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Building a National Model for Knowledge Exchange in Malawi: Findings From a Health Information Needs Assessment

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Getting the right information into the right hands at the right time is a challenge for many health systems in developing countries. Health workers need access to reliable and up-to-date health information in order to support their clients. This health information needs assessment, conducted in the capital city and 3 districts of Malawi from July 2009 to September 2009, aimed to determine access to, and need for, health information in HIV/AIDS and family planning/reproductive health at all levels of the health system. Using qualitative research methods, the study showed the need to (a) build the capacity of government technical working groups to collect and store information and to promote information exchange at all levels of the health system; (b) improve information synthesis and packaging, particularly for users at peripheral levels; (c) strengthen the district level to serve as an information hub for district- and community-level providers; and (d) explore mobile technologies to increase provider access to knowledge and information.

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Getting the right information into the right hands at the right time is a challenge for many health systems in developing countries. Health workers, in particular those located outside urban areas or well-resourced hospitals, often have difficulty accessing current, relevant information or competency training for their jobs (Pakenham-Walsh & Bukachi, 2009). In countries such as Malawi where poor access to health information is combined with a severe shortage in human resources, the challenge becomes a crisis. The terms *information* and *health information* used throughout this article refer to evidence-based, technical information, including best practices, clinical norms and procedures, implementation guidelines, materials for behavior change communication, and drug dosage guidelines. The terms do not encompass health information systems, statistical reporting, or health monitoring.

As with health systems strengthening, increasing the dissemination of health information in developing countries requires a multitiered approach because the need for information is different at each level of the health system (central, district, community). With the rapid spread of Internet access and mobile phone use in the developing world, the ability to reach all cadres of health workers with the information they need should skyrocket. Mobile phones in particular show great potential for boosting information penetration, especially in areas where access to health information is limited (Mishra & Singh, 2008; World Health Organization, 2011).

Although new technologies may exist, the mechanisms for moving health information up and down the health system often are lacking or are not used effectively. In addition, there is little systematic evidence on information needs of health workers, particularly of frontline health workers. Specific barriers to accessing and using information by health workers are not well documented in the literature (Godlee, Pakenham-Walsh, Ncayiyana, & Cohen, 2004). In Malawi, specifically, little data exist on how health workers seek and share health information.

In response to these gaps, in 2009, the Knowledge for Health (K4Health) project, funded by the United States Agency for International Development (USAID) and based at The Johns Hopkins Bloomberg School of Public Health Center for Communication Programs, conducted an in-depth needs assessment in Malawi. The study aimed to identify priority health information needs among managers and providers working in family planning/reproductive health (FP/RH) and HIV/AIDS, as well as to explore opportunities and challenges for improving information flows. It also intended to help design an intervention to improve access to, and use of, health information in Malawi. K4Health subsequently designed an 18-month demonstration project to improve the exchange and use of FP/RH and HIV/AIDS knowledge among health workers at all levels. This article includes an in-depth discussion of key findings from the needs assessment and a brief overview of the subsequent demonstration project.

Malawi Background

Malawi, a landlocked country in southeastern Africa, is one of the poorest countries on Earth. It is also one of the most densely populated countries in sub-Saharan Africa. Of the 15 million people living there, 85% live in rural areas where access to clean water, sanitation, and health facilities is extremely limited. An estimated 53% of Malawians live below the poverty line, and life expectancy is in the low 50s (National Statistical Office of Malawi, 2008; World Bank, 2010). In addition, Malawi is facing

a serious human resources challenge within the health sector. The ratio of doctors, nurses, and other medical professionals is extremely low at 2.0 doctors and 36.8 nurses per 100,000 people. Community health workers number only 80 per 100,000 people (World Health Organization, 2008).

Poor infrastructure and low literacy rates compound the problem of getting information to health workers where they need it most—in rural, hard-to-reach communities with limited access to health information resources. With so much of Malawi's population living in rural areas, with little or no access to nurses or doctors, community health workers are often the only medical personnel who come into contact with people needing medical attention. One of the main objectives of the Malawi needs assessment was to determine whether community health workers have access to the information they need to care for their clients.

The Malawi Needs Assessment

Between July 2009 and September 2009, K4Health conducted its first country-level needs assessment in Malawi. The purpose of the assessment was to determine the demand for and access to information and knowledge in FP/RH and HIV/AIDS at different levels of the health system. The assessment was guided by the following research questions:

1. Information needs: What are the health information needs of FP/RH program managers, service providers, and community health workers in Malawi? How are they currently meeting these needs?
2. Networks: What professional or knowledge networks in Malawi currently serve these audiences? What lessons can be drawn from these networks?
3. Technology and tools: What are the most promising technologies and tools to reach these audiences? What channels are organizations currently using to communicate with their staff, colleagues, partners, and clients in the field?
4. Infrastructure. What level of Internet access exists in Malawi, and how does it vary within the country? What is the status of mobile phone access?

Methodology

Design

The needs assessment used qualitative methods to collect information in response to the research questions previously identified. Methods included key informant interviews and focus group discussions with key stakeholders throughout the health system. Key informant interviews were conducted primarily at the central level, and community level data were collected through focus groups. A combination of both methods was used at the district level.

The study team included K4Health staff in Baltimore, Maryland, and Arlington, Virginia, and an on-the-ground team led by a Malawi-based researcher and two support staff. The study team designed structured interview guides for the key informant interviews and focus group discussions in consultation with the donor, USAID. Before beginning data collection, the study team pretested and revised the survey instruments.

Sampling

The study used convenience sampling to recruit study participants. At the central level, participants included USAID staff, representatives from the Ministry of Health and National AIDS Commission, and directors and senior managers from nongovernmental organizations and professional networks working in FP/RH and HIV/AIDS. At the district and community levels, participants included district health officers, district management teams, nongovernmental organization district managers, health facility staff, and community health workers. The research team conducted 25 individual interviews and 10 focus groups (Table 1).

Study Setting

The study was conducted in Lilongwe, Malawai's capital city, and in three districts: Salima, Nkhotakota, and Blantyre. The research team selected these districts to reflect variability of FP/RH and HIV/AIDS activities. Selection was also guided by consultation with key Ministry of Health officials.

Data Management and Analysis

The research team recorded interviews and focus groups on tape, and the team took notes to review emerging themes and patterns in the data. The recorded data were transcribed verbatim. The team conducted a thematic data analysis manually, which systematized and structured the data under codes and themes.

Table 1. Number of interviews and focus group discussions conducted, by health system level

	Central level	District level	Community level	Total
Individual interviews	20	4	1	25
Respondent profile	Directors, officers, and senior managers from the government, nongovernmental organizations, and professional networks	District health officers and nongovernmental organizations district managers	Health facility staff	
Focus group discussions	1	3	6	10
Respondent profile	United States Agency for International Development staff	District health management team and nongovernmental organizations district managers	Health facility staff and community health workers	

Results

Findings from the K4Health needs assessment are presented in Table 2 and subsequently discussed.

Table 2. Summary of key findings

Major themes	Key findings
Information Needs	• Health care workers at all levels have difficulty obtaining current, evidence-based information on family planning/ reproductive health and HIV/AIDS, such as reference materials, best practices, and health and service statistics. • Community health workers are the last to receive reliable information—they need synthesized information in the local language and in a format suitable for dissemination.
Accessing and Sharing Information	• Ministry of Health receives current health information but lacks a way to package and share knowledge with service providers and partner organizations. • E-mail and the Internet are widely used for seeking and sharing information at the central level and among international nongovernmental organizations. • Outside major cities, oral communication channels are preferred, including radio, face-to-face meetings, and, more recently, mobile phones. • Print materials are essential, especially given limited Internet access. • Mobile phones are commonly used at all levels for text messages and calls.
Barriers	• No national system for knowledge sharing and no central location where complete, up-to-date family planning/ reproductive health and HIV/AIDS information can be found. • Governmental and organizational websites are usually out of date. • Mobile phone networks can be unreliable and air time is costly. • Most district health staff members have limited access to computers and the Internet and community-level staff have virtually no access. • Chronic understaffing leaves little time for seeking or sharing information.
Opportunities	• Mobile phone access is better than expected at all levels and offers a promising way to reach frontline health workers through an SMS network. • Technical Working Groups already exist and could be strengthened to provide a national platform for partners to meet and to share information. • District health offices have the potential to serve as local information hubs for district and community level staff.

Health Information Needs in FP/RH and HIV/AIDS

There is limited access to relevant and current information on FP/RH and HIV/AIDS at all levels of the health system, particularly at the community level. Information tends to degrade the further away it moves from the source. A common challenge mentioned by community health workers is the delay in receiving up-to-date information and the necessary materials for their jobs. Community health workers have no access to the Internet, and they are last in line to receive print materials. They tend to rely on outdated resources even when new guidelines or protocols have been introduced at higher levels of the health system. Community health workers are trained at recruitment, but they rarely receive refresher training or updates thereafter.

> The most challenges that we face is mainly in the way information reaches us. Information reaches us late and we don't have materials to disseminate the information [to clients].
>
> —Focus group participant, Nsenjere Health Center

Managers and providers at the district and central levels need practical, evidence-based technical and clinical information with local relevance, context, and language. They lack high-quality information on current issues in FP/RH and HIV/AIDS, as well as easy-to-use materials and tools for trainings and other forums.

> We haven't actually, as a country, been able to have standardized and updated materials to use. For example … we want to conduct a [community-based distribution agent] training and we are using a [Ministry of Health] curriculum which was developed maybe 10 years ago which lacks a lot of information like HIV.
>
> —Interview participant, Management Sciences for Health

Sources of Information

Among respondents at the central level, the most commonly mentioned sources of health information included the Internet, government and partner organizations, government-sponsored technical working groups, training workshops, and meetings. However, study participants typically face difficulties getting reliable information from any of these sources. Information that is available tends to be scattered and difficult to locate and the information sources themselves (people and platforms) may have limited access to current content.

Information available on the Internet is limited by another set of challenges. Often, local websites are not maintained, and information is outdated. Although access to the Internet is widely available to health professionals at the central level, the large number of websites on the Internet is a deterrent.

> … as you know the Internet is broad. It's very difficult to go directly to a place where you actually find what you want unless … if there would be a known website where people could just go directly and access information

> concerning to what you want. Otherwise just going on the Internet to search for information, you spend probably a week without actually finding what you want.
>
> —Focus group participant, Nkhotakota District Management Team

At the district level, Internet use is generally limited to senior managers, if Internet access is available at all. In addition, most district-level workers lack knowledge and skills about how to use the Internet and computers. At the community level, computers and the Internet are not available by any means. Health workers have only limited access to up-to-date information through meetings with supervisors and infrequent distribution of print materials.

Communication Channels

Respondents tended to describe their culture as an oral one that does not prioritize reading and does not readily share technical information or knowledge. Factors contributing to poor information sharing in the health sector include the following:

- Understaffing: Respondents mentioned they are chronically understaffed and prioritize serving their patients rather than reading or sharing information.
- Lack of forums for knowledge sharing: National and local forums for sharing information are not routinely organized due to cost and logistics.
- Professional hierarchies: Differences in the professional stature of doctors, nurses, and health workers create gaps in information and knowledge sharing, which are aggravated further by distances and weak communication channels.
- Bulky information: Much of the available health information is too dense to be useful. Respondents, especially community health workers, need information that is segmented, synthesized, and summarized to highlight the important points.
- Overuse of technical jargon: Available information is often technical, complicated, difficult to understand and, therefore, difficult to share. In addition, most materials are available in English only. Community health workers, in particular, mentioned language as an important barrier.

> … often times we have that challenge of translation … you find maybe there are so many documents that are very important, you want these issues to be communicated to [service providers] but they are not in a language which [providers] can read and understand …
>
> —Interview participant, Malawi Network of People Living with HIV/AIDS (MANET+)

> … the other challenge, you have the information but it's huge … you don't know: Is this applicable to Malawi? How do I simplify this information and relate it to what I have? And how do I [pass] this information on?
>
> —Interview participant, Ministry of Health, Health Education Unit

Oral communication channels are highly valued in Malawi, including face-to-face interactions, radio, and, more recently, mobile phones. Regardless of the health system level, respondents value face-to-face exchanges such as meetings and workshops for sharing information and introducing new ideas. They appreciate the opportunity to seek immediate clarification and feedback from the source. The challenge here is cost and scale. It is without doubt that face-to-face communication offers a rich means for information sharing, yet it is not an efficient way to systematically reach large numbers of health workers on a regular basis. Meeting and workshops do not happen regularly because the cost of bringing together health workers is too high. Alternatively, radio has great potential to reach many health workers, including those in remote areas, with up-to-date information at low cost.

Given that mobile phone ownership and access is on the rise in Malawi, mobile technology offers an information-sharing opportunity that is worth exploring at the district and community levels. Respondents at all levels were in favor of using mobile phones—in particular, SMS messaging—to increase provider access to essential knowledge and information related to their jobs.

Respondents at all levels also mentioned the need to provide print copies of reference materials—including simple and short reference tools—to support knowledge gained from face-to-face or radio communications. Print materials are particularly useful for health facility staff and community health workers to maintain their knowledge in the absence of Internet connectivity. The challenge is to keep print materials up-to-date and accessible at the peripheral levels.

Knowledge Management

Malawi lacks a structured system for knowledge management, including a centralized website, print collection, or organized practitioner network. While information on HIV/AIDS and FP/RH may exist in Malawi, it is often outdated and lacks standardization.

> Our information is a bit scattered. I think we don't have centralized information, we don't know … if you really need this information, whom should you consult or whom should you contact …
>
> —Interview participant, Christian Health Association of Malawi

The knowledge management capacity of local organizations needs strengthening in order to improve how they document, store, and share information and knowledge. Most organizations at the central level in Malawi, including the government, have their own websites and a small library of technical resources. However, most do not update their websites and do not offer a good platform for accessing up-to-date information. In addition, organizations generally do not share print resources on a regular basis.

At the district level, many district health offices have the potential to serve as important information outlets for district- and community-level health providers. For example, they usually have a designated space for a library, but they lack materials and a process for sharing information with the community.

Professional Networks

Malawi has numerous network organizations, associations, and government-sponsored technical working groups that could potentially play an important role in information sharing. However, these networks need considerable capacity-building support, especially in the area of proactive knowledge exchange. The networks are active in the main cities of Blantyre and Lilongwe, but, because of cost and scale, they cannot recruit members and conduct meetings on a regular basis outside these cities. Likewise, producing and mailing network resources to members is too costly for the networks to sustain.

The most effective local networks appear to be the technical working groups organized by the Ministry of Health and National AIDS Commission. They aim to meet regularly and to coordinate information sharing among key stakeholders. These technical working groups could potentially provide an effective platform for sharing information, certainly at the central level. One of their key functions is to share information with their network members, but they typically lack capacity in organizing, managing, and exchanging knowledge. Because many technical working groups members are from nongovernmental organizations that have offices at the district level, strengthening the capacity of these groups could also enhance their ability to share information at lower levels of the health system through their district staff.

Technologies and Infrastructure for Knowledge Sharing

At the time of the study in mid-2009, Internet and email were the most widely used technologies for information transfer in Lilongwe and major regional capitals. Among district health offices, access to the Internet and email was improving but mainly limited to senior district staff. The district level still struggled with issues of bandwidth due to slow and unreliable dial-up connections. In addition, those using mobile phones to access the Internet had connectivity problems because of poor mobile networks. At the community level, health workers had no access to the Internet.

Nevertheless, findings showed that health providers were embracing technology which could be used to enhance information access and sharing. In addition to growing access to the Internet (particularly in Lilongwe), mobile phone ownership or access was higher among all respondents than expected. Mobile penetration was estimated at approximately 14% in 2009 when this study was conducted (Business Wire, 2010). However, the majority of respondents in the capital reported using SMS regularly and having not one but two mobile phones (for work and personal use). At the district level, about half of respondents reported owning or having access to a mobile phone with SMS capability. Even among community health workers, access to mobile phones was not uncommon, although actual ownership was low. The most frequently mentioned challenges related to mobile phones included inconsistent network access, cost of air time, and lack of electricity to recharge phones.

Respondents from the government and donor level down to the frontline health worker reacted positively to the idea of leveraging mobile phone SMS capabilities to improve communication between district- and community-level providers. They believed that, over time, mobile connectivity would improve and airtime costs would become more affordable. By the middle of 2011, mobile phone penetration in Malawi had risen to 23% as a result of new competition in the mobile provider market, increased network coverage, and reduced handset and airtime costs (AfricanisCool, 2011).

Respondents were also in favor of creating a system that would better support critical information sharing between district and community levels. For example, at the district level, respondents providing clinical services need the ability to access technical information at a moment's notice; they would like to see this happen either through the Internet or a mobile phone information network.

> … now our organization is offering ARVs [antiretroviral drugs] and at times you are stuck whether to continue giving ARVs or not. A patient comes with a complaint and you are not sure whether it's side effects of ARVs or not, so at times you check in the books and it's not there. Now, probably, if there could be a website or direct communication with the ARV unit, that will be good.
>
> —Focus group participant, Nkhotakota District Management Team

Discussion and Recommendations

Health systems in developing countries typically face challenges in exchanging health-related technical information and knowledge efficiently, in both directions—down to, and up from, the peripheral levels (Godlee, 2004; Patrikios, 1995). Improving the flow of health information is critical to increasing access to and use of knowledge for improving health services (Pakenham-Walsh, 2009). In Malawi, this requires building capacity in knowledge management for government departments, nongovernmental organizations, and professional networks at the central and district levels. Moving information beyond headquarters also requires strengthening existing decentralized structures to serve as information hubs for the district and community levels. Specific recommendations for the central, district, and community levels are provided below.

Central Level

National Knowledge Management System

There is a need for a properly managed, centralized knowledge management system and national website where Malawi-specific information can be collected, organized, and housed electronically and then sent to local organizations in hard copy. The national site could provide links to other relevant websites, such as the Ministry of Health and National AIDS Commission sites. Although web-based information would directly benefit those with Internet access, it would reach many more indirectly. Government departments, professional networks, and nongovernmental organizations would likely rely on the national website for reliable and current information when preparing print materials, training courses, and radio programming.

Professional Networks

Professional networks offer a good opportunity for partners to meet and to share information and best practices. Existing technical working groups may be the best positioned to improve knowledge exchange between government departments and nongovernmental organizations working in FP/RH and HIV/AIDS at the central level. In addition, because many of the nongovernmental organizations members have offices or affiliates at the district level, the technical working groups could capitalize

on nongovernmental organization inroads to share information and resources with members located outside of Lilongwe. To do this, however, the technical working groups require capacity building to improve their own internal management, as well as to help capture and organize knowledge and to exchange it with their members.

Content and Packaging

Overworked health workers lack the time to read. In addition, they may be easily discouraged by the volume and complexity of available information on FP/RH and HIV/AIDS, and by the language in which it is presented. Health information should be tailored for specific end-users so that it is relevant to their particular needs. Directors and managers at the central level need up-to-date, evidence-based best practices to design national policy and health programs and to develop norms and guidelines. District staff need information to support program implementation, training, supervision, and clinical services. At the community level, health workers need simple, clearly packaged materials for use with clients to support behavior change, basic treatment, and referrals.

Producing the right content requires working with existing information sources, such as the government and nongovernmental organizations, to improve the process of synthesizing and packaging information, particularly for users at peripheral levels. Key content should be culled from current publications, manuals, guidelines, and best practices to produce easy-to-read and easy-to-use materials in electronic and print forms for different cadres of health workers.

District and Community Levels

District Health Office

The district health office offers an opportunity to greatly improve knowledge sharing at the district and community levels. Many of these offices are already in the process of making Internet accessible to more staff members, and most have rooms that have been earmarked for libraries but that are not yet functional. Creating a district learning center in the district health office could improve access to key health information for district health staff and possibly community health workers. The utility of decentralized information hubs has been demonstrated in other developing-country settings (Bukachi et al., 2007).

In Malawi, the district learning center should serve as a decentralized location for information sharing and learning for district managers and clinical staff, as well as for professional associations, networks, and nongovernmental organizations working in the district. Regular opportunities for face-to-face knowledge sharing at the district level are invaluable because most managers and providers will never have the chance to attend forums at the national level. The district learning center should also provide print materials from the Ministry of Health and partner organizations, free or affordable Internet access (including access to eLearning courses), and space for training workshops or district meetings for clinical staff and service providers.

Capacity building at the district level would ensure that essential information, such as new guidelines and best practices, flows from the central level to the district learning centers and on to community health facilities. Information provided at the district level should be both clinical and programmatic for use by clinical providers and district management staff. Information should also be summarized in suitable formats for community health workers, such as simplified guidelines, instructional materials, and job aids.

Connecting With Community Health Workers

The district health office should create a process to ensure that community health workers are able to access the information they need to perform their jobs. This entails linking all community-based health facilities to the district-level structure and ensuring that all relevant information or guidelines are communicated to community health workers within the shortest time possible. Creating special radio programming for providers, ensuring wide access to radios, and forming radio listening groups could be effective ways to update the knowledge of community health workers and to keep them connected with current issues in FP/RH and HIV/AIDS. The radio programs could provide details on new information and guidelines so that recipients can become familiar with the content prior to receiving the print material. Radio is often called "Africa's medium" and should be expanded to support the oral culture in Malawi.

Another possibility is to create a community kiosk, or mini information center, located within the health facility. This would bring key content closer to community health workers and would be useful for those who cannot travel to the district learning center. Print materials available at the kiosk should include essential health information for community health workers and facility staff. One example of a successful community library is the Chiwamba Community information Center established outside Lilongwe in early 2000. This center serves the entire community and uses a variety of communication tools (visual, oral, print, and recreational), as well as two-way information flows to promote sharing of external and local knowledge. It has contributed to the formation of knowledge-sharing networks and improved health-seeking behaviors among community members (El Halaby, 2006).

Mobile Technology

Mobile phones have the potential to boost knowledge exchange in Malawi, within and between different levels of the health system, and to expand the reach of health information to frontline health workers in remote areas. The assessment found that mobile networks were available and health workers had access to mobile phones, even at the community level. Increasing mobile phone ownership and demand for Internet access are good indications that technology can be a driver of improved access to knowledge and information. As a result, development of a mobile phone network for health workers should be explored to promote health information exchange, from the center to the periphery and also from the periphery back to the center. District staff would use the network to send SMS messages to providers regarding new health information, events, meetings, and short public health messages. Likewise, community health workers could communicate issues to their supervisors through SMS or phone calls, provided they had access to battery-charging capacity, such as through solar chargers.

There is a growing body of evidence that shows how mobile health (mHealth) programs can improve health care, even in remote and low-resource environments (Chib, Lwin, Ang, Lin, & Santoso, 2008). Timely information exchange using mobile phones can directly affect the quality of care provided by frontline health workers (Mechael, 2009; Ranck, 2011; World Health Organization, 2011). For example, health workers participating in a mobile phone network can send SMS messages or call their supervisors for immediate guidance or to arrange referrals. As a result, health workers are connected to essential information at their point of care and can better respond to their clients' needs (Earth Institute, 2010; Ranck, 2011; Vital Wave Consulting, 2009). While access to high-end technologies is limited in Malawi, simple mobile phones have the potential to reach large numbers of managers and providers

quickly. Also, disseminating information and alert messages via SMS is likely more cost-effective than using conventional communication channels (e.g., walking and using public transport to reach a supervisor or waiting for routine supervision visits to discuss client issues).

Although new technologies have great potential in Malawi, it is important to support traditional communication methods as well. For years, oral traditions have served to spread health practices and beliefs and could be capitalized on to improve the acceptance of alternative knowledge-sharing practices. Face-to-face communication, print materials, and radio are all highly valued and, among some target groups, have much greater reach than emerging technologies. Traditional means of knowledge sharing should complement the introduction of any new technologies.

Possible Solutions

On the basis of the results of this assessment, K4Health designed and implemented an 18-month demonstration project in Malawi (from January 2010 through June 2011). The project aimed to improve existing mechanisms for knowledge exchange among health workers at the central, district, and community levels. The premise of the project was that FP/RH and HIV/AIDS services will be strengthened if health providers used appropriate information to improve their practice. The project developed interventions at each level of the health system:

- Central: The project strengthened the capacity of two technical working groups to collect, organize, and store essential information useful at all levels. The project also developed electronic toolkits providing easy access to Malawi-specific FP/RH and HIV/AIDS information resources.
- District: District learning centers in Salima and Nkhotakota districts (where the needs assessment was conducted) were established to serve as information hubs for district staff and community health workers. The learning centers house a library with print materials, offer free Internet access, and provide space for face-to-face interactions.
- Community: A mobile phone network was established in Salima and Nkhotakota to increase provider access to knowledge and information. District health staff and community health workers were connected to each other through SMS messaging and phone calls.

The demonstration project was evaluated using a pre/post design with a control group. Three important lessons emerged from the final evaluation:

1. Existing government technical working groups are effective as a central point for knowledge management among government departments and nongovernmental organizations.
2. Using decentralized structures already in place at the district level is an ideal way to help move information beyond headquarters. Despite its limitations in Internet access, the district health office is well placed as a knowledge-sharing hub for clinical staff and service providers.
3. Mobile phones offer an effective information-sharing opportunity at the district and community levels to provide essential information to health workers and to connect them with their supervisors.

A full description of the demonstration project and its key findings will be reported in a future article.

Conclusion

This needs assessment raised several key issues in knowledge management affecting Malawi, including a weak culture of sharing clinical and technical information; lack of easily digestible, up-to-date health information for managers and providers; slow movement of information up and down the health system; lack of a central source of standardized information in FP/RH and HIV/AIDS; and limited access to the Internet among managers and providers outside the central level, international organizations, and senior staff at the district level.

Any knowledge management project in Malawi should use a diversity of communication channels to help overcome barriers in technical information sharing. Opportunities that could be explored include: the value of oral tradition; the utility of existing technical working groups to form the backbone of a national knowledge management system; the potential of the district health office to serve as a central hub for improving information flows; the possibilities of using radio more to meet the needs of an oral culture and to address language issues; and the prospects of using mobile phones to improve knowledge sharing between district staff and community health workers and to connect these health workers with essential information for their jobs.

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