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Case Studies in Mobile Phone-Based Health Promotion

CHAPTER OVERVIEW

Perhaps the newest type of technology-based approach for health promotion being used today is the mobile phone. Mobile phones can be very simple, with only voice capabilities for making and receiving telephone calls. However, mobile phones can also be highly sophisticated, allowing for calls, short message service (SMS, also known as text messaging), access to the Internet, and storage of files, photos, and music. Mobile phones are distinct from handheld computers and devices such as the Palm Pilot™ and others that allow for users to access word processing, accounting, databases, scheduling, address books, and other software features on a small handheld computer. Because of rapid evolution in handheld computing, we have seen the rise of "smart phones" (i.e., universal devices that incorporate all the features of a handheld computer and telephone). Given the current state of the field, the examples and considerations offered in this chapter allow the reader to consider program possibilities primarily using phones and smart phones. The advantages of using mobile phones are numerous: As with other technologies, they offer substantially greater reach to populations heretofore isolated from health promotion. In addition, they may offer new opportunities to bridge digital divides in access to technology. Unlike other technologies, they can offer constant access to users. Disadvantages of mobile phones include limited opportunities for extensive, detailed, and exhaustive messaging and education.

While some digital divide issues can be overcome using mobile devices, we still face challenges in inequitable access to the Internet and other advanced features on mobile phones. Let us consider these advantages and disadvantages in greater detail.

This chapter covers issues that are unique to the mobile phones for technology-based health promotion interventions. As with other chapters, we offer two case studies of health promotion using mobile phones. The first, called STop Smoking Over Mobile Phone, or STOMP, has strong evidence of effectiveness for smoking cessation. The second, called EpiSurveyor, is one of multiple efforts transpiring in developing country settings to improve the delivery of public health messages and services. We consider some challenges associated with mobile phone-based health promotion, and consider best practices that are related to the use of this modality including considerations for choosing a phone or mobile computer for your technology-based project and suggestions for what is feasible and shows promise with mobile computing. Of particular importance is the shift from using a technology that requires large equipment and a place to operate it to the ubiquitous and "always on" nature of the mobile phone. Another important consideration is the substantially expanded reach offered by mobile technologies. The chapter also includes key terms and additional resources.

CASE STUDIES OF STOMP AND EPISURVEYOR

Case Study: STop Smoking Over Mobile Phone— The STOMP Program

Introduction and Methods

The STOMP program was first developed and evaluated for efficacy in a randomized trial with over 1,700 smokers with mobile phones in New Zealand. Those in the intervention group received materials and information via text messages that were designed to promote smoking cessation. They were encouraged to set a quit date. Participants could text back information about their goals to quit, and, once a date for cessation was established, participants would receive five messages each day for the 5 days leading up to the quit date. On the quit day, participants received 1 month of free outgoing text messages. They were encouraged to communicate with all their friends and family members about their intentions to quit. This was designed to link them into existing networks to facilitate support. During the subsequent 4 weeks following the quit date, they continued to receive five messages each day (Rodgers et al., 2005).

STOMP recognized that smokers have strong cravings during cessation attempts, and organized the multiple messages and texting opportunities specifically as a distraction and to offer users something to do with their hands during their quit attempt. Other features of the program included "quit buddies" (i.e., people with similar characteristics and quit dates with whom the user could communicate); a library of strategies that users could access for tips on craving management; polls, sent to all intervention participants on a current topic; and quizzes on health and smoking issues.

At the end of the intensive text messaging period lasting 4 weeks after the quit date, messages tapered off to three per week for the remaining 5 months of the program. These messages focused on maintenance for those who had quit. Messages were tailored to individual user stages of quitting throughout the program.

Results

STOMP was shown to be successful; almost a third of those enrolled in the intervention quit compared to 13% in the control group (Rodgers et al., 2005). STOMP is licensed exclusively by HSAGlobal from the University of Auckland Clinical Trials Research Unit and is the first program to be supported by its HealthMessagingEngine (HME; http://www.hsaglobal.net/ node/63). The New Zealand government has branded the program nationally as "Txt2Quit" and offers the service through the national quit line. STOMP can be licensed in the United States through i.e. healthcare (www.iehealthcare.com) where it is branded as Kick Buts™. Current users of the program include The Quit Group, New Zealand's national quit line (www.txt2quit.co.nz), and TELUS as part of its corporate employee wellness program. As a result of working with The Quit Group and real-world user feedback, the licensed program has been modified somewhat to reduce the daily messages prior to the quit date and the daily messages during the 4 months following the quit date. The current program messaging plan is outlined in Table 8.1, reprinted from hsaglobal.net.

STOMP is now being tested in other countries, including Turkey, where it is being rolled out as part of a randomized trial to determine fidelity in replication (M. Ybarra, personal communication, September 25, 2009). The original program was developed with substantial community input from the Maori in New Zealand; Maori community members crafted messages that were culturally relevant and acceptable within their community (Rodgers et al., 2005). Thus, program replication requires adherence to a similar process of crafting messages with community input to ensure relevance and appropriateness. Figure 8.1 shows screenshots of the messages in the STOMP program along with an image of the back-end database that stores program messages and incoming text content from participants.

Case Study: EpiSurveyor—Expanding Program Evaluation and Delivery Through Handheld Computers

Introduction

Many of the programs showcased in this book consider the application of technology for direct-to-consumer programs on health. While these are certainly appropriate, and do underscore our ability to increase program reach, we have not yet considered programs for health promotion that target providers of care. Making provider tasks easier and increasing capacity to collect, store, and transfer data using handheld devices means there is substantial promise for increasing the reach of services beyond clinics to community settings, including rural settings where primary care may be severely limited.

Table 8.1 Message type, frequency, and tailoring used in the STOMP program

The STOMP Program				
The Program	*Stage*	*Period*	*Message Rate*	*Message Type*
	Prequit	14–1 Days Prior to Quitting	1–2 daily	Cessation
	Quit Day	1 day	3 on day	Cessation
	Intensive	Quit Day–4 Weeks	3 per day	Cessation
	Maintenance	Week 5–end	1 every 3 days	Cessation
Relapse	Relapse (Early or Late)	4 Weeks–After Quit Day Only	3 per day	Relapse
Craving and Slip-Ups	Anytime	Anytime	Up to 50	Craving/Slip-Up

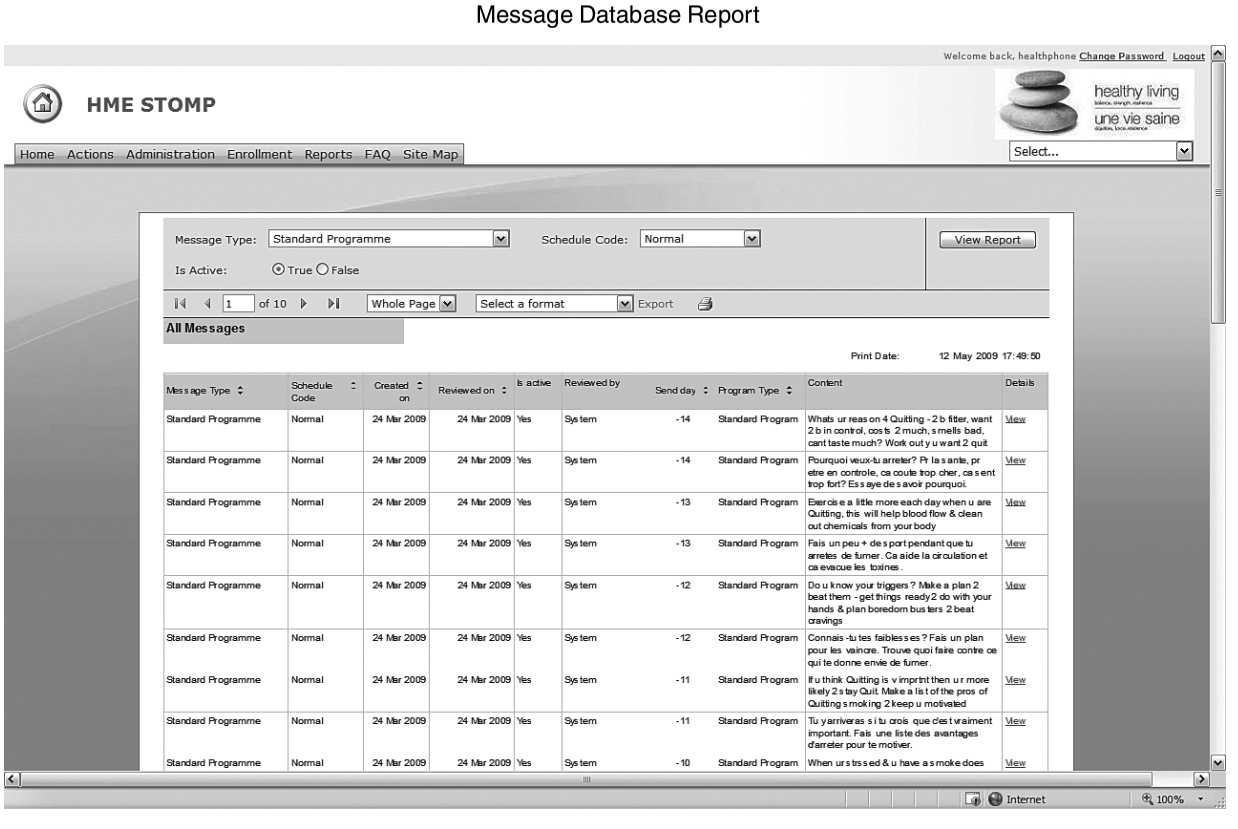
Source: HSAGlobal (2009).

EpiSurveyor is a simple and easy-to-use software program, designed initially for personal digital assistants (PDAs) and handheld computers such as the Palm Pilot™. As PDAs have gradually transformed into, and been replaced by, mobile phones, DataDyne (creator of EpiSurveyor) has now created a version of its software program that is compatible with mobile phones and with smart phones.

The primary goal of EpiSurveyor is to allow providers to collect important health information from patients and community members in rural and hard-to-reach areas that are remote and may lack electricity and/or other computing equipment. These data can be collected to inform and evaluate programs. Epidemiologic data are useful in understanding distribution and patterns of disease, although this approach can be limited when data are not available in hard-to-reach areas for lack of opportunity to carry and access desktop computers, databases, and electricity.

Providers using EpiSurveyor can easily create a survey online, transfer it to their phone, and then transfer it to their phone in order to administer the form in diverse field settings. A fundamental advantage of EpiSurveyor is the free access to the software that allows for simple database and

Figure 8.1 Screenshots of messages from STOMP



(Continued)

(Continued)

Example Text Messages

survey design by nonprogrammers; typically, using software programmers can be an expensive endeavor that is less accessible to persons in low-resource areas, particularly in developing country settings. As a result, people in these areas typically continue to rely on paper-and-pencil data collection; such an approach requires resources to copy surveys, transport them, and complete data entry after having completed forms by hand. By having a handheld computer device in the field, all of these steps are eliminated—surveys are stored on the handheld device, data can be uploaded via satellite or to a desktop or laptop computer as soon as one is available, and data entry occurs as the interview takes place, limiting chances of potentially problematic data entry errors.

The creators of EpiSurveyor consider that the tool has important potential for improving quality of care in resource-poor settings. They anticipate that persons who create a survey using the program could share it electronically and, in so doing, reduce the need for re-creating an entire new survey locally on the same topic. For example, if there can be a centralized database of surveys, practitioners interested in completing a needs assessment on maternal and child health could access this database rather than beginning from scratch to create a new tool. Furthermore, EpiSurveyor makes it easy to modify surveys, so you can adapt such a tool for local relevance, changing language and adding or deleting questions as needed.

Product Use

Figure 8.2 shows sample elements of the EpiSurveyor program, including information on how to develop and customize a survey. The process is similar to using Microsoft Office Access™ to create a database. Figure 8.2 shows screenshots from the finished product—how a survey would appear on paper and how it appears on a mobile phone device (Selanikio, 2010). Text Box 8.1 illustrates the steps involved in designing a handheld interface for data collection and data transfer.

EpiSurveyor has been used to improve the delivery of care through assessments and evaluations with organizations such as the Centers for Disease Control and Prevention, the American Red Cross, and the U.S. Army. EpiSurveyor has been used in many resource-poor settings such as Ghana and Sumatra, but is also currently used in the United States, Canada, and Europe. Since the online version (www.episurveyor.org) was introduced in July 2009, more than 1,400 users have registered and begun collecting data on mobile phones. By March 2010, more than 25,000 forms had been uploaded from phones to the EpiSurveyor website.

The creators of EpiSurveyor, DataDyne, say in their own words,

> By creating simple yet powerful software, making it affordable to all, actively disseminating it, and providing technical support, we can overcome the most important current barriers to a data-driven model of developing country public health. (Selanikio, 2010)

CHALLENGES IN STOMP AND EPISURVEYOR AND OTHER MOBILE PHONE-BASED PROGRAMS

Limited Opportunities for In-Depth Programs

With mobile phones one of the major drawbacks is the limited opportunity for going into depth with program content. Screen size of the device is usually very small, and larger screens, while

Figure 8.2 Examples of a questionnaire on paper and handheld device

Survey Name: AllNairobi
No of Questions: 4

1: **This is the AllNairobi Form (label)**

2: **Have you received malaria bed net (multi)**

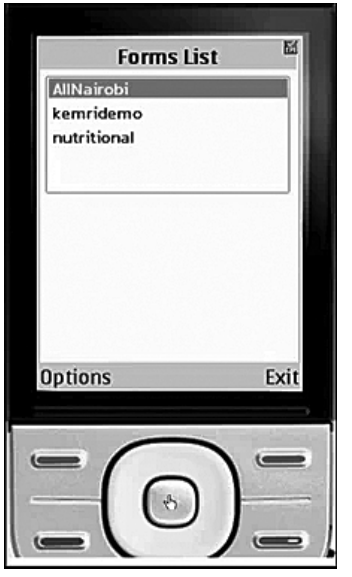
Data Field Name: Malarial
Possible responses:
- Yes
- No
- Dont Know

3. **How many have received bed net? (free)**

- Data Field Name: howmany

4. **Data (date)**

- Date Field Name: Date



appealing, limit the advantage of portability desired by consumers. With smaller screens it is difficult to communicate detailed content through text—having more text may mean smaller font, making things very difficult to read. Additionally, if considering a text messaging program, the limits to SMS in the United States are 160 characters, including spaces, so messages must be short. The ability to use a variety of content delivery strategies such as video, audio, and graphics can be limited because of the viewing space on the device.

Limited Access to Advanced Features of the Mobile Device

While an advantage offered by mobile devices is access to populations previously affected by the digital divide, there remain concerns that the types of features available on mobile phones, such as Internet and e-mail access, text messaging, and other nonvoice capabilities, are not accessible equally across socioeconomic groups. In the United States, the costs associated with data packages on mobile phones can be prohibitive—users have to pay for each incoming and outgoing call and text message or buy expensive packages to cover costs for unlimited text messaging and voice plans; access to the Internet to check e-mail or surf the web adds cost also. A recent report suggests that even when consumers have the capability to access e-mail and the Internet and use text messaging on their phone, they are not taking advantage of it—a survey of U.S. mobile phone users aged 13 and older showed that almost half (45%) of phone users preferred to use the device solely for voice communication and didn't take advantage of other nonvoice capabilities (Graham, 2009). It isn't clear whether the trends in computing that are historical and constant of smaller, more portable, and cheaper devices will translate into greater use of ubiquitous computing worldwide.

Device Sharing and Associated Lack of Confidentiality

Mobile phones are much easier to share with family and friends. This could actually be an advantage, particularly if you have a program that you are eager to disseminate to anyone and everyone. However, if your program participants need to meet specific eligibility criteria and if they are receiving content that is sensitive or personal, then you may be at a disadvantage using a mobile phone. Maintaining security on mobile phones will be a challenge—you cannot be completely sure that the person you are communicating with is indeed the person enrolled in your program.

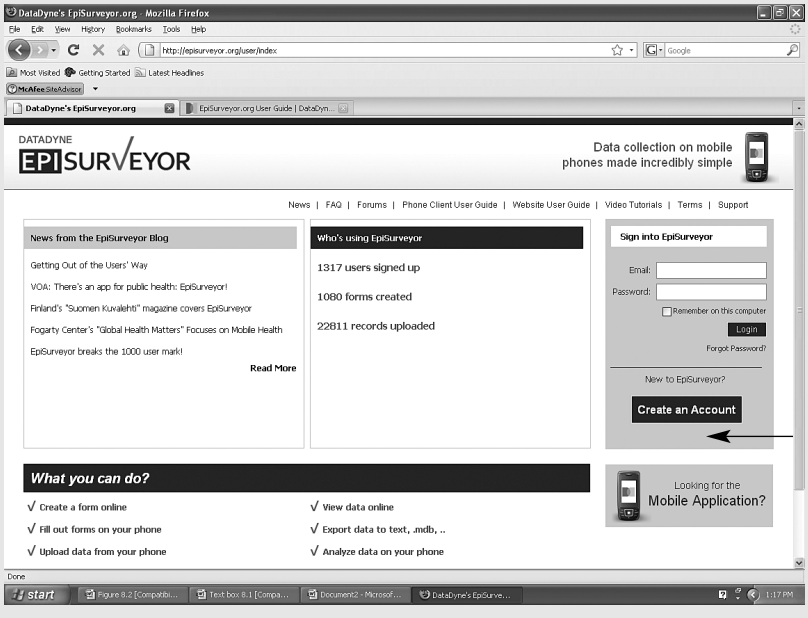
BEST PRACTICES EMPLOYED IN STOMP AND EPISURVEYOR AND OTHER MOBILE PHONE-BASED PROGRAMS

Reaching Audiences With Mobile Devices

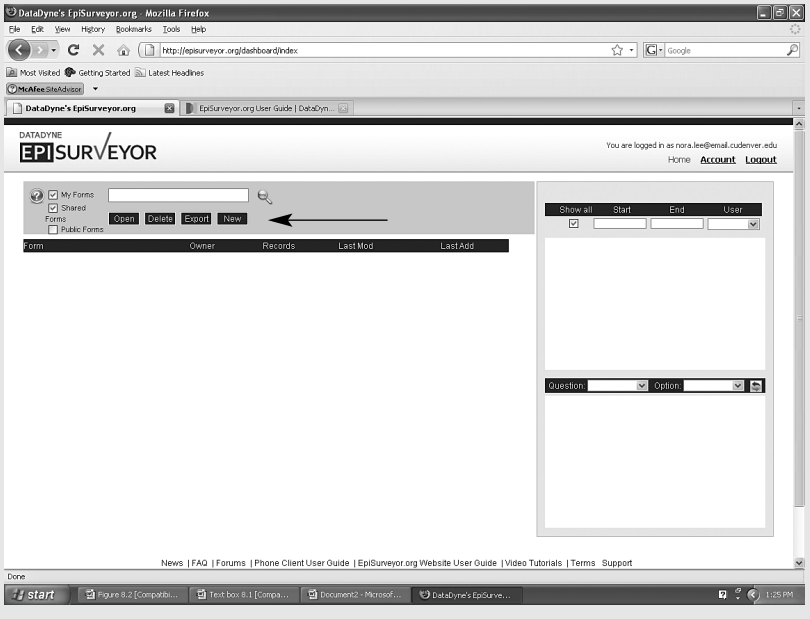
As with other modalities, one of the primary advantages of using mobile phones for health promotion is the potential to have greater reach with your programs to a much larger audience than would typically be seen for more traditional programs. Mobile phones continue to grow in popularity; in the United States, estimates are that 75% of adults have a cell phone and 62% use the device for activities such as text messaging, e-mail, taking pictures, recording video,

TEXT BOX 8.1

1. Register with the EpiSurveyor site, at http://episurveyor.org/user/ index, by clicking on "Create an Account" under "New to EpiSurveyor?":



2. Create a new survey in EpiSurveyor by clicking "New":



- Add these 5 parts:
  Label indicating the purpose of the form
  Date of interview (Make this a date question.)
  Number of children (Make this free input numeric, and required.)
  Number of people living in the house (Make this multiple choice.)
  Sex of respondent (Make this multiple choice [M or F], and radio.)

3. Install EpiSurveyor to your mobile device:
   - If the GPRS/EDGE/3G connection on your phone is not activated, activate according to user manual.
   - Go to http://www.episurveyor.org/m.
   - Select your phone make and model.
   - Follow the prompt to save the application; select the folder where you want to save the EpiSurveyor .jar file.
   - Once the download is complete, you can either (a) copy the EpiSurveyor installation file to the phone's memory card or (b) transfer the file via Bluetooth to the phone.
4. Download a form to your mobile device:
   - Go to "Forms List" and select "Options" and then "Get New Forms"; click on the form you want to download.
   - Collect data.
   - Basic analysis can be performed on the mobile device.
5. Transfer data from your mobile phone to the server (one or all unsent forms):
   - Highlight the form on the "Forms List" screen from which you want to send records.
     - Select the "Options" menu; highlight the "View Saved" menu option.
     - Sent records are marked with a check.
   - Check the boxes of all the records you want to send.
     - Press the "Options" button; scroll to "Send Data to Server."
     - Once records are sent, a confirmation message will appear.
     - At the top of the screen, you will see the form name, total number of records, and in parentheses how many records are unsent.
     - All data that have been sent are accessible for view and analysis by logging into the online account.
   - To go back to the "Forms List" screen press the "Options" button.
   - Scroll down to "Back" and press "Enter."

Source: http://datadyne.org/episurveyor/webguide; http://datadyne.org/episurveyor/phoneguide

and looking up information (Horrigan, 2008). In addition, there is evidence that populations previously disadvantaged by the digital divide have better access to mobile computers. For English-speaking Latinos and African Americans, use of mobile phones is equal to or surpasses that of White Americans and is almost universal among teens and young adults. Note, however, that these data are from surveys conducted in English—disparities in access to mobile phones remain in the United States for Spanish-speaking Latinos (Horrigan, 2008).

Other sources indicate that as many as 1 in 7 adults in the United States use only a mobile phone, and 20% have given up their landlines altogether (Harris Interactive, 2008). Industry trends on the use of smart phones show continuing increases in proportions of cell phone users who intend to purchase a smart phone as their next mobile device. There is a high degree of competition between the BlackBerry™ from Research in Motion (RIM), which

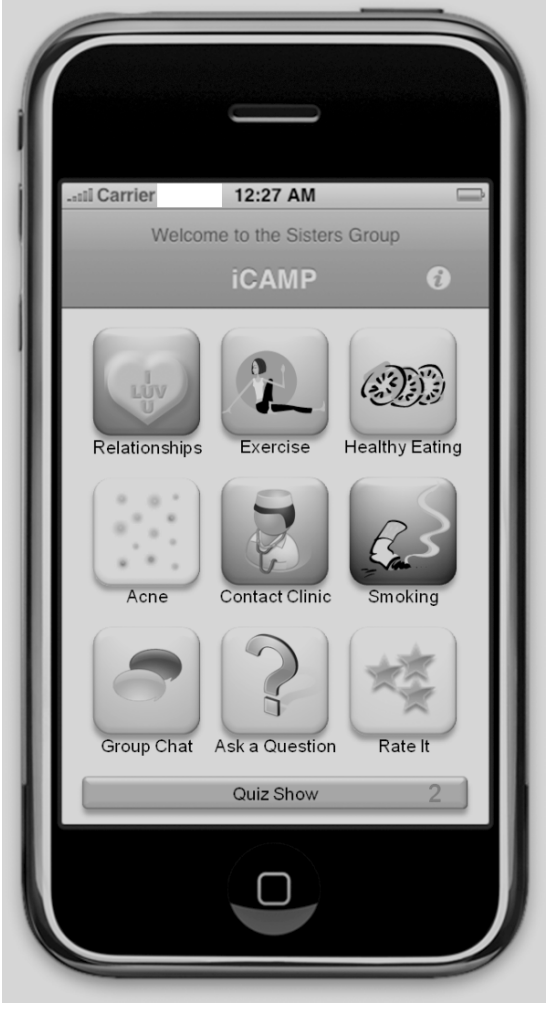
holds the highest market share, and the iPhone™ from Apple, with the second highest share. Data suggest that the iPhone™ will continue to grow in popularity as Apple continues to make the device more affordable—there are units available costing between $99 and $299 (Carton & Woods, 2009). Furthermore, Apple has developed a mechanism whereby independent computer programmers can create applications ("apps")—also called "widgets"—that are simple, easy-to-use programs that can be very lifestyle oriented. Widgets or apps can allow for such health-related activities as identifying the caloric and nutrition content of fast food meals, monitoring blood pressure, reminding users to take medications, accessing healthy recipes, and monitoring physical activity—and many are free to iPhone™ users or available for very low cost (e.g., 99¢). The introduction of these apps has meant that the iPhone™ has become the handheld device most used for accessing the Internet (M:Metrics, 2008). Google has developed the Android (Open Handset Alliance) program, which is a free, open-source platform for creating widgets and applications that can be run on smart phones. With Android (http://source.android.com/), the capability for applications and widgets can now extend beyond the iPhone™ to other smart phones. Figure 8.3 shows the screen of an iPhone™ and selected health applications. The user can touch any icon on the screen and be directed to the application.

Outside the United States, there has also been a proliferation of cell phone access and use. Reports indicate that as many as 60% of adults worldwide have signed up for mobile phone service or handsets (Daily Mail Reporter, 2009) and that there are as many as 3 billion mobile phone users globally (Ridley, 2007). Some suggest the promise of mobile technologies for health promotion in the developing world has surpassed the potential of computers, the Internet, and kiosks—the low cost, limited need for equipment, and wireless capability all point to portability and access that mean far greater reach than could be achieved with desktop or even laptop computing equipment (Selanikio & Donna, 2005).

Constant Access and "Always On" Features of the Mobile Device

Another opportunity programs take advantage of with mobile devices is their portability, making users much more accessible. Because people can carry and have access to their phones and handheld computers much more consistently than they can to their desktop or laptop computers, we as health professionals can have access to them more frequently. This becomes important when considering health promotion approaches that are time-sensitive—reminders to take medications, to make appointments, and to check blood pressure or blood sugar levels can all be delivered through text messages at predetermined times of the day and days of the week. It may be much more likely to reach people with a text message to remember their hypertension medication on their phone at 7 a.m. than via e-mail on the computer. The other advantage that portability lends is the ability to conduct health promotion in remote, hard-to-reach, or potentially dangerous areas. Collecting data for a program evaluation using a handheld device allows for the program evaluator to access more remote areas; it may also allow for access to areas where higher crime levels thwart attempts to carry obviously expensive computing equipment such as laptop computers.

Figure 8.3 The iPhone™ and opportunities for health-related applications



WHAT ARE EMERGING TRENDS IN MOBILE PHONE-BASED HEALTH PROMOTION?

Efforts to Incorporate Streaming Video and Other Smart Phone Applications

There is a growing interest in the use of smart phones for the delivery of content via cell phone. In particular, people are experimenting with the use of video delivery and delivery of data such as e-mail.

We face challenges in attempting to utilize smart phone features such as video and e-mail. In the United States, such phones are still expensive, often require a costly monthly service plan, and are not universally popular among cell phone users. It is critical to revisit the considerations for program development outlined in Chapter 3 in planning to utilize such features in your program. If your target audience doesn't access or utilize smart phones, then you may be making inappropriate plans to incorporate these features in your program. While the cost of phones and plans may diminish over time, we still do not have good evidence that smart phones and their advanced features are in use among the audiences we should reach with technology-based health promotion.

Linking Phones to Face-to-Face Clinic-Based Services

We are beginning to see strategies employed by clinics that can facilitate linkage to care via cell phones. Using phones to encourage patients to take medication has been employed with some promising success (Connelly, Faber, Rogers, Siek, & Toscos, 2006; Logan et al., 2007). Using cell phone text messages to remind patients of appointments or to advise them that test results are available is another approach with promise. As with computer kiosk and Internet programs, cell phones have ample promise for increasing clinic services outside clinic walls.

SUMMARY

We are in the very early stages of using mobile phones to deliver health promotion—either as stand-alone programs or to enhance existing programs. While we have yet to amass substantial data on the efficacy of this modality for health promotion, the field continues to yield important and compelling information that handheld devices have enormous potential.

As considered in other chapters, the decision to use mobile phones in your health promotion program should be based on a number of different factors. If you are working with a population that readily and consistently uses mobile phones, you may consider this ideal to reach larger numbers of your target audience. Consider carefully the program features you wish to provide; what mobile phones offer in terms of "always on" or ubiquitous computing may be diminished by an inability to deliver sophisticated or detailed content. If you seek to have a program that can be scaled up to different states or even countries, you should pay close attention to the hardware and wireless program components to ensure compatibility in technology across different settings. Finally, it may be shortsighted to consider the mobile device as a tool only for stand-alone health promotion efforts. Ultimately, the devices could be used to enhance existing programs by reinforcing messages users have received in a clinic setting, or reminding patients to take medications, or offering detailed directions on how and when to access services.

Table 8.2 offers definitions for terms you may come across in considering a promotion program using a mobile device. Below the table are some key concluding questions for this chapter.

Table 8.2 Key terms and definitions related to mobile phones

Term	*Definition*	*Additional Resources*
3G, or Third Generation	The term given to the newly emerging, faster wireless systems currently available on the market; the popular iPhone™ and BlackBerry Curve™ use the 3G system	http://www.itu.int/home/ imt.html
IMT 2000, or International Mobile Telecommunications	The term developed by the International Telecommunication Union and used to describe the systems intended to link all the newly developing wireless communication systems; systems can be linked through a combination of land-based wired technologies and satellites	http://www.itu.int/home/imt.html
Java Virtual Machine	Computer software that allows for a virtual machine to execute computer programs	http://en.wikipedia.org/wiki/Java_Virtual_Machine
NGN, or Next-Generation Networking	A name given to the anticipated advancements we will see in the coming 5–10 years in telecommunications and technology-based networks	http://en.wikipedia.org/wiki/Next_Generation_Networking
Open Systems	The name given to a system that allows for interoperability and portability of programs	http://en.wikipedia.org/wiki/Open_system_(computing)
WiMax	Worldwide Interoperability for Microwave Access; the wireless transmission of data across devices	http://en.wikipedia.org/wiki/WiMAX

? CONCLUDING QUESTIONS

1. Does your intended program audience use mobile phones or handheld computers?
2. Which is more commonly owned? How often is the device used?
3. If you intend to use a mobile phone, will you use your program to communicate via voice and/or SMS? Why? Do you have evidence that your intended audience has a preference for one over the other?

4. If using SMS, how will you develop program messages? How will you incorporate best practices for health promotion (e.g., use of theory for behavior change) into your SMS messages?

5. Will you incorporate other nonvoice elements into your program such as video or links to the Internet? If so, what do you know about the wireless connection capabilities of your users? If their device has the capacity to download videos and access the Internet, will they be willing to utilize their device to do this? Will they have to pay extra to do this?

6. How do you intend to collect evaluation data for your program? Can you use the mobile phone or handheld computer to collect data? If so, how will you program your data collection instruments to collect information feasibly via the handheld device?

7. How will you store and subsequently transmit your program evaluation data?

CHAPTER EXERCISE

We know from literature in health promotion that there are multiple theoretical factors that contribute to behavior change at the individual level. Several of these have been shown to consistently impact behaviors (see Chapter 1):

Outcome expectancies (also called positive outcome expectancies and negative outcome expectancies) are the outcomes that an individual anticipates will happen if he or she performs a given behavior. For example, if a person quits smoking, he can expect improved health in the long term and improved breath in the short term (positive outcome expectancies). He may also anticipate experiencing weight gain (negative outcome expectancy).

Norms are beliefs related to what peers "normally" believe, accept, or do. For example, individuals may believe that their peers consider consistent helmet use during bike riding to be important, and an individual may also believe that others like her will consistently use a helmet for bike riding.

Self-efficacy is the belief that an individual has that he or she has both the capacity (skill) to perform a behavior and the confidence to do it, even when circumstances make it challenging to do so. For example, a person can develop self-efficacy to avoid drinking sugary sodas by successfully practicing refusal and making substitutions.

Your task is to identify a behavior or behaviors that you would like to impact with your text messaging program. Design several messages (between three and five) that are crafted to address outcome expectancies, norms, and self-efficacy related to your selected behavior. Remember that your text messages cannot exceed 160 characters.

ADDITIONAL RESOURCES

The use of mobile phones is only beginning, and we anticipate that in the coming decade there will be substantial growth in this area. Of particular interest to observe in the coming decade will be the proliferation of use in developing country settings. The United Nations Foundation in conjunction with Vodafone has written a report on various programs in developing country settings that are

employing this technology for health promotion—they range from HIV prevention to tuberculosis treatment adherence to training health care providers (Baron & Ling, 2007; Vital Wave Consulting, 2009). As mentioned above, the STOMP program is being scaled up for use in multiple countries and across multiple populations, and we anticipate that this could be one of the earliest with data on effective dissemination strategies for mobile phone interventions (HSAGlobal, 2009). However, with such little evidence of intervention efficacy using these modalities, there remain few resources as of yet that can offer detailed information on best practices for health promotion for ubiquitous computing.

Websites

Resource	*Description*
http://www.hsaglobal.net/node/34	STOMP program
http://www.unfoundation.org/global-issues/technology/mhealth-report.html	United Nations Foundation report written in conjunction with Vodafone
http://www.unfoundation.org	United Nations Foundation website
http://www.vodafone.com/index.VF.html	Vodafone website

Note: All websites noted here are hot-linked at www.sagepub.com/bull; at this site you will also find newer resources relevant to the material in this and other chapters.

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