The Construction of an Application to Manage Health Problems of Ethnic Groups in Chiang Dao District to Reduce Social Inequality in Access to Essential Services in Public Health

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Abstract

Public health inequality has played a significant role in Thai society, especially among the ethnic groups who are regarded as vulnerable. They have encountered problems accessing public health services in Chiang Dao district, Chiang Mai province, due to communication and distance problems causing higher mortality rates than in low-lying areas. The objective of this research was to create an application to facilitate preliminary healthcare services and treatment of the ethnic groups in an attempt to reduce social inequality in accessing basic healthcare services of the ethnic groups. The research process involved eight steps. The first step was concerned with examining frequently discovered illnesses and ailments among the ethnic group in the study area from Chiang Dao hospital and its public health network as well as from documentary research and in-depth interviews. The second step was fieldwork with community participation to investigate actual healthcare problems in the study areas. The third step was concerned with collecting, analyzing and synthesizing the collected data. The fourth step dealt with preliminary treatments of illnesses and ailments, submission of the data to medical personnel for verifying the correctness of the data, and classification of basic treatment methods according to types of illnesses. The fifth step involved fieldwork to collect four ethnic languages, which included Akha, Karen, Hmong, and Lisu. The sixth step was about the design and construction of the application. The seventh step was to test the operation of the application with 150 ethnic individuals before carrying out the improvement. The last step was about the formation of the application manual.

The application for preliminary healthcare and illness treatment for the participating ethnic groups was constructed based on the Flutter software development kit and the Dart programming language and operates on the android operation system on mobile phones. The application was tried and used by 150 ethnic respondents for preliminary healthcare and illness treatment. A questionnaire was then administered to find out the satisfaction of the application users. The overall mean efficiency of the application is at a high level (Mean = 4.24, S.D. = 0.53). To construct this healthcare application for the ethnic groups is another channel for them to better access public health services in the district as generally impeded by linguistic and distance problems. This is a form of healthcare system development in the country, which could be a solid foundation for overall national development and a part of the Sustainable Development Goals

Keywords: Inequality, Ethnic Groups, Technology, Public Health, Mobile Application

Introduction

Public health is an important issue and is regarded as a basic necessity for the well-being of people in preventing and curing diseases for good health and sanitation (Winslow, 1920). For national development, it is crucial to provide a better quality of life for the public. One way to develop the social and health status of ethnic groups in Thailand is to enable their access to social services to improve their life quality and reduce the social

inequality gap. This can be done through arranging and distributing social services according to the legal rights of minority ethnic people regarding education, public health, and social welfare by developing service channels and enabling access to these services. As good public policy, the health of citizens of all ages should be improved and promoted, especially for the disabled, the underprivileged and the ethnic elderly (Ministry of Social Development and Human Security, 2023).

Chiang Dao district is located in the north of Chiang Mai province. This ethnically diverse district comprises 14 minority ethnic groups (Arunsirot & Chaichompoo, 2019). Due to the ethnic diversity and remote locations of their settlements, access to healthcare services is a significant problem encountered by these ethnic groups. From interviewing local public health personnel, it was found that communication and long-distance problems are the major obstacles for these ethnic groups. This is particularly acute for the elderly who cannot communicate in Thai. Middle-aged ethnic residents can communicate but they are not proficient enough. Therefore, language is a major barrier between public health personnel and ethnic people when explaining the details of illnesses and treatment methods. Distance from services is also a barrier for ethnic communities who are located in mountainous areas; 76 kilometers from Chiang Dao district to Chiang Mai city center, and transportation is difficult because of the steep roads with this district designated as a high-risk zone in the rainy season due to frequent landslides. This is another hurdle for ethnic people to obtain healthcare services. Furthermore, a large number of ethnic people do not have Thai citizenship and this has a strong negative effect on their well-being because they are not included in the public health database, thus depriving them of their healthcare rights. Therefore, they do not usually come to see the doctors when they become sick because they are not able to pay for medical bills only seeking medical treatment when their illnesses have become severe, making treatment more difficult. The ethnic elderly has a shorter life than those in urban areas because they are unable to access healthcare services, their settlements are distant, and their children work in cities or other locations so the elderly are often left to fend for themselves without having sufficient healthcare knowledge, and ultimately increasing their mortality rate. Given these facts, the Thai Health Promotion Foundation has categorized minority ethnic groups as vulnerable and risky or requiring special attention to access healthcare services due to social inequality. It is a social factor limiting or making it difficult for them to access healthcare services (Moonpanane & Thepsaw, 2019).

This study focuses on social inequality, and factors affecting the health of the ethnic groups to reduce social inequality, and enable greater access to services, by using the technology of wireless communication through portable devices. Applications for these portable devices are now able to be rapidly developed and are widely popular. The advantages of having mobile applications are convenience and unlimited access. Mobile phone prices have become very affordable, enabling more ethnic people to buy smartphones for personal use (Mahatthanachai & Mahatthanachai, 2022). Ramdurai (2021) showed that mobile apps are available that provide many advantages for healthcare services, allowing users to make more rapid decisions, and increasing the quality of accessibility which could lead to a positive effect on patient care outcomes.

The objective of the current research was to create an application that could be used by remote ethnic groups to access healthcare more readily, thereby mitigating the healthcare problems facing these communities. Four ethnic groups, the Lisu, Akha, Karen, and Hmong were the communities considered, with the primary aim of providing them with the ability to access, and receive, information and recommendations for relieving their illnesses and removing the barriers to accessing medical services. The findings of this research project, and the

smartphone application developed, will also inform and facilitate access to healthcare services for these, and other, ethnic groups in all regions of the country.

Research Objectives

1. To construct an application for healthcare and how to give basic illness treatments for the ethnic groups to reduce social inequality in accessing basic public healthcare; and

2. To examine the satisfaction with the application of the users

Methods and Materials

1. The study framework was to develop a solution to the problem of social resource inequality in accessing the public health system by constructing a smartphone application to provide greater access to healthcare and provide information and recommendations on basic treatments to the ethnic groups. The application also provides recommendations for appropriate medication and enables a search for conveniently accessible public health service units and hospitals in the district.

2. The purposive sampling method was applied to select the target group of 150 ethnic individuals consisting of 40 Akha people, 40 Karen people, 35 Hmong people, and 35 Lisu people.

3. The research methodology in this study was as follows:

- Documentary research was conducted from report summaries of out-patients of Chiang Dao Hospital and public health offices in the study area. Data regarding the number of ailments of local people, stored in the hospital database, was reviewed to obtain an overview of the ailments experienced by the community members.

- Data on non-communicable and chronic communicable diseases, sourced from the Chiang Dao Community Hospital and 12 Tambon health promotion centers, were investigated by conducting in-depth and unstructured interviews with medical personnel. A participatory rural appraisal was also carried out, which was a mutual learning process between people within and outside the communities by organizing seven focus group discussions. It was found that there were twelve syndromes, which included reproductive and sexually transmitted diseases; skin diseases; ear diseases; accident and toxin; eye diseases; respiratory diseases; brain and neurological diseases; blood circulation; digestive diseases; bone and muscular diseases; urinary bladder diseases; and others.

- Basic diagnosis and treatment guidelines were examined from the text, general diagnoses and treatment notes written by Achananuphap (2008), categorized according to the types and symptoms of each ailment, which were illustrated in 1,145 pictorial illustrations. Three professional medical personnel were requested to verify the content validity of the data. The verification results were overall at a high level (Mean = 4.30, S.D. = 0.11).

- The verified data were incorporated into the database with the basic treatments categorized according to the types and symptoms of the ailments.

- Collaboration with concerned individuals was sought for their assistance and facilitation to collect the language data for this research. These individuals included village heads and religious leaders in the Lahu, Lisu, Akha, Karen and Hmong churches.

- Three language informants for each language were selected. The criteria were that they could be either male or female who can read and write their ethnic language as well as use their language for daily

communication. Being witty was a helpful trait to facilitate communication, and they needed to be willing to cooperate until the end of the language data collection period with the research team.

- A database was developed for storing the data on ailments and diseases, diagnosis guidelines, basic self-care methods, and the use of modern medication. This database was the core of the application that was developed. Additionally, the data on healthcare service centers in the district were also stored, which included their names, types, addresses, locations, contact individuals, and phone numbers.
- The application was designed and its contents emphasized pictorial illustrations and short texts for easy understanding. To facilitate those residing in very remote or mountainous areas without an Internet connection, the application was designed to operate both online and offline.
- The application was verified and assessed for its quality by three computer experts. It was found that the overall technical propriety of the application was at the highest level (Mean = 4.57, S.D. = 0.47).
- The questionnaire was constructed to examine the satisfaction of the users with the implementation of the application.

The overall steps in constructing and developing the application are illustrated in Figure 1.

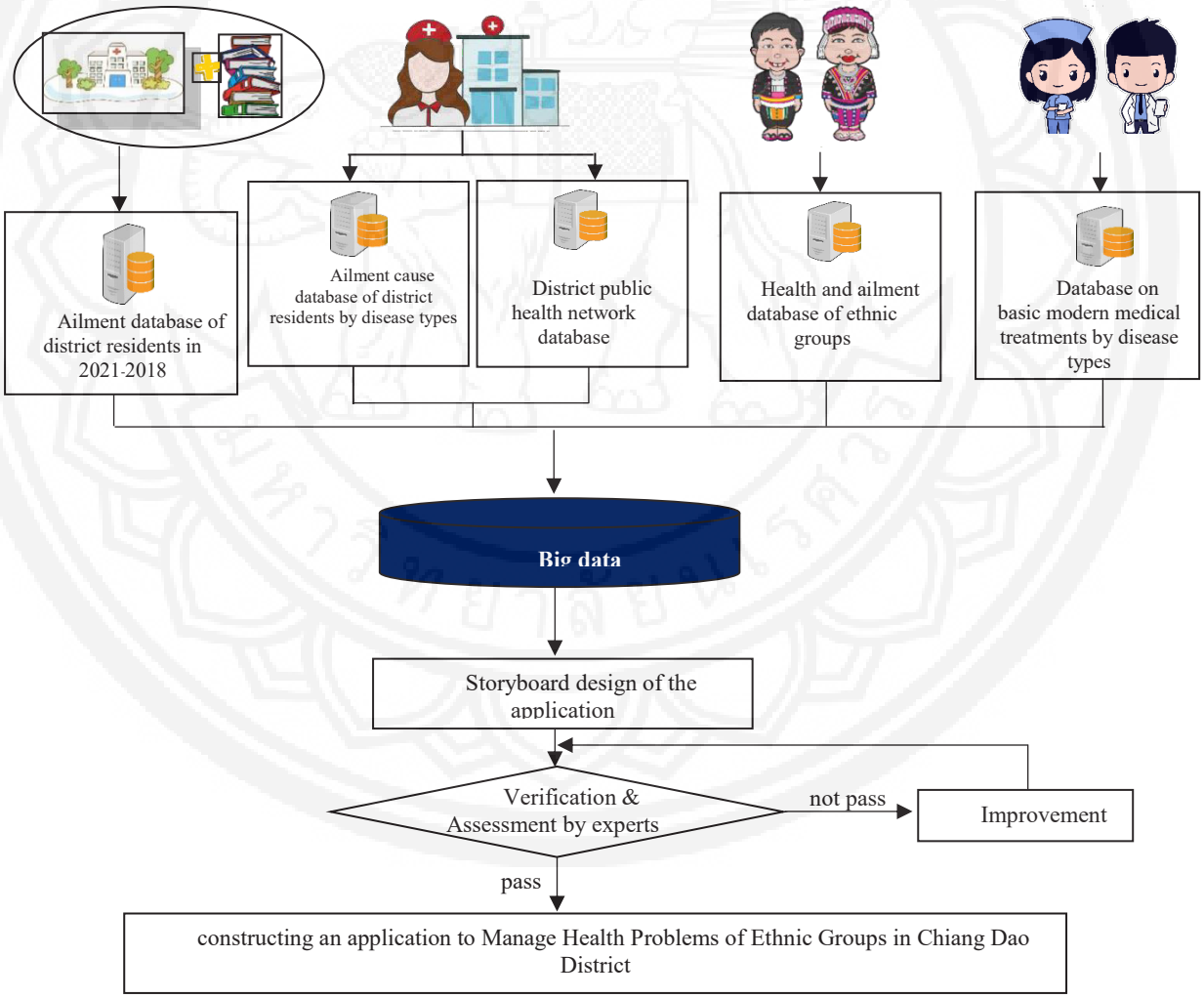

Figure 1 Steps in designing and constructing the application

Results

After having analyzed, designed and developed the application, the results of its assessment are as follows.

1) Results of the application construction

The application is available in four ethnic languages. It can be downloaded and installed from Play store. After being installed, the system is displayed with the icon on the screen as follows (Figure 2A-2D).

Figure 2 The application icons for four languages (A) Karen (B) Lisu (C) Akha, and (D) Hmong

When a user clicks the icon to start the operation for the first time, the system will display the screen to record their personal information: name, surname or family name, and current address. The address is intended to identify the user's location and find the nearest medical center. The example of the registration screen for gathering personal information in Lisu language is shown in Figure 3.

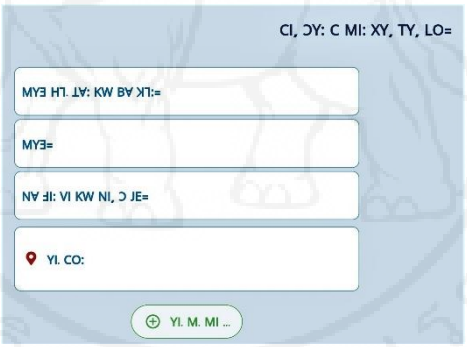

Figure 3 The screen for registration in Lisu language

After registration, the system navigates to the home screen, which consists of the following menus: personal information, symptom assessment, and search for a medical center. The example of the home screen in Lisu language is shown in Figure 4.

Figure 4 The home screen in Lisu language

When the symptom assessment icon is selected, the system will show the sub-menus according to symptomatic aspects occurring to the user. The example of the symptom assessment screen in Lisu language is shown in Figure 5.

Figure 5 The symptom assessment screen in Lisu language

When the symptom icon is selected, the system will show major and minor symptoms that could occur in particular cases for the users to assess the symptoms by selecting relevant pictorial icons as in Figure 6. After that, the symptom assessment will be summarized to the user followed by the treatment method and recommendation in addition to the nearest location of the medical center respectively, as shown in Figure 7 – 8.

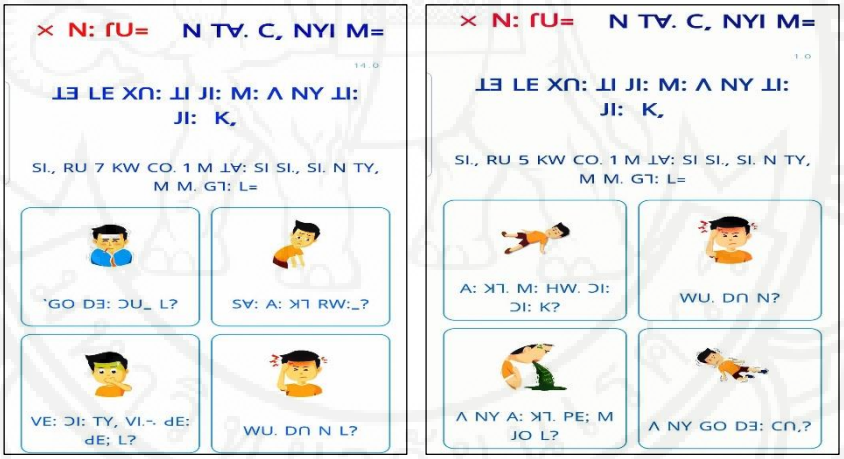

Figure 6 Screen with symptom assessment in Lisu

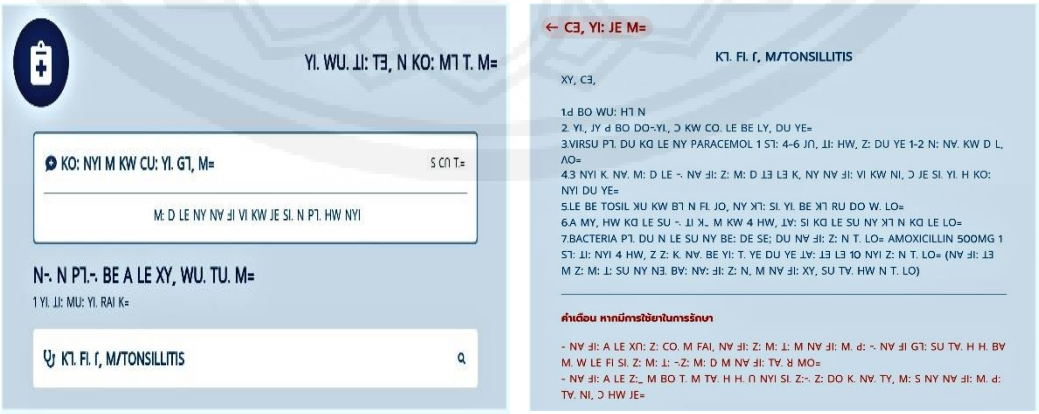

Figure 7 Screen with symptom assessment summary with treatment method and recommendation in Lisu

Figure 8 Screen with the search for the nearest medical centers in Lisu

2) The study results on the satisfaction with the application of the users

After the application was implemented in the villages of the four ethnic groups, 150 village public health volunteers were requested to assess their satisfaction with the application through the questionnaire. The results are shown in Table 1.

Table 1 Assessment results on the satisfaction with the application of the users

Description	Mean	S.D.	Level
1. Contents of the application			
1.1 The contents are accurate and complete.	4.10	0.58	high
1.2 The contents are in accordance with the needs.	4.00	0.53	high
1.3 The contents are easy to understand.	4.06	0.65	high
1.4 The contents can be actually implemented.	4.12	0.52	high
1.5 The data obtained are useful and beneficial.	4.26	0.56	high
Total	4.11	0.57	high
2. Beauty, design and screen display			
2.1 The screen design is attractive.	4.68	0.47	highest
2.2 The screen design facilitates easy navigation.	4.38	0.49	high
2.3 The screen design focuses on convenient information exchange among users.	4.40	0.49	high
2.4 The screen design enables users to access the data to all menus easily.	4.54	0.50	highest
2.5 The fonts and pictorial illustrations are suitable.	4.66	0.48	highest
2.6 Background and font colors are suitable for reading.	4.44	0.50	high
Total	4.52	0.49	highest
3. Language			
3.1 The language is correct.	3.94	0.47	high
3.2 The language is easy to understand.	4.04	0.49	high
3.3 The language is suitable for users.	4.16	0.55	high
Total	4.05	0.50	high
4. Operations of the application by users			
4.1 The application functions correctly.	4.36	0.48	high
4.2 The application processes the data quickly.	3.84	0.65	high
4.3 The file size of the application is suitable.	4.02	0.71	high
4.4 The application is easy to use without complication.	3.86	0.53	high

Table 1 (Continued)

Description	Mean	S.D.	Level
5. Other aspects of the system			
5.1 Utility of the application	4.36	0.48	high
5.2 Actual use	4.56	0.50	highest
5.3 Novelty and differences from general applications	4.62	0.49	highest
Mean	4.51	0.49	highest
Total	4.24	0.53	high

The information presented in Table 1 indicates that the overall satisfaction of the 150 village public health volunteers with the use of the application was at a high level, with a mean of 4.24 and a standard deviation of 0.53. When the items are considered, it is revealed that the respondents were satisfied with the beauty, design and screen display at the highest level, with a mean of 4.52 and a standard deviation of 0.49, followed by other aspects of the system with the mean of 4.51 and the standard deviation of 0.49; the contents with the mean of 4.11 and the standard deviation of 0.57; language with the mean of 4.05 and the standard deviation of 0.50; and operations of the application by users with the mean of 4.02 and the standard deviation of 0.60.

Additional recommendations of the respondents included:

- There should be information about drug stores or private medical centers in the district as well as the routes to get there from current locations.
- The system should be connected with ambulance services in case of emergency.
- The application should add sound to facilitate those who cannot read.

Discussion

An application for healthcare and basic treatments of ailments for the four ethnic groups was constructed to run on a smartphone. The assessment results on satisfaction with the application were at a high level (Mean = 4.24, S.D. = 0.53). This is because the system design and development were based on community participation in driving healthcare. The ultimate aim is to reduce social inequality in accessing fundamental public healthcare services, which could bring about sustainable self-care actions in ethnically diverse communities. A survey on problems and difficulties in accessing public health services of the ethnic people was conducted as part of the in-depth investigation on frequently found sicknesses and diseases in ethnic individuals. Medical personnel and officers at state-run hospitals and medical centers were interviewed. Community participation enabled us to obtain firsthand information about their health and well-being needs, which could be incorporated into the design and construction of the application. This is in line with Creighton (2005) who stated that community participation is a step in the analysis of the research context, enabling appropriate planning and understanding of local lifestyles, and then designing activities which enable community operations to become successful.

Additionally, collecting the language data from the informants by applying linguistic principles is important to obtain natural language under real social contexts. The data were collected from the informants familiar with the four ethnic languages with clear and systematic criteria for selecting the informants; thus yielding correct and complete language data. Prommarak and Rittikoop (2021) stated that the best way to analyze language should be based on the natural language that native speakers use for daily communication. The use of socio-linguistic

knowledge regarding language variation and word choice was employed for more detailed explanations to the informants. Choosing words for medical content is challenging and problematic to the understanding of users and is therefore crucial when preparing linguistic data to ensure correct language usage in the application. This concept is in line with that posited by Phokhaisawan, Ingkhamrathorn and Suthiphong (2018) who stated that language is a social activity that everyone must learn to be able to fully participate in their community. Thus, using a correct and suitable form of language depends on various factors that affect the understanding of social members and make communication successful.

In designing and developing the application, the concept of an infographic was incorporated by using pictorial information as a part of the application design. Short concise texts and pictorial illustrations were used to present diagnostic information about diseases for easy, quick and clear understanding by the users. This is analogous to the data being summarised into illustrations to convey meanings and understanding of contents more easily. In addition, colors and sizes of the illustrations also attract the attention of users. This practice follows Khamsuwan (2019) who showed that transforming textual data into infographic illustrations enabled the public to acquire knowledge and understanding better and faster than conveying that information solely through the text. Trithosadet (2018) confirmed that infographic presentations are very beneficial in transferring information, as humans perceive pictorial information better than textual or verbal information. Colorful and beautiful aspects of illustrations or pictures can better attract the attention and interest of users or readers.

The development of this application for smartphones was based on the five steps of the System Development Life Cycle (SDCL). The steps include a needs analysis, application component analysis/ development roadmap/ flowchart construction, user interface design, application development, and application tryouts and improvement. In addition, technological advancement was exploited for the ease of daily activities, enabling users to use the application efficiently, flexibly and in response to their needs without restrictions of time and place. Boonchum, Khamdam and Khruathong (2020) found that application development based on SDLC is systematic and sequential, resulting in standard efficiency of the system and effectiveness of use.

Conclusion and Suggestions

The construction of this healthcare application for the ethnic groups has added another channel for them to better access public health services in the district as generally impeded by linguistic and distance problems. This is a form of healthcare system development in the country, which is a solid foundation for overall national development and a part of the Sustainable Development Goals.

Operational recommendations were as follows:

1) There should be support for further development of the application so that more functions and contents can be covered.

2) Public relations campaigns should be launched to publicize the application to other nearby ethnic communities to use it.

3) Administrators directly in charge of the application should be formally appointed so that the application can be improved and regularly maintained.

Moreover, the following extensions were suggested for further studies:

1) A user-data function should be added to process the data into big data in an attempt to improve the healthcare system in the form of information data, which is part of designing public health policies or guidelines of the government.

2) A sound version of the application should be added to facilitate those who cannot read and write.

3) A function in connection with public health agencies should be added.

4) Disease data should be annually updated, particularly new outbreaks.

5) Versions in other ethnic languages should be developed to provide more health alternatives to other ethnic groups in the area.

6) The application on smartphones with the IOS operation system should be developed.

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