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Application of The Spread of Pneumonia in Cirebon Regency

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Abstract

Background: *The health development program is implemented to improve public health through health services. Technological developments in application development can determine how wide the scope of disease spreads in an area.Pneumonia is a respiratory tract infection caused by viruses and bacteria, the most significant cause of death in children worldwide. In 2019, more than 740,000 deaths of children under five years old were recorded due to pneumonia.*

Aim: *This study aims to design a disease-spread application so that it knows the spread of pneumonia in the Cirebon district.*

Methods: *This research method is qualitative and quantitative, using the data input process and measurement of system test results. The variables in the qualitative approach are input (toddler's name, mother's name, date of birth, village, address, gender, type of pneumonia), process (database structure, data entry, recap and storage, percentage), output (tables, graphs, and maps), and database. Meanwhile, the quantitative approach was carried out by measuring the results of system trials by looking at usability factors, namely overall satisfaction (OVERALL), system usability (SYSUSE), information quality (INFOQUAL), and interface quality (INTERQUAL).*

This study's population is 40 students, and it uses a purposive sampling method, where the entire population is a sample. The sample is part of the number and characteristics possessed by the population.Data collection uses observations, interviews, and system trial techniques carried out by users. Users analyze questionnaire items to calculate scores totaling seven points on the Likert scale.

Results: *The application for distributing pneumonia cases in Cirebon district has been successfully tested on 40 respondents. The system was tested using PSSUQ with four variables. The system test results show that the system is in the category of very feasible, with an overall percentage of 93%. The results of this category were based on the interpretation of the PSSUQ likert. Therefore, the application for the distribution of pneumonia cases can be used to determine the spread and awareness of the disease in the Cirebon district area.*

Keywords: *Pneumonia, Application, Distribution, Disease*

INTRODUCTION

The health development program is carried out to improve public health through health service efforts. Public health service efforts are carried out in the form of promotive, preventive, curative, and rehabilitative. This is done to increase awareness, willingness, and the ability for everyone to live a healthy life [1]. Pneumonia is the leading cause of death in children worldwide. Pneumonia is a disease of the lungs that occurs due to infection due to microorganisms such as fungal bacteria, micro bacteria, and pneumonia viruses in the air sacs in the lungs [2]. Symptoms in pneumonia are cough, fever, dyspnoea, and crackling sound during examination [3]. The risk of pneumonia in toddlers is usually due to smoking parents, malnutrition, low economy, densely populated environment, and lack of exclusive breastfeeding and congenital diseases of toddlers [4].

Pneumonia contributed to more than 740 thousand deaths of children under five years of age in 2019, of which 14% of deaths were in children under the age of 5 and 22% of deaths in children aged 1 to 5 years. In the 2021 Indonesian health profile, 9.4% of the main cause of death for children under five was pneumonia. This figure makes the pneumonia control program for toddlers very prioritized. One of the efforts that can be made to control this disease is to increase the discovery of pneumonia cases in toddlers [5]. The coverage of the discovery of pneumonia cases in toddlers in 2019 was 52.9%; in 2020, it was 34.8%, and in 2021, it was 31.4% [6]. The decrease in the number of cases of pneumonia in toddlers is due to the impact of the COVID-19 pandemic, where there is a stigma that affects the reduction in the number of visits for toddlers coughing or breathing difficulties at the health center [7]. The prevalence of pneumonia in the West Java area is 4.62%, below the national prevalence of 4.8%. Pneumonia cases in the Cirebon Regency area in 2022 reached 64.7%. This figure shows that the cause of death in toddlers is pneumonia [8].

Seeing the high prevalence of pneumonia in toddlers and the risk factors that cause pneumonia, surveillance was carried out to determine the spread of pneumonia cases in children under five in Cirebon Regency [9]. Surveillance is carried out to make available information about the situation, disease trends, and risk factors of public health problems and factors that affect them as decision-making material [10]. Technological developments can be in the form of application development that supports information processing systems. The use of disease spread applications is able to determine how wide the scope of disease spread in an area. The development of disease mapping applications can be known through applications in digital maps derived from data that has been inputted [11]. This application makes it easier for local governments to take preventive measures against these diseases. An area close to each other will be more at risk of contracting it than an area far away. Information about the layout of an area and the pattern of disease spread will be more visible when using a spatial approach. So that data about a disease will be better monitored, not only on who is sick but also on the geographical location between an area and the cases that occur. Therefore, disease mapping is carried out to help monitor the spread of the disease in the Cirebon district area [12].

METHODS

This research uses qualitative and quantitative methods. The variables in the qualitative approach are input (toddler's name, mother's name, date of birth, village, address, gender, type of pneumonia), process (database structure, data entry, recap and storage, percentage), output (tables, graphs, and maps), and database. Meanwhile, the quantitative approach was carried out by measuring the results of system trials by looking at usability factors, namely overall satisfaction (OVERALL), system usability (SYSUSE), information quality

(INFOQUAL), and interface quality (INTERQUAL).

This study's population is 40 students, and it uses a *purposive sampling method,* where the entire population is a sample. The sample is part of the number and characteristics possessed by the population [13]. Data collection uses observations, interviews, and system trial techniques carried out by users by analyzing questionnaire items in scores totaling seven points on the Likert scale.

RESULT AND DISCUSSION

A web-based mapping application was successfully developed under the pneumonia integrated information system. There are two categories of users in this application, namely admin and user. The admin category is an application manager who can monitor all data that has been input into the application, such as the regional health office. Then for the user category, it is a data manager in a health center where the coverage of distribution is only in areas that are included in the area of the health center. Those who fall into the category of users are usually the puskesmas medical record officer, puskesmas admin, or puskesmas reporting officer. Each user has a username and password that each user and admin can change.

The application home page has a login feature where users must fill in their username and password. The admin can only register users for application access so that the admin can limit the number of users. The user registration is in the form of registering the name of the health center, which is the scope of monitoring the spread of pneumonia.

User users carry out pneumonia case data input. Data that can be input includes the name of the toddler, mother's name, date of birth of the toddler, village, address, gender, and type of pneumonia. There are four types of pneumonia: pneumonia < 1 year, pneumonia < 5 years, severe pneumonia < 1 year, and severe pneumonia < 5 years. Filling in the type of pneumonia data is in the form of options available in the application. The data on the distribution of cases in a health center is classified based on the village where the pneumonia case occurred.

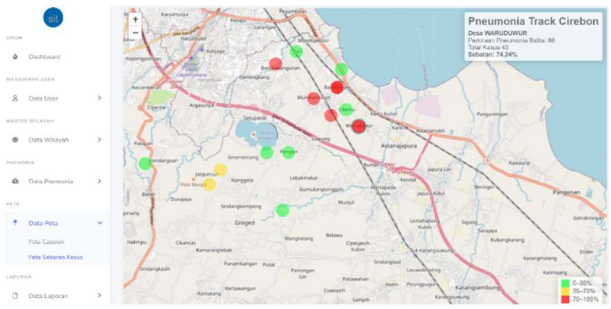

Figure 1. Pneumonia Case Distribution Mapping Display

Figure 1 shows a menu of case distribution maps where there are points where pneumonia distribution locations are located with specific colors. Each color has its category where green indicates a low rate of pneumonia cases with a percentage of spread of 0-35%, yellow indicates a medium category with a percentage of spread of 35-75%, and red indicates a high category of spread with a rate of 70-100%. Village information, estimated

pneumonia of toddlers, total cases, and distribution percentage will be visible when users select colored location points. The zoom-in and out features of the map are available in this menu. Pneumonia case reports can be downloaded in CSV, PDF, and Excel. The form of the report can be adjusted to the needs of users so that it will make it easier for users to report disease distribution data.

Using computer-based technology can overcome large amounts of data and minimize errors. The application makes it easier for users to create the data reports they need. If there is an input error, the data can be corrected on [14] *time* with the online system. The data input process in the application can be done flexibly, namely anytime, anywhere, and using any device so that the reporting process is not hampered and makes it easier for users to carry out their duties [15]. Therefore, using the application will result in accurate reports and a good data documentation [16], [17].

Geospatial analysis and Geographic Information Systems (GIS) are essential tools in mapping the spread of the virus. Not only mapping but case tracking and distribution can be known according to an area's territory [18]. GIS systems allow for dynamic mapping that simultaneously visualizes temporal and spatial information [19].

Based on Sulistyo's 2022 research, it is stated that the use of GIS greatly supports monitoring the spread of infectious diseases by mapping disease risk zones [20]. Then Hanif and Effi's research on the distribution of infectious and non-communicable diseases of BPJS patients at the Melur health center in 2020 is known to use the Arcview Gis 3.3 application where the largest spread of infectious and non-communicable diseases is mapped based on the age and gender of the population [21]. So that the most common types of diseases can be known and further prevention and treatment can be carried out to overcome these diseases. Ionia's research explains that GIS is able to display information on disease distribution areas, the number of disease cases, categories of disease distribution levels, and visualization of distribution in the form of maps. With the existence of GIS, the process of preventing the spread and handling of diseases can be known through the system without a manual process [22].

The system trial was carried out on 40 students using a PSSUQ *(Post Study System Usability Questionnaire) questionnaire* to measure the satisfaction of system users. The calculation of the results of the system test is grouped based on 4 categories, namely *system usefulness (SYSUSE), information quality (INFOQUAL), interface quality (INTERQUAL), and* overall *satisfaction (OVERALL).* The following are the results of the calculation of the PSSUQ score, namely:

Table 1. PSSUQ Test Recapitulation Results

QUESTION	Skala							Total
Sysuse	1	2	3	4	5	6	7	
Number of Score	0	0	0	7	32	68	213	
Higent Score	0	0	0	28	160	408	1491	2087
Percentage of eligibility	40 x 8 x 7						=	2240
Infoqual	2087 / 2240 x 100%						=	93%
Number of Score	0	0	0	0	29	65	186	
Higent Score	0	0	0	0	145	390	1302	1837
Percentage of eligibility	40 x 7 x 7						=	1960
Interqual	1837 / 1960 x 100%						=	94%
Number of Score	0	0	0	3	12	34	71	
Higent Score	0	0	0	12	60	204	497	773
Percentage of eligibility	40 x 3 x 7						=	840
Overall	773 / 840 x 100%						=	92%
Number of Score	0	0	0	10	76	180	494	
Higent Score	0	0	0	40	380	1080	3458	4958
Percentage of eligibility	40 x 19 x 7						=	5320
Number of Score	4958 / 5320 x 100%						=	93%

Table 2. Likert Interpretation Adjustment

No	Percentage	Interpretation
1	0-20	Very unworthy
2	21-40	Unworthy
3	41-60	Enough Worthy
4	61-80	Worthy
5	81-100	Very Worthy

Table 1. The results of the PSSUQ calculation will then be compared with Table 2 regarding the adjustment of the interpretation of the Likert scale. The score for SYSUSE is 93% in the very feasible category. Then, the score for the INFOQUAL variable is 94% and belongs to the very decent category. The score for INTERQUAL is 92% in the very decent category. The score for OVERALL is 93%, which is very decent. These categories have been by the Likert interpretation adjustment table.

PSSUQ is a questionnaire used to measure and evaluate user satisfaction with the system or computer application developed. PSSUQ is also a good tool in providing a level of evaluation of the usability of technology systems [23]. The category of *System Usefulness* or the usefulness of a system in PSSUQ is related to how relevant, informative, important, meaningful, useful, and significant a system is in the decision-making process [24]. Then the *information quality* (INFOQUAL) category is the quality of information presented clearly, completely, actually, and trustworthy so that information can be conveyed properly and can provide education for user [25]. *Information quality* is one of the main factors used in evaluating ease and user satisfaction [26], [27], [28].

Interface Quality (INTERQUAL) is an assessment of the quality of the system interface. A simple application interface can make it easier for users to access the application so that user satisfaction with the application increases. The design of the interface in the application must be in accordance with the needs of the

user to make it easier for the user to operate the system. Then for the OVERALL category, it is an overall system assessment of the PSSUQ categories. The OVERALL category has a score of 93% which is in the very decent category. This shows that the application is very feasible for health facilities to implement, and users have been satisfied with the application that has been developed.

CONCLUSSION

The application for distributing pneumonia cases in the Cirebon district has been successfully tested on 40 respondents. The system was tested using PSSUQ with four variables. The system test results show that the system is very feasible, with an overall percentage of 93%. The results of this category were based on the interpretation of the PSSUQ Likert. Therefore, the application for the distribution of pneumonia cases can be used to determine the spread and awareness of the disease in the Cirebon district area.

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