MOBILE PHONES IN HEALTH CARE IN UGANDA: THE APPLAB STUDY

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ABSTRACT
This study explores the preliminary lessons in the use of mobile phones to promote access to health care information in Uganda. The project under study is the AppLab Uganda Project which operates a Health Tips application, educating users on sexual and reproductive health. Data was collected through in-depth interviews with project developers, partners, medical practitioners and IT journalists and a survey of 149 people randomly selected from two tertiary educational institutions in Uganda. Findings tend to suggest that the need to access health information via mobile text messages is mediated by cost incentives, misconceptions of brand name ‘Google SMS’, and content relevance. There are questions concerning the appropriateness of text messaging as compared to using voice calls to access health information. These issues have implications on the objectives of the health care project and the individual strategies of project partners. Preliminary conclusions emphasize the need to integrate a referral system to registered health professionals and facilities and the need for education and/or a marketing strategy with an indigenous branding to address the misconception of the brand name ‘Google SMS’. Implications for research, policy, and practice are outlined.

Keywords: Mobile health, health care information, Uganda, Google

1. INTRODUCTION
The African continent is seen as the world's second-largest and second most-populous continent, after Asia. It covers 6% of the earth’s total surface area and 22% of the total land area, with a population of approximately one billion people accounting for 16% of the world’s total population (World fact book, 2009). With a massive increase in population in the continent, there is a need to find ways of improving accessibility and efficiency in healthcare services. The rapid increase in mobile telephone use in sub Saharan Africa has generated concerns among researchers about possible ways in which this innovation can be leveraged to increase healthcare accessibility and efficiency in the region (Meso, Musa, & Mbarika, 2005). Uganda, a landlocked country in East Africa, bordered by Kenya, South Sudan, Democratic Republic of Congo and Tanzania in the East, North, West and South respectively, has made tremendous progress in deploying mobile phones for health care benefits. It has a population of 32.7 million inhabitants of which 50% are between the ages of 15-64 and life expectancy of 53 years. More than 80% of the workforce is employed through the agriculture sector. However, Uganda’s service industry accounts for more than 50% of the nation’s gross domestic product (GDP). The landlocked country contains natural resources, including fertile soils, regular rainfall, copper, and gold.
Just as other countries in Sub Saharan Africa (SSA), Uganda confronts a number of health-related challenges and the health indicators are far from encouraging. The citizens are often plagued with infectious diseases such as, malaria, Hepatitis A, and typhoid fever, tuberculosis (WHO, 2009). The primary challenge is the lack of well-trained medical health professionals and facilities (Bossert & Beauvais, 2002). Many rural areas are without physicians especially specialists. On an average, most countries in SSA have less than 20 doctors per 100,000 people and a majority of new medical doctors and nurses seek for jobs in richer countries (WHO, 2006; WHO, 2008). Moreover, where accessibility to health care exists, affordability becomes another issue. In Uganda per capita spending in healthcare per year is only US$ 57 compared to US$ 287, US$ 250 and US$ 273 per capita, respectively in the United States, the European Union and Japan (WHO, 2008).

Second, sub-Saharan Africa's epidemics vary significantly from country to country in both scale and scope. Recent statistics from International HIV and AIDS charity (Avert) working to avert HIV and AIDS worldwide suggest that diabetes and HIV seem to be the overriding health problem in this sub Saharan African region of the world. An estimated 1.9 million people were newly infected with HIV in sub-Saharan Africa in 2007. In total, 22 million people are living with HIV in the region, which is two thirds (67%) of the global population of people with HIV (AVERT, 2008). Another killer disease that is plaguing SSA is malaria. Approximately 60% of the population of SSA live in endemic areas and are at risk for malaria. About 9 out of 10 of malaria deaths occur in sub-Saharan Africa, the majority being children. Further, the World Health Organization (WHO) estimates that in every 30 seconds a child dies of malaria in Africa (WHO, 2009). The socio-economic impact of this situation is felt across sectors of activities – agriculture, education, industry, transport, and human resources. Uganda has a significant need for access to health care and more efficient utilization of their health care professionals. This will help address a numbers of primary diseases (malaria, typhoid, cancers, fever and diarrhea) that comprise 80% of the illnesses diagnosed in their clinics (AVERT, 2008). These are diseases that can be easily diagnosed and treated with conventional medicines.

Telemedicine has been proposed as a practical approach that offers a set of new and innovative health solutions applicable to resource-poor environments like Uganda (Kifle et al., 2006). Telemedicine is defined as the use of telecommunication and information technology to provide health care to people who are separated by geography and distance from the provider. In these resource-poor settings, the approach is to examine how low-cost, low-tech and more accessible technologies like mobile phones can be used to enhance efforts in a preventive approach to healthcare. Such technologies underpin opportunities for health education and monitoring patient compliance. Telemedicine opens a new avenue to address and fill the existing gap. Telemedicine however encompasses several technologies ranging from video conferencing, transmission of computed tomography (CT) images and computer-assisted or Web-based provider-patient communication systems (Kaplan, 2006). The difference uses of mobile phones have also accounted for repertoire of telemedicine with regards to the delivery of health care and sharing of medical knowledge over a distance using telecommunications.

2. **Health Care Delivery in Uganda**

The healthcare delivery system in Uganda is made up of seven different levels. Health Centers, which are categorized into levels I to IV, and covers geographic areas ranging from villages to counties, with varying level of population coverage (1,000 for level I to 100,000 for level IV). Their roles also differ, from Heath Center I, focusing on prevention and health education to Health Center IV, which cover prevention, cure, rehabilitation, and emergency surgeries. The next level is District Health Services, which typically covers a population of
500,000. Regional Referral Hospitals typically cover 2 Million people, providing select specialty care and outreach services, in addition to the functions provided by the institutions previously mentioned. National Referral Hospitals, which cover 27 Million people, provides comprehensive specialty care, research and training, in addition to other roles (Markle, 2007). This unique nature of the Health delivery system in Uganda coupled with a relatively smaller population density as compared to other African countries paradoxically requires a fairly low technology approach to remote training and yet the technology is inadequate for the task. Uganda’s access is severely limited by nearly nonexistent infrastructure, unmanageable travel to clinics, and relatively high cost of health care services. Currently, the cost of consultation consumes about 15 to 20% of an individual’s average monthly income (Ministry of Health Uganda, 2010). These impediments push people to wait for treatment, allowing their disease to advance to a stage that is harder to diagnose, more difficult to treat, and too often fatal.

With these resource challenges, a preventive approach to healthcare in sub-Saharan Africa using mobile phones cannot be over emphasized. However, health education, which plays a crucial role in the prevention of many diseases, is often ineffective or nonexistent. Mobile phones are the most prevalent ICT in the developing world, and the penetration rate is rising rapidly (Kaplan, 2006). Also relevant is the fact that mobile phone ownership is increasingly more common in the lower socio-economic segments of society (Samrajiva & Zainudeen, 2008). Statistics from the International Telecommunication Union (2008a) suggest that mobile cellular subscriptions in Uganda have increased tremendously, outpacing the slight increase in Internet subscriptions, while fixed telephone lines and fixed broadband subscriptions have remained nearly flat as seen in table 1.

<table>
<thead>
<tr>
<th>Service Providers</th>
<th>Number</th>
<th>Communication</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Telephone Operators</td>
<td>2</td>
<td>Fixed phone lines</td>
<td>162,300 (0.53% of the population)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Telephone subscribers</td>
<td>4.35 million (14.11% of the population)</td>
</tr>
<tr>
<td>National Postal Operators</td>
<td>1</td>
<td>Pay phone</td>
<td>10,925</td>
</tr>
<tr>
<td>Mobile Telephone Operators</td>
<td>22</td>
<td>Mobile Cellular Subscribers</td>
<td>8.2 million</td>
</tr>
</tbody>
</table>

Source: ITU, 2008a

Despite the fact that mobile phone penetration rates are on the rise in SSA, the growth within countries is not generally evenly distributed. In Uganda, for example, while mobile penetration rates have increased markedly, the greatest growth rates are found in urban areas (Murthy, 2011, Maranto & Phang, 2010). It is estimated that, mobile phone subscriptions in Uganda have increased by 1700 percent between 2002 and 2008. The total number of mobile phone subscribers rose to 8.2 million by the end of 2008; the mobile phone subscriptions per 100 inhabitants in 2002 was 1.51, and that of 2008 was 27.2 (ITU, 2008b). However, there is still a huge urban-rural divide in terms of ownership and use of mobile devices. Mobile penetration in 2010 in the central region of Uganda was 67% in urban areas and 36% in rural areas, it the Northern region it was 70% in the Urban areas and 42% in the rural areas and the western regions had a 64% penetration rate in urban areas as opposed to 37% in the rural areas (Murthy, 2011). While mobile phones may have the potential to provide greater healthcare access to a larger portion of a population, there are certainly within country equity issues to consider as well. This unprecedented global diffusion of mobile phones in SSA has
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sparked debates on how these countries can effectively harness this innovation for development (Heeks and Jagun, 2008). It has been argued that mobile phones have a multi-stranded impact on the poor and hence there is a need for a more comprehensive approach to conceptualize the link between mobiles and development (Duncome and Boateng, 2009; Boateng, 2010).

This study therefore examines case study evidence to support the proposition that mobile phones and mobile SMS could be an effective healthcare intervention in Uganda. We seek to explore the preliminary lessons in the use of mobile phones to promote access to health care information in Uganda. The project under review is the Application Laboratory (AppLab) Uganda Project. The Application Laboratory is an initiative of the Grameen Foundation. Grameen Foundation, Google, and MTN Uganda have been working together since September 2007 to establish the physical, human, and technological infrastructure needed to support the initiative. In Uganda, the AppLab runs The Health Tips Application which educates users by answering common questions about sexual and reproductive health. It provides users with timely, trusted, accurate, and actionable information. The application also provides information on sexual and reproductive topics relevant to adolescents, such as body changes and sexual abstinence. The project completed its pilot phase in 2009 and has since been rolled-out nationally. This study explores the impact or ‘potential impact’ of the Health care Tips Application in health care in Uganda. It details the health care outcomes and challenges in deploying and managing the application in the developing country. The underpinning research question of this study is, how can mobile phones be used to support health care activities and what is the potential impact?

Several authors have opined that Mobile phones can be used to improve delivery of healthcare services (Kaplan, 2006., Mapham, 2008., and Idowu et al, 2003), provide access to relevant information (Kifle, 2007) and strengthen social support, and can serve as tools for research, monitoring and evaluation (Mapham, 2008) in developing countries. Haynes et al. (1996) found that communication efforts which keep the patient engaged in health care may be the simplest and most cost-effective strategy for improving adherence to chronic medication. Kwok et al, (2006) determined the effectiveness of a text messaging reminder in improving attendance in primary care using a multicenter three-arm randomized controlled trial with seven primary care clinics in Malaysia. They concluded that Text messaging reminder system was effective in improving attendance rate in primary care. Kaplan (2006) in his attempt, sampled evidence from a systematic literature review of published articles on mobile phones in healthcare to support the idea that fixed and mobile telephones is, or could be, an effective healthcare intervention in developing countries. He found compelling evidence regarding the overall cost-effectiveness and use of mobile phone in health education, scheduling doctors’ appointments and text message reminders in developing regions. Today, mobile phones can be used in a series of modalities to facilitate health care delivery and training. There can be used to provide appointment reminders, make free emergency calls, create treatment adherence systems, record patient diaries, conduct risk assessments, provide information and even conduct research (Mapham, 2008). This article reviews some of the many benefits and functions associated with mobile phone use and health management looking at the AppLab Uganda Project.

3. RESEARCH METHODS

The study used a mixed methods approach. First, a case study approach to document AppLab project and develop an in-depth understanding of the usage and impact of Google SMS Health Tips Application (GSHTA) among a cross-section of users was employed. Data was obtained through 13 semi-structured interviews with the project manager of the AppLab project; two personnel of the MTN Village Phone project; the content manager of Straight...
Talk, a local content developer for the project; and nine users comprising of three students, two lecturers, two information technology (IT) journalists, one IT manager and one medical doctor. A focused group discussion was also conducted with six of the users and the project manager of the AppLab project. The objective of the focus group was to create a forum for discussing the project objectives and user perceptions and experiences. Interviews were recorded, transcribed and coded into themes to develop constructs explaining the usage and impact of GSHTA.

Second, in a follow-up to the case study, a survey was conducted to investigate the usage and impact of GSHTA on a larger population of potential users. The potential users were randomly selected from the campuses of two leading tertiary educational institutions in Kampala, Uganda. Educational institutions were selected as an appropriate site for study since GSHTA was primarily targeted to young adults. The 20 item questionnaire was administered to 149 users. The response rate was a minimum of 91 percent across all the questions on the questionnaire. The questionnaire was structured in four parts: the demographics, mobile phone usage behavior, mobile functions usage and awareness and usage of GSHTA. Data was analyzed through a descriptive statistics – frequencies and cross-tabulations – to develop understanding mobile phone usage behavior of users and usage and impact of GSHTA.

4. **AppLab Uganda’s Health Care Applications**

The AppLab Initiative was officially launched in Uganda on June 29, 2009. AppLab Uganda is made possible through collaboration between Grameen Foundation, Google and MTN Uganda. This partnership, established in September 2007, taps into the core expertise of each organization. The Grameen Foundation has extensive experience using technology as an enabler for building sustainable and scalable business models designed to improve the lives and livelihoods of the poor. This foundation with footprints in almost 33 nations has been able to harness ICTs for development in areas of health, agriculture and microfinance. The Grameen foundation has recorded significant progress in India since 2000 by advancing access to microfinance and technology in the underserved and unserved regions of the country. They have focused on educating microfinance institution leaders about the long-term strategic value of information systems, training their staff to successfully align information technology with their business operations, and building a network of locally-based technology providers and a worldwide online community to support these institutions (Schreiner, 2006). In Indonesia the Grameen foundation also launched an AppLab initiative to explore the expanded capabilities offered by 3G technologies which can provide a wider array of healthcare services than more basic technologies (Heim, 2007). In 2009, the Grameen Foundation launched an initiative to determine how best to use mobile phones to increase the quantity and quality of antenatal and neonatal care in rural Ghana called the Mobile Technology for Community Health (MoTeCH) initiative (Michael, 2009). Google is the worldwide leader in search technology, organizing the world's information and making it accessible. MTN operates the platform of Village Phone Operators and Shared Phone Operators in Uganda a unique distribution channel for reaching underserved markets, as well as the communication infrastructure serving the whole country.

AppLab Uganda provides a service known as Google SMS. Google SMS is a group of mobile applications that allow users to access information services. Google SMS facilitates two applications namely; Information Tips Application and General Web Search and Google Trader in Uganda. The information tips application allows users to simply text message a search query to the number 6001, and the application will reply the message with the results. Users can use this SMS application to obtain information tips on health care, agriculture and the weather. The General web search application enable users to search for anything on the
worldwide web through Google SMS. User’s text queries to the number 6007. The Google Trader application is a trading platform where users can buy and sell goods and services through SMS. Users register, make submissions and query the trading platform by texting to the number 6006. In Uganda, Google SMS services are exclusive to MTN mobile subscribers. Google SMS is currently free from Google but charges from the MTN for usage apply to the general search and Google Trader application. Text queries to the Information Tips application (6001) were free till December 2010.

This study is focused to explore the impact and the potential impact of health care tip application in health care in Uganda. Google SMS Health Tips and Google SMS Clinic Finder enable users to find information on sexual and reproductive health care and to locate health care facilities in Uganda respectively. Uganda has a high demand for information on HIV/AIDS, sexually transmitted infections, and reproductive health. Uganda's Ministry of Health estimates the adult prevalence of HIV/AIDS (15-49 years) in 2005 was 7.0% (Uganda HIV/AIDS Sero-Behavioral Survey, May 2005). The accuracy of information sexual and reproductive health care is essential to dispel local myths and help them make informed decisions. The Health Tips Application, primarily targeted at young adults, educates users by answering common questions about sexual and reproductive health. It is aimed that the information provided should be timely, accurate and actionable. For example, users can text “Health pregnancy” to learn what to do if you are pregnant and how to prepare for a safe labor.

The Clinic Finder offers a directory providing details of local clinics, including the types of services offered as well as the hours of operation. This searchable directory makes it easier for users to find appropriate medical assistance. For example, users can text “Clinic Kampala” to locate health facilities in Kampala. The application also enables patients to find answers to questions that arise after treatment. The content for the health care tips application is provided through two local partners; Marie Stopes Foundation Uganda and Straight Talk. Marie Stopes Foundation Uganda is a leader in Sexual and Reproductive Health and provides content for the Health Tips and Clinic Finder Service. Straight Talk is a leader in health communication in Uganda and provides content for the Health Tips and Clinic Finder Service.

A pilot study was carried out for GSHTA within the months of June to December 2009. Over the six months period, the code 6001 received 2,426,298 retrievals from 654,442 unique users. However, these statistics comprise enquiries on health care tips, agriculture tips and weather tips. The project manager intimated that, in reference to non-disclosure policies, none of the partners has access to sufficient information to develop a profile for a potential user. Hence, MTN has statistics on hits to a particular service – 6001; however, it has no statistics on the content of queries made by users. Google, alternatively, has statistics on the content of the queries made from the service but no information on the unique mobile number initiating a query. Occasionally, Google presents a summary report on the content of queries received to MTN and the local content providers. This information is used to improve the content provided through GSHTA. Within this period of the pilot study all the services provided to the three Google SMS applications [6001, 6006 and 6007] were free. In January 2011, a fee was introduced for the Google Trader [6007]. The introduction of the fee initiated a loss in the patronage of Google Trader service and led to a ripple effect across the two other applications. Between January to June (6th), the code 6001 received 1,123,349 numbers of retrievals from 504,190 unique users.
Figure 1 Number of retrievals to Google SMS Applications


5. **How Mobile Phones Support Health Care**

The above model proposes that mobile phones can be used to support preventive and curative health care activities. Preventive health care activities cover health education and promotion to prevent the occurrence of illness or curb and control the outbreak of illness. Curative care activities cover treatment and post-treatment activities. Curative care also includes information and communication strategies which will inform decisions for urgent care (for example, first aid) and enhance compliance to medical regimens and recommendations. We conceptualize mobile phones in this study to have two effects – incremental and transformative – on compliance intervention strategies. *Incremental effects*
characterize the effects from using mobile phones to enhance current preventive and curative health care activities. For example, mobile phones may enhance activities such as telephone education, such as the use of Google SMS to enhance teaching and learning, evident in the AppLap Case. Mobile phones also facilitate communication and interaction, offering new modes of delivery, and generally transforming teaching and learning processes (Kenny, 2009. Motlik, 2008). There can also be used in scheduling Doctor’s appointments, and receiving appointment reminders through text messages (kwok et al, 2006). However with the case of the GSHTA mobile phones are primarily used to educate and provide information to access health facilities.

Transformative effects characterize effects from using mobile phones to create something new – new forms of compliance intervention strategies. Transformative effects may include developing new mobile-driven multimedia education strategies, goals and means to change the schemes of thought. For example, “Text to Change,”- is a health non-profit organization running a project in Uganda, where the focus is on HIV/AIDs education as well as the promotion of HIV Counseling and Testing (HCT) services (Text To Change, 2008). In a six week pilot project targeted at 15,000 participants, a total of 255 participants came for HCT services and the response rate for the pilot quiz was on average 17.4% per question. The mobile-enabled HIV/AIDs education contributed to behavior to access HCT services among 255 participants. These examples demonstrate the transformative effects mobile phones may have on health care activities. Based on the model the underpinning research question of this study is:

How can mobile phones be used to support health care activities and what is the potential impact?

5.1 Findings from Focus-Group Discussion and Interviews
Six key issues were discussed in the focus group discussion and interviews. These issues cover misconceptions of the application’s brand name; edutainment features; content errors and local language translations; collaboration with networks of health care professionals; potential cost of GSHTA; and user feedback. The issues are briefly presented with feedback and answers from the AppLab project manager and content manager of Straight Talk.

5.1.1 Misconceptions of the Application’ Brand name “Google SMS”
Two students commented that there is a misconception associated with brand name of the application. One of the students explained that, “most people associate Google with the Internet, hence, the name Google SMS, tends to imply that you need mobile Internet on the mobile phone in order to access it”. Another student also expressed concern that, using a local name – an indigenous Uganda word – to characterize the set of Google SMS applications could create a social connotation to services and therefore enhance adoption.

In response, the project manager of the AppLab Project explained that, concerning the brand name, though Uganda is the first country in Africa where this set of Google SMS applications has been deployed, Google has plans to extend implementation to other countries in Africa. Further, the applications which are currently exclusive to the MTN network will be made accessible to other mobile networks in Uganda and beyond. It was therefore necessary to keep a unique identity for the product vis-a-vie the long term plans. These long term plans coupled with a primary role Google as a critical partner in the project contributed to the choice of the brand name. The content manager of Straight Talk also attested to these comments of the AppLab Project manager.
5.1.2 Lack of an Edutainment Feature
A medical doctor interviewed questioned that, considering the demographics of target users being predominantly young adults, it was necessary to introduce an edutainment feature like quizzes or a reward system like airtime, to sustain the interest of young adults and adolescents. The doctor argued that young adults have short attention spans and edutainment features could increase or sustain their interest in GSHTA.

An IT manager related this suggestion to the model used by the Text to Change in their health campaign. Text to Change used both quizzes and airtime as a reward system to promote HIV/AIDS education. Users were referred to a hospital which led to an increase in participants accessing HIV Counseling and Testing (HCT) services. Reward systems may be considered necessary especially when the service becomes a paid service.

In response the content manager of Straight Talk, argued that, the project will fail to reach the users who actually need the information when a reward system is added. She emphasized that people should not be compelled or coerced to seek for information which will be of benefit to them, especially with health care. They should be made to understand the value of the information and why the information was beneficial to them. Encouraging behavior change in health care should stem from understanding need for change or compliance to medical regimens and the consequence of non-compliance.

5.1.3 Content Relevance and Local Language Translations
An information technologist journalist also pointed out that the service often returned information which was not-relevant to the question asked. For example querying the system with terms which was both common to human health care and agriculture generates answers which were of irrelevant to either of them. A student also observed that, the system could accept queries in one local Uganda language ‘Luganda” however, the answers were returned in English. This was considered inconsistent and less useable to those who were not literate in English, but at least literate in Luganda.

In response the project manager of the AppLab Project, explained that, though the application had been launched, it was still being updated to produce more relevant content. He acknowledged the existence of these errors and the feedback was necessary to improve the functionality. Concerning the content translation into local languages, he intimated that, it was initially planned that medical content will be translated into local languages. However, the team faced a number of challenges regarding the plurality of languages in Uganda and the plurality of words used to explain diseases/illness in local languages. Thus, the universality of interpretations of medical terminologies in across different languages in Uganda was quite far-fetched. Coupled with the long term objectives of Google to deploy the applications across Africa, content translation was stopped.

5.1.4 Referrals to Health Institutions or Clinic
A lecturer commented that the service often returned information which was exceedingly generic. It was considered that a referral clinic or telephone number to a registered health professional should be added to answers to queries with respect to relevance. The objective is not to prescribe but refer users to the nearest clinic or health professional to obtain further information or help.

In response, the project manager of the AppLab Project explained that there is currently no agreement with registered health professionals or clinics to be used as referrals. He also added that, MTN has plans to add an interactive voice response (IVR) service to the application in the near future. This extension had been considered as they had received similar concerns from users preferring voice calls over text messages. The content manager of Straight Talk also discussed the challenge in the provision of detailed answers and the
maximum number of characters for an SMS text message. As of now, the answers to queries, has three parts: the answer to query, the content provider – be it Marie Stopes Foundation or Straight Talk – and a disclaimer stating ‘this are information only’. Hence, adding more information may need a compromise in the details in the answer provided. However, she acknowledged that the suggestion was worth exploring.

5.1.5 Cost or Potential Cost
Students interviewed expressed concern on the pricing of the service after December 2010 when a pricing model will be introduced. The students claimed it cost almost 3 US cents for one query on Google through mobile Internet. They discussed that the cost of using the service should not be more than the cost of using mobile Internet to query for the same information through Google. Further, since mobile phones have limited memory for storing text messages, the students also questioned whether they were going to be charged twice if the same queries were initiated by a unique mobile number.

In response, the project manager of the AppLab Project intimated that in order to remain competitive and to be sustainable, the service was going to be priced in consideration to the cost of alternative services like mobile Internet. However, he discussed that there currently no plan to address scenarios of identical queries from a unique mobile number. One of the lecturers suggested that a weekly report of queries could be emailed automatically to an email address associated to the mobile number to give users a record of their queries and answers. However, this solution has to address non-disclosure policies, since it may require one of the partners to know the complete profile of a user.

6. FINDINGS FROM THE SURVEY
A total of 149 respondents participated in the survey on their mobile usage behavior and their usage and impact of GSHTA. Students constitute 88 percent of respondents interviewed. The remaining respondents are made up of workers in managerial roles (6 percent), lecturers (4 percent) and medical doctors (2 percent). Concerning gender, 49 percent of the respondents are male and 51 percent female. The respondents primarily consist of young adults. 96 percent of the respondents are between 18 and 30 years and 4 percent are between 31 and 45 years. One person was below 18 years and one person between 46 and 60 years. The minimum educational level obtained or enrolled in by the respondents is tertiary. Concerning monthly income, 50 percent of the respondents claimed to be employed and earned a monthly income. 21 percent earned less than $100; 11 percent earned $100-$250; 10 percent earned $250-$500 and 8 percent earned $500-$1000. All respondents who earned less than $250 were students.

6.1 Mobile Phone Usage Behavior
A 100 percent of the respondents surveyed owned at least one mobile phone. 55 percent of them had recently acquired their mobile phones within the last five years. Mobile phones tend to be treated as a personal device. 65 percent of respondents own one mobile phone and deemed it “unnecessary” to have more than one. However, a number of these respondents owned mobile phones which use dual sim-cards (14%). Concerning mobile phone sharing practices, 31 percent of the respondents share their mobile phones. 53 percent of those who share their mobile phone have only one mobile phone. These respondents share their mobile phones with family and friends.

Concerning gender and mobile phone acquisition, males are more likely to purchase their own mobile phones and females usually receive mobile phones as a gift. 43 percent of males personally purchased their mobile phones, compared to 23 percent of females surveyed. On the other hand, 6 percent of males received their phone as a gift from a relative.
compared to 28 percent of the women surveyed. One student received her phone as a gift from her father in transition between secondary and tertiary education.

Of the various network providers available, 61 percent uses MTN and 24 percent use Warid. The 61 percent of the respondents who used MTN deem it “cheaper” than other providers. Among the other network providers are UTL, Zain, Orange, Safaricom, and Mango. Almost all of the respondents (93 percent) use Pay-as-you-go services while only 7 percent has a mobile phone contracts with their service providers. The prepaid users (96 percent) admitted that they purchase less than $10 of airtime on a weekly basis, the majority being male; 50 percent spend less than $2.5, the majority being female. Concerning the brands of mobile handsets, 74 percent use Nokia. According to one student respondent, “Nokia is a popular brand and is extremely user-friendly”. 7 percent of respondents use Samsung, while the rest span amongst Sony Ericsson, Motorola, Blackberry, Apple’s iPhone and handsets from local network operators.

6.2 Mobile Phone Functions
Concerning the usage of mobile phone functions, 89 percent of users utilize the voice call function. 97 percent use text messaging and 52 percent use the Internet function on their mobile phone. Some respondents shared that “these functions are easy ways to communicate with friends and family, and the mobile phone makes life more convenient”. Other functions used include the calculator, the alarm clock, picture messaging, and voice mail.

![Figure 3 Mobile Phones Functions Usage](image)

6.3 Source and Privacy of Health Care Information
57 percent of the respondents claimed to receive their current medical information from a health professional or medical doctor. These respondents attested that medical doctors provide professional health care information. A total of 15 percent receive medical information from familiar relations they trust, being their friends or family. One respondent shared that “my friends and family work in the hospital, and I can easily receive professional information from them”.

Moreover, 5 percent of respondents get medical information from the Internet. General responses were “I can find more information from the Internet”. Other respondents mentioned using media sources, as well as the bible, as their source for medical information. 75 percent of the respondents expressed concerns with privacy regarding their health information.
information. One respondent noted that “privacy is important. I do not want other people knowing my personal medical information”.

6.4 GSHTA Awareness and Usage
There is significant awareness of Google SMS Health Tips. 60 percent of 136 respondents claimed to have knowledge of Google SMS Health Tips. 52 percent [43 respondents] of those who know about it use it; primarily once a week. These 43 respondents constitute approximately 30 percent of respondents surveyed in the study. 62 percent of those who use GSHTA are male and 38 percent are female. Concerning preventive health care, 62 percent of GSHTA users use the service to obtain healthcare information when they are not ill. However, respondents had concerns about sharing information on the queries they made through the application. Hence, no data was collected on that. Concerning curative health care, only 50 percent of GSHTA users have used it while they were sick. Seventy-four percent of the users consider themselves to have better access to healthcare information, thus experiencing an incremental impact. These users also claimed to have gained new knowledge about illnesses/diseases through GSHTA, thus obtaining knowledge which empowered them to make better health care decisions. Further, we also examined the use or potential use of mobile phones for other health care activities. Out of 146 respondents, 60 percent claimed to have used mobile phones for scheduling and confirming health care appointments; 49 percent claimed to have used mobile phones to call or receive calls concerning post-treatment; and 59 percent considered GSHTA to be useful for urgent health care.

7. DISCUSSION AND CONCLUSION
There tends to be a promise for the use of mobile phones in health care in Uganda. First, we may argue from the findings that, while there is an appreciable awareness of GSHTA among students in tertiary educational institutions involved in the study, awareness does not tend to automatically lead to usage. This may be due to a number of contributory factors including the misconceptions about Google SMS being an Internet-enabled service and the potential cost involved maintaining a mobile phone subscription. In the focus group discussion, the misconception of the name was emphasized. A few other students questioned during the survey also iterated the association of Google SMS with the Internet. More education and/or a marketing strategy with an indigenous branding may be the starting point to address the misconception. Concerning the cost of maintaining a mobile phone subscription, the findings suggest that 65 percent of GSHTA users tend to either earn less than $100 a month or are unemployed. A majority of the users also tend to be male, who also seem to be earning more income than the female users. Hence, there is an issue of cost and another issue of gender differences in adoption, which may also be indirectly related to the monthly income and weekly mobile expenditure. Males were found to be more likely to purchase their own phones and also tend to have a higher weekly mobile expenditure as compared to females. Further, results from the pilot study point out that users are more likely to continue using GSHTA while it remains free. Measures to reduce the cost of GSHTA post-December 2010 will be highly critical and, more immediately encouraging usage among females is necessary.

Second, findings also suggest evidence in the use of GSHTA for both preventive and curative health care activities- at least 50 percent of users of GSHTA used it for these activities. Non-users also considered it to be useful for urgent health care. Despite this evidence, content relevance in relation to queries and the need go beyond generic information to more specific content including referrals to health care professionals or facilities, are key challenges which need to be addressed. The study suggested that student young adults tend to source for health care information primarily from health care professionals, and also from familial relations and the Internet. This finding has an implication on health care education.
and promotion strategies – there is a need to use current intervention strategies to create more access to health care professionals and facilities. In rich interpersonal contexts, as in Sub-Saharan countries, the patterns of communication tend to favor low individualism, high power distance and high collectivism (Hofstede, 1985). People in these countries are more likely to act as group members than individuals, and more comfortable to use something which is being used by the groups they are associated with or recommended by groups or person of authority. They also consider face-to-face interaction to be an essential part of communication and thus, interpersonal or social relationships are more likely to influence technology mediated communication. Technologies which tend to enhance the richness of communication and interaction will therefore be favored. This argument is iterated by the fact that, 60 percent of respondents claimed to have used mobile phones for scheduling and confirming health care appointments and 49 percent claimed to have used mobile phones to call or receive calls concerning post-treatment. In comparison, GSHTA users constitute only 30 percent of the respondents. We argue that, GSHTA should seek to interface their strategies with current mobile phone usage behavior. The content developers of GSHTA should include referrals to registered health care facilities and professionals; and perhaps, a statement to show the support of the Ministry of Health in Uganda in promotional and marketing materials may also improve confidence and encourage usage.

However, alongside benefits to improve on businesses and information access, mobile technology is also being harness for the benefit of public health in Uganda evident in the findings. This technology has change and will continue to change the lives of many indigents by proving relatively low cost health information access for preventive and curative measures. The results signify that the use of GSHTA is massively serving as a delivery tools for health education and training targeted towards healthcare providers and patients in Uganda.

Concerning policy and practice implications, we applaud this initiative by Google, MTN and Grameen Bank and other local partners, Straight Talk and Maries Stopes Foundation Uganda. The importance of this strategic partnership to manage this GSHTA is a promise for sustainability. Increasing access to health care information is a critical factor in promoting a preventive health care approach. We will encourage the platform to be opened to other mobile operators to increase adoption, where possible [even if it remains as an MTN service], subscribers on other mobile networks should be allowed to access the service at a fee competitive with alternative sources of information. There is also a need to collaborate with local networks of registered health care professionals and health care facilities in order to incorporate referral information in the content of answers to queries. Perhaps, the Ministry of Health in Uganda may be of considerable help in initiating these partnerships. Further, the project partners should create regular workshops or open forums where they meet different potential users and stakeholders to obtain feedback concerning the use of GSHTA and other Google SMS applications. This could be done both online and offline with an objective of educating and capturing user perceptions and experiences concerning the use of the service. Knowledge from these open forums will inform future marketing strategies and content development.

Using larger population, future research should test the strength of interrelationships between gender, type of queries, monthly income and mobile expenditure. This study focused on students in two educational institutions in Kampala, the capital city; different potential user groups and different communities should be also surveyed to compare the generalizability of findings from this study. This will offer an opportunity to test how other factors such as education levels, age, health status and community/city of residence (context) affect the use of mobile phones for preventive and curative health care activities. We argue that this study is nowhere exhaustive, but has generated fresh insights and new knowledge
which can inform future mobile health research, mobile health strategies and policy development.

8. REFERENCES


