhancements health ministries so desperately need. It is fortuitous for Kenya that a second phase of support has been provided through the PEPFAR initiative.

In 2006, the Office of the U.S. Global AIDS Coordinator sanctioned the formation of the Human Capacity Development Technical Working Group, thereby underscoring the importance of HRH issues with regard to the PEPFAR initiative. This working group provides a forum for sharing best HRH practices and disseminating systems, such as this one, to other countries receiving PEPFAR resources. It is only through this kind of global recognition and support that appropriate and necessary HRH investments can occur.

The Kenya Workforce Database and Analysis Project offers an example of initiating HRH evidence-based practice. It is the first of many steps that are

necessary for addressing important workforce issues. The long-term goal of this endeavor is to provide Kenya with a functional and sustainable system for tracking their health care workforce. Analyses generated from this project will provide Kenyan policy makers with reliable and accurate information thereby enabling the country's leadership to make informed workforce policy decisions. This project serves as a model for assessing human resources and has demonstrated relevance to other sub-Saharan countries struggling with similar workforce issues.

ACKNOWLEDGMENTS

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