

Web-Based Disease Mapping System Using Clustering Technique For Rural Health Unit: An Assessment Study Towards System Development

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Abstract

The study focuses on the assessment that aimed to develop a web-based disease map generation tool utilizing a clustering technique that can help in identifying the prevalent disease in the municipality and in managing and storing patients' records. The study is descriptive research; a purposive sampling technique was used. One instrument was used; the needs assessment questionnaire was used to determine if there is a need to develop a system. The respondents of the study were the personnel of Rizal, Laguna Rural Health Unit. The statistical tools/techniques applied in the study were percentage, mean, frequency, and ranking. Based on the results of the needs assessment, it was found out that there were difficulties when using the manual process of identifying disease prevalence in the municipality and in managing and storing patients' records. Based on the conducted assessment by the researchers the following conclusions were derived; there are problems recognized with the use of the manual procedure in identifying disease prevalence in the municipality and can be resolved by the proposed system's disease map; there were challenges identified in managing and storing patients' records and can be resolved by the functionalities of the proposed system; the features of the proposed system can help the personnel of Rizal Laguna RHU in their day-to-day transaction.

Keywords Clustering Technique, Disease Mapping, Health Care, Rural Health Unit

I. INTRODUCTION

The clustering technique has been widely used in various applications including data exploration and data reduction or grouping similar entities into homogeneous classes, consequently organizing large quantities of information and enabling labels that facilitate communication [1]. Numerous specific examples of the use of clustering technique have been reported in the literature, such as characterizing patients based on cluster symptoms or identifying medical patient groups most in need of targeted interventions

[2]. Clustering technique partitions a data set into several

groups such that similarity within a group is larger than that among groups. A large amount of data, usually tend to summarize this huge number of data into a small number of groups or classes to facilitate its analysis. Thus, this technique is useful for mapping disease prevalence in a specific area.

A disease map can provide a spatial understanding of a population's health and the distribution of diseases in an area. Moreover, disease mapping applies to the technique of

generating a visual representation of geographically-referenced data such as population information and disease prevalence data. Mapping these data highlights locations with particular characteristics and show relationships between places [3].

Rizal Laguna Rural Health Unit is located at the heart of the municipality of Rizal, Laguna. It serves as the medical capital of the municipality and can easily be accessed by Rizaleños since it is located at the center of the municipality. Rizal Laguna RHU is the primary provider of health services of the eleven barangays in Rizal, Laguna namely (1) Antipolo, (2) Talaga, (3) West Poblacion, (4) East Poblacion, (5) Tala, (6) Pauli 1, (7) Pauli 2, (8) Entablado, (9) Tuy, (10) Laguan and (11) Pook. Rizal Laguna RHU has 31 workers including the Municipal Health Officer, nurses, and other staff [4].

Issues on record-keeping and mapping of the disease were the problems experienced by the Municipal Health Officer and Staff of Rizal Laguna Rural Health Unit. In terms of the problem in record keeping, some of the records were not organized, others were duplicated and some were lost. In terms of mapping of disease, they are still using the manual procedure to find out the frequency of disease prevalence in the municipality, thus, resulting in consuming a lot of time in encoding those data.

According to Dr. Sam Joseph C. Cirilo, Municipal Health Officer of Rizal, Laguna RHU does not have a computerized system for creating disease maps and still using the manual procedure in identifying disease prevalence in the municipality. They manually tabulate the number of diseases occurring in a specific Purok of a particular barangay to identify what particular diseases have a high frequency. This procedure consumed a lot of time and effort and also results in unorganized records of data leading to data redundancy or data loss [5].

The study focuses on the assessment that addresses the needs and opportunities on how to improve the Rural Health Unit services and program. The result of the assessment will use as an input in the development of a Web-based Disease Mapping System using Clustering Technique that will automate the daily transaction of the said Municipal Rural Health Unit. The proposed system will utilize a clustering technique that will produce valuable information that can be used in decision making. This will also help other nearby Rural Health Unit in Laguna that still using the manual procedure in their day-to-day transaction.

II. THE OBJECTIVE OF THE STUDY

The objective of the study is to determine the need to develop the “Web-based Disease Mapping System using Clustering Technique” Based on the results of needs assessment,

Specifically, it aims to:

1. Identify the challenges encountered by the respondents in using the manual procedure of identifying disease prevalence in the municipality.
2. Classify what are the challenges encountered by the respondents in managing and storing patients' records.
3. Recognize appropriate functions of the proposed system that will address the issues identified.

III. METHODOLOGY

Data Generation Procedure

In the conduct of the study, data and information were gathered through interviews, and survey questionnaires. There was a questionnaire given to the Health Officer and Staff of Rizal Laguna Rural Health Unit,

questions that will determine the need to develop a system. This questionnaire was answered and an interview was conducted with the Rizal Laguna RHU staff to identify the problems and difficulties such as generating disease maps and managing patients' records.

Statistical Treatment of Data

The statistical techniques that were used are Percentage, Mean, Frequency, and Ranking.

The percentage was used in interpreting the results of the needs assessment questionnaire. Comparing the responses of the respondents was necessary to understand the need of the system.

Formula: $P = (F/N) \times 100\%$

Where: P = Percentage

F = frequency

N = total frequency

Frequency and Ranking were used to interpret the comments and suggestions of the evaluators on the developed system. The comments and suggestions were counted to determine which were with the most occurrences.

Mean was used to interpret the outcome of the evaluation of the developed system. Mean was calculated by taking the sum of the values data set and dividing by the number of values.

Mean:

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$$\bar{x} = \sum x / n$$

where:

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\bar{x} = sample arithmetic mean

x = each individual value in the sample

n = sample size

IV. RESULTS & DISCUSSION

Results Need Assessment

The first instrument was used by the researchers to identify that there is a need for a system to be developed. The questionnaire was composed of questions that are significant to the matter or subject that was included in the study. It was about the challenges encountered by the respondents on using the manual procedure in identifying disease prevalence in the municipality and in managing and storing patients' records. The respondents which were the personnel of Rizal Laguna Rural Health Unit answered by choosing from the choices provided by the researchers and if their answer was not included in the choices, they can write their answer.

Table 3 shows the answers of the respondents to the first specific problem of the study which is "What are the challenges encountered by the respondents in using the manual procedure of identifying disease prevalence in the municipality?"

Table 3: Challenges Encountered by the Respondents in Using the Manual Procedure of Identifying Disease Prevalence in the Municipality

Question	Frequency	Percentage
Not constantly updated	11	78.57%

Vulnerable to environmental problem	9	64.29%
Records are not available when needed	12	85.71%
Not present in some places	8	57.14%
Time-consuming	11	78.57%

According to the staff of Rizal Laguna Rural Health Unit based on the Needs Assessment questionnaire, the biggest problem with the manual procedure in identifying disease prevalence in the municipality is 85.71% of the answers were that records are not available when needed. While 78.57%, thought that maps were not constantly updated and were time-consuming to

do. Also, 64.29% responded that the manual process is vulnerable to an environmental problem and 57.14% answered that it was not present in some places.

Table 4 displays the response of the staff of Rizal Laguna Rural Health Unit to the second specific problem of the study which is “What are the challenges encountered by the respondents in managing and storing patients’ records?”.

Table 4: Challenges Encountered by the Respondents in Managing and Storing Patients’ Records

Question	Frequency	Percentage
Absence of record organization	11	78.57%
Vulnerable to environmental problem	13	92.86%
Records are not readily available when needed	12	85.71%
Missing or lost records	12	85.71%

Lack of updated reports	12	85.71%
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Based on the responses of the respondents on the second question, 92.86% answered that the biggest challenge in managing and storing patients' records is that records were vulnerable to an environmental problem. While 85.71% responded that records were not readily available when needed, there were missing or lost records, and that there was lack of updated reports. Also, 78.57% of the respondents answered that record organization was absent.

V. CONCLUSIONS

The study was conducted to develop a web-based system that can help the staff of the Rizal Laguna Rural Health Unit in managing patients' records and generating disease maps. These are the findings of the study:

The biggest challenge with the manual procedure in identifying disease prevalence in the municipality according to the personnel of Rizal Laguna RHU is that

records were not available when needed, 85.71% of the respondents answered this.

The biggest problem with manual managing and storing of patients' records according to the personnel of Rizal Laguna RHU is that records were vulnerable to an environmental problem, 92.86% of the respondents answered this.

Based on the conducted assessment by the researchers the following conclusions were derived;

1. There were problems recognized with the use of the manual procedure in identifying disease prevalence in the municipality and can be resolved by the proposed system's disease map;

2. There were challenges identified in managing and storing patients' records and can be resolved by the functionalities of the proposed system;

3. The features of the proposed system can help the personnel of Rizal Laguna RHU in their day-to-day transaction.

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