Spatial Analysis Case DHF (Dengue Hemorrhagic Fever) in The District Pekalongan Year 2015 - 2017

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Abstract

Introduction: The incidence of DHF in Pekalongan District experience an Increase in cases in 2015-2017. Incident Rate (IR) of 2017 DHF is 22.12 / 100,000 population and Case Fatality Rate (CFR) of DHF is 0.99%. The high prevalence of DHF is Followed by the situation of endemic community health centers and endemic villages. Objectives: The porpose of the research to Determine the spatial pattern of the distribution of dengue cases in Pekalongan District. Methods: This type of research is a descriptive study with an ecological study design. Results: Distribution of dengue cases in Pekalongan District from 2015-2017 had the highest cases of 27 cases in June, while the Lowest cases were 12 cases in August. The water temperature in Pekalongan District during 2015-2017 is Relatively constant, with an average water temperature between 27.2oC-28.6oC. The average air humidity in Pekalongan District for the period 2015-2017 is Relatively constant humidity with the highest occurring in February with 85% and the humidity cancel the which is 73.3% occurring in August until September. The highest rainfall occurred in February with 394mm and the Lowest average rainfall occurred in August with 26.7mm. Areas with extensive land use, high rice fields and high population densities have a high distribution of dengue cases.Conclusion: there is a correlation between water temperature, rainfall, population density, land use, indicators of transmission of House Index, Countainer Index, Breteau Index and free number of mosquito larvae with the incidence of DHF. While air humidity does not have a significant correlation to the incidence of DHF in Pekalongan District. suggestions:

Keywords: Dengue Hemorrhagic Fever, Spatial Analysis, Climate

Introduction

Dengue hemorrhagic fever (DHF) is a potentially disease Extraordinary Events (KLB) with a high mortality rate. It makes DHF as one of the important health problem. Agents DHF form of dengue virus is transmitted through mosquito-borne source (vectors) that Aedes aegypti, Aedes albopictus and Aedes scutellaris, but until now the main vector transmitting dengue fever is Aedes aegypti.

DHF first occurred in Surabaya in 1968. Since that time dengue disease spread to many regions, until 1980 all provinces in Indonesia have been affected by dengue and to date the incidence of dengue fever in Indonesia remains high (Sandy, 2015). Based on data from the Central Java Provincial Health Profile (2014), Insidence rate in 2014 amounted to 36.2 / 100,000 population with a CFR of 1.7%, higher than in 2013 (1.21%), the year 2015 amounted IR DHF 47.9 per 100,000 people, with CFR of 1.6%, whereas in 2016 amounted to 43.38 IR dengue cases per 100,000 people, with CFR of 1.46% (Central Java Health Office, 2016).

Of dengue cases in Pekalongan, 2014 IR DBD CFR 20.37 per 100,000 at 2.79%, 2015 IR is 22.32 per 100,000 people, with CFR of 2.51%. 2016, IR rose to 35.04 per 100,000 inhabitants, and CFR fell to 0.63%, while the 2017 IR dengue cases has decreased from the previous year to 22.12 per 100,000 population with CFR 0.99% (DHO. Pekalongan , 2017)

Distribution of dengue cases in Pekalongan during the years 2013-2015 has increased, there are several district and village endemic, sporadic, and secure in Pekalongan. In 2013 the number of endemic village some 23 village, the village of some 133 village sporadic and Rural secure a total of 129 villages. In 2014 the number of endemic village some 29 village, the village of some 147 village sporadic, and safe village some 109 villages. In 2015 the number of endemic village some 42 village, the village of some 144 village sporadic, and safe village some 99 villages. 2016, the number of endemic village some 46 village, the village of some 163 village sporadic, safe village some 107 villages. Whereas in 2017 Number of Villages with endemic category increased to 49 the village, while some 148 villagers sporadic village, and the village of Desa safely reduced to 88 (DHO. Pekalongan, 2017). Free numbers larvae in

Pekalongan continued decline of national standard value that is equal to> 95%. The 2012 numbers are free larva was 93%, in 2013 was 90.66%, in 2014 was 89%, and 2015 was 87.8%, while the larvae-free number in 2016 slightly increased to 91.64%, and the free number of mosquito larvae in 2017 was 89.32% (DHO. Pekalongan, 2017).

Increased Extraordinary Events DHF is influenced by many factors, one of which environmental factors. Media environment has contributed as a vector, where the physical and environmental factors become determinant in the potential transmission of the frequency distribution of dengue cases. World Health Organization (WHO) states that the higher number of vector density, the higher the risk of transmission of dengue disease (Wijaya R, 2007)

Spatial analysis is the analysis of epidemiological able to explain the spatial analysis of dengue cases territory. Kerungan analysis can assist in mapping and map the existing cases in a community or group to approach the area and environmental analysis (Lawson, 2006 and Lai 2007 In Fajriatin 2014)

One of the diseases that can use spatial epidemiological approach is dengue. Spatial epidemiology of dengue cases provide information that could explain how cases of dengue, the role of the environment, the breeding place of mosquitoes and dengue endemicity area maps affect each other in spatial or spatial analysis. So the purpose of this study was to analyze the spatial cases of dengue fever in Pekalongan years 2015- 2017.

Methods

This study is a descriptive study design ecology. The study population was the entire region in Pekalongan which consists of 19 sub-districts. Sampling in this study using stratified random sampling technique, the sample criteriaEndemic in the District of Pekalongan District Health Department based on data from years 2015-2017 DHF with incidence rate (IR) of high and low free number of mosquito larvae. Endemic sub-district into the sample are distinguished by different geographical location of the region. Based on these criteria, the sample in this study is endemic in 3 sub-districts Kedungwuni Pekalongan District, District Kajen, and the District Siwalan.

Data needed in this research obtained from health centers and Pekalongan District Health Office. The required data is the number of dengue cases in Pekalongan in 2015-2017, the data House Index (HI), Container Index (CI), Breteau Index (BI) Pekalongan 2015-2017. While the data on total population in 2015-2017 Records obtained from the Agency of Statistics Pekalongan. Data on the climate (rainfall, humidity, and air temperature) obtained from climatological station level III Tegal, Central Java.

The data collected was then analyzed spatially using a geographic information system (GIS) with ArcGIS. Spatial analysis in this study using a basic map Pekalongan. Geographic information systems in the form of a map of variables: population density, land use, indicators of potential transmission (House Index, Countainer Index, Breteau Index, and Figures Free Flick) as well as maps of dengue cases in endemic areas in Pekalongan. Spatial analysis is done by using the correlation method (overlay) that will form a map overlay.

Results

1. Distribution Pattern Case

The number of dengue cases in Pekalongan from 2015 to 2016 has increased significantly, with the number of cases in 2015 is 199 cases, while the number of cases in 2016 is 316 cases. In 2017 the number of dengue cases namely 203 cases, that number has decreased compared to 2016. The area with the highest number of cases in 2015 the District Kedungwuni as many as 55 cases with IR 87.46 / 100,000 population, in 2016 the District Kajen as many as 69 cases with IR 98.69 / 100,000 population, in 2017 the District Kedungwuni total of 32 cases with IR 50.88 / 100,000 population and the District Kajen as 32 cases with IR 48.58 / 100,000 population, while the lowest cases during 2015-2017, namely the District Petungkriyono with the number of cases 0.

Table 1. Cases of dengue in Pekalongan Year 2015-2017

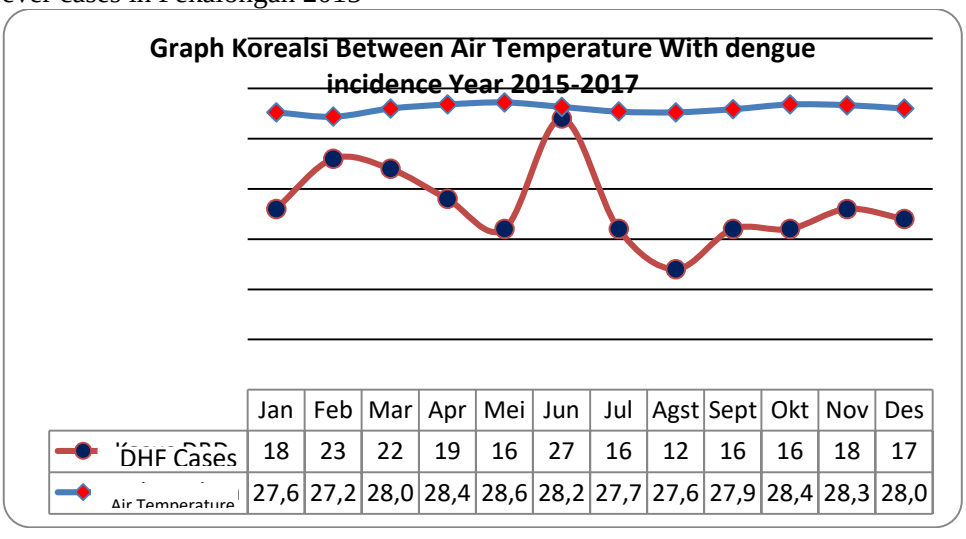
No.	SUB-DISTRICT	2015		2016		2017	
		Case	IR / 100,000	Case	IR / 100,000	Case	IR / 100,000
1	Kandangserang	0	0	2	5.91	2	5.91
2	Paninggaran	2	5.09	2	5.09	2	5.09

3	Lebakbarang	3	28.17	1	9.39	1	9.39
4	Petungkriyono	0	0	0	0	0	0
5	Talun	2	7.28	6	21.83	6	21.83
6	Doro	5	11.93	19	45.34	8	19.09
7	Karanganyar	12	36.3	26	78.65	15	45.38
8	Kajen	22	33.4	65	98.68	32	48.58
9	Kesesi	11	15.12	18	24.75	12	16.5
10	Sragi	11	1.84	28	42.85	16	24.49
11	Siwalan	7	15.25	12	26.15	9	19.61
12	Bojong	14	19.76	35	49.4	15	21.17
13	Wonopringgo	19	42.85	18	40.59	18	40.59
14	Kedungwuni	55	87.46	49	77.92	32	50.88
15	Karangdadap	4	11,19	4	11,19	5	13.99
16	Buaran	15	33.52	9	20.11	9	20.11
17	Tirto	7	10.69	8	12.22	7	10.69
18	Wiradesa	10	18.28	8	14.63	7	12.8
19	Wonokerto	0	0	6	14.59	7	17.03
	Total	199	22.32	316	34.93	203	22.44

The statistical distribution of dengue cases in Pekalongan years 2015 - 2017 diketahuai median of 18 cases with the lowest number 9 cases occurred in 2015 and the highest 63 cases that occurred in 2016.

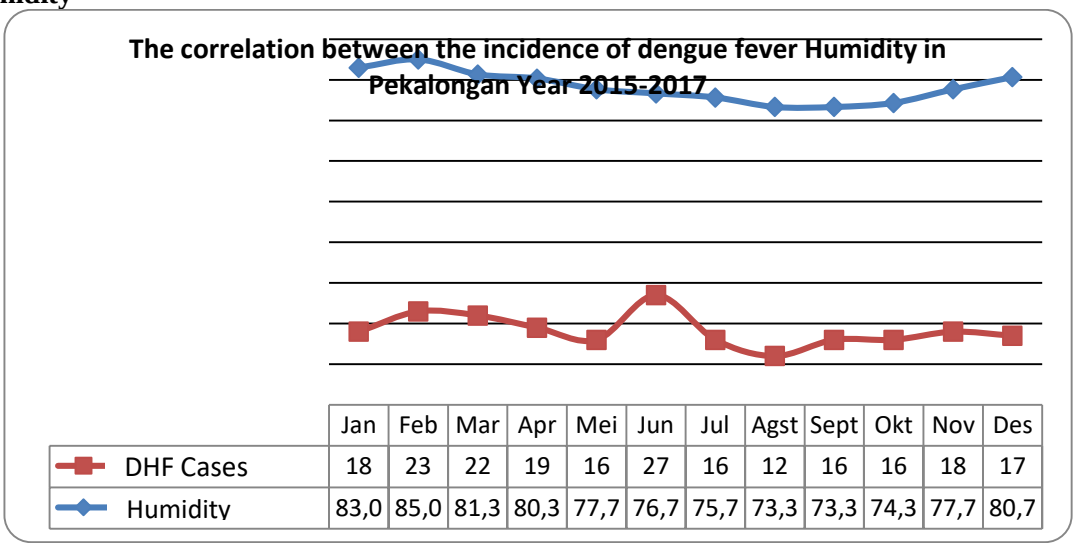
2. Air temperature

Overview fluctuations in air temperature with dengue fever cases in Pekalongan 2015-2017. On average the highest dengue cases with 27 cases occurring in 28,2ºC air temperature and average low of 12 cases of dengue fever cases occur in air sushu 27,6oC. Known air temperature in Pekalongan are in the average range 27,2ºC - 28,6ºC.



Graph 1. Graph Korelasi Between Air Temperature With dengue incidence Year 2015-2017

3. Humidity



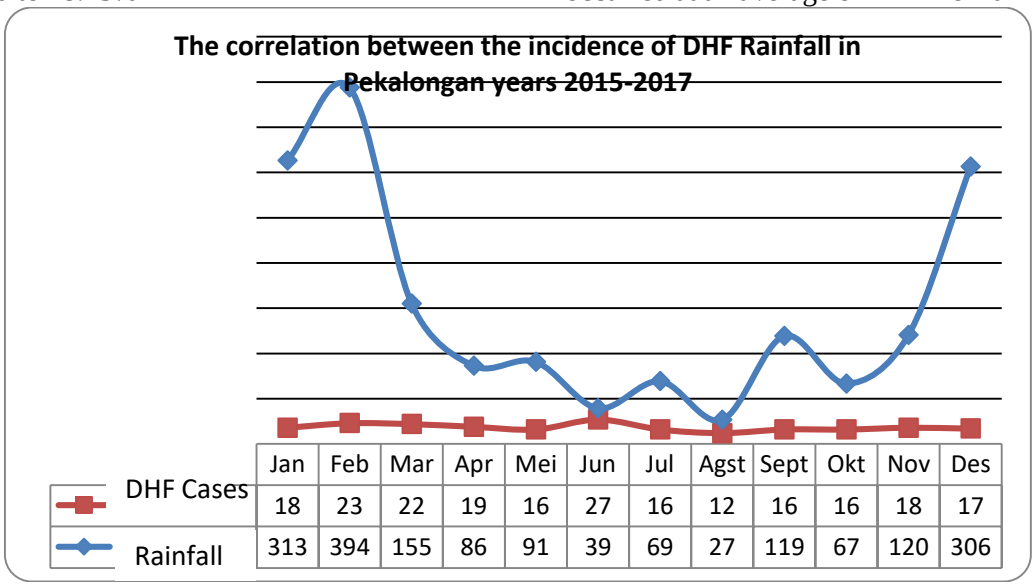
	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Agst	Sept	Okt	Nov	Des
DHF Cases	18	23	22	19	16	27	16	12	16	16	18	17
Humidity	83,0	85,0	81,3	80,3	77,7	76,7	75,7	73,3	73,3	74,3	77,7	80,7

Graph 2. The correlation between the incidence of dengue fever Humidity in Pekalongan Year 2015-2017

Overview humidity correlation with dengue fever cases in Pekalongan 2015-2017. The average high of 27 cases of dengue fever cases occur in air humidity average 76.7%, while the average low of 12 cases of dengue fever cases occur in air humidity is 73.3%. Average - Average humidity in Pekalongan in 2015-2017 amounted to 78.25%

4. Rainfall

Patterns of rainfall correlation with dengue fever cases in Pekalongan 2015-2017. The average high of 27 cases of dengue fever cases occur in an average rainfall of 39 mm while the average lowest cases sebasar 12 cases occurred at an average of 27mm of rainfall.



	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Agst	Sept	Okt	Nov	Des
DHF Cases	18	23	22	19	16	27	16	12	16	16	18	17
Rainfall	313	394	155	86	91	39	69	27	119	67	120	306

Graph 3. The correlation between the incidence of DHF Rainfall in Pekalongan years 2015-2017

5. Population Density

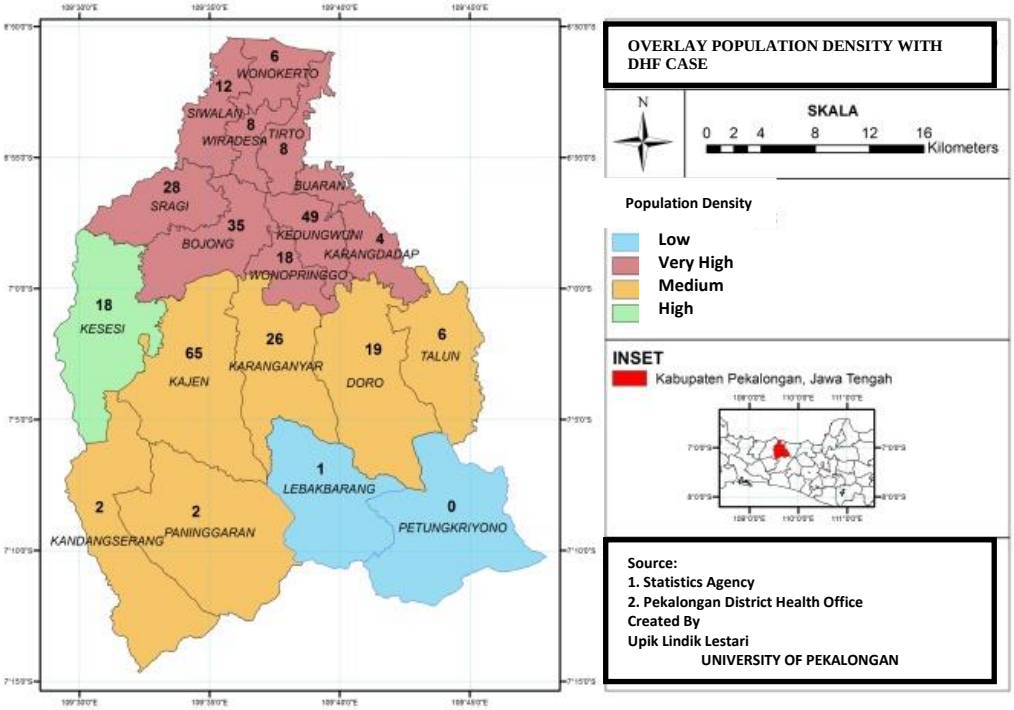
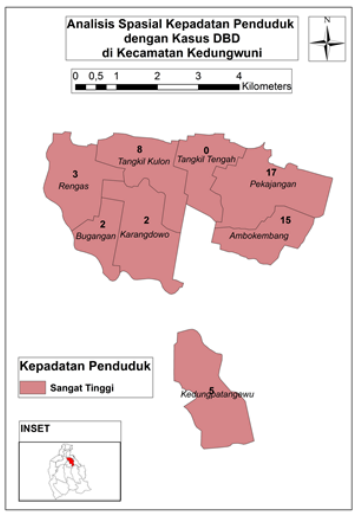


Figure 1. Correlation Spatial Density With Socks DBD in Pekalongan 2016

Overlay GIS between population density with DHF cases in Pekalongan, districts with low population density category of the District and Sub-district Petungkriyono Lebakbarang have a category of dengue cases is low. Districts with the categories of the population density was the District Paninggaran, District Kandangserang, District Kajen, Karanganyar, District Doro, District Talun, the township has a category of dengue cases from low to high is 2 districts with the category of dengue cases is low, 1 sub-district by category of dengue cases moderate and 3 districts with high dengue cases category. Districts with a high population density categories namely Sub Kesesi which have a high category of dengue cases namely sebasar 19 cases. Districts with unbelievably high population density category the District Karangdadap, Wonopringgo sub-district, District Kedungwuni, Kecamanatan Bojong, District Sragi, District Siwalan, District Wiradesa, District Wonokerto, District Tirto, and Subdistrict Buaran. 5 districts have moderate DHF cases category, and 5 districts in the category of high dengue cases.

Fugure 2. Overlay of population density with DHF cases in Kajen Subdistrict



Fugure 3. Overlay of population density with DHF cases in Kedungwuni Subdistrict

Fugure 4. Overlay of population density with DHF cases in Siwalan Subdistrict

The distribution of dengue cases in the District Kajen endemic village in the category of high, medium and low. While the 11 villages in the District Kajen terlingkup included in the category of very high population density. The distribution of dengue cases in the District Kedungwuni endemic village in the category of high, medium and low with 8 villages in the District Kedungwuni included in the category of very high population density. The distribution of dengue cases in the District Siwalan endemic village in the category of low population density in the village including the one in the medium category, two villages in the high category, and 10 villages included in the category of very high population density.

6. Based Transmission Potential Indicator HI, CI, BI, Free Number Of Mosquito Larvae (ABJ)

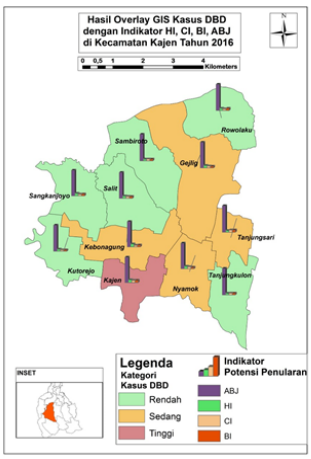


Figure 5. Overlay GIS dengue cases with indicators HI, CI, BI, and free number of mosquito larvae in Subistrict Kajen

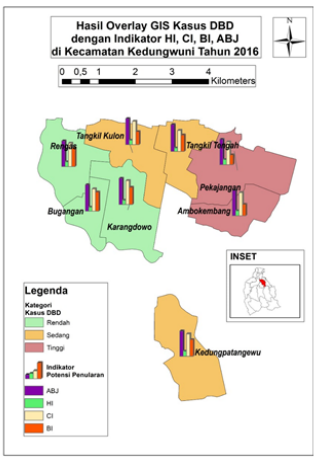


Figure 6. Overlay GIS dengue cases with Indicator HI, CI, BI, and free number of mosquito larvae in Subdistrict Kedungwuni

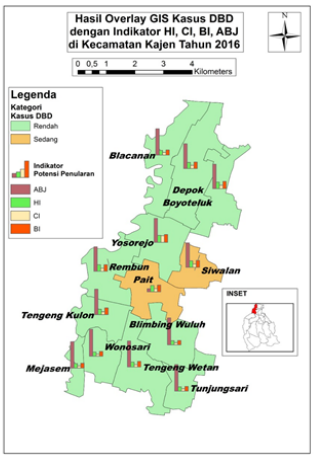


Figure 7. Overlay GIS dengue cases with indicators HI, CI, BI, and free number of mosquito larvae in Subdistrict Siwalan

Overlay GIS between indicators of dengue cases with HI, CI, BI, and in District Kajen ABJ can be seen in Figure 5, note the value of ABJ and HI in 10 villages in the category yet qualified.

CI values in 9 villages not memenihi condition while the first villages namely Kutorejo qualify with a value of 4.8% (CI <5%).

BI value in 10 villages in the district are eligible Kajen ie <20%. The highest ABJ value that is equal to 94.3%, namely Tanjung Kulon, Tanjung Sari village, and the village Sambiroto. While the value of the lowest ABJ sebasar 90% ie Kebonagung Village.

HI highest value 10% Desa Kebonagung 5.7% while the lowest HI namely Tanjung Kulon, Tanjung Sari village, and the village

Sambiroto. The highest CI value of 7.9% which is the Village Kajen lowest CI 4.8% while the Village Kutorejo. The highest value of BI Village Kajen 7.9% ie 4.5% while the lowest BI is the village Kutorejo.

overlay GIS between indicators of dengue cases with HI, CI, BI, and in District Kedungwuni ABJ can be seen in Figure 6, note the value of ABJ, HI, CI, and BI in 8 villages in the category yet qualified. ABJ highest value of 88.5% is the village Middle Tangkil while the value of the lowest ABJ sebasar the Village Kedungpatangewu 83.2%. The highest value of 16.8% HI is the village Kedungpatangewu lowest HI 11.4% while the Village Middle Tangkil. The highest CI value of 78.3% is the village Karangdowo lowest CI 69.2% while the Village Middle Tangkil. The highest value of BI is the village Bugangan 62.8% while 32.4% is the lowest BI Village Pekajangan.

Overlay GIS between indicators of dengue cases with HI, CI, BI, and in District Siwalan ABJ can be seen in Figure 7, note the value of ABJ, HI and CI in 13 villages in the category yet qualified. BI value in 6 villages are eligible (BI <20%), while 7 villages are not eligible. The highest ABJ value that is equal to 86,7%, ie Wonosari and Village Blimbingwuluh while the value of the lowest ABJ sebasar the Village Yosorejo 77.4%. The highest value of 22.6% HI Desa Yosorejo while 13.3% is the lowest HI Wonosari and Village Blimbingwuluh. The highest CI value is the village Yosorejo 21.3% while 6.1% is the lowest CI Wonosari. The highest value of BI is the village Yosorejo 25.3% while the lowest 14% of BI is the village Blimbingwuluh.

7. Land Use

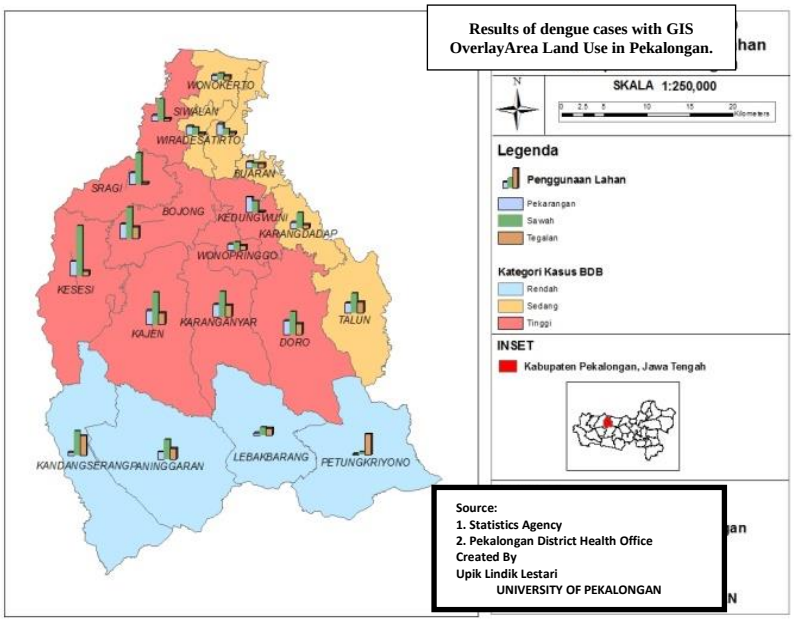


Figure 8. Results of dengue cases with GIS Overlay Area Land Use in Pekalongan.

Regions with a land area of moor higher than those for the yard included in the category of low dengue cases, including the District Petungkriyono, District Lebakbarang, District and Sub-district Paninggaran Kandangserang. While vast areas with rice fields and yards higher than the moor land area included in the category of high dengue cases, including Doro Sub District, Karanganyar, District Kajen, District Kesesi, District Sragi, District Siwalan, District Bojong, District Wonopringgo, District Kedungwuni. Pengguaan spacious area with wetland, upland, lower yard and the settlement

included in the category of moderate DHF cases, the District Wonokerto, District Wiradesa, District Tirto, District Buaran, District Karangdadap, District Talun.

Discussion

1. Distribution of Dengue Cases

Distribution of dengue cases throughout the year has increased at the beginning of the year and then declined until mid-year and then

increase occurred in June, after an increase from August to December. an increase of dengue cases annually is expected to be influenced by the status of endemicity area and some environmental determinants that contribute to the spread of dengue vectors such as density, temperature, humidity, rainfall, population density and land use.

The increase in dengue fever cases in Pekalongan also affected by mosquito resistance to insecticide, which Kedungwuni areas including areas that are resistant to insecticides. The increase in cases of dengue fever are also affected by the mosquito breeding habitat, seen from ilia countainer index (CI) is high may be a possibility that the habitat of the mosquito Aedes peninggkatan Albopictus. Whereas the breeding places of Aedes Albopictus tend to be outside than inside the house with heights of between 800-850 meters above sea level. It supports that the heights of Pekalongan are the region with the height, so that there is a high possibility of the proliferation of Aedes Albopictus in Pekalongan.

2. Air temperature

Known air temperature in Pekalongan are in the average range 27,2ºC - 28,6ºC, this temperature is the optimum temperature for the breeding of Aedes aegypty (25ºC - 30ºC).

Environments with air temperature conditions become favorable conditions for mosquitoes so mosquito age (longevity) longer and the chance to become a larger vector (Santjaka A, 2016). Ssehingga risk of dengue transmission is greater region. climate change and the spread of dengue virus found that average air temperatures and rainfall have significant influence with the incidence of dengue.

3. Humidity

Relations with the air humidity is descriptive of dengue cases can be explained that the average humidity during 2015-2017 in Pekalongan ranged between 73.3% - 85%. The optimum humidity for the survival of Aedes mosquito vector that is 65-90%. Although the humidity in Pekalongan including optimum moisture for mosquitoes, but the results showed that there was no correlation between the incidence of dengue humidity. This is because the humidity is not directly related to the incidence of dengue, however, affect the lifespan of mosquitoes that are vectors of transmission of dengue. At low air humidity is below 60% evaporation of water from the body of the mosquito so that it can shorten the life of mosquitoes ..

4. Rainfall

The increasing spread of the disease can be caused by the growing number of vectors as an intermediary for the spread of disease. High rainfall causing puddles of water which is a breeding place for mosquitoes comfortable. Rainfall is one of the main predictors of transmission of dengue fever, because of the high rainfall will increase the relative humidity, thereby extending the lifespan of adult mosquitoes. Cuarah Increased rainfall can increase the habitat and populations of larvae and also create new habitats for adult mosquitoes.

Rainfall is not directly related to the incidence of dengue. Rainfall as environmental capacity for the establishment of breeding place in various places as breeding places of dengue mosquito vector.

5. Population density

Results of research conducted that the correlation between population density with DHF cases in Pekalongan show high dengue cases are more prevalent in areas with a population density of moderate to very high, whereas low population densities tend to have dengue fever cases also lower.

Factors affecting the population density or the removal process of disease transmission from one person to another. Without prevention efforts are adequate, the more densely populated it causes more conducive breeding so that the virus can lead to an increase in cases (Achmadi, 2012)

Population factors have an impact on the occupancy density. An environment with a number of solid occupancy facilitate the mosquito vectors to infect because of the distance fly to bite others getting smaller. An environment with a high population density with limited land also allow for the landfill in the home and outside the home as a potential breeding places of mosquito larvae.

6. Based Transmission Potential Indicator (HI, CI, BI, Free Number Of Mosquito Larvae)

Environment is a component that acts as a medium of transmission of dengue disease. The risk of transmission of dengue disease can be known through the value of the indicator House Index (HI), Countainer Index (CI), Breteau Index (BI), and Figures Non Larva (ABJ). That a total of 32 villages in three sub-district endemic Pekalongan shows the entire region has

a value of ABJ, and HI under standard, while the value of CI is only one village on the value of standards yiatu Village Kutorejo, to the value of BI most areas of the District Kajen and District Siwalan are in standard values of <20%.

Free number of mosquito larvae value, HI, CI, and BI standard below shows that the density of the vector (Aedes aegypti) is still high. The higher the number density of the vector, will increase the risk of transmission and penyebaram DHF

7. Land Use

Extensive use of yards and pemukaiman result of population density in an area, in which the tendency of the higher density of population, the higher the incidence of dengue is happening. Land use and settlement of a large yard also resulted in environments with high population density with limited land gave rise to the landfill in the home and outside the home that could potentially become larvae breeding sites.

Of the three districts in the research samples, location to I including coastal areas where water is obtained from wells and tap water, so many people who collect water in tubs, especially the source water comes from the tap. In addition, some of the residents work as fishermen, they usually have a water container barrel large enough to be a high potential for mendaji breeding places of Aedes spp. As for the location to II is in the non-coastal lowland areas with dense residential population, the region with the type of housing and the habits of the population like the other city areas. Dense settlement will increase the transmission of dengue disease. Location to III are in the plateau area, water here is quite easy to obtain

Conclusion

Correlation between air temperature, rainfall, population density, land use, the indicator of transmission of the HI, CI, BI and ABJ with incidence of dengue. While the air humidity does not have a significant correlation to the incidence of dengue in Pekalongan. Sugestion need to do research that is more related to the distribution of dengue cases to include the coordinates.

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