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Challenges in implementing dengue surveillance in Bantul District Special Region of Yogyakarta, Indonesia

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ABSTRACT

The surveillance system is a source of information for policymaker to address the dengue outbreak. However, there was a lack of information on the effectiveness of dengue surveillance system in reporting the outbreak. This study aims to assess dengue surveillance activities in Bantul District, Special Region of Yogyakarta, Indonesia, one of the districts with a high burden of dengue, to provide information on current effectiveness and need assessment for further improvement for dengue surveillance system. This qualitative study was conducted in Bantul District, Special Region of Yogyakarta. The assessment approach was based on the input-process-output-outcome (IPOO) model. The study participants were selected based on purposive sampling. Data were collected through interviews. Eight program holder surveillance were interviewed based on the interview guide. The surveillance system in Bantul Regency already utilizes electronic reporting. Reporting cases of dengue uses the system for surveillance of outbreak events (SISKLB). Analysis and interpretation are done to monitor progress in cases. The follow-up evaluation cases is vector control to prevent the spread of the case. The incidence of dengue is still higher than the national rate. The case fatality rate (CFR) for dengue is <1%; CFR has hit its target. The larvae-free rate hasn't reached its target yet. Optimizing electronic reporting can improve the quality of information used as a reference in decision-making. SISKLB was created for timely reporting and monitoring of dengue cases. Monitoring available data laboratory can be used as a quick response to take action to prevent an increase in cases.

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1. INTRODUCTION

Dengue hemorrhagic fever has been a public health problem for the last twenty years [1]. More than 100 tropical and non-tropical countries have reported dengue cases, and Europe and the United States have reported dengue cases [2]. Southeast Asia has many dengue cases, accounting for almost half the global burden of dengue [3]. Symptoms of dengue infection can range from mild to severe, from asymptomatic to dengue hemorrhagic fever and dengue shock syndrome [4]. These manifestations partially require hospitalization. Hospitalization is an economic burden that the government bears [5]. The increased cases of dengue have an impact on socioeconomics. The number of hospital days is the proxy for societal impact

because it implies school/work absenteeism. The economic impact is direct and indirect costs associated with hospitalized and ambulatory dengue cases [2]. Indonesia is number two of the 30 countries with the most dengue cases [3].

The Special Region of Yogyakarta (DIY) is a dengue-endemic area. The incidence of dengue cases in four districts and cities in DIY in 2020 was all higher than the national target of 49/100 thousand population. In 2020, DIY became the third province with the highest dengue fever incidence rate in Indonesia, namely 93.2 per 100,000 population [6]. Most dengue cases in DIYcome from Bantul Regency [7]. Bantul Regency has the highest cases with an incidence rate of 128 per 100,000 population in 2020. During the last five years, the incidence of dengue has fluctuated, but Bantul Regency is still the area with the highest DIY cases [8]. Continuous data collection, analysis, interpretation, and information dissemination are surveillance activities [9]. The recording of dengue haemoragic fever (DHF) sufferers in Indonesia was collected with a passive surveillance system. Reporting is done from the health center level to the city or district health office and compiled at the health center [10]. An ongoing surveillance system must provide information that can be used as a reference in policy-making by stakeholder [11]. Public health monitoring systems analyze large data sets to look for patterns or trends that can help with disease control or prevention in the long run. The evaluation of the dengue surveillance system is a crucial task to guarantee proper disease surveillance [12]. Policymakers should take immediate precautions if surveillance data shows an increase in cases. This is badly needed in disease control. The fructuated incidence of dengue in the district helps make a question mark on how the surveillance system runs. The surveillance system in Bantul Regency needs assessment to determine the policy implemented. This article aims to analyze dengue surveillance activities running in Bantul District, DIY, Indonesia.

2. METHOD

This research uses a qualitative design with a needs assessment approach based on the model for public health administration, the input-process-output-outcome (IPOO) model [13] of the dengue surveillance system in Bantul Regency. Assessment in this study was carried out on inputs, processes, and outputs. Input, process, output, and outcome consist of several components. The input stage included health resources, such as medical and health institutions and health workers. The process stage, also called activities, refers explicitly to public health management; the output stage reflects the results of public health's input and process stages, which can be necessary for public health evaluation within governments. Finally, the outcome stage reflects the customers' evaluation, such as whether they are satisfied with the public health services delivered. In this study, the outcome of the Surveillance system is quality of life in the community. The community's quality of life is a big part of the research, so researchers cannot do it simultaneously. This is one of the weaknesses of this research, so the researcher has yet to assess the outcome.

Informants in the study were selected based on purposive sampling. Primary health centers with a high incidence of dengue were selected as a source of information. The criteria for inclusion in this study is the dengue program holder in the region with a high incidence of dengue in the Bantul District. Informants from the health office act as triangulation informants to ensure the quality of the data obtained. The exclusion criterion is that the informant is unwilling to be interviewed. Data collection was carried out by interview. Interviews were conducted with the informer using an interview guide. Seven out of twenty-seven dengue program holders at the (PHCs) and one person at the health office were informants of this study as shown in Table 1.

Table 1. Characteristic informers of in-depth interview

No of informants	Sex	Age (y)	Education level	Work experience (y)
PHC 1	Female	51	Associate degree	3
PHC 2	Female	42	Associate degree	5
PHC 3	Female	35	Bachelor	2.5
PHC 4	Male	47	Associate degree	6
PHC 5	Male	45	Associate degree	4
PHC 6	Female	27	Associate degree	3
PHC 7	Male	46	Bachelor	21
HO	Female	51	Bachelor	27

Note: PHC: primary healthcare; HO: health office

The number of informants used is based on the saturation of the data obtained. Audio recording was used for data collection. The results of the interviews were transcribed, and a qualitative analysis was carried out based on the theme. The first step in the qualitative analysis is from the transcript results then the coding is carried out. The same coding is grouped by category according to the research objectives. Assessment of

surveillance activities in the Bantul District based on input approach, process, and output. The theme given to the input is staff availability, infrastructure, and available budget allocation. Based on the process obtained thema, data reporting processes, processing data, presentations, information dissemination, and evaluation. Based on the outputs, it is dengue rate incident, case fatality rate (CFR), and free larva rate compared to the national target. The analysis results of interviews with health center program holders and the health office obtained the following themes in Table 2. The research has been approved by Ahmad Dahlan University ethics committee with etic approval number 012111081.

Table 2. Key finding theme in-depth interview

No	Frame area discussion	Coding	Key findings theme
1	Input		
	Human resources	Education	Availability of staff
		Dual task	Training
		Length of work	
		Training	
	Infrastructure	Vehicle	Availability of supporting equipment
		Ownership	
		Equipment condition	
	Provision of budget	Source budget	Source of budget and adequacy
		Utilization	
		Sufficiency	
2	Process		
	Data collection	Case reporting, data source	Data reporting process and follow-up of dengue cases.
		Epidemiological investigation criteria, prevention, conducted epidemiological investigations	
		Reporting, dengue diagnosis, epidemiological investigation officer, transmission, accuracy of report, follow-up epidemiological investigation	
	Data processing	Data type, data benefits, processing time	Data processing
	Data analysis	Presentation of data, case increase. factor affecting	Data presentation
	Information dissemination	Dissemination of information, information targets, information content, dissemination method	Information dissemination
	Feedback	Feedback, evaluation	Evaluation for decision making.
3	Output		
	Incident rate	Cases monitoring, national targets cases.	Incidence rate dengue in Bantul higher national target
	CFR	Follow-up in case of death, achievement targets, death case	CFR dengue in Bantul District has reached the nationally target
	Free larva index	Monitoring free larva index, improvement efforts free larva index, reporting application	The free larvae rate in Bantul has not yet reached its national target

3. RESULTS AND DISCUSSION

Informants in this study consisted of seven officers responsible for the dengue program at the primary healthcare (PHC) level and one staff holding the program from the health office. Almost all informants are female. According to work experience, the informant worked mostly for less than ten years, but some worked for more than twenty years. Based on education level, most have an Associate degree. Table 1 shows the information on characteristic of informants of this study. Dengue surveillance activities running in the Bantul District were assessed qualitatively. An in-depth interview was performed with the holders of the dengue program. From the in-depth interviews, we also identified themes which were classified into input, process, and output presented as follows.

3.1. Input

Qualitative interviews with officers holding the dengue program at the primary health centers obtained the following results. Dengue hemorrhagic fever in the surveillance system at the health office and primary health centers is the responsibility of one of the staff as the holder of the dengue program. Each health center already has dengue program holders. However, apart from managing the dengue program, other programs must be handled by the same officer. Apart from that, to carry out the obligations of the dengue program, there are still officers who have never received training related to dengue surveillance activities.

> *"Actually, I'm (an) extra in the dengue program. I'm sanitary. Sanitation work has nothing to do with dengue. Because of the lack of human resources, it is a double job."* (PHC 7)

The public health center has facilities and infrastructure available to support program activities. Available computers are used together. Nothing specific for one program. Telecommunications equipment and vehicles for officers use private property to carry out their duties. This condition is not an obstacle in carrying out its obligations.

> *"Laptop, cell phone, vehicle, and my private property. The public health center has a computer; you can use it if you want to borrow it, but it is not a specialized facility for dengue programmers."* (PHC 3)

Based on budget availability, for dengue program activities, the budget comes from health operational assistance (BOK) funds used for vector control activities and cadre meetings. Based on the adequacy of the budget, the program holder declares that the budget is sufficient and adjusted according to the planned activities.

> *"If there is funding from the BOK, it's for meetings."* (PHC 4)

3.2. Process

The assessment process of the surveillance activities carried out during the collection process, processing, analysis, and interpretation of data regularly and continuously, and then the dissemination of information to units that need to be able to take action and prevent disease. Reporting dengue cases uses an information system for surveillance of outbreak events (SISKLB) for dengue. This system is an electronic information system developed in the Bantul District office. Every health service, primary health center, and hospital in Bantul Regency can access this system. This system has been used since 2020. Health services in the Bantul District can enter patient information directly into this system using separate access keys from each health service.

Dengue patients treated at the hospital will be reported using SISKLB, which hospitals in the Bantul District access. For patients domiciled in Bantul District treated outside Bantul District, reports of hospital's early vigilance (KDRS) dengue will be sent to the health office. Health service officers will carry out patient input. Report dengue infection cases only dengue patients who were hospitalized. Patients diagnosed with dengue at public health centers have not been reported in the SISKLB system.

> *"Reports from the hospital, from the KDRS."*(PHC 1)

Communication between dengue program holders, the health office, and the public health center is more accessible by WhatsApp group (WAG). If a patient with DHF were treated at a hospital, WAG provides information on KDRS. The presence of WAG can be immediately followed up by conducting epidemiological investigations in the affected area. The results of the investigation can be input into SISKLB.

> *"Yes, put in every case. It goes straight to SISKLB, and so does the epidemiology investigation."*(PHC 2)

The existence of DHF sufferers has then carried out epidemiological investigation in the patient's area, which public health center officers carry out. Epidemiology research is done on patients who are diagnosed with DHF. Fogging was conducted if the result was positive in investigation epidemiology. Positive results from the epidemiological investigation indicate local contagion or many cases of dengue in the sufferer area. Fogging is carried out by officers from the health office in collaboration with the public health center and local community leaders. Fogging activities are carried out once in each area where local transmission is found. If the investigated epidemiology results are negative, the vector control recommendations are still implemented.

> *"From the SIS KLB, all of this has appeared, in total, starting from the address. We will investigate epidemiologic only DHF diagnoses, but if not DHF, we don't investigate."* (PHC 7)

Reporting DHF patients in Bantul District has been done using SISKLB dengue. Data processing activities in SISKLB are already available in the system so that officers can view dengue patient data by region. This monitoring is used to determine the control program to be performed. Officers have been monitoring the dengue transmission season. They used monitoring as a reference in carrying out prevention during the transmission season and mobilizing the community to carry out vector control before the rainy season. Refresh information related to dengue has been made to increase knowledge for officers and health cadres. Health promotion for the community continuously builds awareness and community participation in good behavior.

3.3. Output

The calculation of the incident rate, CFR, and larvae-free rate the health office programmer has analyzed each year. The incident rate in Bantul District from 2016 has increased, and in 2017-2018 decreased, but in 2019 and 2022, it increased again. If we look at the national target, the expected DHF incidence rate is <49/100,000 population, so the DHF incidence rate in Bantul District is still higher than the national target-description of incident dengue hemorrhagic fever in Bantul District in 2016-2022 as shown in Figure 1. The trend of DHF cases from 2016-2018 has decreased but increased again in 2019. During the COVID-19 pandemic, 2020 and 2021 declined and experienced an increase again in 2022 [14], [15].

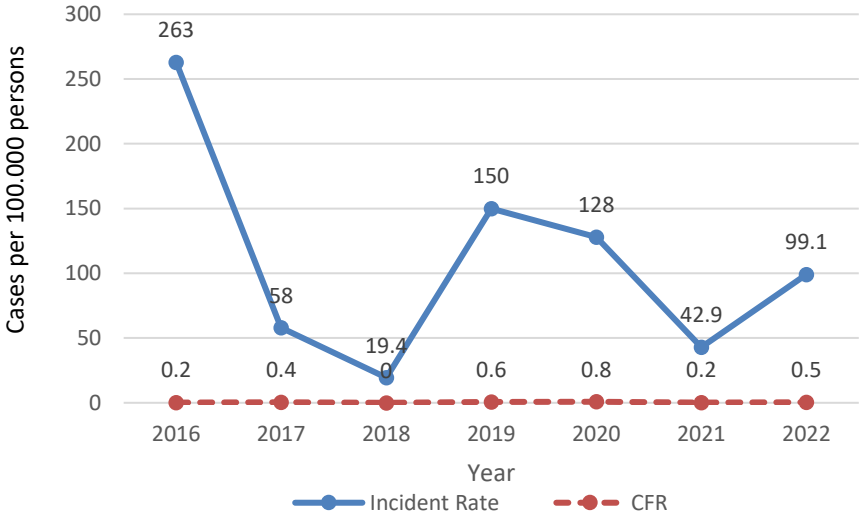

Figure 1. Incident rate and CFR dengue hemorrhagic fever in Bantul District in 2016-2022
Source: Secondary data from the Bantul District Health Office

Based on the national target, the dengue CFR is <1%, and the CFR in Bantul District has reached the national target. Even so, there are still cases of death due to DHF in Bantul District. The national target for larvae-free rates is more than 95%, but the achievement rate in Bantul District is still less than 95%. Vectors were observed during an epidemiological investigation and reported to the system SISKLB in any case of DHF. However, there is a particular reporting system associated with vector density. The vector reporting systems nationwide use surveillance systems vectors and disease-carrying animals (SILANTOR). SILATOR reporting is done every month. SILANTOR is used to record the density of vectors for dengue and malaria. Several public health centers stated that they had reported vector monitoring every month. During the pandemic, they did not regularly report monitoring larvae.

> *"If it is included in SISKLB, every time there is a case. But if SILANTOR happens once a month."* (PHC2)

Our study found that most dengue program holders had multiple responsibilities, so officers were overworked. This excessive load makes the program implemented not optimal, but the surveillance systems have been backed up by electronic reporting. Systems are accessible both to hospitals and primary health care in the territory of Bantul District. In Maldives, Surveillance officers also experience this condition [16]. In addition, the staff's ability must supported by training to improve the capabilities and responsibilities that must be carried [16]. The electronic system (SISKLB) report used in Bantul Regency is an advantage of the existing surveillance system compared to other areas, which still use paper as their reporting system. SISKLB can be accessed every time. That can immediately be monitored at the public health center and health office levels. The use of electronic reports is recommended [17]. Budget electronic reporting is affordable and can be implemented nationwide [18]. Electronic reporting from research in Nigeria shows that surveillance reporting can increase precision and completeness [19]. Electronic reporting enables health services to monitor the increase in cases, which can be used to prompt action for prevention. Good precision enables public health authorities to be more effective in protecting and promoting public health. Thus, public health surveillance is essential to public health practice [20]. Base data for SISKLB in dengue is hospitalized cases

that can cause a late response. The case files that were monitored only those hospitalized for dengue cases resulted in a lack of sensitivity to surveillance. Not all cases of infection with dengue need hospitalization. Most dengue fever infections are just dengue fever and can heal independently without complications [21]. Dengue surveillance can be improved with early detection of dengue cases with diagnostics NS1.

Besides that, the results of epidemiological investigations have been integrated into SISKLB. Preventive measures can be taken immediately in areas with dengue cases. In a previous study, vector control was carried out as soon as possible after discovering that a dengue patient can reduce the possibility of transmission by up to 90%. It is necessary to detect cases as early as possible and follow up with control as soon as possible to prevent an epidemic from occurring [22]. Control can be carried out with an integrated vector control strategy using chemical and non-chemical strategies [23].

Even though the Bantul District has used electronic reporting for dengue, it can still not suppress the case of dengue. The prevalence of DHF in the Bantul District is still experiencing fluctuations. Nationally, the incidence of DHF in Indonesia is still a public health problem. The trend of dengue cases in Indonesia is similar to Brazil's, which has increased in recent decades [2]. Many factors are associated with the occurrence of dengue fever. Some research indicates there is a seasonal link to the occurrence of dengue fever [24]. Other factors that promoted the incidence of dengue fever include social-ecological habitats associated with mosquito density [25]. In our study, the officials took precautions by moving the public to conduct vector control before monsoon season. However, it still show no significant results, requiring all community involvement to participate actively in vector control [26]. Educating the public was necessary to improve knowledge and good practice in preventing dengue. Television, radio, and other social media can promote communication about dengue [27]. Providing messages on the risk of dengue fever and health promotion can increase prevention behavior [28].

The high number of dengue cases is an implication on the state's economic burden. The financial burden incurred by the state in the Yogyakarta region could reach 51 million dollars in 2015 [29]. Bantul Regency is the most significant contributor to dengue cases in the DIY. The dengue cases recorded in SISKLB are based on hospitalized patients. This condition needs early detection for dengue cases. Laboratory tests to support the diagnosis are required. The use of NS1 can be an alternative diagnosis that has high sensitivity [30]. The sensitivity and specification of several NS1 diagnostic rapid tests indicate good results so that they can be used as equipment for dengue screening [31]. Examination with NS1 has high sensitivity on the third day after the onset of fever [32]. Previous research indicated NS1 was detected in the blood from the first day until day 18 after the onset of symptoms [33]. Based on this study, we recommend an NS1 use of a first-level healthcare facility to screen for dengue suspects. Next, reporting on the SISKLB of all infected suspects is used as a reference in the prevention of the increase in cases of dengue. The electronic reporting system supported by the early detection of dengue cases will strengthen the surveillance system.

Vector to determine the risk of dengue infection by larva or pupa stage monitoring in containers inside and outside the home. Indonesia aims at the risk of dengue infection if the free larva rate is less than 95%. Vector density can be seen by the breteau index (BI), container index (CI), house index (HI), and pupae per person index (PPI). Levels of risk for dengue transmission: low (HI<0.1%), medium (HI 0.1%-5%), and high (HI>5%) [34]. Monitoring dengue virus in an adult mosquito can be used as early detecting hazardous area for dengue transmission [35]. The surveillance systems' vectors and disease-carrying animals (SILATOR) can be used to monitor hazardous areas. System SISKLB and SILATOR in the Bantul District can support the dengue surveillance system in the Bantul District. Data availability in both systems can help stakeholders take appropriate precautionary measures. It needs to be aware of all the elements involved in the surveillance system of both governments and communities to try to prevent the occurrence of dengue.

This research only assesses the dengue surveillance system qualitatively. Quantitative analysis, like data quality needs to be asses. Data quality to assess completeness and validity in public health surveillance. This is a limitation in this research. It is necessary to assess the quality of data obtained on SISKLB for further research.

4. CONCLUSION

The dengue fever surveillance system running in Bantul District needs the use of optimized electronic reporting. Optimizing electronic reporting with laboratory detection in primary health care can improve the quality of information used as a reference in decision-making. Laboratory detection with NS1 rapid tests can detect dengue in the early phase. SISKLB was created to report and monitor dengue cases on time. Monitoring available data laboratory can be used as a quick response to take action to prevent an increase in cases.

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