INFO30005 Project Proposal:
An Education and Appointment Website to Accelerate the Immunization Coverage in Rapid Urbanizing Areas

Team: teamVaccine

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Preliminary

The outbreak of the Coronavirus COVID-2019 at the start of the year 2020 awakened our fear of pandemic and epidemic disease. Other than COVID-2019, we have several serious outbreaks of dangerous viruses in human history, such as Black Death and SARS. From those examples, we can see that certainly, epidemic diseases will cause deaths, economic crises, and many other affect impacts. It is even more crucial nowadays since globalization has linked all parts of the world together and the negative impacts associated usually spread more rapidly than our imagination. This raises the importance of the prevention of epidemic disease, which is immunization using vaccines.

Thanks to the advanced technologies today, we do have vaccines for many existing preventable diseases. Immunization (by using vaccines) is a simple, safe and effective way of protecting people against harmful diseases before they come into contact with them[1]. Immunization not only protects individuals but also others in the community, by reducing the spread of preventable diseases. Vaccines are not rare and immunization is encouraged around the world.

Yet, we still have issues regarding immunization. Consider the following:

1. People in rapid urbanization or developing areas lack education, hence they do not know immunization, or they are not aware of the importance of immunization. They might not get a vaccination that is needed due to a lack of information.
2. People in rapid urbanization or developing areas have financial difficulties to get the vaccination and need government support. But they do not have the channel to communicate with the government and the hospital.
3. People in rapid urbanization or developing areas only know limited types of vaccines and their understanding is not up to date. Misleading information, such as measles vaccine will cause disorder and brain damage, might even cause anti-vaccination emotions[2].
4. People in rapid urbanization or developing areas have desire on certain types of vaccines, but the government or hospital have not introduced those vaccines to the market yet. This fact is reflected by the low HPV introduction around the world[3].
5. People in rapid urbanization or developing areas find it difficult to book an appointment with a hospital or clinic directly.

To accelerate the immunization coverage worldwide, including the developing areas, and to protect more people from diseases, it is worthy to solve the problems above.

Hence, in this proposal our team will highlight how we aspire to develop a web-based application that will increase the immunization coverage in developing areas that are undergoing urbanization through three main means:

1. We want to build a website for educational purposes that can increase people's awareness of the importance of immunization.
2. We want to build a website with an appointment system. After seeing information on vaccines, users do not have to find hospital websites or calling hospitals for booking. They can use our website for an appointment directly.

3. We want to build a website to connect different parties together. We want to build a platform so that users, hospitals, vaccine suppliers, governments can communicate with each other and collaborate.

Problem Specifications

In this section, more detailed analysis and interpretation regarding the problem will be given.

Problem statement:

We got inspiration from an OpenIDEO challenge: “Accelerating Immunization Coverage for Rapid Urbanization Challenge”

Link: https://challenges.openideo.com/challenge/infuse-urban-immunization-challenge

We want to build an educational website with appointment and feedback systems for people in rapidly urbanizing areas so that they can collaborate with hospitals and government more efficiently to boost the immunization coverage in the area.

Problem interpretation:

1. **Rapid urbanization:** Many developing areas originally are countryside. Due to the development of the country, those areas merge with cities and undergo urbanization. Usually, urbanizing areas have a lower standard of life compared to big cities but are much better than real rural areas. Similarly, people in those areas are not very well educated and have limited information. The solution to the challenge should increase awareness of the importance of immunization among those populations first.
2. **Immunization coverage:** To increase the immunization coverage, different parties shall collaborate. Government support and hospitals(clinics) action are required. Sometimes the vaccine producer and vaccine research center also plays an important role. If we want to increase the coverage, one significant action is to provide a platform, bring those parties together and let them communicate and collaborate without obstacles.

Targeted areas:

In 2018, an estimated 19.4 million infants worldwide were not reached with routine immunization services such as 3 doses of DTP vaccine. Around 60% of these children live in 10 countries: Angola, Brazil, the Democratic Republic of the Congo, Ethiopia, India, Indonesia, Nigeria, Pakistan, the Philippines and Viet Nam[4].

Given the data above, we can see that most of the developing counties lack immunization coverage. Hence our main target will be developing countries that already have some technology foundations, such as Viet Nam, Pakistan, Philipines, Indonesia and India.

Note:
However, we will not limit access to our website from regions outside our targeted areas. Users from developed areas can still use our website, but they might not find many hospitals available for booking in their surroundings as our focus is not developed countries and will not have many collaborations with hospitals in developed areas. Other than the booking system, our other functions will be able to work as normal for users in developed areas.

Possible causes for low immunization coverage:

1. Lack of education and information
2. Lack of awareness
3. Lack of facilities (hospital, clinics) in reachable areas[5]
4. Poor health staff motivation and attitude[6]
5. Lack of promotion/follow-up of routine immunization/health communication[7]
6. Lack of resources/logistics (e.g., insufficient funding and stock-outs which affect reliability, missed opportunities to immunize and cold chain)[8]
7. People do not have channels to get the vaccinations they want. For example, certain useful vaccines are available elsewhere but are not introduced into the area by the government.
8. Financial difficulties[9]

People suffering this problem:

1. People living in rapid urbanization area.
2. Susceptible population in the country or even the world.

Current solutions:

1. Compulsory immunization coverage supported by the government
    a. Some countries' government arrange compulsory vaccination for children and teenagers[10].
    b. However, most of the time, only children and teenagers will have the chance to get the vaccination. Many adults who need immunization as well will not be covered.
    c. Those adults still face problems such as lack of channels and lack of financial support.
    d. Moreover, only some diseases are immunized.

2. Advertising posters in clinics and hospitals
    a. Only people who visited the hospital might have seen the posters.
    b. The information included in a single poster is not complete.

Our solution

In this section, we are going to highlight the logistics of our web-based application revolving around users, problems to be addressed and goals.

Intended Users:

1. People in rapid urbanization area who do not have a high education level and does not have much understanding of immunization and its benefit.
2. People in rapid urbanization areas who find it difficult or inconvenient to arrange appointments directly with hospitals and clinics for vaccination.
3. People in rapid urbanization area who need channels to express their thoughts on vaccination (to hospitals or governments).
4. Representatives from hospitals, clinics, vaccine suppliers and governments who want to collaborate with patients and among themselves using our platform.

Features:

1. Account

a. ***Sign up:*** New users need to create an account with our website. It requires information including users' name, email address, password, date of birth, country and city that they are living in.
b. ***Log In:*** Existing users need to perform a login in order to access their accounts.
c. ***Account management:*** Users should be able to change their information, details and other settings with an account management center.
d. ***Collaborator account:*** Hospitals, governments or vaccine suppliers work with us will be provided with a collaborator account. Other than standard account functions, they are also granted the authority to review the feedback from standard users.

2. Educational Pages (main feature 1)

a. ***Database:*** The website will display sophisticated information about vaccines that is available. Details such as:
    i. Vaccine name
    ii. Diseases associated with the vaccine
    iii. Target population
    iv. Side effects and adverse reactions after taking this vaccine
    v. The valid period after injection
    vi. And many more…
b. ***Suggestions:*** Some users use our website to find more about a specific vaccine. Some might just be attracted by advertisements and start to browse our website without a clear goal and just want to learn more about immunization. This function will display:
    i. Most popular vaccines recently
    ii. Vaccines that are searched most frequently

iii. Vaccines suggested by authorized organizations or governments
iv. Vaccines suggested by experts and doctors who collaborate with us

In this way, they can still take away something from the information we provided to them directly.

c. ***Interactive small game (optional):*** The game will display some interesting multiple-choice problems about immunization to the user and introduces an interactive learning environment.

3. Appointment System (main feature 2)

a. ***Appointment:*** Users can book an appointment through the vaccine page directly or through launching a new appointment through the sidebar.
In each vaccine page, there will be a "make an appointment" button. By clicking this button, information about this vaccine will be auto-filled in the application form. After that, the website will ask the user to put in personal details that they would like to use for the appointment. Our website then will display hospitals with this vaccine available and the user can choose one from them. Users should also choose an appointment time. Throughout the process, our website is connected with the hospital's service system to make sure that the information we displayed to the user (e.g. the available time) is accurate and the appointment is successful.
For new appointments launched at the sidebar, users need to manually choose the vaccine that they want to book. Other than this step, the rest of the process is identical to the application launched on the vaccine page.

b. ***Payment (optional):*** Users can pay the appointment fee and vaccine fee (if needed) to the hospital directly during appointment procedure through our website. Our website will not keep the money by ourselves. We will provide a payment method (third party) so that any fee associated will be directed to the hospital.

c. ***Notification:***
   i. Users will receive emails about the outcome of an appointment. If successful, details about the appointment will be provided. If unsuccessful, reasons and instructions for re-booking will be provided.
   ii. Users will receive a reminder through email one day before their scheduled appointment with the hospital

4. Feedback

a. ***Feedback to hospital:*** User can use our feedback system to inform the hospital about:
   i. Infectious but preventable diseases that they are suffering
   ii. Vaccines that they are looking for but are not available in the hospital yet
   iii. Vaccines which are highly demanded among the population
   iv. How to improve the hospital’s vaccination service

b. ***Feedback to government:*** User can use our feedback system to inform the government about:
   i. Infectious but preventable diseases that they are suffering
   ii. Vaccines that they are looking for but are not available in the country/area yet

iii. Vaccines which are highly demanded among the population
iv. Suggestions on country/area's immunization strategy

c. ***Review:*** Representatives from hospitals and the government will be able to review the feedback provided by regular users frequently by using the collaborator account. If the feedback is valid and constructive, hospitals and the government will get inspirations from people's thoughts on how to increase the immunization coverage.

5. Chat room (optional)

a. ***Chat room box:*** On every page of our website, there will be a button at the bottom right to initiate a chat with our online doctor.
b. ***Auto reply:*** For simple enquiries, a robot will be used to reply to the message. The robot will analyze the keywords in the user's message and send out the pre-coded response or guide the user to provide more details on their situation for further analysis. If the robot is unable to handle the enquiry, then the user will be able to switch to a real online human doctor.
c. ***Doctors:*** The online doctor who is responsible for replying user's question will be from our collaborating hospitals. They will work from 9:00 am – 5:00 pm. For time out of this range, the auto-reply is available.
d. ***Pictures (optional):*** Users can send pictures to support their text messages.
e. ***Chat history:*** All chat will be stored in our database. They might be useful in the case of legal disputes.

Any sub-features labeled as (optional) might or might not be implemented, depending on the progress of the projects later. If the subfeature is not labeled (optional), we should implement it.

How our features solve the problem:

1. Educational pages & Chat room:

Through education, firstly, we can inform people about the existence of some disease and its vaccine. Secondly, for people who do not accept vaccines due to some ethical or other issues, they might start to understand the benefit and the scientific principle behind vaccination. Thirdly, for people who are willing to get vaccination but are puzzled by different kinds of information, they can find clear, accurate descriptions and data on our website. Through these ways, we have increase people's awareness on immunization, more and more people will be willing to have vaccination. Since the patient is the most important party in our issue, by increasing the number of people who are vaccinated, we have accelerated the immunization coverage.

2. Account & Appointment System:

After education, we have to make sure that the user indeed books a vaccination with our hospitals. Otherwise, this will not lead to an increase in immunization coverage. If our

website only has the educational pages and users still need to find a booking website, they might be lazy to do so and, in the end, they are not vaccinated. If this happens, our website does not guarantee an increase in immunization coverage. By combining education with a booking system, we provided a very convenient service. After checking the information about disease and vaccines, users can book directly on the vaccine page. They no longer need to find another website.
Booking online also provide convenience for people who are not comfortable with the phone calling booking method and people with disabilities. Our website provides an alternative and ensures that those groups of people are able to get their desired vaccination.
By increasing the number of people who get vaccinated, we have increased the immunization coverage.

3. **Feedback:**
   Other than patients, hospitals and the government also plays an important role. Government is the key party that makes decisions on immunization strategy in the area. These immunization strategies certainly will be beneficial to residents, but through taking in the opinion and suggestions from people, the immunization strategies might be even more efficient and more appealing to most of the residents. For hospitals, listen to patients' opinions and adapt their immunization service accordingly will increase patients' willingness to get vaccinated. They can also introduce vaccines that are desired by the population and contribute to the overall immunization coverage. Hence, through our website, the government and hospitals will be benefited and work together with residents to further boost the area's immunization coverage.

Assumptions:

1. The challenge states "rapid urbanization". Our targets are the area that is undergoing urbanization but lack a solid foundation (such as education and facilities). In reality, people in those areas have access to the internet and have smartphones. So, our website can still reach them.

Meeting Schedule

Team meeting is held for all team members to be informed with the progress of the project at various times before the deadline. In addition, this will enable team members to support each other shall any problems with any aspects of the project occurred. Furthermore, the meeting serves as a platform for constructive discussion regarding the project planning and execution.

Based on initial agreement, the following is the weekly meeting schedules and its corresponding venues:

Day: Every Thursday
Time: 5:15 pm
Venue: University Libraries (any) or Online through Wechat / Zoom

Date	**Time**	**Meeting Notes**	**Comments**
2020.3.12	5:15 pm	-Group formed -Topic decided -Main functions decided: education, appointment	
2020.3.19	5:15 pm	-Proposal 70% done -Discussed how to improve proposal	Online meeting
2020.3.26	4:00 pm	-Finish web design by next Monday for all possible web pages (Anthony) -Lehan finished 80% of the backend -Refined workload distribution -Refined tools will be used, including js, html, css and react	Online meeting
2020.4.2	5:15 pm	-Point out improvements on mock-up server -Clarification on assessment submission date -Final check on the proposal with Daniel	Online meeting
2020.4.9			
2020.4.16			
2020.4.23			
2020.4.30			
2020.5.7			
2020.5.14			
2020.5.21			
2020.5.28			

Git Repository

https://github.com/lehang123/Info30005_Project

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[5] Michael Favin, Robert Steinglass, Rebecca Fields, Kaushik Banerjee, Monika Sawhney, Why children are not vaccinated: a review of the grey literature, *International Health*, Volume 4, Issue 4, December 2012, Pages 229–238, https://doi.org/10.1016/j.inhe.2012.07.004

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