Evaluation of the Capacity Project's Human Resources Information Systems (HRIS) Strengthening Process in Swaziland, Uganda and Rwanda

July 2009

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ACKNOWLEDGMENTS

Throughout the process of conducting the assessment and writing of this report, we received invaluable assistance from the following people. In addition to all our interview respondents (see Annex A), we would like to thank:

- Ms. Carol Bales, HRIS Software and Usability Specialist, The Capacity Project
- Dr. Ousmane Faye, Chief of Party, The Capacity Project/Rwanda
- Dr. Linda Fogarty, Results and Knowledge Management Director, The Capacity Project
- Ms. Chazile Mavuso, Finance and Administration Assistant, IntraHealth International
- Dr. Pamela McQuide, Workforce Planning and Policy Advisor, The Capacity Project
- Dr. Vincent Oketcho, Chief of Party, The Capacity Project/Uganda
- Mr. Collin Sikwibele, Monitoring and Evaluation Advisor, Southern Africa Human Capacity Development Coalition
- Mr. Dykki Settle, Health Informatics Director, The Capacity Project
- Ms. Solange Tuyisenge, HRIS Specialist, The Capacity Project/Rwanda
- Ms. Shannon Turlington, Senior Systems Development Manager, The Capacity Project
- Ms. Julie Spero, HRIS Specialist, The Capacity Project
- Mr. Samwel Wakibi, HRIS Advisor, The Capacity Project/Kenya
- Ms. Anne Wilson, Director, The Capacity Project.

We are extremely grateful for their contributions to this report and would like to express our deepest thanks to all.

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LIST OF ACRONYMS

DDDM	Data-Driven Decision-Making
ECSA	East, Central and Southern Africa
HMIS	Health Management Information System
HR	Human Resources
HRH	Human Resources for Health
HRIS	Human Resources Information System
HWAB	Health Workforce Advisory Board
ICT	Information and Communication Technology
IT	Information Technology
M&E	Monitoring and Evaluation
MOH	Ministry of Health
MOSHW	Ministry of Health and Social Welfare
SLG	Stakeholder Leadership Group
WHO	World Health Organization

EXECUTIVE SUMMARY

Background

The Capacity Project worked to strengthen human resources information systems (HRIS) in several low-resource countries to assist decision-makers and human resources (HR) managers in identifying and responding to critical gaps in human resources for health (HRH). This included a focus on five key elements: 1) developing participatory HRIS stakeholder leadership; 2) strengthening information and communication technology (ICT) infrastructure; 3) developing and deploying software; 4) enhancing skills in data-driven decision-making; and 5) building in-country capacity to ensure sustainability and continuous improvement.

The findings and recommendations in this report cover the Capacity Project's implementation of HRIS in Swaziland, Rwanda and Uganda. This report is a synthesis of detailed technical findings documented in three country case study reports that were based on a series of key informant interviews in each of the countries between November 2008 and April 2009, and provides guidance to inform future HRIS planning and implementation.

Findings

The HRIS project combined several major cultural changes and introduced ICT to HR in an under-resourced environment that lacked infrastructure and experience with workforce planning. Considering this starting point and the unique conditions of each country studied, the project has been very successful. One key indicator of this success is the strong support offered by the ministries of health and professional councils in the three countries involved. System-level outcomes show a general increase in the accessibility, accuracy, efficiency, transparency and cost-effectiveness of HR information. Health workforce outcomes include improved HRH leadership and advocacy related to policy issues, increased HRH strategic planning and research, improved HRH management and personnel systems and easier verification of information on health care practitioners.

The use of HRIS was most successful in Swaziland, where reports were routinely used at the central Ministry of Health and Social Welfare and helped to dramatically reduce the number of vacancies in the system and improve recruitment. In Uganda, the strengthening process for the Capacity Project's iHRIS Qualify software at health professional councils supported the professionalization of the health workforce by providing a far more efficient and responsive information system. Rwanda's HRIS at the central Ministry of Health, although not fully implemented at the time of the evaluation, produced some previously unavailable reports on hires, transfers and leavers.

The impact of the implementation of stakeholder leadership groups (SLGs) varied; the SLG in Uganda was very successful and instrumental as a driving force in the HRIS process, while those in Rwanda and Swaziland provided more indirect support. The Project's collaborative yet guided approach of implementing iHRIS Qualify worked well and should be used as a model in future HRIS work. The Project's iHRIS Manage software took longer to develop; while sufficient for central aggregation and analysis, it lacks features most pertinent to district roll-out. The Microsoft Access step-solution applied in Swaziland appears limited in implementation and must be upgraded to a mature system. The general lack of local experience with computers and data

analysis hinders overall success by slowing data entry and inhibiting analytical use, particularly where HR departments are under-prioritized. The Project's guided coaching and training of users in data-driven decision-making through workshops are key to success, but more and longer sustained input is required.

The choice for a freely downloadable, Open Source software solution enables sustainability by providing access to a global support community. Of the three systems reviewed, the iHRIS Qualify system at the Uganda Nurses and Midwives Council seemed most sustainable, as the other two systems deal with ICT staff transitions and weak HR management support. The authors suggest that further effort focus on increasing sustainability by making linkages and collaborating with other ministries (education, finance) as well as the private sector. Rwanda's eHealth initiative is a promising development in this respect.

Key Recommendations

For improved HRIS development:

- Strengthen the project management approach
- Restructure and broaden SLGs
- Include user groups, ICT and content advisors in participatory development and customization process of software
- Implement international standards for data codes through eHealth strategies
- Improve access controls.

For improved data-driven decision-making:

- Allocate more resources for capacity-building in computer literacy, data entry and data analysis skills among HR staff
- Focus on concurrent professionalization of the HR function
- Strengthen the reporting process
- Integrate automated HRIS reports in publically available, central knowledge management portal websites
- Promote immediate system relevance at the local level to encourage linkages by introducing annual leave or training modules, or by linking the system directly to payroll
- Introduce an information feedback loop early in the process.

For improved sustainability:

- Implement retention strategy for technical staff
- Improve monitoring and evaluation; strategically plan early success stories for demonstration and provide information feedback loops
- Support Open Source ICT developers' networks and education
- Continue to strengthen networks.

INTRODUCTION

Overview

Strong human resources information systems (HRIS) offer support to the entire workforce, including policy-makers, managers and workers, and ensure that countries have the necessary human resources (HR) information to address critical health care issues. A mature and complete HRIS equips decision-makers with the data needed to answer key policy questions that can better ensure a steady supply of trained health workers; ensure that health workers with the right skills are deployed to the right positions and locations to meet health care needs; and improve retention of health worker skills and experience. Without this platform other aspects of systems strengthening may be more difficult to implement.

Historically, the Capacity Project has sought easy-to-use and sustainable workforce planning software. Since the Project did not view a commercial solution as a desirable fit within USAID's development context, we chose an Open Source software approach that avoided licensing and upgrade fees. Open Source software is distributed under a license that allows anyone to study, copy and modify the source code and redistribute the software in modified or unmodified form, without restriction. At that time, no Open Source HRIS solutions were available, so we decided to develop HR software in-house after other options had been eliminated.

In its second year, the Capacity Project began to work with the study countries to develop software solutions as part of a larger HR information strengthening process comprised of five key elements:

1. **Building HRIS leadership** using a participatory, inclusive approach that incorporates a thorough assessment of any related systems already in use
2. **Improving existing systems** as needed to support HRIS—networks, Internet connectivity, hardware, software, technical support and electrical supply
3. **Developing HRIS software solutions** customized to answer the key health workforce policy and management questions identified as critical for that country
4. **Supporting managers and decision-makers** to effectively use and analyze data for informed and confident decision-making
5. **Ensuring sustainability and continuous improvement** of the HRIS through training and technical support to build capacity in the country to independently support, use and improve the HRIS in the future.

We developed three main systems: iHRIS Qualify (a training and licensure tracking database); iHRIS Manage (an HR management system); and iHRIS Plan (workforce modeling software, not implemented at the time of this evaluation). The systems are available for both Windows and Linux and are integrated in an iHRIS suite. We also made available a stand-alone iHRIS Appliance hardware/software solution. We supported the design of intermediate step-solutions that used Microsoft Access software, as in the case of Swaziland and Lesotho. Capacity Project-supported HRIS strengthening activities took place in nine sub-Saharan countries (Uganda, Rwanda, Swaziland, Lesotho, Namibia, Kenya, Tanzania/Zanzibar, Southern Sudan, Botswana).

This report documents lessons learned from the HRIS strengthening process in Rwanda, Uganda and Swaziland, and is a synthesis of three separate country evaluation reports that provide more detailed focus on country-specific issues, including recommendations and respondent interview transcripts (Blair et al., 2009a; Blair et al., 2009b; de Vries et al., 2009). The reports were based on a series of interviews in each of the three countries between November 2008 and April 2009 to address the following questions: 1) How successful was system development, including efforts to involved stakeholders? 2) What is the quality of the system implemented? 3) How has HRIS strengthening affected national and subnational HR decision-making? 4) How sustainable are the systems? The current report will present this information following the five key processes of the HRIS strengthening implementation.

Addressing HRIS Problems

Most African countries rely on paper-based systems for HR management information, with mainframe computer systems located only in central ministries (e.g., Ministry of Finance) to run the payroll for all government departments. Countries using such manual systems tend to struggle with poor data access and accuracy, inefficient information delivery, fragmented and unshared data, payroll difficulties and a general lack of transparency. These issues mean that HR staff are often forced to make educated guesses when planning for HR and are prevented from tracking human resources for health (HRH) and costing issues efficiently and effectively.

Inaccurate and inefficient information

Several interview respondents noted inaccuracies in the old HRIS; since HR information staff did not have access to up-to-date information, they could only supply data they already knew to be erroneous. The systems in all three countries did not supply proper information on vacancies, and staff-in-post information was compromised by several staff being attached to the same post or at a wrong location. Posts were usually not categorized in a logical manner according to job families, making the data difficult to use for planning purposes.

In addition, the system could not accommodate registrants with multiple qualifications, particularly in the case of the various nursing training levels such as the enrolled or registered classifications. As a result, professional council manual records were compromised by double-counting. Employers and members of the public could not easily verify whether clinicians' claims to be registered were valid. The process of registration was very slow, and file retrieval was even slower. Some qualified students went into employment without registration to avoid paying the fees, and difficulties in accessing files led to the inability to identify many of the individuals who registered fraudulently or were impersonating others.

Also, the various entities of the health sector did not, and could not, work together to share HR data. Because a comprehensive HR system did not exist, different development partners and agencies created unlinked HR subsystems. Because data were not adequately shared, generating information about the health workforce in the country posed a serious challenge, and responses to simple questions sometimes took a month.

Inadequate data for decision-making

Given the incomplete and poor quality of available data, HR staff had limited understanding and capabilities to provide useful HR information to senior management. It took months of effort to

go through individual files to analyze the demographic profile of registrants. Even then, errors occurred as files were moved from office to office for reasons of day-to-day administration. There were delays in identifying vacant posts for promotions, as this process was dependent on letters between the different tiers of the Ministry of Health (MOH). There was no accurate master filing system that enabled names and numerical file codes to be matched and retrieved easily, which usually meant that whole shelves or cabinets of files had to be searched on each occasion. Sometimes files and appraisal forms were lost, due to circumstances such as changes in office location. In addition, an ever-growing amount of shelf space was required, when space was at a premium.

Inefficient human resources management

Due to poor payroll management, newly recruited staff were often not paid for three to four months; in a few extreme cases, staff were not paid for an entire year. Some retired staff died without receiving a pension. Several respondents noted that the process for identifying ghost workers—workers who remained on the payroll but were no longer active in the workforce due to retirement, termination, death, etc.—and stopping their salaries often took an average of six months, with some cases taking nearly two years.

Also, the paper-based system lacked transparency, and the complex sequence of steps involved in recruitment or other HR processes left a complicated audit trail**.** At the facility-level, managers submitted proposals to the personnel unit, which processed and made changes to the proposal, then forwarded it to the Ministry of Public Service and to the Civil Service Commission for final approval. This process took six month in most instances, so it was difficult for facility-level staff to know the status of their vacancies. Because up-to-date workforce data were not available, their absence, whether due to double-counting or missing files (both of which were often discovered as data were entered into the HRIS) was not necessarily noticed.

METHODOLOGY

Research Strategy

For the study, the Capacity Project team used a qualitative research methodology complemented by documentary research. We developed a semistructured interview tool with open-ended questions. When possible, we sent the questionnaire and a consent form to respondents in advance for their review and preparation. We transcribed a selection of audio recordings particularly rich in detail and used these transcripts as source material for quotations. We also analyzed thematic content using QSR Nvivo qualitative analysis software. We analyzed government reports as well as Capacity Project documents such as meeting minutes, trip reports and annual workplans.

We presented preliminary findings and recommendations to the major stakeholders involved in the study in Uganda and Rwanda, and they subsequently provided their endorsement.

Data Collection and Sampling

We chose Swaziland, Uganda and Rwanda as sites for the case studies because systems had been in place the longest in these countries. The HR challenges in the three countries are quite

similar, including shortages of doctors and nurses and too few staff in rural areas. Rwanda has the most decentralized structure, yet districts overall are very under-resourced.

Teams consisting of a health workforce planning expert and an HRIS specialist interviewed 61 key informants via a one- to two-hour semistructured interview (see Table 1).

Table 1. Respondents Interviewed, by Country (See Annex A)

Country	Interviews
Swaziland	20
Uganda	26
Rwanda	14
Regional (East, Central and Southern Africa)	1
Total	**61**

The teams targeted respondents who played an active role in either the implementation of an electronic HRIS or HRH in general. Teams purposively sampled within three key groups: HRIS developers and managers; participants of stakeholder leadership groups (SLGs) and decision-makers who use HRIS for planning; and regular users of HR information, including personnel departments, heads of departments, council registrars and regional managers or matrons. Interviewers obtained permission to conduct and record the interviews using a standardized consent form, and kept all interview data confidential.

THE IMPACTS OF HRIS STRENGTHENING

Unique Development Paths

In each country, the initial conditions of development strongly influenced the development process. As the Swaziland Ministry of Health and Social Welfare (MOHSW) was publicly perceived to be a failing ministry, the initiation of the HRIS was complemented by merit appointments in senior management. As the principal secretary noticed the system's utility in addressing health service problems, information generated by the HRIS about major vacancy problems reached the prime minister's desk and quickly became a major focus during the launch of the country's new health policy. Within this enabling environment, HRIS strengthening efforts had a remarkable impact with very little technical assistance. However, in Rwanda the strong emphasis on decentralization made for a more challenging development environment that lacked sufficient support staff at the central-level, where iHRIS Manage was developed as a test project. Thinly spread district resources in Uganda and Rwanda meant little time for HR managers to take on new data entry activities.

Table 2 shows the relative progress of HRIS strengthening in each country according to each of the five development phases. The development of iHRIS Qualify and customization of iHRIS Manage in Uganda is most advanced.

Table 2. Implementation Progress in Three Countries Studied

Country	HRIS assessment	SLG	Infrastructure strengthening	iHRIS Manage or equivalent	iHRIS Qualify or equivalent	Data use for decision-making	Sustain-ability
Rwanda	Not conducted	Established	Led implemen-tation of MOH network	Complete at MOH but in restricted use. Rolled out to 22 districts (June 2006)	Interest expressed	Workshop conducted	eHealth strategy in develop-ment; HRIS manager trained
Swaziland	Complete	Established	New computer hardware delivered and in use	Access database complete and in use (Oct. 2006)	Interest expressed	Workshop conducted, advanced use	Cooperation with South African Health Workforce Coalition; high usage by central ministry
Uganda	Complete	Well established	Complete at central-level	Complete at MOH but not in use. Rolled out to two districts. (June 2008)	Complete at professional councils (Sep. 2006)	Workshop conducted, advanced use	Integration in knowledge management portal; Health Workforce Observatory; local developers and managers trained; high usage at councils

Rather than having central ministry staff enter data themselves, there was a strong push at the central-level to put data entry duties in the hands of district-level staff via the implementation of iHRIS Manage (or equivalent). District implementation was most advanced in Rwanda, where implementation staff rolled out iHRIS Manage to 22 districts, half the total target. Staff in Uganda rolled out in two pilot districts. At the time of this assessment, respondents in Swaziland noted that district roll-out was being planned; this has since occurred. In Uganda's Lira District, staff supported by the World Health Organization (WHO) organized HRH data prior to implementation, which substantially helped increase district readiness for HRIS implementation.

Health System Outcomes

Improved data accessibility

HRIS strengthening greatly improved accessibility of information. Data files are now easily retrievable and contain several fields of identification that can be easily separated or aggregated. The HRIS provided a mechanism to organize available data and make them accessible to a larger audience.

The enhanced access means that staff can pull out information at a moment's notice and with a sizable reduction of paper shuffling. As a result, many local managers found out that they had vacant posts they had not previously known about due to the prevalence of ghost worker data in the old system.

Improved data accuracy

The improved accuracy had an unprecedented and immediate impact. After data were entered and aggregated in the HRIS, individuals no longer appeared twice in the systems, thus providing a much more accurate representation of qualified health workers in the country. Further, all qualifications now appear in one electronic form, as opposed to several different registers, making it easier to avoid mistakes when aggregating data across cadres. In addition, the consolidation of data in one location has made visible previously unknown gaps that can then be rectified. A registrar in Uganda described recognizing the absence of about 100 files of which the registrar was previously unaware.

The HRIS has also made data entry much easier, resulting in more timely data. Further, the new system has allowed better oversight regarding staff who lack proper licensing, and inconsistencies in the licensing process can be observed and remedied. A representative from one of the Uganda professional councils noted a general laxity in licensing before HRIS, which was remedied by the system. This new ability to easily access, verify and update data with the iHRIS software has improved the council's data accuracy. At the time of the evaluation, a few users in Rwanda had used the reports to verify and improve the accuracy of their data.

More efficient systems

Many respondents remarked that the HRIS reduced the time it took for inquiries or problems to be dealt with. For example, the time required to identify ghost workers and stop payment on their salaries was reduced from several months (an average of six, with an extreme of two years) to one month or less. One Swazi official pointed out that the HRIS was particularly helpful in speeding up the time it takes for data verification. With respect to a promotion or appointment, HR staff can now verify the employee's status and identify vacancies almost instantly, whereas this process had previously taken between four and six months. Another official similarly echoed that it used to take three to six months to get people on the payroll; this can now be taken care of in a matter of seconds. The implications of quick payroll data uptake are clear in terms of reducing staff frustration. Under the old system, many health workers who had relocated from distant regions were not reimbursed for transportation or rent, or were only reimbursed after many months. A health worker who receives no pay for three to six months becomes much less motivated to perform well and may shift to the private sector.

Increased transparency

Respondents noted that the new HRIS had a large impact on transparency, in particular on the hiring process. In Rwanda prior to the Capacity Project's work, HRH information was collected as part of a more broadly focused 26-page health center report and a 40-page report from district hospitals. The HRIS condensed the information from all of these forms into a single form, making the information much more transparent. In Swaziland, respondents noted that because the HRIS allows users to see the location of a request in the system and what action is

pending, the complex sequence of steps involved in recruitment was made much more visible. Further, because of the monthly circulation of paper reports, managers at the facility-level were much more aware of the status of their requests. As the flow of health workforce data has increased, information is now communicated from the level of facilities and departments to that of the ministries and back again, creating a feedback loop that has dramatically improved systems transparency.

Improved cost-effectiveness

We did not consult financial data to engage in a true cost-benefit analysis. However, Swazi respondents suggested that the immense time savings offered by the HRIS—more efficient finding, updating and sharing of information (including reduced travel expenses) as well as reduction of the time to eliminate errors such as ghost workers—translates into substantial salary cost-savings. Clearly, optimization of workforce planning helps to increase efficiency and reduce wasteful spending. For example, a senior nurse matron noted how the HRIS helped him schedule staff to work in positions for which they were best trained. One respondent remarked that an alternative way of looking at cost-saving is to suggest that an HRIS "frees up funds tied up elsewhere." For example, if a post has been created and stands vacant, funding that has been allocated toward that post is not available for other needs.

Health Workforce Outcomes

Because iHRIS Manage is in early stages of use in Uganda and Rwanda, it has not yet been extensively used for national-level strategic planning. Consequently, we selected a disproportionate number of the insights below describing the use of HRIS for data-driven decision-making (DDDM) from respondents in Swaziland. iHRIS Qualify has been used by the Uganda Nurses and Midwives Council since 2006. Table 3 shows the current HRIS usage by category in the three countries. Note that before HRIS strengthening, none of the countries had implemented an HRIS other than a general mainframe system for payroll management located at a central ministry, such as Swaziland's Ministry of Public and Service and Information, or simple Excel spreadsheets, as in the case of Rwanda's central MOH.

Table 3. Current HRIS Usage in Three Case Study Countries

Usage Category	**Swaziland** Microsoft Access	**Uganda** iHRIS Qualify (iHRIS Manage)	**Rwanda** iHRIS Manage
Leadership, policy and advocacy	X	X	
Strategic planning	X	X	
Research support	X		
Monitoring staff numbers	X		X
Vacancies and recruitment management	X		
Attrition (promotion, seniority) management	X		
Identifying ghost workers and misaligned staff	X		
Support of budgeting			
Payroll management	X		
Detecting licensing fraud		X	
Looking up records	X	X	X
Planning staff rotation	X		
Planning training needs		X	

Ministerial HRIS information needs and interests differed distinctly from those of the district-level staff. Ministerial staff in all three countries wanted strategic information to identify the extent of national problems, evaluate the effectiveness of action taken to address them and identify the extent of regional disparities in staff numbers.This covered both the relationship between staff establishments and workload and the number of vacancies. Many ministry respondents were concerned with the very pronounced shortage of doctors outside the main cities. Districts, on the other hand, were more concerned about the availability of existing staff to provide services and whether training was allocated on a fair and rational basis.

Improved human resources for health leadership, policy and advocacy

Swazi respondents noted that the symbiotic combination of HRIS information with political advocacy provides a key strategic advantage to professionalize the HR function. For example, the Swaziland MOHSW analyzed vacancies and staffing needs with the HRIS to create detailed and well-supported staffing requests from the central government (Ministry of Public Service and Information). As a result, approximately 200 posts were approved and added during the first year of the HRIS, and 300 posts were added the next year. In addition, the MOHSW used HRIS reports to request and receive new posts to absorb contract staff, ensuring continuity of services. Further, HRIS-produced information about workforce numbers and HRH problems reinforced the need for a Health Services Commission to be written into the new HR Policy in Swaziland.

The local levels joined in similar advocacy efforts, where the monthly feedback loop of reports to facilities allowed local HR managers to communicate their needs back up the chain. At the facility, regional and central-levels, the HRIS provides a better view into misaligned health workers and empowers HR managers to trace back the errors and report them to the central HR unit.

In one example of the impact of these efforts, a very under-staffed psychiatric hospital had been paying seven nurses who were working at other health facilities, while employing three workers in its own facility who were being paid from other facilities—a net loss of four nurses. Yet despite this net loss under the old system, management viewed the process of moving staff to the right areas as too slow and paperwork-intensive to correct the situation. With the new HRIS, the misaligned workers can be identified and the situation rectified much quicker and easier. In Uganda, the Pharmacy Council used the HRIS reports to successfully argue its interests to develop better national legislation. The Pharmacy Council also used HRIS reports to improve access to pharmacy schools by successfully lobbying the local pharmaceutical industries to establish several scholarships for students who could not afford the fees.

Increased human resources for health strategic planning and research

Swazi respondents noted that improved monitoring of HR resources will eventually show a decline in the number of uncoordinated requests for posts, which translates into more efficient capital investments. The system has encouraged managers to use their existing resources more effectively. In Swaziland's Lubombo District, a workshop using HRIS and health management information system (HMIS) data resulted in a change in the planning approach, focusing less on requesting additional posts and more on reviewing the optimal skill mix of staff (see sidebar below).

The Benefits of HRIS Data in Swaziland's Lubombo District

Lubombo officials had complained of low staffing levels. During a planning exercise after HRIS implementation, the statistics unit combined worker data from the HRIS and HMIS. Officials were surprised to find they actually had higher staffing levels than other regions, in large part due to the strong support of faith-based organizations and missions. As a result, planners turned their attention away from the central-level and focused on better internal allocation of existing resources. Thanks to the HRIS data, they also discovered that several health workers who had transferred to other facilities long ago were still on the payroll in their original facilities. They were able to rectify the situation and ensure that workers were paid from the right source and transferred to other regions when needed. Upon finalization of their regional workplans, officials received more surprising reports: they had been allocated new posts, but the HR department had not notified them of this fact. Regional leaders renewed efforts to advocate for filling those posts. Without the HRIS data, they would have remained off-target in their strategic approach.

The personnel unit itself has taken a more proactive role in informing department heads of upcoming retirements, promotions or concluding contracts. As insight into the number and distribution of vacancies increases, recruitment will become more effective, and issues of staff allocation, geographic equity and deployment will become more critical. This would produce both budgetary and health services benefits.

In Uganda, the MOH reported that HRIS information about numbers and distribution of staff specializations across the country brought to light not only resource needs of training institutions, but also insight into the relationship between where health workers do their training and where they take up posts. Thus, the HRIS could be used to address geographic disparities in health workforce training and deployment.

HRIS has also enabled students, nongovernmental organizations and other researchers to conduct more accurate research. For example, a WHO consultant used Swaziland's HRIS data to recalculate staffing levels and determined that the country's presumed lower middle class status in terms of the number of doctors per 100,000 has been overestimated (Ruck, 2009).

Improved human resources for health management and personnel systems

The HRIS has made the largest impact on strengthening the management of the HR system, particularly the precision with which personnel systems are managed. Files can be accessed much more rapidly and accurately since individuals only appear once in the database. In Uganda, the MOH allocated resources more rationally by relating the numbers of staff to patients, using both HRIS and patient information. In Swaziland, HR managers can now monitor transfers and take action to speed the process when necessary, thanks to improved tracking in the recruitment process. Managers can now place new staff on the payroll much faster, typically after two months as opposed to the previous average of six months. The system enabled a nurse manager at a regional referral hospital to make the best use of scarce, skilled nurses and in planning nursing rotations among different clinical areas.

Easier verification of information on health care practitioners

The easy access to data has allowed for increased verification of the identities of registered and employed health care professionals. In Swaziland, a larger number of health workers are registering with professional councils thanks to the HRIS. Several respondents in Uganda noted

the immediate use of the HRIS to verify identities and qualifications. At the Nurses and Midwives Council, the data revealed a significant gap between the number of nurses and midwives who are trained and those who receive licensure. Data show that 21,888 nurses and midwives entered training between 1980 and 2003, but only 14,637 of them completed their education and became registered with the council, and just 7,022 have a current license. These results are influencing funding for pre-service education and workforce projections. Also, it is now more difficult for individuals to falsify documents and/or impersonate someone. When people come in for renewal, council staff can verify their current information, easily picking out impersonators.

Impact on Health Services

The HRIS directly strengthens HRH, as the previous examples have demonstrated. Though it is commonly assumed that the HRIS will also indirectly improve health services, in this study we have not been able to provide empirical evidence for this linkage. Nevertheless, anecdotal observations suggest that increases in worker productivity and performance have led to increases in the number of patients seen and have improved client satisfaction, eventually translating into more lives saved. Furthermore, improved access to accurate, timely data is thought to greatly increase the capacity of planners and decision-makers to identify the configuration and number of health workers needed to provide key health services. While HRIS alone will not improve services, it is a key component that creates efficiencies, increases effectiveness and puts a tool in the hands of ministries and others to plan, budget, deploy and track success in service access. It also enables ministries to more effectively advocate for services and relevant health workers because the ministries and planners have the data to make the case. This notion is supported by micro- and macro-level studies (Joint Learning Initiative 2004; WHO, 2006).

STRENGTHENING INFRASTRUCTURE FOR INFORMATION AND COMMUNICATION TECHNOLOGY

In Rwanda, the HRIS team worked in the central MOH to improve wiring and connectivity, networking, the physical information and communication technology (ICT) server room, standard software and office equipment, including projectors, copiers, laptops and desktops (Spann, 2005). Similarly, the team complemented the installation of iHRIS Qualify 1.0 in the Uganda professional councils by undertaking an office-wide information technology (IT) strengthening process, including the establishment of a local area network.

Despite overall success, when technical failures developed in Rwanda, the situation unfortunately took longer than expected to resolve as a result of a lack of local IT support. A similar problem occurred when the MOH's revised IT structure blocked opportunities to rectify the situation. In response to these issues, the HRIS team developed better procedures and structures within the hardware implementation process, which included locating servers outside the MOH and utilizing several manual backup systems.

The Rwanda MOH staff noted that it would have liked local technicians to be more closely involved in the development and maintenance of the system. Although local technicians initially

may not have had sufficient expertise, the Project learned that building local capacity is essential to ensure that the software is sustainable. Specific on-the-job training, rather than more general training at schools, seems essential for ICT support staff. MOH staff noted that ICT staff training should ideally occur over a period of three to five months, as one-week workshops were inadequate for capacity-building.

iHRIS Manage has been developed as a central-level software solution, which tends to make it somewhat irrelevant for district needs. A number of unforeseen serious technical issues surfaced during district implementation, including a lack of standardized entity codes, infrastructure problems (such as inadequate hardware, Internet connections or electricity), access-control problems and a lack of training in computer use and absence of technical support. To offset Internet connection problems, the HRIS team strategically developed a stand-alone offline version and an all-in-one HRIS appliance.

STAKEHOLDER LEADERSHIP DEVELOPMENT

The effectiveness of stakeholder engagement varied significantly. Efforts in Uganda were very successful, as the Health Workforce Advisory Board (HWAB) met more or less monthly during its initial phase, remained stable and made significant development contributions, without being seen as duplicating efforts made by an existing HR Working Group.

The SLGs in both Rwanda and Swaziland were less successful. In both cases, the SLGs were more formal and only indirectly committed to the process. In Rwanda, the pre-existing HR Technical Group had a broader membership—including donors—and a consequently wide agenda. In this context, HRIS implementation was of very little direct interest to non-MOH members and the SLG reacted only passively. In Swaziland, the staff involved in the SLG were possibly too senior, already overcommitted in their responsibilities, and the body acted more as a place to formally approve steps to be taken. In the end, a small group of dedicated people drove the Swaziland process, with the nursing official taking the lead.

According to key informants, the following factors contributed to the success of the SLG in Uganda:

- Members were highly motivated, and found the time to meet sufficiently often to control the various projects. The lack of reimbursement as an intentional strategy on behalf of the workforce policy advisor to ensure committed participation might have played a role.
- Through their own experiences, the HWAB members recognized the need to strengthen HRH data. Several members who had worked together on previous projects, such as a retention study, helped develop the HWAB. Some members had, thus, already developed working relationships and reached conclusions about HR data improvement needs.
- A study trip to the Kenya Nursing Association fostered commitment to develop iHRIS Qualify among members.

- The leadership, drive and diplomatic skills provided by the Capacity Project/Uganda chief of party and the senior workforce planning and policy advisor, both involved in driving the process, were remarkable.
- The HWAB's 26 "Guiding Principles" was markedly different from the Swaziland SLG's "Agreed Principles of Operation." Most notably, the Ugandan principles are largely focused on the HWAB members' relationships and organizations and stressed respect, equality, mutual support and efficiency, while the Swazi principles focused on tasks that needed to be accomplished.
- The MOH perceived the HWAB as being outside of politics, a noncompetitive partner relative to other MOH interests; thus the HWAB was immune to usual competitions over scare resources from donors. The MOH HR department was reportedly "an orphan" at the time the HWAB was created and the HRIS did not pose a threat to other entities. The fact that the HWAB is not a decision-making body helped to sustain this image as a noncompeting partner to MOH interests.

SOFTWARE DEVELOPMENT AND DEPLOYMENT

iHRIS Qualify and iHRIS Manage Software Development

Generally, iHRIS Qualify was developed quickly and exceeded user needs, which we found partly attributable to the fact that developers benefited from the knowledge of the professional council, strong in-country project leadership and a senior workforce and policy content advisor. While users and advisors worked closely with the developers in Uganda, this mix of stakeholders was not nearly as efficient in Rwanda, where the development of iHRIS Manage lacked the support of a workforce management advisor.

The iHRIS Manage development was relatively unplanned, and emerged out of ongoing improvements on to an initial spreadsheet in response to repeated requests by the Rwanda MOH for a central-level workforce deployment tracking database. Few in-country staff had experience with management software systems, and the lack of a senior advisor was exacerbated by poor retention of technical and managerial staff (both at the MOH and at the United States and country-level Capacity Project offices), communication problems due to a lack of strong project management tools and unforeseen technical failures. The latter included a server backup problem that was exacerbated by a concurrent firewall change at the MOH, which halted progress considerably and led to a shared mistrust.

Data Entry, Updating and Quality

Efforts in all three countries have included major initial investments in data entry. Particularly for low-resource ministries or councils, data entry support has proved instrumental in getting an HRIS project going. With respect to the councils, historical data entry was first undertaken by the Capacity Project, but new registrant information is routinely entered by council staff themselves. Most councils have completed or are near completion of data entry.

Aside from the difficulties of linking remote regions electronically, district or local data entry can also be problematic because of a lack of basic computer and typing skills and potential

conflict regarding hardware ownership (e.g., computers are sometimes viewed as status symbols). For the Uganda councils, information on registrants is entered into the iHRIS Qualify database as individuals register with the councils for the first time or during renewal. At least one Uganda council reported that at the time of the evaluation they did not have adequate staff to continue data entry. Although the Capacity Project employed data entrants to enter the bulk of historical data, their contracts ended in December 2008.

Respondents in all three countries noted the need for more code standardization. In Rwanda's multilingual context especially, data entry is hindered by the lack of standards in coding. Work in this area is now taking place in Rwanda and Uganda but should have taken place in an earlier phase of the project. Suggested areas for standardization include entity codes (hospitals, districts, etc.), district-level codes (leaver codes, joiner codes, position titles, etc.), occupation codes and nationality codes for foreign staff (e.g., DR Congo doctors in Rwanda).

In Swaziland, the circulation of paper HRIS staffing reports on a regular (monthly) basis to health facilities has led to enhanced data entry, updating and quality. The reports are verified locally and returned to the MOH with recommended adjustments through monthly meetings. This starts an information feedback loop that has proved crucial not only for working out database inaccuracies, but also for enhanced motivation, relevance, ownership and even HRIS advocacy at district levels.

Usability

As with all software systems, users must maintain regular interaction with the HRIS to retain familiarity with the system and its possible applications. Several iHRIS Qualify users found the software to be user-friendly and had very few complaints, but steps could be taken to improve usability nonetheless. Some users found it confusing to navigate and input data into iHRIS Qualify. There remains a possibility of entering duplicate records, and some users found it difficult to produce custom reports or were unfamiliar with the Linux-based software version. Too, the iHRIS software is sometimes misaligned with existing paper data collection forms. With respect to iHRIS Manage, the link to add, update or change positions was frequently (although not consistently) faulty; some users were unable to print or export reports to common Microsoft Office applications. Some remarked that the interface for the system was not intuitive, and other users voiced a desire to see individuals' positions and the facilities at which they work when searching. Respondents perceive Swaziland's Access-based system to be user-friendly and simple to follow, but customization of reports was generally inaccessible for nonexpert users. The evaluation team found that some of the users did not seem to know how they could request these customizations.

Security, Access Control and Confidentiality

Some serious concerns arose regarding access control to iHRIS Manage and the Swaziland Access-based database; staff could alter records that were not under their purview. This is because both software solutions were designed for use in highly centralized organizations with a key HR staff member in overall control. In Swaziland, all staff have access to data via a few general passwords; security is not tied to personal identification (password-protected role-based access accounts). With respect to iHRIS Manage, managers can view and modify data at any hospital. Further, having access to multiple facilities also made the software less efficient,

since it was difficult to filter out data from other facilities. These faults go against good practice and were being addressed by the development team.

Data confidentiality was a concern in negotiations between the MOHSW and the central ministry before the development of the HRIS. Direct database linkages between the MOHSW and councils were constrained by organizational and confidentiality issues since the councils are chartered to remain independent. The linkage between the system and confidentiality in the personnel unit itself posed another problem. Particularly when it concerned high-level HR changes, the most senior HR officer often excluded certain data from the system in order to ensure confidentiality even within the personnel office.

Linkages and Institutional Collaboration

A solid linkage between HRIS and payroll systems reduces duplicate data entry and improves the accuracy and timeliness of HR information. Such linkage is difficult to achieve, particularly at the startup phase, because the benefits of an HRIS are not immediately perceived unless information is shared. Central government officials are often initially reluctant to embrace the idea of an HRIS and automatic linkage to payroll because of issues of confidentiality, fear of duplication and fear of changes that might have unforeseen consequences. In Swaziland it took six months of careful negotiation and trust-building between MOHSW HRIS champions and the central government managing payroll before payroll data were released on a monthly basis to the MOHSW.

Generally speaking, the success of the SLG depends largely on collaboration. In Rwanda and Swaziland, the need for increased collaboration is more evident than in Uganda because collegial relationships had already developed there via the HWAB. Respondents from all three countries urged a closer collaboration with the Ministry of Education in order to incorporate training and scholarship information.

The private sector must also be included in this collaboration. In Swaziland, for example, private-sector facilities reportedly resisted submitting data to the MOH due to confidentiality concerns. To overcome this, one solution may be the promotion of an amendment to the public health act that includes required submission of health information from the private sector and registration with professional councils (currently not the case for medical doctors).

Skill Enhancement in Data-Driven Decision-Making

Strategic Report Planning

Report generation generally benefits from HRIS champions—individuals who can share with others what reports might be usefully generated. Most reports in the three countries are generated upon request, although some reports are created at regular, scheduled intervals in each country. The Rwanda HRIS specialist created and submitted reports monthly, quarterly and annually, including a quarterly worker skills audit. The Swaziland statistics unit also plans to disseminate a monthly report listing staff changes such as promotions, retirements, deaths, study leave, contract endings or other causes. However, these were the only examples we found of explicit report planning or tracking in any of the three countries. The evaluation team

also found that district decision-makers and users have more operational (day-to-day) and less strategic user needs for the software compared to the central MOH.

Further, as noted by a number of Swazi respondents, staff initially lacked interest in generating HRIS reports, possibly as a result of the vast differences in the appearance of the HRIS from the paper-based system or the complexity of the information provided. This prompted the Swazi HRIS implementation team to model HRIS reports on pre-existing report forms.

In order to enhance DDDM, the development process includes successful generation of reports and implementation of a reporting process. Standard reports available in each system were developed by reviewing the strategic questions posed by the SLGs and requests made by implementing partners. Because respondents found the custom report tool too difficult to use, they often asked the HRIS programmer to write more easy-to-use standard reports. In Swaziland the ability to generate customized reports remained only within the statistics unit. In Rwanda, the HRIS specialist was the only person at the time of the evaluation who regularly used iHRIS Manage to produce reports. Some respondents were interested in the types of information produced by other governments, such as annual reports, to build upon others' ideas about content and layout.

Swazi respondents noted difficulties in report dissemination; local stakeholders were not circulating reports they received, and only a few point people received the reports locally. This problem was addressed by disseminating reports at cadre-specific meetings to better ensure that reports reached their intended recipients.

Respondents expressed few problems concerning the publishing of reports. The Uganda MOH's knowledge management portal provides an excellent model of supplying a large volume of workforce information. The aim of the portal is to integrate information from the Capacity Project's HRH Global Resource Center, HRIS data, the HRH Action Framework, clinical resources from journals and websites and MOH documents in a single electronic point of access. Using this model will save staff time, as this will be the first-line source of information; users will not need to contact HR staff directly.

HRIS Training

Project staff carried out initial training on systems and data usage in concert with the HRIS implementation, and a local Capacity Project team member also offered training on the HRIS. Trainers perceived a general lack of basic computer literacy among many (especially senior) staff, particularly in rural areas. Many district-level data entry staff could work faster by being trained in touch typing.

Trainers faced an obstacle in determining how best to translate ICT language into a simple, plain form easily accessible to HR managers. In Swaziland, for example, the central HR staff initially felt the "statistics unit database" fell outside their usual administrative responsibilities and were reluctant to engage the new system. To resolve this issue and emphasize the system's relevance and benefits, the local statistics development team introduced the system to the HR team in the form of a general HR workshop, identifying objectives, and then later illustrating the utility of the HRIS in providing responses. This strategy of approaching the training as HR training as

opposed to more technical HRIS training helped align relatively computer-illiterate personnel with the HRIS.

Data-Driven Decision-Making Workshops

The frequent transfer of HR staff across ministries, particularly where HRH staff are managed by other ministries and promoted in and out of the health ministry, added another hurdle. High turnover rates emphasized the need to train all personnel departmental staff on the HRIS. A respondent from one of the councils noted that the people initially trained on data entry are no longer in those positions, and new employees are now entering data. Regional managers in Swaziland expressed a need for training such that the managers are able to handle the system and train others in using it, fostering sustainability at the regional level.

The team addressed these issues by conducting DDDM workshops, which were held in each country for HR planners and managers after the system installation to improve skills, address policy and management questions particular to each country and determine next steps for HRIS strengthening. These workshops were instrumental in furthering the understanding of HRIS utility through demonstration in Swaziland and Uganda. This was less the case in Rwanda because of the lack of a complete system, although participants agreed the workshop adequately addressed their expectations regarding HR management and planning, data systems, data collection plans, data quality, data use and data sharing (McQuide et al., 2008).

The DDDM workshop in Uganda in the fall of 2007 provided the first opportunity for the HRIS team and participants to review and discuss reports from the iHRIS Qualify system in the Nurses and Midwives Council at a national level. The following initial outcomes, observations and lessons resulted from the workshop:

- DDDM is a journey or process for making effective collaborative decisions, not a destination. This process is characterized by collection, integration and dissemination of data to answer policy and management questions; analysis and reporting of data; and process and procedures for acting on the data.
- Perhaps the most important part of DDDM is enabling decision-makers to use it. Colorful reports, graphs and pie charts will have no effect unless they are combined with active leadership, change management and effective professional development for the key decision-makers.
- There is considerable HR data and even decision-ready information residing in individual silos—the challenge is to move all these data to relational databases through a secure network to store and access data and present it to decision-makers (Adano, 2007).

Further participant feedback from Uganda noted that the workshop gave meaning to the data they had been generating and built up credibility and interest in establishing HR information systems (Bales and de Vries, 2009). As this was the first time participants had integrated information from the various subsystems in HRH, they learned to see how all HR pieces fit together and provide meaningful information. Interestingly, for many respondents, the most surprising realization is typically the amount of data already available from different subsystems. The workshop worked to drive home the point that an HRIS is a phenomenal tool for data integration, wherein the sum becomes much more important that the parts.

ENSURING SUSTAINABILITY AND CONTINUOUS IMPROVEMENT

Continuous Support of Data-Driven Decision-Making and Training

This process of first improving the HRIS reporting function, then providing individual training in HRIS usage and then conducting a DDDM workshop has succeeded in introducing HRIS to a profession that is relatively void of data analysis. However, more internal support and intensive coaching are needed to sustain this success. One Rwandan respondent suggested that training for district HR managers should focus on how the reports and data from the system can be used to solve district-level problems, instead of how they can be used for national-level planning. In response to HRH staff's desire to use the information supplied by other countries' health services as a learning tool for their own situations, the HRIS team organized regional meetings on HRIS, where implementers from many countries have opportunities to share stories and lessons learned. Participants in these meetings noted an increase in their understanding of and appreciation for the role of data and information (Capacity Project, 2009).

Retention within the HRIS Development Partnership

Capacity Project staff allocated to HRIS typically consisted of an HRIS specialist and a more senior person who can open doors at senior levels and champion the project. The loss of either member of this team can pose challenges to sustainability. This was a particular concern in Rwanda. The Capacity Project/Uganda chief of party had not only been with the Project for some time, but was also very influential within the MOH and had held a senior post there. Likewise, the success of the iHRIS Qualify software in Uganda was due in large part to the stability of the SLG there, in which turnover of individual members is buffered by the overall ability to avoid the loss of social and institutional memory and momentum.

Human Resources for Information and Communication Technology

Skilled and experienced technical staff who can work effectively with senior managers and future users are in short supply throughout the world, particularly in low-income countries. Few staff in each country possess the technical skills to support the HRIS initiative. Despite the existence of shadow programming teams in Uganda, this was an obvious sustainability concern expressed in all three countries. The server problem of iHRIS Manage in Rwanda might have been avoided if the programming team from the Capacity Project in the United States had persisted in their efforts, despite turnover, to put in place a standard mechanism where solutions are verified for their applicability or sustainability before implementation, including the local availability of ICT support. In Swaziland, respondents noted that the implementation of a technical help desk or the consistent employment of an HRIS trainer to train people on how to use the system will be an ongoing need in the context of high staff turnover in HR, and might be advisable at the global or regions levels.

Dedicated Ministerial and Professional Council Staff

HRIS implementation is a large-scale project, and as such requires significant time for in-country (MOH) senior management to advance it and for MOH analytical staff to turn data into valuable management information. The staff establishment in the Rwanda MOH was too small and subsequently overstretched in terms of workload, which meant that there was limited ability to focus efforts toward driving the HRIS project forward. Respondents in all three countries voiced concern regarding the lack of internally funded positions at the central level dedicated

solely to HRIS. The MOH must view HRIS as an integral part of its business model before needed permanent contracts can be established. This should be a strategic project goal.

The Capacity Project initially funded data entry staff to populate the databases in all countries, and then handed the system back to local staff for local data entry. Unfortunately, several councils in Uganda as well as the MOHSW in Swaziland did not have the staff to continue data entry and keep the registers up to date. Too, backlogs may develop in the larger councils when staff leave or are absent with long-term illness. Councils do not share data entry staff, nor are they housed in the same location to facilitate economies of scale.

Financial Resources, Equipment and Physical Infrastructure

A number of respondents identified the scarcity or unavailability of equipment and financial resources for maintaining HRIS as a barrier to sustainability. In some cases, the small amount of computer hardware on site has been reserved by staff for special projects. Staff were calling for coordination among users of donor-funded software and hardware and those who receive funding for equipment through nondonor sources. In Rwanda, the national eHealth strategy is beginning to address the lack of integration between the different health care programs and their related software and hardware.

Many respondents implied concern that once equipment could no longer be procured from or maintained by the Capacity Project, maintenance and replacement (if needed) would cease. Swazi respondents expressed a powerlessness to persuasively articulate their HRIS budget needs and compete successfully for limited financial resources. Fundamental infrastructure problems (e.g., inadequate hardware, poor Internet connectivity and electrical supply) persist.

Linkages

While progress has been made to link district and regional HR offices to the central system, there remains the political and technical challenge of linking the iHRIS software to the HMIS or payroll databases (the latter often on incompatible mainframes). This coincides with a need for national standardization of codes across ministries and even beyond the government system. Too, the HR offices have not yet actively pursued collaboration with the private sector and ministries of education. These needs and goals can be met by arranging data-sharing agreements, settling issues of ownership and increasing the relevance of data by showing the power of database linkages.

For the long-term sustainability of the HRIS project, the quality of central information depends on districts' ability and willingness to supply up-to-date information. Overworked staff do not necessarily recognize the HRIS as important to their work because they see no direct results from the system. If the HRIS is not updated regularly due to under-prioritization, all users will lose confidence in the data, threatening sustainability. District respondents generally expressed a desire for a greater role beyond merely submitting data, and appeared willing to take on tasks including analyzing data and contributing to recommendations. Clearly, making the system relevant to the needs of the various users is critical to increasing usage and a sense of ownership, both of which contribute to HRIS sustainability.

The Professional Status of Human Resources

The shift from paper-based files to computer systems and on to DDDM requires a culture change. Respondents noted concerns regarding the capacity of HR departments to drive this behavioral change, since HR departments are often unable to meet current demands. HR departments in Swaziland and Rwanda suffered from this strain, though Uganda mitigated the situation by appointing a few new staff with previous HR experience.

Additionally, some Swazi respondents noted that many central-level staff do not recognize the link between HR planning and funds spent or saved, and therefore fail to see its importance overall. A confounding problem in Swaziland is that the MOHSW itself has not had an HR policy in place.

Monitoring and Evaluation

None of the countries studied had monitoring and evaluation (M&E) systems in place at the time of this evaluation. Respondents noted that the most useful measures of success are the number and type of reports that are requested and/or produced and the management action that results at each level of the system. Respondents recommended efforts to analyze the completeness of the HRIS data, measures on the extent to which data are regularly updated and status updates on the monthly return/nonreturn rate of reports sent to the regional facilities. Tracking the nonreturn rate of these reports helps to identify where additional technical assistance might be needed. A closely related measure includes the extent to which information reduces the workload of district HR staff. This is particularly important, as district HR staff are responsible for updating the system. Respondents suggested an evaluation of the extent to which the computer system replaces paper-based records for most day-to-day transactions. This could be inferred from how long users have been logged on. Another measure would be the number of users who have logged on in a particular period.

Enabling Global and Regional HRIS Leadership and Support

The HRIS team made extraordinary efforts to introduce HRIS at global meetings. HRIS staff repeatedly collaborated with key stakeholders such as the WHO, Pan American Health Organization and the World Bank in the context of WHO Health Metrics Network meetings (McQuide and Settle, 2006). The team worked hard to create a partnership with the WHO and East, Central and Southern Africa (ECSA) countries to establish a secretariat for the Africa Health Workforce Observatory in order to coordinate regional HRH analysis (McQuide et al., 2006). Further, HRIS members at one ECSA meeting played a pivotal role in moving all 14 member states toward a resolution acknowledging that strong HRIS are necessary for informed policy decisions (ECSA, 2007). HRIS staff also presented work at the ECSA Colleges of Nursing, which later led to collaboration between WHO and the Capacity Project on other HRIS issues (McQuide and Matte, 2006). Both the Swaziland and Uganda nursing leaders attending such conferences were first brought in contact with HRIS and started their developmental process from there.

In each case studied, leaders of the nursing cadres developed a specific interest in initiating HRIS projects after Capacity Project presentations about the HRIS software at regional workshops and conferences (in Rwanda, this happened on the basis of HRIS work done by HRIS staff previous to the Capacity Project). Commitments to continue this type of global

networking include completing country HRH profiles based on available templates (with WHO and ECSA support) and establishing more national health workforce observatories to support HR analysis using HRIS (Capacity Project, 2009).

CONCLUSIONS AND KEY RECOMMENDATIONS

General Conclusion

From the onset, the HRIS project combined several major culture changes. It introduced ICT to the HR field, a professional field that is not data-oriented and is populated by staff who often prefer dealing with people face-to-face or writing HR procedures to entering data or analyzing and writing reports. Further, due to the lack of district ICT structure, we deeemed it unfeasible to follow the usual route of building from the bottom up. In the three countries, there was little experience in workforce planning and HR analysis, which is not surprising as until the HRIS systems there was little reliable data that could be used for the purpose. Further, while a project of this scale requires a substantial investment on the part of local, in-country senior and middle management, the benefits from better decision-making and more efficient processes are only attained after several years of input.

Considering this starting point, results so far have been successful. Through HRIS, the Capacity Project has been recognized as a global leader in increasing the quality and availability of information for HRH planning, development and support, "representing the best in engineering practices, excellent documentation, consistency, and high standards" (Habte and Emmet, 2008). The Project's iHRIS Suite was cited as one of "50 successful Open Source projects that are changing medicine" (Nursing Assistant Guides, 2009).

As a downside to this initiative's swift success, the HRIS team had less time for reflection and maturation of management planning than anticipated. As a result, the countries we visited had not systematically implemented management discipline. Rwanda, in particular, would have benefited from more management discipline, as evidenced by the delay in rectifying a server problem, the fallout of which caused a slight loss of trust and faith in the project.

Development: Existing Systems, Stakeholder Leadership and Software

Development conclusions

Due to the lack of supportive infrastructure and appropriately trained staff in developing countries, the focus on improving existing systems as needed to support an HRIS can be a major hurdle to progress, as the Rwanda case exemplified. This is particularly the case when district feeder systems are implemented, as they require robust decentralized networks and main electricity to function effectively, which is a rarity in rural and remote areas.

An effective SLG is instrumental to success. In Uganda, a dedicated SLG met regularly and followed useful guiding principles that stressed valuing everyone's contribution and playing a constructive part in the project. On the other hand, in Swaziland and Rwanda, the SLGs were relatively weak. In Swaziland, internal champions responding to an urgent political need to improve internal management drove the successful HRIS implementation. While the successful SLG in Uganda also received the support of champions internal to the MOH, the Capacity Project/Uganda office and the Project's country point person—who was also an effective senior

policy and planning advisor—complemented these efforts with strong leadership to ensure adequate linkage and communication of country needs.

In terms of development, we conclude that iHRIS Qualify has been more successful in the case studies relative to iHRIS Manage. As a central operational system for recording and maintaining registrations with one type of user, it is less complex than iHRIS Manage. In addition, the development of iHRIS Qualify was guided and coached by an advisor with plenty of experience with the processes and sytems that are being designed during system development and supported by a strongly enabling environment, including a working SLG. This was not the case with iHRIS Manage, nor for the Swaziland database. Swaziland's succes can largely be attributed to efforts by a few persistent (nurse) champions and a political climate that capitalized on the HRIS as a means to improve operations in the face of public criticism. While a major philosophical component of the Open Source development process includes a strong emphasis on working with the local users to develop and customize the software to their unique needs, content advice by HRH experts and an enabling environment remain key to success.

There is little doubt that iHRIS Qualify will continue to prove invaluable to the Uganda Nurses and Midwives Council, in part because the council has enough staff to keep it up to date, which is essential for usage. This may not be the case in smaller councils, though. The outlook for iHRIS Manage in Rwanda is less optimistic, in part because it needs significant development to address district-level use cases. iHRIS Manage in its current form is designed for use at the central level only, and lacks features that would make HR administration easier at district-levels. This serves as a barrier to fostering district ownership of the HRIS. In Swaziland, the Microsoft Access database has achieved its maximum potential. Given the policy of devolving input to districts, as the district and security issues are addressed, it might make sense to migrate to iHRIS Manage.

Development recommendations

Strengthen the project management approach. We recommend a general strengthening of the project management approach using standard tools. The production of Gantt charts, regular reports on significant delays, an issues log (to note specific issues and actions taken) and a log of lessons learned can help achieve this. We propose a system of project management "lights" to be introduced in each country, covering about a dozen main tasks and perhaps three or so milestones to structure communication between the United States and country offices and alerting all relevant managers of significant delays. This could be facilitated by user-friendly software, such as Project Kick Start. We also recommend the adoption of other project management features such as a risk register, setting out all the factors that would negatively impact a project, assessing their probability and severity and including an action plan to mitigate the risks.

Restructure and broaden SLGs. A comprehensive SLG can build relevance into system design from the start. However, an SLG typically consists of senior managers and decision-makers at the central levels. Regional and local decision-makers—who have the most impact on data input, storage and sustainability—typically have little input on design and management questions. Revising the standard composition of the SLG might be one solution. We recommend that the SLG system include (perhaps in subgroups) the following:

1. The typical senior steering group (SLG, HWAB, etc.) based on a mandate of council that exists outside of politics
2. An initial group of heads of regions, so that the concerns and suggestions of district-level users, which differ in emphasis from the ongoing SLG, are taken into consideration
3. A junior-level group of users, who can supply immediate feedback on user-friendliness and software improvement suggestions. The chair of this group should participate in the senior-level ongoing steering group as liaison.

We recommend allowing the SLG to build upon existing HR issues, such as the case in Uganda in which the SLG referenced the retention study.

Include users, ICT and content advisors in participatory development/customization. Following the success of designing iHRIS Qualify, we find it essential to consistently include a senior HRH content advisor in the country-driven development process. We recommend an organizational system in which development parties include, at the very least, users (including the SLG), ICT developers and managers and content advisors. These three parties should maintain a dialogue to develop a participatory and custom-tailored country development approach. The facilitative skills of the advisors should be key function requirements. Because some users find it difficult to visualize final results, demonstrations of existing and alternative systems—as happened in Uganda—are important to provide examples as a mental reference of the vision.

Implement international standards for data codes through eHealth strategies. The development of standardized system codes should be addressed early in the development process because it requires central-level enforcement that takes time to cultivate. There is a strong case for using the International Standard Classification of Occupations, known as ISCO-88 (2). When it becomes available, WHO's more detailed classification, which is consistent with ISCO's, should be used. This should include clinically-orientated programs, such as HIV/AIDS, so that it is possible to easily relate disease prevalence and staffing numbers, and should cover the Ministry of Education so that analyzing information on health care students becomes easier. HRIS staff should work with district hospital HR managers to ensure that entity codes conform to national standards and fully meet HR managers' needs. We recommend that a standard set of HR and facility codes be placed in drop-down menus; this would both improve data quality and speed of data entry.

Improve access controls. In Rwanda and Uganda, access control should be tightened up so that staff have access only to those records for which they are authorized to change or view. In Swaziland, access control should be improved by upgrading from the Access-based step-solution with limited security levels to a mature iHRIS product. This also includes training on, and enforcement of, user roles and tasks currently existing in the system.

DDDM: Effective Usage and Analysis of Data

DDDM conclusions

In Swaziland, early implementration of the step-solution led to a small revolution in information access and efficiency within the MOHSW. In the context of criticisms about the country's crippled health system and failure of ministerial duties, the HRIS provided a powerful vision for

a better future. In Uganda, the implementation of iHRIS Qualify has been a tremendous success, allowing several professional councils to professionalize their work and make significant improvement in their data accuracy as well as the number of registrations. In Rwanda, despite various difficulties, the HRIS has been rolled out in 22 districts, is getting a foothold in providing regular HR information and will soon be supplemented by a comprehensive eHealth strategy. The overwhelming success and enthusiasm of HRIS implementation locally is evidenced by the fact that local-level officials have voiced a desire to implement the iHRIS Manage system, which is designed for central-level use.

On the whole, the diversity of HRIS usages significantly increases with the length of time the HRIS has been in place, making the initial start-up phase more challenging. We have observed that the most successful HRIS implementations include efforts to strengthen the capacity of the HR department and professional councils to advocate for their needs. Initial usages of the workforce tracking or management system have been primarily focused on identifying vacancies and information on staffing posts, eliminating ghost workers, improving recruitment and correcting misaligned workers. Usage of iHRIS Qualify has been strongly linked to improving the accuracy and efficiency of registration data. As a result of HRIS, HR management is commonly becoming more precise and strategic at all scales: planning staff rotations, approaching problems of geographic disparities in health workers and anticipating future workforce skills needs.

DDDM recommendations

Allocate more resources for capacity building. The popular DDDM workshops need to be supplemented with training of relevant HRIS staff in a sustained way, over a longer period, to enable such a large cultural change in decision-making to take place. IT training needs to be made available to general staff in order to overcome barriers to computer use. Training methodologies need to adhere to local timing and include a transfer-of-knowledge strategy. Training of trainers is key, in particular with respect to data entry; councils should consider sharing data input staff and equipment.

Focus on concurrent professionalization of HR functions. Because a weak HR department is unable to capitalize on the opportunities provided by the HRIS strengthening process, it is relevant to include strengthening of the professional identity of HR as a goal to implement HRIS. This includes teaching the HR department how to realize the benefits of an HRIS and how to analyze data. This is particularly important for staff at HR departments that typically are not well trained in strategic planning, systems thinking and data analysis. The HRIS can diagnose all these problems, but the HRIS alone cannot solve them all.

Strengthen the reporting process. The custom reporting tool in the iHRIS suite needs to be made more user friendly and piloted (field tested) before it is released, or more training or explanation is needed. These issues are being specifically addressed in the next version of the suite. We recommend avoiding the creation of a complicated reporting tool, as this might backfire and make users afraid to experiment. Further, training on report planning would be useful to promote strategic usage of HRIS data and drive support for its implementation. It would be particularly important to time the publication of reports to when they are of most benefit to the planning process. There would be value in each council producing monthly,

quarterly and annual reports of the numbers of new registrations and total registrations. This information could be used to compare with the outputs from education to see what percentage of graduating staff registered. In addition, it would be of value to the councils to compare it against income from registration.

Standardize HRIS in integrated knowledge management portals. A mechanism should be put in place to improve sharing of standard reports as widely as possible. Ministries of health should use web portals to publish their workforce statistics on an automated basis, similar to the Uganda MOH's intent to provide a minimal data set that is updated monthly. Professional councils should make available the details of their registrants on Internet portals. This takes the burden off HRIS managers to produces custom reports and encourages further linkages of HRIS data into other key eHealth systems. In addition, the public could check whether a health care professional is in fact qualified and in good standing. It would be helpful to be able to search by name of practitioner or by location, so someone in a particular town could quickly locate the nearest pharmacist, doctor, etc. Further, a shared website, preferably a knowledge management portal, would reduce costs and increase user-friendliness.

Promote system relevance to encourage linkages. Particularly at the district (data entry) level, more emphasis needs to be placed on the relevance of the system from inception. This can be accomplished by ensuring that districts maintain up-to-date records through the introduction of an annual leave and training module, or the explicit linkage of HRIS to payroll (speeding up reconciliation), produced as an incentive for local-level use of iHRIS Manage. The major point of emphasis here is to turn relevance into opportunity for improving the systems, and allowing district-level or other initiatives to self-organize beyond what was envisioned and explicitly planned. For example, the needed automated linkage to payroll at the Ministry of Finance will more likely be successful if it is driven by users who understand how these linkages can speed up the reconciliation process and their paychecks.

Introduce an information feedback loop early in the process. The closed information loop in Swaziland, in which paper-based reports are routinely disseminated on a monthly basis from central to district levels with a backup of requested changes, is an excellent example. The positive feedback cycle creates momentum for the system by demonstrating to local users that the routine data are being used to take actions that have a direct effect at their level.

Sustainability: Build Capacity and Ensure Continuous Improvement

Sustainability conclusions

At present, the overriding need to train staff in basic computer skills, HRIS and DDDM, and to reprioritize HRIS or HR planning, severely limits HRIS usage. A lack of experienced data analysts is evident throughout. In some ways this is not surprising, as not enough robust data have been available to justify the development of the workforce analyst role. Recruitment and retention of technical HRIS project staff is a real issue. Even where there are strong technical people to keep things going, such as in Uganda, the exodus of one person would cause major problems. Swaziland has limited support, which could become overburdened if the system were expanded. In the longer term, Rwanda's university-based eHealth center of excellence could potentially provide support across East Africa.

Sustainability recommendations

Implement retention strategy of technical staff. Action needs to be taken to reduce the risk of essential staff leaving and ensure a growing supply of such staff in future years. The retention of key project implementation staff could be encouraged by bonus payments when important milestones have been met, with a particularly attractive bonus at the end of the project. A revision of hiring practices might be of interest, since not all HRIS duties require key ICT skills. More shadow programming teams should be developed in Africa, and acquire skills and work in collaboration with the US team. New sources of technical support need to be identified, including local commercial providers. While Makerere University in Uganda has a programming course, graduates lack the competence required by the MOH. Rwanda's planned center of excellence in eHealth is a promising development.

Improve M&E systems. We recommend that the SLG standardize and manage a comprehensive performance monitoring plan customized to local needs, with standard indicators measuring outputs and outcomes. The effectiveness of HRIS should be evaluated and monitored by recording the number, type and end recipient of reports requested. This should include the impact on strategic issues such as filling the large number of vacancies in certain parts of the country and supporting health care programs. Periodic quality control visits to facilities should examine whether and how HRIS data are being used by managers, assess how the data enter into planning and contrast local knowledge and use with what is available on the system and the extent to which facilities staff are sharing information. We suggest periodic collection of samples of field survey data to monitor data accuracy.

Strategically plan early success stories for demonstration. Because of the delay in producing tangible benefits, a strategic HRIS development plan should focus initial data use and report generation on early demonstration of success to enhance the readiness of stakeholders to participate and buy into the proposed system. For example, roll-out efforts should take into consideration the geographic areas that have strong resources and leadership, in order to capitalize on local capacity to illustrate model projects for further replications. Further, live demonstrations of the relevance of the system can influence the readiness of various stakeholders to provide further support, both in terms of funding and making key linkages to improve the system's relevance and necessity.

Support Open Source ICT developers networks and education. There must be professionals able to respond to country or local customization needs. For the short to medium term, we recommend putting in place a regional team that is able to provide technical support and customization. In the longer term, we recommend sustaining the development of professional networks of Open Source developers and increasing support to educational institutions involved in training of Open Source ICT experts. In the cases of district roll-out, the increased need for district-level ICT support networks needs to be taken into account.

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ANNEX A: LIST OF KEY RESPONDENTS

Name	Title	Organization
Swaziland		
Ms. Thembi Khumalo	Chief Nursing Officer	MOHSW
Mr. Henry Dlamini	Principal Human Resource Officer	MOHSW
Ms. Gladness Magongo	Senior Human Resource Officer	MOHSW
Mr. Sibusiso Sbandze	Principal Health Planner	MOHSW
Mr. Samual Johnson	Consultant	Skillspare
Ms. Zanele Simelane	HRIS Analyst	MOHSW
Ms. Sisi Lukele	HRIS Analyst	MOHSW
Mr. Edmund Dlamini	Principal Environmental Health Officer	MOHSW
Ms. Glory Msibi	Registrar	Nursing Council
Ms. Chazile Mafuso	Finance and Administration Officer, Former HRIS Data Entry Clerk	IntraHealth International/Southern Africa Human Capacity Development Coalition
Mr. Phumelele Dlamini	Senior Matron Hospital	National Psychiatric Hospital
Mr. Mquibelo Dlamini	Senior Matron, Former Registrar of Swaziland Nursing Council	Hlatikulu Hospital
Ms. Nicola Ruck	Health Human Resources Consultant	European Union
Mr. Samwel Wakibi	Capacity Project HRIS Advisor	IntraHealth International/The Capacity Project
Mr. Wendy Shongwe	Sectoral Officer for Health	MOPSI, Management Services Division
Mr. Michael Nzavele	Regional Health Administrator	Lubombo Region MOHSW
Ms. Masitsela Mhlanga	President	Swaziland Nurses Association
Uganda		
Dr. Steven Mallinga	Minister of Health	MOH
Ms. Mary Nanono	Permanent Secretary	MOH
Mr. Benjamin Udongo	Registrar	Allied Health Professionals Council
Dr. Pamela McQuide	Country Point Person	IntraHealth International/The Capacity Project
Dr. Paul Kiwanuka-Mukiibi	Consultant	P S Consulting
Mr. Ntalazi Francis	Assistant Commissioner/Human Resources Management	MOH
Mr. Charles Isabirye	Acting Assistant Commissioner/HRD	MOH
Ms. Rachel Birungi	Senior Personnel Officer	MOH
Ms. Irene Zawedde	HRIS Manager	IntraHealth International/The Capacity Project
Ms. Juliet Nansonga	Senior Information Scientist	MOH
Mr. Martin Kiyingi	Systems Administrator, Resource Centre	MOH
Dr. Edward Mukooyo	Assistant Commissioner, Resource Centre	MOH
Mr. Martin Namutso	HRIS Consultant	IntraHealth International/The Capacity Project
Mrs. Neville Oteba	Registrar	Pharmacy Council
Mr. Emanuel Kuanga	Deputy Registrar	Medical Council
Ms. Maureen Ahimbisibwe	Records Assistant	AHP Council
Dr. Peter Kusolo	District Health Officer	Lira District
Ms. Brenda Komagum	Personnel Officer	Oyam District
Dr. Vincent Owiny	District Health Officer	Oyam District

Name	Title	Organization
Dr. Lawrence Kaggwa	Retired Director for P&D, MOH, HWAB Member	Retired from MOH
Prof. Sam Luboga	Former Assistant Dean, Medical School, HWAB Member	
Mrs. Chota Margaret	Commissioner for Nursing Services	MOH
Mrs. Rita Matte	Former Registrar	Nurses and Midwives Council
Dr. Francis Runuumi	Commissioner for Planning	MOH
Dr. Vincent Oketcho	Chief of Party	IntraHealth International/The Capacity Project
Ms. Sarah Awor	Biostatistician	Oyam District
Mr. Ocen Gregory	Senior Environmental Health Officer	Oyam District
Susan	Records Assistant	Oyam District
Rwanda		
Dr. William Twahirwa	Technical Director	IntraHealth International/The Capacity Project
Mr. Vivens Kalinganire	HR Advisor	IntraHealth International/The Capacity Project
Ms. Solange Tuyisenge	HRIS Specialist	IntraHealth International/The Capacity Project
Mr. Steven Karengera	Director of Planning Unit	MOH
Mr. Augustine Bashabe	ICT Director/MOH	MOH
Dr. Randy Wilson	ICT Director	Management Sciences for Health
Mr. Jovite Sinzahera	M&E/Capacity Project	IntraHealth International/The Capacity Project
Dr. Richard Gakuba	eHealth Coordinator	MOH
Mr. J. Victor Kabanda	Human Resources	Nyamata Hospital
Ms. Elisa Mupenzi	Human Resources	King Faisal Hospital
Ms. Peace Mbabazi	Human Resources	Nyagatare Hospital
Mr. Fidele Karangwa	Administration and Finance Unit Acting Director	IntraHealth International/The Capacity Project
Ms. Monique Murekezi	Human Resources	Muhima Hospital
Dr. Emilien Nkusi	HMIS Coordinator	MOH
Mr. Donatien Bajanama	Hospital Management Professional	MOH
Ms. Chantal Multijima	Registrar	Medical Council
Dr. Ousmane Faye	Chief of Party	IntraHealth International/The Capacity Project
Dr. Gerard Ngendahimana	Deputy Director	IntraHealth International/USAID HIV/AIDS Clinical Services Program
Ms. Julie Kimonyo	Chief Nursing Officer	MOH

The Capacity Project is an innovative global initiative funded by the United States Agency for International Development (USAID). The Capacity Project applies proven and promising approaches to improve the quality and use of priority health care services in developing countries by:

- Improving workforce planning and leadership
- Developing better education and training programs for the workforce
- Strengthening systems to support workforce performance.

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