

ASLI KULANE: Hi, I'm Asli Kulane, and I'm an Associate Professor in International Health at Karolinska Institute. Today we going to discuss mHealth as one of the current innovations that contribute to global health.

As you have learned so far, global health challenges require different kinds of solutions. Particularly in places with limited resources, there's a need for solutions that work, cost less, and are effective. Rapid advancement in technology has improved the development of the world in an extraordinary way. There have many innovations in health care that have been developed recently.

However in this session, we will focus on mHealth, particularly how the discovery of mobile phone technology has contributed to the health sector. As you can see in this graph, it shows the progress in global information technology over the last 15 years. The top blue line shows the number of mobile subscriptions in the world. Globally, mobile cellular subscription has significantly increased from 20 to 97 per 100 people in the world in 2015.

Does that mean that everyone in the world has her own or his own phone? What it actually means is that in some countries, some people have two phones, or maybe two SIM cards, because there are different telephone service providers with different offers.

Let's take a closer look at how mobile subscription is distributed around the world. This figure shows there's a variation between different regions of the world. For example, in Europe, it's 120%, while in Africa it has reached 73%. So if you look at the right side of the graph, the shortest bar represents Africa. Despite the fact that Africa has the lowest mobile subscription, it has a fast growth rate of 13% per year. This actually means that more people are getting mobile phones without ever having had a landline phone at home.

In addition to mobile phones, mobile broadband has also become available. In fact, mobile broadband is also expanding rapidly and available in rural areas, where some 30% of the world's rural population have access to mobile broadband. Mobile broadband has even reached communities in the countryside that do not even have electricity, nor running water.

So what's great about mobile phones? Well, all mobile phones provide a possibility to call, to text, to send voice messages, and now with the availability of the wireless internet, mobile phones have even more functions, so we can connect in many ways. These include browsing

the internet for information, internet calls, video calls, as well as exchange of photographs.

According to this figure, the most used features of mobile phones in countries in sub-Saharan Africa are listed as sending SMS, listening to music, taking photos, internet browsing, and for social networking. Maybe some of you are even following this course on your mobile phones.

So what is mHealth? According to the World Health Organization, mHealth is defined as the medical and the public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices. Although we will talk about mobile phone technology now, mHealth is actually more than that, as you can see from the definition. But today, we're going to focus on the mobile phone and its use in health.

In fact, because it's so practical, and the technology has developed so fast, mobile health-- or mHealth-- has gained the momentum in recent years globally. It has had a particular profound usefulness in low and middle income countries where a study by Hall and others had assessed the impact of mHealth interventions in low and middle income countries.

The most common use of mHealth include the use of mobiles to improve data connection, in care delivery like diagnosis and treatment, patient communication, as well as monitoring. So let's look at some examples from different parts of the world.

In terms of data collection and reporting, mHealth is very useful for collecting data. This has been one of the major uses of mHealth, and it includes registries tracking the vital events. In comparison to the traditional paper-based resources, it has shown to have a higher quality of data.

An intervention by UNICEF in Malawi introduced SMS services as a tool for data collection. And as you can see here in this figure, a health surveillance assistant was provided with a mobile phone to collect data on child nutrition. The service provider, marked with a red cross, fed the information in a mobile phone. And this data would be sent as an SMS to a center SMS server. The server could then send feedback to the assistant, who would give the information to the caregiver.

This information would also provide an aggregated data for use by key stakeholders, such as government institutions. Sending the data by SMS reduced the delay in information that normally happens when transporting data on paper. In another example, in Cambodia during

the wake of the SARS outbreak of 2003, the SMS services improved surveillance during the crisis.

What happened is the staff across the country collected data and sent it by SMS to national offices. When a threshold level of people infected was reached, a warning signal was generated, and a rapid response team dispatched to those areas. In other countries like Bangladesh, Uganda, Nigeria, and Senegal, registering birth dates of newborns or the due dates of the expecting mothers using SMS services have been very successful with improved the registration of birth rates as well as immunization coverage.

So as you can see, the mobile phone can be used to get an overview of how the health of a country is actually performing. Mobile phones can be cheap and affordable resources in diagnostics. Let's take the example of Uganda, where mobile cameras have been used to diagnose dermatological diseases.

When a patient comes to see their community health worker about a skin program, the health worker can take an image with their mobile phone camera and send it to a trained pathologist, who may be in a hospital far away in another part of the country. The pathologist can then help make accurate diagnosis. The same thing happens in Botswana, where trained community workers send photographs to gynecologists to help them get better early detection of cervical cancer.

A current ongoing project, set up by our own university, Karolinska Institute in Sweden, and Stellenbosch University in South Africa uses mobile phone cameras for burns. So how does this work? When someone has been burned, they obviously going to see their local community clinic or an emergency center for care. This may be in the rural areas in the countryside, far away from any advanced clinic or hospital.

But the nurse or the doctor, with their patient's consent, can instead use an app in their mobile phone that has been developed for this purpose and take a photo of the burn. Then the nurse or the doctor logs into the app with their personal identification, they open a new case, and fill in the information about the patient, the burn injury, and the circumstances around the burn.

They also required to draw the burn on an inbuilt function in the app to calculate the total body surface area that's affected. Only after that can they take the photos of the burn. And when the case is ready, the nurse or the doctor uploads it to a central server, which, when it gets there, a medical expert will be notified via text message or email. And they can access the

image over the web, either by mobile or by the computer. There, they can view and classify the images, and then provide appropriate diagnostic and treatment information back to the doctor or the nurse who can treat the patient.

Now what about communication? Of course, mobile phones help communication. It's easier to get hold of someone. When it comes to health, mHealth has been the forefront of the so-called provider to provider communication. For the purpose of improving maternal and child health in Rwanda, a rapid SMS MCH system was developed, in which a community health worker used SMS to follow up pregnant women during their antenatal care.

You can see in this figure a community health worker provided with a mobile phone to send SMS when advice is needed. The request goes to a server, where complied advice or information is stored, and an automatic reply is sent back to the community health worker. At the same time, the SMS reaches health facilities, including the ambulance services, which can be dispatched if needed.

Following this intervention, health facility delivery for women increased tremendously from 72% to 92% in one year. In terms of treatment, in Western Kenya mHealth was also used to improve the adherence to pediatric malaria treatment guidelines. In this case, health care workers in the rural health facilities received two SMS daily for 6 months, followed by one SMS weekly for another six months. This long intervention led to an improvement in adhering to the malaria treatment guidelines by the health care providers, and therefore, their provision of better treatment.

In conclusion, as you can see, mHealth is an innovative approach that can help to promote health and prevent disease in countries with limited resources or with weak health systems. MHealth in low and middle income countries has been in place for a couple of years with very promising development. However, there's a need for strong, hard evidence to emerge in the coming years to scale up cost-effective interventions.