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elationship Study of Physical Environmental Factors, Larvae Free Index, Distribution of Dengue Hemorrhagic Fever and Distance Index to Dengue Hemorrhagic Fever Cases (A Case Study in Gorontalo City Province of Gorontalo)

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act - This research was a survey study, with a spatial and ecological approach, with descriptive quantitative method. ry data obtained from interviews using questionnaires and for area measurements of patients address used the coordinates Global Positioning System (GPS), secondary data including: demographic data, climate data (rainfall, temperature, and lity), and elevation data. Respondents in this study were all of patients with Dengue Hemorrhagic Fever (DHF) in Go- o City in 2010 as many as 205 people. The data from this study was analyzing by statistical analysis such as distribution ncy, regression, and chi-square. The results of this study were: (1) Physical environmental factors such as rainfall, tem- ire, humidity, elevation had a relationship with dengue cases. Larva Free Index have a relationship with dengue cases. Free Index by Gorontalo City (LFI) in 2010 was still below average from national standard (95%). The distribution of ie cases in Gorontalo city was cluster with distance index was 50 meters and transmission caused by Aedes aegypti beha-

vords - Physical Environmental Factors, Larva Free Index, Distribution of Dengue Hemorrhagic Fever, Distance Index, ue Hemorrhagic Fever Case

Introduction

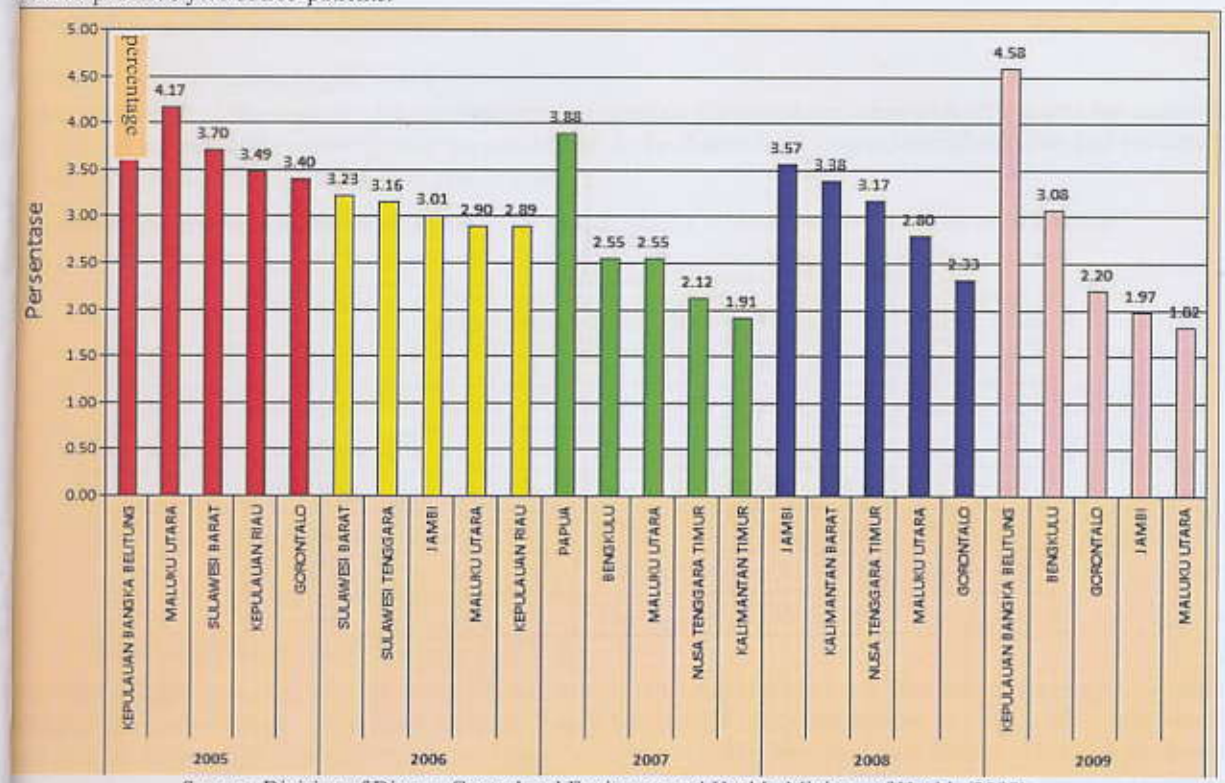
gue Hemorrhagic Fever was categorical as a potentially disease which could be outbreak and highly related with settlements onmental sanitation. The vector of disease were Aedes aegypti and Aedes albopictus that live and breed in the residential aborhood. The two types of mosquito bites will cause dengue virus enter the body and attacks the human blood cells, so that evel of thrombocyte will decrease. The Symptoms experienced by sufferers such as headache, high fever and if a slowly ling with high level attacks, it would be fatal like death over suffers. (Hamzah, 2004).

Based on data in 2009, the province with the highest mortality rate are Bangka Belitung (4.58%), Bengkulu (3.08%) and ntalo (2.2%) and while the lowest mortality rate are West Sulawesi (0%), DKI Jakarta (0.11%) and Bali (0.15%). Mortality in National scale had successfully on the below target 1%, but the most of province (61.3%) has a still high mortality rate e (1%) (Ministry of Health Republic of Indonesia, 2010). Based on these data, dengue is still the one disease which must get attention and for province of Gorontalo in attempt to bring down the mortality rate through officer training for case man- nent, providing facilities for early detection, precise and fast handling doesn't yet reach their target.

n nationally in 2009 Gorontalo had ranked province on three (3) high of 2.2% in mortality rate is based on the level of inces in Indonesia. It can be concluded that DHF in Gorontalo require an intensive treatment and must integrated. The iled graphics increased of mortality rate per 100,000 populations during years 2003-2009, and graphics of nationally mor- y rate in 2009 are presented in Fig. 1.

Based on data of dengue fever cases from 2003 – 2010, amount of patients with dengue hemorrhagic fever had increased n year to year with the annual cycle of 3 and 5 years. Gorontalo City dengue cases in 2003 reported 2 people death from 20 ents, in 2004 there were 2 patients without death, in 2005 the amount of patients had increased 84 patients and 5 people death. 006 reported 133 patients with DHF and 2 people death, in 2007 there were 124 patients with 2 people death, in 2008 reported

nts and 5 people death. Dengue cases in 2009 reported 86 patients and 1 person death, and in 2010 has been increased to om the previous year of 205 patients.



Source : Division of Disease Control and Environmental Health, Ministry of Health (2009)

Fig. 1. Top Five Province with high Mortality Rate of DHF 100,000 per Population in Indonesia 2005-2009

ıough it has made various efforts to control of vector such of the eradication of adult mosquitoes with thermal fogging ıtion), eradicate the mosquito's breeding place, outreach to the community, using of larvicida with 3M plus: (drain and g a bathtub, close the water reservoirs, and bury a thrift). However the case of dengue hemorrhagic fever has increased ear to year. Some of the obstacles to prevention of dengue is possibility of cases without symptoms (asymptomatic), varial occurrence (viruses are passed on to offspring via eggs), vector Ae. aegypti mosquitoes has been resisting with ides, and the behavior of people which support the existence of mosquito's habitats (Boewono DT et al (2012).

ubjects and Methods

search was survey method. Subjects were patients with DHF who lived in the Gorontalo city and recorded on Gorontalo alth Office's register hose months from January – December 2010. The determination of this research data are based on ients or parameters used on this research. This type of data consists of primary data and secondary data. Secondary data : climate data (rainfall, temperature, and humidity), altitude, housing density and population density, land utilization, ion density; Data of patients with dengue fever per village hose in 2010 in Gorontalo city, and social population's data by vant instance.

population of this research were population of patients with DHF in Gorontalo city were spread in six (6) Sub-district onsist of Dungingi Sub-districts (60 people), Kota Tengah Sub-district (35 people), Kota Utara Sub-district (20 people), elatan Sub-district (45 people), Kota Barat Sub-district (19 people), and Kota Timur Sub-district (26 people). Total ion is 205 people.

al sampling method used for take a sample, so the entire population being samples totaling 205 people has taken by the with consideration that data of DHF patients in Gorontalo City in 2010 is available, the amount of people can be reached, n the distances are easily for affordable and can be found. Simple regression analysis and multiple regression was use to the relationship of climatic factors consisting of rainfall, air temperature, and humidity with dengue cases in Gorontalo he relationship of environmental sanitation (water supply systems, toilet, environmental cleanliness, and drainage) with ıses in Gorontalo City were analyzed in cross-tabulations form with chi-squares with a significant probability of 0.05.

ults

ropagation of DHF Cases in Gorontalo

tribution of dengue cases in 2003-2010

data were obtained that amount of dengue patients in Gorontalo City number of dengue fever patients has increased o year and were found in every region of the sub-district. At the district level dengue surveillance data was generate to DHF form patients has fluctuated from year to year.

Table 1. Distribution and Amount Dengue Cases of Gorontalo City Based on Sub-District in 2003-2010

No	Sub-District	Years and Amount of DHF Cases							
		2003	2004	2005	2006	2007	2008	2009	2010
1	Dungingi	-	-	-	23	18	13	11	60
2	Kota Tengah	4	-	37	47	26	32	22	35
3	Kota Utara	-	-	11	4	13	15	11	20
4	Kota Selatan	10	1	35	31	39	17	24	45
5	Kota Barat	-	-	51	15	5	10	4	19
6	Kota Timur	6	1	50	50	23	12	14	26
	Total	20	2	184	170	124	99	86	205

Source: Health Department of Gorontalo City, 2010

on data in Table 1, amount of cases dengue fever patients in each sub-district was fluctuation. During 8 years since highest amount of dengue cases totally in Kota Tengah Sub-district (203), the amount of dengue patients in second as in Kota Selatan Sub-district (202), Kota Timur Sub-District (182), Dungingi Sub-district (125) and the lowest ict with dengue patients was in Kota Barat Sub-district (104). When viewed with totally in every years in Gorontalo in 2010 was the highest first (205), in 2005 was a second highest (184) and the third highest in 2006 (170). During 8 been 3 times the outbreak cases. In Gorontalo City since found cases of dengue in 2003, had two (2) times in case of an it's meaning that an increase in cases of 100% from the previous years, was in 2005 (184 cases) were previously in e were 2 cases and in the year 2010 (205 cases) were previously in 2009 there were 86 cases.

Incidence rate of dengue hemorrhagic fever in Gorontalo City

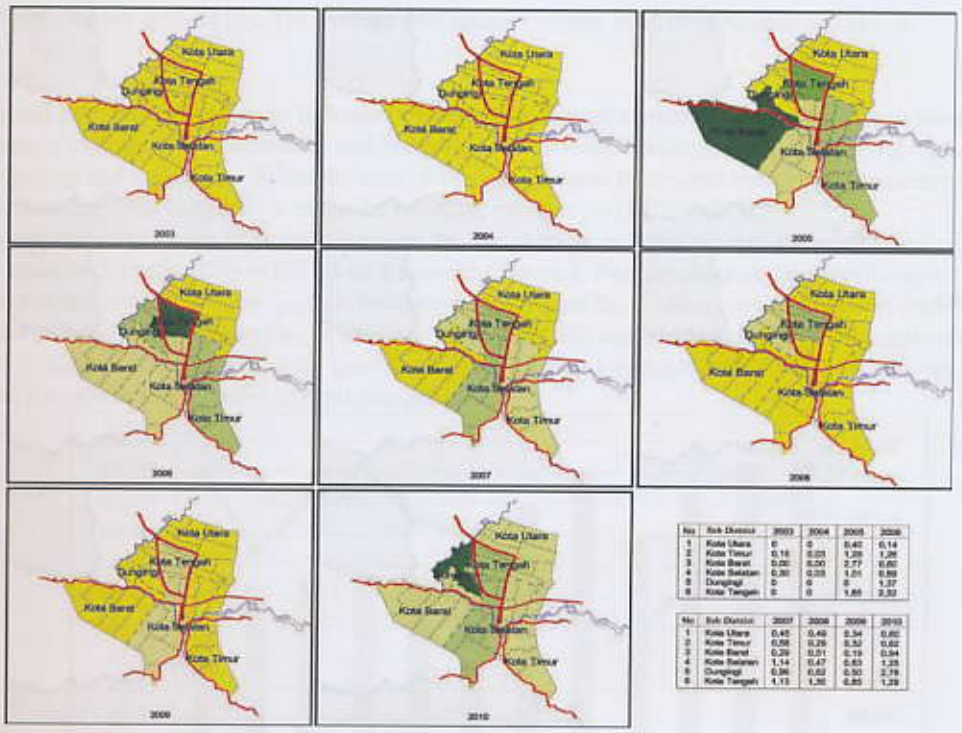
nce rates (IR) within period of 8 years from 2003 – 2010 in Gorontalo City are presented with detail in Table 2. The f patients each year based on the differently of sub-district both IR values in each sub-district. Dungingi Sub-district overed in 2006 with an IR value 1.37 (medium level) and increased with highly in 2010 with IR value 2.78.

Table 2. The Amount of Dengue Incidence in Gorontalo City

No	**Sub-district**	**Incidence Rate (IR)**							
		2003	2004	2005	2006	2007	2008	2009	2010
1	Dungingi	0,00	0,00	0,00	1,37	0,96	0,62	0,50	**2,78**
2	Kota Tengah	0,00	0,00	**1,85**	2,32	1,13	1,30	0,85	1,29
3	Kota Utara	0,00	0,00	0,40	0,14	0,45	0,49	0,34	0,60
4	Kota Selatan	0,30	0,03	1,01	0,89	1,14	0,47	0,63	1,25
5	Kota Barat	0,00	0,00	**2,77**	0,80	0,29	0,51	0,19	0,94
6	Kota Timur	0,16	0,03	1,28	1,26	0,58	0,29	0,32	0,62

Source: Health Department of Gorontalo City 2003 – 2010.

n Table 2 the incidence rates (IR) DHF from year to year of Gorontalo City both in sub-district didn't increase every year, ncrease was highly occurred in three to five-years cycle. It can see from the amount of cases where in 2003 the amount of le, a very high increased in 2005 number of 180 cases and in 2010 increased to 205 cases. This incident shows outbreak ccurs between three and 5 years. Distribution propagation of IR values are shown in Figure 2



With DF :
ow (0,60 - 1,05)
(1,06 - 1,50)
m (1,51 - 1,95)
(1,96 - 2,40)
igh (2,41 - 2,78)

ministrative Map of Gorontalo City 2009

Fig. 2. Distribution map of Incidence Rate (IR) of dengue in Gorontalo City in 2003-2010

ical Environmental Conditions

ns of the physical environmental conditions on this research such of climatic factors including rainfall, air temperature, and altitude.

infall

g with Christopher's conclusion in 1960, rainfall is one of the climatic variables that can be used as an "early warning" lling dengue fever. In addition to rainfall there is also other climate variables are also related, the variable are tem- nd humidity. The increased intensity of rainfall will be increased a humidity, and followed by the appropriate air re will be increasing the lifespan of the vector mosquito, but also supports this mosquito activity (Ambarita, 2011).

Table 3. Monthly Rainfall Data with DHF cases in Gorontalo City in 2010

Registrar Rainfall Station	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
apa	203,27	147,64	202,00	186,00	142,00	124,55	129,64	68,55	50,36	101,09	156,36	170,18
awawa	132,45	102,27	136,82	136,64	114,91	154,45	101,91	61,00	85,18	74,55	70,09	111,82
daludin	165,40	97,00	142,40	161,33	186,26	148,00	95,00	56,80	75,00	99,50	131,56	169,40
atudaa	158,90	104,31	140,75	145,56	138,96	103,68	63,47	23,62	49,61	75,93	127,43	144,08
iyonga	225,29	191,60	191,43	279,08	161,85	160,08	165,90	121,43	112,84	199,73	317,83	236,39
erata	177,06	128,56	162,68	181,72	148,80	138,15	111,18	66,28	74,60	110,16	160,65	166,37
ases (DHF)	67	23	14	19	19	30	11	5	2	6	3	6

urce: Results of Data Analysis in 2010

ighest rainfall per monthly occurs on January 177.06 mm with amount of dengue cases are 67 cases. The lowest rainfall n that occurred on August, amount of cases are 5 cases. Rainfall monthly averages need to be aware, when high rainfall November – April. Rainfall has a positive effect in one year between 1500 mm – 3670 mm, the change between on ntensity 500 mm – 1500 mm per year, but when rainfall is on interval 1500 – 3500 mm per year it will tend to increase

of DHF (Nurma et al, 2010). The average of Rainfall monthly in 2010 presented in Table 3.

erature

ason and drought season has an influence on level ambient of temperature. This influence tends to be local to a period, it's because the temperature and humidity level is more complex and influenced by a global phenomenon, topography and vegetation. When the turn of the rainy season to drought season air temperature ranges between , this is an optimum temperature range for breeding mosquitoes (24°C – 28°C).

imograph for showing the interaction between the two average monthly climate are rainfall and air temperature on a ague cases in Gorontalo City in 2010 which shown in Figure 3. Dengue cases on January (67 cases) with temperature and rainfall was 177.60 mm, and the lowest case on September 2 cases with rainfall was 74.60 mm and air tem- 27,5oC. High rainfall followed by an increase amount of DHF cases in January 2010. Similarly, the air temperature 27oC is an optimum temperature for growing of Aedes aegypti mosquito. That is shows between rainfall and tem- rmine the growth of the Aedes aegypti mosquito.

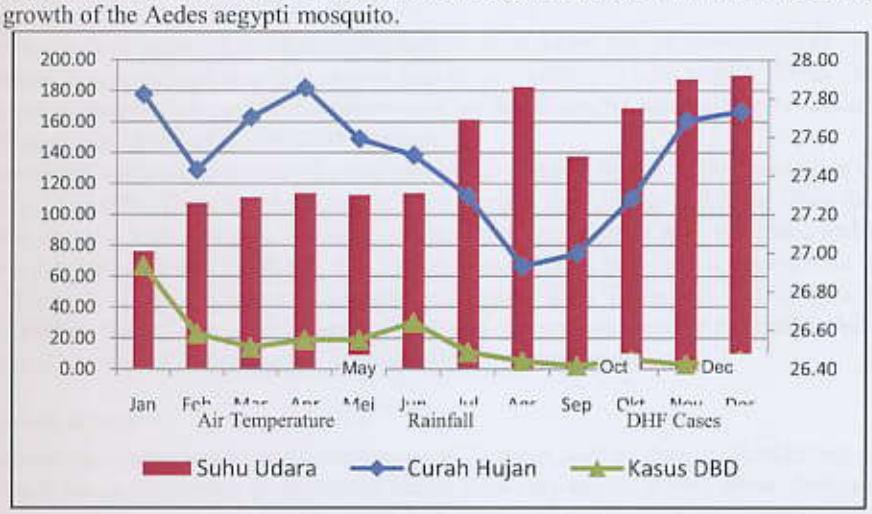


Fig. 3. Graph of rainfall, temperature, and dengue cases in 2010

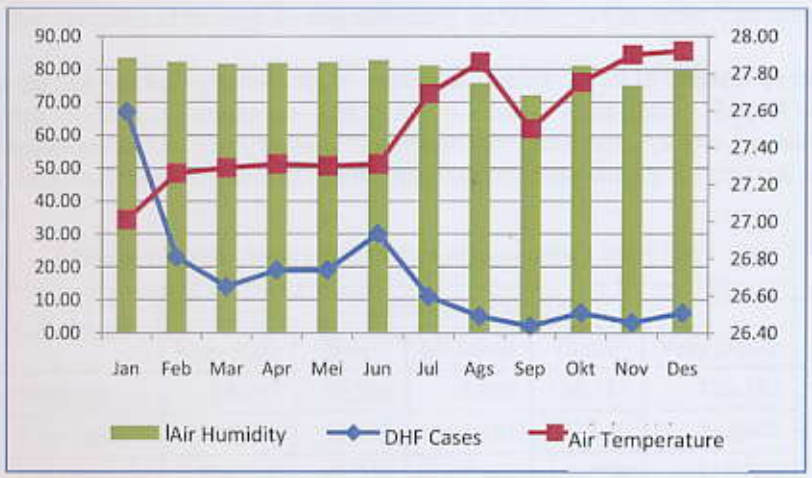


Fig. 4. Graph of Air Humidity, Temperature and Dengue cases in 2010

r Humidity

lity specifies the amount of water vapor in air. The amount of water vapor in the air is a small part of the whole at- and air components are very important in terms of weather and climate. Water vapor is the part that is not constant, om 0 % - 5 %. The variability of water vapor content in the air by place or time is important because: 1) The amount of or in the air is an indicator of the potential capacity of the atmosphere of the rain, 2) Has a radiation absorbing prop- e earth that will speed determine of earth's heat loss, 3) the greatest amount of water vapor in the air so, more amount otential energy are available in the atmosphere and it's a source or origin of wind rain. Data humidity used a secondary hly in 2010. The data were analyzed by interpolation of rainfall recording stations.

of air humidity analysis average for monthly 72.05% - 83.49%. The highest value of humidity average was in while the lowest average value of humidity occurred in September 2010. The distribution of average air humidity ted in climograph on Figure 4, which shows the interaction of temperature and humidity cycle and DHF cases in 2010. The distribution of average relative humidity of at least 72.05% - 74.34% and air temperature 27,38oC - ptember found as many as 2 cases of DHF. At low air humidity 74.35% -76.63 in August 5 cases of DHF and ses of DHF.

dity on the range of 78.93% -81.20% in December (6 cases of DHF), October (6 cases of DHF) and July (11 cases emperatures on the range 27,75oC-27,92oC, the humidity is very high 81.21% - 83.49% in June (30 cases of DHF), (19 cases of DHF), and February and March (23 and 14 cases of DHF), and January more 67 cases with air tween on the range 27,01oC-27,19oC. The interaction between the humidity and temperature of Gorontalo City in t for growing of larvae Aedes aegypti.

on

e of the environmental factors that influence the outgrowth of Aedes aegypti mosquitoes as vectors of dengue. The ing a elevation map as the base map is a contour map of Gorontalo City with scale 1: 50,000. Map elevation can be ine of elevation distribution by administrative area, so that it can be seen village or sub-district as a potential des aegypti mosquito, thoroughly with DHF patients.

of analysis of data about the elevation of a majority in sub-districts in Gorontalo City has an elevation of > 100 m f 4611.29 ha or 69.07%. Dungingi Sub-district, Kota Tengah Sub-district and Kota Utara Sub-district is an area ion > 100 m. Region with elevation < 100 m is Kota Barat Sub-district with wide area 968.82 ha are covers of e, Dembe I, Pilolodaa, Tenilo, Pilolodaa, and Tenilo. Kota Selatan Sub-district covers with wide area 602.67 ha e village, Donggala, Tanjung Keramat, Siendeng, and Tenda. Kota Timur Sub-district with wide area 492.78 ha h of Leato Village, North Leato, and Talumolo. Based on the analysis it can be concluded that the elevation > 100 be discovered a spread of Aedes aegypti in Gorontalo City, but uneven.

tions of housing density

ity are facilitate the dissemination and transmission of diseases such as dengue. Residential density in Gorontalo tted in Table 4, where the density of settlement varies from very sparse to very dense. Settlement conditions with sity in the city of Gorontalo includes Dungingi Sub-district (129.18 ha), Kota Selatan Sub-district (118.28 ha), Sub-district (87.46 ha), and Kota Timur Sub-district (87.53 ha). The total density is very dense in Gorontalo City .83 percent. The condition of housing density that rarely are scatter in Gorontalo City with an area 4450.57 ha or

Sub-district is the one has the largest density of settlement amount of 129.18 hectares spread over four village are 48.00 ha), Libuo (36.35 ha), Tomulabutao (20.21 ha), and South Tomulabutao (24 , 63 ha). The density of set- ngingi Sub-district are dominated by housing density are very dense and populous, amount of dengue cases were 010 are 60 cases. Kota Selatan Sub-district is dominated by residential density is very rare, amount of dengue cases cases of DHF.

Table 4. Housing density distribution of Gorontalo City in 2010

Sub-district	Housing Density (ha)				
	Very Rare	Rare	Middling	Dense	Very Dense
Dungingi	88,897	73,526	5,000	126,117	129,183
Kota Barat	1384,819	13,193	113,157	82,940	33,0804
Kota Selatan	839,240	61,120	69,580	160,220	118,280
Kota Tengah	119,850	122,840	5,740	149,360	87,460
Kota Timur	1.067,880	22,770	159,270	137,440	87,530
Kota Utara	949,870	73,730	120,070	145,340	

Results of Analysis Data in 2012

ation of Physical Environmental Factors to DBD Cases

lationship of rainfall to dengue cases

ainfall and dengue cases relationship used statistical analysis with SPSS 16.0. Based on results of correlation the relationship between rainfall and dengue cases showed no association being with (R = 0.47). The coefficient of

(R2) 0223, is meaning that regression line equation can be stated that 22.3% of the variation of dengue cases by s a determinant factor for dengue cases of Gorontalo City in 2010, and amounted to 77.7% of DHF variation are ther factors. Furthermore, from the analysis of variance (F-test), the value of F (count) 2874 with a probability eater than 0.05 so this relationship was not significant / non-significant with constant value (a value) of -12.996 = 0.222 and the regression equation: Y = a + bx, so cases of DHF = -12.996 + 0.222 (rainfall), the linear regression , can be used to predict dengue cases. Increase of rainfall has positive relationship with dengue cases. It explained im increase of rainfall can provide the opportunities change increased cases of dengue incidence of 2.2 cases 2 cases).

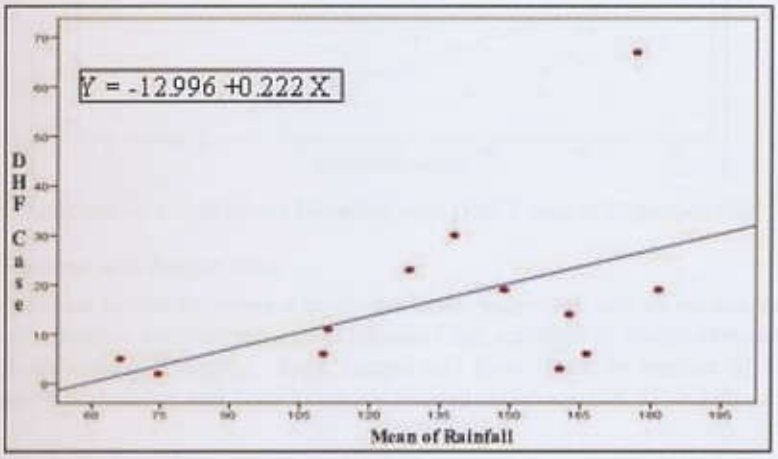


Fig. 5. Relationship Graph of Rainfall with DHF cases of Gorontalo City in 2010

lationship of Temperature with dengue cases

ariance (F-test) obtained F-value (count) of 15.562 with a probability 0.003, which smaller than 0.05. From re-esults obtained a constant value (a-value) 1287.361 and b-value - 46.178 so the regression equation; Y (Cases of 361 - 46.178 (Air Conditioning), can be used to predicting dengue cases or an increase of temperature has a neg-on with dengue cases. It explained that every 1oC increase of temperature can provide the opportunities changes ngue cases incidence 46.178 (accomplished 46) cases. Graph of linear regression equation between dengue cases are are presented in Fig. 6.

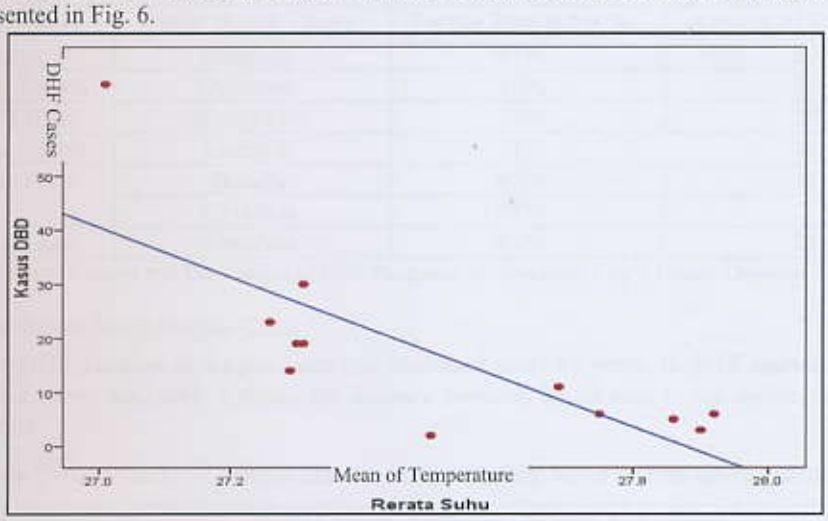


Fig. 6. The Relationship Graph of Temperature with DHF cases of Gorontalo City in 2010

lationship of air humidity with DHF cases

correlation analysis in fig.7 can be interpreted the relationship between air humidity factor and dengue cases elation (R = 0.63). From regression test results a constant value (a-value) -233.069 and b-value 3.130 so that the ation; cases of DHF = -233.069 + 3.130 (Humidity), can be used to predict dengue cases, it has a positive rela-een humidity with dengue cases. The increased of humidity and followed by an increase of dengue mosquito larvae sult, amount of dengue cases will be increase.

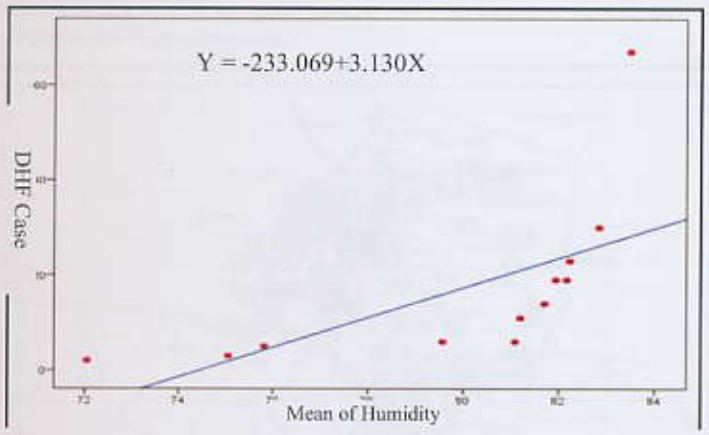


Fig. 7. The Relationship Graph of Air Humidity with DHF Cases of Gorontalo City in 2010

lationship of elevation with dengue cases

ne one of the physical factors to shows a mosquito larvae outgrowth and its relationship with dengue cases in y. The results of elevation analysis maps in Gorontalo City, scattered in lowest elevation <50 meters above sea ation each sub-districts are Dungingi, Kota Tengah and Kota Utara by amount of 115 cases, meanwhile of ch of Kota Barat, Kota Selatan, and Kota Timur are located in elevation of 50 - > 100 meters above sea level with HF.

lationship of larva free index with dengue cases

in table 5 show that, the incidence of dengue cases are related with larva free index of Gorontalo City. It can show l analysis by SPSS 17.0 software, the correlation can be interpreted the relationship between amount of free larvae ases showed a correlation (R = 0.92), coefficient of determination (R2) 0.854, which means that variations of ts amounted to 85.4% can be explained by larva free index in Gorontalo City in 2010, and remainder amount 14.6% it variation explained by other factors.

Table 5. Amount of Cases of Dengue and larva free index of Gorontalo City in 2010

o.	Sub-district	Public Health Center	Larvae Free Index %	Amount of DHF cases
.	Dungingi	Dungingi	61%	60
.	Kota Tengah	Dulalowo	78%	35
.	Kota Utara	Wongkaditi	79%	20
.	Kota Selatan	Limba B	74%	44
.	Kota Barat	Buladu	82%	14
		Pilolodaa	95%	5
.	Kota Timur	Tamalate	85%	26

ce: Administrator of Control and Eradication of DHF Programs of Gorontalo City's Health Department

nce and Distribution Index Dengue Cases

y is endemic DHF, because of dengue cases had increased years by years. In 2010 amount of dengue 205 cases, distance index shows that, table 6 shows the distance between for all case in sub-districts of Gorontalo City are een 0-50 meters.

Table 6. Distance index of dengue cases in Gorontalo City based on Sub-district in 2010

ak	Jumlah Kasus di masing - masing Kecamatan											
	Dungingi		Kota Tengah		Kota Utara		Kota Selatan		Kota Barat		Kota Timur	
	Jumlah	%	Jumlah	%	Jumlah	%	Jumlah	%	Jumlah	%	Jumlah	%
	60	100	35	100	20	100	45	100	19	100	26	100
00	0	0	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0	0	0
300	0	0	0	0	0	0	0	0	0	0	0	0
)	0	0	0	0	0	0	0	0	0	0	0	0
	60	100	35	100	20	100	45	100	19	100	26	100

orrhagic Fever's cases spread of Gorontalo City in 2010 by thematic distribution map (fig.8.) dengue cases had licated that environment is heterogeneous.

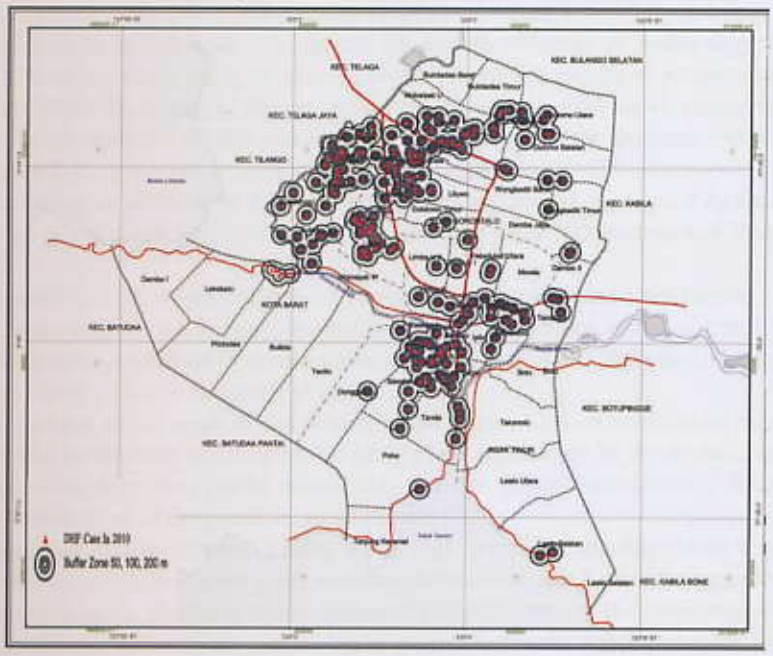


Fig. 8. Map of Buffer Zone and Dengue Cases Distribution of Gorontalo City in 2010

sion

vas concern in this study, when every rainy season DHF incident will be primary problems of Gorontalo's people. highest and it has been flooding. After flooding that it will be an outbreak of dengue fever. But if rainfall are least will increase of mosquito breeding places and increase of mosquito's population. As with other vector-based e showed patterns associated with climate, especially rainfall because it affects to spread of mosquito vectors and irus transmitting from one human to another human (Nurma, et al., 2010). High intensity of rainfall and a long looding and it can to eliminate the Aedes aegypti mosquito breeding places that normally live in clean water. As of mosquito breeding will be reduced, so the mosquito population will be reduced "(Early, et al., 2010).

ors has a relationship with a case of dengue fever of Gorontalo City in 2010 amounted to 47.2%. This study are in ch by Sumantri (2008), stated "there is a relationship between the incidence of dengue cases with rainfall in da (2012), stated: "there is a relationship between rainfall and dengue incidence during 2002 - 2011 in Semarang". ese studies was take data of annual rainfall, with a span of years 5 and 9 years.

an influence direct against presence of Aedes aegypti mosquito breeding places. The population of Aedes ae- breeding depends on the place. High rainfall and lasts for a long time can cause flooding so as to eliminate the breeding places that normally live in water. As a result amount of mosquito breeding will be reduced, so the ation will be reduced. However, if rainfall in low levels and in a long time it will be increase mosquito breeding ase the mosquito's population.

., (2010) suggests that: "temperature gives a great effect on change of dengue incidence on temperatures between he relationship average of temperature on monthly with dengue cases were analyzed with regression. From the regression can be interpreted the relationship between air temperature factor and dengue cases showed no cor- 78). The coefficient of determination 0.609 are means, it can explain 61% of variation on dengue cases can be temperature factor of Gorontalo City in 2010, and the remainder amount 39% variation in dengue cases are er factors.

ith (WHO, 2003), that: "The mosquito lifespan is affected by humidity has on levels <60% mosquito lifespan ecause it is not enough time to transfer virus from the stomach to salivary glands". The Conditions of Gorontalo appropriate for Aedes aegypti mosquito growth and proliferation are the humidity on 79% -86%.

re consistent with the opinion by Nurma, et al., (2010), that "air humidity gives a great effect on the change in gue when the moisture on interval 82% - 87%". The research by Minanda (2012), stated "There is a relationship ty with incidence of dengue during in years 2002 – 2011, in Semarang".

th Gunawan in 2000, the function of Air humidity is for survival activity by Aedes aegypti larvae and mosquito Low humidity will shorten a life of the mosquito. In otherwise on high levels of humidity will be extend the life In highest humidity, mosquitoes will become a more active and more likely to bite "(Suwito, et al., (2010).
n analysis elevation in Gorontalo City sustain for growth of larvae of Aedes aegypti, the elevation ranges of bout 50-> 100 meters above sea level with the proliferationt and growth of Aedes aegypti. This is in accordance by Hamzah (2004) "the ability of female mosquitoes flew an average on 40 meters up to 100 meters".
des aegypti are in elevation 0-1000 meters above the sea level. In the lowlands (<500 meters) from common of tion levels are high. It has low population in mountainous areas (> 500 meters), while in the state of Southeast it found in elevation about 1000-1500 meters which the limit of the spread Aedes aegypti mosquito. Aedes pable flew up to a distance 100-200 meters from breeding place "(Department of Health Republic of Indonesia,

arvae free index had illustrates the lack of community participation in eradicating mosquito breeding, so in- ulation of Aedes aegypti and dengue transmission. Larvae free index in a poor condition and the distribution in especially in densely population of residential area, are reflecting that, the more transmission caused by behavior han humans (WHO, 2008 in Boewono et al, 2012).
index is associated with a weak of community empowerment efforts in terms of mosquito breeding place era- the people had participated in mosquito breeding place eradication in inside and outside the home, the places lly of mosquito breeding place can be minimized" (Siregar, 2004). Eradication of dengue vector is an absolutely for cut the transmission of dengue fever in Gorontalo City.
sity are associated with population density, when high density of housing shows a narrowness of distance be- ngs, so that the air circulation is not good, settlements be moist, less lighting is a good media for the proliferation acteria carrying diseases. Similarly, the existence of Gorontalo city as the economic center has a rain water drain stence of rain water installation around the house respondent is not a risk factor for incidence of dengue. Aedes o lives around human settlements, inside and outside the home, especially in urban areas and breed in a variety of s that not directly contact with ground and protected from the sun (Sari, 2005).
in fig. 8 shows that house location between house with dengue cases in Gorontalo City relatively adjacent 50 potentially be a source of transmission. The transmission of dengue in Gorontalo city is very determined by ctor Aedes aegypti mosquito which has an ability flew (<100 m). The results of this study supported a statement et al 2012 states that: "The distance of dengue transmission is 100 meters within theirs scope fly (flight range of

ed cases pattern distribution is indicator that, there is a concentration of vector habitats, so has potentially curs. The generally, clustering incidence of DHF with a tendency follow within high population density and low x (Boewono DT et al, 2012). Conditions of dengue cases distribution in Gorontalo city are clustered (Fig.8) that is vior of Aedes aegypti mosquito is a major factor has occurred of DHF. The increasing cases of dengue in Go- years to years, probably weak of community participation in mosquito eradication, in addition a weak of effec- cticides used in vector control programs on thermal fogging.
nalysis and discussion that has been described can be concluded that, physical environmental factors in Gorontalo ctors as rainfall, air temperature, humidity, and elevation has a relationship with dengue cases. Larvae free index ip with dengue cases. The average of larvae free index of Gorontalo City in 2010 are still below from national), so the public participation needs to improve. The distribution of dengue cases in Gorontalo city are clustered, f 50 meters and the transmission caused by the behavior of Aedes aegypti mosquitoes.

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and Dengue Haemorrhagic Fever. WHO Report on Global Surveillance of Epidemic-prone Infectious Diseases. Chapter 6