Introducing eHealth in developing countries

Amelia Bowlin,
Lovisa Ekberg,
Malin Medbo
Adithya Venkatesh Ravirajan,
Nathaly Sanchez Chan

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Abstract

Something all developing countries have in common is their an inadequate healthcare system, where there is an inequality among who gets access to good healthcare resources. The inequality is depicted within the costs, availability, and rural and urban area. The issue could be addressed by implementing eHealth, which is information and communication technologies (ICT) related to healthcare. In this paper, the focus was Ecuador, which is a small developing country situated in South America. In order to develop a strategy for implementing eHealth in Ecuador, examples of successful and unsuccessful implementations were gathered from other developing countries in Africa, South America and Asia.

To gain a better understanding on the topic, multiple literature papers were read and two interviews were preformed. The first interview was with the head of the emergency center at Galapagos, Milton Aguas, and the second one with Dr. Pravin Surendran, a rural Doctor from India. The information gathered on South American countries were on applications for remote monitoring and virtual consultations that have been implemented. Similarly, in African countries apps were also created. One of the apps was a maternal help app with advice and reminders. In Asian countries, the information learned was that they implemented vaccine reminder apps, an SMS emergency system, and some focus was placed on improving their digital health by using 5G. Lastly, it was enlightened that Ecuador made attempts to introduce ICTs, but due to poor structure and short-term planning the projects have proved unsuccessful.

Common among the most successful cases were sufficient funding and a clear structure for the implementation. On the other hand, common within the unsuccessful cases were lack of education, willingness and infrastructure. ICTs are significantly harder to implement if the healthcare workers are unwilling to integrate it in their daily routines. In addition, there is a low amount of cellphone users in developing countries, due to lack of infrastructure. A solution to these problems can begin with funding for education and infrastructure. The countries can get the funds by applying for and receiving funding from the World Health Organization.

A pattern was discovered when learning from the eHealth projects in different countries. The pattern enabled recommendations for Ecuador to prevent Ecuador from being another victim of unsuccessful eHealth projects. Hopefully, the recommendations can help build a strong healthcare system to provide equal healthcare to all.

Contents

1 Introduction

Citizens from developing countries dream of moving to a developed country to have a better life, and access the resources that were not as accessible in their home country. According to the world bank, a developing country has a per capita income less than 1,100 USD as of the year 2019 [1].

1.1 Developed and developing countries

Focusing on the differences between developing and developed nations, developed nations engages the technological and infrastructural developments with the global market whereas these developments are less in developing nations [2]. The major source of revenue depends on the natural resources available in developing countries. The standard of living is high in developed nations, on the contrary there is a low standard of living and high poverty rates in developing countries [2].

When it comes to healthcare, developed countries are more advanced in several subjects, such as implementing eHealth technologies and maintaining proper health records in such a way that it can be easily accessible for patients and healthcare officials [2]. On the other hand there is a shortage in medical staffs and insufficient infrastructure for implementing eHealth in developing countries[2].

1.2 What is the United Nations doing to help?

The United Nations (UN) has worked hard to close the gap between developing and developed countries, to allow global access to the same resources [3]. The UN made a list of Sustainable Development Goals (SDG) to accomplish by 2030, just nine years from now [3]. Together with different institutions, everyone is working actively to implement all the goals [3]. There are 17 United Nations SDG's, which are grouped by topics such as: health, sanitation, climate change, equality, and more [3]. The one this paper will focus on is the third SDG, health and well-being. A way to get closer to achieving these the third goals is with the implementation of eHealth, which is a continuously growing field of interest [3]. Within eHealth, an incredible amount of progress has been made and more is to come. With a pandemic spreading around the world, eHealth has become more important than ever before.

1.3 Aim

A small developing country in South America, Ecuador, was the focus of this paper. Ecuador's expansion of eHealth has been quite limited, and they struggle with coordination, structure of projects, and ideas [4]. eHealth can help strive toward implementing a better health system and to reach the stated SDG. In addition, eHealth can be a tool for Ecuador to connect their rural and urban areas.

This project aims to collect information from different sources for a literature review on eHealth projects in developing countries. The focus will be on what has been done in various countries in Africa, South America and in Asia to evaluate their similarity in terms of challenges faced when implementing eHealth. Then narrowing down to what could be and has already been done in the target country Ecuador. The report contains an analysis of the results obtained by the previous projects, including both successful and failed results for a broad review. It also includes economics research to determine its feasibility in that target area.

2 Background

One of the goals, stated in the health and well-being SDG, is equal healthcare for all individuals without creating economical challenges [5]. Unfortunately, this has yet been accomplished, and there are differences within the healthcare systems between areas and countries. In addition, expensive healthcare and the lack of resources are widespread problems. By implementing and using eHealth solutions, healthcare can be improved, prevent and cure illnesses, along with lowering costs [6].

2.1 What is eHealth and its importance?

According to the World Health Organisation (WHO), eHealth is the development of services, tools, and research using information and communication technologies (ICT) in the health sector [7]. For developing countries, eHealth can help decrease the inequalities, an attempt to defeat the global economical and geographic barriers [8].

By implementing eHealth, the impact of the physical distance between patients and health workers can be reduced [8]. eHealth can lead to a stronger connection between

rural and urban areas, as well as, allowing for a connection between different countries and resources. Also, it can be a quick way to spread important information to a large number of people [8].

Another reason eHealth is important is its educational use for medical school. By making education widely available, the quality of care the users receive will be improved [9]. As if it were not enough, by implementing eHealth, efficiency could be achieved. When the processes are efficient the costs of medical diagnostic and treatment will decreased, striving for reducing inequalities around healthcare access [9].

2.2 Target country: Ecuador

Ecuador is a country located in South America with an area of 283.561 km^2 as seen in Figure 1. As of 2021 it accommodates nearly 17 million people throughout the four regions; the Pacific Coast, Andes Highland, the Amazon Jungle, and the Galapagos Islands.

Figure 1: Location of Ecuador [10].

As previously discussed, Ecuador is amongst the developing countries in the world [11]. The countries main source of income is from exporting banana, flowers, cacao,

oil, and other natural resources [11]. Even though it is rich in nature, it is considered a developing country due to the low standardized minimum wage leading to high poverty rates, poor education, lack of quality health services, and other similar problems [11]. Even though there have been attempts to implement eHealth in this country, as hospital automation and data management, increased use of eHealth services could yield an improvement of Ecuador's healthcare situation [4].

3 Method

The method used to gather information for the project was literature studies and interviews. Scientific papers were found by searching through different databases and websites, like EDS, provided by Chalmers library, Google Scholar, etc. by using different keywords. The literature research of already implemented eHealth solutions focused on developing countries rather than developed and has been limited to the areas of Africa, South America and Asia. Implementations that have been tried but failed in these areas were also taken into account to get a broader view. The literature included is chosen carefully to make sure that the technology and account information is not outdated, and that the content is not biased.

Keywords: eHealth Ecuador, eHealth developing countries, eHealth funding, WHO, PAHO

Some information was gathered from interviews. Two interviews were performed online with predetermined questions. The interview transcripts can be found in Appendix A. The first interview was with Milton Aguas, working in an emergency call center in Galapagos-Ecuador and the second with Dr. Pravin Surendran from India, both to get a better understanding about the eHealth structures and possibilities in each country.

4 Results

Recently, the use of eHealth services has increased rapidly all over the world [12]. A reason for this is due to the COVID-19 pandemic, where countries had to adapt to manage the increased pressure on the healthcare system [12]. This increase has led to both successful and unsuccessful eHealth implementations which will be presented

below for Asia, Africa and South America. The current health and eHealth situation in Ecuador is also included. In addition, the healthcare economic plan is introduced to get more insight into the situation.

4.1 eHealth implementations in South America

Due to the pandemic the need for remote health care has increased rapidly [12]. With a shortage of medical staff and medical resources, high focus was placed on implementing eHealth [12]. South America has always been in need of a solutions due to healthcare access inequalities, quality of healthcare and populational changes both demographically and epidemiologically. The pandemic has put more light on this problem and created a course of action [12].

One of the eHealth implementations that has been done was enabling remote monitoring and virtual consultations. In Argentina a website service called *Tele-Covid* was implemented. It allows for a remote follow-up meetings for COVID-19 affected patients along with support to additional risk groups such as pregnant women, people with chronic diseases, newborns, and people with disabilities [12]. In Paraguay a system was set up to monitor medicines and supplies, as well as enabling several procedures to be carried out online. In addition, telemedicine platform called *TeleSalud* was implemented in Peru with the aim of enabling virtual consultations using Zoom or Skype where patients can come in contact with specialists. Similar implementations were made in several other South American countries [12].

According to P. Chatterjee at al. a relevant problem with virtual consultations is that the bases for the doctor's evaluation are through verbal communication and the patient's self-perception [12]. To solve this, says P. Chatterjee, is by implementing Internet of Things (IoT) eHealth devices, that can measure health indicators such as blood pressure, ECG, blood glucose etc [12]. These devices uses artificial intelligence (AI) technology where the patients symptoms are analyzed and paired to predesigned decision trees to best decide a plan of treatment. The devices will decrease the amount of needed visits to healthcare facilities as well as increasing efficiency of remote treatment. P. Chatterjee implies that this method both reduces the workload for the healthcare professionals and improves the diagnosis accuracy [12]. AI has the capability of processing large amount of data in a short time, such as previous hospital visits, treatments, complications and laboratory results. By machine learning, the model can be trained and then create priority lists for the medical staff to attend [12]. Also predictions of resource shortages can be made, enabling optimal distribution

[12].

4.2 eHealth implementations in Africa

In West Africa 1 out of 6 children do not reach the age of five due to minor illness. In Burkina Faso an app called *AlloLaafia* (Mooré for "Hello health") was implemented to increase maternal and infant healthcare [13]. In Burkina Faso mobile phones are used by 90% of the population, and 75% of all the women [13]. This suggests a health care app can increase healthcare knowledge and save lives. The app communicates via text messages reminding mothers and fathers when it is time for their child to visit a healthcare center for vaccination and weighing. The app also provides advice on different healthcare topics, such as what to feed your baby, family planning and pregnancy monitoring. In this way, life saving knowledge reaches people that normally does not have easy access to this type of information [13].

The implementation of information and communication technologies (ICT) is not as straight forward as one may wish. According to B.D. Osunyomi et. al, there are several reasons for difficulties faced when attempting to carry out ICTs in Africa [14]. Some of the reasons are insufficient access to funding, a lack of knowledge on how to use ICTs, deficient ICT infrastructure, and sparse human capital [14].

Even if the possibility of implementing ICTs emerges, it is not always carried out [15]. One of the main reasons for this is simply due to resistance from the healthcare professionals that would implement them. Nurses, doctors, and other healthcare professionals (HCP) participated in a study of eHealth adoption and its use in Sub-Saharan Africa [15]. In this study, there were HCPs that found the implementation of the eHealth technology to be performance enhancing [15]. It speeds up their daily clinical activities, giving more time to care for patient in a better way. Some are compelled to use it depending on patient and family opinions, and try to implement it even if it is challenging at first [15]. Others simply find the technology interesting and enjoy working with the medium. The problematic group are those who do not see how it can be implemented in their day to day schedule [15]. They rather see it as an extra task to fit in, not something that will increase their work efficiency. One common denominator is that some of them are seniors and find the technology to be complicated and difficult to learn and remember to use [15]. Others feel they do not have enough time in their stressful schedule to learn and implement the technology [15].

4.3 eHealth implementations in Asia

Asia is the largest and most populated continent on the planet [16]. It is home for nearly 4.5 billion people (60 percent of world population) [16], and includes several developing countries [17]. When it comes to development and implementation of digital health, Asia-pacific is regarded to be one of the fastest growing regions, and the implementation of eHealth has been rising in a steady fashion [17].

A lot of infrastructural developments and tech support are being facilitated in the developing nations in Asia. Indian government has taken initiatives and implemented many programs in improving healthcare across the nation [18]. Some of the implemented apps are *KiddoHealth*, *Swasth Bharath* (Health India), and *Kilkari*. *KiddoHealth* is a vaccine tracker mobile app that was introduced to check the immunization status of the children, which helps in timely vaccination for the children [18]. *Swasth Bharath* (Health India) is used to educate people in terms of symptoms and treatment of some diseases, first aid, and public health alerts [18]. *Kilkari* mobile app educates pregnant women and new mothers about pregnancy, child birth and childcare [18]. There are also other initiatives taken such as national health portal, online registration system,etc [18].

To know more about the efficiency of these eHealth implementations in rural areas of the country, we organised an interview with Dr. Pravin Surrendran, a rural doctor in India. According to Dr. Surrendran, "India has implemented various eHealth applications to help patients gain better medical access and medical education. However, many patients do not have smartphones which poses a limitation towards some of the applications they can access. In addition, the bandwidth in India can not hold many users, only 100,000 people which is a small portion in India". More on the interview is found in Appendix A.

Another notable developing country in Southeast Asian Region is Malaysia [19]. Malaysia has dual tiered system of healthcare services, which means both government and private sectors are involved in healthcare. In the healthcare system, over the past two decades, many investments were made towards integrating digital health [19]. The nation has introduced *Malaysian Health Data Warehouse*, which is a national health care information gathering and reporting system covering all government and private healthcare facilities [19]. Another service called *Doctor on call* has been introduced, which is a digital healthcare platform that helps connecting patients with doctors [19]. In 2016, Microsoft and Collaborative Research in Engineering, Science and Technology joined hands to create a digital health hub which focuses on

telemedicine, smart access, remote patient monitoring and corporate wellness [19]

Sri Lanka, an Island nation present in southeast Asia, has been a product of civil war for 30 years from 1983 to 2009 [20]. Since then, the nation has tried to improve its healthcare by many economic reforms and by introducing digital healthcare [21]. The Sri Lankan government has managed to provide a personal health number to its residents and maintain a digital health record [21]. Another service introduced was *Dengue tracking* mobile app by which a person can fill his/her information and symptoms, and get treated immediately [21]. In addition, an emergency SMS system has been brought into existence for accident service called *NHSL* (National hospital of Sri Lanka). Additionally, *Suwasariya 1990* is a new 24/7 ambulance service which has successfully handled 32000 cases as of now [22]. The government has also decided to improve their digital health program using 5G telecommunication, which can withstand more users [22].

The government of Myanmar (former Burma) developed a strategic plan to establish the digitisation of government systems in the year 2013, which also included its healthcare sector [23]. Since then, contribution of technology over Burmese healthcare environment such as healthcare delivery and services are improving steadily. One example Myanmar has introduced is a software for pregnant women [23]. Another is the app *Myancare*, which is used for many purposes such as booking an appointment to visit a doctor. This app also allows to chat with the doctor and helps educating patients about the diseases themselves [24].

4.4 eHealth implementations in Ecuador

The projects Ecuador have been implementing include connection with nurses, follow-up after hospitalization, virtual platforms for booking and managing appointments, interconnected records, education in terms of drugs, maternity, teenage pregnancy, and others [25]. Figure 2, shows an app called *ECU-911*. The app was created to contact the emergency call center for any accident, health-related problem or for requesting police assistance. Nonetheless, the app is not widely used at all [26]! Even though, it is currently operating just as effective as making a regular call [26].

Another project attempted in Ecuador was a pilot plan which interconnects regional and city hospitals ICTs [4]. In 2019, different institutions throughout Ecuador, and a couple from abroad, worked on projects for the healthcare system in Ecuador [4]. Each of them had a structured plan and started a project with a specific hospital

- either regional, city, public or private. However, all the projects had their own individual plan rather than one cohesive plan. Therefore, once the projects began in different hospitals, there were complications with integrating the different hospitals together because the individual projects did not compliment each other [4].

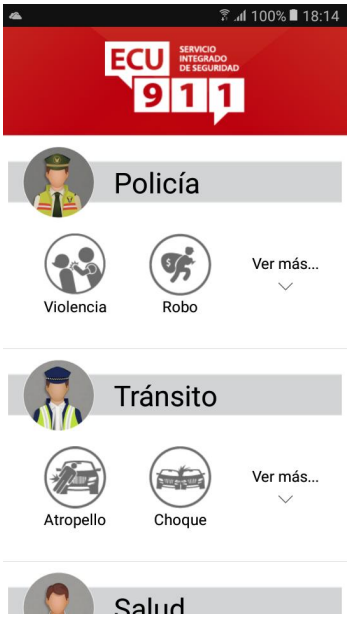

Figure 2: App for notifying an emergency in Ecuador [27].

According to private communication with Milton Aguas, the head of the emergency center in Galapagos-Ecuador, due to the pandemic, ECU-911 built a system to have digital data of all the calls and emergencies received daily. The platform has different ways to display the data, and it is mainly used to keep track of the COVID-19 cases, other health-related emergencies, safety, and security [26]. Figure 3 displays the declared emergencies received from March 1st of 2020 to April 24th of 2021 in Ecuador, having an average number of coordinated attendance to emergency calls of 10.074 per day.

Aguas said that most of the calls received are from a mobile phone call, only a few are done through landline, and even less are done from the ECU-911 app [26]. The other data sources for the website are from surveillance cameras installed in different spots on each island of the Galapagos archipelago. These cameras are mainly used for monitoring the well-being of the citizens and for recording any unusual event. Unfortunately, all the data is transmitted through satellite, therefore, the connection is not suitable for having a real-time feed to the platform. In addition, rural areas do

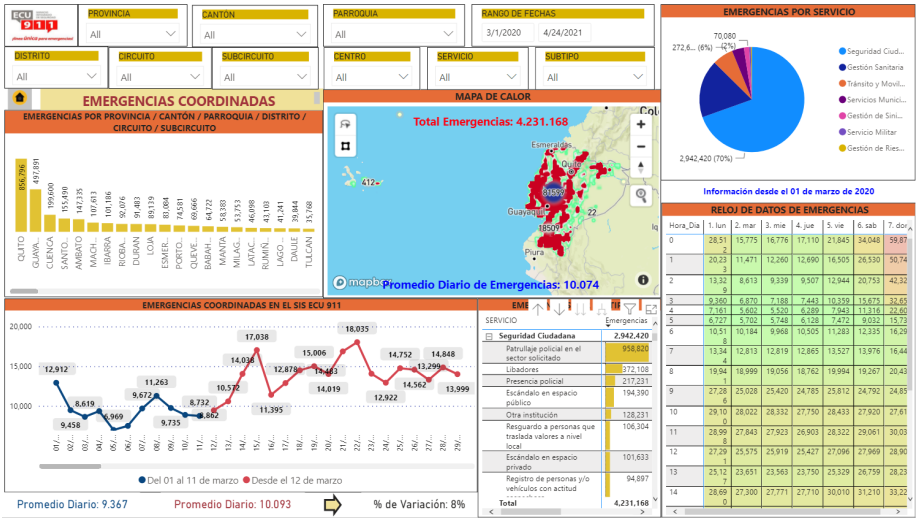

Figure 3: Online platform for storing emergency calls data in Ecuador [28].

not have mobile reception. Therefore, the calls in those areas have a lower density than urban areas and are always performed through landlines [26]. Figure 4 shows the total number of alerts per day that are received at the center. These are not always health emergencies, but they are distributed accordingly to help the citizens, residents and tourists in the area. The average alerts per day received are 28.172 throughout the country mostly due to: COVID-19, accidents, violence, disturbances, and breaking the curfew implemented to reduce the spread of the pandemic.

Aguas continues to explain the call center analyzes the alert received in the Galapagos and classify it as either a health-emergency or another type of alert [26]. If it is heart disease or an accident, the response is immediate. If it is a COVID-related call, it is first assisted by telemedicine to determine if they need hospital care, to send a doctor to the patient's home. If it is considered a mild case, the health personal will give recommendations to recover safely at home. This classification is done mainly due to the lack of health infrastructure in the Islands. By tackling mild cases in their homes and by using telemedicine, the saturation of the hospitals is avoided. The pilot plan of storing data and displaying it in a website was implemented previously in the Galapagos Archipelago. Therefore, the system was already online and available for the Islands when the pandemic struck the country March of 2020. After that, the website is being fed with information on all the regions of Ecuador.

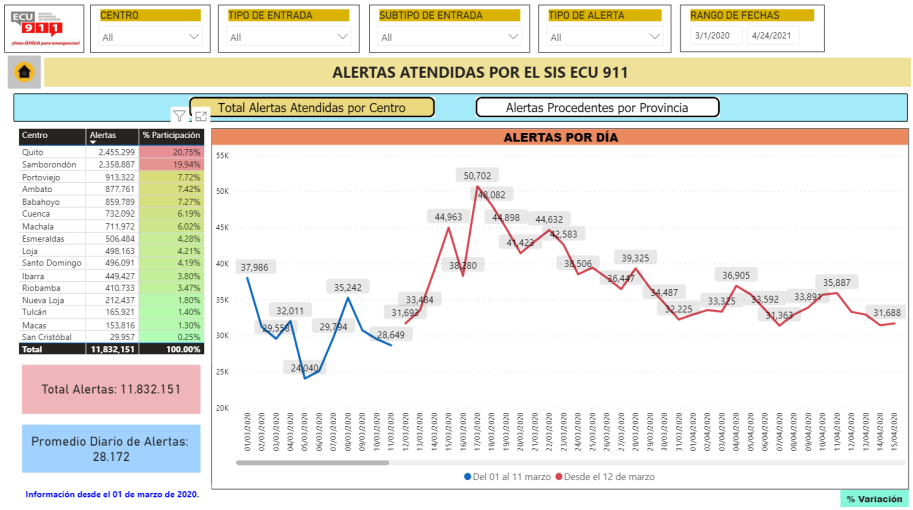

Figure 4: Online platform showing alert data per day in Ecuador [28].

4.5 Funding and Education for eHealth

In order to implement eHealth in developing countries, the country must prove there is willingness, readiness, and that they have the necessary tools to successfully implement ehealth in their country [29]. After proving their willingness and readiness, the country is able to apply for funding from the World Health Organization (WHO) [30]. WHO will help provide the necessary funding to implement eHealth and its infrastructure for the country, as well as help educate the doctors and the patients on how to use it [30].

WHO's goal is to provide affordable healthcare to all with the donations from numerous developed countries, displayed in Figure 5 [31]. As shown in Figure 6, in 2018 to 2019, WHO funded 139 million US dollars (USD) to the Americas, 758 million USD to Africa, 288 USD to South-East Asia, and more [31]. The funding they provided was used in countries for various health care applications, for example, building a better healthcare system, providing medicine for HIV or building telecommunication like in Bangladesh [31].

Not all countries apply all aspects of eHealth into their country. For example, some countries only apply telecommunication or an organized way for doctors to see the available pharmaceutical and for patients to order pharmaceuticals online [29]. Depending on what the country can implement and want to implement WHO will try

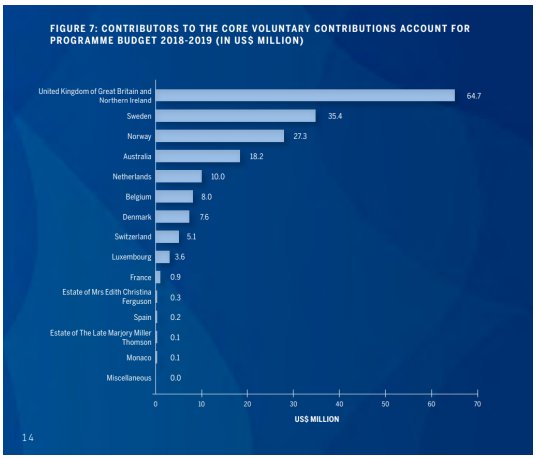

Figure 5: The figure displays the funding provided to the World Health Organization from Developing Countries

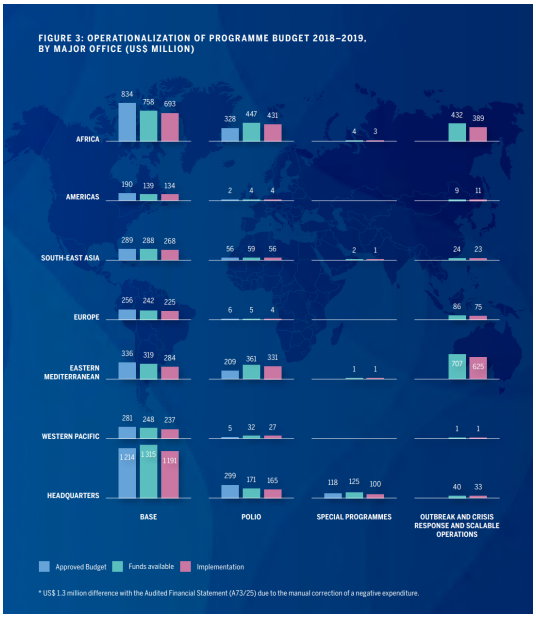

Figure 6: The figure displays the funding WHO provided to some developing countries in they year 2018 to 2019

their best to help them succeed.

One tool WHO provides is a way for countries to plan with the following steps [32]. First to have a need and a plan to satisfy the need [32]. Second to set small, medium and large goals and start attempting to reach the small and medium sized goals [32]. Last to plan to monitor the eHealth status and a risk analysis should be made [32].

Another tool WHO provides is a way to benefit from secure technology and a way to provide public health solutions for all [33]. Their inspiration is to make sure "No one behind – children or adults, rural or urban" [33]. The world health organization provides a vast option of tools to help the countries succeed with eHealth, it is only up to the country to keep eHealth striving.

5 Discussion

The implementation of eHealth over the years in developing countries are increasing. There are many successful implementations in the past and recent events. But, there are some cases that, unfortunately, have not been successful. This might be due to various reasons in the surrounding.

5.1 Successful eHealth implementations

The use of eHealth services has increased rapidly over the last year around the world. The main reason for this increase, is the COVID-19 pandemic which has forced remote healthcare services. In several South American countries remote monitoring and virtual consultations has been enabled to decrease the pressure on hospitals. Before the pandemic, this was not a widespread method for lesser urgent health issues. This crisis has shown that it is possible. It seems that a common denominator for eHealth implementation is that a crisis has to emerge for action to be taken.

In areas where a large part of the population owns cellphones, eHealth can definitely be implemented. The most important thing is that the apps and services are easy to understand and to use. The *Hello Health* app used in Burkina Faso is successful due to its simplicity. The users receive text messages and reminders with valuable information, therefore they do not have to be actively on the app themselves.

In addition, Asia demonstrates several cases of successful eHealth implementations. The Asian market has introduced different apps to deliver information about different diseases, such as symptoms, treatment and other facts. Increased knowledge, decreases pressure on hospitals, allowing the most urgent health issues to be prioritized. Sri Lanka has introduced economic reforms to improve healthcare as well as introduced digital healthcare. Improvements regarding their digital health records have taken place, along with an app to fill in ones information and symptoms to get immediate treatment.

It is clear to see that the important thing when introducing digital healthcare is that it is easily accessible and used for the patients. Cases where patients receive important information and have direct contact with doctors have proven to be important factors leading to success. Furthermore, the government plays a large role in eHealth implementation. Economic reforms to improve health care are beneficial allowing educational programs to be introduced. If the population and healthcare

professionals are educated on how to use eHealth services it will be much easier to implement, saving money in the long term.

5.2 Challenges with eHealth implementation

A couple reasons to why its hard to implement eHealth is the lack of preparation and strong telecommunication. The shortfall of infrastructural development has made the implementation of eHealth more difficult. Many countries have begun implementing some aspects of eHealth but they got more excited about the idea than planning and making sure it can sustain.

In some rural areas within developing countries, there is a high number of people that lacks literacy skills. Therefore, eHealth implementations are harder to implement as they are unaware of how to use technology in their daily lives. Another reason why it is hard is population expansion. Population expansion in developing countries have made it more challenging to implement eHealth, due to the fact that there is a growing population and a lack of technical support, for the software side, and medical staffs.

In some cases the diagnosis, done by medical staffs, is based on the information given by patients through texts or verbally, which might lead to misdiagnoses. Hence, patients believe if they are sick or something is wrong, the information must be passed onto them from the doctor in person and not over a digital application. This poses a huge limitation in the implementation of digital health because patients are not willing to accept change and try something new. India is only one example of a country which failed on implementing digital health out of many. Because of these failures from some countries the world health organization (WHO) has made specific requirements and planning help in order to get funding from WHO.

5.3 Challenges with implementing eHealth in Ecuador

Despite all the efforts put in, it is still challenging to establish a robust, sustainable system in Ecuador in terms of eHealth. Since the projects developed in that country have been done separately, in terms of different institutions, it is hard to centralize the information and the processes. Thanks to the interview held with the head of the Emergency Callcenter ECU-911, we noticed a vast improvement in digitalization and organization of operations in the Galapagos Islands. The main issue is the

lack of stable internet connection due to its location. Aguas indicated that all the connectivity is done by satellite, and it is subject to environmental situations like rain or storms. It also gets saturated when too many people are trying to use an internet connection. The connectivity makes it difficult to have real-time systems and think about other eHealth implementations like teleconferences (not only for COVID-19 cases) or assisted surgeries. In some rural regions, they lack of mobile reception on their phones causing a need to use landlines. Therefore, it is even harder for the people living there to quickly communicate with healthcare providers.

The same level of organization is not yet fully implemented in the mainland of Ecuador. We believe that by improving the internet connection in the archipelago, the eHealth projects could perform better and aim for new projects. It is also essential to work along with the government instead of developing projects independently.

Finally, another important aspect we encountered was a high number of digital illiterate people. Digital literacy is another important aspect of eHealth since people will need to know how a smart device works to use it. That is why many people prefer using conventional services to book an appointment and attend a healthcare facility.

5.4 What could be done in Ecuador

A general plan of the future of eHealth in Ecuador is of interest. Different health institutions need to work together to strive for the same goal, to improve the access to good and equal health. There are several successful solutions in Asia, Africa and South America that includes platforms where it is possible to find health related information. This information can be lifesaving and reach out to a lot of people in a fast way which can spare unnecessary emergency actions both short and long term. There are some implemented eHealth solutions to this in Ecuador, but it could be a possibility to work further with, a single monitored emergency call center that is accessible for everyone. A platform that does not need real time updates, and therefore it can be used in the rural areas where the infrastructure is less developed and dependent on outer factors like weather. It can eventually open possibilities for including different languages, and also make it easier to use for people with disabilities which can improve the inclusiveness.

The implemented *ECU-911* app is in development and has not been around for that long, but it has already started to connect the emergency health care. One

of the benefits with this already implemented solution is its inclusiveness. It is not only useful for persons that own a mobile phone, but also allows people to use landlines. This gives a wide range of users and provides a central emergency base. An increasing number of phones and users can also increase the possibilities even more, which can be a way to lower the gap between the rural and urban areas and hopefully it can be available for everyone. This could be a good starting point for a continued development.

Ecuador has made great progress towards building a better health care system. However, they are far from making it accessible for all. As previously discussed, in the Galapagos there is an app citizens can use to call for help. However, there are not a lot of smartphone users which poses a problem. If there are not enough smartphone users how can the app become a success? A solution could be if Ecuador gets the appropriate funding from the world health organization to implement eHealth infrastructure, and educate citizens on how to use eHealth platforms. With the proper infrastructure, there may be an increase in smartphone users and an increase in people getting the appropriate medical attention when needed. With an increase in smartphone users and education on how to use eHealth applications, for citizens, it can bring ease to the patients. For example, when booking an appointment, viewing doctors notes, or doing a virtual appointment. In addition, it will also be more convenient, save time, and bring comfort to the patients. Those are just some examples of all the possibilities that can arise in Ecuador in the foreseen future.

6 Conclusion

After performing extensive research within the last eight weeks, it was clear that many developing countries are taking steps towards implementing at least some aspects of eHealth. Online booking or smartphone apps could be examples of implemented eHealth. The goal of this paper was to gather information on developing countries who implemented eHealth successfully, and countries who struggled with the implementation. With the information gathered, we analyzed how Ecuador can learn from other countries successes and failures to keep eHealth striving after being implemented.

Like all developing countries, the implementation of eHealth does not come free. For Ecuador to make successful steps, Ecuador needs to apply for funding from WHO. To get the funds, Ecuador needs to show WHO they are willing and ready for change,

accepting digital solutions in healthcare. Afterwards, WHO can help Ecuador come up with a plan to keep eHealth striving, then provide the funds to help the country make steps towards proving equal access to healthcare to all. We believe Ecuador is on the correct path, and we hope that within the next ten years we see Ecuador strive within the healthcare system.

7 Acknowledgments

We would like to give a huge thanks to Milton Aguas and Pravin Surendran for taking the time out of their day to provide us with insightful information on the progress of eHealth in Ecuador and India. We would also like to give a huge thanks to Seyed Moein Pishnamaz for meeting with us weekly and providing feedback and advice on the project.

8 Division of work

The project was divided into different portions based on everyone's interests, connections to the topic they researched, what needed to be done.

Malin focused on eHealth implementations made in Africa and South America. She also focused on the discussion part on successful cases of eHealth implementations in different countries and what factors could be the causes for this.

Adithya focused on Asia. He also helped in an interview with Dr.Pravin (Doctor working in COVID center in Rural areas of pondicherry) for giving an insight about eHealth in India.

Amelia worked on the budget, interview transcript, discussion, and the conclusion. Inside the discussion, she contributed to "Challenges with eHealth implementation" and "What could be done in Ecuador".

Lovisa worked on the method, some parts of the background and introduction. She also worked on and the discussion part "What could be done in Ecuador", based on the successful and failed projects in the results.

Nathaly focused on Ecuador-related topics which included general information, the previous cases already developed, and the difficulties when implementing new eHealth

projects. She also helped with the interview with Milton Aguas.

General sections like introduction, discussion, abstract and conclusions, were developed with everyone's contributions. During the meetings, the flow of the report was checked and agreed upon by all the team members.

A Interview Transcript

Two interviews were conducted to help get a better understanding on how health care is in developing countries. The two interviews were done with professionals from two different developing countries, one in Ecuador and the other in India.

The interview with Ecuador was done with Milton Aguas, the head of the emergency center in Galapagos-Ecuador. During the interview he explained how calls were transferred to the call center pre-COVID and post-COVID and how the calls were distributed. Milton explained before COVID-19 the organization created an app to use when you need to call for help. The app goes straight to the call center and the call center provides the appropriate solution. However, Milton explained many citizens do not want to use the app due to a lack of smartphones and poor internet connection in the region. Also because many do not want to use the app for an unknown reason.

After COVID-19 Milton explained the organization build a well organized website which records all the calls that come into the call center and organizes them based on what the call was, for example health emergency and crime. In addition, the organization build COVID-19 measure based on the symptoms described on the phone. To limit the expose of people, if a person has certain symptoms they would tell the person to stay home and send a doctor to them or how to help them over the phone. However, if the call was a health emergency and not COVID-19 related they send an ambulance immediately.

The interview with India was done with Pravin Surendran, a rural area doctor. Pravin explained the different aspects of eHealth implemented in India and why he thinks eHealth is failing. Pravin started the interview explaining the universal health care platform all doctors can use throughout the hospital to view the different medication and patient information. Pravin said there is education for medical professionals on how to use the platforms allowing for good communication within the hospital. He then explained how eHealth for pregnancy and kids from birth to age 5 is the most successful implementation. Pravin also informed us on different platforms patients can use to have access to better health care, for example, a medical dictionary, a way to track your diagnose to cure, and apps. However, many patients do not want to use the platforms because they want medical advice and medication from a doctor and a doctor only. Also, the patients are not educated on how to use the platforms and resources provided to them.

In addition, another reason why eHealth is failing in India is because there is a lack of smartphone users. Within the smartphone users there is a lack of education on how to use the smartphones leads to smartphone users not using the resources provides. Lastly, Pravin explained how the communication towers in India only have a bandwidth for 100,000 patients to use the platforms which is only a small portion of India's population.

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