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Knowledge for Health

# Knowledge for Health Environment Scan



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Knowledge for Health (K4Health)

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Family Health  
International



**Table of Contents**

Table of Contents ..... i

List of Figures and Tables ..... ii

List of Abbreviations ..... iii

Acknowledgments ..... v

Executive Summary ..... vi

**I. Introduction ..... 1**

    A. Research questions ..... 1

    B. Methods ..... 2

**II. Health information needs of program managers and providers ..... 3**

    A. Problems accessing health information ..... 3

    B. Information-seeking behaviors ..... 5

    C. Meeting health information needs ..... 6

**III. Technologies and tools ..... 8**

    A. Computer-based ICTs ..... 8

    B. Mobile technologies and wireless communication ..... 21

    C. Other emerging technologies and tools ..... 29

**IV. E-health Applications ..... 39**

    A. E-health functions using ICTs ..... 39

    B. Professional development ..... 41

    C. Support for patient care ..... 51

    D. Networking ..... 59

    E. Access to the scientific literature ..... 66

**V. Who’s Doing What? ..... 76**

    A. Knowledge Networks Relevant to K4Health ..... 76

    B. Key Findings from HIPNET Interviews ..... 86

    C. Knowledge management initiatives at USAID ..... 95

**VI. Implications and recommendations for K4Health ..... 101**

    A. Selecting appropriate technologies and tools ..... 101

    B. Meeting the need for locally relevant content ..... 103

    C. Needs assessments, monitoring, and evaluation ..... 105

    D. Building the K4Health Network ..... 105

**Appendices ..... 107**

    A. Annotated bibliography for K4Health priority countries ..... 107

    B. HIPNET member organizations that participated in interviews ..... 126

    C. Questionnaire for HIPNET interviews ..... 129

**References ..... 131**

## List of Figures and Tables

### Figures

Figure 1. How many people are online? .....	9
Figure 2. World Internet penetration in 2008, according to Internet World Stats .....	10
Figure 3. Internet penetration in K4Health priority countries in 2008, according to Internet World Stats .....	11
Figure 4. ICT Development Index (IDI) by geographic region, 2002-2007 .....	12
Figure 5. Fixed broadband subscriptions by level of development .....	14
Figure 6. Mobile broadband subscriptions by level of development.....	15
Figure 7. Monthly cost of 20 hours of Internet access and 100 minutes of mobile phone use, as percentage of per capita income.....	16
Figure 8. Growth in global ICTs, 1998-2008 .....	21
Figure 9. World phone and Internet access in 2007 .....	22
Figure 10. Phone and Internet access in K4Health priority countries in 2007 .....	23
Figure 11. Most frequently visited social networking websites, by region .....	38

### Tables

Table 1. Relative ranking of key features of mobile devices and computers .....	27
Table 2. Growth in worldwide audience (age 15+) for social networking sites, including access at home and at work .....	35
Table 3. E-health functions using ICTS.....	40
Table 4. Professional development and e-learning projects using ICTs.....	42
Table 5. Projects using ICTs to support patient care .....	52
Table 6. Projects using ICTs for networking.....	60
Table 7. Projects using ICTs to increase access to the scientific literature .....	67
Table 8. Knowledge networks relevant to K4Health.....	77
Table 9. Knowledge Management Initiatives at USAID .....	97

## List of Abbreviations

AED	Academy for Educational Development
AFRI	The African Farm Radio Research Initiative
AIM	Analysis, Information Management & Communications Activity
AJOL	African Journals OnLine
AJP	African Journal Partnership
ARHP	Association of Reproductive Health Professionals
ART	antiretroviral therapy
BIREME	Latin American and Caribbean Center on Health Sciences Information
CAs	cooperating agencies
CANDHI	Central American Network for Disaster and Health Information
CAP	community access point
CDC	Centers for Disease Control and Prevention
CDMA	code division multiple access
CEE	Central and Eastern Europe
CGIAR	Consultative Group on International Agricultural Research
CME	continuing medical education
COP	community of practice
DEC	Development Experience Clearinghouse
DHS	Demographic and Health Surveys
DRP	Developing Radio Partners
ESD	Extending Service Delivery Project
FAO	Food and Agriculture Organization of the United Nations
FAQ	frequently asked question
FHI	Family Health International
FP/RH	family planning/reproductive health
GAID	United Nations Global Alliance for ICTs and Development
GHI-net	Global Healthcare Information Network
GIS	geographic information system
GNI	gross national income
GPS	global positioning system
GSM	global system for mobile communications
HAIN	Health Action Information Network (Philippines)
HDN	Health and Development Networks
HIFA2015	Healthcare Information For All by 2015
HIF-net	Health Information Forum
HIP	Hygiene Improvement Project
HIPNET	Health Information and Publications Network
HRH	Human resources for health
IBP	Implementing Best Practices
ICARDA	International Centre for Agricultural Research in Dry Areas
ICN	International Council of Nurses
ICTs	information and communication technologies
ICT4D	Information and Communication Technologies for Development
IDI	ICT Development Index

IICD	International Institute for Communication and Development
IMCI	integrated management of childhood illness
INASP	International Network for the Availability of Scientific Publications
IRH	Institute for Reproductive Health
ISP	Internet service provider
IT	information technology
ITU	International Telecommunication Union
IYCN	Infant and Young Child Nutrition Project
JHU/CCP	Johns Hopkins University Center for Communication Programs
K4D	Knowledge for Development
K4Health	Knowledge for Health project
KCR	Kothmale Community Radio
KM	knowledge management
KM4Dev	Knowledge Management for Development
KM4PH	Knowledge Management for Public Health
LILACS	Literatura Latino Americana e do Caribe em Ciências da Saúde
MCH	maternal and child health
MOH	Ministry of Health
MSH	Management Sciences for Health
NAFIS	National Farmers Information Service
NGO	non-governmental organization
NIS	New Independent States
OECD	Organization for Economic Cooperation and Development
PDA	personal digital assistant
PLoS	Public Library of Science
POLHN	Pacific Open Learning Health Net
PRB	Population Reference Bureau
ProCAARE	Program for the Collaboration Against AIDS and Related Epidemics
RAFT	Reseau Afrique Francophone de Telemedecine
RSS	really simple syndication
SCMS	Supply Chain Management System
SciELO	Scientific Electronic Library Online
SMS	short message service (text messaging)
TALC	Teaching Aids at Low Cost
TBA	traditional birth attendant
TTS	text-to-speech
UNHCR	United Nations Refugee Agency
USAID	United States Agency for International Development
VLDP	Virtual Leadership Development Program
VoIP	Voice over Internet Protocol
Web4Dev	Web for Development
WHO	World Health Organization

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## **Executive Summary**

The Knowledge for Health (K4Health) project seeks to improve family planning/reproductive health (FP/RH) and other health services in developing countries using proven knowledge management approaches. K4Health commissioned an Environment Scan in 2009 to help define the project's niche and future direction. The scan explored five areas: health information needs assessments, Internet access in less developed countries, promising technologies and tools for K4Health audiences, health knowledge networks, and key FP/RH stakeholders.

To answer these questions, information was collected from three sources. Relevant publications were identified with the PubMed and POPLINE search engines and by searching online databases and bibliographies. Google and pertinent listservs were used to locate online resources, including grey literature, relevant projects, and health information networks. Telephone interviews were conducted with knowledge managers at 17 organizations that participated in meetings of the Health Information and Publications Network (HIPNET) in 2008 and 2009.

### ***Findings from the Environment Scan***

#### ***Health Information Needs***

Health information needs assessments of providers and managers in developing countries are limited in number and scope. It is clear, however, that access to useful health information remains limited in the developing world. Facilities and medical libraries have few materials on hand, and these are often out of date or too sophisticated, too generic, or too theoretical to meet the practical needs of frontline providers. Slow, unreliable Internet connections and the high cost of books, journal subscriptions, and Internet access compound the problem. In the face of these obstacles, managers and providers in developing countries generally rely on four sources of information: (1) learning activities sponsored by their facility or health system; (2) official materials, such as guidelines and protocols; (3) discussions with colleagues; and (4) textbooks.

#### ***Internet Access***

Internet use is increasing more rapidly in developed than developing countries. The proportion of the population online is only 6% in Africa and ranges from 17% to 29% in Asia, Latin America, and the Middle East. Internet connections in developing countries tend to be unstable, slow, and costly. Few health professionals outside of tertiary centers have fast, reliable Internet connections, and email—not web browsing—is their most common activity online. Despite this, FP/RH organizations are increasingly relying on the web to disseminate materials, although a niche remains for CD-ROMs.

Like the rest of the population, health professionals have increasingly turned to community access points—including cybercafés, Internet kiosks, libraries, community centers, and government-subsidized telecenters—to access the Internet. Community intermediaries may also increase Internet access: for example, agricultural extension

workers, health and development NGOs, and community radio stations can and do search out useful information online, translate it into the local language, put it into context, and disseminate it via local communication systems.

### ***Promising Technologies and Tools***

Many pilot projects have explored the use of mobile technologies and wireless communication for health applications. Basic cell phones are ubiquitous in developing countries and offer both text messaging and voice capabilities. While text messaging is more reliable and less expensive, the brevity of the messages limits their usefulness. New technologies that can recognize or synthesize natural speech have increased the potential of voice platforms. The agricultural sector has pioneered voice-based information systems that farmers access via mobile phones; these may serve as a model for community health workers. Providers have also found personal digital assistants (PDAs) useful because they offer ready access to reference materials and job aids. Ultimately, PDAs and smart phones may become the primary way that people access the Internet, but neither the devices nor the wireless networks are readily available in developing countries as yet.

A new and rapidly evolving generation of Web 2.0 tools and technologies that encourage collaboration and interactivity also holds promise for knowledge sharing in FP/RH. For example, blogs let project participants share updates and raise questions with a larger community; wikis allow workgroups to collaborate on documents; social bookmarking enables communities of practice to jointly build a searchable set of online resources; and commercial social networking sites can offer a platform for knowledge sharing or inspiration for the design of health knowledge networks.

New audio and visual technologies can overcome barriers posed by literacy. Text-to-speech and speech recognition can power voice-based information systems. Podcasting can distribute speech and music cheaply. And simple digital video technologies can capture project activities and tell stories in more compelling ways.

### ***Knowledge Networks***

A host of health and development knowledge networks have emerged to serve policy makers, researchers, program managers, health providers, and the general public.

K4Health can learn from and may consider collaborating with networks that:

- Have similar goals and activities, such as HIPNET and the Health Information Forum (HIF-net);
- Promote ICTs for knowledge sharing, such as Knowledge for Development (K4D), Mobile Active, Web for Development (Web4Dev), and Zunia;
- Focus on family planning and reproductive health, such as the CORE Group, the Global Healthcare Information Network (GHI-net), and the Program for the Collaboration Against AIDS and Related Epidemics (ProCAARE);
- Focus on specific regions or countries, such as the EurasiaHealth Knowledge Network, the Health Action Information Network (HAIN) in the Philippines, and national affiliates of the Health and Development Networks (HDN);

- Draw health care managers and providers, such as communities of practice hosted by the IBP Knowledge Gateway and Satelife’s discussion groups; and
- Provide platforms for knowledge sharing, such as the IBP Knowledge Gateway and the Development Gateway.

### ***Key Stakeholders***

HIPNET members offer a rich source of materials and advice for K4Health’s FP/RH knowledge bundles. However, they need help from K4Health to assess the information needs of health professionals, adapt materials to specific settings, reduce duplication in materials produced, disseminate their products, and assess the value of emerging ICTs.

### ***Implications and Recommendations***

#### ***Appropriate technologies and tools***

Migrating too quickly to the web will leave important parts of the K4Health audience behind. Thus, it is important to package content in multiple formats for dissemination via old as well as new technologies, including print, radio, and CD-ROM. However, new technologies offer the potential for greater cost-effectiveness and reach, especially for low literate audiences. K4Health should explore the most promising, including:

- Texting, voice, and web applications for cell phones and other mobile devices,
- Inexpensive camera and video technologies,
- Internet access via community access points and local intermediaries, and
- Social networking and other Web 2.0 tools.

#### ***Meeting the need for locally relevant content***

To be useful, information needs to be tailored to the setting and the information needs of a specific cadre of health workers—but it is difficult, labor-intensive, and costly to repackage information in this way. K4Health should consider recruiting local information specialists to help and encouraging countries to collaborate on regional products.

#### ***Needs assessments, monitoring, and evaluation***

This is a weak area. K4Health can help fill the void by conducting health information needs assessments; contributing to the Healthcare Information For All by 2015 (HIFA2015) database on providers’ information needs; and helping operationalize the HIPNET monitoring and evaluation guide.

#### ***Designing the K4Health network***

K4Health should build on other knowledge networks, for example, by using established knowledge sharing platforms, such as the IBP Knowledge Gateway; tapping FP/RH knowledge repositories; and joining networks that are active in priority countries. Creating sub-communities focused on specific technical areas or countries; incorporating popular knowledge sharing tools; and actively managing the site to build trust and stimulate discussion can also attract more users to the K4Health network.

## I. INTRODUCTION

The goal of the Knowledge for Health (K4Health) project is to improve the provision of family planning/reproductive health (FP/RH) and other health services in developing countries using proven knowledge management approaches. The project's purpose is to transfer knowledge to the people who affect the quality of service provision, namely health care decision-makers, program managers, and service providers. K4Health commissioned this Environment Scan to help define the project's niche and future direction. To this end, the Scan reviews research and analysis on FP/RH health information needs, information and communication technologies (ICTs) and tools, and knowledge networks that are relevant to developing countries. Special consideration is given to countries that are a priority for K4Health, including Egypt, Ethiopia, India, Jordan, Malawi, Namibia, Peru, Rwanda, South Africa, and Uganda.

### A. *Research questions*

The research was guided by the following series of questions:

- (1) **Needs:** What health information needs assessments have been conducted to date with audiences similar to those of K4Health? What are the key findings from these needs assessments? What recommendations for K4Health can be drawn from these findings?
- (2) **Networks:** What health information networks currently exist that serve audiences similar to K4Health? What lessons can be drawn from these networks? Which networks should K4Health collaborate with in a formal way in order to maximize the impact of its own network and minimize duplication? Is there a gap in the existing networks? What niche might the K4Health network fill?
- (3) **Technology and tools:** What are the most promising technologies and tools for K4HEALTH audiences? What promising technological tools are on the horizon? What channels are organizations successfully using to connect with their clients in the field? PDAs? Other technology gadgets? How are they being used? What are the success stories? What are some of the cutting edge technology tools being used in allied disciplines (e.g., education and agriculture)?
- (4) **Infrastructure:** What does the literature say about access to the Internet in less developed countries? What does it say about K4Health priority countries? What issues should K4Health consider when developing websites and creating other online knowledge exchange mechanisms (e.g. bandwidth and the existence of Internet cafés)?
- (5) **Key stakeholders:** Who are the key FP/RH health information players? What are the key FP/RH topics of interest to these groups? Who might K4Health tap to become part of its network? Any potential fireballs?

As the research proceeded, two additional areas of interest were identified and pursued: first, knowledge management experiences at and the potential for collaboration with organizations that are active members of the Health Information and Publications Network (HIPNET) and, second, knowledge management activities undertaken by the United States Agency for International Development (USAID) and the projects it funds in all technical areas, including but not limited to global health.

## ***B. Methods***

The first step in the research was a search for relevant published literature using the PubMed and POPLINE search engines. Online databases and bibliographies, including the dgCommunity on ICTs for Development and the Source research library on ICTs and health, were also searched for relevant publications.

Given that much of the Environment Scan focused on the use of electronic ICTs, locating resources on the Internet was a second and larger focus of the research. Google searches were conducted and relevant listservs (e.g., HIFA2015, dgAlerts, and Drumbeat) were monitored to find grey literature on relevant issues and to identify projects and health information networks of interest. Organizational and project websites provided much of the information on the knowledge networks and knowledge management activities described in this report.

Lastly, telephone interviews were conducted with knowledge managers and other staff working at 17 organizations that participated in HIPNET meetings over the preceding year and responded positively to a request for an interview. In most cases, interviews were conducted with a single person working at the organization, but sometimes two or three people with different job responsibilities participated. (See Appendix B for a list of organizations that participated and Appendix C for the questionnaire.)

## II. HEALTH INFORMATION NEEDS OF PROGRAM MANAGERS AND PROVIDERS

Health information needs assessments of providers and managers in developing countries are limited in both number and scope in the published literature. What information does exist for developing countries mostly focuses on doctors. More research has been conducted on information-seeking behaviors by healthcare providers in developed countries, although those findings are less directly relevant to K4Health audiences. No matter what the setting, many studies rely on self-reported information-seeking behaviors which tend to differ from observed behaviors. Interviews with HIPNET members suggest that cooperating agencies (CAs) often rely on informal feedback to determine the information needs of their audiences; when they do conduct formal assessments, the results are generally not published. However, some general conclusions applicable to K4Health audiences can be drawn.

### A. *Problems accessing health information*

Access to useful health information remains limited in many parts of the developing world, and it contributes to poor knowledge and incorrect practice among health workers at every level (Pakenham-Walsh and Bukachi, 2009). Common complaints by health care providers and managers include (Geyoushi et al., 2003; Hoppenbrouwer and Kanyengo, 2007; Kafiriri and Bondy, 2006; Muula et al., 2003, Pakenham-Walsh and Bukachi, 2009; Pandita and Singh, 2008; Tumwikirize et al., 2007):

- ***Lack of materials.*** Health facilities and even medical libraries in the developing world often have few books, journals, guidelines, handbooks, or other print materials on hand—and those available are frequently out of date. The problem is aggravated when libraries are too far away for providers to visit regularly. Managers suffer from a lack of access to the grey literature (such as policy documents, government reports, legislative summaries, and best practices) and to local demographic, epidemiological, and service utilization data.
- ***Inappropriate and irrelevant materials.*** Available materials may be too sophisticated, too generic, or too theoretical to meet health workers' information needs. For example, frontline providers benefit little, if at all, from scientific journals. Rather they need practical, easy-to-read content targeted to the local context and to their job responsibilities—that is, content that has been specifically packaged to meet their needs.
- ***Lack of access to the Internet.*** Internet connections are often slow, unreliable, or entirely absent.
- ***High costs.*** Buying books, subscribing to journals, and accessing the Internet are not affordable for most health workers.

- **Limited access to meetings and medical societies.** In some countries, providers have complained that gatekeepers make it difficult to attend professional meetings or join professional groups.
- **Time pressures.** Long hours and heavy workloads mean that providers are too busy to read updates or search for needed information.
- **Lack of a reading culture.** Health directors, doctors, nurses, and clinical officers in Zambia reported that they only read for examinations (Hoppenbrouwer and Kanyengo, 2007). Without a continuing medical education (CME) requirement as an incentive, they do not try to keep current.

As the last two items on the list suggest, just making information sources—including the Internet—readily available may not entirely solve the problem. Indeed, information overload creates new obstacles to finding and using information, as shown in studies of US doctors. These studies found that patient visits typically generate at least one question for doctors, usually related to treatment. (According to observers, however, there are even more questions that seem to go unrecognized by doctors). Most of these questions go unanswered because doctors (Dawes and Sampson, 2003; Smith, 1996):

- Find it too time consuming and labor-intensive to search for answers in the huge amount of material available,
- Doubt that there is a definitive answer, or
- Simply lack a sense of urgency.

Time pressures are also paramount for nurses, who want immediate answers to questions regarding patient care. The need for rapid retrieval may compromise the quality of the information (Dee and Stanley, 2005).

Like their counterparts in developing countries, US doctors complain that textbooks are often out of date and that digging through journals for answers is painfully slow. Part of the problem is that doctors simply lack the skills needed to find and evaluate relevant scientific information. In addition, doctors generally frame questions in terms of a specific patient (“should I test this patient?” rather than “what are the indications for conducting this lab test?”) which makes it more difficult to find answers. These studies also suggest that doctors are seeking support, guidance, affirmation, and feedback—not just information (Dawes and Sampson, 2003; McKnight and Peet, 2000; Smith, 1996).

Studies of nurses in developed countries confirm the importance of information-seeking skills. They found that nurses and nursing students lacked confidence in their ability to use the professional libraries available to them, did not know what health information resources were available, and did not realize that librarians could teach them how to search for information. Although the nurses and students possessed general Internet-searching skills, they were unable to use the advanced features of medical databases to narrow and expedite their searches (Dee and Stanley, 2005).

Thus, it is not surprising that when doctors and nurses in developing countries look for answers, they turn to resources that require the least amount of time, effort, and money to

consult—typically textbooks and colleagues, both of which offer concise and reliable information but which are not always up to date (Dawes and Sampson, 2003; Dee and Stanley, 2005; McKnight and Peet, 2000; Smith, 1996).

## ***B. Information-seeking behaviors***

Studies in developing countries suggest that health care managers, doctors, nurses, and other providers generally rely on the following sources of information (Geyoushi et al., 2003; Hoppenbrouwer and Kanyengo, 2007; Kafiriri and Bondy, 2006; Muula et al., 2003; Smith et al., 2007):

- Activities sponsored by the facility or the health care system, such as hospital or clinic meetings, seminars, training workshops, and CME programs;
- Official materials, such as guidelines, manuals, and hospital protocols;
- Discussions with colleagues; and
- Textbooks.

Where Internet access is available, health professionals do use it. In South Africa, for example, nine in ten general practitioners have Internet access, home usage is high, and overall Internet usage patterns are similar to international studies (Masters, 2008). However, health professionals may not be fully aware of what resources are available online. A survey of teaching hospitals in Cameroon, Nigeria, Tanzania, and Uganda found that only half of postgraduate doctors in training were aware of the World Health Organization's HINARI Access to Research Initiative and just one-fifth knew of BioMed Central (Smith et al., 2007). Access may also be uneven. In India, for example, the Health InterNetwork uncovered gaps in Internet access based on gender and rank. The project worked to close these gaps by installing computers in women's residences at medical colleges and by ensuring that staff at primary health centers received computers and training (Kuruvilla et al., 2004).

Studies of doctors, nurses, and other healthcare providers in the US and other developed countries have found that they continue to rely most heavily on colleagues for medical information, despite the increasing availability of electronic resources and a new emphasis on evidence-based medicine. This is partly because of colleagues' familiarity and ready availability (even more so in the age of email) and partly because colleagues provide concise, organized answers that synthesize knowledge and experience and are directly relevant to clinical questions (Dee and Stanley, 2005; McKnight and Peet, 2000).

The importance of other information sources varies between studies. A study of primary care practitioners in Kentucky found that they relied more heavily on print materials than the Internet. More important, however, was a striking gap between providers who frequently sought information from any and all sources and those who did not (Andrews et al., 2005). A US study of nursing students and clinical nurses found that both groups tended to rely on colleagues and books for medical information; in addition, however, students tended to cite electronic resources, including personal digital assistants (PDAs), electronic journals and books, and online databases. Notably the students had greater access to electronic resources, greater computer skills, and more training on how to use electronic

resources. Limited search skills, however, meant that many favored easy and familiar Internet resources, such as popular search engines and keyword searching, over specialized health information databases that they found harder to access and more difficult to use (Dee and Stanley 2005). Studies of physicians frequently find a heavy reliance on journals, even though journals more often report preliminary research findings than generally accepted practices and procedures (McKnight and Peet, 2000).

### **C. Meeting health information needs**

Program managers and providers need information that is (Pakenham-Walsh and Bukachi, 2009; Revere et al., 2007):

- Trustworthy, that is, generated or verified by an authoritative source,
- Up-to-date and known to be regularly updated,
- Relevant to the local context,
- Practical rather than theoretical,
- Easy to digest, and
- Convenient and accessible.

K4Health should consider employing the following strategies to meet these needs:

- **Assess information needs:** Use “pull” models that respond to the assessed information needs of health workers, rather than “pushing” unwanted and unnecessary information out to people (Godlee et al., 2004). It is important to examine both (1) providers’ perceived needs, that is, the information they say they want, and (2) providers’ actual needs, that is, the information required to correct their misconceptions and incorrect practices (Pakenham-Walsh and Bukachi, 2009).
- **Emphasize basic references:** Create and routinely update basic reference and learning materials for frontline providers, such as handbooks and drug formularies, which can give them quick and easy access to most of the information they need (Godlee et al., 2004).
- **Tailor and repackaging information:** Make sure that raw information is reviewed, filtered, summarized, and repackaged before dissemination to ensure its relevance and reliability, make it easy to digest and use, give it a local focus, and tailor it to the needs of a specific audience, such as nurses, community health workers, policy makers, or program managers (Chetley, 2006; Godlee et al., 2004; Ladd et al., 2008; Pakenham-Walsh and Bukachi, 2009; Pandita and Singh, 2008; Revere et al., 2007; Roberts et al., 2007). Language is a central issue here. Building the capacity of ministries of health, library services, and local non-governmental organizations (NGOs) to prepare and distribute their own health information materials can help achieve this goal, although this may be difficult and expensive. So can strengthening local communities of practice (Godlee et al., 2004).

- ***Reach out to and support information specialists:*** Work with existing information specialists or train a new cadre of knowledge managers to support healthcare workers. Librarians and library services in the health sector are often overlooked and underused even though they possess relevant knowledge and skills. Information specialists can play several important roles: they can help managers and providers locate the information they need; they can teach managers and providers how to retrieve information using computers, the Internet, and medical databases; and they can use their knowledge of the information needs of local health workers to repackage information for them (Dee and Stanley, 2005; Hoppenbrouwer and Kanyengo, 2007; Revere et al., 2007). Where information specialists do not exist, local staff may need to be trained as knowledge managers to filter, select, and adapt relevant content for health workers (Ladd et al., 2008).
- ***Make access easy and strengthen its visibility:*** Ensure that knowledge resources can be accessed quickly, with minimal effort, and for free—and that health managers and providers know where to find them (Dawes and Sampson, 2003; Godlee et al., 2004; Muula et al., 2003; Pandita and Singh, 2008; Smith 1996). This may dictate which ICTs and communication channels are used to distribute information.

### **Responding to local information needs in Kenya: AfriAya**

AfriAya generates the HIV/AIDS content it distributes from a host of sources, including official Ministry of Health (MOH) publications, partner agencies, local HIV/AIDS organizations, and the Internet. However, it also looks to the communities it serves for inspiration: it collects community questions and concerns to ensure that it supplies the information that people want and that frontline providers need. These questions may be prompted by specific community experiences, simple factual misunderstandings, or the social and cultural factors that contribute to HIV transmission.

Information specialists at a central hub are responsible for assembling and preparing the content. AfriAya quickly discovered that, despite the large amount of information regarding HIV/AIDS on the Internet, very little was directly suitable for poor communities. Therefore, AfriAya's information specialists must repackage the information to ensure that it is relevant and appropriate before sending it to AfriAya's field centers. Frontline health workers and change agents use the information to respond to queries and problems raised by community members.

Source: Chetley, 2006

### III. TECHNOLOGIES AND TOOLS

#### A. *Computer-based ICTs*

Computer-based ICTs allow people to communicate both locally and globally via:

- Email,
- CD-ROMs and DVDs,
- Voice over Internet Protocol (VoIP) systems, and the
- World Wide Web.

While the web has the greatest capabilities, Internet access in developing countries is often limited and unreliable (see below). Hence email—which is reliable, inexpensive, and widely available—has had a bigger impact on health communications in developing countries. Email can reduce professional isolation by giving health workers a way to communicate with colleagues, participate in discussion forums, subscribe to newsletters and listservs, and receive publications (Godlee et al., 2004; Porter, 2004; Rhine, 2006). Special services even make it possible to access the web with email: Satellife's GetWeb service (<http://www.healthnet.org/getweb.php>) delivers web pages and online documents via email to health professionals who lack good Internet connections.

However, email is asynchronous, that is, sender and recipient do not interact simultaneously. This may be a benefit, for example, when people want a convenient way to correspond across different time zones or work around busy schedules. It may also pose a limitation, for example, when people want to engage in a dialogue with immediate feedback. In contrast, web-based communications, ranging from instant messaging to

#### **Less sophisticated technologies may be better**

In the Philippines, the BuddyWorks Community Partnership in Delivering Telemedicine Services installed expensive computer workstations and broadband connections at ten remote health sites so that doctors posted there could seek outside consultations and make referrals. Doctors did not use the new equipment, however, because the process required so many steps (logging on, going to a website portal, entering relevant clinical data, and waiting for an expert to respond) that their efforts to seek outside opinions often failed.

A second telemedicine project succeeded where the first failed by embracing a much simpler and widely available technology: cell phones. Most doctors already owned a mobile phone, but the project gave them modest prepaid allowances for text messaging and free conference call services for voice-based referrals. The system proved popular and sustainable, with 44 doctors working in remote areas making more than 300 referrals over a six-month period.

Source: Marcelo, 2009

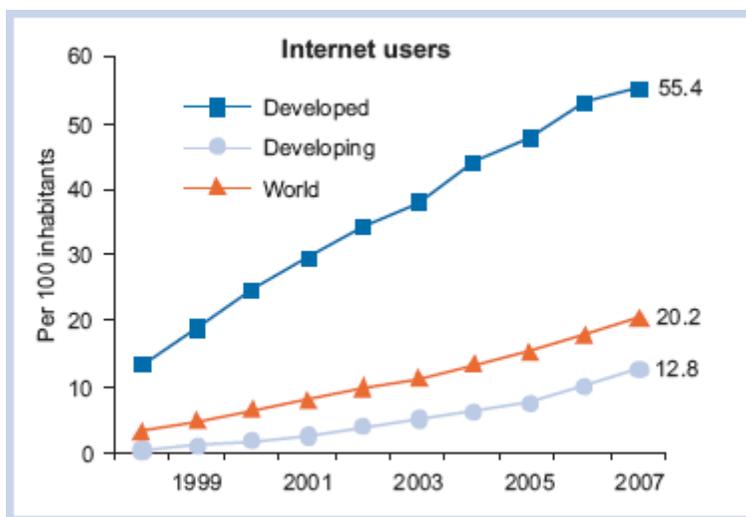
VoIP systems to web-based conferencing, allow people to interact in real time. As email has become more popular, however, a new problem has emerged: clogged inboxes in which messages can get lost literally, when they are caught by spam filters, or figuratively, when they go unnoticed amid the welter of messages in an inbox (Pakenham-Walsh, 2007).

CD-ROMs and DVDs play a different role. Because of their ability to hold large amounts of information, including massive multimedia files, they can substitute for the Internet where connections are slow and unreliable and the ability to download files is limited. They can disseminate entire libraries of documents or whole training courses. The eGranary digital library system takes this approach one step further: it distributes entire libraries of material on a computer hard drive that can be wired into a local area network (Roberts et al., 2007).

### Penetration and reach

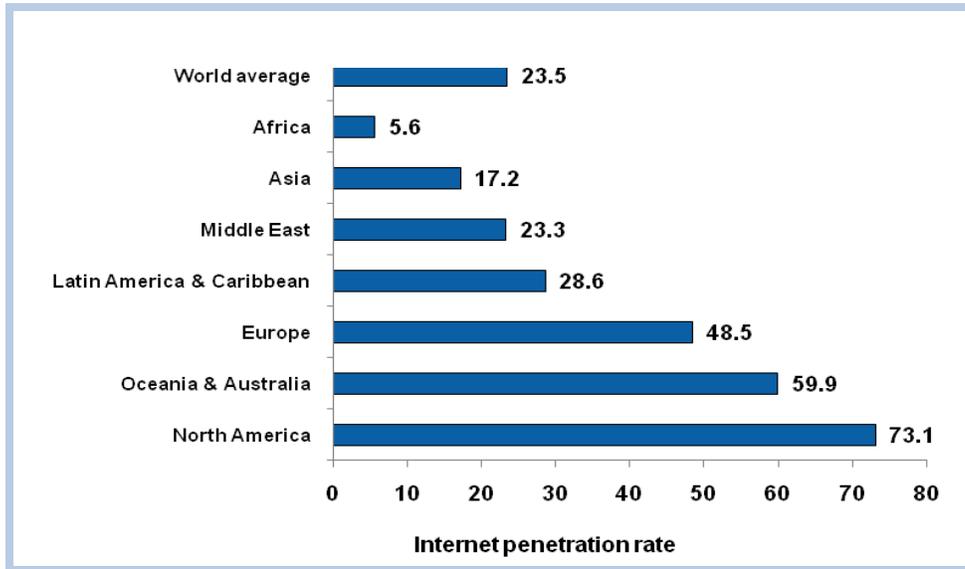
Internet use has grown rapidly over the past decade, but at a more rapid pace in developed than developing countries (see Figure 1). In 2008 almost one-quarter of the world’s population used the Internet, but usage levels vary widely between and within regions (see Figure 2). Internet penetration is lowest in Africa, at 6%. It ranges from 17% to 29% in Asia, Latin America, and the Middle East. And it peaks at 73% in North America (Internet World Stats, 2009). This gap will likely persist for many years to come because Internet penetration in low-income countries is converging very slowly with the rest of the world (Juech, 2008).

**Figure 1. How many people are online?**



Source: ITU, 2009, p. 5

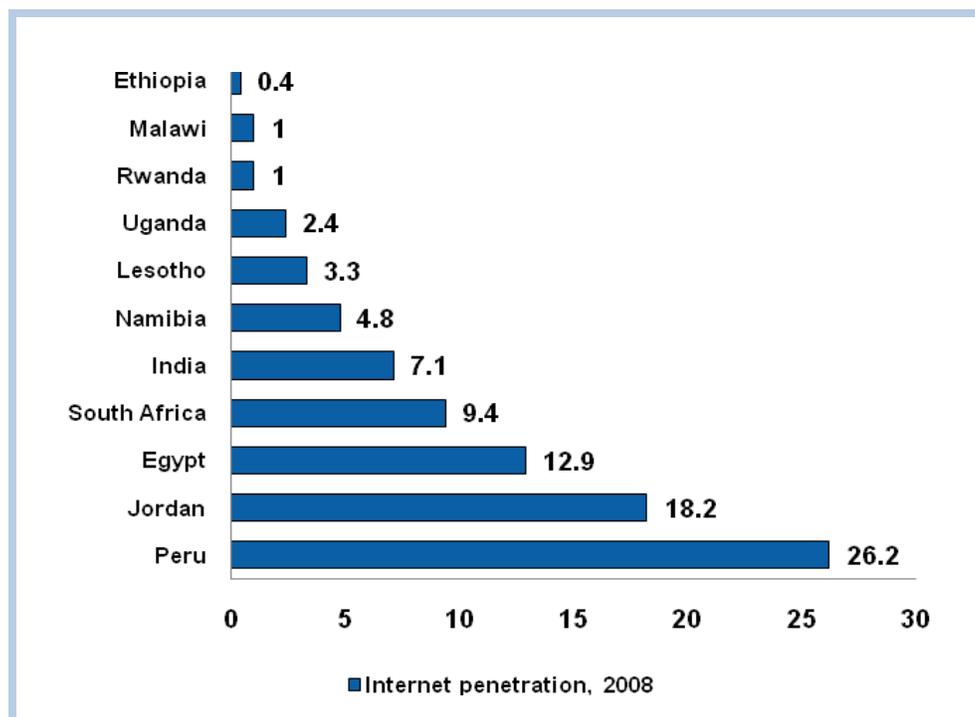
**Figure 2. World Internet penetration in 2008, according to Internet World Stats**



Source: Internet World Stats

Figure 3 shows Internet penetration rates for K4Health priority countries. In most of these countries, less than 10% of the population uses the Internet. Penetration rates are highest in Jordan (18%) and Peru (26%). Trend data is available for some K4Health priority countries from the International Telecommunication Union (ITU) (see Appendix A for tables of country data). In Egypt the proportion of the population using the Internet increased from less than 1% in 2000 to 13% in 2008. Over the same time period, it rose from 2% to 18% in Jordan and from almost 10% to 26% in Peru. Internet use has grown less dramatically in the other countries: rising from less than 1% in 2001 to nearly 4% in 2007 in India; from 5.5% in 2000 to 10.5% in 2008 in South Africa; and from less than 1% in 2000 to 6.4% in 2008 in Uganda. In absolute terms, this means there are over 4 million Internet users in South Africa, over 7 million in Peru, over 10 million in Egypt, and over 42 million in India.

**Figure 3. Internet penetration in K4Health priority countries in 2008, according to Internet World Stats**

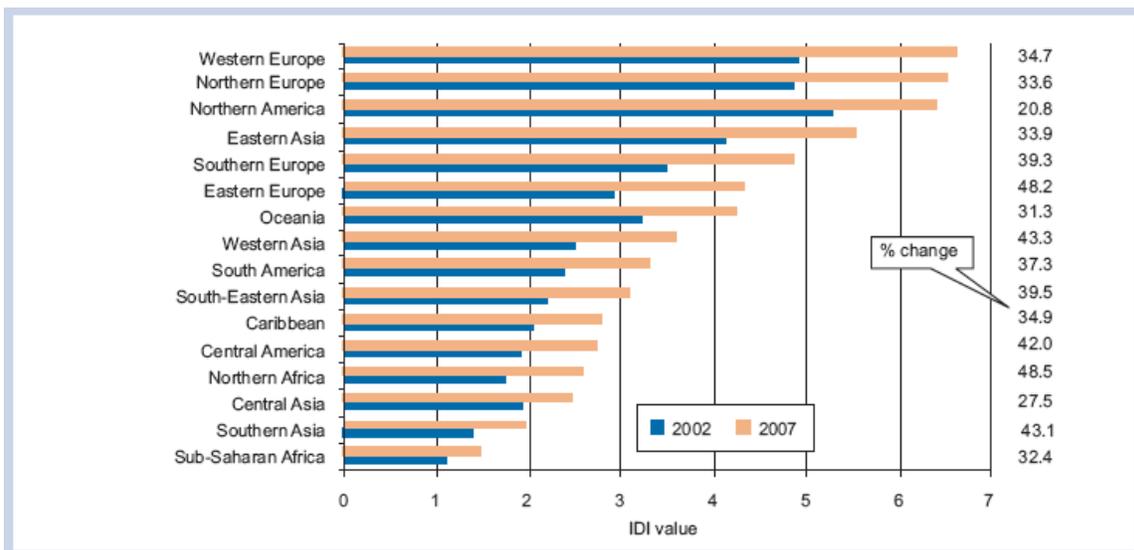


Source: Internet World Stats

A nationally representative survey of 17 countries conducted by ResearchICTAfrica has shed more light on Internet usage in sub-Saharan Africa (Gillwald, 2008; Gillwald, 2009; Gillwald and Stork, 2008). The proportion of survey respondents who knew what the Internet was ranged from a low of 4% in Mozambique to a high of 51% in South Africa. The proportion who used the Internet was 0% and 15%, respectively, in those two countries. Household computer ownership in the 17 countries surveyed ranged from 0.2% in Ethiopia to 14.8% in South Africa, but only a small minority of these had working Internet connections at home. Most Internet users relied on public access points, but nonetheless went online frequently. The proportion of Internet users who went online at least once a week ranged from a low of 44% in Senegal to a high of 94% in Uganda.

ITU has created an ICT Development Index (IDI) that provides a broader measure of the digital divide between North and South. The index combines measures of ICT access (including phone lines, bandwidth, and home computers), ICT use (including Internet use and mobile broadband subscribers), and ICT skills (including literacy and school enrollment). As Figure 4 shows, the IDI increased in every region of the world from 2002 to 2007, but the digital divide barely changed. Developing countries remained almost as far behind in 2007 as they did in 2002 (ITU 2009). Further analysis of the data found that the IDI is strongly correlated with per capita gross national income (GNI) and the association is increasing over time (ITU 2009).

**Figure 4. ICT Development Index (IDI) by geographic region, 2002-2007**



Source: ITU, 2009, p. 23

The digital divide within developing countries looms as large as the digital divide between North and South. For the most part, only urban and wealthy elites have access to new technologies in developing countries because of cost and educational barriers (Chandrasekhar and Ghosh, 2001). In Africa, for example, all 54 countries have direct Internet access in the big cities, but connectivity is extremely limited in rural areas (Bukachi and Pakenham-Walsh, 2007).

For health care, this means that outside of tertiary centers, such as teaching hospitals and research institutions, only a very small percentage of health professionals have fast, reliable Internet connections. For example, a 2005 assessment of computer use by health and health education program officers in southwestern Nigeria found that 6 of 22 NGOs and 4 of 8 government health ministry departments had no computers. Even when government offices had computers, they were likely to be located in and reserved for administrative and statistics offices. Only 25 of the 48 individual respondents had computer skills. While nearly two-thirds of both types of agencies had access to email, less than one-third had web browsing, and even fewer had CD-ROMs (Oyadoke et al., 2005-06).

Similarly, a 2005 survey of primary care services in Brazilian municipalities with over 100,000 residents found that one in three primary care centers had a computer, but only one in ten had Internet access. About one-fifth of all health workers used computers for professional activities. This included almost half of physicians, nurses and other college-educated professionals, but only about one-tenth of nursing technicians, community health agents, and others with a high school education (Tomasi et al., 2009).

As a result, email—not web browsing—is the most common use of the Internet for health professionals in sub-Saharan Africa and probably for those in Asia and Latin America as well. They use email for professional interactions, clinical advice, and referrals. In Africa, limited access to and awareness of electronic information sources also means that medical students and doctors continue to rely heavily on textbooks (Smith et al., 2007). While textbooks are an appropriate resource for many questions, they are more likely to be out of date unless they, too, have migrated to electronic formats.

## **Obstacles to electronic ICTs**

Many obstacles hinder access to computers, the Internet, and related technologies in developing countries. In India, for example, the HIN project set aside six months to establish Internet connections at health facilities and academic institutions. However, it took over a year to establish connections at some sites because of difficulties in securing reliable electricity and telephone services, complex bureaucratic processes, and competing demands on overtaxed infrastructure (Kuruville et al., 2004). According to the ResearchICTAfrica survey, the leading reasons for not using the Internet in sub-Saharan Africa were lack of access to a computer, not knowing how to use it, and lack of access to an Internet facility. Even when respondents did use the Internet, they reported that limited bandwidth and high prices made it less useful to them (Gillwald and Stork, 2008; Schmidt and Stork, 2008). Worldwide, most obstacles revolve around poor infrastructure, high costs, limited human resource capacities, and inappropriate content.

### ***Poor infrastructure***

**Electricity.** Many developing countries lack a stable power supply system: cities often experience frequent power failures, while rural areas may lack electricity altogether. Worldwide one in four people lack access to electricity, the vast majority in developing countries (World Bank, 2008).

Solar power offers an alternative to the electrical grid, although cost may limit scaling up (Bukachi and Pakenham-Walsh, 2007). Partners in the Satellife project tested a variety of solar chargers for PDAs in Africa and found the chargers to be cost-effective and reliable (SATELLIFE, 2005). Minimizing the amount of power needed to run computers and other ICTs can help offset the relatively high costs of solar power. For example, Inveneo ([www.inveneo.org](http://www.inveneo.org)), a non-profit organization based in California, designs rugged, simple ICT systems for remote villages that require a small fraction of the power that standard computers consume. Its systems operate consistently and cost-efficiently with a wide range of alternative power sources, including solar, hydro, and wind.

**Phone lines.** Telephone lines provide the most affordable Internet connections in many areas, but telephone mainlines are concentrated in urban areas of the developing world (Afemann, 2000). Poor quality phone connections mean that Internet sessions are frequently cut off (Oyodoke et al., 2005-06). While many pilot projects have avoided these problems by using VSAT satellite technology to connect to the Internet, high

costs—often due to legislative restrictions on private enterprise—have undermined their sustainability (Mars, 2009b).

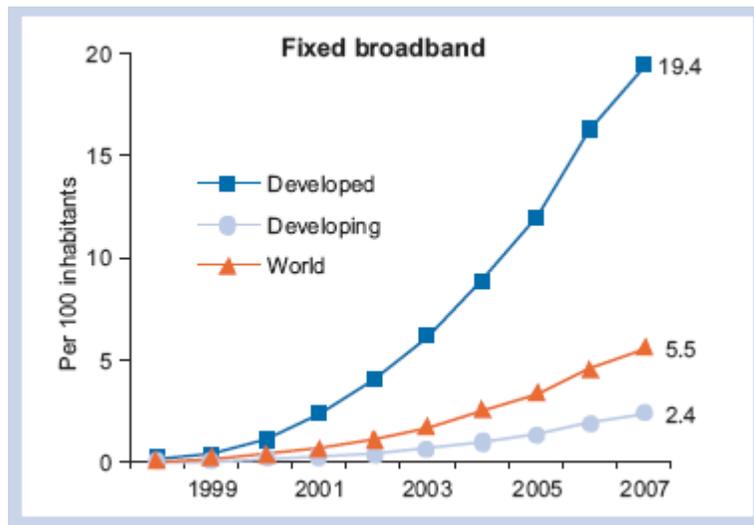
**Low server capacity and limited number of Internet Service Providers (ISPs).** Users may need to call 20 times before they can connect with a server in southwestern Nigeria (Oyodoke et al., 2005-06).

**Slow and unreliable connections.** Broadband connections are limited in developing countries, while slower dial-up access is cheaper and far more widely available (Chetley, 2006; Esteve and Machin, 2007). (See Figures 5 and 6 below, and Figure 9 on p. 21.) In addition, connections are often unstable and may be abruptly cut off. Data from HINARI suggest that usage levels for Internet services in developing countries depend more on good connectivity than a country’s economic strength or other variables (Bukachi and Pakenham-Walsh, 2007). While connectivity itself is related to a country’s gross national product (GNP), other factors such as government policies and subsidies also play a role (ITU, 2009).

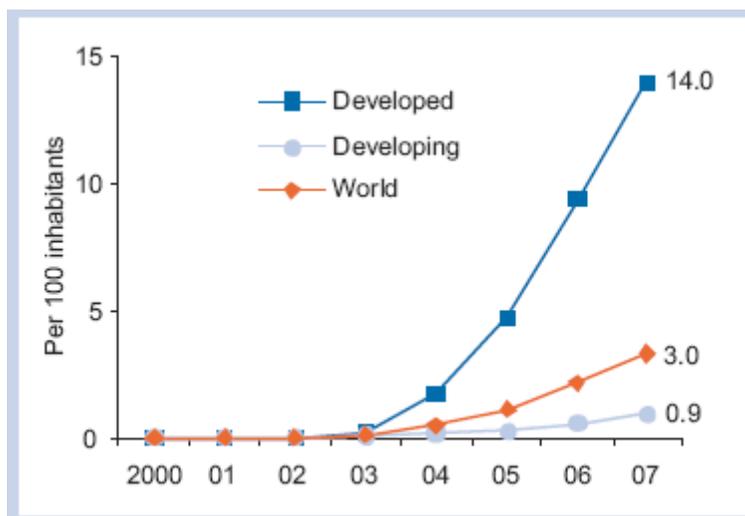
**Bandwidth.** Every country can now access the Internet, but developing countries have poorer connections to the network of international fiber optic cables or Internet “trunks” (Maxfield, 2004). As a result, Internet bandwidth is far higher in developed economies (4,755 bits per inhabitant) than in transition economies (223 bits), developing economies (177 bits) or the least developed economies (7 bits) (Roberts, 2008). The International Network for the Availability of Scientific Publications (INASP) provides practical advice on optimizing bandwidth

(<http://www.inasp.info/file/72bd90cc575a6c2b3002f773553258bb/bandwidth-management-and-optimisation-briefing-packs-workshop-materials-and-information-resources.html>) and conducts training workshops on how to address the problem (<http://www.inasp.info/file/54694be02f53f6491a1dcefedfc02d3/bmo.html>).

**Figure 5. Fixed broadband subscriptions by level of development**



Source: ITU, 2009, p. 5

**Figure 6. Mobile broadband subscriptions by level of development**

Source: ITU, 2009, p. 6

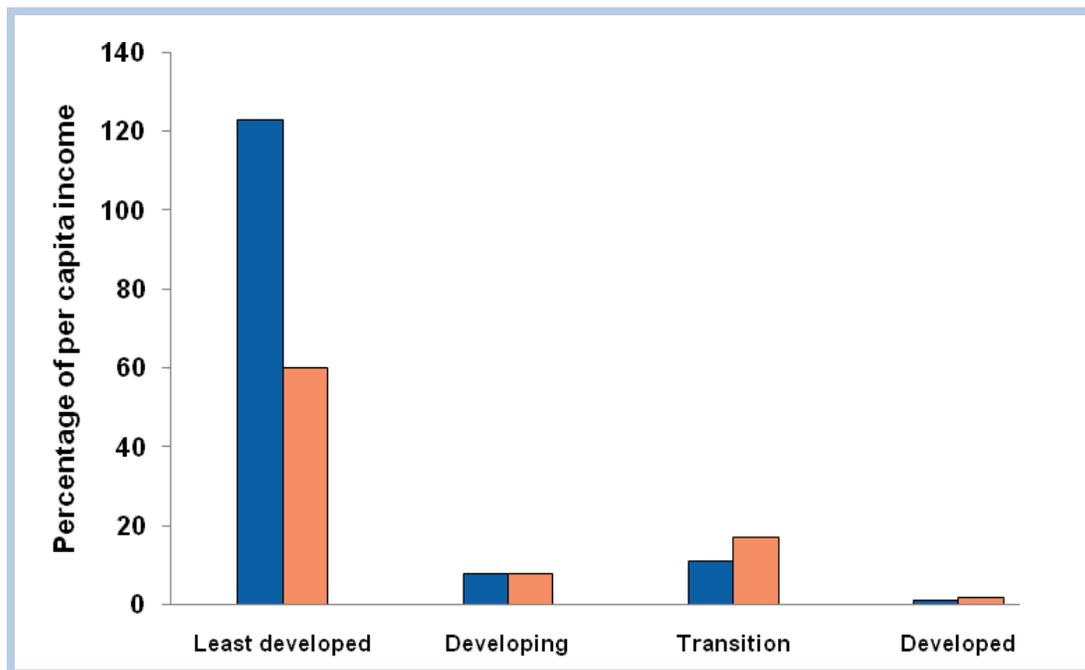
### *High costs*

**Absolute costs.** The cost of hardware, software, telephone connections, and ISPs is high in developing countries compared with the rest of the world (Bukachi and Pakenham-Walsh, 2007; Juech, 2008; Mars, 2009b). For example, the cost of 20 hours of Internet access per month is US\$41 in the least developed economies, compared with US\$22 in developing economies; transition and developed economies pay even less (Roberts, 2008). Limited competition—often monopolies—on ICT services drives costs up (Al-Shorbaji, 2008; Mars, 2009b). In Africa, the fact that about 70% of Internet traffic passes out of the continent also pushes up Internet costs (Mars 2009b; Schmidt and Stork, 2008).

**Affordability.** Even when the absolute cost of Internet access in developing countries is similar to that in industrialized countries, it makes up a much larger proportion of available income (Mars, 2009b). The cost of 20 hours of Internet access is equal to 123% of per capita income in the least developed economies, compared with about 10% in developing and transition economies and 1% in developed economies (see Figure 7).

Price differentials extend beyond the Internet. An analysis of the ITU's ICT Price Basket, which includes fixed telephone lines and mobile cellular telephone services as well as broadband Internet services, found that high-income developed countries tend to have lower relative prices for ICT services than developing economies. On average, the 2008 ICT Price Basket equaled 1.6% of developed countries' per capita GNI, compared with 20% of per capita GNI in developing countries. The low was 0.4% in Singapore and the United States, while the high was about 72% in Madagascar and Niger. This is important because the analysis also found a strong link between ICT prices and ICT access and use (ITU, 2009).

**Figure 7. Monthly cost of 20 hours of Internet access and 100 minutes of mobile phone use, as percentage of per capita income**



Source: Roberts 2008

**Rapid innovation in hardware and software.** The swift obsolescence of hardware and software exacerbates the financial burden. It is difficult for governments, NGOs, and cybercafé entrepreneurs to keep up with the latest equipment. This means, for example, that if health websites incorporate new generations of Internet applications, developing country users may not be able to access them (Maxfield, 2004).

**Internet Service Providers (ISPs).** ISPs in developing countries are less reliable and more costly than those in industrialized countries (Mars, 2009b; Maxfield, 2004). For example, the average monthly cost for 20 hours of Internet access in sub-Saharan countries is US\$55, compared with as little as US\$15 in the United States (Mars, 2009b).

**High costs are frequently passed on to users.** In developed and developing countries alike, individuals often bear the cost of connecting to the Internet. For example, students at African universities may be charged library fees to cover Internet access or directed to commercial cybercafés if they want to browse the web or check email (Watts and Ibegbulam, 2006; West, 2008).

### *Limited human capacity*

**Computer literacy.** Health care staff at all levels—but especially those working at the primary and district levels—lack computer skills and experience and have rarely received any training in this area (Al Shorbaji, 2008; Bukachi and Pakenham-Walsh, 2007; Pandita and Singh, 2008). Studies in sub-Saharan Africa show that even medical students

lack relevant training and skills; this is one reason why they consult electronic resources infrequently (Ogunyade and Oyibo, 2003; Watts and Ibegbulam, 2006).

ResearchICTAfrica has created a seven-point scale to assess a population's digital literacy. This e-skills index combines knowledge and use of the Internet with measures of people's confidence in using five basic computer functions: search engines, email, word processing, online discussion forums, and making calls over the Internet. South Africa scored the highest on the e-skills index among the 17 African countries surveyed, but even in South Africa survey respondents scored only 1.25 points out of a possible 7 points (Schmidt and Stork, 2008). Higher education, male gender, urban residence, higher income, access to the Internet at work, and full-time student status were among the factors linked with higher scores, although not all factors proved significant in all countries.

**Lack of information technology (IT) professionals.** Maintaining computer systems and troubleshooting problems requires considerably more skills and training than simply using a computer (Chetley, 2006). However, there are few IT training opportunities and hence few IT specialists in developing countries outside of capital cities (Maxfield, 2004). Those who are present generally lack experience in health informatics (Al-Shorbaji, 2008).

**Resistance to using ICTs.** Health workers may resist using ICTs because of the many changes they bring to the way care is delivered, to work practices, and to who makes decisions about patient care (Chetley 2006).

### *Content*

**Language.** English remains the predominant language on the web (Juech, 2008). Although an increasing number of health websites are being developed in French, Spanish, and Portuguese, much less is available in local languages such as Kiswahili and Hindi (Maxfield, 2004). Familiarity with English is even more important for IT specialists who deal with software (Chandrasekhar and Ghosh, 2001). Developing countries may find that imported e-health systems were developed in foreign languages for the cultural needs of other countries (Al-Shorbaji, 2008).

**Literacy.** Most health websites, regardless of language, present material at a high school or college level of literacy. This may be beyond the skills of frontline health workers (Elder and Clarke, 2009; Maxfield, 2004).

**Internet savvy.** Internet users need to know how to identify authoritative and credible sources on the web—based on their familiarity with the organizational sponsors, subtle culture-bound cues in the language used, and other factors that distinguish commercial from non-profit sites and expertise from opinion. These cues or codes may present a barrier for users in the South who lack the context for understanding them and have few local alternatives (Maxfield, 2004).

### Three initiatives to create local content

Internet use in many regions of India is inhibited by the lack of content in the country's 15 national languages. In response, N-Logue—whose franchisees provide telephone and Internet access at village kiosks—has established strategic alliances to create local language software and content in areas of interest, including education, agriculture, and financial products. Local service providers have also taken an active role in generating content that is attractive to villagers (Caspary and O'Connor, 2003).

Sehetna ([www.sehetna.com](http://www.sehetna.com)) is the first Arabic-language health web portal. Launched in 2006 by the Jordan Health Communication Partnership and the INFO Project at Johns Hopkins University Center for Communication Programs (JHU/CCP), the site targets a broad audience, including health providers, academia, researchers, government officials, and policy makers as well as the general public. The interactive and easy-to-use site provides content on healthy lifestyles, chronic and non-communicable diseases, safe motherhood and child survival, and other topics. Users can read the latest health news and articles from around the world, join a discussion group, or ask questions of an expert (HCP, 2009).

The EurasiaHealth Knowledge Network (<http://www.eurasiahealth.org/aids>) was created by the American International Health Alliance to address language barriers facing health professionals in the New Independent States (NIS) and Central and Eastern Europe (CEE). It maintains repositories of clinical practice guidelines, medical textbooks, and other educational materials on AIDS and tuberculosis in Russian and other local languages so that health professionals have access to up-to-date information and training in languages they understand. It also promotes regional knowledge sharing through discussion forums, a teleconsultation forum, and listservs that operate in local languages.

**Lack of local content.** Global information packaged in the North dominates health content on the web. There is a lack of locally created and locally relevant health information, or even information that has been repackaged and contextualized to suit different locations (Chetley, 2006; Juech, 2008).

## Strategies for expanding access

### *Shared access points*

Individuals do not necessarily need a personal connection to the Internet, especially if they are only using it for limited functions such as email. Sharing devices and connections is a commonly used approach to reduce costs and broaden access. This can be arranged in many ways (Colle, 2003):

- Entrepreneurs and franchisers may establish for-profit urban cybercafés or rural Internet kiosks that sell Internet services.
- Libraries, schools, training centers, and community centers can install Internet access points to serve learners.

- Governments and NGOs can build and operate telecenters that offer free or heavily subsidized Internet services to low-income clients.
- Individuals may “poach” wireless Internet connections (consider, for example, the enterprising medical student in Liberia who parked his car next to a hotel with wireless Internet, spent a couple of hours downloading a physiology textbook, copied it to a flash drive, and then shared it with his classmates) (Lambat 2008).

According to the ResearchICTAfrica survey, most Internet users in sub-Saharan Africa rely on public access points, including—in rough order of descending importance—cybercafés, the workplace, schools and universities, and libraries (Gillwald, 2008; Gillwald, 2009; Gillwald and Stork, 2008). Among the K4Health priority countries surveyed, 87% of Internet users in Rwanda, 60% in Ethiopia, 52% in Uganda, 46% in South Africa, and 24% in Namibia relied on cybercafés. The workplace was also important in most of these countries, providing access to 53% of Internet users in Uganda, 36% in Namibia, 32% in South Africa, and 24% in Ethiopia.

The rise of community access points (CAPs) is fueling much of the increase in Internet access in developing countries. Experience shows that health professionals in developing countries are willing to patronize cybercafés and other CAPs to access the Internet—even at some inconvenience to themselves (Lambat, 2008). Studies in sub-Saharan Africa, including Cameroon, Nigeria, Tanzania, and Uganda, have found that cybercafés are often the primary place where medical students access the Internet because institutional libraries offer very limited access (Smith et al., 2007; Watts and Ibegbulam, 2006). Cost, however, may pose an obstacle: students cannot always afford to stay online long enough to do extended web browsing and therefore may be limited to email. Reliance on community access points can also create other challenges for information dissemination; for example, cybercafé customers may not be able to install the applications needed to use CD-ROMs distributed by global information providers or to download and save files.

Overall, CAPs have a mixed record in terms of demand and financial sustainability (Caspary and O’Connor, 2003; Maxfield, 2004). According to Colle (2003), CAPs are more likely to attract clients and succeed when they:

- Offer needs-based and locally relevant content,
- Offer appropriate, demand-driven information and services,
- Have committed multiyear funding and organizational resources,
- Recruit local champions to mobilize others to accept and utilize ICT programs,
- Train community volunteers, especially women, to help operate the CAPs,
- Are clustered and networked with other CAPs so they can share resources and support,
- Make a systemic effort to raise community awareness of ICTs as useful resources,
- Conduct needs assessments and project evaluations, and
- Develop a long-term business plan that fits the community’s culture and balances income generation with the provision of public goods.

For more information on CAPS, check the telecenter initiative at the United Nations Global Alliance for ICTs and Development (GAID) ([www.telecentre.org](http://www.telecentre.org)).

### *The role of intermediaries*

Community intermediaries—whether institutions or individuals—can serve as a bridge between the Internet and the broader community and help overcome language and literacy barriers. Intermediaries can read, translate, and convert information from the Internet into content that is relevant to the local context; they can use local communication systems to disseminate content to people who lack access to or are unable to navigate the Internet themselves (Edejer, 2000). Effective intermediaries are located close to and trusted by the community; they are also knowledgeable about both ICTs and the local context (Girard, 2003). Individuals, such as midwives, teachers, and agricultural extension workers, can serve as intermediaries. Sometimes CAP operators hire local people to function as intermediaries; they search the Internet for information requested by community members and pass it along to them (Maxfield, 2004).

Organizations can also serve as intermediaries. For example, health and development NGOs may download materials from the web and distribute them locally in print, on CD-ROMs, or on flash drives. In India, village knowledge centers established by the M.S. Swaminathan Research Foundation acted as intermediaries for illiterate villagers. The centers downloaded desired information from the Internet as audio files and played them on loudspeakers for everyone to hear (Roman and Colle, 2002).

Community radio stations are emerging as one of the newest and most promising Internet intermediaries, because radio is the most pervasive, accessible, affordable, and flexible medium in rural areas. It also has a long tradition of serving as a community hub: in different times and places radio has been used to broadcast birth and death announcements, issue invitations to parties, order food and supplies from stores in other villages, call for emergency medical assistance, and even deliver personal medical advice from the local doctor (Girard, 2003). In the Internet age, community radio stations may download health programming for rebroadcast, for example, from OneWorld's AIDS Radio network (<http://radioafrica.oneworld.net/>); they may use material from the web to create their own programming; or they may broadcast messages that community members submit over mobile phones or by email (Chetley, 2006; Feek and Long, 2003; Wheeler et al., 2009).

Radio stations and their staff can act as search engines, locating the information online that may be of use to the community. They can act as translators, deciphering the voluminous but largely unilingual content of the Internet. And they can provide both local and international context for information that they pull off the web (Feek and Long, 2003). For example, Kothmale Community Radio (KCR) in Sri Lanka has computers and Internet access for research and production purposes. It also broadcasts a program in which presenters browse the Internet on behalf of listeners who phone or mail in requests. Local experts, such as doctors and lawyers, are invited to interpret the information for listeners; thus the radio station adds value to the information by putting it into local context. KCR also packages the most frequently requested information for off-line use (Caspary and O'Connor, 2003).

For more on radio, see the section below on combining mobile phones and radio, p. 29.

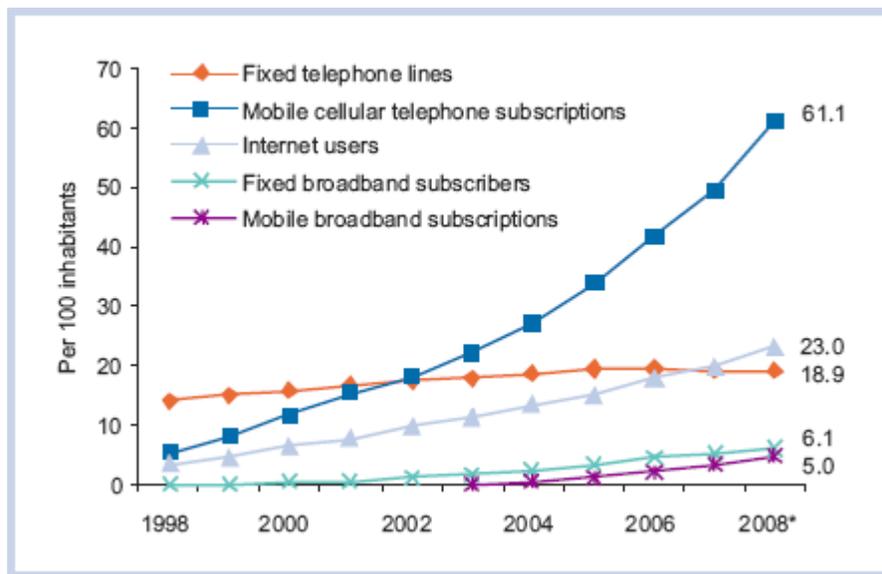
## B. Mobile technologies and wireless communication

Developing countries are giving up on traditional wired telecommunications systems in favor of wireless networks, because they are cheaper to install, less dependent on existing infrastructures, and offer state-of-the-art technologies. As a result, cell phones are far more ubiquitous in developing countries than other ICTs. They are also less expensive (Bukachi and Pakenham-Walsh, 2007). Other mobile devices, including smartphones, PDAs, and laptops, can also connect with wireless networks.

### Penetration and reach

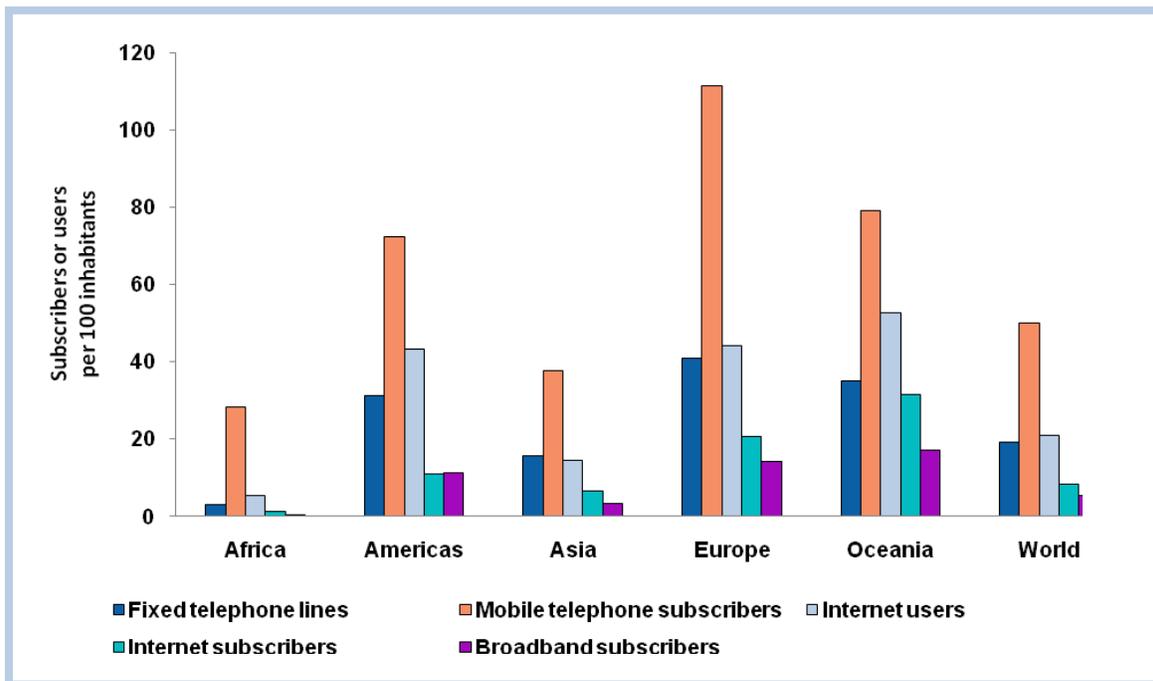
Rapid and accelerating growth in mobile phone subscriptions over the past decade has made this the most widely available ICT worldwide. By the end of 2008, there were over three times more mobile cellular subscriptions than fixed telephone lines; cells phones are also poised to take the lead over landlines for Internet access (see Figure 8). The disparity is greatest in developing countries where both fixed telephone lines and Internet use are extremely limited (Figure 9). In Africa, for example, there are 28 mobile phones per 100 people, compared with just 3 landlines and 5 Internet users. Cell phone costs also compare favorably with Internet access costs in the least developed economies (ITU, 2009) (see Figure 7, p. 16).

Figure 8. Growth in global ICTs, 1998-2008



Source: ITU, 2009, p. 3

Figure 9. World phone and Internet access in 2007



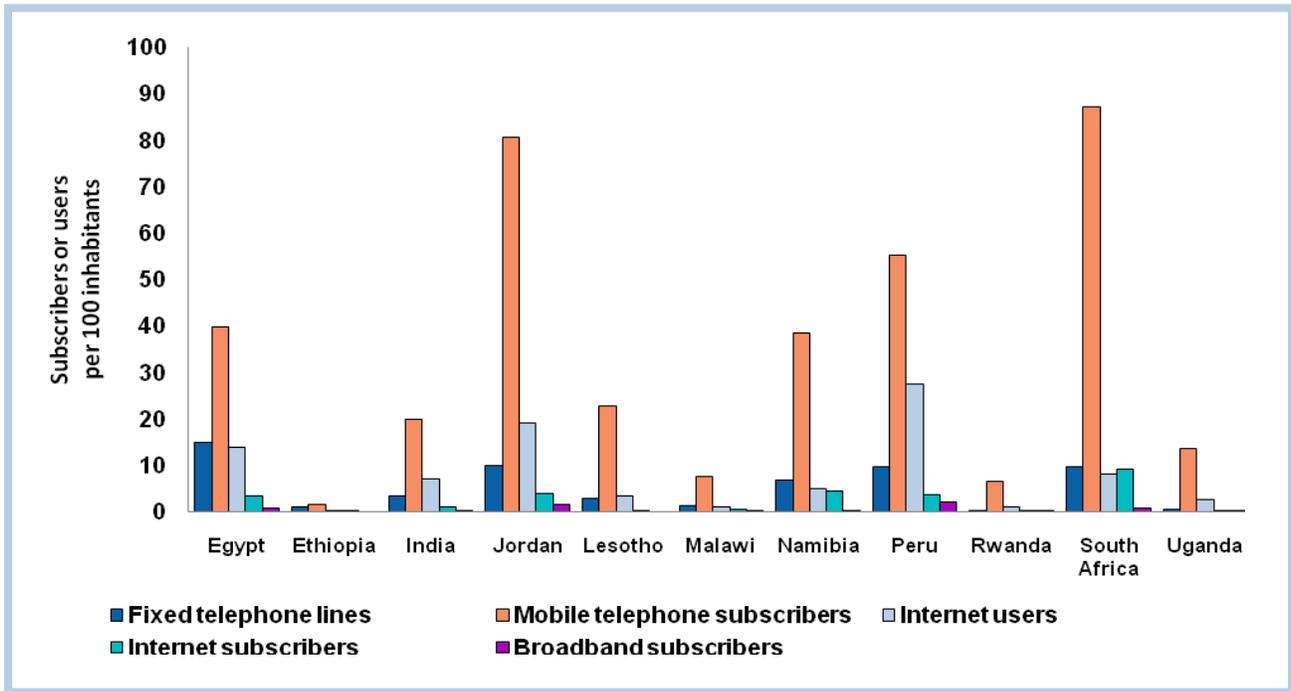
Source: ITU, 2007

Worldwide, the number of cell phone subscribers jumped from 1.1 million in 2002 to 3.3 million in 2007, for a compound annual growth rate of almost 24%. The fastest growth (49% annually) occurred in Africa, where 90% of all telephone subscribers used mobile phones by 2007. Mobile phones also account for around 70% of all telephone subscribers in the Americas, Asia, and Europe (ITU, 2008). Continued rapid growth is predicted for mobile technologies in the developing world. In India, mobile phone penetration increased from 1% in 1998 to 28% in 2008 and is predicted to reach 82% by 2018 (Sharma, 2008).

Among K4Health priority countries (see Figure 10), the majority of the population already subscribes to cellular phone service in Jordan, Peru, and South Africa. With the exception of Ethiopia, where connectivity of any kind is minimal, cell phone service vastly outstrips both fixed phone lines and Internet use.

The ResearchICTAfrica survey confirmed the existence of a gender gap in mobile phone access in sub-Saharan Africa: men outnumbered women in every country, no matter what the overall level of mobile phone ownership was. Among the K4Health priority countries surveyed, 20% of men versus 11% of women in South Africa had a mobile phone. Comparable figures were 11% and 7% in Namibia, 4% and 1% in Uganda, and 0.9% and 0.4% in Ethiopia (Gillwald, 2008).

**Figure 10. Phone and Internet access in K4Health priority countries in 2007**



Source: ITU, 2007

### Barriers and trends

Mobile devices run up against some of the same barriers to access as computer-based ICTs. While far less costly than computers, mobile devices are relatively more expensive in developing than developed countries when measured as a percentage of income (ITU, 2009; Mars, 2009b). Hence people may share a mobile phone, rather than owning their own, or own a handset but not be able to afford to call out. As competition increases and business models evolve, both the cost of handsets and services may come down (Anta, 2009; Sharma, 2008; Vital Wave Consulting, 2009; West, 2008; Wheeler et al., 2009). A highly competitive marketplace may explain the relatively low mobile prices found in some developing countries in Asia, such as India (ITU, 2009).

Globally the trend is toward faster connections and longer battery life as new, improved wireless technologies are introduced (Anta, 2009; Sharma, 2008; Vital Wave Consulting, 2009; West, 2008; Wheeler et al., 2009). However, cellular services in developing countries are likely to continue to rely on older technologies, such as GSM and CDMA, which have very low transmission rates and do not permit fast Internet connections (Esteve and Machin, 2007; Schmidt and Stork, 2008).

### Cell phones reach more people

According to a 2004 survey conducted by AfriAya, South Africans and Tanzanians generally get information on antiretroviral therapy (ART) from traditional rather than new media. However, 31% of South Africans and 10% of Tanzanians said they obtained information on ART from mobile phones and text messages—this was more than computers /CDs, email, and the Internet. As access to mobile telephones continues to rise in Africa, so may the number of people using them to access health information (Elder and Clarke, 2009).

Smart phones with built-in web browsers are becoming more widely available on a global level. Like the other trends driving m-health applications, however, the introduction of smart phones is lagging in many developing countries (Esteve and Machin, 2007; Ganapathy and Ravindra, 2008; Kaplan, 2006; Wright, 2008).

## Capabilities and health applications

### *Short message service (SMS)*

Many m-health projects have tried to take advantage of the SMS capability (also known as text messaging) of basic cell phones, which are ubiquitous in developing countries and relatively inexpensive. Texting offers many advantages. It:

- Is much less expensive than voice,
- Can reach people even when they have their phones turned off or cannot afford to pay for time on their cell phone,
- Functions with low bandwidth,
- Can remain up when voice and other data channels crash due to high volume,
- Can be sent simultaneously to many people, who have the option of forwarding the SMS to even more people, and
- Can be used to trigger actions on Internet servers, such as sending emails, updating databases, altering web pages, and looking up information and distributing it to other mobile phones (Kaplan, 2006; West, 2008; Wheeler et al., 2009).

Although applications may be limited by the brevity of the messages allowed (160 characters) and the need for literacy, SMS have great potential for the health sector. For example, the FrontlineSMS text messaging system (<http://www.frontlinesms.com>), which was designed for the non-profit sector, has been successfully deployed in over 40 countries. The Frontline system, which lets a computer send and receive group text messages, has been used for surveillance of avian flu outbreaks in Africa; sending health alerts to young people about HIV/AIDS, tuberculosis, and malaria in Benin; coordinating a blood donation program in Botswana; running surveys among rural healthcare workers in Ecuador; coordinating healthcare workers in Malawi; providing HIV/AIDS information to teachers in South Africa; tracing patients who fail to keep clinic

appointments and sending patient reminders in Tanzania; and aiding community-based healthcare in rural communities in Uganda (UN, 2007; Vital Waves Consulting, 2009).

While there have been many pilot studies and feasibility studies of using cell phones for health applications in developing countries, they have not yet collected convincing data on the impact, outcomes, or cost-effectiveness of the interventions (Kaplan, 2006).

### ***The role of voice***

Voice communications are the traditional domain of telephones, and they have the benefit of avoiding the barriers posed by lack of literacy. Voice may be especially appealing in Africa, where there are many traditionally oral cultures (Bukachi and Pakenham-Walsh, 2007). At the most basic level, the availability of phones—or in remote areas, VHF walkie-talkies—allows frontline health workers to call referral centers for advice and instructions when they are faced with difficult cases or emergencies (Musoke, 2002). Similarly, farmers have used mobile phone “conferencing” to expedite learning sessions with agricultural extension workers. In Uganda, for example, farmers gather around a mobile phone with a speakerphone capability and call an extension worker when they are ready to start a training session. The extension worker can work out of his/her own office and even look up and pass along information from the Internet as needed (Gakuru et al., 2009a).

New technologies offer the potential to affordably scale up voice-based solutions even further. By using machines to play prerecorded messages or to synthesize natural speech, telephones can serve as a portal to comprehensive information systems. While such systems may not offer as much detail as the visual interfaces offered by print materials and the web, the voice solution is still a promising platform for less literate health workers in developing countries: It can be customized for local languages, is readily accessible, and is a very natural way of seeking information (Gakuru et al., 2009a).

Some of the earliest efforts have come in the agricultural sector (Gakuru et al., 2009b). In Kenya, for example, the Banana Information Line piloted a text-to-speech (TTS) telephone service in 2006 that let farmers call in for recorded information, in English or Kiswahili, about how to plant, grow, and harvest bananas. The technology allowed the information to be updated simply by editing web pages (Tucker, 2007). The approach proved so successful that it was expanded into the National Farmers Information Service (NAFIS) (<http://www.nafis.go.ke/home>) which uses an interactive voice response system to offer farmers information on a wide range of crops and livestock. The CELAC/BROSDI project in Uganda not only disseminates expert information over mobile phones, but also includes information and innovative techniques directly generated by the farmers themselves (Gakuru et al., 2009a).

In India, LifeLines (<http://www.lifelines-india.net>) also provides a voice information portal for farmers. Farmers can dial the Lifelines number 365 days a year and record their questions on an automated voicemail system. A knowledge worker reviews the questions on a web interface; searches a database of frequently asked question (FAQs) for answers, or, if necessary, routes the question to an agricultural or veterinary expert for a response;

and then stores the answers in an audio database (British Telecommunications, 2007; UN, 2007). Using a PIN code, the farmer calls back 24 hours later to retrieve the recorded answer. The project is exploring the use of SMS to alert farmers as soon as a response is available (Walter 2009). In addition, villagers with access to an Internet kiosk can send digital photos of diseased crops or animals for remote diagnosis. While farmers were initially apprehensive about using the service, promotional efforts by field volunteers and demonstrated results have changed their attitudes (Walter, 2009). The system now covers around 2,000 villages in four states, receives an average of 450 calls daily, and has built a database of over 180,000 FAQs (Lall and Sahi, 2009). Farmers appreciate the value of LifeLines, and there is substantial evidence of its contribution to improved crop productivity and sustainable farming practices. Recently the technology platform has been customized to support rural teachers, and it could also serve as a model for health care providers.

Indeed, Microsoft and others are developing a speech recognition-based information system to ensure that semi-literate community health workers have access to critical information. HealthLine's menu-driven program can be accessed via landlines or mobile phones. Callers specify a topic or disease and are walked through a set of menus until they reach the information they are seeking, which comes in the form of a prerecorded message in their local language. Providers can use it for immediate help in treating a patient or for self-learning. Field testing began with low-literate maternal and child health (MCH) community health workers in Pakistan in 2007, and the system has been refined in response (Sherwani, 2007; Vital Wave Consulting 2009). For example, user studies found that it was important to employ the local language, Sindhi, rather than Pakistan's lingua franca, Urdu; that health workers prefer using a spoken menu rather than the telephone keypad to select menu choices; and that the least literate users still find it difficult to use the system. An expansion to East Africa is now being planned (<http://www.cs.cmu.edu/~healthline/>).

Researchers at Carnegie Mellon and Aga Khan Universities, which have contributed to the HealthLine project, have posted a compelling demonstration of several different approaches that speech technologies can use to convey useful information to community healthcare workers in emerging regions (Karim et al., nd). They also point out some challenges to this approach, which include the fact that, compared with graphical interfaces, speech-driven systems are slow, inefficient, and do not lead to as good information retention. However, they make a strong case for the cost-effectiveness and usefulness of such systems in developing country settings where cell phones are ubiquitous, but literacy is weak.

### ***Wireless internet connectivity***

People in developing countries are increasingly using wireless devices, including smartphones and PDAs, to connect to the Internet. Sometimes they rely on wireless because there simply is no wired alternative. Sometimes they turn to mobile devices because they are cheaper, more readily available, more robust, and less technically demanding than computers (Elder and Clarke, 2009). Falling costs, rising connection speeds, and improved browser technology are pushing the trend, as are innovative

technical solutions developed by wireless ISPs to offer affordable services and reach remote areas (Maxfield, 2004; Wireless Internet Institute, 2003; Wright, 2008).

**Wireless is growing dramatically in India**

As of March 2008, the city of Chennai (Madras) had 5.6 million mobile phones for a population of 8 million. This represents a 13,300% increase in the cellular subscription base since March 1998. The story is the same in most other metros and cities in India. Increasingly, Indians are using mobile devices to access the Internet. In fact, more mobile Internet users are added each year than the total wired base. As of June 2007, there were 38 million wireless Internet connections in India compared with 11.6 million wired connections, and the gap continues to grow. The introduction of 3G will make mobile devices a logical choice for health care.

Source: Ganapathy and Ravindra, 2008

Data from Nigeria, for example, show that 7.3 million people browsed the web on mobile phones in 2008 (Wheeler et al., 2009). It is possible that mobile devices, rather than computers, will become the primary way that Africans and Asians—and for that matter, everyone else—access the Internet.

A recent study compared different options to access the Internet: laptop computers, PDAs, mobile phones, and desktop computers with modems. It assessed their practicality for developing countries based on four factors: price, usability of the screen and keyboard interface, response to unstable power supplies, and performance under conditions of high heat, humidity, and dust. Mobile phones ranked at the top on three out of four factors, while PDAs were at the bottom. Laptop and desktop computers fell in the middle (Esteve and Machin, 2007) (see Table 1).

**Table 1. Relative ranking of key features of mobile devices and computers**

Device	Price	Usability	Power	Conditions
Laptops	3	2	3	2
PDAs	4	3	2	4
Desktop computers with modems	2	Best	4	3
Mobile phones	Best	4	Best	Best

Source: Esteve 2007

Other experts also have concluded that laptops may have better long-term prospects for health and development applications in developing countries than PDAs. A new generation of laptops is being developed that can compete with PDAs on cost, power consumption, and wireless connectivity, while offering the greater functionality of bigger

screens and more memory (Chandler, 2008). The Indian “simputer” ([www.simputer.org](http://www.simputer.org)) is somewhere in between a PDA and a personal computer. It is inexpensive; uses a touch screen, icon-driven interface to minimize the computer literacy required to operate the device; and is designed to withstand the harsh environmental conditions found in rural areas of the developing world (Casparly and O’Connor, 2003).

While wireless devices can help address some of the most basic barriers to Internet access, notably lack of infrastructure and high costs, they share many of the same capacity and content obstacles as computers. Users need training, ongoing technical assistance, and troubleshooting support. They must also be able to read and understand material posted on the Internet. The small screen size of smart phones and PDAs also offer a challenge, as does the low bandwidth of most mobile networks. Web pages must be reformatted for small devices and low-bandwidth transmission (Chandler, 2008; Elder and Clarke, 2009; IFHAN, 2008).

Satellife’s experience with PDAs in health projects in a dozen developing countries has been thoroughly evaluated (Bridges, 2003; Satellife, 2005). Findings include:

- Small screen size is not an obstacle if content is designed accordingly, but it may be difficult to display certain kinds of content, such as diagrams, illustrations, and tables.
- The usefulness of PDAs depends on the development of locally relevant content, such as treatment guidelines and drug protocols, in an appropriate format. Once content is in place, however, it is much easier to update on PDAs than in print form.
- PDAs are durable, with a failure rate of less than 1%, but repair and replacement is problematic in Africa and parts of Asia and Latin America.
- The power supply poses a challenge where there is no electricity. Solar panels may be more viable than batteries.
- Regardless of age and gender, novices can master the basic functions on a PDA with one and a half days of training; more complex functions require three days of training.
- Technical support is critical. ICT personnel with solid training and database experience need one to two weeks of special training to support the use of PDAs.

### ***Electronic storage***

PDAs have one additional and important capability: they can store large volumes of information. The Satellife project placed a virtual library of reference materials and job aids on PDAs that it distributed to nurses and medical students in pilot projects in Kenya and Uganda. The resources included country-specific essential drug lists and treatment guidelines, medical references, diagnostic tools, and training materials. Because ready-to-use materials were too oriented to US and European settings, Satellife compiled content from other sources, including the World Health Organization (WHO) and each nation’s MOH, and adapted it to the handheld format. The PDAs were time savers for busy providers, who could quickly and easily refer to the information at their convenience: on a bus ride home, over a quick break, or during a patient visit. Updates and new materials

were periodically downloaded to the PDAs to keep the information up to date (Bridges, 2003; Satelife, 2005).

Project evaluations found that the PDAs were an effective tool both for collecting health data (another application of the technology) and for disseminating information to providers. Because the PDAs were easier to carry around than textbooks or papers, they were more frequently consulted. Providers found it easy to integrate the technology into their daily routines and reported that having access to the job aids and reference materials on the PDAs had improved their ability to perform various tasks, including diagnosis, treatment, and drug selection. In the words of one: "Quick access to information meant informed decisions."

The Makerere University School of Medicine in Uganda now tries to provide every medical student with a PDA so that they can use reference tools and drug databases when treating patients (Juech, 2008). Specialty e-book readers offer another option to provide access to virtual medical libraries. For example, AED-Satelife has used the Mobipocket Reader, converting relevant content into a compatible format so that it can be read on the device (Chandler, 2008).

### ***Combining mobile phones with radio***

Agricultural programs are exploring how mobile phones can be combined with radio in innovative ways. Farm Radio International is exploring how farmers can engage in radio programming through their mobile phones, for example, by calling in to radio talk shows, being interviewed over the phone by a broadcaster, or sending text messages to radio stations to ask questions during a live show. The African Farm Radio Research Initiative (AFRRI) works with 25 commercial radio stations in Ghana, Malawi, Mali, Tanzania, and Uganda to help farmers receive and share information about crops and farming practices. AFRRI is currently documenting the use of ICTs in the rural radio sector and by farmers and plans to test more advanced uses of mobile phones with radio broadcasting (Banks, 2009).

Developing Radio Partners (DRP) is contemplating a project called the Ideas Network, which would transform the quality and quantity of health information for the rural poor by linking radio with text messaging in environments with limited Internet access. DRP imagines a scenario where a sick villager with a mobile phone would text his/her symptoms to a radio station, which would relay the information to a health worker; the health worker could respond by text message or on the air. The texts would enable radio stations to recognize disease trends and prepare informational spots about common illnesses (Banks, 2009).

## **C. Other emerging technologies and tools**

### **Multimedia**

Chetley (2006) and West (2008) have identified some other emerging technologies, in addition to mobile telephones and wireless Internet access, which have the potential to

contribute to health care in developing countries. When literacy poses a barrier, the following technologies may be especially appealing:

- Speech-interface technologies, either text-to-speech or speech recognition,
- Machine translation of text,
- Cameras on mobile phone handsets,
- Portable digital video technologies that let individuals produce and health workers screen local language videos easily and inexpensively.

These authors also point out that combinations of ICTs may be more effective than any single technology, for example, using radio to extend the reach of the Internet.

## **GPS and GIS**

Data collection activities are increasingly using global positioning system (GPS) units and GPS functions built into mobile devices because they allow data to be mapped. When combined with geographic information systems (GIS), these tools can aid in health decision-making (Ladd et al., 2008). In the Middle East, for example, geographic information systems (GIS) have been used to look for clusters of childhood cancer in Tehran and examine the spatial distribution of outbreaks of Rift Valley fever in Yemen. In Saudi Arabia, local health planners use data on catchment areas and patient distribution for decision-making (Al-Shorbaji, 2008). The use of GPS units in surveys does require additional training and hands-on practice for data collectors (IFHAN, 2008).

## **Web 2.0 tools**

There is no single, clear definition for “Web 2.0.” The term refers to a second generation of web development, design, and tools that is changing how information is created and flows over the Internet. Generally speaking, Web 2.0 tools and technologies encourage collaboration, interactivity, and knowledge sharing (Bughin and Manyika, 2007). As a result, Internet users are creating an increasing proportion of the content available online and sharing it—immediately—with one another (Nicholas Cap Consulting, 2008). Applications of these new tools are evolving quickly, and their implications—whether for business, government, development, or the health sector—are not yet clear.

A 2007 survey of 2,847 business executives worldwide conducted by McKinsey summarizes recent experience with Web 2.0 technologies (Bughin and Manyika, 2007). Although the survey focused on commercial enterprises, it did tap executives in developing countries and its findings echo anecdotal reports from the development sector. Over three-quarters of the executives surveyed were investing in Web 2.0 trends; 70% were using the tools to interface with customers, 51% to interface with suppliers and partners, and 75% to manage internal collaboration. More than half were pleased with the results of past investments in Web 2.0 technologies; 42% believed they should have invested more heavily in the past; and 24% believed they should have invested sooner. The survey also found that interest in Web 2.0 tools was rising, especially in some regions that were slow to invest over the past five years. Interest was highest in India, where four-fifths of respondents said their companies planned to increase Web 2.0

investments over the next three years. This compares with 69% in Asia and the Pacific, 65% in Europe, 64% in China, 64% in North America, and 62% in Latin America 62%.

Web 2.0 tools are so new that there is no agreement on best practices, and only anecdotal assessments of impact are available. However, several important themes emerged in an online discussion of the McKinsey survey results (Bughin and Manyika, 2007):

- **Grassroots efforts seem to work better than top-down initiatives.** Because many Web 2.0 tools are simple to implement, small groups of interested individuals can launch informal pilots to test their viability. This approach benefits from the passion and knowledge that “natural owners” can bring to bear on an issue. Older executives tend not to understand the opportunities offered by Web 2.0 tools, take a more cautious approach, and may pose a hindrance, especially if they limit Web 2.0 decisions to one or two technology specialists.
- **Web 2.0 tools offer valuable benefits when used internally.** Tools like wikis can improve internal collaboration, aggregate knowledge, capture unstructured and anecdotal information, and reach common agreement on content.
- **Web 2.0 tools are equally valuable when directed outside the organization.** They can strengthen external connections with suppliers and partners; support sales and marketing efforts by creating a dialogue with customers; tap customers’ ideas and expertise to improve product design; and even engage critics in a productive discussion.

Although Web 2.0 tools may hold untapped potential for the health sector, they have been little used to date and the technologies are constantly in flux. Hence the review that follows should be considered very preliminary. For more discussion of the use of these tools for development, see the Knowledge Sharing Toolkit ([www.kstoolkit.org](http://www.kstoolkit.org)) developed by the ICT-KM Program of the Consultative Group on International Agricultural Research (CGIAR) and the Food and Agriculture Organization (FAO) of the United Nations.

### ***Blogging***

Blogs are online journals or commentaries that are hosted on a website and often distributed to readers using RSS feeds (see below). They can have one or many authors. Blogs are less formal than reports or articles, quicker and easier to create, and invite readers to respond and post comments.

Various kinds of blogs are rapidly being adopted in international development. Project participants may use blogs to share updates, reflect on progress, and ask questions of the larger community; over time, the blog creates a "learn as we go" record of the project. Leaders may use blogs to share their ideas, reflect, pose questions and concerns to their staff, and model knowledge sharing. Health consumers can use blogs to share their experiences living with a disease (ICT-KM, 2009).

At the Population Reference Bureau (PRB), the PRB Blog is a place to share current events, news, and opinions on population, health, and environmental issues. The Communication Initiative sponsors a Communication, Media, and Development Policy

blog space ([http://www.comminit.com/en/development\\_policy](http://www.comminit.com/en/development_policy)) and invites members to contribute; the result is a lively and active debate. The blog produced by the INFO Project, to which over ten staff members contributed, proved to be a success on several fronts. It gave the project a personalized voice and demonstrated staff members' commitment to the issues they worked on—which helped engage both collaborators at other international health organizations and the users of INFO's products overseas. The blog received about 100 hits per day, showing that there were some regular readers. Finally, the blog helped stimulate conversation within INFO among people working on different activities (Reiss, 2009, personal communication).

However, interviews with HIPNET members found that some organizations are concerned by the informal quality of blogs. They worry that the content of blogs may not be sufficiently vetted and, as a result, create accuracy issues or distort the organization's message. Some people question whether blogs are appropriate for official websites.

### ***Microblogging***

Microblogging tools, such as Twitter, instant messaging, and text messaging, permit users to write brief text updates (usually less than 140 characters) and send them to specific individuals, a restricted group chosen by the user, or the world at large. The messages may travel via cell phones, email, MP3 players, or on the web. A blogger from Malawi has pointed out that microblogging tools such as Twitter may be especially well suited to the African environment because they can take advantage of the heavy reliance on mobile phones (Mumba, 2007).

While often used for social chatter, microblogging can have other applications. For example, Marie Stopes International uses Twitter primarily for announcements—of news stories, project activities, publications, job openings, and the like (<http://twitter.com/MarieStopes>). Each tweet includes a URL so that interested followers can find out more online. Microblogging also can allow individuals to tap into a network of people with common interests and concerns (ICT-KM, 2009). For example, it is possible to use microblogging to ask questions and receive immediate feedback, publicize an event, or learn about new tools and ideas. Forum One Communications uses a private microblogging tool called Socialcast in this way to promote internal knowledge sharing. Socialcast lets staff members exchange information with one another on an informal basis, for example, by asking and answering quick questions. Perhaps because of microblogging's informality—and/or its “cool” factor—the tool seems to be more effective than email at certain kinds of internal knowledge sharing (Pringle, 2009). It is possible that microblogging by cell phone might be an effective way to communicate with and among frontline providers in remote areas.

### ***Wikis***

Wikis—the most famous of which is Wikipedia—are simple online databases that allow any user with a Web browser to easily edit each page. This allows many authors to contribute to an online document or discussion. No special software or third party webmaster is needed to post content. Wikis also keep track of the history of each page so that users can track changes, compare versions of a document, and examine the evolution

of contributors' thought processes. Thus, wikis allow groups of people to (ICT-KM, 2009):

- Work together to write a document,
- Collaborate without emailing back and forth,
- Share action plans, to-do lists, checklists, and the like,
- Prepare agendas, take notes, and share resources for meetings,
- Translate materials, and
- Manage content that changes over time, such as process manuals and FAQs.

One example is the wiki maintained by the Knowledge Management for Development (KM4Dev) community ([http://www.km4dev.org/wiki/index.php/Main\\_Page](http://www.km4dev.org/wiki/index.php/Main_Page)). It uses the wiki as:

- A collaborative workspace for workshops or projects,
- A way to share the community's perceptions of the state-of-the-art in knowledge management and knowledge sharing with a wider audience, and
- A teaching environment where people can learn to use a wiki.

The Community Knowledge area of the wiki makes FAQs and information pages out of the knowledge that surfaces in the community's online conversations and from member experiences.

In a similar way, Satellife is using a wiki to support the collaborative development of an open source, standards-based platform for data collection, analysis, and reporting to promote evidence-based decision-making for health care (<http://www.healthnet.org/gather.php>). The Development Center at the Organization for Economic Cooperation and Development (OECD) sponsors Wikigender ([www.wikigender.org](http://www.wikigender.org)) to facilitate the exchange of and improve knowledge on gender-related issues around the world.

### ***RSS (Really Simple Syndication) feeds***

RSS feeds help publishers broadcast regularly updated content in a readily accessible format. They also let individuals subscribe to online distribution of news headlines, blog entries, podcasts, or other information (ICT-KM, 2009).

### ***Mash-ups***

Mash-ups combine two or more sources of information to create a new product or service. By juxtaposing existing pieces of information, mash-ups can provide new points of view or put information into different contexts (ICT-KM, 2009). For example, the Harvard-MIT Division of Health Sciences & Technology operates a global disease alert map ([www.healthmap.org](http://www.healthmap.org)) that pulls information on disease outbreaks from health organizations' RSS feeds and displays it on Google Maps (Nicholas Cap Consulting, 2008). The resulting mash-up shows the location of current disease outbreaks worldwide.

### ***Photo and video sharing***

Sites like YouTube and Flickr let individuals or organizations share videos and photos with others. They are contributing to a shift to multimedia content online. Many health

and development organizations place videos, including project footage and how-to guides, on YouTube and link to them from their websites. Some, like the World Bank, have a YouTube channel where they post videos and playlists (<http://www.youtube.com/worldbank>). The Health and Development Networks (HDN) hosts a private gallery on Flickr where pictures from conferences and other events are posted; only network members have access.

### ***Podcasting***

Podcasts are audio or video recordings broadcast over the Internet or distributed via an aggregator like iTunes. They can be downloaded onto a compatible digital player or played on a computer. Podcasting reduces the cost of distributing speech and music and, like radio, it can overcome literacy issues. Unlike radio, however, podcasts allow people to listen to a program whenever they choose (ICT-KM, 2008).

### ***Social bookmarking and tagging***

Social bookmarking refers to the practice of saving bookmarks to a public website and “tagging” them with keywords. Social bookmarking can provide professionals with a better way to share and manage information resources than creating bookmarks (which cannot be accessed from different computers and locations), building a favorites list (which may not have a flexible enough folder structure to permit easy cross-referencing), or forwarding links in email (which may get lost in the flood of email) (ICT-KM, 2008). To create a collection of social bookmarks, users register with a social bookmarking site that lets them store bookmarks and add tags of their choice. Visitors to social bookmarking sites can search for resources by keyword, person, or popularity, and see the public bookmarks, tags, and classification schemes that registered users have created and saved.

If groups agree to tag useful web resources with a shared tag, the group can benefit from each member's searches. For example, members of the KM4Dev community began bookmarking resources they wanted to collect and share with a single tag (“npk4dev”) at the social bookmarking site, [del.icio.us](http://del.icio.us). Their efforts have built a public, searchable set of resources, including websites, wikis, blogs, and other online resources, that have interesting content on knowledge management for development (<http://npk4dev.wordpress.com/>). Forum One Communications also uses a common login to a social bookmarking site so that staff members can share tags and bookmarks (Pringle, 2009).

### ***Personalization***

Another manifestation of Web 2.0 trends is the increasing importance of personalization for Internet portals (Nicholas Cap Consulting, 2008). Websites that originally offered visitors a way to search for relevant information are increasingly offering users a personal workspace. For example, the FRAME Network for Natural Resource Management practitioners (<http://www.frameweb.org/>) gives members a personal space to store personal files, collect resources and knowledge, blog, share files, connect with FRAME members in their own network, and manage personal content and preferences. Members logged in to the Development Research Management Portal (<http://rmportal.net/>) are

encouraged to use their personal workspace at the site as a virtual office when they are in the field, working from home, or lack access to a storage device.

**Social networking**

Social networking sites, such as Facebook and Second Life, build online communities of people with shared interests and activities and provide various ways for them to interact, including chat, messaging, email, video, voice chat, file sharing, blogging, and discussion groups. While the most well-known social networks are commercial sites, organizations can use similar systems to build staff or expert communities.

Recent years have seen enormous growth in the number of people using social networking sites. While use is beginning to level off in North America, social networking is growing rapidly everywhere else (see Table 2). In Brazil, for example, 85% of people aged 15 and up who accessed the Internet from home or work in September 2008 visited a social networking site (up from 76% the year before)—and that excludes traffic from public computers at Internet cafes and access by mobile devices. While Brazil leads the way in social networking in Latin America, Chile, Columbia, Argentina, Venezuela, Mexico, and Puerto Rico are also experiencing rapid growth, with 70% to 80% of Internet users visiting a social networking site in 2008 (comScore Inc., November 2008).

**Table 2. Growth in worldwide audience (age 15+) for social networking sites, including access at home and at work**

Region	Number of unique visitors		Percent change
	June 2007	June 2008	
Asia - Pacific	162,738,000	200,555,000	23%
Europe	122,527,000	165,256,000	35%
North America	120,848,000	131,255,000	9%
Latin America	40,098,000	53,248,000	33%
Middle East & Africa	18,226,000	30,197,000	66%
<i>Worldwide</i>	<i>464,437,000</i>	<i>580,510,000</i>	<i>25%</i>

Source: comScore World Metrix (comScore Inc., August 2008)

India also has experienced strong growth in social networking, with a 51% increase in total unique visitors to social networking sites from December 2007 to December 2008. This far exceeds the 22% increase in the total number of Internet users over the same time period. In December 2008, 60% of the 32 million Indians age 15 and up who accessed the Internet at home or work visited a social networking site. While Orkut is most visited social networking site in India, Facebook, Hi5, and Bharatastudent are also experiencing rapid growth. Elsewhere in Asia, social networking sites reach 40% to 50% of Internet users in Taiwan, China, and Japan; 60% to 68% in New Zealand, Hong Kong, Malaysia, South Korea, and Australia; and a high of 74% in Singapore (comScore Inc., 2009).

An analysis of data from Australia, Brazil, France, Germany, Italy, Spain, Switzerland, UK, and the US, where social networking sites have a longer history and a broader base, suggests what the future may hold for the developing world as computer and smart phone technologies proliferate (Nielson Company, 2009):

- Social networking and blogging sites have overtaken personal email to become the fourth most popular online activity (after search, portals, and PC software applications).
- People are spending increasing amounts of time on social networking and blogging sites. Between December 2007 and December 2008, the total amount of time spent online increased by 18%; time spent at social networking and blogging sites rose by 63% (although it is not clear whether people are spending the additional time reading or writing blogs); and time spent on Facebook jumped by 566%. Social networking now accounts for one in every 11 minutes online in these countries overall—and one in every four minutes online in Brazil.
- While young people drove the initial growth of social networking, use is now rising faster among people over age 34.

Facebook took over the global lead from MySpace in April 2008, after making a concerted effort to become more culturally relevant in markets outside the US. It introduced natural language interfaces in several markets, which helped propel a 153% growth in users from June 2007 to June 2008. Over that 12-month period, the number of unique visitors to the site tripled in Europe, quadrupled in Asia and the Middle East/Africa, and grew tenfold in Latin America. However, many other social networking sites are also growing strongly: Users grew by 100% at Hi5, by 50% at Friendster, by 41% at Orkut, and by 32% at Bebo over the same time period (comScore Inc., August 2008).

As Figure 6 shows, the popularity of different social networking sites varies between countries and regions. In 2007, for example, Orkut dominated in Brazil and India, Hi5 in Peru and Mexico, Facebook in Egypt and South Africa, and Friendster in Indonesia. Still other websites dominate in China (51, Xiaonei, Chinaren) and Japan (Mixi, Lococom, Kanshin-kukan), partly because of their distinctive language requirements (Nielson Company, 2009).

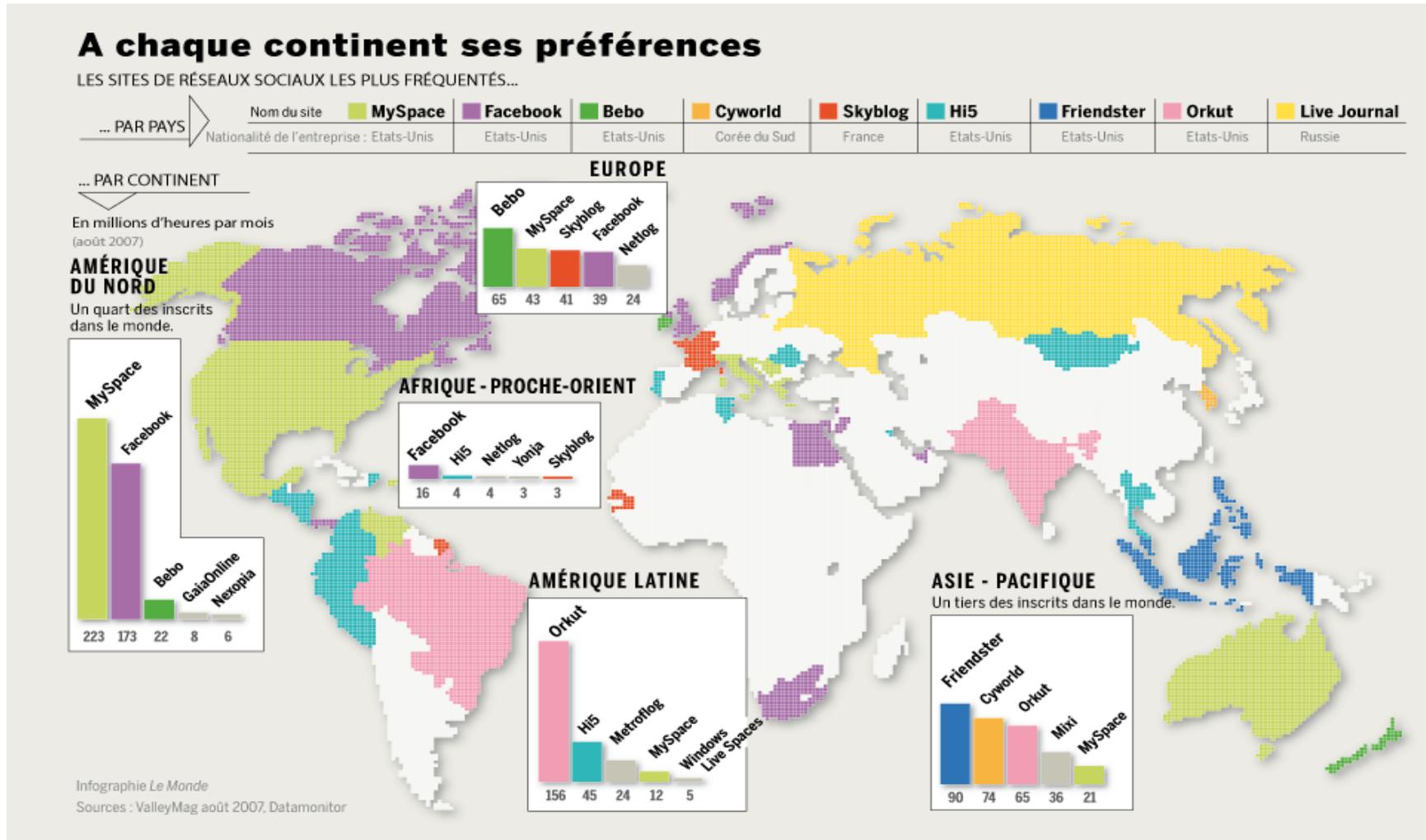
An analysis of the potential of social networking sites for commercial advertisers by the Nielson Company (2009) has implications for the use of social networking sites to promote global health agendas. Nielson concluded that, while social networking sites hold great promise for advertisers, new approaches are needed to reach their members. Members of social networking sites have a greater sense of ownership, see themselves as suppliers as well as consumers of content, and enjoy the personalized nature of the environment. Thus it is important to engage in a conversation with members, rather than pushing out content; to be authentic, candid, and rely more on word of mouth; and to add value through interaction and consultations via fan sites and sponsored groups. This may

be more labor-intensive and more expensive than traditional advertising approaches, although user-generated activity and content may offset some of the costs.

Nielson (2009) recommended that organizations:

- Understand that social networks are a communication channel just like television, newspapers, radio, and the telephone and thus present an opportunity for everyone. Any company with an offering, product, or service can use social networks to communicate, engage, and connect with consumers.
- Tap into what makes social networks successful: consumers' willingness to generate opinion and co-create content.
- Increase interactivity at the organization's own website to enable communities and conversations to form.
- Participate in conversations on social networking sites to promote content to a wider audience across the web.
- Consider the relationship between social networks and other media. Early trends suggest that online usage is complementing, not substituting for traditional television viewing. They could be mutually reinforcing.
- Copy whatever the successful advertising model turns out to be for social networks.

Figure 11. Most frequently visited social networking websites, by region



Source: Le Monde, 2008

## **IV. E-Health Applications**

### **A. *E-health functions using ICTs***

As Table 3 illustrates, the health sector has tried using ICTs to reach many different audiences, including managers, administrators, frontline providers, patients, and the general public. Of the many projects piloted, only some have been scaled up and institutionalized. Nevertheless, they suggest the potential uses of computer-based ICTs, mobile devices, and other technologies for knowledge sharing in the health sector.

The remainder of this section will examine the e-health functions most relevant to the audiences targeted by K4Health.

**Table 3. E-health functions using ICTS**

Function	Technologies tested	Information flow and audience
Disease surveillance	Mobile devices	Health workers report illnesses, and officials track disease outbreaks and issue early warnings to health workers.
Data collection	Mobile devices	Health workers collect (1) data for public health surveys or (2) patient information for electronic medical records and submit it to a central data collection and storage system.
Professional development	Internet CD-ROMs Videoconferencing Radio	Managers and providers participate in e-learning activities, including training courses, CME, forums, conferences, and mentoring. They receive updates via newsletters and listservs.
Support for patient care	Mobile devices Internet	Healthcare providers' access information and job aids (including patient records, guidelines and protocols, medical references, and decision support tools) to help diagnose, treat, counsel, and refer patients.
Teleconsulting	Mobile devices Email Internet Cameras	Healthcare providers send notes, images, and test results to medical experts at distant sites and receive advice on a patient's diagnosis and treatment.
Networking	Email Internet Social networking	Healthcare providers and managers share their knowledge and experience in discussions with colleagues, either locally or globally
Access to research literature	Internet CD-ROMs	Managers and decision-makers access databases, journal articles, and other literature to review evidence for best practices
HMIS	Mobile devices Computers	Health facility staff members submit operational and administrative data to headquarters.
Patient monitoring and alerting	Cell phones Remote sensors	Patients receive reminders to take medicines, attend appointments, etc. Patients send information about their health status to a provider.
Health education and promotion	Cell phones Internet	The general population receives text messages that raise awareness of health issues, submits health questions, or participates in quizzes.

## B. Professional development

As ICTs diffuse through the developing world, they create new opportunities to meet health workers' needs for preservice and continuing education. Table 4 illustrates the many different ICTs that have been used to support the professional development of nurses, doctors, community health workers, and others located at a distance from training resources and experts. These include:

- **Radio:** Nepal's Radio Communication Project has demonstrated how a distance education serial broadcast over the radio can strengthen rural providers' knowledge, attitudes, and performance on the job. On a global basis, interested radio stations can get instructional radio programs for health and social development workers from Healthworks, along with instructions on how to adapt and implement the course.
- **Cell phones:** The DFAQ and EnableM mobile phone platforms enable students to send questions and comments to fellow students and to teachers via text or voice messages.
- **Videoconferencing:** Medical and nursing schools in Africa are using videoconferencing to share instruction with classrooms at remote sites (Mars, 2009a).
- **Satellite technologies:** *BridgeIt* and *Mindset* use satellite technologies to transmit videos to classroom and hospital settings, respectively.
- **PDAs:** ENACQKT and the Mobile HIV/AIDS Support have distributed training and e-learning materials to health workers on PDAs—an approach also embraced by *Satellife*.
- **CD-ROMs:** As *Malaria: An Online Resource* demonstrates, CD-ROMs are capacious enough to hold an entire interactive training course, circumventing barriers posed by limited Internet bandwidth. The DELIVER Project is transferring its experience with paper-based instructional design to interactive CD-based training as it develops self-paced electronic training courses on logistics using *Articulate™* software.
- **Digital cameras and scanners:** An initiative in Uganda found that using digital cameras and scanners to help prepare CME materials markedly improved their impact and popularity (Mugumya, 2007).
- **Internet:** Several large-scale initiatives, including the Pacific Open Learning Health Net (POLHN) and the Reseau Afrique Francophone de Telemedecine (RAFT) project rely on the Internet to host and distribute large numbers of courses to create a systematic educational system. Webinars are also a widely used educational tool. The IMARK suite of distance learning resources for agricultural management takes the concept one step further: It uses the Internet to supplement individual computer-based learning with an online virtual community that provides a forum for discussion, collaboration, and resource sharing among students. Simply having access to moderated email and online forums, and the high-quality information they provide, can contribute to the professional development of providers (Ojo, 2006).

**Table 4. Professional development and e-learning projects using ICTs**

Project name & country	Technology	Description of activities	Sponsoring and partner organizations	Sources
<p><i>Bridgeit</i></p> <p>Philippines</p>	<p>Mobile phones Satellite technology</p>	<p>This project, launched In 2003 under the title "text2teach," seeks to give fifth and sixth grade teachers access to educational resources in science, math, and English, including 480 lesson plans and a library of 370 videos that can be integrated into classroom instruction. The teachers use mobile phones to select the videos, which are then downloaded via satellite to a digital video recorder connected to a television in the classroom. Within one year's time, the program demonstrated improved academic performance when compared to the study's control group.</p>	<p>Nokia Philippine Dept of Education International Youth Foundation Pearson UNDP</p>	<p>UN DESA 2007 <a href="http://www.nokia.com/A4254307">http://www.nokia.com/A4254307</a></p>
<p><i>DFAQ – Mobile Dynamic Frequently Asked Questions</i></p> <p>South Africa</p>	<p>Mobile devices</p>	<p>DFAQ is a collaborative knowledge sharing tool that complements traditional coursework by giving students with questions access to knowledgeable peers, tutors, and faculty. Students use SMS to text their questions into the system, where they are placed in a public queue. Peers can read and respond to the questions. An email notification is also sent to a forum manager or educator in case peers cannot answer the question. DFAQ affects learning in four ways:</p> <ul style="list-style-type: none"> <li>- Exposure to other students' questions underscores a student's own understanding or, for that matter, misunderstanding.</li> <li>- The system's anonymity creates the feeling of a safe environment which encourages more students to ask and respond to questions.</li> <li>- Students can monitor their own development by observing changes in the way they ask questions</li> <li>- Faculty receives feedback on students' learning difficulties.</li> </ul>	<p>Center for Educational Technology, University of Cape Town</p>	<p>UN DESA 2007 <a href="http://www.mlearn.org.za/CD/papers/Ngambi.pdf">http://www.mlearn.org.za/CD/papers/Ngambi.pdf</a></p>

<p><i>Distance education for nurses</i></p> <p>Kenya</p>	<p>Computers</p>	<p>Beginning in 2005, e-learning methods were introduced to upgrade the skills of 22,000 enrolled nurses and raise them to the level of registered nurses. A complex blend of face-to-face sessions, e-learning and print-based content, clinical placements, continuous assessment tests, intra-module assignments, and final examinations are being used. The e-learning content, including four training modules, has been distributed to computers and on CD-ROMs at more than 100 eLearning centers in remote areas. Almost 200 workers have received ICT training to support the distance learning, and nurses are incidentally learning computer skills through their participation in e-learning. The program, which is much more cost effective than traditional classroom education, allows the students to remain on the job in their home communities and has greatly increased the country's training capacity.</p>	<p>Nursing Council of Kenya African Medical Research Foundation (AMREF) Ministry of Health Accenture Kenyan nursing schools</p>	<p>Ngatia 2008 Ozbolt 2008 <a href="http://www.amref.org/what-we-do/upgrading-20000-nurses-in-kenya/">http://www.amref.org/what-we-do/upgrading-20000-nurses-in-kenya/</a></p>
<p><i>EnableM</i> <a href="http://www.enablem.com">www.enablem.com</a></p> <p>India</p>	<p>Mobile devices</p>	<p>This for-profit company has created several elearning platforms for mobile devices that use both SMS and voice. Mindturf provides study guides, sample tests, puzzles, and other tools for students preparing for competitive exams. Study Buddy is a community application that lets individuals join study groups and interact with peers. Mobile LILA is a self-tutoring system to learn Hindi. The applications include moderated chats and message boards and a dedicated call center for live conversations with counselors.</p>	<p>EnableM</p>	
<p><i>E-Learning for Health Project</i></p> <p>Philippines</p>	<p>Cell phones Internet Video-conferencing</p>	<p>The National Telemedicine Center developed four video modules for community health volunteers in remote areas on accidental childhood poisoning, stroke, TB, and avian influenza. The modules last 7–10 minutes each and are narrated in the vernacular with English subtitles. After volunteers view a video, they join an interactive question and answer session with volunteers in other communities and an expert in Manila; the connection is established using locally available technology and the best available bandwidth -- broadband Internet, videoconferencing, or cell phones. Voice calls were found to be most effective, although participants also appreciated videoconferencing. Community members were keen to accept the new modality, because it employed technologies that were already familiar to them. Pretests and post-tests given to participants revealed that they were able to gain knowledge from the e-learning activity.</p>	<p>National Telemedicine Center USAID</p>	<p>Marcelo 2009</p>

<p><i>Enhancing Nurses Access for Care Quality and Knowledge through Technology (ENACQKT)</i></p> <p>Caribbean</p>	<p>PDA's</p>	<p>ENACQKT provides training and other services to nurses via PDA's. A key component is building nurses' capacity through technology instruction, giving them the means to access healthcare applications through the PDA's provided by the program. This enhances professional development and improves quality of care for patients. Project principals report several achievements, including time savings for nurses and greater access to information, particularly in the areas of medication and treatment support. The project also reports success in empowering nurses to speak to physicians about conditions, treatments, and diagnosis.</p>	<p>IDRC University of Saskatchewan</p>	<p>Vital Wave Consulting 2009</p>
<p><i>Global Health Network (GHNet) Supercourse</i> <a href="http://www.pitt.edu/~super1/">http://www.pitt.edu/~super1/</a></p> <p>Global</p>	<p>Internet</p>	<p>The Supercourse is a repository of lectures designed for physicians and other health personnel around the world. The Supercourse has recruited 64,000 faculty from 172 countries to share their best slides and lectures in an open source library of 3,611 lectures in over 20 languages. In 2008 over 1 million students worldwide took courses. All lectures are reviewed for quality by the global faculty and others and evaluated annually to ensure that they remain current, relevant, and of high quality. To increase access to the courses, GHNet has 45 mirrored servers located around the world, including Egypt, Sudan, and China, and has distributed 20,000 Supercourse CDs. The lectures are a small file size so they can be easily downloaded quickly, even through a slow Internet connection.</p>	<p>WHO Collaborating Center at the University of Pittsburgh</p>	<p>Global Health Network 1999 Sivan 2009 Solez 2005</p>
<p><i>Healthworks</i> <a href="http://www.h-c-r.org/healthworks.htm">http://www.h-c-r.org/healthworks.htm</a></p> <p>International</p>		<p>This radio series consists of 13 programs for health and social development workers based on a post-graduate course at Curtin University, Australia. The shows are widely disseminated through collaboration with OneWorld Radio. The audio is in special English, narrated at a slow pace for listeners who use English as a second language, and technical words are spelled out. Each episode is 15 minutes in length and covers topics such as health promotion, health prevention and intervention strategies, and community needs assessments. The radio series is accompanied by a workbook with spaces for taking notes and responding to learning activities on the radio. Listeners get the workbook from the participating radio station and return it there afterwards to receive a Certificate of Participation. A CD pack is also available at a small cost that contains all the elements of the Healthworks series for radio stations that want to translate the series or record it with their own narrator.</p>	<p>Healthworks</p>	<p>Feek 2003</p>

<p><i>Hispano-American Health Link (EHAS) program</i>  <a href="http://www.ehas.org">www.ehas.org</a></p> <p>Peru</p>	<p>VHF radio            Wi-Fi            VOIP            Email</p>	<p>EHAS began by deploying telecommunication systems in 39 health facilities in remote areas of the Amazon, following a comprehensive communications needs assessment of CBHWs. The systems were powered by solar panels and used VHF radio-based voice and data communication technologies, which are easy to use, robust, and inexpensive to run. They provided voice and email communications. The m-health application also provided materials (such as journals, evidence-based guidelines, and local health news on managing childhood and maternal health care) and an online e-learning test and assessment system. Access to experts' or second opinions was provided through a store-and-forward tele-consultation system. An evaluation of the nine-month pilot led to expansion of the system to other parts of Peru and other countries, using a broad array of technologies, including Wi-Fi, VOIP, and satellite links.</p>	<p>Technical University of Madrid            Engineering Without Frontiers</p>	<p>Martinez 2003            Iluyemi 2009</p>
<p><i>IMARK</i>  <a href="http://www.imarkgroup.org">www.imarkgroup.org</a></p> <p>global</p>	<p>CD-ROM            Internet</p>	<p>IMARK is building a comprehensive suite of distance learning resources in agricultural information management. It includes a series of computer-based distance learning modules, available on CD and via the Internet, and an online virtual community. Learners can create a tailored course by designing their own Personal Learning Path. The interactive, self-paced learning modules help information professionals learn new concepts, approaches, and attitudes for effective information management. Subjects covered include the management of electronic documents, building electronic communities and networks, investing in information for development, digitalization and digital libraries, and networking in support of development. The IMARK online community allows learners to follow up on what they have learned and to share their experiences with other learners, contributors, and professionals. It provides a virtual space to exchange ideas and engage in discussions on areas of interest: request help from each other in the language of their choice; work together, brainstorm and hold meetings; upload and share documents, web resources, contacts, news, and events; and access archived discussions.</p>	<p>FAO            Over 30 partner and contributing organizations</p>	

<p><i>Improving CME for rural health workers through ICT training</i></p> <p>Uganda</p>	<p>Computers Digital cameras Scanners</p>	<p>Launched in July 2005, this project harnesses ICTs and multimedia to cut through CME bottlenecks for rural health workers. The major focus is on gathering and repackaging high quality health information that meets health worker's needs, enhancing communication with visuals and other materials to increase interactivity and training health workers to use basic ICTs. The approach was piloted at UMU and three pilot hospitals, and the MOH is now adopting it at other hospitals.</p>	<p>IICD Uganda Martyrs University (UMU)</p>	<p>Mugumya nd</p>
<p><i>Malaria: An Online Resource and CDROM</i></p> <p>international</p>	<p>Website CD-ROM</p>	<p>This trilingual resource, which is used in 138 countries, trains technicians and doctors on how to diagnose and treat malaria. A self-assessment module is included.</p>	<p>Royal Perth Hospital</p>	<p>Feek, 2003</p>
<p><i>Mindset Health</i></p> <p>South Africa</p>	<p>Video</p>	<p>Mindset aims to deliver large-scale health education and health promotion. This is achieved through the development of digital health education material delivered by video, by multimedia computer lessons and print, and by daily satellite broadcast to 200 hospitals in South Africa, with on-demand satellite datacasts for health care staff. The TV receivers for the satellite broadcasts are usually placed in the outpatient departments of rural hospitals. The initial focus has been on tuberculosis and HIV/AIDS.</p>	<p>Mindset Network national DOH Sentech</p>	<p>Mars 2009a</p>
<p><i>Mobile HIV/AIDS Support</i></p> <p>Uganda</p>	<p>PDA's</p>	<p>This project aims to provide high-quality medical information and advice on HIV/AIDS care and treatment to healthcare workers in Uganda and throughout sub-Saharan Africa. After an initial needs assessment, project leaders developed a prototype PDA-based training program on the clinical care, research, and prevention of HIV/AIDS. Results of the testing and evaluation have not yet been published.</p>	<p>Trinity College, Dublin Makerere Hospital Medical School Dublin Institute of Technology</p>	<p>Vital Waves Consulting 2009 <a href="http://www.universitiesireland.ie/pubs/report0306.pdf">http://www.universitiesireland.ie/pubs/report0306.pdf</a></p>

<p><i>Nurse and midwife training at Education &amp; Resource Center (ERC), Aga Khan University</i></p> <p>Kenya, Tanzania, Uganda, and Pakistan</p>	<p>Web-conferencing</p>	<p>ERC sites have used low-bandwidth web-conferencing capabilities to enable nurses and other health care providers at remote locations to complete formal educational programs. Four Aga Khan University nursing programs in Kenya, Uganda, Tanzania, and Pakistan were routinely connected to each other—and to 82 different Internet sites—for 377 hours over an 18-month period. This enabled classrooms of nursing students at participating institutions to participate in lectures given by instructors in other countries, with the opportunity for everyone to see, hear, and ask questions from any of the four sites. Other elearning tools developed or utilized by the Agha Khan University include (1) a web-based virtual learning environment (AKUMed) that lets learners and tutors interact online, the use of Elluminate Live for synchronous e-learning over low-bandwidth Internet connections, and (3) a web-based distance learning system for primary care centers that allows multiple threaded discussions on specific interest areas and the sharing of resources.</p>	<p>WHO Aga Khan Development Network Nottingham University Czech Republic Ministry of Education University of Iowa</p>	<p>Cook 2008 Kholja 2009</p>
<p><i>Nursing Promotion Program</i></p> <p>Guatemala</p>	<p>Phones Computers Video-conferencing</p>	<p>This program educates and trains nursing students while they deliver nursing care to remote areas of Guatemala. Doctors and medical staff in Guatemala City assist and guide the nursing students, who carry emergency kits for initial diagnosis, treatment of emergencies, common problems, and follow-up visits. Serious cases are referred to the nearest clinic. Before joining this mobile healthcare network, the nursing students are trained by real-time videoconferencing using telephones, computers, and a telewriter. Tele-courses are also given onsite in the Nursing School in Coban and in other remote areas. The community nursing course is supported by a complete virtual library. Mobile phones link the nurses with health specialists in urban areas. Using mobile telephones combined with tele-learning has proven to be a very cost-effective healthcare delivery tool, because mobile phones are relatively inexpensive and widely used in remote areas. This program trained at least 300 new nurses over one year, while providing healthcare service in remote areas.</p>	<p>National School for Nurses in Coban Guatemalan Ministry of Education Canadian Agency for International Development Centre for Nursing Studies (Newfoundland, Canada)</p>	<p><a href="http://www.mspas.gov.gt/">http://www.mspas.gov.gt/</a> <a href="http://www.enecav.edu.gt/">http://www.enecav.edu.gt/</a> Vital Waves Consulting 2009</p>

<p><i>Pacific Open Learning Health Net (POLHN)</i>  <a href="http://www.polhn.org">www.polhn.org</a></p> <p>Oceania</p>	<p>Internet            CD-ROM</p>	<p>POLHN has established 17 learning centers at hospitals and nursing schools in 12 Pacific Island nations since 2003, each of which includes a server, up to 20 networked computers, and Internet connectivity. An interactive website and course management system provides a platform for the delivery of online courses. The site contains both scheduled instructor-led courses and self-paced courses that are always available. To ensure relevance, courses are developed by academic institutions in the region; they cover a wide range of areas, indulging STI counseling and HIV/AIDS. To address low bandwidth, POLHN ships a CD version of each course to all learning centers, so that students only need to use the Internet to post assignments and communicate with lecturers and other students. POLHN is working to increase the capacity for local development and delivery of resources that can support face-to-face, hybrid, and online courses. For example, it has developed courses for local instructors on online pedagogy and course development. Since 2003, over 1,000 students have participated in 44 courses through POLHN.</p>	<p>POLHN            National MOHs            WHO/WPRO</p>	<p>Baxendale 2008</p>
<p><i>Peoples Open Access Education Initiative: Peoples-uni</i>  <a href="http://www.peoples-uni.org/">www.peoples-uni.org/</a></p> <p>global</p>		<p>This initiative was launched in 2007 to help with public health capacity building in low- to middle-income countries through Internet-based education. It keeps costs to a minimum by using Open Educational Resources freely available on the Internet (and modified by teachers and students to reflect local issues) and volunteer tutors and faculty. Individual course module development and delivery teams have been formed by over 80 people from 24 countries. Courses currently offered include biostatistics, HIV/AIDS, maternal mortality. They have been developed in response to competencies identified as relevant to public health practice in low- to middle-income country settings. The program is accredited by the UK Royal Society for Public Health and leads to certificates and diplomas.</p>	<p>UK Royal Society for Public Health</p>	<p>Heller 2007</p>

<p><i>Radio Communication Project (RCP)</i></p> <p>Nepal</p>	<p>Radio</p>	<p>Beginning in 1996, the RCP broadcast a radio-based distance education program for rural health workers and a radio drama serial for the general population, with a focus on improving the quality of contraceptive services and empowering clients to actively seek contraceptive information and services. The distance education radio serial, entitled "Service Brings Reward," employed an entertainment-education approach and was supplemented by supervision and self-assessment activities, program booklets, resource manuals, and job aids. Researchers found that after participating in the distance education program, providers had improved technical knowledge of family planning, improved attitudes toward family planning, and greater awareness of positive counseling skills. The improvements in provider behaviors had a positive effect on clients' attitudes and behaviors and were sustained long after the radio broadcasts ended.</p>	<p>Nepal Department of Health Services National Health Training Council (NHTC) National Health Education Information and Communication Council (NHEICC) Family Health Division (FHD) USAID JHU/PCS</p>	<p>Storey and Boulay 2001</p> <p><a href="http://www.jhuccp.org/asia/nepal/radio.shtm">http://www.jhuccp.org/asia/nepal/radio.shtm</a></p>
<p><i>Reseau Afrique Francophone de Telemedecine (RAFT) project</i></p> <p>Burkina Faso, Cameroon, France, Ivory Coast, Madagascar, Mali, Mauritania, Morocco, Niger, Senegal, Switzerland, and Tunisia</p>	<p>Internet VSAT</p>	<p>RAFT was initiated in 2000 by medical students from the Bamako University School of Medicine in Mali to acquire Internet access to continuing education after graduation. RAFT's core activity is webcasting interactive courses, which typically involve presentations and dialogues between experts in different countries. To enable access where bandwidth is extremely limited, RAFT developed a platform that requires only 28 kb/s for high quality transmission of voice and still images. Because video requires more bandwidth and offers less educational value, users can adjust the quality of the video downward as needed. Anyone may participate in the continuing education sessions. The intent is to establish a community of learning and information sharing. The project has worked to overcome the belief that quality content has to come from the North. Over half the courses are produced by partners in the South, and professors in Europe now take classes in tropical medicine taught by African colleagues. Local coordinators are trained to develop online content that meets local needs and rural realities in participating countries. In addition to Internet-based distance learning and CME, RAFT also supports teleconsultations, national medical web portals, email and other connections with local colleagues. The project's impact can be profound. In Mali, for example, RAFT provides an inducement for a physician to commit to three years in a remote village. In return for providing primary care, the physician receives connectivity to colleagues and family and the opportunity to pursue a degree in epidemiology from a French university via distance learning.</p>	<p>Geneva University Hospitals Local country partners, including hospitals, universities, and government ministries</p>	<p>Bagayoko 2006 Geissbuhler 2007 Geissbuhler 2003 Ozbolt 2008</p>

<p><i>Short Course on ART (SCART)</i></p> <p>international</p>	<p>Email</p> <p>Internet</p>	<p>Since 2003, ITMA has run a three-week course on ART and clinical management of HIV infection in the summer for physicians from resource-poor countries. After completing the course, a hybrid web/email forum is offered to the participants to support their decision-making and help manage difficult cases. The website also offers a discussion forum and access to policy documents, guidelines, and supporting material on HIV/AIDS care in low-resource settings and links to other important websites. More recently, ITMA has converted the face-to-face course to a series of 13 online training modules. At a workload of 4–5 study hours per week, the 3-week face-to-face course requires a minimum of 3 months' online training.</p>	<p>Institute of Tropical Medicine in Antwerp (ITMA)</p>	<p>Zolfo 2009</p>
<p><i>Videoconferencing for postgraduate medical education</i></p> <p>South Africa</p>	<p>Video-conferencing</p>	<p>In 2001, as part of an e-health learning initiative, the Free State Department of Health set up an interactive satellite broadcast system, and now offers health care training at 40 venues. Their last evaluation included over 2200 users. After the cessation of Phase One telemedicine services in KwaZulu-Natal, the local university approached the provincial DOH, in 2001, and was given approval to use the videoconferencing infrastructure for postgraduate medical education. Equipment has been upgraded, and postgraduate teaching sessions are multicast from the Nelson R Mandela School of Medicine to four other academic sites. In 2006, 765 hours of tuition in 17 academic programmes were shared by videoconferencing. A total of over 72 000 person-hours of tuition were offered in 2006, with approximately 40% of participants situated at rural hospitals. The medical school also shares its teaching sessions with other provinces, including the Walter Sisulu Medical School and the East London Medical Complex in the Eastern Cape, and the Polokwane Hospital in Limpopo. International teaching has taken place in collaboration with several countries in North Africa, Europe and North America.</p>	<p>Free State Department of Health Nelson R Mandela School of Medicine</p>	<p>Mars 2008</p>

Some efforts, such as the distance education programs for nurses in Guatemala and Kenya, blend several of these technologies together, sometimes along with traditional face-to-face instruction. For example, Management Sciences for Health (MSH)'s Virtual Leadership Development Program (VLDP) trains teams of health professionals over the course of 13 weeks, during which they develop a leadership project that addresses a real organizational challenge. Team members work independently on the VLDP website, but they also participate in onsite team meetings within their organization. Leadership and organizational development specialists facilitate the program, providing support and feedback to participants via email, telephone, and website postings. After completing the program, teams receive follow-up support through LeaderNet, a virtual community of practice where they can access materials, exchange ideas, and participate in events.

The key is to choose the most appropriate technology for the setting, since it is possible to accomplish the same ends with different technologies. For example, the E-learning for Health project in Philippines was able to connect community health volunteers with an expert in Manila for live question-and-answer sessions via broadband Internet, videoconferencing, or cell phones. Voice calls proved the most effective (Marcelo, 2009). A needs assessment can establish whether or not a certain technology is likely to work. In Tianjin, China, for example, a survey of nurses conducted prior to a distance education project found evidence of rapidly increasing use of and access to computers and the Internet as well as positive attitudes toward them (Cragg et al., 2003). Some of the most successful e-learning efforts have designed platforms with technological limitations in mind. For example, RAFT not only developed a platform that requires minimal bandwidth to transmit high quality voice and still images, it also lets users adjust the quality of video downward as needed (Geissbuhler et al., 2007).

Training a cadre of indigenous health informatics professionals can help ensure that projects select appropriate technologies and applications (Ozbolt, 2008). They can also help with another important element that is critical to the impact of training and e-learning programs: developing local content that is directly relevant to learners' information needs on the job.

### ***C. Support for patient care***

Health care providers need ready access to up-to-date and practical information on patient care. Table 5 describes some of the many projects using ICTs to meet this need.

**Table 5. Projects using ICTs to support patient care**

Project name & country	Technology	Description of activities	Sponsoring and partner organizations	Sources
<p><i>AfroAIDSinfo</i>  <a href="http://www.afroaidsinfo.org">www.afroaidsinfo.org</a></p> <p>South Africa</p>	Internet	AfroAIDSinfo is a web-based information portal that provides up-to-date, scientifically accurate information on HIV/AIDS with a specific focus on the Southern African region. The portal is divided into five sections, to cater for five consumer groups: researchers/scientists, health profession (provides information on prevention, treatment and care), policy (includes information on government responses), education (provides resources for educators and learners), and the public (general information on HIV and AIDS and community initiatives).	<p>South African Medical Research Council</p> <p>International AIDS Society (IAS)</p> <p>Bristol-Myers Squibb HIV/AIDS Research Institute</p>	<p>Mars 2008</p> <p><a href="http://www.sahealthinfo.org">www.sahealthinfo.org</a></p>
<p><i>AIDSinfo</i></p> <p>Global</p>	PDA's	This PDA tool provides users "on-the-go" access to important antiretroviral therapy associated with adverse events (drug toxicities), including information on the clinical manifestations, risk factors, and monitoring and management of adverse events. The tool is based on tables from the United States "Guidelines for the Use of Antiretroviral Agents in HIV-Infected Adults and Adolescents."	United States Department of Health and Human Services (DHHS)	<p>UN DESA 2007</p> <p><a href="http://aidsinfo.nih.gov/PDATools/PDAToxicities.aspx">http://aidsinfo.nih.gov/PDATools/PDAToxicities.aspx</a></p> <p><a href="http://aidsinfo.nih.gov/PDATools/PDAGlossary.aspx">http://aidsinfo.nih.gov/PDATools/PDAGlossary.aspx</a></p>
<p><i>Cell Phone Applications for Clinical Diagnostic Therapeutic and Public Health Use by Front Line Healthcare Workers</i></p> <p>Mozambique</p>	Mobile phones	The project principals have created a suite of applications that can run on standard mobile phones. The applications provide Mozambican health workers with diagnostic and analytical tools, including reference material in the phone's memory, a calculator for determining drug dosage, and a program for analyzing inputs from medical sensors (e.g., low-cost pulse oximeter probes or a simple electrocardiogram).	<p>Microsoft Research</p> <p>Department of Information Systems</p> <p>University of Melbourne</p>	<p><a href="http://www.ni.unimelb.edu.au/Research%20and%20Activities/Projects/cell.html">http://www.ni.unimelb.edu.au/Research%20and%20Activities/Projects/cell.html</a></p> <p>Vital Waves Consulting 2009</p>

<p><i>D-Tree International</i></p> <p>Tanzania</p>	<p>PDA's</p>	<p>D-Tree develops treatment protocols for commonly diagnosed illnesses based on best field practices. The protocols will be programmed into inexpensive handheld computers for use by frontline health workers. These devices will be augmented with a system of patient-held data cards with embedded computer chips that record individual medical information needed for diagnosis and treatment. This system also allows health workers to collect information including type of visit, diagnosis, and prescribed treatment - information which can be stored in the device and later downloaded into a central database system to generate statistical data for evaluation, research, or surveillance. D-Tree was recently awarded grants to scale-up the work from pilot studies in South Africa and Tanzania.</p>	<p>D-Tree International</p>	<p><a href="http://mobileactive.org/directory/practitioners/d-tree-international">http://mobileactive.org/directory/practitioners/d-tree-international</a></p> <p><a href="http://www.d-tree.org">www.d-tree.org</a></p>
<p><i>Enhancing Nurses Access for Care Quality and Knowledge through Technology (ENACQKT)</i></p> <p>Caribbean</p>	<p>PDA's</p>	<p>ENACQKT empowers nurses by providing training and other services via PDA's. A key component is building nurses' capacity through technology instruction, giving them the means to access healthcare applications through the PDA's provided by the program. This enhances professional development and improves quality of care for patients. Project principals report several achievements, including time savings for nurses and greater access to information, particularly in the areas of medication and treatment support. The project also reports success in imparting a sense of empowerment to the nurses in terms of speaking to physicians about conditions, treatments, and diagnosis.</p>	<p>IDRC University of Saskatchewan</p>	<p>Vital Wave Consulting 2009</p>
<p><i>Handheld-based Electronic Medical Record for Paramedics in rural areas</i></p> <p>India</p>	<p>PDA's</p>	<p>This handheld-based electronic medical record (EMR) system is based on the Linux operating system and allows access to large mobile databases. The open source system is designed for paramedical health workers serving remote areas in rural India. A PDA loaded with the handheld-based EMR provides workers who have little access to medical doctors with different kinds of decision support and alerts. Auxiliary nurse-midwives (ANMs) use the system to support prenatal care and child health. The PDA's include a database on the 5,000 clients in the ANMs' catchment area, replacing paper-based records, as well as disease modules based on WHO guidelines. In pilot tests, the ANMS liked the system and learned to use it in three hours</p>	<p>Decision Systems Group, Brigham and Women's Hospital, Boston MA Harvard-MIT Division of Health Sciences and Technology MIT- Media Lab Asia</p>	<p>Anantraman 2002</p>

<p><i>HealthLine</i></p> <p>Pakistan</p>	<p>Phones (voice)</p>	<p>To ensure that semi-literate community health workers have access to critical information, Microsoft and others are developing HealthLine, a speech recognition-based information system. The solution is based on Microsoft Speech Server2007 beta software. The menu-driven program can be accessed via landlines or mobile phones. Callers specify a topic (or disease) and are walked through a set of menus until they reach the information they are seeking. The information is then read to them—from a prerecorded message—in their local language. HealthLine was tested among a group of low-literate maternal and child health community health workers in Pakistan in mid-2007. It will continue to be tested in the field with the results informing new features, functionality, and enhancements. Ideally, the solution will be scaled across Pakistan for maximum impact.</p>	<p>Microsoft Research Carnegie Melon University Aga Khan University Health and Nutrition Development Society (a Pakistani NGO)</p>	<p>Vital Wave Consulting 2009</p> <p><a href="http://www.cs.cmu.edu/~healthline/flash/detail/">http://www.cs.cmu.edu/~healthline/flash/detail/</a></p>
<p><i>HIV Mobile Decision Support</i></p> <p>South Africa</p>	<p>PDAs  Smart phones</p>	<p>Dimagi and its partners have been working since 2005 on a software program for handheld mobile devices that will help field health workers screen HIV/AIDS patients and determine their medical needs. A three-month pilot program was implemented in several hospitals in Tygerberg, South Africa. Health workers used PDAs and smartphones to enter data. The software was designed to be sensitive to local needs, providing support in several local languages and a general user-friendly experience. Although the project focused on HIV/AIDS screening, the software and devices could be modified to assist with screening for other illnesses, or with triage and diagnosis.</p>	<p>Dimagi, Inc. D-Tree International Harvard School of Public Health Harvard University Program for AIDS (HUPA)</p>	<p><a href="http://www.dimagi.com/content/hiv-support.html">http://www.dimagi.com/content/hiv-support.html</a></p> <p><a href="http://www.d-tree.org/index.html">http://www.d-tree.org/index.html</a></p> <p>Vital Waves Consulting 2009</p>
<p><i>Johns Hopkins Point of Care Information Technology (POC-IT)</i></p> <p>United States</p>	<p>Internet  Mobile devices</p>	<p>The POC-IT center develops electronic evidence-based clinical decision support guides to help health care professionals raise the standards of care and improve patient safety. POC-IT Center Guides on infectious disease and HIV are accessible through the Web and can be downloaded on to mobile devices for use at the bedside in both primary and specialty care clinical settings. The guides distill complex material into need-to-know information that is easily accessible, rapidly viewed, with frequent updates so only the most up-to-date information is viewed. The Guides can be used on multiple platforms with integration of additional electronic resources (such as resistance calculators and drug-to-drug interaction tools) and can be easily repurposed for different audiences and for different types of use. The POC-IT Center also integrates CME material into the guides, allowing clinicians to learn and acquire CME credit in the context of actual patient care.</p>	<p>Johns Hopkins Medicine</p>	<p><a href="http://www.hopkinsmedicine.org/poc-it">http://www.hopkinsmedicine.org/poc-it</a></p>

<p><i>Lifelines</i> <a href="http://www.lifelines-india.net">www.lifelines-india.net</a></p> <p>India</p>	<p>Phones</p>	<p>Launched in the late 2006, Lifelines is a phone-based service which enables farmers in India to access accurate and up-to-date information on agricultural topics. Farmers can dial the Lifelines number 365 days a year and record their question on an automated voicemail system. This message is then picked up by a dedicated knowledge worker who sources the necessary information from prerecorded FAQs or, if the query is new, from a panel of agricultural and veterinary experts. The answer to the question is left as a recording on the phone, which the farmers can pick up 24 hours later. By March 2008, coverage had expanded to 700 villages in four states, covering a working population of more than three million people; call volume had reached an average of 350 calls daily, and a database of over 88,000 'frequently asked questions' has been built, enabling knowledge workers to provide a very timely response to repeat queries. The same technology platform has been customized to support rural teachers in India by the QUEST Alliance and the Education and Employment Alliance (EEA). During a 2007 pilot at 116 schools in West Bengal, 600 elementary school teachers posed questions on academic matters via phone or the Internet. Their queries were answered within 24 to 48 hours by a qualified panel of training resource persons and subject matter experts. Over time, the service will build a rich FAQ database that can be accessed directly over the Internet.</p>	<p>British Telecom (BT) OneWorld International Foundation</p>	<p>UN DESA 2007 BT, 2007 Lall and Sahi, 2009 Rahman, 2009</p>
<p><i>Map of Medicine</i> <a href="http://www.mapofmedicine.com">www.mapofmedicine.com</a></p> <p>Kenya, Nigeria, Tanzania, Uganda, Zambia, and Cameroon</p>	<p>Internet. PDAs</p>	<p>The Map of Medicine is a web-based tool developed in the UK that provides comprehensive, up-to-date information on diagnosis and treatment, presented in easy-to-use flowcharts or care pathways. After pretesting a reduced content set in a Kenyan hospital in 2006, access to the full Map and its 390 pathways was extended to 11 teaching hospitals across six African countries. An online survey found that almost half of users accessed the Map twice a week or more, and a large majority found the required pathway. Users considered it useful for patient care, thought it contributed to their professional development, and planned to continue using it. However, poor Internet connections presented a serious obstacle, and there was also a need for localized pathways tailored to the African situation. In response to feedback, the Map of Medicine began working to develop smaller, localized versions of the malaria and TB pathways, with streamlined relevant information to make them quickly accessible. The Map is also investigating mobile versions for PDAs.</p>	<p>UK National Health Service (NHS) Cisco's Internet Business Solutions Group (IBSG) Map of Medicine WHO's Sharing eHealth Intellectual Property for Development (SHIPD) initiative</p>	<p>Rhodes 2008 Vital Wave Consulting 2009 <a href="http://www.cisco.com/web/about/ac79/docs/wp/Kijabe_Hospital_CS_10_09a.pdf">http://www.cisco.com/web/about/ac79/docs/wp/Kijabe_Hospital_CS_10_09a.pdf</a> <a href="http://www.medic-to-medic.com/">http://www.medic-to-medic.com/</a></p>

<p><i>Mobile E-IMCI</i></p> <p>Tanzania</p>	<p>PDA's</p>	<p>The project's research team created a program called e-IMCI, which runs on a PDA and guides health workers through the Integrated Management of Childhood Illness (IMCI) protocols with step-by-step instructions. The pilot results for e-IMCI were encouraging, suggesting that the technology is user-friendly and that both patient care and caregiver efficiency can be improved.</p>	<p>Dimagi, Inc. D-Tree International Rockefeller Foundation WHO The Jerre D. Noe Professorship</p>	<p><a href="http://www.dimagi.com/content/mobile-e-imci.html">http://www.dimagi.com/content/mobile-e-imci.html</a> <a href="http://www.cs.washington.edu/homes/bderenzi/Papers/chi1104-bderenzi.pdf">http://www.cs.washington.edu/homes/bderenzi/Papers/chi1104-bderenzi.pdf</a> Vital Waves Consulting 2009</p>
<p><i>Satellite PDA project</i> <a href="http://pda.healthnet.org/">http://pda.healthnet.org/</a> Ghana, Uganda, Kenya</p>	<p>PDA's Data collection Access to references</p>	<p>Satellite put PDA's into the hands of physicians, medical students and community volunteers in different settings in order to demonstrate their viability and usefulness, especially for the collection of health data and dissemination of medical information. The Ghana 2001 measles immunization campaign used PDA's in a short-term survey intended to determine the efficacy of the measles immunization campaign outreach efforts and collect some baseline health information. Uganda tested use and usefulness of PDA's by medical practitioners to conduct an epidemiological survey on malaria, and access and use certain medical reference tools and texts. Kenya tested the use and usefulness of PDA's by students to collect field survey information, and access and use certain medical reference tools and texts as part of their studies. Positive results on all counts, but some obstacles too.</p>	<p>American Red Cross Makerere University Medical School HealthNet Uganda Moi University Faculty of Health Sciences, Eldoret, Kenya Indiana University Kenya Program Bridges.org</p>	<p>Kinkade 2008 Bridges 2003 SATELLIFE 2005</p>
<p><i>SATELLIFE</i></p> <p>South Africa</p>	<p>Smart phones</p>	<p>Trained nurses in three hospitals in Port Elizabeth, South Africa will be using smartphones to access locally relevant health information such as the South African Primary Care Guidelines and Essential Drug List, the Diseases and Conditions section of the local health department's website, and a medical calculator. After four days of training on the devices and the software, the nurses said that they felt truly empowered because they would have information whenever they needed it. The project has made arrangements for IT support at each hospital as well as with the cellphone service provider. When local staff visited the nurses in the first week after training, the nurses were already asking for additional health information!</p>	<p>AED-SATELLIFE</p>	<p>McCollough 2009</p>

<p>TRACnet <a href="http://www.tracrwanda.org.rw/">http://www.tracrwanda.org.rw/</a></p> <p>Rwanda</p>	<p>Mobile phones</p>	<p>TRACnet is a comprehensive data entry, storage, access, and sharing system used to manage critical information on HIV/AIDS patients and monitor ART programs in Rwanda. Medical personnel can use TRACnet to monitor drug distribution, create and submit reports electronically, and access the most up-to-date information on HIV/AIDS care and treatment. TRACnet has a bilingual English and French interface and was designed for use with all types of technology and information systems, but today 90% of users access it via mobile phones, rather than more expensive and less reliable computers and Internet connections. Results of the gradual deployment and development of TRACnet have been promising. Anecdotal evidence has shown that most health personnel own mobile phones and are used to text messaging; they demonstrate ease of use after 15-30 minutes of training. By the end of 2005, 21 medical centers had switched from paper-based systems to TRACnet's electronic records system. By 2007, TRACnet covered all 168 health facilities that provide ART, and there were plans to extend the system to 400 more facilities. Rwanda's MOH hopes to expand the system to cover other chronic illnesses.</p>	<p>TRAC (Treatment and Research AIDS Center) at the Rwandan Ministry of Health</p> <p>Voxiva</p> <p>US Centers for Disease Control and Prevention (CDC)</p>	<p>Vital Wave Consulting 2009 <a href="http://www.un.org/esa/sustdev/publications/africa_casestudies/tracnet.pdf">http://www.un.org/esa/sustdev/publications/africa_casestudies/tracnet.pdf</a></p> <p>Frasier 2008</p> <p>UNDESA 2007</p>
<p>Uganda Health Information Network (UHIN)</p> <p>Uganda</p>	<p>PDAs</p>	<p>UHIN uses PDAs to collect data for the health management information system and to provide reference materials and job aids to health workers, including nurses, nursing assistants, clinical officers, and community health workers. The e-learning content was developed with the local health workers who were going to use it. This process involved the digitization of the existing paper-based health data forms, decision support guidelines, and educational materials. Stakeholders identified diarrhea, malaria, and pneumonia as key diseases to focus on initially and later added other topics such as HIV/AIDS, maternal and child health, and TB. Sources of content include local clinical and treatment guidelines, selected WHO content, and relevant content from health and medical journals. A team in Uganda converts the content into html format that can be read in a browser application that is loaded on the PDA. In five rural districts content broadcasts are sent to health workers via a specially created wireless network that piggybacks on the cellular network. The program was launched in 2003 and by 2006 350 PDAs were in use—often shared by up to six CBHWs at a health post or center because there were too few devices to go around. Health workers enjoy using the devices and rely on them for clinical management of patients and public health work in the community.</p>	<p>Uganda Chartered HealthNet (UCH)</p> <p>AED-SATELLIFE</p> <p>Makerere University Medical School</p> <p>Connectivity Africa</p> <p>International Development Research Center (IDRC) of Canada</p>	<p><a href="http://unpan1.un.org/intra/doc/groups/public/documents/UN/UNPAN030003.pdf">http://unpan1.un.org/intra/doc/groups/public/documents/UN/UNPAN030003.pdf</a></p> <p><a href="http://pda.healthnet.org/">http://pda.healthnet.org/</a></p> <p><a href="http://mobileactive.org/files/MobilizingSocialChange_full.pdf">http://mobileactive.org/files/MobilizingSocialChange_full.pdf</a></p> <p>Vital Waves Consulting 2009</p> <p>Iluyemi 2009</p> <p>Chandler 2008</p>

Some initiatives have tried to meet this need by providing online access to preselected databases of useful materials. For example, AfroAIDSinfo ([www.afroaidsinfo.org](http://www.afroaidsinfo.org)) is an Internet portal that provides up-to-date, scientifically accurate information on HIV/AIDS with a specific focus on the Southern African region. The portal is divided into five sections to meet the needs of different audiences, one of which is health providers. Similarly, the Capacity Project's HRH (Human Resources for Health) Global Resource Center (<http://www.hrresourcecenter.org>) provides a searchable library on human resources for health that is focused on developing countries. Other portals, such as Health Sciences Online ([www.hso.info](http://www.hso.info)) and Source ([www.asksource.info](http://www.asksource.info)), have a broader coverage but also try to meet the information needs of health managers, trainers, and providers.

The advent of mobile devices has created a handy new way for frontline providers to access job aids, decision support tools, guidelines, protocols, and reference materials as they are needed, even during patient consultations. Physicians in industrialized countries have long had a wide choice of commercial software products for PDAs that supply diagnostic and treatment tools relevant to their specialties, such as drug dosage calculators and medical references (UN, 2007). For example, the Johns Hopkins POC-IT Center distills complex medical material into easily accessible, evidence-based clinical decision support guides that providers can consult at a patient's bedside. More recently, pilot projects in developing countries have begun developing software and health content for handheld devices that are tailored to:

- Specific patient populations, such as people living with HIV/AIDS, sick children, or pregnant women;
- Specific categories of health workers, such as nurse-midwives or community-based health workers; and/or
- Specific locations, for example, by providing national or district guidelines or by transmitting alerts about local disease outbreaks.

The big advantage of mobile devices is that providers can carry them along as they see patients. With a PDA or smart phone in hand, providers can check a relevant decision support tool or reference guide whenever the situation calls for it. Often this application is combined with a system to collect patient information for electronic medical records and health management information systems. D-Tree's PDA applications for developing countries are an example of this approach. Providers in developing countries find the tools empowering. They have used them to follow Integrated Management of Childhood Illness (IMCI) protocols in Tanzania, advise pregnant women on complications in India, calculate drug dosages in Mozambique, and screen HIV/AIDS patients for medical needs in South Africa, among other uses.

Voice-based systems relying on cell phones, which so far primarily have been used for agriculture and education in south Asia, offer another way for frontline providers to access needed information. In Pakistan, for example, the HealthLine speech recognition system lets semi-literate community health workers retrieve recorded information about a disease or issue in their local language (Vital Wave Consulting, 2009).

Tele-consultation systems go beyond the projects listed in Table 5. Instead of connecting uncertain providers with tools and information to help them make treatment decisions, they let providers ask medical experts at tertiary facilities for advice on how to treat a patient. Tele-consultation systems have been widely deployed in developing countries as a way to leverage the expertise of medical specialists who are in short supply. The projects employ a wide variety of ICTs, ranging from voice calls and text messages, to email messages with photos attached, to sophisticated medical testing systems (Malakata, nd). In Uganda, for example, the RESCUER project gave solar-powered VHF walkie-talkies to illiterate rural traditional birth attendants (TBAs) so they could call for help in emergencies and warn referral hospitals that a patient was on the way (Musoke, 2002).

#### **D. Networking**

ICTs can help health professionals at all levels share their knowledge and experience with colleagues, when time and distance does not permit them to meet face to face. Table 6 gives some examples of projects that use ICTs for networking.

##### **Tools**

Email is one of the most ubiquitous tools used for networking. Listservs, which permit individuals to correspond with a group of colleagues working in the same field, are common in the health and development sectors. Some are broad and global in nature, while others focus more narrowly on a specific geographical region, technical issue, or cadre of workers. Many function as electronic newsletters that simply disseminate information, for example, alerting subscribers about an organization's activities or new publications. However, others serve as a platform for continuing discussion between members of a permanent online community (see COPs below) and thus promote debate and discourse. This type of listserv also promotes off-list correspondence between individual members, who can ask for and receive immediate and relevant advice.

Email is also frequently used to support structured and time-bound discussion forums on a specific topic. Like face-to-face meetings, email forums are participatory, collaborative, and multi-directional. Unlike face-to-face events, however, they are affordable and asynchronous and open to anyone with an email account, anywhere on earth. Thus they serve to network colleagues in remote locations, amplify the voice of people in developing countries and remote locations, and facilitate communication and the generation of new knowledge. As the Insight Initiative discovered (see Table 6), email discussion forums can increase the number of voices heard and perspectives expressed at traditional conferences and can disseminate conference presentations far beyond attendees. They have also been used by health professionals to exchange knowledge, debate policy and practice, and set agendas (Porter 2004). To succeed, however, both email listservs and discussion forums require the active and focused participation of members. Success is more likely when moderators work proactively to ensure the clarity and relevance of all messages and actively solicit input to increase the diversity of contributions. A translation facility to engage people in languages other than English is also helpful (Pakenham-Walsh, 2007; Porter, 2004).

**Table 6. Projects using ICTs for networking**

Project name & country	Technology & Tools	Description of activities	Sponsoring and partner organizations	Sources
<i>Aftercare</i>  South Africa	Mobile phones Internet	Aftercare supports the effective treatment and counseling of HIV/AIDS patients. Volunteer CBHWs, who monitor 15 to 20 patients, are given cell phones that are loaded with R55 (US\$8.50) in airtime each month and equipped with a special menu enabling the CBHWs to record data on a patient's symptoms and drug adherence. During home visits with patients, the CBHWs discuss their treatment and use the mobile phone to relay information about the patient to a central database. A care manager uses a web-based system to monitor and analyze the incoming patient information, respond to workers' questions, and provide supplemental information to improve patient care. Real-time communication between the care manager and CBHWs is usually by voice. Program goals include reducing treatment errors, increasing the volume of patient data, and increasing patient comfort.	Cell-Life University of Cape Town Cape Peninsula University of Technology	Kinkade 2008 <a href="http://www.shareideas.org/index.php/Cell-Life: Using Mobile Technology to Prevent and Treat HIV/AIDS in South Africa">http://www.shareideas.org/index.php/Cell-Life: Using Mobile Technology to Prevent and Treat HIV/AIDS in South Africa</a> UNDESA 2007 <a href="http://www.cell-life.org/">www.cell-life.org/</a>  Iluyemi 2009
<i>AfyaMtandao</i> <a href="http://www.afyamtandao.org">www.afyamtandao.org</a>  Tanzania	Internet	This health network brings together health service providers, policy makers, and development partners in Tanzania. It provides a platform to raise awareness and exchange knowledge in several health areas such as telemedicine and hospital management information systems. Apart from workshops, the health network also facilitates awareness raising and knowledge sharing on ICT for health through its website, newsletters, and several online communities.	IICD	<a href="http://www.iicd.org/articles/exchanging-knowledge-between-health-professionals-in-tanzania">http://www.iicd.org/articles/exchanging-knowledge-between-health-professionals-in-tanzania</a>
<i>Farmers' Conference</i>  Syria, Algeria, Iran, Jordan, Egypt and Eritrea	Mobile phones	A 2008 conference drew more than 50 farmers from north Africa and the Middle East, who were asked to present their situations, knowledge, experiences, ideas, and skills using storytelling. Their stories were recorded in video, audio and text forms for dissemination in various ways, including on the web. The organizers also uploaded small story clips onto mobile phones and showed the farmers how to send these to other farmers via cell phones. The goal is to stimulate knowledge sharing and a farmer-to-farmer extension system to facilitate the spread of useful ideas, techniques, and knowledge around agricultural activities.	International Centre for Agricultural Research in Dry Areas (ICARDA) CGIAR	<a href="http://ictkm.wordpress.com/2008/07/15/icarda-ksinr-project-uses-mobile-phones-for-knowledge-sharing/">http://ictkm.wordpress.com/2008/07/15/icarda-ksinr-project-uses-mobile-phones-for-knowledge-sharing/</a>

<p>Global Alliance for Nursing and Midwifery Communities of Practice (GANM)  <a href="http://my.ibpinitiative.org/public/ganm/">http://my.ibpinitiative.org/public/ganm/</a></p> <p>International</p>	<p>Internet</p>	<p>GANM builds the capacity of nurses and midwives by helping them to share their knowledge, expertise, and practical experience with local and international colleagues; access coherent information on what works and what doesn't; participate in discussions with experts and individuals from different countries; and access evidence-based tools, materials and strategies. GANM also conducts forums and has a website, which offers members a resource library of published materials, announcements, a calendar of events, periodic discussions on topics of interest, and a virtual workspace. Sub-communities, such as a Spanish-language COP on making pregnancy safer, are emerging.</p>	<p>IBP Initiative  WHO  WHO Collaborating Centers for Nursing and Midwifery  JHPIEGO  JHU/CCP  Public Health Institute</p>	<p>Compernelle 2006</p>
<p><i>Health &amp; Development Networks (HDN)</i>  <a href="http://www.hdnet.org">www.hdnet.org</a></p> <p>international</p>	<p>Internet</p>	<p>HDN hosts, administers, and moderates online electronic discussion forums on HIV/AIDS and related issues, including regional forums for Africa (AF-AIDS) and Asia and the Pacific (SEA-AIDS). HDN has Key Correspondents based in different countries, with diverse technical backgrounds, who provide seed ideas for discussions on the forums by submitting personal viewpoints, summaries of country strategies and policies, project descriptions, interviews, and the like. They also provide daily briefings and reports from international AIDS conferences, so members who are unable to attend can still participate.</p> <p>More recently, HDN has created National Partnership Platforms. These are country-based information, dialogue, and advocacy platforms that support Civil Society partners for the exchange of information and experience on AIDS, TB, and related issues among key stakeholders. Partnership platforms currently operate in Ireland, Thailand, Uganda, Zambia, Zimbabwe, Cambodia, and Malaysia. Common elements include a national AIDS/TB e-forum and associated website, key correspondent team, local initiatives, and country-level campaigning and target advocacy.</p>		
<p><i>HealthNet Nepal</i></p> <p>Nepal</p>	<p>Internet</p> <p>Info access  Discussion groups, etc.</p>	<p>Since 1995, this subsidiary of SatelLife has provided access to locally generated information resources and electronic conferences. It also produces weekly news publications and sponsors five discussion groups. To increase the amount and dissemination of locally generated information, HealthNet Nepal provide free space online to medical journals published in Nepal, prepares and hosts the Health Science Bibliography of Nepal, and provides full-text theses, reports, and health statistics.</p>	<p>AED SATELLIFE</p>	<p>Pradhan 2003</p>

<p><i>HealthNet Zambia</i></p>	<p>Email</p>	<p>The HealthNet project provided email-based health information exchange between developed and developing countries and within developing countries. It was primarily used for dissemination of literature, control of the drug supply, monitoring epidemiological data, referral consultations, and communication.</p>	<p>University of Zambia Medical Library</p>	<p>Hoppenbrouwer 2007</p>
<p><i>Insight Initiative</i>  Southern Africa, Asia and the Pacific</p>	<p>Email  Extended discussion around conferences</p>	<p>This initiative provided electronic networking and communication support to two conferences in order to increase the voices and perspectives heard and to facilitate exchange of relevant content. Two time-limited, moderated, and structured discussions related to the conferences were held using the ProCAARE email discussion forum. A moderation team used clearly designed questions to guide the discussions. In addition, 26 key correspondents from around the world were recruited to write articles that fed into the conference discussions and later to provide session coverage from the actual events. During the conferences, the team provided critical analyses of the presentations and collected participants' views. Structured discussions of the conferences continued after the events. The initiative drew contributions from Asia, Africa, Latin America, and the United States, and generated a wide range of content and views from communal, institutional, and individual perspectives. Participation increased from 700 to just under 2,500 over 6 months.</p>	<p>Health &amp; Development Networks (HDN)</p>	<p>Chetley 2006  Osterwalder 2002</p>

<p><i>ProCOR</i>  <a href="http://www.procor.org/">http://www.procor.org/</a></p> <p>International and regional</p>	<p>Email          Internet</p>	<p>ProCOR is an ongoing email and web-based electronic conference aimed at addressing the emerging epidemic of cardiovascular disease in the developing world. The goal of ProCOR is to create a dynamic international forum where health care providers, researchers, public health workers, and others may share timely information and participate in raising the awareness about this emerging public health challenge. Moderators screen incoming messages and post current research, clinical and public health information, thus ensuring the high scientific quality of the discussion. ProCOR has spawned regional outgrowths in Argentina, Brazil, Guatemala, India, Lebanon, and Pakistan. In India, for example, AmiCOR works to popularize preventive care of cardiovascular diseases among health care providers and general public; serves as an interactive forum for physicians, policy makers, researchers, consumers and other stakeholders to debate policies and raise the awareness of the emerging cardiovascular epidemic in India; serves as a resource of information regarding prevention and treatment strategies for CVD; nurtures young researchers to develop locally relevant solutions to cardiovascular disease prevention; and plays a community advocacy role.</p>	<p>Satellite          Low Cardiovascular Center</p>	<p>Feek 2003</p>
<p><i>SAATHII</i>  <i>(Solidarity and Action Against the HIV Infection in India)</i>  <a href="http://www.saathii.org">www.saathii.org</a></p> <p>India</p>	<p>Internet          Website          Listserv</p>	<p>SAATHII was launched in 2000 to facilitate dialogue among the diverse sectors involved in the fight against HIV/AIDS in India. It includes a range of capacity-building initiatives, such as facilitating network-formation, mapping of resources and services, and information dissemination and technical assistance to service providers. Its listserv (saathii@yahogroups.com), started in 2000, addresses the need for timely information delivery. SAATHII has also published an online version of its national HIV/AIDS directory for India. This searchable database has contact information and service descriptions for over 1150 implementing, funding and policy organizations. The SAATHII website serves as a clearinghouse of information on HIV/AIDS in India. SAATHII is now identifying HIV/AIDS health-care providers who would be willing to share their knowledge and experience with others through specialized community e-forums to be hosted on the website.</p>		<p>Ramakrishnan  <a href="http://www.is-watch.net/node/558">http://www.is-watch.net/node/558</a></p> <p><a href="http://www.apdip.net/resources/case/rnd51/view">http://www.apdip.net/resources/case/rnd51/view</a></p>

Web-conferencing and videoconferencing require greater technological investments than email listservs and discussion forums. Where technology and bandwidth permit, however, they can support live events with real-time debate and dialogue between participants located in different countries (Solez et al., 2005). For example, WHO's Knowledge Management for Public Health (KM4PH) program has conducted many web-conferences, ranging from monthly presentations originating from different continents to a three-part Global Forum on World Health Day in 2006. During a recent 18-month period, participants from over 50 developing countries logged on to KM4PH web-conferences. The sessions stimulated member groups, such as the Public Health Education Network in KwaZulu-Natal Southern Africa, to begin conducting their own web-conferences (Cook et al., 2008).

### **Networking via cell phone**

Over 50 farmers from North Africa and the Middle East attended a Farmers' Conference sponsored by the International Centre for Agricultural Research in Dry Areas (ICARDA) in 2008. They presented their situations, knowledge, experiences, ideas, and skills using storytelling, and their stories were recorded in video, audio, and text forms for dissemination in various ways. One of the most innovative approaches was uploading small story clips on to mobile phones and teaching farmers how to send them directly to other farmers via cell phones. The goal is to stimulate knowledge sharing and a farmer-to-farmer extension system to facilitate the spread of useful ideas, techniques, and knowledge around agricultural activities.

Source: Manning-Thomas, 2008

### **Communities of practice**

Communities of practice (COPs) represent the ultimate in virtual networking. They bring people with similar interests and similar job functions together in an ongoing community so that they can share their experience and expertise and work together to generate new knowledge. Membership in COPs may be open to all or by invitation only. COPs typically use both email and Internet technologies to communicate. They may operate listservs, hold periodic discussion forums, publish digests and newsletters, sponsor online discussion boards, maintain archives and libraries of relevant documents, post announcements of events and job openings, and more. The choice of technology and platform determines who is able to participate and to what extent (Hardon, 2005; Mwakalinga, 2005). Sometimes an online venue is simply not appropriate. Field workers in grassroots organizations, for example, may find it difficult to incorporate regular log-ons and participation in online discussions into their daily or weekly routine (Hardon, 2005).

Membership in a COP lets people overcome professional isolation and connects with peers and colleagues, no matter where they are located. Community members can ask questions, find help, keep up to date with current knowledge and best practices, and validate their practices (Hara and Hew, 2006). By tapping the expertise and experience of

the entire group, COPs can also reach consensus on emerging practices and policies and generate new knowledge.

### **Recognizing the need for a COP**

MEASURE DHS was surprised to discover that a forum for people using Demographic and Health Survey (DHS) data had sprung up on the Stata website. The forum gave DHS data users—who, by definition, are among MEASURE DHS' core constituencies—the opportunity to ask technical questions about handling and analyzing DHS datasets and to seek help from their peers. The organization had missed an opportunity to meet a real need of their audience, who had migrated elsewhere to form a COP. A DHS data users forum has since been proposed as part of the overhaul of the DHS website (Nybro, personal communication).

Ideally COPs grow naturally out of shared interests and commitments. For example, C3NET, which focuses on ICTs as a tool for development, grew out of a 2002 South-South Exchange Travelling Workshop in India. Workshop participants, who came from many countries, wanted a way to continue the discussion. Because the COP responded to a real demand, the community quickly expanded, has generated spontaneous discussion, and has even spawned short-lived sub-communities around particular themes—all without much direction or prompting from moderators (Mwakalinga, 2005).

Examination of more and less successful health and development COPs in the United States and developing countries suggest some key factors that contribute to their longevity and productivity. First is the question of membership. The more that members have in common in terms of their expertise, job responsibilities, and location, the more freely they express themselves and the more focused are their discussions (Mwakalinga, 2005). COPs that lack a narrow focus pose a greater challenge for moderators. Second is meeting members' needs. By discussing the objectives and functioning of a proposed COP with members ahead of time, sponsors can make sure that the platform and content will meet member needs and expectations and that the COP will be perceived as a valuable resource (Hardon, 2005). Third is fostering trust and a sense of community, so that members are willing to speak openly, share their experiences, and learn from one another. To some extent this grows naturally out of members' similar work and interests. However, moderator's efforts to maintain a friendly environment and periodic face-to-face meetings can enhance it (Mwakalinga, 2005). The moderator is also important to keep online communications focused and professional (Hara and Hew, 2006; Hardon, 2005).

### **Broader knowledge sharing networks**

COPs may overlap with or form a part of broader knowledge networks. These networks often serve a wider audience, for example, including policy makers, researchers, and even the general public along with health providers and program managers. Over time, networks frequently expand their activities to encompass a mix of knowledge sharing

tools and functions. As part of its capacity-building efforts to fight HIV/AIDS in India, for example, SAATHII operates a listserv, publishes an organizational directory, hosts an online information clearinghouse, and is planning to launch e-forums with providers. Likewise, AfyaMtandao's efforts to raise awareness and share knowledge regarding the use of ICTs in the health sector include face-to-face workshops, a website, newsletters, and multiple online communities.

Knowledge sharing networks of this kind may spawn more narrowly focused sub-networks and sub-communities to better serve the needs of their members. For example, ProCOR, which addresses cardiovascular disease in developing world, has national affiliates in some countries to nurture locally relevant knowledge. Similarly the International Institute for Communication and Development (IICD) (<http://www.iicd.org/>) supports the creation and operation of National ICTs for Development (ICT4D) Networks in the countries where it works; each of these networks arranges meetings, produces newsletters, stimulates local research and training, generates and shares lessons learned, maintains a local ICT4D website, and uses the Dgroups online platform as an extension to face-to-face activities.

### ***E. Access to the scientific literature***

It can be difficult for researchers and academics in developing countries, as well as decision-makers and managers, to access the scientific literature and/or contribute to scientific discourse. Part of the problem is the cost of journal subscriptions: according to a WHO study that prompted the creation of HINARI, 56% of institutions in the lowest-income countries had no current subscriptions to international journals and 21% had an average of only two journal subscriptions (Aronson, 2004). There are other barriers as well: researchers in developing countries complain about poor funding, a culture that is inimical to posing good questions, different perceptions of ethics, language and writing barriers, and the difficulty of getting published in international journals (Horton, 2000). Barriers to publication make access to the grey literature even more important, and that is also difficult in developing countries.

In response to these problems, international organizations and public-private partnerships have launched a number of initiatives to provide free or low-cost access to international scholarly journals for institutions and readers in developing countries (Bukachi and Pakenham-Walsh, 2007; Juech, 2008, Pandita and Singh, 2008). These include WHO's HINARI initiative, INASP's Perii Program, the Ptolemy Project, and others listed in Table 7. In the field of reproductive health, for example, POPLINE offers a searchable database with over 350,000 abstracts and citations to scientific articles, reports, books, and unpublished reports. To broaden access to the database, POPLINE provides free, comprehensive searches on request for people affiliated with academic, government, or qualified organizations in developing countries. It also delivers free full-text copies of documents in the database to individuals and organizations in developing countries via email or postal mail. POPLINE has joined HINARI to extend access still further.

**Table 7. Projects using ICTs to increase access to the scientific literature**

Project name & Country	Technologies	Description of activities	Sponsoring and partner organizations	Sources
<i>African Index Medicus (AIM)</i>  Africa	Internet	AIM is an online index to African health literature and information sources. The database includes all African medical journals as well as articles on or related to Africa and published in other regional or international journals.	WHO AHILA	<a href="http://indexmedicus.afro.who.int/">http://indexmedicus.afro.who.int/</a>
<i>African Journals OnLine (AJOL)</i> <a href="http://www.ajol.info">www.ajol.info</a>  Africa	Internet	AJOL provides free hosting for over 340 peer-reviewed journals from 26 African countries, including more than 100 journals in health and related fields. AJOL provides free access to tables of contents and article abstracts, plans to offer full text online of open access and partner journals beginning in 2009, and also sponsors a document delivery service. In 2008, AJOL had 618,351 visits from 222 countries, with over two million page views. The site also offers a sophisticated searching tool to help users locate articles and email alerts for new journal issues.	African Journals OnLine INASP	Crampton 2009 Smart 2004
Bioline International <a href="http://www.bioline.org.br/">www.bioline.org.br/</a>  international	Internet	Bioline International is a not-for-profit scholarly publishing cooperative committed to providing open access to quality research journals, including reproductive health journals, published in developing countries. By providing a platform for the distribution of peer-reviewed journals (currently from Bangladesh, Brazil, Chile, China, Colombia, Egypt, Ghana, India, Iran, Kenya, Malaysia, Nigeria, Tanzania, Turkey, Uganda and Venezuela), BI helps to reduce the global knowledge divide by making bioscience information generated in these countries available to the international research community world-wide.		
BioMed Central <a href="http://www.biomedcentral.com/">http://www.biomedcentral.com/</a>  international	Internet PDAs	BioMed Central is an independent publishing house committed to providing immediate open access to peer-reviewed biomedical research. All original research articles published by BioMed Central are made freely and permanently accessible online immediately upon publication. Users of Palm compatible PDAs, PocketPCs, and Windows CE devices can receive research article abstracts from BioMed Central. AvantGo's free software, which must be installed on a computer, will automatically download research abstracts from BioMed Central when you synchronize your PDA.	BioMed Central	<a href="http://www.biomedcentral.com/info/about/avantgo/">http://www.biomedcentral.com/info/about/avantgo/</a> UN DESA 2007

<p><i>BIREME (Latin American and Caribbean Center on Health Sciences Information)</i></p> <p>Latin America</p>		<p>BIREME promotes the use of scientific and technical health information in Latin America. It has developed a bibliographic database called Latin American and Caribbean Literature on Health Sciences (LILACS) which indexes journals from the region. It also set up the Virtual Health Library which provides free online access to a range of evidence-based resources that support health care decisions; the library is designed to meet the information needs of specific communities of users, such as authorities, politicians, lawgivers and health managers, researchers, teachers and students, physicians and allied health personnel, community agents, communication professionals, and the general public.</p>	<p>PAHO Foundation for the Support of Science of São Paulo (FAPESP) Chilean National Council of Sciences</p>	<p><a href="http://www.bireme.br/bvs/bireme/l/homepage.htm">http://www.bireme.br/bvs/bireme/l/homepage.htm</a> <a href="http://www.virtualhealthlibrary.org">http://www.virtualhealthlibrary.org</a> <a href="http://lilacs.bvsalud.org">http://lilacs.bvsalud.org</a> <a href="http://www.bvsalud.org">www.bvsalud.org</a></p>
<p>Blue Trunk Library</p> <p>International</p>	<p>Print</p>	<p>The Blue Trunk Library is a collection of over 100 books on medicine and public health that, for ease of transport and storage, is packed into a blue metal trunk fitted with shelves. They are designed primarily for local or district health centers. Priority is given to practical manuals offering easily accessible solutions to the medical, public health and management problems facing medical staff. The collection takes into account differing levels of education among health staff, with different publications addressing the same topic from different points of view. Blue Trunk Libraries are available in English, French, Portuguese, and Arabic. Over 1,500 Libraries had been distributed in 69 countries by the end of 2006. Demand outstrips supply.</p>	<p>WHO</p>	<p>Mouhuelo 2006</p> <p><a href="http://www.who.int/ghl/mobile-libraries/bluetrunk/en/index.html">www.who.int/ghl/mobile-libraries/bluetrunk/en/index.html</a></p> <p><a href="http://www.hifa2015.org/wp-content/uploads/2008/09/hifa2015-summary-blue-trunk-libraries.pdf">www.hifa2015.org/wp-content/uploads/2008/09/hifa2015-summary-blue-trunk-libraries.pdf</a></p>
<p><i>Central American Network for Disaster and Health Information (CANDHI)</i></p> <p>Central America</p>	<p>Internet CD-ROMs</p>	<p>CANDHI operates ten disaster health information centers in medical libraries and disaster-related organizations in six countries to provide electronic access to public health “gray literature” on disasters and other health information resources. The centers required a large investment in IT hardware, software, internet connectivity, and technical training at each site. In addition, CRID has created searchable CD-ROMs of disaster-related documents. Each center provides local Internet access to the collection, and CANDHI is working to create an online portal.</p>	<p>National Library of Medicine PAHO UN International Strategy for Disaster Reduction Regional Center of Disaster Information for Latin America and the Caribbean (CRID)</p>	<p>Arnesen 2007</p>

<p><i>Communications for Better Health (CBH) program</i></p> <p>Sub-Saharan Africa</p>	<p>Print Internet CD-ROMs Radio and TV</p>	<p>CBH sought to improve the accessibility of relevant health information and experience in the developing world'. It focused on the creating information centers to disseminate relevant health information and also to collect organize and share local experiences. Staff at the information centers created local databases by selecting appropriate information from international resources, in-country or regional colleagues, and local health professionals. The database was maintained in paper and often in electronic format. This information was published in nationally edited and prepared digests, which were distributed to health professionals and policy makers and also disseminated via the Internet and CD-ROM as well as in print. The content of the digests was selected with local health conditions in mind and included abstracts, relevant articles by local health specialists, summaries of findings from community health projects, personal health experiences, interviews, FAQs, questionnaires and answers, and quizzes. In Ghana the digest gained mass exposure through bi-weekly readings of highlights on television morning show, newspaper health column, and radio.</p>	<p>Dreyfus Health Foundation (DHF) Health Foundation of Ghana (HFG) University of Zambia Medical Library</p>	<p>Feek 2003 <a href="http://www.dhfglobal.org/news.html">http://www.dhfglobal.org/news.html</a> Hoppenbrower 2007</p>
<p><i>Health InterNetwork Access to Research Initiative (HINARI)</i></p> <p><a href="http://www.healthinternetwork.org">http://www.healthinternetwork.org</a></p> <p>international</p>	<p>Internet</p>	<p>To launch HINARI in 2002, WHO negotiated with medical journal publishers to provide free or low-cost online access to scientific information for researchers in the developing world. Access is primarily free for public institutions in countries with a gross national product of \$1,000 per year, while there is a small charge in countries with a gross national product of \$1,000 to \$3,000 per year. Over 150 publishers now offer more than 6,200 journals to health institutions in 108 countries. Levels of use have grown steadily since HINARI's inception. In 2006 libraries in the developing world downloaded 4 million articles from HINARI.</p>	<p>WHO</p>	<p>Aronson 2004 Dzenowagis 2002 Bukachi 2007 <a href="http://www.who.int/hinari/en">http://www.who.int/hinari/en</a></p>
<p><i>HealthNet Nepal</i></p>	<p>Internet</p>	<p>HealthNet Nepal was established in 1995. It provides access to locally generated information resources, sponsors electronic conferences, hosts a website, produces weekly news publications, and hosts discussion groups. To provide access to locally generated information and resources, it provides free space to Nepali medical journals, hosts the Health Science Bibliography of Nepal in collaboration with the Institute of Medicine, and provides full-text theses, reports, and health statistics on Nepal.</p>	<p>AED SATELLIFE</p>	<p>Pradhan 2003</p>

<p><i>Health Sciences Online (HSO)</i> <a href="http://www.hso.info">www.hso.info</a></p> <p>global</p>	<p>Internet</p>	<p>The HSO website, launched in 2008, is a virtual learning center with browse and search functions. HSO provides free, online access to a comprehensive collection of top-quality courses and reference materials in medicine, public health, pharmacy, dentistry, nursing, basic sciences, and other health sciences disciplines. These materials are donated, hosted, and maintained by content partners, so quality is maintained, and materials can be constantly updated. Currently the site includes more than 50,000 resources selected by clinicians and other experts from existing resources at professional societies, accredited continuing education organizations, governments, and universities.</p>	<p>American College of Preventive Medicine CDC NATO UBC World Bank WHO World Medical Association</p>	
<p><i>Index Medicus for the Eastern Mediterranean Region</i></p>	<p>Internet</p>	<p>The Eastern Mediterranean Region Library Network (EMLIBNET) produces an international index to Eastern Mediterranean health literature and information sources using the Medical Subject Headings MeSH list of the U.S. National Library of Medicine.</p>	<p>WHO</p>	<p><a href="http://www.who.int/librariy/databases/emro/en/index.html">http://www.who.int/librariy/databases/emro/en/index.html</a></p>
<p><i>PERii (Programme for the Enhancement of Research Information)</i></p> <p>global</p>	<p>Internet</p>	<p>Since 2002, the Perii program has worked to increase access to both international and nationally published research. Perii has negotiated for discounted or free access to online information from publishers in developed countries, developed digital services at libraries and trained researchers on how to use them, helped researchers in developing countries publish their work, and advised journals in developing countries about how to publish online. Based on its experience with African Journals OnLine, INASP has developed a methodology for groups of journals to publish on community websites. Perii's Journals OnLine project supports country-specific databases of journals to give greater access to indigenous scholarship; databases for Bangladesh, Nepal, Vietnam, and the Philippines were launched in late 2007.</p>	<p>INASP</p>	<p><a href="http://www.inasp.info">http://www.inasp.info</a> Smart 2004</p>

<p><i>POPLINE</i></p> <p><a href="http://db.jhuccp.org/ics-wpd/popweb/">http://db.jhuccp.org/ics-wpd/popweb/</a></p> <p>global</p>	<p>Internet</p>	<p>POPLINE is the world's largest database on reproductive health, containing citations with abstracts to scientific articles, reports, books, and unpublished reports in the field of population, family planning, and related health issues. The database contains nearly 360,000 records and adds 12,000 records annually. Special features include links to free, full-text documents; the ability to limit a search to peer-reviewed journal articles; RSS feeds for topical searches; and many abstracts in French and Spanish. POPLINE operates a document delivery service that provides free full-text copies of documents (as either electronic files or photocopies) to individuals and organizations in developing countries. Comprehensive searches are provided for anyone affiliated with an academic, government, population, or qualified organization in a developing country free of charge; results are mailed or sent by email.</p>	<p>INFO Project, Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs USAID</p>	
<p><i>PLoS (Public Library of Science)</i></p> <p><a href="http://www.plos.org">www.plos.org</a></p> <p>international</p>	<p>Internet</p>	<p>This non-profit organization publishes seven online peer-reviewed journals, including PLoS Medicine and PLoS Neglected Tropical Diseases, following an Open Access model that makes all articles available free to read and share. PLoS makes every effort to ensure that authors from the developing world can publish with them via a fee waiver program for authors who cannot afford PLoS publication fees. This has contributed to greater diversity in the geographic coverage of authors.</p>	<p>PLoS</p>	<p>Allen 2009</p>
<p><i>Ptolemy Project</i></p> <p>East Africa</p>	<p>Internet</p>	<p>Ptolemy appoints African surgeons as research affiliates of the University of Toronto, giving them Internet access to the university library's entire collection of full-text resources. A survey found that surgeons given access to electronic health information read more articles than before and found the information highly relevant to their clinical, teaching, and research activities. The surgeons prefer electronic journals to textbooks and are more inclined to change their practice based on information found in western journals than local journals.</p>	<p>University of Toronto Association of Surgeons of East Africa</p>	<p>Burton 2005</p>
<p><i>SciELO (Scientific Electronic Library Online) Network</i></p> <p><a href="http://www.scielo.org">www.scielo.org</a></p> <p>international</p>	<p>Internet</p>	<p>SciELO is a pioneer initiative for developing countries within the Open Access movement. It operates collections of online journals from eight countries: Argentina, Brazil, Chile, Colombia, Cuba, Portugal, Spain and Venezuela on public health and the social sciences. It includes over 450 journal titles and more than 130,000 free full-text articles, including original scientific articles, review articles, editorials, and other types of communication.</p>	<p>BIREME/PAHO/WHO State of São Paulo Research Foundation (FAPESP) CNPq (National Research Council)</p>	

<p>Source international</p>	<p>Internet</p>	<p>Source is an international information support centre designed to strengthen the management, use, and impact of information on health and disability by practitioners and organizations. The Source portal provides access to:</p> <ul style="list-style-type: none"> <li>- A bibliographic database of over 25,000 health and disability information resources, both published and unpublished;</li> <li>- A contacts database which allows users to search for publishers, distributors, information providers, and training organizations working in health and disability worldwide; and</li> <li>- A newsletters and journals database of over 150 international newsletters, magazines and journals available free or at low cost to readers in developing countries, including links to the full-text of the newsletter where possible.</li> </ul>	<p>Centre for International Health and Development Healthlink Worldwide Handicap International Exchange</p>	<p><a href="http://www.asksource.info/index.htm">http://www.asksource.info/index.htm</a></p>
<p>Teaching-aids at Low Cost (TALC) <a href="http://www.talcuk.org">http://www.talcuk.org</a> international</p>	<p>Print CD-ROMs</p>	<p>TALC assembles and distributes high-quality, copyright -free health education and training materials to developing countries, including essential texts on nursing, surgery, HIV/AIDS, and infectious diseases. More recently TALCt has also begun disseminating health information on CD-ROMs to reduce costs. E-TALC produces easy-to-use CD-ROMS of copyright-free information with a simple search engine. Like TALCs books, the CD-ROMs provide free access to up-to-date and appropriate health and development information and training materials for health workers in developing countries. Information on the CD-ROMs can be downloaded, emailed, or printed and freely reproduced and shared. E-TALC also allows users to select, adapt, and tailor materials to meet local needs and develop their own library of materials at very low or zero cost.</p>	<p>TALC DFID</p>	<p><a href="http://www.talcuk.org/e-talc.htm">http://www.talcuk.org/e-talc.htm</a> Feek, 2003</p>

The open access movement, represented by publishing groups like the Public Library of Science (PLOS) and BioMed Central, offers another approach to making information more widely accessible. In this model, publishers do not charge readers subscription or access fees; the cost of online publication is borne by donors and authors or their institutions (which forms a barrier for developing country authors). Readers can access the literature on the Internet and are free to download, copy, distribute, and translate the content for nonprofit and educational use as long as the source is acknowledged (Bukachi and Pakenham-Walsh, 2007; Satyanarayana, 2004; Swan, 2008).

However, connectivity and other technical problems have limited the usefulness of initiatives that rely on online access (Aronson, 2004). Additional problems are posed by the content of international peer-reviewed journals, which focus largely on addressing problems of the developed world; the under-representation of journals published in the developing world in global indexes and databases; the dominance of English in research journals; and the limited usefulness of scholarly journals for clinicians (Bukachi and Pakenham-Walsh, 2007).

In response to these problems, other initiatives have sought not only to increase access to the scientific literature in developing countries, but also promote the publication and dissemination of locally produced materials, including studies by developing country researchers and materials that are of practical use to health providers.

### ***Regional journals***

National and regional publications in the developing world can provide access to research and information on topics of local relevance, serve as a resource for continuing education, and act as a forum for aspiring researchers to enhance research and publication skills. However, there are many obstacles to launching new regional journals including insufficient resources, lack of rigor in research papers, poor writing, the limited number of expert reviewers fluent in the local language, and authors' concerns about these journals' stature and reach (Goehl, 2007).

Hence some organizations have stepped in to support the publication and distribution of regional journals. For example, the African Journal Partnership (AJP) has helped establish journal-to-journal partnerships between international and African medical journals, including *Mali Médical* and *African Health Sciences*. Activities include training for editors and reviewers, writing workshops for authors, and promotion to international indexes, such as MEDLINE (Goehl, 2007). INASP has provided support to developing country research publications since 1998, beginning with the launch of African Journals OnLine (AJOL). AJOL now includes 189 journals from 21 African countries; the website provides tables of contents, article abstracts, and a homepage for each journal, and encourages editors to share experiences and knowledge. Participating journals report increased international submissions and increasing contact with international researchers. Since 2004 AJOL has also provided open-source software that enables journals to manage the entire publishing process. The software was created with the developing world in mind: it operates efficiently at low bandwidths, is easy to use, and has many guides and help functions built in (Smart, 2004).

### ***Regional indexing and databases***

Some international databases, such as POPLINE, are designed to collect materials that are relevant to developing countries and to include abstracts in multiple languages. They cover every part of the developing world. Increasingly, these efforts are complemented by databases and indexes of medical and public health literature published in specific regions, with the expressed objective of increasing access to the scientific and medical literature published in those regions.

For example, BIREME (the Latin American and Caribbean Center on Health Sciences Information) has developed the LILACS (Literatura Latino Americana e do Caribe em Ciências da Saúde) bibliographic database to collect and index health literature published in Latin America. The Scientific Electronic Library Online (SciELO) also focuses on making Latin American journals more widely accessible. African Journals OnLine and the African Index Medicus have helped to increase the visibility of science journals published in Africa (Bukachi and Pakenham-Walsh, 2007); an African version of SciELO is also planned (<http://www.scidev.org/en/news/top-south-african-journals-to-go-open-access.html>). In India, the Indian Council of Medical Research has taken a lead in establishing IndMED ([www.indmed.nic.in](http://www.indmed.nic.in)) to provide web access to abstracts of 78 Indian biomedical journals (Satyanarayna, 2004). Bioline International takes a more global approach: it provides a platform for the distribution of peer-reviewed journals from a variety of developing countries, including Bangladesh, Brazil, Chile, China, Colombia, Egypt, Ghana, India, Iran, Kenya, Malaysia, Nigeria, Tanzania, Turkey, Uganda, and Venezuela.

### ***Print libraries***

Sometimes hard copies remain the best way to disseminate information. WHO's Blue Trunk Library ships out small print collections of essential health information materials for use by district hospitals and other frontline facilities. The emphasis is on materials of practical use to health providers (Mouheulo). The Nursing Library Project at the United Nations Refugee Agency (UNHCR) employs a similar approach. With support from the pharmaceutical company Merck Sharp & Dohme and the International Council of Nurses (ICN), the project is shipping trunks with about 80 titles to health providers working in refugee camps and surrounding areas in Tanzania and Zambia. These portable libraries provide up-to-date nursing and health information as well as training to better meet refugee health needs (<http://www.unhcr.org/cgi-bin/texis/vtx/GNA?page=tza&newsid=43ff36594>).

### ***CD-ROMs***

Where Internet connections are absent or limited, CD-ROMs and DVDs can help fill the gap. For example, POPLINE disseminates its database on CD-ROM and encourages installations on local area networks (LANs) so that multiple users at an organization can access the single disc ([http://db.jhuccp.org/ics-wpd/popweb/INSTALL\\_ENG.pdf](http://db.jhuccp.org/ics-wpd/popweb/INSTALL_ENG.pdf)). Medical libraries frequently turn to this kind of solution. For example, the Medical Library of the College of Medicine at the University of Nigeria—one of the country's largest—provides users with access to a range of CD-ROMS, including the biomedical

journal database Medline, health education and training materials distributed by TALC, and CD-ROMs from WHO and UNAIDS (Watts and Ibegbulam, 2006).

The Central American Network for Disaster and Health Information (CANDHI) relies heavily on CD-ROMs to supplement Internet access to its knowledge repository, which is available at its ten disaster health information centers. CANDHI has created searchable CD-ROMs of electronic documents on specific subjects, such as volcanoes or water resources, as well as specialized CD-ROMs on the lessons learned from specific natural disasters. The CDs have been distributed to hundreds of health professionals and disaster managers across Central America and provide an easy mechanism to generate interest in and use of vital information for disaster planning. CANDHI is also considering issuing CD-ROM and print versions of its Disaster Information Center Toolkit, which it initially developed as a multimedia, interactive web application (Arnesen et al., 2007).

### ***Onsite digital libraries***

The WiderNet Project based at The University of Iowa has refined another solution to the bandwidth gap: the onsite eGranary digital library, which stores textbooks, journals, downloaded web pages, multimedia, presentations, and other materials on a computer server with large storage capacity. Once installed as part of a local computer network, the server provides high-speed access to the entire library of documents. When an Internet connection is available, even a slow one, additional documents and materials can be downloaded to the library from the web when the system is idle, for example, at night. Extra space is also left on the digital library server for the distribution of locally produced materials. Local Wi-Fi networks can leverage the content of the digital library even further, for example, across an entire campus (Roberts et al., 2007). More than 200 eGranary digital libraries are currently installed in developing countries (Cook et al., 2008).

## V. WHO'S DOING WHAT?

### A. *Knowledge Networks Relevant to K4Health*

No effort was made here to define “knowledge network.” The term was considered to broadly refer to any group that promotes communication and knowledge sharing between self-selected members. Knowledge repositories that lack ancillary activities to promote discussion were excluded.

Table 8 lists more than two dozen knowledge networks that could be relevant to K4Health. Some of these networks are concerned broadly with international development, while others focus on global health, information dissemination, or ICTs. Different types of networks may have different utility for the K4Health project.

- Two knowledge networks, HIPNET and the Health Information Forum (HIF-net), have goals that parallel those of the proposed K4Health network and may duplicate some K4Health activities. As such, they could provide a foundation for the K4Health network. The following section, which reports key findings from interviews with HIPNET members, illustrates how relevant and useful the knowledge and experience of HIPNET members could be for attaining K4Health goals. Further investigation is recommended into HIF-net.
- Networks focused on the use of ICTs for health and development may be a source of knowledge and support for staff involved in refining K4Health’s collaborative publishing and adaptation tools and in developing innovative formats and channels to exchange knowledge. Relevant networks include: the ICT-KM Program of the CGIAR, the Zunia Knowledge Exchange (formerly dgCommunities) on ICT, Knowledge for Development (K4D), Mobile Active, and Web for Development (Web4Dev). IICD’s National ICT4D Networks can also provide insights about applying ICTs in specific countries, including one K4Health priority country: Uganda.

Networks that exchange knowledge regarding the reproductive health and family planning issues that K4Health plans to target are an excellent resource for the development—and perhaps even more importantly, the regular updating—of K4Health knowledge bundles. Their knowledge repositories and resource centers include materials that are candidates for inclusion in the knowledge bundles. Their members can provide informed advice on the composition of the bundles. And their ongoing discussions and submission of new resources can alert K4Health staff when it is necessary to update the bundles. These networks include: certain working groups at the CORE Group, certain Zunia Knowledge Exchange groups (formerly dgCommunities), some forums at the Global Healthcare Information Network (GHI-net), certain COPs hosted by the Implementing Best Practices (IBP) Knowledge Gateway and the Program for the Collaboration Against AIDS and Related Epidemics (ProCAARE).

**Table 8. Knowledge networks relevant to K4Health**

Program/ URL	Sponsors, contractors, Partners	Technical and geographical focuses	Objectives	Networks	Other KM products and services
<b>AFRO-NETS</b> <b>(African Networks for Health Research &amp; Development)</b> <a href="http://www.afronets.org/">http://www.afronets.org/</a>	SATELLIFE, WHO/AFRO	Health research for development  Anglophone Africa	To facilitate information exchange among networks active in health research for development and collaboration for capacity building, planning, and research	Active email discussion forum for public health professionals	Repository of documents; event listings; links
<b>AHILA</b> <b>(Association for Health Information and Libraries in Africa)</b> <a href="http://www.ahila.org">http://www.ahila.org</a>	WHO/AFRO, 46 country members	Health information  Africa	To promote the provision of information to health workers, the professional development of librarians, resource and knowledge-sharing among health information professionals, and national databases of medical literature	Electronic discussion group (AHILA-net) for health information professionals	Event listings, links
<b>AIHA</b> <b>American International Health Alliance</b> <a href="http://www.aiha.com/en/">http://www.aiha.com/en/</a>  <a href="http://www.eurasiahealth.org/">http://www.eurasiahealth.org/</a>	USAID	Health  Global Eurasia	To help communities and nations with limited resources build sustainable institutional and human resource capacity via twinning partnerships and other programs that tap the knowledge and skills of experienced health professionals and others	EurasiaHealth Knowledge Networks for AIDS and TB: clearinghouse for Russian-language information and resources, online discussion forums, mailing lists, event listings, etc., for scientists, community activists, govt officials, and other health experts working in Eurasia.	Peer-to-peer partnerships between healthcare organizations; resource library
<b>AIMEnet</b> HIV/AIDS Monitoring and Evaluation Network <a href="http://www.cpc.unc.edu/measure/networks/aimenet">http://www.cpc.unc.edu/measure/networks/aimenet</a>	MEASURE Evaluation	HIV/AIDS  Global	To promote knowledge sharing on the M&E of HIV/AIDS programs	Listserv with over 1,000 members from global organizations, NGOs, donor agencies, MOHs and national AIDS bodies, and research institutions	

<b>ICT-KM Program of the CGIAR</b> <a href="http://ictkm.cgiar.org/">http://ictkm.cgiar.org/</a>	Consultative Group on International Agricultural Research (CGIAR)	Agriculture  Global	To promote and support the use of ICTs and KM to improve the effectiveness of the CGIAR System's work, and to establish the CGIAR System as a leading knowledge broker	2 COPs, one for IT Managers and the other for Information Managers at CGIAR and its partners	Library; resource area; Knowledge Sharing Toolkit; e-newsletter; three blogs on ICT-KM, knowledge sharing, and the virtual library
<b>Communication Initiative (CI) network</b> <a href="http://www.comminit.com">http://www.comminit.com</a>	Dozens of partners, including international donors, governmental agencies, NGOs, foundations	Communication for development  Global Africa Latin America	To share the experiences of and build bridges between people and organizations engaged in or supporting communication as a fundamental strategy for economic and social development and change	Three networks with different geographical scopes and over 75,000 members: Communication Initiative: Global; Red de La Iniciativa de Comunicacion: Latin America; and Soul Beat Africa. The global network includes the ICT4D (ICT for Development) site.	Searchable database of summarized information on programs, M&E, change theories, etc.; discussion forums; polls and surveys; development classifieds; Drumbeat E-magazine; blogging with active debate
<b>CORE Group</b> <a href="http://www.coregroup.org/">http://www.coregroup.org/</a>	Network of 48 NGOs	Child health  Global	To generate collaborative action and learning to improve and expand community-focused public health practices for underserved populations around the world.	Members work together in 8 technically focused Working Groups (including groups on HIV/AIDS and safe motherhood) to develop activities and products to strengthen health interventions; they hold meetings, manage a listserv, produce tools, and gather resources	Child health & development database, monthly e-newsletter, listservs; workshops and conferences; child survival community listserv for people working on child health and development;
<b>Development Gateway online resources portal</b> <a href="http://www.developmentgateway.org/">http://www.developmentgateway.org/</a>	Development Gateway Foundation; UNFPA manages Population and RH portal	International development  Global	To enable better aid management and coordination, leverage the Internet for online communications among development practitioners worldwide, and connect developing country organizations and empower them to use ICT to scale up local development efforts.	Zunia Knowledge Exchange groups, including online discussion forums, online events, email alerts and newsletters, links to information resources, feature articles, and reports on key issues,	AiDA online directory of development activities; worldwide tender and contract information in dgMarket; country listings of development resources; Country Gateway websites.

<b>GHI-net (Global Healthcare Information Network)</b> <a href="http://www.ghi-net.org/">http://www.ghi-net.org/</a>	INASP	Health  Global	To help others work more effectively together in the creation, exchange, and use of healthcare information.	Four email forums (see entries for HIFA2015 and HIF-net), including HR4D-net on health research and CHILD2015 on healthcare for infants and children. A fifth email forum on maternal and reproductive health care is planned.	Online resource about the availability and use of information by healthcare providers; advocacy for political and financial support of healthcare providers in developing countries
<b>HAIN Health Action Information Network (Philippines)</b> <a href="http://www.hain.org">www.hain.org</a>		Health  Philippines	To serve the research, information, and education needs of Philippine and international agencies working in health and development.	Works with community-based health programs, NGOs, development organizations and groups working with specific populations, media practitioners, academicians, government officials, and donor agencies.	Operates Resource Center; conducts training and educational activities, particularly on SRH and pharmaceuticals; publishes newsletters, books, and monographs; engages in research and advocacy.
<b>HDN Health &amp; Development Networks</b> <a href="http://www.hdnet.org">www.hdnet.org</a>		HIV/AIDS & TB  Global, Africa, Asia/Pacific, & National (including Partners Uganda)	To promote civil society involvement, multi-stakeholder partnerships, access to quality information, electronic networking, and accountability in decision-making for AIDS and other health- and development-related fields.	Moderates three electronic discussion forums for those responding to the HIV/AIDS pandemic: INTAIDS (policy and news worldwide); AF-AIDS (regional forum for Africa); SEA-AIDS (regional forum for Asia and the Pacific). Key Correspondents provide daily briefings and reports from international AIDS conferences.	News, publications, and country-specific National Partnership Platforms. The latter support knowledge sharing, dialogue, and advocacy at the country level with a National AIDS/TB e-forum and website, key correspondent team, and country-level advocacy.
<b>Healthlink Worldwide</b> <a href="http://www.healthlink.org.uk">http://www.healthlink.org.uk</a>		Health (HIV/AIDS, malaria, TB, disability)  Global	To empower people to voice their health needs and have those voices heard.	Works in partnership with local, national, and international organizations on communication, KM, networking, and learning; supports information needs assessments, learning networks, and the development of electronic communication tools (eforums, websites, CD-ROMs) and resource centers	Partner in Source International Information Support Centre, which provides access to a health and disability information resources; Health Exchange magazine

<p><b>HIFA2015 Healthcare Information for All by 2015</b> <a href="http://www.hifa2015.org/">http://www.hifa2015.org/</a></p>	<p>GHI-net</p>	<p>Health  Global</p>	<p>To ensure that by 2015, every person worldwide will have access to an informed healthcare provider</p>	<p>Two email discussion forums (HIFA2015 and CHILD2015). Network has over 2,200 members from 142 countries. Members are developing the HIFA2015 Knowledge Base, a web-based resource about information needs and ways to meet them.</p>	<p>Campaign promoting communication, understanding and advocacy among all stakeholders involved in the creation, exchange and use of healthcare information, including health workers, publishers, librarians, information technologists, researchers, and policymakers.</p>
<p><b>HIF-net</b> <a href="http://dgroups.org/Community.aspx?c=a4287629-aff1-40b6-a560-4e91e6f568bb">http://dgroups.org/Community.aspx?c=a4287629-aff1-40b6-a560-4e91e6f568bb</a></p>	<p>INASP Global Forum for Health Research</p>	<p>Global health</p>	<p>To improve access to reliable information for health researchers and healthcare providers in developing and emerging countries</p>	<p>Email discussion group about health information needs in resource-poor settings</p>	<p>Documents and links</p>
<p><b>HIPNET Health Information and Publications Network</b> <a href="http://www.infoforhealth.org/hipnet/index.shtml">http://www.infoforhealth.org/hipnet/index.shtml</a></p>	<p>USAID</p>	<p>Health information  Global</p>	<p>To promote access to technical health information and innovative information technologies; encourage cooperation among member organizations; eliminate duplication of materials; and promote the dissemination and use of each organization's materials.</p>	<p>Listserv for organizations working with USAID's Global Health Center which produce and disseminate print and electronic information in the field of international health.</p>	<p>Quarterly meetings, bi-annual conferences, online resource center, email forum, mailings of print materials to libraries.</p>
<p><b>IFHAN</b> The International Health Facility Assessment Network <a href="http://ihfan.org/">http://ihfan.org/</a></p>	<p>MEASURE Evaluation, USAID, WHO</p>	<p>Health  Global</p>	<p>To strengthen health facility-based data collection and use; and to provide technical leadership and coordination for health facility assessments (HFAs)</p>	<p>Listserv for health professionals at donor organizations, NGOs, and MOHs; sponsored 2009 Online Forum on use of technology in HFAs, surveys, and censuses</p>	<p>Strategic and technical meetings; country and regional capacity-building workshops; searchable metadata and survey catalogs</p>

<p><b>IICD</b> (International Institute for Communication and Development) <a href="http://www.iicd.org/">http://www.iicd.org/</a></p>	<p>Works with partners from the public, private, and non-profit sectors</p>	<p>ICT for development  Global &amp; National (including I-Network in Uganda)</p>	<p>To create practical and sustainable solutions using both modern and traditional media to connect people and enable them to benefit from ICT, thereby contributing to the MDGs and sustainable development.</p>	<p>Community of trainers working in IICD's Country Programs; global and national ICT for Development (ICT4D) networks (with meetings, newsletters, website, and online discussions); and local schools networks as part of Global Teenager project</p>	<p>iConnect Online website to share knowledge, experiences, lessons learned, and resources, on ICTs in development; iTrainOnline initiative for computer and Internet training; research; workshops; calendar of events.</p>
<p><b>Implementing Best Practices (IBP) Knowledge Gateway</b> <a href="http://www.ibpinitiative.org/knowledge_gateway.php">http://www.ibpinitiative.org/knowledge_gateway.php</a></p>	<p>Consortium of more than two dozen agencies representing donors, providers, and TA partners</p>	<p>Reproductive health  global</p>	<p>To close the knowledge-to-practice gap by supporting improved access to and the use of information to improve the introduction, adaptation, and scaling-up of best practices</p>	<p>Over 300 COPs with 10,000 members from 186 countries (as of May 2008). Each one has online discussions and its own library, discussion board, announcement board, and calendar</p>	<p>Searchable resource library; Global Discussion Forums; and COPs focused on different topics and geographical regions.</p>
<p><b>INASP</b> <b>International Network for the Availability of Scientific Publications</b> <a href="http://www.inasp.info">http://www.inasp.info</a></p>		<p>Dissemination of research  global</p>	<p>To support scholarly communication and networks with particular emphasis on the needs of developing and emerging countries.</p>	<p>Facilitates knowledge sharing within five stakeholder groups (researchers, editors, national publishers, librarians, and ICT professionals) via global and regional meetings, peer exchange visits, study visits, and online forums.</p>	<p>Free/discounted access to journals; training and support for writing articles, publishing journals, disseminating information, and managing bandwidth; national services that provide access to indigenous scholarship; database of organizations; many publications</p>
<p><b>IAPHL</b> <b>International Association of Public Health Logisticians</b> <a href="http://my.ibpinitiative.org/public/Default.aspx?c=ca7f45ec-3b4a-400f-a055-b19ed8771066">http://my.ibpinitiative.org/public/Default.aspx?c=ca7f45ec-3b4a-400f-a055-b19ed8771066</a></p>	<p>USAID / DELIVER Project</p>	<p>Health and logistics</p>	<p>To facilitate the exchange of knowledge sharing in supply chain management and commodity security, promote the use of local and regional expertise; and develop a COP allowing members to improve their professional skills and network.</p>	<p>Alumni of supply chain management courses conducted by DELIVER and FPLM are encouraged to join this community for supply chain management professionals.</p>	<p>Discussion forums on supply chain management topics, member profiles, announcements of upcoming events, and a library for supply chain management tools and documents</p>

<p><b>K4D</b>  <b>Knowledge for Development</b>  <a href="http://www.worldbank.org/wbi/knowledgefordevelopment">www.worldbank.org/wbi/knowledgefordevelopment</a></p>	<p>World Bank</p>	<p>Development  World Bank client countries</p>	<p>To enhance understanding of KM concepts, tools, and practices; build staff skills in KM tools and approaches; and enable development agencies and client governments to develop and implement successful KM initiatives</p>	<p>ICT Leadership Community for development professionals, policy makers, government officials, private sector executives, civil society leaders, academics, and media representatives.</p>	<p>Policy reports and advice on the knowledge economy; studies of global learning and experience on the knowledge economy; learning events; and ICT publications, including toolkit on electronic discussion forums</p>
<p><b>KM4Dev</b>  <b>Knowledge Management for Development</b>  <a href="http://www.km4dev.org">www.km4dev.org</a></p>	<p>Swiss Agency for Development and Cooperation, IDRC, Helvetas, Skat</p>	<p>International development  global</p>		<p>Email discussion list for international development practitioners interested in KM; also hosts face-to-face workshops</p>	<p>Wikis; repository of articles, papers, books, links, and other resources; <i>KM4D Journal</i>; working groups and projects</p>
<p><b>KM4PH</b>  <b>Knowledge Management for Public Health</b>  <a href="http://www.who.int/km4ph/en/">http://www.who.int/km4ph/en/</a></p>	<p>WHO, World Federation of Public Health Associations (WFPHA), International Association of National Public Health Institutes (IANPHI)</p>	<p>Public health  global</p>	<p>To bridge the know-do gap in global public health by strengthening public health workforce development through the effective creation, sharing, translation and application of public health knowledge to improve global health and to achieve the MDGs</p>	<p>Web-based discussion portal</p>	<p>Live online events (none held since 2007), public health news and event calendar</p>
<p><b>MobileActive.org Community</b>  <a href="http://mobileactive.org">http://mobileactive.org</a></p>		<p>Mobile phones for social impact  global</p>	<p>To expand access to knowledge about the use of mobile technology to make the world a better place; to accelerate NGO use of effective strategies and tactics for mobile use; and to build partnerships and facilitate access to technology and funding.</p>	<p>Email discussion group for grassroots activists, NGO staff, intermediary organizations, content and service providers, and organizations who fund mobile technology projects</p>	<p>Blog about innovative mobile uses; directory of mobile vendors, tools, and NGO projects; strategy and how-to guides, case studies; country database of mobile providers, subscribers, and costs; news feed; social bookmarks</p>

<p><b>MSH</b>  <b>Management Sciences for Health</b>  <a href="http://www.msh.org">www.msh.org</a></p>		<p>Global health  management</p>	<p>To save lives and improve the health of the world's poorest and most vulnerable people by closing the gap between knowledge and action in public health; to help managers and leaders in developing countries create stronger management systems that improve health services for the greatest health impact.</p>	<p>Global Exchange Network for Reproductive Health (GEN) holds virtual conferences to promote knowledge sharing among countries that have "graduated" from USAID population assistance.  LeaderNet is a virtual COP that offers online seminars, resources, and networking opportunities to improve health management</p>	<p>Resource center including tools and publications on effective management practices for health professionals; self-instructional e-learning tools and tutorials; learning programs that blend face-to-face and electronic methodologies; virtual seminars</p>
<p><b>PSP-One</b>  <a href="http://www.psp-one.com/">http://www.psp-one.com/</a></p>	<p>USAID</p>	<p>Reproductive health and family planning  global</p>	<p>To increase private sector provision of RH/FP products and services in developing countries by providing technical leadership in private sector strategies; synthesizing and disseminating proven strategies, research findings, and tools; and providing country-level support in development and scale-up of successful private sector approaches.</p>	<p>Two online forums: Network Exchange is for commercial and not-for-profit network operators, implementers, evaluators, USAID staff, and CAs. The Network for Africa lets private sector stakeholders exchange information, share technical resources, and build MOH capacity; it also hosts online chats with experts.</p>	<p>Searchable resource center; searchable database of health projects that work with the private commercial sector; online conferences and panel discussions; variety of publications including technical and research reports, tools, and primers for policymakers</p>
<p><b>ProCAARE</b>  <b>Program for the Collaboration Against AIDS and Related Epidemics</b>  <a href="http://www.procaare.org/">http://www.procaare.org/</a></p>	<p>AED-SATELLIFE, Harvard AIDS Institute, HDN</p>	<p>HIV/AIDS  Global</p>	<p>To provide a forum for dialogue among those who are engaged in addressing the critical issues of HIV/AIDS both in the developing and industrialized world</p>	<p>Actively moderated email and web-based discussion group for physicians, nurses, researchers, policy makers, program managers, and other health practitioners who address HIV/AIDS</p>	<p>Repository of information on NGO activities, projects, policy issues, education and training opportunities, and research findings</p>
<p><b>RHINO</b>  <b>Routine Health Information Network</b>  <a href="http://www.rhinonet.org">www.rhinonet.org</a></p>	<p>MEASURE Evaluation</p>	<p>Health information systems  global</p>	<p>To strengthen the role of evidence-based decision-making by promoting the effective collection and use of routine health information</p>	<p>Moderated email listserv for professionals interested in routine health information, data collection, management and use</p>	<p>Week-long moderated online forums; blog for members; annotated bibliography database of scientific and grey literature; resource center</p>

<p><b>SATELLIFE Center for Health Information and Technology</b> <a href="http://www.healthnet.org/">http://www.healthnet.org/</a></p>	<p>AED</p>	<p>Health information  global</p>	<p>To facilitate dialogue and disseminate relevant information on the urgent health topics. enables the exchange of information for decision-making through:</p>	<p>Locally owned and managed HealthNet knowledge networks in six countries provide low-cost email, computer literacy training, health data collection, and information resources; 11 electronic discussion groups (e.g., AFRO-NETS and ProCAARE); and an email discussion group for nurses and midwives</p>	<p>GetWeb tool that delivers web page content via email; open source tool (GATHER) for data collection, analysis, and reporting; four newsletters that digest relevant news from peer reviewed journals; and database of essential health links.</p>
<p><b>Web4Dev Web for Development</b> <a href="http://www.web4dev.org/">http://www.web4dev.org/</a></p>	<p>United Nations</p>	<p>Development</p>	<p>To apply Internet-related technologies towards the achievement of the MDGs and to maximize the effectiveness of web resources within the UN system</p>	<p>Online community with mailing list for practitioners and experts in web communication and information management</p>	<p>Hosts annual conferences to exchange best practices, with some portions disseminated via live webcasts</p>

- Geographically focused networks, such as the EurasiaHealth Knowledge Network and the Health Action Information Network (HAIN) in the Philippines, can be key partners in countries where K4Health works. They offer K4Health an easy way to reach out to and connect with health professionals. In addition, they offer a reservoir of local knowledge in two forms: first, they often operate resource centers that focus on local needs and collect local as well as global materials and, second, their members have lifetimes of experience with local health policies, programs, and service delivery. Some local knowledge networks are freestanding, while others function as the local branches of global networks like HDN and ICT4D. For example, Partners Uganda is an HDN affiliate that provides a virtual meeting place for organizations and people in Uganda concerned with HIV/AIDS to network and share knowledge.

Further investigation is recommended into local networks and branches of global networks that operate in K4Health priority countries.

- Networks whose members come from K4Health target audiences—i.e., health care managers and frontline providers—may offer lessons learned about the best ways to reach and share knowledge with these groups. However, most of the knowledge networks identified in Table 8 operate at a higher level: they target researchers, technical specialists, government officials, and the like. This suggests how difficult it may be to draw frontline workers into electronically based networks. The COPs hosted by the IBP Knowledge Gateway and Satellife’s discussion groups, including ProCAARE, may offer the best insights in this area.

Networks that operate entirely or primarily on a face-to-face basis, such as professional groups representing nurses and doctors, health taskforces, and local workgroups, may provide a better entrée into K4Health’s target audiences. In priority countries, K4Health should try to identify and collaborate with these local networks.

- Some networks, like the Development Gateway, offer K4Health an established platform for knowledge sharing. Based on discussions with HIPNET members, the IBP Knowledge Gateway may be the best option for K4Health because it is so familiar in the reproductive health and family planning community and already hosts dozens of COPs relevant to K4Health. It might be a good place for K4Health to house new COPs focused on specific knowledge bundles or specific priority countries.

When creating, operating, or participating in knowledge networks, K4Health should also keep the following three lessons learned from this review of relevant knowledge networks:

- Promoting the active participation of members and sustaining a network over time requires considerable effort by moderators and other facilitators. This is one of the main reasons why the level of activity of knowledge networks varies so widely. A

good example here is the role played by the Key Correspondent Teams working at HDN's global, regional, and national knowledge networks. They actively stimulate discussion and debate in e-forums by posting personal viewpoints, summaries of country strategies and policies, project descriptions, interviews, and daily briefings and reports from international AIDS conferences.

- Dividing a larger network into smaller communities with a narrower geographical or technical focus (such as the Communication Initiative's regional networks or the CORE Group's working group) is a proven and productive strategy. When people have more in common—in terms of interests, expertise, and even language—they are more likely to participate in a community and more likely to gain from the experience.
- Knowledge networks can attract more members and promote more effective knowledge sharing and information exchange by incorporating certain tools and activities. For example, an online survey of professionals attending a social marketing conference at the US Centers for Disease Control and Prevention (CDC) found that the three features that motivate respondents to visit a knowledge translation website regularly are: a listserv, searchable database, and the website's usability, accessibility, and applicability (IHP, 2009). Key elements for knowledge networks include: venues that promote discussion, such as listservs, online forums, and face to face meetings; searchable repositories of information resources; databases of relevant organizations, projects, and services; regularly updated listings of events, job opportunities, and funding opportunities; and platforms that enable members to contribute to the development of a shared knowledge base.

## ***B. Key Findings from HIPNET Interviews***

Telephone interviews were conducted with staff at 17 organizations that participated in HIPNET meetings over the past year and responded positively to a request for an interview. In most cases, interviews were conducted with a single person working at the organization, but sometimes two or three people with different job responsibilities participated. (See Appendix A for a list of those organizations that participated in the interviews and Appendix B for the questionnaire.) Given the opportunistic nature of the sample, one cannot generalize too much from these interviews. Nevertheless, the responses, taken as a group, do shed light on K4Health's planned activities.

### **Audiences**

- Some organizations distinguish between internal and external audiences because considerable energy is devoted to internal knowledge management activities.
- Respondents at several organizations view USAID and other CAs as primary audiences, in some cases taking precedence over audiences located in the developing countries that are the ultimate focus of their projects.

- Knowledge sharing activities at most of the organizations do not extend as far as frontline providers and managers. Instead they are directed to relatively high-level policy makers, government officials, program managers, and technical specialists, as well as USAID missions and country offices—all of whom are located in large cities with relatively good communications infrastructure. The organizations rely on these intermediaries to move information “the last mile” to frontline staff via local trainings and workshops. Some respondents expressed concern about whether and to what extent this was really happening.
- Some organizations, such as the Extending Service Delivery (ESD) Project and Family Health International (FHI), do produce and disseminate materials directly to frontline audiences. They are more cognizant of the challenges of developing locally relevant information for less educated audiences.

## Products

The organizations produce a wide variety of information products, most of which fall into the following categories:

- Scientific and technical information, such as data analyses, technical and research reports, program and system assessments, software models, journal articles, and conference presentations;
- Stories and case studies that describe successes, best practices, and lessons learned from field experience;
- Practical tools for service delivery and support systems, including manuals, guidelines, protocols, handbooks, job aids, and client materials;
- Training curricula, courses and materials; and
- Advocacy and promotional materials.

## Needs assessments

- Many of the organizations have **not** conducted a systematic information needs assessment of the audience, or they have done so belatedly, sketchily, or for some products but not others. Lack of time and money pose obstacles.
- In the absence of formal needs assessments, organizations rely heavily on observations made during field visits and informal assessments by staff at missions and field offices to design their products and activities. In fact, some respondents view their role as responding to requests made by field offices, USAID missions, and in-country partners. When collaborating with local counterparts, the assumption is that they know local audiences well enough to tailor products appropriately. On occasion, however, work may be undertaken without any serious discussion of what is needed.

- Many respondents report looking at informal feedback to make improvements and mid-course corrections. In hindsight, for example, one Senior Manager believes that the initial design of a Global Resource Center was a little too top-down and could have benefitted from more input from the primary target group. However, the organization used feedback from users to modify the site, for example, changing the navigation and taxonomy to make it easier to locate desired resources.
- Some organizations, notably the Association of Reproductive Health Professionals (ARHP) and FHI, do conduct thorough assessments beforehand and evaluations afterwards to assess the needs of the audience, typically using surveys. FHI has collected data that is immediately relevant to the audiences of interest to K4Health and should be pursued.
- Some organizations, such as Futures and MSH, do not have the mandate or opportunity to plan and produce information products. Their role is to disseminate whatever is produced by various projects.

## **Knowledge sharing tools and technologies**

### ***Print publications***

Organizations have been steadily shifting away from print to save money on production and transportation costs. However, respondents recognized that a strong preference remains for hard copies in developing countries, where electronic delivery is more likely to be aspirational than real—especially for health care providers. Print also offers the advantages of durability and greater visibility with busy audiences. Hard copies have a long life, during which they may be passed around and photocopied repeatedly. Typically organizations compromise by (1) centrally printing and/or distributing hard copies only in response to a special need or request, or (2) delegating responsibility for printing hard copies, as needed, to their field offices.

### ***CD-ROMs***

Everyone recognizes the benefits of CD-ROMs: they provide an inexpensive way to distribute large files or groups of files that might be difficult to download with slow connections in developing countries. For example, MEASURE DHS is contemplating putting its Statcompiler tool on a standalone DVD because bandwidth issues make it hard to use online in developing countries. CD-ROMs are more popular in Latin America than Africa, and it is important to do a software needs assessment beforehand to make sure that users can open them.

The interviews revealed some disagreement on the importance of CD-ROMs. Many organizations have scaled back dramatically on CD-ROMs and shifted distribution entirely to their websites as bandwidth has increased in the countries where they work. CD-ROMs are only produced in special circumstance or for remote locations; for example, IntraHealth produced a CD of selected resources from the Global Resource Center for southern Sudan. In contrast, other organizations, such as FHI and JSI, continue

to routinely produce CD-ROMs containing whole libraries of their publications or bulky distance learning courses. FHI also licenses its publications for inclusion on CD-ROMs produced by Teaching Aids at Low Cost (TALC), eGranary, and other organizations, for a big multiplier effect.

### ***Email***

Many organizations rely primarily on email, including listservs and newsletters, to communicate with staff and update outsiders about activities and publications. Email has proven to be an effective way to reach people, even in low bandwidth environments and over many time zones. At MSH, for example, field staff will email librarians at headquarters with search requests to avoid logging on to the organization's Intranet. Staff surveys at ARHP and EngenderHealth, however, have found that people feel overwhelmed by the volume of email, prompting those organizations to look for alternative ways to communicate. At CARE, many staff members delete internal emails as they arrive and rely instead on the archived postings at CARE's Google Group.

In addition to sending updates to their own lists of subscribers, all of the organizations routinely post announcements on dozens of outside email listservs, choosing them for their relevance to a specific product or activity. Several respondents mentioned the importance of targeting email announcements to subscribers' interests in order to reduce the barrage of unwanted information. Fewer of the organizations manage email-based discussion forums, which require considerable staff time to organize and operate. However, they frequently participate, either by supplying content experts or by joining the audience.

### ***Web-based services***

Most organizations use the web as their primary channel to disseminate materials, despite continuing connectivity issues in parts of the developing world. In addition to posting materials on their own websites, organizations place them (or links to them) at other portals and websites, such as the USAID Development Experience Clearinghouse (DEC) and the IBP Knowledge Gateway. Users typically download materials as PDF files, although evidence shows that Word files are easier to adapt and translate. Knowledge sharing and learning activities, including training courses, presentations, conferences, and seminars, are also beginning to migrate to the web. Hence it is not surprising that driving traffic to the organization's website seems to be a preoccupation for many of those interviewed. Getting the word out to staff is also important: SCMS has launched an effort to train its own field staff on the tools available on the organization's Intranet and Internet sites, so that they can take full advantage of the resources available.

Organizations attach a lot of importance to their websites, and several respondents reported recent or upcoming redesigns. Goals include making the website competitive in features and looks, making it user friendly and easier to navigate, increasing the amount of information available, strengthening search functions, adding features that permit user-generated content, and making it more interactive. To deal with bandwidth issues, organizations may try to minimize the size of downloadable files, develop low bandwidth e-learning platforms, or limit pictures and video.

### ***Communities of practice***

A few of the organizations operate external COPs. Many more participate in COPs run by other organizations or support internal COPs limited to their own staff and partners. The latter are usually called workgroups and often operate in shared Intranet spaces. Experience with these workgroups has been very positive. They are extremely flexible: they can be formed around a project, theme, or region; they may last for as long—or as short a time—as they are useful; their activity levels can wax and wane with a project; and they need not be moderated.

The activity level and sustainability of both the internal and external COPs run by these organizations varies widely, sometimes to the deep frustration of the individuals in charge. Respondents noted that energetic leadership, outside facilitation, user friendly platforms, and periodic face-to-face meetings may contribute to the success of COPs. Choosing an appropriate technological platform is also important. For example, the Hygiene Improvement Project (HIP) has found that COPs for local NGOs in Ethiopia operate best as face-to-face meetings, with email and resources posted on the web playing a supplemental role.

### ***Mobile devices***

There was a general consensus that cell phones and texting, because of their ubiquity in the developing world, offer great potential for knowledge sharing. So far, however, only a few organizations have engaged with mobile devices and then only for various kinds of data collection and reporting. While intrigued by the possibilities, none of the organizations has figured out how to put these technologies to use in other ways. MEASURE Evaluation has reformatted its website to be cell phone-friendly, and informal feedback indicates that people do access the site using handhelds. IntraHealth is looking at ways to use RSS feeds, alerts, and messages to make its HRH Global Resource Center “mobile.” However, skeptics point out the difficulty of boiling down messages into short texts, the lack of wireless Internet networks in developing countries, and limited ownership of more sophisticated and hence more capable devices.

### ***Face-to-face interaction***

There was unanimous agreement on the continuing importance of face-to-face interaction, although getting people together can be expensive and inefficient. Everyone agrees that there is no electronic substitute for relationship building and debate. Most of the training workshops and meetings conducted in developing countries remain face to face. However, combining electronic and face-to-face interaction has some potential, for example, following up live training with email discussion forums. In certain circumstances, the crowds drawn to live events have outnumbered the people who later view a recording of the same event online.

### ***Videoconferencing and web-conferencing***

Videoconferencing is largely limited to communicating between offices because of the hardware needed. However, many of the organizations have embraced web-conferencing packages such as Elluminate and Adobe Connect. These are widely used for connecting with field offices, staff and workgroup meetings, conducting remote training, and

webinars. Web conferencing does, however, require technical support to train users and deal with technical glitches. Bandwidth can also be a limiting factor.

### ***VoIP***

Many organizations have turned to Skype as a cheaper alternative to regular phone lines for conference calls.

### ***Video***

Several respondents view the advent of easy and affordable video technologies as an opportunity for knowledge sharing given the power of images, but they have not yet figured out how to fully exploit them. For example, the Flip Cam (<http://www.theflip.com/products.shtml>), a video camera about the size of a cell phone priced at about \$150, allows users to easily capture, upload, edit, and share brief videos. Potentially it could be used in the field to conduct brief interviews, document activities, or post updates (Pringle, 2009). The Futures Group has begun videotaping presentations and interviews with staff visiting from overseas in order to make them more widely available; it also hopes to incorporate a video component in a new e-learning module. One interested staff member has also begun filming scenes and interviews during trips to the field. FHI is increasingly using low-tech videos to tell stories and has distributed cameras to field offices.

### ***Web 2.0 tools***

Opinions regarding the usefulness of Web 2.0 tools are sharply divided, reflecting a generational difference in personal experience and comfort with emerging tools. Skeptics dismiss them as time-consuming and trendy dead-ends that do not make a clear contribution to the work at hand. Proponents argue that they are the preferred way for a younger generation of professionals at home and overseas to communicate and that organizations will eventually be forced to follow. While some organizations expressed enthusiasm and are actively pursuing at least some of these tools, other respondents say they lack the time, expertise, and interest to move forward with them. The Intelink online platform recently introduced at USAID is moving in this direction, since it supports a host of new tools, including blogging, wikis, and tag clouds; however, it is only accessible to government employees and is not yet used by the Bureau of Global Health.

Few organizations have much experience with these tools (FHI's organizational policy blocked YouTube and Facebook until recently). Therefore, the discussion was largely theoretical. However, there were clear differences in the perceptions of different tools:

- Wikis are viewed positively. Some organizations have Wikipedia pages; FHI has signed a contract to contribute to a new medical wiki called Medpedia; and CARE, FHI, and IntraHealth have used wikis as password-protected collaborative worksites that allow remote partners to contribute to joint projects.
- Several organizations have considered blogs, but most have rejected them because they worry that blogging is too time-consuming, reaches small audiences, is too casual to be appropriate for an official website, and, most importantly, may

- include content that is not evidence-based or complete. Loss of control over content is a deep worry.
- While organizations may display social bookmarking icons on their web pages, none of the respondents had anything to report about this tool.
  - YouTube is viewed as a cost-effective way to post videos, although organizations tended to use the site on an ad hoc basis. For example, the Institute for Reproductive Health (IRH) has posted a video from Haiti showing the Red Hot Chile Peppers demonstrating how to use cycle beads.
  - IntraHealth has successfully experimented with an internal microblog to keep staff connected, and a few respondents expressed a theoretical interest in Twitter.

By far the most interest was expressed in social networking sites like Facebook. (Although Second Life was also mentioned, bandwidth demands make it impractical for developing country applications. Judging by these conversations, Facebook seems to be the default social networking option for CAs.) Even skeptics admitted that young people in developing countries, including their own staff members, are increasingly spending time on Facebook. However, they criticized health and development organizations for launching Facebook pages without a strategy to draw an audience or get any benefit from the site. They wonder whether people really get work done via social networking, whether social networking sites attract serious-minded people, and how possible it is to control content.

While an internal Facebook page for MEASURE Evaluation staff proved time-consuming and unproductive, ARHP has had a successful experience with the site. Its Facebook page has proven to be a very productive way to share information: many people view the page, which is used to post upcoming CME activities and new materials, share articles, and advertise webinars. ARHP staff members also use their personal Facebook accounts to start relevant conversations with peers and colleagues. According to ARHP, the biggest benefit of using Facebook is that it pushes information out to people logging onto the site, as opposed to a website passively waiting for people to visit. It must be remembered, however, that ARHP's membership and audience consist almost entirely of US-based reproductive health providers.

MEASURE DHS is in the midst of launching a Facebook page which it hopes will substitute for email alerts, provide a more interactive way to stay in touch with people, drive people to the DHS website, and collect the kind of in-country success stories that elude formal surveys. It also fits with the project's goal of reaching new and different audiences for DHS data. MEASURE DHS is compiling a list of Facebook members who would be a good match for the page, such as ex-employees who now work at other organizations, and hopes to go live with a critical mass of people already on board.

Another way to look at commercial social networking sites is not as a platform, but rather as an inspiration and role model for an organization's own knowledge networks. The Director of Knowledge Exchange at MSH points out elements of Facebook that could and should be incorporated into any successful knowledge network, such as being able to

see community members and profiles, leveraging connections into face-to-face meetings, and sharing video and audio files.

## Judging success

Most respondents feel this is a weak area. All of the organizations collect and analyze basic statistics on web traffic, downloads and publication requests, training registrations, and newsletter and listserv subscriptions. While newer analytical tools can provide more detail, this approach does not allow organizations to truly understand who is using their products and how. Thus there is heavy reliance on anecdotal feedback; many respondents expressed faith that their field offices have a good idea about which of their products are being used and how. Other respondents mentioned efforts to systematically collect what they hope will be success stories.

Some organizations have conducted limited surveys, usually online, of people who visit their site, request a publication, or sign up for a newsletter. For example, EngenderHealth randomly selects some people downloading tools and asks who they are and what they expect from the tool; a follow-up questionnaire six months later asks about their actual use of the tool. MSH has surveyed its own staff for internal KM efforts. Other surveys focus on a specific tool; for example, IYCN surveyed recipients of a CD-ROM in Madagascar on how they were using it, lessons learned, and success stories. However, one respondent does not think formal surveys are all that useful because they receive too few responses and only from those who loved the product in question, yielding biased results.

FHI and ARHP stand apart from the other organizations in their focus on formal evaluations of their products. For FHI, this means establishing impact indicators, training people to capture impact stories, dedicating staff to assessing impact, conducting special analyses, and even conducting formal research trials on product uptake. For ARHP, it means following formal CME accreditation guidelines, asking process questions in CME post-tests, surveying people who request publications as well as organization members, and tracking complaints.

The results of the phone interviews are especially interesting given HIPNET's contribution to the development of M&E indicators to judge the success of information products and services. Over several years members of HIPNET with an interest in M&E discussed and exchanged ideas on how best to monitor and evaluate information initiatives. Their collaborative efforts culminated in the production of a *Guide to Monitoring and Evaluating Health Information Products and Services* for use by program staff, M&E teams, and information professionals working in international health (Sullivan et al., 2007). The Guide defines 29 indicators that can measure how information products and services contribute to improving health programs. The indicators are designed to assess a product's reach, usefulness, and use, as well as collaboration and capacity building. Judging by the phone interviews, however, the guide has not been uniformly embraced and applied by all of HIPNET's member organizations.

## Promising new tools and technologies

There was little agreement among respondents as to which new technologies and tools hold the most promise for disseminating health information. Some of those with the greatest experience emphasized that the real key is using a combination of all channels available, especially the tried and true, rather than looking for some new magic bullet. Among the promising tools mentioned were video, texting on cell phones, webinars, listservs, interactive websites, videoconferencing, social networking sites, and COPs.

## Other lessons learned

- Respondents at IYCN and ARHP both emphasized the need for evaluation. One is concerned about collecting lessons learned and making improvements, while the other notes the importance of measuring impact in terms of behavior change.
- A staff member from FHI believes that libraries and information officers are underappreciated. While organizations send them materials, they do not truly target them. However, information officers possess essential communication skills and are paid to do this work. She suggests reaching out to them to propel the dissemination and use of information products.
- A staff member at AIM is concerned by continued silo thinking and a lack of appreciation for knowledge management at the Bureau for Global Health. Efforts are needed to get people to move beyond their immediate firefighting needs and think in terms of larger knowledge sharing systems.
- A staff member at the Hygiene Improvement Project (HIP) cautions against getting too excited at the country level about new ICTs because the connectivity is not yet there.
- A staff member at the Futures Goup believes that USAID's lack of explicit support for basic KM activities, such as maintaining a website, poses a problem. Without a specific mandate and funding, it is unrealistic for USAID to expect CAs to accomplish KM goals.

## Knowledge networks

**Global networks.** The organizations and their staff participate in a host of different global knowledge networks, including listservs and COPs. For example, the staff at FHI monitors 70 listservs in order to keep up with the flow of information. However, there is a preference for networks that focus more narrowly on a specific technical area, such as HIV/AIDS or the supply chain, because they are more likely to offer information directly relevant to one's work. Hence many different networks were mentioned, but few by more than one person. IBP, Core Group, and HIPNET were exceptions: they were each mentioned by several different respondents. Generally, people tend to rely on a few trusted websites and listservs, often recommended by others.

**Local networks.** Staff at field offices promote knowledge sharing at the local level by joining taskforces, working groups, committees, and professional groups that are active at

the regional, national, or local level. They also attend relevant meetings and conferences and collaborate with local organizations. For example, the Extending Service Delivery (ESD) project has established a relationship with the Medical Women's Association of Tanzania so that its members can help promote the healthy timing and spacing of pregnancies and recruit other local supporters for ESD's approach. Local networking relies almost exclusively on face-to-face communication.

## **Working with K4Health**

- Most organizations have materials that would be appropriate for K4Health's knowledge bundles and are happy to contribute in this way. Some respondents also said they could help K4Health by testing its tools in the field and getting feedback. A respondent at the Futures Group expressed a desire to review K4Health materials to make sure the knowledge bundles do not gloss over local policy issues. A few organizations have such different audiences than K4Health that there seems to be little room for collaboration.
- Many organizations thought K4Health could benefit them by taking on the burden of local adaptation of materials, by strengthening the field testing of materials, and/or by helping them disseminate their products. They also hoped K4Health could help reduce overlap and duplication in CAs' products.
- One respondent felt it would be useful for K4Health to produce reviews of new ICTs and best practices that would identify which strategies are worth pursuing. Another hoped that K4Health could make HIPNET more engaging.
- All of the respondents want to see this report.

### ***C. Knowledge management initiatives at USAID***

Table 9 presents a variety of knowledge management (KM) activities undertaken by USAID itself, internally, and by USAID-funded projects. Not all of these activities are focused on health; microenterprise, natural resources management, and poverty reduction are some of the other technical areas represented in the table. Taken together, however, they reflect the wide array of KM approaches that USAID is experimenting with.

USAID is promoting a positive environment for interactive communication and collaboration within the agency by moving to the Intelink platform for its Intranet and by promoting use of its ALLNET extranet with partners. A KM reference group meets weekly to address KM needs at the agency and look to the future. The Global Development Commons is actively seeking technological innovations in knowledge sharing and communication for development, for example, using open-source 3D mapping systems to inform decision-making around African trade corridors and disaster response in Bangladesh.

The agency also backs more conventional knowledge management approaches. It is facilitating access to the information and knowledge compiled as part of USAID-funded projects by hosting standalone knowledge repositories (e.g., ACQUIRE and the Development Experience Clearinghouse) and encouraging resource centers and databases as part of project sites (e.g., AIDSTAR One's G3PS database on Good and Promising Programmatic Practices for HIV/AIDS). It sponsors e-learning platforms (e.g., the Global Health eLearning Center and the web-based learning management system at the Development Research Management Portal). Projects also routinely use e-newsletters, communities of practice, and blogging to stimulate discussion.

Several of these projects are of special interest for K4Health. Like the HIPNET member organizations discussed above, AIDSTAR-One ([www.aidstar-one.com](http://www.aidstar-one.com)) has a significant overlap with K4Health both in terms of technical content and a focus on disseminating reliable information and good practices. This creates opportunities for collaboration—and also raises the specter of potential duplication of effort. K4Health should consider accessing AIDSTAR-One's expertise and its G3PS database in the creation and review of knowledge bundles on integrated family planning and HIV/AIDS services. Many of AIDSTAR's focus areas are of direct relevance to integrated services, including prevention, counseling and testing, treatment, and PMTCT.

The microLinks project, which promotes knowledge sharing around USAID's microenterprise programs, stands out as an example of an integrated and comprehensive approach to knowledge networks. It draws on a remarkably varied range of tools and approaches to promote knowledge sharing around microenterprise development.

MicroLinks' activities include:

- Hosting online discussions with experts,
- Collecting and disseminating experiences and lessons learned from the field,
- Publishing a biweekly news source,
- Operating a hotline that allows mission staff and practitioners to get advice from microenterprise specialists,
- Organizing Communities of Practice,
- Recording and posting audio interviews with practitioners and experts,
- Maintaining an extensive Resources Portal,
- Hosting a RSS research feed, and
- Providing a wide range of training resources, including distance learning courses, online courses, and training curricula and materials.

The FRAME network of natural resource management practitioners is notable for its efforts to provide a home on the web for organizations and individuals active in that field. It provides a platform and information technology support for NGOs and local and international projects so that they can have their own web page promoting their work. FRAME also provides a personal space for members to store and share files, collect resources, blog, and manage personal content and preferences.

**Table 9. Knowledge Management Initiatives at USAID**

Project	Purpose	KM Activities
<b>ACQUIRE Project Digital Archive</b> <a href="http://www.acquireproject.org/archive/html/index.html">http://www.acquireproject.org/archive/html/index.html</a>	To increase the use of RH/FP services, with a focus on facility-based services and clinical contraception, especially LAPMs.	This searchable knowledge resource contain a wide range of resources that were developed over the life of the ACQUIRE project, at both the global and the country levels, and is organized over eight thematic areas.
<b>AIDSTAR-One</b> (AIDS Support and Technical Assistance Resources, Sector I, Task Order 1) <a href="http://www.aidstar-one.com">www.aidstar-one.com</a>	To provide technical assistance to the Office of HIV/AIDS and USG country teams in PEPFAR non-focus countries in KM, technical leadership, program sustainability, strategic planning, and program implementation support. To make new and emerging information on HIV/AIDS more available to program planners and managers, summarized for busy people, and highlighting those aspects that support the development and implementation of strong and effective programs.	A resources section on the website includes links to primary sources of HIV epidemiologic and other service data. The project is identifying Internet-enabled learning vehicles that encompass training, education, just-in-time information and communication; vehicles being explored are discussion forums, web-based learning, computer-based learning, virtual classrooms, chat-rooms and illumination sessions. A searchable database on Good & Promising Programmatic Practices (G3Ps) will document and disseminate successful innovative approaches and sustainable models; evidence-based best practices and lessons learned; and new approaches, tools and methodologies in HIV/AIDS programming. Technical Briefs synthesize state-of-the-art information and research.
<b>ALLNET</b> <a href="http://www.usaidallnet.gov">www.usaidallnet.gov</a>	This USAID extranet provides a shared environment where USAID staff, their partners, and others engaged in international development partners can interact, share critical data, and work together seamlessly.	ALLNET houses a diverse collection of communities developed to support USAID online collaboration and to facilitate interactive communication and cooperation among agency employees, contractors, and partners. They include: <ul style="list-style-type: none"> <li>• Interact --a prototype community being developed to support USAID online collaboration and to facilitate interactive communication and cooperation among Agency employees, contractors, and partners, and</li> <li>• The USAID Knowledge Management Reference group, which is composed of people from across the Agency who are involved in KM.</li> </ul>
<b>Bridge - Bringing Information to Decisionmakers for Global Effectiveness (BRIDGE)</b> <a href="http://www.prb.org/About/InternationalPrograms/Projects-Programs/Bridge.aspx">http://www.prb.org/About/InternationalPrograms/Projects-Programs/Bridge.aspx</a>	To improve the policy environment on key population and health issues in developing countries by providing influential audiences with up-to-date information and the skills to interpret and use it for improving health policies and practices.	Bridge publishes policy-relevant publications for developing country audiences, sponsors the <b>Interagency Gender Working Group (IGWG)</b> , holds technical updates that bring professionals together to discuss interventions for gender issues, establishes networks of journalists, conducts seminars and webcasts for journalists, shares news and opinions in the PRB Blog, and hosts live discussions with experts at PRB Discuss Online

<p><b>CK2C (Capitalizing Knowledge, Connecting Communities Program)</b>  <a href="http://www.dai.com/work/project_detail.php?pid=201">http://www.dai.com/work/project_detail.php?pid=201</a></p>	<p>To strengthen knowledge sharing and learning in natural resources management</p>	<p>CK2C conducts stocktaking exercises to identify where and why investments in NRM have had a strong, positive impact; manages the FRAME website (see separate entry below) to facilitate knowledge sharing; trains USAID mission and home office staff on the fundamentals of sound NRM; and uses a wiki (<a href="http://ck2c.wikispaces.com/">http://ck2c.wikispaces.com/</a>) to create a manual supporting communities of practice</p>
<p><b>Development Experience Clearinghouse (DEC)</b>  <a href="http://www.dec.usaid.gov">www.dec.usaid.gov</a></p>	<p>To increase access to USAID-funded technical and program documentation</p>	<p>This repository holds over 63,000 documents. Users can search the Development Experience System (DEXS), USAID's online database of agency-funded technical and program-related documents; download documents in PDF format for free; and sign up for a email announcements of recently acquired documents.</p>
<p><b>Development Research Management Portal</b>  <a href="http://rportal.net/">http://rportal.net/</a></p>	<p>To provide a group space for collaborative work equipped with group workflow tools.</p>	<p>The portal houses a library of webpages, documents, spreadsheets, images, flash videos, audio files, events, and news. It provides members with a virtual personal office space where they can upload and/or publish materials. And it provides a web-based learning management system to deliver online courses and manage virtual learning communities.</p>
<p><b>Fistula Care Project</b>  <a href="http://www.fistulacare.org">www.fistulacare.org</a>.</p>	<p>To address the enormous backlog of women awaiting fistula repair.</p>	<p>The website shares program insights and technical expertise. It offers a wide variety of resources and tools, including training guides and curricula, communications and social mobilization materials, journal articles and presentations, technical updates and program reports, country-specific updates on current activities, stories of women whose lives have been transformed by fistula repair, and detailed and regularly updated information about the project's on-the-ground, country-specific activities</p>
<p><b>FRAME</b>  <a href="http://www.frameweb.org/">http://www.frameweb.org/</a></p>	<p>To facilitate knowledge transfer and relationship building among Natural Resource Management (NRM) practitioners.</p>	<p>FRAME provides a platform and information technology support for NGOs or local and international projects so that they can have a home on the Web. It sponsors a series of Communities of Practice for NRM practitioners. Its library has expanded to include the Resource Management Portal (see separate entry). It provides up to the minute news on world events related to NRM, an electronic newsletter, and a personal space for members to store and share files, collect resources, blog, and manage personal content and preferences.</p>

<p><b>Global Development Commons</b>  <a href="http://www.usaid.gov/about_usaid/gdc/">http://www.usaid.gov/about_usaid/gdc/</a></p>	<p>To seek innovations that enable people around the world to gather data, share knowledge, forge partnerships, and make better decisions</p>	<p>The Commons shares information; builds communities around tools that help disseminate and interpret information; taps innovation through competitive challenges designed to bring the best new technology into development work; identifies technology solutions through pilots that improve access to market information, health resources, and education services; and partners with other development actors to take successes to scale. It has created a site (<a href="http://www.GlobalDevelopmentCommons.net">www.GlobalDevelopmentCommons.net</a>) that profiles and promotes successful applications of technology to international development efforts, used open source 3D mapping systems to inform decision-making around the African trade corridors and disaster response in Bangladesh, integrating advanced Google search tools into USAID.</p>
<p><b>HPI Youth Policy Initiative</b>  <a href="http://www.youth-policy.com">http://www.youth-policy.com</a></p>	<p>To improve youth reproductive health (YRH) and HIV/AIDS policy worldwide.</p>	<p>This site features a searchable database containing 126 full-text policies addressing YRH from 46 countries.</p>
<p><b>Hygiene Improvement Project (HIP)</b>  <a href="http://www.hip.watsan.net/">http://www.hip.watsan.net/</a></p>	<p>To reduce diarrheal disease and improve child health by promoting three key hygiene practices: safe feces disposal, hand washing with soap and safe storage and treatment of water at point-of-use.</p>	<p>HIP includes a repository of resources for hygiene improvement, including tools, guidelines, good practices, presentations, and research results; holds electronic conferences to discuss and debate critical issues; and fosters COPs where appropriate.</p>
<p><b>Interagency Youth Working Group (IYWG)</b>  <a href="http://www.inforhealth.org/youthwg/">http://www.inforhealth.org/youthwg/</a></p>	<p>To provide global technical leadership to advance the reproductive health and HIV/AIDS outcomes of young people ages 10-24 in developing countries</p>	<p>IYWG conducts meetings, manages a searchable resource database, and issues publications.</p>
<p><b>KM Reference Group</b></p>	<p>Sponsored by M/CIO, the USAID KM Reference Group is composed of people from across USAID who are involved with the Agency's many knowledge management efforts. It tries to help USAID address its current and future KM needs.</p>	<p>The group meets every week. There's much discussion about linking to the State Department's Diplopedia or creating a parallel wiki for USAID called Developedia. The State Dept. also has lots of internal communities of practice and there is interest in doing that at USAID as well. The KM Collaborative Space (<a href="http://communities.usaidallnet.gov/km/">http://communities.usaidallnet.gov/km/</a>) provides a secure environment for the group to share information, coordinate KM efforts, and engage in technical discussions.</p>

<p><b>microLINKS</b> (Microenterprise learning information and knowledge sharing) <a href="http://www.microlinks.org/ev_en.php?ID=1_201&amp;ID2=DO_ROOT">http://www.microlinks.org/ev_en.php?ID=1_201&amp;ID2=DO_ROOT</a></p>	<p>To improve the impact of USAID microenterprise programs and activities and provide access to the latest information on microenterprise, including best practices and proven approaches</p>	<p>KM activities include the Speaker's Corner (online discussions with subject matter experts and practitioners), Notes from the Field (brief stories relating an experience or lesson learned while in the field), microLINKS Connections (bi-weekly news source), Specialist Hotline (enabling USAID mission staff and microenterprise practitioners to get timely, accurate, and thoughtful responses to technical questions), Communities of Practice (CoPs), microLINKS Conversations (online audio interview series with practitioners and experts), News and Announcements, a Resources Portal (over 4,000 documents, presentations, and other resources related to microenterprise development), microLINKS RSS research feed, and training resources (distance learning courses, online courses, training curricula and materials).</p>
<p><b>POVERTYFrontiers</b> <a href="http://www.povertyfrontiers.org">www.povertyfrontiers.org</a></p>	<p>To promote knowledge sharing among those involved in poverty reduction, asset-based approaches to development, and poverty-related issues</p>	<p>News and announcements, event listings, topic pages on issues in poverty reduction topic pages (with links to documents, web resources, and events), searchable repository of publications, and recorded conversations on poverty with leading researchers and experts</p>
<p><b>STOP AI</b> (Stamping Out Pandemic and Avian Influenza)</p>	<p>To limit the impact of avian influenza and to minimize its potential to spread globally.</p>	<p>STOP AI facilitates the global availability of technical experts by developing a roster of regional and international experts capable of deploying to developing countries in advisory and response roles when needed. It offers technical assistance and developing training courses to increase use of internationally accepted practices for animal and human disease control. And it provides logistical support to US and international teams responding to outbreaks.</p>
<p><b>USAID Knowledge Services Center (KSC)</b> <a href="http://library.info.usaid.gov/">http://library.info.usaid.gov/</a></p>	<p>To serve the information needs of USAID staff and support the Agency's development efforts.</p>	<p>This library is a comprehensive hub for library, research, and knowledge management activities within USAID. Selected resources are now available on the web as well as in the library.</p>
<p><b>USAID Global Health eLearning Center</b> <a href="http://www.globalhealthlearning.org/">http://www.globalhealthlearning.org/</a></p>	<p>To meet the need of USAID field staff for access to technical public health information</p>	<p>The Center currently offers a menu of 28 courses (48 are envisioned) that allow learners to expand their knowledge in key public health areas and to access up-to-date technical information. They combine technical content with program principles, best practices, and case studies. They are intended to provide concrete examples and to stimulate thinking about how to solve problems in the field.</p>

## VI. IMPLICATIONS AND RECOMMENDATIONS FOR K4Health

### ***A. Selecting appropriate technologies and tools***

The number of potential communication channels is growing fast with the advent of new technologies involving computers, the Internet, and mobile devices. This makes it more challenging to select the communication technologies and tools that will be the most effective for disseminating information to and sharing knowledge with a specific audience. Key factors include a technology's reach, costs, human capacity requirements, and ease of use.

“Old” technologies, such as print, radio, and face-to-face meetings, may not be as exciting as electronic forms of communication, but they have far greater reach and sustainability in many settings, including the rural areas where most service delivery takes place. Lessons for K4Health include:

- *Do not get overexcited by the prospect of new electronic technologies*; all too often sufficient connectivity does not yet exist at the country level. Slow and unreliable Internet connections may not permit more than email.
- *Do not migrate too quickly from email and CD-ROMs to total reliance on the web*, or elements of the audience may be left behind because of access issues.
- *Support the dissemination of hard copies* by supplying whatever computer files and materials are needed to expedite printing in-country.
- *Consider CD-ROMs for distributing bulky collections of materials*, such as complete K4Health knowledge bundles, or interactive training programs.

“New” technologies can be extremely cost-effective, for example, posting a PDF file online instead of paying to ship thousands of hard copies long distances. They also can have greater reach than old technologies. Lessons for K4Health include:

- *Anticipate and address bandwidth issues*. Solutions include designing computer-based and wireless platforms with low bandwidth options and minimizing the size of downloadable files.
- *Take advantage of both asynchronous and real-time electronic communication channels*. The former offers unparalleled convenience, while the latter can stimulate the give-and-take of debate.
- *Be prepared to exploit the potential of mobile devices*, which are becoming widely available, may offer the best access to the Internet, and offer a uniquely

convenient source of information. Consider voice, texting, and web-based applications. Investigate voice recognition, speech to-text, and voicemail technologies. Consider whether brief text alerts could serve as reminders and updates for providers. Format websites and the contents of knowledge bundles to fit on a small screen.

- *Analyze mobile markets carefully* when weighing applications for mobile devices. Smart phones and PDAs have a clear edge when it comes to capabilities, but cell phones and texting are affordable, available, and supported in far more locations. In some countries, smart phones and 3G networks may be a long time in coming.
- *Take advantage of inexpensive camera and video technologies*, both to reach less literate audiences and also to make content for other audiences more compelling. Consider incorporating a video component into K4Health knowledge bundles.
- *Recognize that social networking sites are a trend that is going to change the way health professionals—including those in the developing world—communicate and exchange information.* Work within the organization to bridge the generational divide and promote an organizational culture that views Web 2.0 tools as a valid opportunity.
- *Foster grassroots experimentation with Web 2.0 tools*, but make sure that pilot tests have coherent strategies to drive demand and to help meet project objectives. Monitor what commercial firms as well as non-profits are doing on Facebook and look for the emergence of best practices.
- *Copy successful elements of social networking sites.* The K4Health knowledge network can benefit by modeling some features on the most successful and well-liked elements of Facebook and other social networking sites.
- *Launch a discussion about the impact of social networking and other Web 2.0 tools on the notion of a definitive information source.* As content becomes more fluid and collaborative (e.g., Wikipedia), how is it possible to maintain control over the quality of information products? What does this mean for K4Health knowledge bundles and their adaptation to local settings?

As always, the greatest reach and biggest impact comes from using multiple communication channels and technologies. Lessons for K4Health include:

- *Use face-to-face and virtual interaction to reinforce one another.* The impact of training workshops and conferences is heightened when participants can continue to converse and access materials via email or on the web. Similarly, a virtual COP can benefit from occasional meetings in the flesh; these accelerate the process of building trust and strong relationships.

- *Take advantage of existing information dissemination systems*, for example, by cross-posting on relevant listservs and by placing materials in the TALC and eGranary libraries, to extend the reach and impact of information products.
- *Seek out local intermediaries that can extend the reach of the Web*. Radio stations can be recruited to turn web-based materials into community broadcasts. Staff at community access points for the Internet, including franchise kiosks, cybercafés, and libraries, can be recruited and trained to promote (and, if necessary, translate and interpret) certain websites and materials. This could be combined with an offer of free web access for health providers at participating cybercafés.
- *Rely on local partners to move information the last mile*. Placing authoritative knowledge bundles on the web is only the first half of an effective distribution strategy. Moving materials off the web and into the hands of reproductive health managers and providers requires collaborating with country-based organizations that have the ability to deliver them.
- *Package the same content in multiple formats* so that it can be disseminated via different communication channels. Alternate versions of a job aid, for example, could be produced as a web page, a file for display on a handheld device, a PDF file suitable for printing, an audio file for radio broadcast, or a video for screening in rural health facilities.

## ***B. Meeting the need for locally relevant content***

A strong, consistent, and repeated message from the field is that information for health workers is useless unless it is relevant to the setting and easy to digest. The impact of K4Health's knowledge bundles will depend in large part on how well tailored they are to specific users and countries. Lessons for K4Health include:

- *Translation into local languages is essential, but burdensome*. Local organizations are in the best position to translate materials into indigenous languages. Thus K4Health should try to identify and recruit the help of local counterparts that have the capacity—including native speakers—to undertake translations. K4Health can facilitate the translation process by providing guidelines, links to dictionaries of technical terms, advice, and reviews. Note that IntraHealth has experimented with posting materials that need translation online in a wiki to reduce the expense and speed the translation process. Volunteers can offer translations of as much or as little of the material posted on the wiki as they want, and they can comment on one another's translations.
- *When frontline providers have limited literacy or education, materials have to be configured accordingly*. Conventional solutions include simplifying the language used or substituting pictures for text. The increasing ubiquity of cell phones and the advance of speech recognition technologies offer another possibility: voice-based systems that let health workers locate and listen to relevant audio files.

- *Content needs to be tailored to the local setting.* Country-specific materials should focus on health problems that are prevalent locally, limit themselves to drugs and tests that are available locally, and follow national guidelines and protocols.
- *Content also needs to be tailored to specific cadres of health worker.* Providers benefit the most from job aids and protocols that closely match their job responsibilities and work flow, as well as their literacy levels and information-seeking habits.

However, repackaging information to meet the needs of specific audiences in different countries, as described above, is difficult, labor-intensive, and costly—which is why so many global organizations producing health information do not make the effort to do so. The challenge for K4Health will be figuring out a way to repackage information cost-effectively. This will require sharing the task with information users, that is, the government agencies, NGOs, academics, and health professionals in the country who, by definition, are familiar with the local language, setting, and health care system. Another cost-saving approach is to encourage countries that have similar information needs, settings, and languages to share the effort of producing regional information products.

There are three possible approaches that K4Health may take to generate locally appropriate and relevant content:

1. *Adapt global content:* On a small scale, this may mean translating and tweaking WHO guidelines or a job aid produced by an international NGO with input from local program managers and providers. This is the approach most often taken by global health organizations. On a grander scale, it may mean hiring local information specialists to screen the mass of material available on the Internet, select what is relevant, summarize and translate it, and repackage it into a form that will be useful for a designated audience. AfriAya provides a model for this approach.
2. *Create content locally (or regionally):* This means inviting researchers, managers, and providers in the country or larger region to help decide what is needed to fill health information gaps and draft materials accordingly. Geographically focused COPs could help with this.
3. *Promote knowledge sharing between countries:* One of the best examples of this is RAFT's deliberate and successful effort to change the flow of knowledge between North and South. Its courses began with teachers based in Europe talking to students based in West Africa but quickly evolved. Now teachers in Africa instruct students in other African countries, and students in Europe learn about tropical diseases from teachers in Africa.

Web-based collaboration tools, such as wikis and web-conferencing, can facilitate all three approaches by permitting people based in multiple countries to work together. Health informatics professionals, librarians, and information specialists based in local countries also can speed the process along, because they possess knowledge management (KM) skills along with detailed knowledge of the local setting and audiences. K4Health should reach out to them for help in producing and disseminating local knowledge bundles.

### **C. Needs assessments, monitoring, and evaluation**

These seem to be weak areas, and lessons learned are few.

- *K4Health should rely on “pull” rather than “push” models.* Pull models respond to the information needs of health managers and providers, instead of pushing unwanted and unnecessary information out to people. This makes conducting health information needs assessment essential.
- *Needs assessments of healthcare providers should consider both perceived and real information needs.* First, what kinds of information do providers say they need and want? Second, when providers are asked questions about essential health information, what don't they know? Third, during the course of their job, what do providers do wrong? Answering these questions requires well-designed research studies of specific audiences—for example, midwives in Malawi—that are beyond the scope of K4Health. Fortunately, the Healthcare Information for All by 2015 (HIFA2015) campaign is committed to building a global knowledge base on this issue. K4Health should keep abreast of the publications that come out of this effort (e.g., Pakenham-Walsh, 2009) as well as the campaign's online knowledge base (<http://www.hifa2015.org/knowledge-base/>).
- *Monitoring and evaluation requires planning and resources.* Knowing how many viewers a website attracts or how many copies of a publication are downloaded does not offer sufficient guidance to refine and improve information products. It is also important to know who is using a knowledge product and for what purpose, how useful they found it, and what changes could improve the product. While the HIPNET M&E guide provides a roadmap for this effort, the cost remains a challenge. K4Health may need to consider focusing systematic evaluation efforts on a few key information products, while relying on anecdotal and informal feedback for the remainder.

### **D. Building the K4Health Network**

K4Health faces a crowded field. There are a large number of overlapping and competing knowledge networks in global health and development. This makes positioning the proposed K4Health network more challenging. Even when people nominally belong to a lot of networks, however, there is a natural tendency to rely on just a few for most needs—often those most narrowly focused on one's interests. The goal for K4Health is to

position itself as one of the first places RH and FP specialists go to seek information, even though it is going to have a relatively wide scope. The best way to accomplish this may be to subdivide the network into sub-communities focused on specific technical areas, such as HIV/AIDS or gender, or on specific countries or regions. Two other keys to success will be:

- *Incorporating a wide variety of knowledge sharing tools and activities, including discussion lists and forums, face-to-face meetings, a searchable knowledge repository, event listings, and, perhaps most importantly for K4Health, platforms that allow members to contribute to the development of K4Health products, especially the variants tailored to different countries.*
- *Actively managing the site's interactive components to build trust, stimulate discussion and debate, and maintain a supportive environment.*

The large number of knowledge networks related to health and development create many opportunities for collaboration. K4Health can benefit from other knowledge networks and individual organizations in the following ways:

- *Build the K4Health knowledge network on the foundation provided by an existing network, such as HIF-net or HIPNET, rather building a competing network from scratch*
- *Seek out existing materials for knowledge bundles at online knowledge repositories and resource centers sponsored by FP/RH networks. K4Health should also canvas HIPNET members and other NGOs working in the field for candidate materials for the knowledge bundles.*
- *Reach out to members of RH knowledge networks, like HIPNET, for expert review of knowledge bundles and help with field testing tools.*
- *Join existing knowledge networks focused on the use of ICTs for health and development in order to benefit from their technical knowledge and program experience*
- *Seek out and join health knowledge networks that focus on countries or regions that are a priority for K4Health in order to reach out to local health professionals and benefit from their knowledge and experience. These may include virtual networks, such as HDN's Uganda affiliate, or professional groups, task forces, and work groups that engage with each other on a face-to-face basis.*
- *Use established technology platforms, such as the IBP Knowledge Gateway for COPs.*

## APPENDICES

### A. *Annotated bibliography for K4Health priority countries*

NOTE: A wide variety of up-to-date news, analysis, and data on the telecommunications markets in individual countries (as well as by region) and specific technologies are available for a steep price from the consultant, BuddeCom (<http://www.budde.com.au/Reports/>).

#### Egypt

Al-Shorbaji, Najeeb. E-health in the Eastern Mediterranean Region: a decade of challenges and achievements. *Eastern Mediterranean Health Journal*, Vol. 14, Special Issue S157, 2008.

This article reviews ICT penetration, e-health strategies and challenges, e-learning and telemedicine activities, health mapping, health informatics, e-health research, and access to health information in the region.

BuddeCom. *Egypt – Convergence, Broadband, and Internet Markets – Overview, Statistics, and Forecasts*. <http://www.budde.com.au/Research/Egypt-Convergence-Broadband-Internet-Markets.html>.

Supported by forward-looking government programs, Egypt has become one of the leading Internet markets in Africa in terms of users, international bandwidth and services offered. The country is well connected by several international submarine fibre optic cables in combination with a national fibre backbone infrastructure, and the international bandwidth market has been liberalised. The entire sector is highly competitive with around 250 Internet and data service providers, which has led to some of the lowest prices for ADSL services on the continent and broadband packages with up to 24Mb/s delivered to residential households. VoIP Internet telephony has been liberalised, and several companies are rolling out next-generation networks to provide converged IP-based voice and data services.

BuddeCom. *Egypt – Key Statistics, Regulatory & Fixed-line Telecoms Overviews*. <http://www.budde.com.au/Research/Egypt-Key-Statistics-Regulatory-Fixed-Line-Telecoms-Overviews.html>

Egypt's telecom sector is performing consistently well with all sub-sectors being open to competition. The country has the largest fixed-line market in Africa and the Arab region, with a highly profitable incumbent telco (Telecom Egypt) which was partially privatised through an IPO in 2005. The end of its fixed-line monopoly in 2006 has opened up new opportunities for competitive service providers, and a second national fixed-line licence to be awarded in 2009 has received strong interest from international bidders. Efforts are underway to roll out next-generation networks, offering converged IP-based voice and data

services. An increasing demand for bandwidth has led to the development of several additional submarine fibre optic cable systems to go online from 2009.

BuddeCom. *Egypt – Mobile Market – Overview & Statistics.*

<http://www.budde.com.au/Research/Egypt-Mobile-Market-Overview-Statistics.html>.

Egypt became one of the first countries in Africa to launch third-generation (3G) mobile services in May 2007, following the award of the country’s third mobile licence the previous year. The record price that was paid for the licence indicates the potential that is seen in the Egyptian mobile market, and the penetration rate has more than doubled since then to reach 50% in mid-2008. The network operators have launched a wide range of advanced services, including 3G mobile broadband. This report outlines the major developments in the market, with relevant statistics and profiles of the companies involved, including ARPU trends for the major mobile operators. It also contains an in-depth analysis of the third mobile licence valuation.

BuddeCom. *Egypt – Telecom Market Statistics & Forecasts.*

<http://www.budde.com.au/Research/Egypt-Telecoms-Market-Statistics-Forecasts>

The licensing of Egypt’s second fixed network operator has been postponed by at least a year to 2009 as a result of the global financial crisis. The incumbent’s fixed network rollout has slowed, but takeup of ADSL broadband services continues unabated. There will be a shift towards wireless technologies, following the first successful WiMAX deployments in the country. In addition, all three mobile networks have now launched 3G services and are set to become dominant players in the Internet and broadband market as well. With mobile and broadband tariffs already among the lowest on the continent, operators will seek to streamline their operations and distinguish themselves from the competition by quality of service and introducing new services. This report contains key statistics and provides forecasts for 2010 and 2015 for all market sectors.

Egypt: Internet Usage and Telecommunications Reports

<http://www.internetworldstats.com/af/eg.htm>

YEAR	Users	Population	% Pen.	Usage Source
2000	450,000	66,303,000	0.7 %	ITU
2006	5,100,000	71,236,631	7.0 %	ITU
2008	10,532,400	81,713,517	12.9 %	ITU

West, John. *The Promise of Ubiquity: Mobile as Media Platform in the Global South.* InterNews Europe, 2008.

Egypt is included in the country summaries at the end of this book, which presents basic information about the use of mobile phones in a standardized format.

## Ethiopia

BuddeCom. *Ethiopia - Telecoms Market Overview, Statistics, & Forecasts.*

<http://www.budde.com.au/Research/Ethiopia-Telecoms-Market-Overview-Statistics-Forecasts.html>.

Ethiopia still practices a monopoly in almost all areas of its telecoms sector. Market penetration is still very low, but major efforts to roll out a national fibre backbone and wireless access networks have resulted in an acceleration of growth in all market segments. Further massive investments into fixed, mobile and Internet services, totalling US\$4 billion, are planned for the five years to 2012. The government is intent on eventually privatising the national operator, ETC, and introducing competition in mobile and Internet services. This report provides an overview of the telecommunications sector in Ethiopia, a profile of ETC, key statistics, and scenario forecasts for the years 2010 and 2015.

Ethiopia Internet Usage and Marketing Report

<http://www.internetworldstats.com/af/et.htm>

YEAR	Users	Population	% Pen.	Usage Source
2000	10,000	70,600,043	0.0 %	ITU
2005	113,000	72,238,014	0.2 %	ITU Sept/05
2007	164,000	73,872,056	0.2 %	ITU March/07
2008	291,000	82,544,838	0.4 %	ITU March/08

Gillwald, Alison, and Christoph Stork. *Towards Evidence Based ICT Policy and Regulation*. Vol. 1 Paper 2: ICT access and usage in Africa. ResearchICTAfrica, 2008.

This publication presents results of nationally representative surveys on ICTs, including fixed phone lines, mobile phones, public phones, and the Internet, for 17 African countries, including Ethiopia. The data cover access and penetration, reasons for non-use, frequency of use, household expenditures, and willingness to pay.

Schmidt, Philipp, and Christoph Stork, *Towards Evidence Based ICT Policy and Regulation: eSkills*. Research ICT Africa, 2008.

An index to measure e-skills (or digital literacy) is constructed and applied to data from nationally representative surveys in 17 African countries, including Ethiopia. The link between e-skills, education, employment, and other factors is explored.

## India

BuddeCom. *India – Broadband Market*. <http://www.budde.com.au/Research/India-Broadband-Market.html>

While India initially embraced the Internet with a degree of ambivalence, there has been tremendous enthusiasm amongst dial-up users and an estimated 60% of

Internet users still regularly access the Internet via the country's more than 10,000 cybercafes. But when it comes to high-speed broadband access, there has been reluctance to embrace, especially within the corporate sector, and the take-up rate has been relatively slow. By mid-2008, there were almost 4.5 million broadband subscribers – a lowly penetration (by population) of around 0.4%. After a surge in broadband subscribers in 2006, the market settled back to a relatively modest 50% growth in 2007/2008. This report looks at the stage the development of broadband Internet has reached in India.

BuddeCom. *India – Fixed Network Operators*. <http://www.budde.com.au/Research/India-Fixed-Network-Operators.html>

Domestic fixed-line telephony in India has traditionally been the preserve of the state-owned operators, BSNL and MTNL. In 2001, the Indian government opened up the whole fixed-line telephone business to an unlimited number of operators in each of the defined telecom circles (regions). Prior to this, only one private company had been allowed to compete with an existing state-run player in each circle. VSNL, the former monopoly provider of international telephony, also lost its exclusive status in April 2002 when the international market was opened to competition. This report provides an overview of India's fixed network voice services and the operators involved in providing these services.

BuddeCom. *India – Internet Market*. <http://www.budde.com.au/Research/India-Internet-Market.html>

Despite the considerable popularity of Internet in India, the ISP market has been in disarray. There were around 150 operational ISPs in the country, after a period of market rationalisation, but, despite the large number of providers, 10% of the ISPs have 90% of the subscribers. In fact, 5% have 85%. The state-owned – BSNL and MTNL – dominate the market, holding first and second place in terms of Internet subscribers. Cybercafés have certainly been playing a major role in fuelling Internet development in India. About 30% of the total Internet subscriber base has broadband access. Despite this relatively high proportion, development of broadband Internet in India has been particularly slow. This report also takes a look at the wider Internet and e-services market as the country moves slowly towards the New Internet Economy.

BuddeCom. *India – Key Statistics and Telecommunications Market Overview*. <http://www.budde.com.au/Research/India-Key-Statistics-and-Telecommunications-Market-Overview.html>

India continues to be one of the fastest growing major telecom markets in the world. Sweeping reforms introduced by successive Indian governments over the last decade have dramatically changed the nature of telecommunications in the country. The mobile sector has grown from around 10 million subscribers in 2002 to 250 million by February 2008. While GSM technology still dominates the mobile market, CDMA has claimed more than 25% market share. The mobile industry should continue to boom. Fixed-line services grew strongly for a while

but have been experiencing zero and negative growth of late. This report presents the key measures and takes a general look at the market direction.

BuddeCom. *India – Mobile Communications – Major Operators.*

<http://www.budde.com.au/Research/India-Mobile-Communications-Major-Operators.html>

The dynamic Indian mobile telephony market has seen a number of important takeovers and mergers, resulting in significant shifts in market share among the players. Initially three major private players – Hutchison Telecom (subsequently acquired by Vodafone), Bharti, and Idea Cellular - emerged from the fray to do battle. The entry of the state-owned enterprises –BSNL and MTNL – as mobile operators saw BSNL in particular throw out a major challenge to the private operators. And then we have seen the arrival (through the back door) of the CDMA-based services. Among these, Reliance has emerged as a very serious challenger to the GSM operators. This report looks at the operators in this ever-changing sector, providing some pertinent statistics.

BuddeCom. *India – Mobile Communications – Market Overview.*

<http://www.budde.com.au/Research/India-Mobile-Communications-Market-Overview.html>

Growth in India's mobile sector, from a humble start in the mid-1990s, has really picked up pace in recent years, aided by higher subscriber volumes, lower tariffs and falling handset prices. Home to a clutch of global operators working with local companies, India had around 290 million mobile subscribers (including GSM and CDMA services) by mid-2008. And the market was growing at an annual rate of over 50%. While the ARPU has been steadily declining as competing operators offer cheaper tariffs the usage levels have been high thus slowing the decline in ARPU. By 2008 there was a major push to take mobile services into the poorer and rural areas of the country. This report provides an overview of India's mobile market.

BuddeCom. *India – Mobile Communications – Technologies Including 3G.*

<http://www.budde.com.au/Research/India-Mobile-Communications-Technologies-including-3G.html>

India is one of the fastest growing markets for mobile technology. The country's mobile operators have been providing services based initially on GSM, but subsequently a substantial CDMA presence has been added. While India moves into advanced forms of mobile technology, including GPRS and EDGE, the country has been waiting for the adoption of 3G. The government was finalising the 3G licensing process late in 2008. There have however been a series of regulatory battles going on with vigorous participation by the wider market in the discussions. This report looks at the mobile market in India from the viewpoint of the technology platforms in place and those being put in place.

BuddeCom. *India – Mobile Communications – Voice and Data Services.*

<http://www.budde.com.au/Research/India-Mobile-Communications-Voice-Data-Services.html>

India is one of the fastest growing mobile markets and this growth has been boosted by the willingness of the operators to adopt a full range of voice and data services. Prepaid services in particular have been an important driver of growth in subscriber numbers and represent around 80% of the total mobile subscriber base. Mobile data services have started to grow strongly on the back of the expanding mobile subscriber base. In a country that has been preoccupied with television, it will be interesting to see how mobile TV services are picked up. This report looks at the existing and emerging range of mobile voice and data services in India.

BuddeCom. *India – Telecommunications Infrastructure – International.*

<http://www.budde.com.au/Research/India-Telecommunications-Infrastructure-International.html>

As well as its huge national network, India's investment in telecommunications infrastructure over the last decade has extended to a heavy involvement in international infrastructure. Under the leadership of International operator VSNL the country has been assembling an extensive infrastructure of gateways, satellite earth stations and fibre optic submarine cables. Billions of rupees continue to be invested in a combination of submarine cables and microwave systems to satisfy India's demand for international bandwidth and high-quality connectivity. Most significantly, VSNL – which is now known as Tata Communications - has become a serious international player with a series of acquisitions and good strategic moves. This report looks at some of the submarine and satellite systems that have been put in place in recent times as the country addresses its bandwidth needs.

BuddeCom. *India – Telecommunications Infrastructure – National.*

<http://www.budde.com.au/Research/India-Telecommunications-Infrastructure-National.html>

India has a huge national telecommunications network, with 40 million working fixed-line connections by end-2007 (and another 10 million or so fixed wireless services but these are counted as 'wireless' services rather than fixed services). With less than 5% fixed-line penetration, the country has nevertheless achieved a remarkable coverage, 98% of the population having access to a telephone. Despite the heavy investment in telecoms infrastructure over the last decade, servicing the huge population has presented difficulties. Even the booming mobile phone market had still only slightly more than 21% penetration early in 2008. This report provides an update on telecoms infrastructure in India, as the government pushes forward on a number of fronts to speed up roll-out of infrastructure.

BuddeCom. *India – Telecommunications Regulatory Overview.*

<http://www.budde.com.au/Research/India-Telecommunications-Regulatory-Overview.html>

The Indian government has been continuing to push to complete the restructuring of the telecommunications regulatory regime. Some years back the corporatisation of the operational arm of DoT to form BSNL set the scene for the industry to move forward. The subsequent opening up of the market to full scale competition has been dramatic, to say the least. However, some major inconsistencies remain. The introduction of a Unified Licensing regime is certain to go part of the way towards resolving these inconsistencies. This report takes a broad look at the evolving regulatory landscape, together with the liberalisation and privatisation steps that are already changing the sector.

BuddeCom. *India – Telecoms Market Trends and Forecasts*.

<http://www.budde.com.au/Research/India-Telecoms-Market-Trends-Forecasts.html>.

India continues to be one of the fastest growing major telecom markets in the world. Sweeping reforms introduced by successive Indian governments over the last decade or so dramatically changed the nature of telecommunications in this country. The mobile sector has grown from around 10 million subscribers in 2002 to almost 350 million by 2008. Whilst there were signs that the rate and effectiveness of regulatory reform had stalled, during the 2007/2008 period growth in the mobile sector continued at a very healthy rate. By contrast fixed-line services, which had grown strongly for a while, were suddenly experiencing zero and negative growth. And the Internet was still finding its way. In this report we look at the fixed-line, mobile and Internet segments of the market in India and we provide scenario forecasts for each of the market segments.

Chandrasekhar, C.P., and J. Ghosh. Information and communication technologies and health in low income countries: the potential and the constraints. *Bulletin of the World Health Organization* 79: 850–855, 2001.

This paper outlines the potential offered by technological progress in the information and communication technologies (ICTs) industries for the health sector in developing countries, presents some examples of positive experiences in India, and considers the difficulties in achieving this potential. The development of ICTs can bring about improvements in health in developing countries in at least three ways: as an instrument for continuing education they enable health workers to be informed of and trained in advances in knowledge; they can improve the delivery of health and disaster management services to poor and remote locations; and they can increase the transparency and efficiency of governance, which should, in turn, improve the availability and delivery of publicly provided health services. These potential benefits of ICTs do not necessarily require all the final beneficiaries to be reached directly, thus the cost of a given quantum of effect is reduced. Some current experiments in India, such as the use of Personal Digital Assistants by rural health workers in Rajasthan, the disaster management project in Maharashtra and the computerized village offices in Andhra Pradesh and Pondicherry, suggest creative ways of using ICTs to improve the health conditions of local people. However, the basic difficulties encountered in using ICTs for such purposes are: an inadequate physical infrastructure; insufficient access by the majority of the population to the hardware; and a lack of the

requisite skills for using them. We highlight the substantial cost involved in providing wider access, and the problem of resource allocation in poor countries where basic infrastructure for health and education is still lacking. Educating health professionals in the possible uses of ICTs, and providing them with access and “connectivity”, would in turn spread the benefits to a much wider set of final beneficiaries and might help reduce the digital divide.

Ericsson and the Commonwealth Telecommunications Organization. *Assessment of m-content requirements in India and Uganda: Summary Report*. Stockholm: Ericsson AB, 2008.

This report presents key findings from a Commonwealth Telecommunications Organisation (CTO) study in India and Uganda of mobile phone users’ preference regarding the content disseminated over the phones (m-content). It examines intentions to use, awareness of m-content, user satisfaction, and demand for SMS versus voice. It also discusses value for money, frequency of use, and the main drivers and barriers to services. The report tries to predict the future uptake of services and changes in the delivery of m-content in India and Uganda.

Ganapathy, K., and Aditi Ravindra. mHealth: A Potential Tool for Health Care Delivery in India. Presented at the conference on Making the eHealth Connection, Bellagio, Italy, July 13-August 8, 2008.

After a general discussion of the advantages and challenges of mHealth, recent technological advances, and clinical applications in developing countries, this article examines the potential for mHealth in India and describes pilot projects in that country.

India: Internet Usage Stats and Telecommunications Market Report  
<http://www.internetworldstats.com/asia/in.htm>

YEAR	Users	Population	% Pen.	Usage Source
1998	1,400,000	1,094,870,677	0.1 %	ITU
1999	2,800,000	1,094,870,677	0.3 %	ITU
2000	5,500,000	1,094,870,677	0.5 %	ITU
2001	7,000,000	1,094,870,677	0.7 %	ITU
2002	16,500,000	1,094,870,677	1.6 %	ITU
2003	22,500,000	1,094,870,677	2.1 %	ITU
2004	39,200,000	1,094,870,677	3.6 %	C.I. Almanac
2005	50,600,000	1,112,225,812	4.5 %	C.I. Almanac
2006	40,000,000	1,112,225,812	3.6 %	IAMA
2007	42,000,000	1,129,667,528	3.7 %	IWS

Mishra, Saroj, K. Ganapathy, and Baljit Singh Bedi. The Current Status of eHealth Initiatives in India. Presented at the conference on Making the eHealth Connection, Bellagio, Italy, July 13-August 8, 2008.

The article offers an extensive review of ehealth activities in India, including electronic medical records and hospital automation; telemedicine initiatives at the

national, state, and hospital levels; and elearning in the health sector. It also examines capacity building efforts for ehealth, e-governance in the health sector, the village resource center concept, national policy initiatives related to ehealth, ehealth projects planned at the national level, and the ehealth industry.

## Jordan

Al-Shorbaji, Najeeb. e-health in the Eastern Mediterranean Region: a decade of challenges and achievements. *Eastern Mediterranean Health Journal*, Vol. 14, Special Issue S157, 2008.

This article reviews: ICT penetration, e-health strategies and challenges, e-learning and telemedicine activities, health mapping, health informatics, e-health research, and access to health information in the region.

BuddeCom. *Jordan – Telecoms, Mobile, and Broadband*.

<http://www.budde.com.au/Research/Jordan-Telecoms-Moblie-Broadband.html>.

Jordan has one of the most open telecommunications markets in the Middle East and an independent regulator. The fixed-line market was liberalised on 1 January 2005 with the market open to full competition. Incumbent operator Jordan Telecom Group has been fully privatised. Faced with the unavoidable prospect of losing voice market share to alternative operators, JTG has increased its focus on broadband services, cutting prices for ADSL and launching an end-to-end double-play VoIP offering. The mobile market has very high subscriber numbers in a very competitive four operator market. One 3G licence is in process of being tendered.

Jordan: Internet Usage and Marketing Report

<http://www.internetworldstats.com/me/jo.htm>

YEAR	Users	Population	% Pop.	Usage Source
2000	127,300	5,282,558	2.4 %	<a href="#">ITU</a>
2002	457,000	5,282,558	8.7 %	<a href="#">ITU</a>
2005	600,000	5,282,558	11.4 %	<a href="#">ITU</a>
2007	796,900	5,375,307	14.8 %	<a href="#">ITU</a>
2008	1,126,700	6,198,677	18.2 %	<a href="#">ITU</a>

West, John. *The Promise of Ubiquity: Mobile as Media Platform in the Global South*. InterNews Europe, 2008.

Jordan is included in the country summaries at the end of this book, which present basic information about the use of mobile phones in a standardized format.

## Lesotho

BuddeCom. *Lesotho - Telecoms Market Overview & Statistics*.

<http://www.budde.com.au/Research/Lesotho-Telecoms-Market-Overview-Statistics.html>.

Telecommunications in this small Southern African country has undergone transformation from a state-owned monopoly to a privatised national operator, with competition in the mobile sub-sector between two networks, Vodacom and Econet. At around 25%, mobile market penetration is still below the African average. The use of wireless technology and fixed-mobile convergence has led to an accelerated increase of teledensity. Various forms of broadband Internet access are available. Although landlocked, Lesotho is set to benefit from the greater choice of international bandwidth sources that the arrival of several submarine fibre optic cables to the African east coast will bring in 2009.

## **Malawi**

Adamson S. Muula, Humphreys Misiri, Yamikani Chimalizeni, Davis Mpando, Chimota Phiri, Amos Nyaka. What is the access to continued professional education among health workers in Blantyre, Malawi? EQUINET, June 2003.

A cross-sectional descriptive study utilizing an interviewer-administered questionnaire was conducted with 57 nurses, medical assistants, and other healthcare workers in public health centers in Blantyre District, Malawi. Participation in workshops and seminars within the past 12 months was reported by 54 (94.7%) of the participants and 49 (86.0%) reported that their health facilities had clinical hand-over meetings. All participants indicated desire to receive professional journals for free while only 35 (61.4%) would pay for a journal subscription. Current personal and institutional subscription to a journal was low, at 2 (3.5%) each. About 30% had been trained to conduct research and 23 (40.1%) had ever conducted research with only 3 (5.3%) ever written a journal article. 47.4% had access to a working phone at work and only 3 (5.3%) had access to internet facilities at all. Only 21% were satisfied with their own knowledge on health matters.

BuddeCom. *Malawi - Telecoms Market Overview & Statistics*.

<http://www.budde.com.au/Research/Malawi-Telecoms-Market-Overview-Statistics.html>.

Malawi's telecommunications sector is undergoing a small revolution following the privatisation of the national telco, MTL. Copper and fixed-wireless lines are being rolled out at an unprecedented pace, and a national fibre backbone is being implemented. The country's electricity utility is also laying fibre and leasing capacity to telecom operators. A second national operator was licensed in May 2007 and a third mobile network in 2008, with a fourth expected soon. Penetration rates are still well below African averages in both market segments, leaving ample future growth potential. Several ISPs are rolling out wireless broadband networks and mobile data services have been launched. The underdeveloped Internet sector will receive a boost from the arrival of fibre-based international bandwidth in 2009 or 2010, paired with the planned liberalisation of Internet telephony (VoIP).

## Namibia

BuddeCom. *Namibia - Telecoms Market Overview & Statistics*.

<http://www.budde.com.au/Research/Namibia-Telecoms-Market-Overview-Statistics.html>.

Namibia was one of the last countries in Africa to introduce competition in the mobile communications sector when a second network finally launched in 2007. Despite this, the country had already achieved a market penetration rate above the African average. Both operators have launched 3G services and are entering the Internet and broadband market. The fixed-line incumbent, Telecom Namibia, quietly entered the lucrative mobile market as the third player but was put on hold by the regulator until the new ICT Bill brings clarity about fixed-mobile convergence, among other issues. Several WiMAX wireless broadband services are boosting Internet connectivity and will bring additional competition to the voice market once Internet telephony (VoIP) is deregulated. With an extensive national fibre optic backbone in place and international submarine fibre optic cables scheduled to reach the country in 2010, Namibia is well positioned to remain one of the most developed telecommunications markets in Africa.

Gillwald, Alison, and Christoph Stork. *Towards Evidence Based ICT Policy and Regulation* Vol 1 Paper 2: ICT access and usage in Africa. ResearchICTAfrica, 2008.

Results of nationally representative surveys on ICTs, including fixed phone lines, mobile phones, public phones, and the Internet, are presented for 17 African countries, including Namibia. The data covers access and penetration, reasons for non-use, frequency of use, household expenditures, and willingness to pay.

Schmidt, Philipp, and Christoph Stork, *Towards Evidence Based ICT Policy and Regulation: eSkills*. Research ICT Africa, 2008.

An index to measure e-skills (or digital literacy) is constructed and applied to data from nationally representative surveys in 17 African countries, including Namibia. The link between e-skills, education, employment, and other factors is explored.

## Peru

BuddeCom. *Peru – Convergence, Broadband, and Internet Market – Overview, Statistics, and Forecasts*. <http://www.budde.com.au/Research/Peru-Convergence-Broadband-Internet-Market-Overview-Statistics-Forecasts.html>.

Internet user penetration in Peru is considerably higher than average for Latin America, a remarkable achievement compared with the country's other economic indicators. The success of the Internet in Peru is primarily due to the mushrooming of cheap public Internet facilities known as *cabinas públicas*. In fact, Peru is a world leader in terms of users who access the Internet in public places. Several government-subsidised broadband projects are underway or up for tender, and a WiMAX auction is to be held in 2009. The broadband market is

expected to continue growing despite the global economic downturn. This report provides an overview of Peru's Internet, broadband, and pay-TV markets, accompanied by relevant statistics, analyses, and broadband scenario forecasts for the years 2013 and 2018.

BuddeCom. *Peru – Fixed-line Market and Infrastructure – Overview, Statistics & Forecasts*. <http://www.budde.com.au/Research/Peru-Fixed-Line-Market-Infrastructure-Overview-Statistics-Forecasts.html>.

Peru's fixed-line teledensity is among the lowest in Latin America; telecom infrastructure reflects the country's poverty map, with most of the fixed lines concentrated in Lima. Despite liberalisation, Peru's local telephony market is still dominated by the incumbent Telefónica del Perú. Movistar, also owned by Telefónica, is in second place, offering local telephony over fixed-wireless technology. As a result, Telefónica controls around 97% of Peru's basic fixed-line market. Long-distance services, on the other hand, are very competitive, stimulated by a multicarrier system. Although teledensity is increasing, many rural municipalities are still unserved. This report provides an overview of Peru's telecom infrastructure, together with profiles of major fixed-line operators, accompanied by relevant statistics, analyses, and fixed-line scenario forecasts for the years 2013 and 2018.

BuddeCom. *Peru – Mobile Market – Overview, Statistics & Forecasts*. <http://www.budde.com.au/Research/Peru-Mobile-Market-Overview-Statistics-Forecasts.html>.

Peru's mobile penetration is about 10% lower than average for Latin America, and this compares favourably with the country's other economic indicators, but there are huge discrepancies between urban and rural regions. Mobile penetration ranges from 102% in the capital city to 8% in some of the poorer parts of the country. Three companies compete in the Peruvian mobile market: Telefónica, trading as Movistar, is the leader; América Móvil is in second place; and third is Nextel Perú, primarily catering to corporate customers. The government is planning a mobile spectrum auction in 2009 to increase competition and expand mobile coverage. Accompanied by key market statistics and analyses, this report provides an overview of the market and a brief profile of mobile operators. It also contains scenario forecasts for the years 2013 and 2018.

BuddeCom. *Peru – Telecom Market Trends, Key Statistics, and Regulatory Overview*. <http://www.budde.com.au/Research/Peru-Telecom-Market-Trends-Key-Statistics-Regulatory-Overview.html>.

Mobile telephony, broadband, and pay TV have been the fastest growing telecom sectors in Peru, accounting for an increasing portion of the country's total telecom revenues. Estimates for 2008 indicate sustained growth, particularly in the broadband and mobile markets. We expect Peru's telecom industry to continue growing in 2009-2011, albeit at a slower pace. The government aims to bridge the digital divide through rural projects sponsored by FITEL, a fund that finances rural operators under the rule of less-bid subsidy. Competition is strongly

encouraged. A single concession regime was adopted in July 2007, and an infrastructure sharing law was issued in July 2008. Mobile number portability will be compulsory for all operators starting from January 2010. This report provides an overview of Peru’s telecommunications and regulatory environment, accompanied by statistical data, analyses, and outlook.

Castagnetto, Jesus, Walter H. Curioso, Marcela Lazo-Escalante, Jesus Peinado, and Crisogono Francisco Rubio. eHealth in Peru: a Country Case Study. Presented at the conference on Making the eHealth Connection, Bellagio, Italy, July 13-August 8, 2008.

This review article examines Peru’s technological infrastructure, use of cell phones and handheld devices for disease monitoring, national health information system, interoperability between health information systems, use of ICTs by patients and researchers, physicians’ access to the Internet, sources of information for health care workers, ehealth capacity building, the use of electronic health records and mobile devices in health care, the market for ehealth, and national ehealth policies.

Galperin, Hernán, and Judith Mariscal. Poverty and mobile telephony in Latin America and the Caribbean. IDRC and DIRSI, 2007

The main goal of this research project is to explore the strategies employed by the poor in Latin America and the Caribbean to access and use mobile telephony services, as well as to identify the major market and regulatory barriers for increased penetration and usage. Peru was one of the seven countries studied, and considerable data is presented on mobile phone ownership and use. Results show that mobile telephony is highly valued by the poor as a tool for strengthening social ties and for increased personal security, and that it is beginning to prove useful for enhancing business and employment opportunities. Overall, the survey results suggest that the acquisition of mobile phones by the poor has an economic impact reflected mainly in improved social capital variables such as the strengthening of trust networks and better coordination of informal job markets.

Peru Internet Usage and Market Report

<http://www.internetworldstats.com/sa/pe.htm>

YEAR	Population	Internet Users	% Pen.	GNI p.c.	Usage Source
2000	25,726,000	2,500,000	9.7 %	\$ 2,100	<a href="#">ITU</a>
2005	28,032,047	4,570,000	16.3 %	\$ 2,360	<a href="#">C.I.Almanac</a>
2007	28,920,965	6,100,000	21.1 %	\$ 2,360	<a href="#">Osiptel</a>
2008	29,180,899	7,636,400	26.2 %	\$ 3,450	<a href="#">ITU</a>

Note: GNI is Gross National Income per capita, and corresponds to World Bank data for the years 2000 and 2006 in US dollars.

## Rwanda

BuddeCom. *Rwanda - Telecoms Market Overview & Statistics*.

<http://www.budde.com.au/Research/Rwanda-Telecoms-Market-Overview-Statistics.html>

The aftermath of the 1994 genocide and a monopolistic market structure until 2006 have weighed on the Rwandan telecommunications sector, but the country is now catching up with other markets in Africa. The privatised incumbent telco is more innovative than most of its African counterparts in the provision of market-driven, affordable services, and it is competing in the mobile sector as well. The country has one of the most developed national fibre infrastructures in the region and is preparing to connect to the new high-bandwidth submarine cables that are being planned along the east coast of Africa.

Frasier, Hamish, Maria A. May, and Rohit Wanchoo. e-Health Rwanda Case Study. Presented at the conference on Making the eHealth Connection, Bellagio, Italy, July 13-August 8, 2008.

This case study reviews Rwanda's demographics, the current state of public health informatics, access to health information, e-health capacity building efforts, electronic health records, mobile e-health activities, and national e-health policies and markets. It profiles all current e-health programs in the country.

Gillwald, Alisonm and Christoph Stork. *Towards Evidence Based ICT Policy and Regulation* Vol 1 Paper 2: ICT access and usage in Africa. ResearchICTAfrica, 2008.

Results of nationally representative surveys on ICTs, including fixed phone lines, mobile phones, public phones, and the Internet, are presented for 17 African countries, including Rwanda. The data covers access and penetration, reasons for (non-)use, frequency of use, household expenditures, and willingness to pay.

Schmidt, Philipp, and Christoph Stork, *Towards Evidence Based ICT Policy and Regulation: eSkills*. Research ICT Africa, 2008.

An index to measure e-skills (or digital literacy) is constructed and applied to data from nationally representative surveys in 17 African countries, including Rwanda. The link between e-skills, education, employment, and other factors is explored.

West, John. *The Promise of Ubiquity: Mobile as Media Platform in the Global South*. InterNews Europe, 2008.

Rwanda is included in the country summaries at the end of this book, which present basic information about the use of mobile phones in a standardized format.

## South Africa

BuddeCom. *South Africa – Broadband and Internet Markets*

<http://www.budde.com.au/Research/South-Africa-Broadband-Internet-Market.html>

South Africa's Internet and Broadband market is finally taking off after years of stagnation due to an expensive operating environment created by Telkom SA's dominance in the fixed-line and bandwidth market. Wireless broadband, including 3G/HSDPA mobile data services now rival available ADSL offerings in terms of both speed and price, and consequently subscriber numbers. With its fixed-line network reaching only 10% of the population, the incumbent has reacted by launching its own 3G network and the country's first commercial WiMAX service, but various competitors are hard on its heels rolling out the same technology, including second national operator Neotel. The arrival of new international submarine fibre optic cables to the country's shores in 2009 will bring down the cost of international bandwidth dramatically.

BuddeCom. *South Africa – Convergence – VoIP, NGN, and Digital Media.*

<http://www.budde.com.au/Research/South-Africa-Convergence-VoIP-NGN-Digital-Media.html>.

With its relatively well developed and diverse infrastructure, South Africa is taking a regional lead role in the convergence of telecommunication and information technologies with the media and entertainment sector, promising reductions in telecommunication costs and better availability of information and services. The legalisation of VoIP Internet telephony in 2005 marked the beginning of a fundamental change in the country's telecoms landscape. VoIP revenue is expected to triple in 2008. Billions of dollars are being invested into IP-based Next Generation Networks capable of delivering converged services more efficiently. ISPs are turning into phone companies, and vice versa. Both are moving into delivering audio and video content over their networks, while in turn the traditional electronic media carriers are discovering the potential of their infrastructure for telecommunications service delivery. DVB-H Mobile TV licences are expected to be issued in early 2009.

BuddeCom. *South Africa – Fixed Line Market and Infrastructure – Overview and*

*Statistics.* <http://www.budde.com.au/Research/South-Africa-Fixed-Line-Market-and-Infrastructure-Overview-Statistics.html>.

Following years of delays, the second national operator Neotel has finally launched services in competition to Telkom SA, using wireless technologies such as CDMA and WiMAX to provide alternatives to the incumbent's copper access network. In addition, the government has created InfraCo, a national infrastructure company to provide cheap backbone network capacity to service providers. The arrival of new international submarine fibre optic cables to the country's shores in 2009 will bring down the cost of international bandwidth dramatically. The government is planning to licence a third fixed network operator in 2009, along with a fourth mobile operator. Despite the significantly increased competition between different service providers, many municipalities in South Africa are implementing their own fibre and wireless broadband networks, including all of the major metro areas.

BuddeCom. *South Africa – Key Statistics, Telecom Market, and Regulatory Overviews*. <http://www.budde.com.au/Research/South-Africa-Key-Statistics-Telecom-Market-Regulatory-Overviews.html>.

South Africa's telecom sector boasts the continent's most advanced networks in terms of technology deployed and services provided. Following years of delays with its licensing, the second national operator (SNO) Neotel has finally launched services in competition to Telkom SA. This, in combination with sweeping liberalisation measures initiated two years earlier, legalising – among other things – the use of VoIP, is beginning to change the country's telecoms landscape fundamentally and bringing prices down. Under the new regulatory regime, alternative service providers are pushing into the market with converged services. The end of Telkom's monopoly on international submarine cables will reduce the cost of telecommunication in South Africa further from 2009. New operating licences to be issued in 2009 include a third fixed-line and a fourth mobile licence, DVB-H mobile TV licences and a WiMAX spectrum auction.

BuddeCom. *South Africa – Mobile Market - Overview and Statistics*. <http://www.budde.com.au/Research/South-Africa-Mobile-Market-Overview-Statistics.html>.

South Africa has a vibrant mobile market that has seen rapid uptake since competition was introduced to the sector 15 years ago. With market penetration around 100% and number portability available, the three network operators – Vodacom, MTN and Cell C – are increasingly forced to find innovative ways of distinguishing themselves from the competition in order to gain and retain customers. In addition, Virgin has entered the market as a mobile virtual network operator. 3G/HSDPA mobile broadband services now rival available DSL fixed-line offerings in terms of both speed and price, and consequently subscriber numbers. While emerging as the country's leading broadband providers, both major mobile operators are also aggressively entering the fixed-line market in a rapidly converging environment. Fixed-line incumbent Telkom SA has reacted by launching its own 3G network in 2008.

Gillwald, Alison, and Christoph Stork. *Towards Evidence Based ICT Policy and Regulation* Vol 1 Paper 2: ICT access and usage in Africa. ResearchICTAfrica, 2008.

Results of nationally representative surveys on ICTs, including fixed phone lines, mobile phones, public phones, and the Internet, are presented for 17 African countries, including South Africa. The data covers access and penetration, reasons for (non-)use, frequency of use, household expenditures, and willingness to pay.

Mars, Maurice, and Chris Seebregts. *Country Case Study for e-Health: South Africa*. Presented at the conference on Making the eHealth Connection, Bellagio, Italy, July 13-August 8, 2008.

This review of ehealth in South Africa examines the current state of public health informatics, interoperability of health information systems, access to health information, ehealth capacity building, electronic health records, mobile ehealth, the market for ehealth, and national ehealth policies. Case studies of six ehealth projects are also included.

Masters, Ken. Access to and use of the Internet by South African general practitioners. *International Journal of Medical Informatics* 77(2008) 778–786.

A national survey of South African general practitioners’ (GPs) use of the Internet found that 89% have Internet access, home usage is high, and overall usage patterns are equivalent to the usage patterns of international studies.

Schmidt, Philipp, and Christoph Stork, Towards Evidence Based ICT Policy and Regulation: eSkills. Research ICT Africa, 2008.

An index to measure e-skills (or digital literacy) is constructed and applied to data from nationally representative surveys in 17 African countries, including South Africa. The link between e-skills, education, employment, and other factors is explored.

South Africa Internet Usage and Marketing Report

<http://www.internetworldstats.com/af/za.htm>

YEAR	Users	Population	% Pen.	Usage Source
2000	2,400,000	43,690,000	5.5 %	ITU
2001	2,750,000	44,409,700	6.2 %	IWS
2002	3,100,000	45,129,400	6.8 %	ITU
2003	3,283,000	45,919,200	7.1 %	Wide World Worx
2004	3,523,000	47,556,900	7.4 %	<a href="#">Wide World Worx</a>
2005	3,600,000	48,861,805	7.4 %	<a href="#">Wide World Worx</a>
2008	4,590,000	43,786,115	10.5 %	<a href="#">W.W.W</a>

## Uganda

BuddeCom. *Uganda – Convergence, Broadband, and Internet Markets*.

<http://www.budde.com.au/Research/Uganda-Convergence-Broadband-and-Internet-Markets.html>.

Uganda was one of the first countries in sub-Saharan Africa to gain full Internet connectivity. Both fixed-line operators, Uganda Telecom and MTN Uganda offer a range of data services including ISDN, ADSL and local and international leased lines. Several Internet Service Providers are offering wireless broadband access. A new competition framework has liberalised VoIP Internet telephony, creating additional opportunities. The strong growth of the fixed-line networks in recent years and an explosion of the number of cybercafés have helped to increase Internet usage. Additional impetus is expected from the launch of 3G mobile broadband services.

BuddeCom. *Uganda – Key Statistics, Regulatory and Fixed-line Telecoms Overview*.

<http://www.budde.com.au/Research/Uganda-Key-Statistics-Regulatory-and-Fixed-Line-Telecoms-Overviews.html>.

Once referred to as the Pearl of Africa, then devastated by civil war, peace and radical economic reforms have transformed Uganda into one of the fastest-growing economies on the continent. The entry of a second national operator and

five mobile networks – MTN, Zain (Celtel), Uganda Telecom, Warid Telecom and Orange (HiTS Telecom) – has revolutionised the telecoms sector. A new simplified licensing regime has significantly reduced barriers to market entry and increased competition. All market segments are experiencing strong growth, although at around 25%, total teledensity is still below the African average. Major initiatives have been launched to bring telecommunication services and the Internet to rural areas of the country, partly funded by the highly successful operators through a universal service fund.

BuddeCom. *Uganda – Mobile Market - Overview and Statistics*.

<http://www.budde.com.au/Research/Uganda-Mobile-Market-Overview-and-Statistics.html>.

The introduction of mobile telephony has revolutionised Uganda's telecommunications industry since Celtel (now Zain) launched the first network in 1995, followed by MTN in 1998, Uganda Telecom in 2001 and Warid Telecom in 2008. France Telecom's mobile unit Orange has bought a majority stake in the country's fifth mobile network, HiTS Telecom, and pledged to invest hundreds of millions of US\$. As early as 1999 Uganda became the first country on the continent where the number of mobile subscribers passed the number of fixed-line users, and the ratio is now more than 40:1. The market is consistently growing at between 50% and 100% p.a., while market penetration at around 25% is still below the African average. The recent introduction of third-generation (3G) services will enable the mobile operators to play a larger role in Internet service provision.

Ericsson and the Commonwealth Telecommunications Organization. *Assessment of m-content requirements in India and Uganda: Summary Report*. Stockholm: Ericsson AB, 2008.

This report presents key findings from a Commonwealth Telecommunications Organisation (CTO) study in India and Uganda of mobile phone users' preference regarding the content disseminated over the phones (m-content). It examines intentions to use, awareness of m-content, user satisfaction, and demand for SMS versus voice. It also discusses value for money, frequency of use, and the main drivers and barriers to services. The report tries to predict the future uptake of services and changes in the delivery of m-content in India and Uganda.

Gillwald, Alison, and Christoph Stork. *Towards Evidence Based ICT Policy and Regulation* Vol 1 Paper 2: ICT access and usage in Africa. ResearchICTAfrica, 2008.

Results of nationally representative surveys on ICTs, including fixed phone lines, mobile phones, public phones, and the Internet, are presented for 17 African countries, including Uganda. The data covers access and penetration, reasons for (non-)use, frequency of use, household expenditures, and willingness to pay.

Schmidt, Philipp, and Christoph Stork, *Towards Evidence Based ICT Policy and Regulation: eSkills*. Research ICT Africa, 2008.

An index to measure e-skills (or digital literacy) is constructed and applied to data from nationally representative surveys in 17 African countries, including Uganda. The link between e-skills, education, employment, and other factors is explored.

Uganda: Internet usage, broadband and telecommunications reports

<http://www.internetworldstats.com/af/ug.htm>

YEAR	Users	Population	% Pen.	GDP p.c.*	Usage Source
2000	40,000	24,400,000	0.1 %	US\$ 410	<a href="#">ITU</a>
2006	500,000	28,574,909	1.7 %	US\$ 280	<a href="#">ITU</a>
2007	750,000	30,262,610	2.5 %	US\$ 280	<a href="#">ITU</a>
2008	2,000,000	31,367,972	6.4 %	US\$ 300	<a href="#">ITU</a>

Note: Per capita GDP in US dollars

Source: United Nations Department of Economic and Social Affairs.

**B. *HIPNET member organizations that participated in interviews***

**Academy for Educational Development (AED):**

**Hygiene Improvement Project (HIP)**

1825 Connecticut Ave, NW

Washington D.C. 20009

[www.aed.org](http://www.aed.org)

**Analysis, Information Management & Communications Activity (AIM)**

655 15th Street NW, Suite 450

Washington, DC 20005

**Association of Reproductive Health Professionals (ARHP)**

1901 L Street, NW Suite 300

Washington, DC 20036

[www.arhp.org](http://www.arhp.org)

**CARE**

151 Ellis Street NE

Atlanta GA 30303

[www.care.org](http://www.care.org)

**CORE Group**

1100 G St NW Suite 400

Washington DC 20005

[www.coregroup.org](http://www.coregroup.org)

**DELIVER**

John Snow, Inc.

1616 Fort Myer Drive, 11th Floor

Arlington, VA 22209

<http://deliver.jsi.com>

**EngenderHealth**

440 Ninth Avenue

New York, NY 10001

[www.engenderhealth.org](http://www.engenderhealth.org)

**Extending Service Delivery Project (ESD)**

Pathfinder International

1201 Connecticut Ave. NW Suite 700

Washington DC 20036

[www.esdproj.org](http://www.esdproj.org)

**Family Health International**

PO Box 13950

Research Triangle Park, NC 27709 USA

[www.fhi.org](http://www.fhi.org)

**Futures Group International**

One Thomas Circle NW, Suite 200

Washington, DC 20005

[www.futuresgroup.com](http://www.futuresgroup.com)

**IntraHealth International**

6340 Quadrangle Drive, Suite 200

Chapel Hill, North Carolina 27517

[www.intrahealth.org](http://www.intrahealth.org)

**Institute for Reproductive Health**

Georgetown University

4301 Connecticut Avenue, NW, Suite 310

Washington, DC 20008

[www.irh.org/](http://www.irh.org/)

**Infant and Young Child Nutrition (IYCN) Project**

PATH

1800 K Street, NW, Suite 800

Washington, DC 20006

[www.iycn.org](http://www.iycn.org)

**MEASURE DHS**

Macro International Inc.

11785 Beltsville Dr., Suite 300

Calverton, MD 20705, USA

[www.measuredhs.com](http://www.measuredhs.com)

**MEASURE Evaluation**

Carolina Population Center

University of North Carolina at Chapel Hill

[www.cpc.unc.edu/measure](http://www.cpc.unc.edu/measure)

**Management Sciences for Health (MSH)**

784 Memorial Drive

Cambridge, Massachusetts 02139

[www.msh.org](http://www.msh.org)

**Supply Chain Management System (SCMS)**

1616 N. Fort Myer Drive, 12th Floor

Arlington, VA 22209-3100 USA

[www.scms.pfscm.org](http://www.scms.pfscm.org)

## **C. Questionnaire for HIPNET interviews**

### **Audience**

- 1) Who is the audience for your KM products and activities?
  - Jobs/education/profl credentials
  - geographical location
  - rural/urban
  
- 2) What kinds of health information do you produce/disseminate?
  - Topics
  - Type
  - Purpose

### **Needs assessments**

- 3) Have you conducted a health information needs assessment of your audience?  
If yes – get description. What were the key findings?
  
- 4) If not, how do you decide what information products and KM activities would be most appropriate for your audience?

### **Knowledge sharing**

- 5) How do you keep in touch with your audience (especially people in the field)? What communication channels, tools, and technologies have you used to:
  - Disseminate information products
  - Facilitate knowledge sharing between audience members
  - Promote learning (any kind of training or professional development)

Which of these do you rely on the most? How successful has each one been in getting information into the hands of managers and frontline providers? What are their strengths and limitations?

#### **PROBE FOR**

- Print publications (distributed as hard copies or pdfs)
- CD-ROMs for publications, training courses, etc.
- Email: listservs, moderated discussion forums
- Web-based services: websites, portals, databases, forums, elearning
- Communities of practice
- Social networking and Web 2.0 tools: blogs, wikis, social networking sites (facebook and myspace), social bookmarking, You Tube, etc.
- Mobile devices: cell phones, smartphones, PDAs, laptops
- Face-to-face interaction at workshops, conferences, etc.
- Videoconferencing
- Other

6) How do you judge the success of your knowledge sharing efforts? (eg, informal feedback from audience members, stats on website use, formal surveys)

7) Which new technologies and tools do you think hold the most promise for disseminating health information? Is your organization exploring any of them?

8) Other lessons learned?

### **Knowledge networks**

9) What global, regional, and/or local knowledge networks does your organization and its staff participate in?

10) If the organization has local field offices -- to what extent do field offices belong to local knowledge networks? What do they do to promote knowledge sharing with local health managers and providers?

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