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Determination of Dengue Hemorrhagic Fever Vulnerable Areas with Decision Support Systems Using Profile Matching

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Abstract. According to data as of January 2019, Cengkareng Subdistrict ranked second out of many cases of dengue fever in West Jakarta City. Endemic DHF disease is caused by a number of factors, one of which is rainfall which results in stagnant water, causing floods and dirty environments such as garbage accumulation which can also be fatal so that mosquitoes can breed more easily. The mosquitoes' population cannot be controlled, only by caring and actively keeping the environment clean. Puddle of clean water is one of the breeding grounds for dengue mosquitoes, for that it is necessary to control environmental cleanliness, check water reservoirs, and monitor larvae to maintain environmental cleanliness so as not to cause harm to you. To prevent an increase in DHF, we have to make a decision support system to determine the environment that is susceptible to dengue from the smallest area, namely the RT on Jalan Kapuk Gang Sinar, Cengkareng District, which is only limited to RW002 consisting of 12RT. One of the methods used in making decisions in determining which environments are vulnerable to DHF is Profile Matching. The decision support system for the Profile Matching process and gap analysis was made based on data in Jalan Kapuk Gang Sinar, West Jakarta. The Profile Matching Method was conducted to determine the RT environment that is vulnerable to DHF based on 2 aspects, namely individuals and the Environment. The results of determining the RT environment that is susceptible to dengue is the lowest final score of 3,728 obtained by RT002.
Keywords : cengkareng, dangue fever, profile matching, determination

1. Introduction

Dengue hemorrhagic fever is a dengue virus that attacks blood cells. Through the Aedes Aegepty Virus this virus is transmitted. This aedes aegypti lives in tropical climates with humid temperatures. Basically, mosquito attacks humans during the day. If someone has been infected with this virus also experience muscle aches, headaches, joint pain, and a decrease in the number of white blood cells. One decrease in the number of white blood cells causes failure, so the patient will suffer from dengue syndrome. [1]

Dengue hemorrhagic fever (DHF) is a disease caused by dengue virus infection. DHF is an acute disease with clinical manifestations bleeding that causes shock that ends in death. DHF is caused by one of four virus serotypes of the genus Flavivirus, family Flaviviridae. There are 4 DHF serotypes: Dengue

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1, 2, 3 and 4 in which Dengue type 3 is dominant virus serotypes cause severe cases. Before causing the disease, the virus requires a period of 4-6 days (intrinsic incubation period). [2].

Dengue Hemorrhagic Fever (DHF) is one of the diseases that is quickly transmitted in the Environment, in Pekanbaru City as many as 7 out of 12 Subdistricts are endemic areas of DHF, from these 7 sub-districts Bukit Raya is a sub-district with case fatality rate from 2005, 2006 and 2007 respectively. - According to 1.44%, 0.0% and 3.5% exceeding national indicators (1.0%). Sociodemography (gender, education, occupation and mobilization and environment (distance of the house, house layout, humidity, water reservoir (TPA), landfill not for daily use, natural landfill, existence of larvae and ornamental plants / yard) are the research objectives to determine the relationship with the incidence of DHF [3].

There were 105 dengue cases in Mataram City in West Nusa Tenggara Province in 2001 with a mortality rate of 1.90%. In 2002 it increased to 233 people with a mortality rate of 1.72%, of which the larva free rate (ABJ) was 92.90%. Furthermore, the number of dengue patients decreased to 156 people in 2003 but with a higher mortality rate of 5.12%, a threefold increase compared to 2002 (Health Office Prop. NTB, 2002). [4]

In Bali Province, South Denpasar sub-district is one of the areas with the highest cases of dengue fever. Maya index is an indicator to measure the number of water reservoirs that can be a breeding ground for mosquitoes. Knowing the relationship between the level of virtual index and the density of Aedes aegypti larvae and pupae on dengue infection in South Denpasar District. Entomological surveys with virtual indicators, house index (HI), container index (CI), Breteau index (BI), and pupa index (PI) to see the density of larvae and pupae in the survey area [5].

In Nigeria, dengue fever is caused by dengue virus, types 1 and 2 have been diagnosed for many years. Although, seroepidemiological surveys have shown that dengue virus activity is widespread in the country, there is scanty information on dengue, hemorrhagic fever with little attention paid to dengue fever, because it presents as classical dengue fever disease by fever, myalgia, headache, arthralgia, retro-orbital pain, gastro intestinal, symptoms and skin rash. [6]

The dengue viruses (genus Flavivirus, family Flaviviridae) are mosquito borne and cause 100 million cases of dengue fever each year in most tropical and subtropical areas of the world. Fifty-seven Swedish travelers to dengue epidemic areas, with clinical and serologically diagnosed dengue fever, were included in this study. The results showed that 15/20 (75%) of the samples collected 5 days or later post onset of disease, but only 5/37 (14%) of the samples collected on days 0 to 4, contained dengue-specific IgM. [7]

Aedes aegypti as the vector of Dengue Hemorrhagic Fever (DHF) disease likes to breed in the water containers. The larvae of A. aegypti mostly found in the bath water containers. The presence of A. aegypti larvae could be caused by the type of water source, the container's color, material, location, lid existence and the container's drain frequency. This study aimed to determine the association of water source type with larvae presence and the additional factors. This study used observational analytic with case control design. The data were analyzed by regression logistic test. The significant variables which associated with the presence of larvae were the water source type (OR = 1.923), container's color (OR = 2.345), container's location (OR = 2.241), container's lid existence (OR = 2.122) and the container's drain frequency (OR = 2.260). [8].

2. Literature Review

Profile Matching is a decision-making mechanism to assume that there is an ideal level of predictor variables that must be fulfilled by the parameters, instead of the static criteria. In a profile matching process, an outline of the process of comparing the individual's competence into the aspects that can be known differences in competence called gap [9][10]. The smaller the gap generated the weight of large value which means it has a better chance to occupy the top position. DSS is used to model human reasoning and the decision-making process; both are capable of accepting facts from users, processing these facts, and suggesting the solutions that are close to the solutions that are presented by human experts [11].

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Medical decision support systems help clinicians to best exploit these overwhelming amount of data by providing a computerized platform for integrating evidence based knowledge and patient-speci3c information into an enhanced and cost-ehective health care [12]. To assist in the determination of a person's determination would be eligible for aid poor house then takes a decision support system that is using the profile matching. This method was chosen because it is able to select the best alternative from a number of alternatives. Alternatives which meant that the right to receive housing assistance based on criteria that have been determined. Profile Matching method is the process of comparing individualal competencies with the competencies specified so as to know the difference competence (also called gap), the smallerthe gap the resulting value is greater than the weight.[13]

3. Research Method

Weighting on the Profile Matching method, is a definite value that is firm at a certain value because the existing values are members of a firm set (crisp set) [14]. In a strict set, the membership of an element in the set is expressly stated, whether the object is a member of the set or not by using the characteristic function.

The steps of the profile matching method are:

1. Determine variable data needed.
2. Determine the aspects used for assessment.
3. Mapping profile gaps.
   Gap = Minimal Profile - Test data profile
4. After the Gap value is obtained, then the weight is assigned to each Gap value.
5. Calculation and grouping of Core Factors and Secondary Factors. After determining the weight of the gap value, then grouped into 2 groups, namely:

a. Core Factor, which is the most important or prominent criteria (competencies) or most needed by an assessment that is expected to obtain optimal results.
   NCF = ENC / EIC
   Information:
   NCF: The average value of the core factor
   NC: The total number of core factor values
   IC: Number of core factor items

b. Secondary Factor (supporting factors), which are items other than those in the core factor.
   Or in other words is a supporting factor that is less needed by an assessment.
   NSF = ENS / EIS
   Information:
   NSF: The average value of secondary factor
   NS: The total number of secondary factor values
   IS: Number of secondary factor items

6. Calculation of Total Value. Total value is obtained from the percentage of core factors and secondary factors which are estimated to influence the results of each profile.
   N = (x)% NCF + (x)% NSF
   Information:
   N: Total value of the criteria
   NSF: The average value of secondary factor
   NCF: The average value of the core factor
   (x)%: The percent value inputted
7. Calculation of ranking. The final result of the profile matching process is ranking. Determination of ranking refers to the results of certain calculations. Ranking = (x)% NMA + (x)% NSA
   Information:
   NMA: Total value of the main Aspect criteria
   NSA: Total value of Supporting Aspect criteria
   (x)%: The percent value inputted

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4. Result and Discussion

From the calculation results above, the final results are sorted from lowest to highest. To find out RTs whose environment is vulnerable to dengue disease. RT002 that gets the title as an environment that is susceptible to dengue disease on Jalan Kapuk Raya Gang Sinar RW002 is RT002 getting a final grade of 3,728. Penialian yang telah dilakukan 5 (lima warga).

Table 1. Aspect Criteria

Criteria Value	1. Dirty
	2. Not clean enough
	3. Clean enough
	4. clean
	5. very clean

Table 2. Assessment RT001

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Eva	3	3	4	2	3	2
2	Siti	4	5	4	4	3	3
3	Nopi	4	2	3	3	4	1
4	Reni	4	3	3	2	3	1
5	Eka	3	4	3	3	4	2

Table 3. Assessment RT002

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Firda	3	3	4	3	2	3
2	Lilis	4	3	4	2	3	3
3	Ami	4	5	5	2	4	2
4	Ayu	5	4	5	3	1	2
5	Lin	3	5	5	3	2	2

Table 4. Assessment RT003

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Amel	4	4	4	3	3	4
2	Esti	4	3	5	1	2	2
3	Nunung	4	2	3	3	4	1
4	Sopia	4	3	3	2	2	3
5	Minah	3	4	3	3	4	2

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Table 5. Assessment RT004

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Nani	4	3	4	3	3	1
2	Siti	5	4	3	3	3	3
3	Jesika	4	4	4	2	4	2
4	Megi	3	3	4	2	4	2
5	Nia	5	2	4	1	3	2

Table 6. Assessment RT005

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Tuti	4	3	4	1	4	3
2	Pina	4	3	3	3	3	3
3	Riska	4	5	3	2	5	2
4	Dini	4	4	3	2	4	2
5	Afi	4	2	3	1	3	2

Table 7. Assessment RT006

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Ayin	3	3	4	2	3	2
2	Mamed	4	5	4	4	3	3
3	Penti	4	2	3	3	4	1
4	Ayu	4	3	3	2	3	1
5	Jeni	3	4	3	3	4	2

Table 8. Assessment RT007

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Elly	5	5	3	4	3	2
2	Anis	5	4	3	2	2	2
3	Enggar	5	4	3	3	2	1
4	Rika	3	3	3	1	2	1
5	Wiwi	3	3	3	2	4	2

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Table 9. Assessment RT008

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Yuni	4	4	4	3	3	2
2	Lilis	3	3	4	3	2	3
3	Devi	5	3	3	2	3	1
4	Erna	4	4	4	4	2	2
5	Nana	4	5	4	4	3	3

Table 10. Assessment RT009

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Sri	5	3	3	2	3	2
2	Ipah	3	5	3	3	3	1
3	Della	4	5	2	2	2	2
4	Siska	4	4	3	2	3	2
5	Kiki	5	5	2	3	4	2

Table 11. Assessment RT010

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Ika	3	3	3	3	3	3
2	Novi	2	4	3	2	3	1
3	Murni	3	5	4	2	2	2
4	Ina	5	5	5	3	5	2
5	Yani	3	4	4	2	3	1

Table 12. Assessment RT011

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Lalan	3	5	4	2	4	3
2	Sumi	3	5	3	3	3	3
3	Yosi	4	4	3	2	2	2
4	Keke	3	3	2	1	2	1
5	Rindu	5	5	5	3	3	2

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Table 13. Assessment RT012

No	Name	Individual			Public		
		A1	A2	A3	B1	B2	B3
1	Nur	4	4	3	2	2	2
2	Fatima	3	5	5	3	4	2
3	Nissa	3	4	2	3	2	1
4	Lulu	4	4	4	1	4	2
5	Marisa	4	3	3	2	3	2

Pemetaan GAP

GAP = Citizen Profile - Feasibility Profile

Table 14. GAP Individualal Aspect RT001

No	Name	Criteria		
		A1	A2	A3
1	Eva	3	3	4
2	Siti	4	5	4
3	Nopi	4	2	3
4	Reni	4	3	3
5	Eka	3	4	3
Feasibility Profile		2	2	3
1	Eva	1	1	1
2	Siti	2	3	1
3	Nopi	2	0	0
4	Reni	2	1	0
5	Eka	1	2	0

Table 15. GAP Public Aspect RT001

No	Name	Criteria		
		B1	B2	B3
1	Eva	2	3	2
2	Siti	4	3	3
3	Nopi	3	4	1
4	Reni	2	3	1
5	Eka	3	4	2
Feasibility Profile		3	4	3
1	Eva	-1	-1	-1
2	Siti	1	-1	0
3	Nopi	0	0	-2
4	Reni	-1	-1	-2
5	Eka	0	0	-1

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Table 16. GAP weight

Deviation	Weight Value	Information
0	5	Competence as needed
1	4.5	Competence individualal more then 1 level
-1	4	Competence individualal less then 1 level
2	3.5	Competence individualal more then 2 level
-2	3	Competence individualal less then 2 level
3	2.5	Competence individualal more then 3 level
-3	2	Competence individualal less then 3 level
4	1.5	Competence individualal more then 4 level
-4	1	Competence individualal less then 4 level

Table 17. Determination of Weight Value GAP Individual Aspect RT001

No	Name	Criteria		
		A1	A2	A3
1	Eva	1	1	1
2	Siti	2	3	1
3	Nopi	2	0	0
4	Reni	2	1	0
5	Eka	1	2	0
Weight value				
1	Eva	4.5	4.5	4.5
2	Siti	3.5	2.5	4.5
3	Nopi	3.5	5	5
4	Reni	3.5	4.5	5
5	Eka	4.5	3.5	5

Table 18. Determination of Weight Value GAP public Aspect RT001

No	Name	Criteria		
		B1	B2	B3
1	Eva	-1	-1	-1
2	Siti	1	-1	0
3	Nopi	0	0	-2
4	Reni	-1	-1	-2
5	Eka	0	0	-1
Weight value				
1	Eva	4	4	4
2	Siti	4.5	4	5
3	Nopi	5	5	3
4	Reni	4	4	3
5	Eka	5	5	4

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Calculation and grouping *Core* dan *Secondary Factor*

Table 19. Value Weight GAP Individual Aspect RT001

No	Name	Criteria			NCF	NSF
		A1	A2	A3		
1	Eva	4.5	4.5	4.5	4.5	4.5
2	Siti	3.5	2.5	4.5	4	2.5
3	Nopi	3.5	5	5	4.25	5
4	Reni	3.5	4.5	5	4.25	4.5
5	Eka	4.5	3.5	5	4.75	3.5

Table 20. Value Weight GAP PublicAspect RT001

No	Name	Criteria			NCF	NSF
		B1	B2	B3		
1	Eva	4	4	4	4	4
2	Siti	4.5	4	5	4	4.75
3	Nopi	5	5	3	5	4
4	Reni	4	4	3	4	3.5
5	Eka	5	5	4	5	4.5

Total Value

Table 21. Total Value GAP Individual Aspect RT001

No	Name	NCF	NSF	N(a)
1	Eva	4.5	4.5	4.5
2	Siti	4	2.5	3.4
3	Nopi	4.25	5	4.55
4	Reni	4.25	4.5	4.35
5	Eka	4.75	3.5	4.25
				4.21

Table 22. Total Value GAP Public Aspect RT001

No	Name	NCF	NSF	N(b)
1	Eva	4	4	4
2	Siti	4	4.75	4.3
3	Nopi	5	4	4.6
4	Reni	4	3.5	3.8
5	Eka	5	4.5	4.8
				4.3

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Determination of Final Results

The formula for calculating the final results above then the final result of determining the environment that is susceptible to DHF with an individual aspect with a value of percent = 70% and Environment aspects with a value of percent = 30%

Table 23. Final Result research of Environment RT pada RW002

No	RT	N(a)	N(b)	Final Result
1	001	4.21	4.3	4.237
2	002	3.68	3.84	3.728
3	003	4.17	4.1	4.149
4	004	4.05	4.28	4.119
5	005	4.12	4.34	4.186
6	006	4.21	4.3	4.237
7	007	3.97	3.66	3.877
8	008	3.91	3.92	3.913
9	009	3.61	4.04	3.739
10	010	3.93	3.98	3.945
`11	011	3.73	3.96	3.799
12	012	3.89	4	3.923

Table 24. Ranking

No	RT	N(a)	N(b)	Final Result
1	2	3.68	3.84	3.728
2	9	3.61	4.04	3.739
3	11	3.73	3.96	3.799
4	7	3.97	3.66	3.877
5	8	3.91	3.92	3.913
6	12	3.89	4	3.923
7	10	3.93	3.98	3.945
8	4	4.05	4.28	4.119
9	3	4.17	4.1	4.149
10	5	4.12	4.34	4.186
`11	1	4.21	4.3	4.237
12	6	4.21	4.3	4.237

5. Conclusion

Based on the results and discussion described, several conclusions can be drawn as a result of the research as follows:

1. Profile Matching Method can be used as an alternative decision support system in determining the RT environment that is susceptible to DHF on Jl. Kapuk Raya Gang Sinar, West Jakarta. So, using the Profile Matching method can help in making a decision.
2. The process of determining the ranking of RT neighborhoods calculated using the Profile Matching method starts with determining the Gap, weighting the Gap value, grouping core factors and secondary factors, calculating the total value, and finally determining the ranking.
3. From the results of the study, which are seen from the aspects of individualals and aspects of the Environment, along with other criteria and by using the Profile Matching method. RT002 environment was ranked first with a final score of 3,728 and had the chance of contracting DHF.

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