Sexual and Reproductive mHealth

Better Access to Health Care through Mobile phones

Geneva Foundation for Medical Education and Research

Johanna Nurmi

Table of Contents

1. Introduction

For decades, the use of media has been recognised as an important tool for improving health. In 1986, the World Health Organisation recommended conveying health information through interactive and audio-visual features. Today, mobile health (mHealth) is considered a key approach in achieving the goals of the United Nations' and WHO's Global Strategy for Women's and Children's Health, launched in 2010. (WHO, 2011.) mHealth is used and recommended by international bodies such as the International Telecommunication Union and WHO, who also have a partnership in mHealth to help combat noncommunicable diseases (WHO, 2012). Mobile phone use continues to rise rapidly in the whole world, especially in the low- and middle-income countries. Mobile networks and high-end mobile terminals are powerful enough to be used to access and store pertinent health information. (Veijalainen, Hara & Bisong, 2011.) This spread of new technology could be used to bring health services to populations that have had limited or no access to them until now (Olla & Tan, 2008).

Numerous sexual and reproductive mHealth projects are taking place all over the world. The use of mobile devices in this field can be considered to be promising, as sexual health is a taboo in most cultures and for the most vulnerable populations, health services are often out of reach. The possibility of finding information anonymously or in a discreet manner has the potential to enhance individual well-being and change harmful practices. The mobile phone is a relatively new phenomenon as a health-promotion tool, and the documentation that exists on the matter is from the last years. The goal of the literature review was to obtain an understanding of the existing evidence for the efficacy of mobile phones in sexual and reproductive health promotion and a scope of on-going projects.

The technique of this review consisted of finding and classifying relevant studies that have been conducted about mobile healthcare in the field of sexual and reproductive health. The method was a wide search in internet databases between September 2012 and November 2012 to collect relevant peer-reviewed articles. The key words that were used in the search were "mobile phones", "text messages", "mHealth" and various terms related to sexual and reproductive health. The reference lists of these articles were also searched through for related publications. The articles that were chosen were then divided into categories according to thematic areas that emerged from the material. In addition, the review consisted of annual reports, working papers, and presentations that shed light on the current situation in the field. The emerging mHealth services have not only

medical but also social psychological consequences: new possibilities for health communication and behaviour change support, and the change that a new technology brings to human communities.
This review is organised into three parts. First we take a brief look at the concepts of mHealth and sexual and reproductive health. This is followed by the presentation of research topics with some examples from each field. Finally we discuss topics that emerged from the presented research and that have an impact on mHealth project implementation.

2. What is mHealth?

Mobile health or mHealth encompasses the use of mobile telecommunication and multimedia technologies to support the achievement of health objectives (WHO, 2011; Tamrat & Kachnowski, 2012). mHealth is applied for instance in health promotion, emergency medical responses, point-of-care support, and data collection (Lund et al., 2012). On account of the immense increase of mobile phone coverage, mHealth is a health technology in strong progress as it is expanding rapidly with hundreds of projects currently being carried out, particularly in the low and middle-income countries. Mobile health is the first component of eHealth, the use of information and communication technologies for health, which reaches hard-to-access areas (WHO, 2011). What makes mHealth different from former health-related use of media, is its capacity for two-way communication and the possibility to send personalised messages directly to a high number of receivers.

mHealth solutions are apt for many environments as they often are straightforward and do not require extensive resources. Providing traditional birth attendants or village health workers with mobile phones makes it possible to, for instance, call for emergency care when needed, which can make emergency responses faster (Chib, 2010). Thus, the mere introduction of mobile devices brings about a possibility of saving lives. In practise, the devices might need to be supported with capacity building, contact network creation and sometimes also technical solutions, such as solar-powered chargers to enable a proper use.

One of the specificities of mHealth is SMS text messages, which have many advantages compared to other communication methods. As Atun & Gurol-Urganci remarked (2006), text messages can “disseminate information immediately, assure a certain level of confidentiality, confirmation of delivery, and cost little”. Text messages have a wide range of uses in interventions of prevention and maintenance, as well as research and data collection.

3. Sexual and Reproductive Health

> *Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes. Reproductive health therefore implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so. Implicit in this last condition are the right of men and women to be informed and to have access to safe, effective, affordable and acceptable methods of family planning of their choice, as well as other methods of their choice for regulation of fertility which are not against the law, and the right of access to appropriate health-care services that will enable women to go safely through pregnancy and childbirth and provide couples with the best chance of having a healthy infant. In line with the above definition of reproductive health, reproductive health care is defined as the constellation of methods, techniques and services that contribute to reproductive health and well-being by preventing and solving reproductive health problems. It also includes sexual health, the purpose of which is the enhancement of life and personal relations, and not merely counselling and care related to reproduction and sexually transmitted diseases.* (UNFPA, 1994, p.43.)

Sexual and reproductive health is crucial for human well-being. It is a prerequisite of the United Nations' Millennium Development Goals, particularly goal 5, which is improving maternal health by reducing maternal mortality and improving access to reproductive health (WHO, 2012). The challenges for sexual and reproductive health include HIV/AIDS and other sexually transmitted infections (STIs), unwanted pregnancies, unsafe abortion, infertility, gender-based violence including female genital mutilation, sexual dysfunction, discrimination on the basis of sexual orientation, and lack of knowledge and care in maternal and newborn health. The challenges are fought with means such as contraceptive technologies, provision of family planning services, knowledge dissemination and services for physical and psychological well-being. However, new tools are needed to achieve the Millennium Development Goals and to provide these services to an ever-encreasing number of people.

4. Research published about Sexual and Reproductive mHealth

In this chapter we present peer-reviewed studies that show the use, acceptance and effectiveness of mHealth in the field of sexual and reproductive health.

4.1 Attitudes toward mHealth

mHealth text-messaging is a widely accepted and well-liked means of sexual health communication (Cormick et al., 2012; Perry et al, 2012; Chang et al., 2011; Cornelius, 2009). Mobile phone interventions have been found to be an acceptable way of supporting many areas of sexual and reproductive health, such as antiretroviral adherence (Sidney et al., 2012), the prevention of sexually transmitted infections (Perry et al., 2012; Gold et al., 2011), and perinatal and postnatal care (Cormick et al., 2012).

A study in Argentina indicated that pregnant women showed interest in receiving information about perinatal and postnatal care through text messages (Cormick et al., 2012). Their low access to the internet made text messages a convenient tool for health communication. In the United States Perry et al. (2012) concluded that text messages are an efficient method for engaging adolescents into prevention of sexually transmitted diseases and noted that the participants who were 15-20 years old "appreciated the helpfulness, convenience, and relevance of a preventive sexual health text messaging resource". Positive feedback was found also in Australia by Gold et al. (2011), who stated that text messages "appear to be a feasible, popular, and effective method of sexual health promotion to young people". In their study Australian youth were sent information about sexual health issues. The intervention received positive feedback and had a relatively low withdrawal rate. Improvement in sexual health knowledge and STI testing occurred. Young people are also considered a pertinent target group for mobile interventions in the United States, because, according to Cornelius (2009), they consider mobile technology as a natural part of everyday life. The study found that African American adolescents were receptive to the idea of receiving messages about HIV/AIDS prevention. They saw texting as part of daily life and evaluated that they could accept up to three messages per day.

In a study by da Costa et al. (2012), Brazilian HIV/AIDS-infected women received text messages to encourage their antiretroviral therapy adherence. The experimental group's adherence differed significantly from the comparison condition. The participants experienced the messages as acts of care and affection and expressed satisfaction in the intervention. Sidney et al. (2012) studied the perceptions on preference, usefulness, potential

stigma and privacy concerns associated with weekly mobile phone reminders to help enhance adherence to antiretroviral therapy among adults with HIV in Bangalore India. It was found that the receivers appreciated the helpfulness of the reminders. The participants did not report experiencing any discomfort or stigma despite the fact that sometimes another person received their message. They preferred calls over text message reminders.

In conclusion, participation in mHealth interventions has been reported to be a positive experience and target populations show acceptance and interest in receiving these services. It is important to note that most of the studies have been conducted in societies where it is accepted for young people to make decisions about their sexual behaviour. The findings cannot be directly applied in countries with highly different social norms. Nevertheless, in the research for this review, no contradictory results were found.

4.2 Effectiveness of mHealth for providing better Sexual and Reproductive Care

A major part of the evidence for sexual and reproductive mHealth comes from the use of text messages as reminders: appoint reminders and treatment compliance support reminders to improve antiretroviral adherence.

4.2.1 Text messages as appointment reminders

Hasvold & Wootton (2011) conducted a systematic review that reported a clear improvement in the care attendance rate after sending reminders to patients prior to their appointment. The findings indicated that personal phone calls were slightly more effective than automated reminders but also more time consuming and expensive. The timing of the reminder did not appear to cause a difference in non-attendance rate, even if the reminder was sent the day before the appointment or the week before. On should note that 30 out of the 33 studies were carried out from Western countries; consequently the results cannot be directly applied in hard to reach areas. In resource-poor settings, questions such as transportation might need more planning; therefore the timing of the reminder has to be adapted to the local settings. Discussing the improved attendance rate and the savings brought about by the reminders, the authors suggest that “all hospitals should consider using automated reminders to reduce non-attendance at appointments.”

4.2.2 Treatment compliance support

Self-management and self-monitoring are crucial in many chronic conditions that are becoming more widespread around the globe (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). In sexual and reproductive health, the encouragement of self-monitoring has been considerably used for the antiretroviral adherence for HIV/AIDS management. In HIV/AIDS treatment, the antiretroviral therapy must be followed regularly. Dowshen, Kuhns, Johnson, Holoyda, & Garofalo (2012) indicated that self-reported adherence improved when HIV/AIDS-infected youth needed to answer with a text message after having taken the medication. Karanja et al. (2011) found that weekly text message reminders are more efficient than daily. This may be explained by self-regulation theories, considering that a weekly message can be experienced as being supportive of a person's engagement and self-efficacy, whereas a daily message may discourage developing an internal locus of control. This assumption needs examination.

Improved antiretroviral adherence after an mHealth intervention has been found with Brazilian women (da Costa et al., 2012) and in resource-limited settings in rural Kenya (Pop-Eleches et al., 2011). Text message support has also been questioned by Kelly & Giordano (2011), who underline the importance of social support that is brought by peer health workers and the fact that technology does not replace human contact. The visit of a community health worker has much wider consequences than mere treatment compliance support. However, in cases where human resources are inadequate, technology can extend the services. Social presence and personal relations may be experienced at least in some extent via technology (Tamminen, Raita, Lehtinen, Silfverberg & Ravaja, 2012).

In addition to antiretroviral adherence, mobile phones have improved treatment adherence and care-seeking in other areas of sexual and reproductive health. For instance in Thailand, a smart phone intervention significantly reduced the delay of antenatal care and immunisation visits. It was also reported to be well-integrated to the health care system. (Kaewkungwal et al., 2010.) An mHealth intervention also modestly improved the attendance of men to post-operative clinical visits after medical circumcision. Transport cost and low education level were seen as hindering factors. (Odeny et al., 2012.)

4.2.3 Cost-effectiveness

The core of mHealth is its capacity to provide affordable and time-saving solutions. Many populations living with or at high risk of HIV are deprived of adequate health care. Digital media has the potential to provide care and prevention cost-effectively (Chiasson, Hirshfield & Rietmeijer, 2010). An example of a relatively low-cost intervention is a toll-free hotline for family planning counselling. Travel expenses and time are saved when professionals counsel by phone. The only requirement from the participants is a mobile phone that is able to make calls. (Corker, 2010.)

A most cost-efficient intervention was conducted in a study in the United States for tracing the sexual partners of individuals diagnosed with a sexually transmitted infection. Mere knowledge of an upcoming reminder call made participants contact their sexual partners and prompt them to seek health care (Montesinos, Frisch, Greene & Hamilton, 1990). This shows the possible behavioural impact of a phone call program: simple awareness of being followed by a professional may have positive effects on health behaviour.

4.2.4 Communicating results

Mobile phones are used in many projects for communicating medical test results. In two states of the United States, nearly half of sexual health clinic attendees were pleased at the idea of receiving laboratory results electronically. These respondents preferred receiving both positive and negative results instead of only negative results. Considering this, the care providers would need to find a way to transmit information about the consequences and follow-up appointments when a positive test result is communicated. Young male participants expressed a higher acceptability of an electronic result service. This could be partly explained by women's lower mobile phone ownership in the target population. In addition, individuals with a lower level of education preferred text messages to e-mail. For regular contact the respondents wished to be called. (Tripathi et al., 2012.) These findings suggest that a prior evaluation of the target group is important to the success of the project.

Programme Mwana, a UNICEF collaboration programme in Zambia, used SMS messages to deliver HIV test results to individuals who had taken the test. The waiting time for results was reduced by almost 60 per cent compared to other communication methods. The project's other application prompts health workers to

communicate test results to mothers and remind them of appointments. The participants have the experience that the communication has improved and the health services are brought closer. (UNICEF, 2012.)

Receiving medical test results by text messages can facilitate the access to sexual and reproductive health services. This was demonstrated by Menon-Johansson, McNaught, Mandalia & Sullivan (2006) in a study of a new patient informing system. With the text message application patients received the test results and treatment sooner. The text message result service also significantly saved staff members' time.

4.2.5 Interventions in education, awareness promotion and prevention

Questions of lifestyle and behaviour are central to health. Various factors affect or influence life choices, and some of these choices have clear adverse consequences on health. Many health problems can thus be prevented by changing the underlying causes. Prevention makes individuals refrain from risk-behaviours and maintain health behaviours; it is promoting and encouraging the adoption of beneficial health choices.

Prevention in the field of sexual and reproductive health includes maintaining health through prevention of sexually transmitted infections and HIV/AIDS and managing already existing diseases. Prevention is fighting deaths and unnecessary suffering by means of maternal and new born healthcare. It is also avoiding irreversible harm by preventing female genital mutilation, a cause of various severe complications, and averting other sexual violence. Most often prevention consists of change in health-related behaviour. Prevention is not only avoiding harms but also constructive behaviours: maintaining health by empowering people to protect themselves and others by refusing unprotected sex, managing pre-existing conditions, giving new significance and choices for transfer into adulthood and resources and support to parenthood.

We already have discussed the prevention of sexually transmitted infections (Perry et al. 2012), HIV (Cornelius, 2009), and improvement of perinatal and postnatal care (Cormick et al., 2012). An other example of efficient knowledge dissemination was implemented in The Democratic Republic of Congo. The aforementioned toll-free hotline made the family planning information accessible to everybody who had access to a phone. It proved to be an effective tool for reaching men, who asked questions especially about contraceptive methods and their side effects (Corker, 2010). This is crucial because erroneous ideas about contraceptive methods are one major reason for avoiding their use, as demonstrated by Tavrow, Karei, Obbuyi & Omollo (2012). In their research about community norms it was found that youth condom use can be

strongly opposed by their environment. Through phones young people have private access to evidence-based knowledge.

Young people's knowledge on sexually transmitted infections can be increased also with text messages. According to a randomised controlled trial in Australia (Lim et al., 2012) just receiving short text messages about sexually transmitted infections improved the knowledge of the youth. In this study receiving the information about diseases did not have a significant effect on condom use but it increased the STI testing in women. This example shows that knowledge dissemination does not automatically lead to behaviour change, and that other behaviour determinants need to be addressed in order to produce a change. Behaviour change will be addressed in the discussion of this review.

The outcomes of interventions are also affected by the living conditions of the target group. As demonstrated by a study of Lund et al. in Zanzibar (2012), a mobile phone intervention for increasing skilled attendance at delivery changed significantly the behaviour of urban women but did not have an impact on rural women. This underlines the importance of tailoring the intervention to the target group: improved knowledge on skilled attendance changes behaviour only if other factors as lack of transport or conflicting social norms do not hinder it.

The wider possibilities of mHealth are gradually examined in ambitious projects where mobile phones are used in creative ways. An example is a study by Chib (2011) where midwives were provided with smart phones and they used videos on topics related to reproductive health to encourage conversation with their clients. Maternal and newborn health is one of the central fields of mHealth, as it gives the chance to spread accurate information to a growing number of women, who are usually eager to learn the best possible practises for their future child. (See e.g.: Lu, Kotelchuck, Hogan, Johnson, & Reyes, 2009; Cole-Ceesay et al., 2010; (Kaewkungwal et al., 2010; Jareethum, Titapant, Tienthai, Vibonchart, Chuenwattana, & Chatchainoppakhun, 2008).

4.2.6 Empowering frontline health workers

Many low and middle-income countries suffer from personnel shortage. In rural areas, health workers are often voluntary peer workers who may have almost inexistent education. Mobile devices are feasible in both gathering and disseminating information (Chib, 2010) and can this way reduce the administrative work and make the work more efficient (Velez, 2011). Mobile phones can connect lower cadres of health workers to

specialists and bring care there were it was not before (Noordam, Kuepper, Stekelenburg & Milen, 2011). This way mHealth improves the effectiveness of remote health workers with enhanced communication, knowledge-sharing, and capacity building (Chib, 2011).

In the case of rural Ghana (Velez, 2011), midwives have limited access to necessary data even though they are the main providers of maternal healthcare. Mobile phones can pass hierarchical systems and give access to knowledge for those that are not in power. The contacts that are achieved with phones can improve the social status of a peer health worker; for instance midwives are able to create networks of social support and achieve more authority and trust in their environment (Chib, 2011). These positive outcomes could be found in rural Uganda, where peer health workers were engaged in an mHealth programme. The project improved patient care and health communication and had a strong support from the participants, both health workers and patients. Unfortunately it did not demonstrate significant differences in quantitative virologic, mortality or retention outcomes of the patients. (Chang et al. 2011.) Health outcomes are the area of mHealth that needs most evidence in the future.

4.2.7 Collecting health data

Mobile technology increases the accessibility of health data in low-resource areas of the world. Information can be collected through simple text messages and stored automatically in a central database. Text messaging is considered as a convenient and feasible communication method for research purposes. (Haller, Sanci, Sawyer, Coffey & Patton, 2006.) Traditional birth attendants can be trained to collect remote data and to create electronic patient records (Andreatta, Debpuur, Danquah & Perosky, 2011). In Liberia, only three days of education for low-literate and illiterate traditional midwives improved their ability to use mobile technology for SMS texting and thus collecting postpartum haemorrhage outcome data (Lori, Munro, Boyd & Andreatta, 2012). With a more accurate real-time tracking of remote areas, the planners of health can provide more accurate care (Andreatta et al., 2011). Quantitatively measurable outcomes of health interventions, especially those that are immediately saved or sent forward, provide trustful knowledge about the efficacy of the interventions without the possible biases of self-reporting.

4.2.8 Social determinants of health

mHealth can be used in defining social determinants of health and combating the social origins of diseases. First, mobiles are used to identify the conditions in which people live and their current situation through data collection. The next step is to use mobile devices to promote change in health-related behaviours and social structures that maintain harmful practices, such as female genital mutilation or childbearing at an early age. There is evidence that mHealth can empower women and healthcare providers (Tamrat & Kachnowski, 2012). In a study about midwives' cell phone use, consistent with previous findings, midwives gained self-confidence through the use of mobile phones (Chib 2011). One explanation is that communication is a key component in improving the services (Noordam et al., 2011; Chib, 2010) and social ties can be strengthened by communication within the medical hierarchy, and with the patient community (Chib, 2011). Marginalized populations can also feel the intervention messages as acts of care and affection by healthcare providers (da Costa et al., 2012). Inequities of the society can be changed on the structural level by giving women access to knowledge. A woman may face external pressure, or the social hierarchy can manifest through internalized norms while using technology (a woman may believe she is incompetent). Gender inequalities can also remain hidden until the access to the new possibilities brought by mobile technology brings them to light. Revealing inequities has a risk of provoking tensions: a new role and power transforms the individuals' social positions. It may force them confront gender prejudice while attempting to assimilate into social hierarchies. These tensions might be necessary for a change to a more just society. (Chib, 2011.)

5. Discussion

According to this short review, at present there is already enough available research evidence to suggest that in many cases, mobile devices are adequate tools for sexual and reproductive health care and promotion. They are especially appropriate in remote, hard-to-reach areas since they are cost-efficient and offer solutions to the shortage of personnel. They have found to bring support to the management of chronic conditions e.g. through treatment adherence and peer support. The most convincing results are in the areas of appointment reminders, treatment compliance and data collection. I will discuss some pertinent questions that emerged from the presented studies: first technology-related questions, then social factors, then notes for project planning and finally the future expectancies.

5.1 Technology

A challenge for developing national and worldwide mHealth systems is the lack of standards in mobile devices. Text messages or voice-box messages can be received in almost every mobile phone. In this review mHealth has been approached mainly through phones using text messaging and calling as health promotion means in view of the fact that until now Low and Middle Income Countries have been largely deprived of smartphones with internet connection. Mobile technology is nevertheless in a strong development. Smartphones may be an especially pertinent development area in developing countries because they are often the first and only devices that are used to connect to the internet. In the future, it is probable that the boundary between mHealth and general eHealth shall become blurred through smartphone applications that enable much richer health communication than plain text messages. In addition to communication, mobile devices can be used for clinical testing. New applications are developed that combine a phone with a microscope camera or blood sugar measure and this information can be sent directly to the hospital. Nevertheless, this is far from the reality in remote areas, where the lack of a phone or electricity is a more pressing challenge. A solar-powered charging system for the battery and prepaid SIM cards or a toll-free emergency number may need to be provided to be able to use the phones (Cole-Ceesay et al., 2010).

What is to be remembered is that introducing technology is never a solution in itself and mHealth must maintain the idea of health promotion. Introducing mHealth may be an attractive opportunity for mobile companies to receive more coverage, grateful clients and publicity. mHealth is a powerful tool, but it is still a tool and the technology hype should not take the place of the pertinent content. Introducing technology may also create tensions, as access to knowledge and the possession of status symbols bring changes to the power structure. The stakeholders are rarely completely free of wishes for personal profit. mHealth interventions can be seen as ways of marketing new services. This is a threat but it can be also a strenght: the cooperation between private and public sectors may be a requirement for successful diffusion.

Moreover, many researchers have expressed concerns about privacy: issues such as trust and social stigma may be central to the participants of health interventions. Sexual and reproductive health is an area that could particularly from benefit the private and personal nature of mobile devices. It must be ensured that a participant of an intervention will not be exposed to a threat because of receiving sexual information. These questions may be resolved by technical means, such as voicemails that demand passwords. It is important to look at a specific area where a project shall be implemented and ensure the informed consent of the

participants. Privacy is also a question at the national and international level where questions of safety are a concern: who has access to the collected data and what consequences it has.

Bearing in mind that internet connections are not widely available in remote areas, smartphones and their use is more expensive than standard mobile phone use and that smartphones also demand more skills from the user, keeping mHealth accessible to a maximal amount of people means keeping it simple. The beauty of mHealth is its capacity to reach the people who have been deprived of health care until now. The projects should be uncomplicated enough that they can be scaled up with local knowledge, local workers and without expensive consultancy.

5.2 Social factors

Health systems of societies and health behaviours of individuals are complex entities that are rooted in history and the socio-economic, educational and cultural environment in which we live. They depend on policies and the structure of the society and current human interactions: therefore the health behaviour is always linked to its context. Health behaviours are also strongly affected by the personal experience, perceptions and capacities of an individual. Most of our health behaviour is taught us by our social environment and happens in this context. Health is the result of personal, interpersonal and environmental factors. (Haukkala, Hankonen & Konttinen, 2012.)

Adopting mHealth is not merely a question of resources and capacities but a question of the willingness to communicate across different levels of hierarchy. Midwives and other remote health workers are sometimes deprived of the communication because of their lower social status and gender-bound roles (Chib, 2010). Thus far, the social aspects of behaviour have not been central to mHealth project planning; yet, social support is an important element in health interventions (e.g. Constantino, Kim, & Crane, 2005). A question one needs to ask is if the interventions should be targeted to individuals or to groups and communities. If, for instance, the attitudes towards young people's sexual behaviour are hostile, would it be more efficient to tailor a family planning project to the youth or those higher in the hierarchy? According to a systematic review of thirty interventions that focused on empowerment of disadvantaged youth, successful interventions required a supportive environment of parents, teachers, or health care providers (Gavin, Catalano, David-Ferdon, Gloppen & Markham, 2010). Another question is, what is the relation of the receiver in the service provider? Is there confidence and trust to the provider? What kind of authority is the source? The quality of the relationship is one of the factors that have an impact on participants' commitment to the project. Other

components can be found by asking, what makes the participants want to hear the information that they are receiving? Are the messages relevant to their situation?

Many mHealth projects have behaviour change as their goal. Nevertheless, they are few to use theories or models of behaviour change in their planning. Programs based on a behavioural change theory are more likely to succeed than those that have no such model underlying them. Their success or lack thereof can also be explained more easily (King, 1999.) In health psychology, behaviour change is seen as a process that includes, in addition to knowledge, numerous other factors, such as self-efficacy, perception of norms, group-belonging and attitudes towards the behaviour. The messages can be designed to empower the participants by supporting their self-efficacy or to engage them to work for healthier life-choices. Practical recommendations for project planning have been outlined by experts in a field guide that discusses the use of mHealth technologies behavioural change communication (Umapathy, O'Sullivan & Rahaim, 2012).

In the planning phase of an intervention the messages should be tailored with care to meet the needs of the target group. And yet, in a systematic review about mHealth behaviour change communication (Gurman, Rubin & Roess, 2012) it was found that less than half of the studies described targeting or tailoring the content even though most of them had conducted formative research about the target group. An example of cautious tailoring is the "Mobile midwife" project in Ghana, where pregnant women and their family members could listen to weekly voice messages following the stage of the pregnancy. The caller could choose from several local languages and after one message she could listen to a second or a third message. Messages were also adapted to the local values and beliefs and customised to mother's care history. (Grameen Foundation, 2011).

When planning a prevention project, it is useful to remember that education alone may be insufficient for people to change their health behaviours (WHO 2003). One useful model for understanding that knowledge dissemination can be supported by other means in order to create more efficient interventions is the theory of planned behaviour of Ajzen (1991; 2012). This prominent model of health psychology indicates that an individual's behaviour intention consist of three dimensions. First, the behavioural attitude that means beliefs about certain behaviour's likely consequences, for instance young people's attitudes about condom use – is it beneficial or harmful. The second dimension is the subjective norm: how a person perceives the normative expectations of significant others. This dimension may benefit from the use of role-models, as people learn by imitating others (Bandura, 1977). The third dimension is the perceived behavioural control that can be defined with the self-efficacy and the factors that influence one's ability to carry out a desired performance.

Behavioural, normative and control beliefs all three together have an impact on the behaviour intention. (Ajzen, 2012.)

In practice, the theory of planned behaviour has a predictive power on the behavioural intentions. To bring the intentions into action, this theory can be completed by other models, such as the implementation intention formation. Implementation intentions are if-then plans that help people turn their intention into action by enforcing goal-oriented behaviour in a critical situation. (Gollwitzer, 1999; Haukkala, Hankonen & Konttinen, 2012). In the field of sexual and reproductive health, implementation intention formation has found to decrease consultation for pregnancy testing and emergency contraception among teenage women (Martin, Sheeran, Slade, Wright & Dibble, 2009). Implementation intentions formation can be supported by text messages or toll-free voice calls that help forming behaviour plans (Prestwich, Perugini, & Hurling, 2010). It can be used in similar cases as presented in the aforementioned study by Lim et al. (2012) where text messages increased STI knowledge in both sexes and STI testing in women but did not have an impact on condom use. To provide support in planning, the intervention participants can also be connected so that they can exchange coping strategies and encouragement messages. Typical fields for implementation intention formation would be antenatal care (pregnant mothers smoking cessation and healthy eating), antiretroviral adherence and family planning.

The essence of mHealth is offering care from a distance. Mobile phones may seem insufficient for prevention and behaviour change communication, but their usefulness is supported by the fact that a key element of health behaviour is self-regulation: the participant him-/herself has the keys to success with his/her engagement and retention. Having behaviour change at scope, the most efficient technique is to support the self-regulation skills of an individual by for instance creating action plans and coping plans for critical situations. Even tailored professional instructions don't have an influence without the commitment and active planning of the participant. (Hankonen, 2011.)

mHealth interventions can also benefit from simple compliance tactics. According to the Self-perception theory of Bem (1972), bigger changes are adopted more easily after a person has first accepted a minor change. This "foot in the door" tactic means that in the intervention participants are presented with small enough challenges at a time, so that they can accept new ideas little by little. Another aspect of intervention planning is the commitment of the participants. Once an individual has engaged him/herself to a program, he/she is more likely to follow it until the end (Cialdini, Cacioppo, Bassett & Miller, 1978). This is reinforced also by the reciprocity norm (Gouldner, 1960) that makes a receiver want to compensate and a rejecter want to accept in order to preserve social balance.

5.3 Future

As mHealth is gradually acknowledged as an adequate tool for health care, expectations rise about scaling up projects and creating mHealth ecosystems. This signifies that mHealth would be an integrated part of national health care systems and it would include different levels of action, from individual level communication to national level sampling. Patient registration, logistical tracking, results notification, requests for action and reminders would all be administered from the same database. A holistic approach of this type has been demonstrated in Mwana initiative, Zambia & Malawi by UNICEF and the organisation Frog. In this project a child's birth registration is done by sending a text message to a "cloud" – an internet database. The baby then receives a code that will be used in all subsequent interactions. His/her health information can automatically be registered at district and national levels. The mother of the child receives visit reminders and test results via SMS. In rural clinics, samples are registered, shipped and tracked. The results can be collected at national registers and used for research and policy planning (UNICEF, 2012).

Technological and policy changes are necessary before this model can become a standard. Even though using phones to collect self-entered health data is faster and more reliable than filling paper forms, changing to automatically captured data offers new possibilities for data collection, research, and patient tracking. This requires that the data be administered in centralised databases instead of isolated systems. (Across Health, 2012.)

In many areas, there is compelling evidence that mHealth can complement the health care system in a resource saving way. Mobile phones are already a fixed part of our everyday life, but the use of them for health purposes is still in its infancy. One of the central questions for mHealth is also the change in the practices at the national and international level: how can the organisational change of practices be managed?

6. Conclusion

mHealth is a pertinent tool in the area of sexual and reproductive health due to its potential for discreet, personal and adaptable bulk-communication. Mobile devices should therefore be taken into account when planning health policies. mHealth projects should also be developed from their pilot stage to full-scale ecosystems where mobile phones would serve as tools for current projects, build on existing platforms and health systems and help to make fragmented health systems more integrated. To scale up successful mHealth

services, policy infrastructures need to be developed to ensure the sustainable funding, coordination and maintenance.

Mobile health has a great potential for sexual and reproductive health as it can improve the accessibility of care, knowledge and medication. This potential must be demonstrated with more high quality research. Most of the research that has been accomplished up until now focuses on user experience or technological questions. Health outcomes need a more robust reporting. The situation will hopefully improve in a few years as many on-going research projects reach their conclusion and new findings are published.

References

Across Health. 2012. How mHealth will fundamentally transform the Pharma-Patient-HCP triangle. Retrieved from http://a-cross.com/health/downloads/120420%20webinar%20v3_Across%20Health_Fonny%20Schenck_Presentation%201.pdf Ajzen, I. (1991), The Theory of Planned Behaviour, Organizational Behaviour and Human Decision Process, 1991, n°50, p. 179-211.

Ajzen, I. (2012). The theory of planned behavior. In P. A. M. Lange, A. W. Kruglanski & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (Vol. 1, pp. 438-459). London, UK: Sage.

Akinfaderin-Agarau, F. (2012). Opportunities and limitations for using new media and mobile phones to expand access to sexual and reproductive health information and services for adolescent girls and young women in six Nigerian states. (Report). *African Journal of Reproductive Health, June, 2012, Vol.16(2), p.219(12)*, *16*(2), 219.

Andreatta, P. P. (2011). Using cell phones to collect postpartum hemorrhage outcome data in rural Ghana. *International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics*, *113*(2), 148–151.

Atun, R. & Gurol-Urganci, I. (2006) Analysis of calls to NHS Direct. In: Atun R.A. editor(s). *The role of mobile phones in increasing accessibility and efficiency in healthcare.* Vodafone Group Plc, 2006.

Bandura, A. (1977). *Social learning theory.* Englewood cliffs, NJ: Prentice Hall.

Bem, D.J. (1972) Self-perception theory. In L. Berkowitz (ed.), *Advances in Experimental Social Psychology*, 6, 1–62. New York: Academic Press.

Chang, L.W., Kagaayi J, Arem H., Nakigozi G., Ssempijja V., Serwadda D., Quinn T.C., Gray R.H., Bollinger R.C., Reynolds S.J. (2011). Impact of a mHealth Intervention for Peer Health Workers on AIDS Care in Rural Uganda: A Mixed Methods Evaluation of a Cluster-Randomized Trial. *AIDS and Behavior*, *15*(8), 1776–84.

Chiasson, M. A., Hirshfield S., Rietmeijer C. (2010). HIV prevention and care in the digital age. *Journal of acquired immune deficiency syndromes (1999), 2010, Vol.55 Suppl 2, pp.S94-7*, *55 Suppl 2*, 94–7.

Chib, A. (2011). Midwives with mobiles: A dialectical perspective on gender arising from technology introduction in rural Indonesia. *New Media & Society*, *13*(3), 486–501.

Chib, A. (2010). The Aceh Besar midwives with mobile phones project: Design and evaluation perspectives using the information and communication technologies for healthcare development model. *Journal of Computer-Mediated Communication*, *15*(3), 500.

Cialdini, R. B., Cacioppo J.T., Bassett R., Miller J.A. (1978). Low-Ball Procedure for Producing Compliance: Commitment then Cost. *Journal of personality and social psychology*, *36*(5), 463.

Cole-Ceesay, R., Cherian, M., Sonko, A., Shivute, N., Cham, M., Davis, M., … Southall, D. (2010). Strengthening the emergency healthcare system for mothers and children in the Gambia. *Reproductive Health*, *7*(1).

Constantino, R., Kim, Y. & Crane, P.A. (2005). Effects of a social support intervention on health outcomes in residents of a domestic violence shelter: A pilot study. Issues in Mental Health Nursing, 26, 575-590.

Corker J. (2010) "Ligne Verte" Toll-Free Hotline: using cell phones to increase access to family planning

information in the Democratic Republic of Congo. *Cases in Public Health Communication & Marketing, 2010,* 4:23–37. Retrieved from: www.casesjournal.org/volume4 (accessed October 3, 2012**)**

Cormick, G., Kim, N. A., Rodgers, A., Gibbons, L., Buekens, P. M., Belizán, J. M., & Althabe, F. (2012). Interest of pregnant women in the use of SMS (short message service) text messages for the improvement of perinatal and postnatal care. *Reproductive Health*, *9*(1).

Cornelius, J. B. & St. Lawrence, J. (2009). Receptivity of African American Adolescents to an HIV-Prevention Curriculum Enhanced by Text Messaging. *Journal for Specialists in Pediatric Nursing*, *14*(2), 123–131.

da Costa, T. M., Barbosa B.J., Gomes e Costa D.A., Sigulem D., de Fátima Marin H., Filho A.C. & Pisa I.T. (2012). Results of a randomized controlled trial to assess the effects of a mobile SMS-based intervention on treatment adherence in HIV/AIDS-infected Brazilian women and impressions and satisfaction with respect to incoming messages. *International journal of medical informatics*, *81*(4), 257–269.

Dowshen, N., Kuhns, L. M., Johnson, A., Holoyda, B. J., & Garofalo, R. (2012). Improving adherence to antiretroviral therapy for youth living with HIV/AIDS: a pilot study using personalized, interactive, daily text message reminders. *Journal of medical Internet research*, *14*(2).

Fjeldsoe, B. S. (2009). Behavior Change Interventions Delivered by Mobile Telephone Short-Message Service. *American Journal of Preventive Medicine*, *36*(2), 165–173.

Gavin, L. E., Catalano, R. F., David-Ferdon, C., Gloppen, K. M., & Markham, C. M. (2010). A review of positive youth development programs that promote adolescent sexual and reproductive health. *The Journal of adolescent health: official publication of the Society for Adolescent Medicine*, *46*(3 Suppl), S75-91.

Gold, J., Lim M.S., Hocking J.S., Keogh L.A., Spelman T. & Hellard M.E. (2011). Determining the impact of text messaging for sexual health promotion to young people. *Sex Transm Dis*, *38*(4), 247.

Gollwitzer, P. M. (1999). Implementation intentions. Strong effects of simple plans. *American Psychologist, 54*, 493-503.

Gouldner A.W. (1960). The Norm of Reciprocity: A Preliminary Statement. American Sociological Review. 1960 Apr;25(2):161.

Grameen Foundation. (2011) Mobile technology for community health in Ghana: What it is and what Grameen Foundation has learned so far. Washington, DC. Retrieved from http://www.cs.washington.edu/education/courses/cse490d/12sp/docs/MOTECH.pdf 20.9.2012

Gurman, T. A., Rubin S.E., & Roess A.A. (2012). Effectiveness of mHealth Behavior Change Communication Interventions in Developing Countries: A Systematic Review of the Literature. *Journal of health communication, 17 (2012)*.

Haller, D., Sanci L., Sawyer S., Coffey C. & Patton G. (2006). R U OK 2 TXT 4 RESEARCH?–feasibility of text message communication in primary care research. *Aust Fam Physician*, *35*(3), 175.

Hasvold, P. E. & Wootton R. (2011). Use of telephone and SMS reminders to improve attendance at hospital appointments: a systematic review. *Journal of Telemedicine & Telecare*, *17*(7), 358–364.

Hankonen, N. (2011). *Psychosocial processes of health behaviour change in a lifestyle intervention: Influences of gender, socioeconomic status and personality*. Dissertation, National institute for Health and Welfare, Helsinki, Finland.

Haukkala, A. , Hankonen, N. & Konttinen, H. (2012). Sosiaalipsykologia terveyskäyttäytymisen

tutkimuksessa. In : Psykologia. 47, 05-06, p. 396-409.

Jareethum, R., Titapant, V., Tienthai, C., Vibonchart, S., Chuenwattana, P., & Chatchainoppakhun, J. (2008). Satisfaction of healthy pregnant women receiving short message service via mobile phone for prenatal support: A randomized controlled trial. *Journal Medical Association Thai, 91*(4), 458–463.)

Kaewkungwal, J., Singhasivanon P., Khamsiriwatchara A., Sawang S., Meankaew P. & Wechsart A. (2010). Application of smart phone in "Better Border Healthcare Program": A module for mother and child care.(Technical advance) (Report). *BMC Medical Informatics and Decision Making, Nov 3, 2010, Vol.10, p.69, 10,* 69.

Karanja, S., Mbuagbaw, L., Ritvo, P., Law, J., Kyobutungi, C., Reid, G., … Lester, R. (2011a). A workshop report on HIV mHealth synergy and strategy meeting to review emerging evidence-based mHealth interventions and develop a framework for scale-up of these interventions. *The Pan African medical journal*, *10*, 37.

Kelly, J. D., & Giordano, T. P. (2011). Mobile phone technologies improve adherence to antiretroviral treatment in a resource-limited setting: A randomized controlled trial of text message reminders. *AIDS*, *25*(8), 1137.

King, R. 1999. Sexual Behavioural Change for HIV: Where Have Theories Taken Us? Joint United Nations Programme on HIV/AIDS (UNAIDS). Geneva, Switzerland. Retrieved from: http://www.unaids.org/en/media/unaids/contentassets/dataimport/publications/irc-pub04/jc159-behavchange_en.pdf

Lim, M. S., Hocking J.S., Aitken C.K., Fairley C.K., Jordan L., Lewis J.A. & Hellard M.E. (2012). Impact of text and email messaging on the sexual health of young people: a randomised controlled trial. *Journal of Epidemiology & Community Health*, *66*(1), 69–74.

Lori, J. R., Munro M.L., Boyd C.J. & Andreatta P. (2012). Cell Phones to Collect Pregnancy Data From Remote Areas in Liberia. *Journal of Nursing Scholarship*, *44*(3), 294–301.

Lu, M., Kotelchuck, M., Hogan, V., Johnson, K., & Reyes, C. (2009). Innovative strategies to reduce disparities in the quality of prenatal care in underresourced settings. *Medical Care Research and Review, 67*(5), 198–230.

Lund, S., Hemed, M., Nielsen, B. B., Said, A., Said, K., Makungu, M. H., & Rasch, V. (2012). Mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar: A cluster-randomised controlled trial. *BJOG: An International Journal of Obstetrics and Gynaecology*, *119*(10), 1256.

Martin, J., Sheeran, P., Slade, P., Wright, A., & Dibble, T. (2009). Implementation intention formation reduces consultations for emergency contraception and pregnancy testing among teenage women. *Health Psychology,28,* 762–769.

Menon-Johansson, A. S, McNaught F., Mandalia S. & Sullivan A.K.. (2006). Texting decreases the time to treatment for genital Chlamydia trachomatis infection. *Sexually transmitted infections*, *82*(1), 49–51.

Michie, S., Abraham, C., Whittington, C., McAteer, J., & Gupta, S. (2009). Effective techniques in healthy eating and physical activity interventions: a meta-regression. *Health Psychology, 28*(6), 690.

Montesinos, L., Frisch L.E., Greene B.F. & Hamilton M. (1990). An analysis of and intervention in the sexual transmission of disease. *J Appl Behav Anal*, *23*(3), 275.

Noordam, A. C., Kuepper B.M., Stekelenburg J. & Milen A. (2011). Improvement of maternal health services through the use of mobile phones. *Trop Med Int Health, 16*(5), 622.

Odeny, T. A., Bailey, R. C., Bukusi, E. A., Simoni, J. M., Tapia, K. A., Yuhas, K., … McClelland, R. S.

(2012). Text Messaging to Improve Attendance at Post-Operative Clinic Visits after Adult Male Circumcision for HIV Prevention: A Randomized Controlled Trial. *PLoS ONE*, *7*(9).

Olla, P., & Tan, J. (2008). Designing a M-Health Framework for Conceptualizing Mobile Health Systems. *Healthcare Information Systems and Informatics, Chapter 1, pp.1-24*, 1–24.

Perry, R. C., Kayekjian K.C., Braun R.A., Cantu M., Sheoran B. & Chung P.J. (2012). Adolescents' perspectives on the use of a text messaging service for preventive sexual health promotion. *J Adolesc Health*, *51*(3), 220.

Pop-Eleches, C., Thirumurthy H., Habyarimana J.P., Zivin J.G., Goldstein M.P., de Walque D., … Bangsberg D.R. (2011). Mobile phone technologies improve adherence to antiretroviral treatment in a resource-limited setting: a randomized controlled trial of text message reminders. *AIDS*, *25*(6), 825–834.

Prestwich, A., Perugini, M., & Hurling, R. (2010). Can implementation intentions and text messages promote brisk walking? A randomized trial. *Health psychology: official journal of the Division of Health Psychology, American Psychological Association*, *29*(1), 40-49. doi:10.1037/a0016993

Sidney, K., Antony J., Rodrigues R., Arumugam K., Krishnamurthy S., D'souza G., … Shet A. (2012). Supporting patient adherence to antiretrovirals using mobile phone reminders: patient responses from South India. *AIDS Care*, *24*(5), 612.

Tamminen, S. , Raita, E. , Lehtinen, V. , Silfverberg, S. & Ravaja, N. (2012) Teknologian sosiaalipsykologinen tutkimus. In : Psykologia. 47, 5-6, p. 410-422.

Tamrat, T., & Kachnowski, S. (2012). Special delivery: an analysis of mHealth in maternal and newborn health programs and their outcomes around the world. *Maternal and child health journal*, *16*(5), 1092‑1101. doi:10.1007/s10995-011-0836-3

Tavrow, P., Karei, E. M., Obbuyi, A., & Omollo, V. (2012). Community norms about youth condom use in Western Kenya: is transition occurring? *African journal of reproductive health*, *16*(2), 241-252.

Tripathi, A., Duffus, W. A., Kissinger, P., Brown, T. J., Gibson, J. J., & Mena, L. A. (2012). Delivering laboratory results by text message and e-mail: a survey of factors associated with conceptual acceptability among STD clinic attendees. *Telemedicine journal and e-health: the official journal of the American Telemedicine Association*, *18*(7), 500-506. doi:10.1089/tmj.2011.0251

Umapathy S., O'Sullivan G.A. & Rahaim S. (2012). mBCC Field Guide: A Resource for Developing Mobile Behavior Change Communication Programs. Abt Associates Inc. February 2012. Retrieved from http://www.mbccfieldguide.com/

UNFPA. (1994) Programme of Action of the International Conference on population and Development, Cairo, 5-13 September 1994. New York: United Nations Population Fund. Retrieved from https://www.un.org/popin/icpd/conference/offeng/poa.html

UNICEF. (2012). *UNICEF and partner awarded for Programme Mwana, programme using SMS messages to deliver HIV test results.* Retrieved from http://www.unicef.org/aids/index_65381.html 15.10.2012

Veijalainen, J., Hara, V. & Bisong, B. (2011) Architectural Choices for mHealth Services in Finland and Cameroon, *12th IEEE International Conference on Mobile Data Management (MDM)*, vol.2, no., pp.46,51, 6-9 June 2011.

Velez, O. (2011). Design and Usability Testing of an mHealth Application for Midwives in Rural Ghana. *ProQuest Dissertations and Theses*.

World Health Organization. (2012) ITU and WHO launch mHealth initiative to combat noncommunicable diseases. Joint ITU/WHO news release. Retrieved from http://www.who.int/mediacentre/news/releases/2012/mHealth_20121017/en/

World Health Organization. (2012) ITU and WHO launch mHealth initiative to combat noncommunicable diseases. Joint ITU/WHO news release. Retrieved from http://www.who.int/mediacentre/news/releases/2012/mHealth_20121017/en/

World Health Organization, Global Observatory for eHealth. (2011). *mHealth: New horizons for health through mobile technologies. Based on the findings of the second global survey on eHealth.* (Global Observatory for eHealth series). Geneva: World Health Organization, 2011. Retrieved from: http://www.who.int/goe/publications/goe_mhealth_web.pdf

World Health Organization. (2012). Millennium development Goal 5. Sexual and Reproductive health. Retrieved from http://www.who.int/reproductivehealth/topics/mdgs/en/index.html

World Health Organisation. (2003). Adherence to long-term therapies: Evidence for action. Geneva: WHO.

World Health Organization. (1986) Young people's health – a challenge for society. Report of a WHO Study Group on Young People and "Health for All by the Year 2000". WHO Technical Report Series, Number 731. Geneva: World Health Organization, 1986:105-13. Retrieved from http://whqlibdoc.who.int/trs/WHO_TRS_731.pdf