SPATIAL ANALYSIS OF COMMUNITY HEALTH CENTRE AT SIGI REGENCY, PROVINCE OF CENTRAL SULAWESI - INDONESIA

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ABSTRACT: Map can be utilized in the field of health and environment. Geographical Information Systems (GIS) and Remote Sensing (RS) techniques utilized in the health sector is driven by the efficiency and effectiveness of both process and results achieved. Spatial analysis of the health sector needs to be done in order to know about the health perspective and problem -based space (territorial) and can analyze an effort to handle (Tunissea, 2008). Community health center (Puskesmas) is one of the government's efforts to improve health care , health care facilities is the most affordable by the community. Community health center (Puskesmas) distribution of spatial information presented in thematic data will optimize health care in a region. The method of analysis using GIS techniques with attention to the analysis of information and data characteristics Community health center (*Puskesmas*). Based on analysis of information and data characteristics Community health center (*Puskesmas*) , Community health center (Puskesmas) generated distribution maps . In Sigi regency there are 19 health centers , 43 auxiliary community health centers and 81 health posts. Analysis of the distribution of the health center informed that each of the districts there is one health center.

1. PRELIMINARY

Indonesia continues to experience population growth, this results in increased support for public facilities and social facilities for the needs of the population. Act No. 36 of 2009 on Health , Article 17 states that the Government responsible for the availability of access to information, education , and health care facilities to improve and maintain the health status. Health facilities is very important to note because it deals with human development. If the terms of the health care system in Indonesia , the role and position of health centers is spearheading the health care system in Indonesia , which aims to meet the needs of individuals or communities to resolve all problems or irregularities on the health of all in society .

Provision of health facilities based on population served by these facilities , Healthy Indonesia Program (2010), targeted ratio of availability of general practitioners per 100,000 population is 40 doctors (Wulansari, 2010). Or the ideal ratio between doctors and patients is 1 : 2500 means that one doctor serving 2,500 residents (Ghufron, 2013). Formal health services such as hospitals , clinic , community health centers *(Puskesmas)*, polyclinics , for public service users formal health services will get a higher profit compared with the user not being (Becker,1968 dalam Susilowati,1999).

Functioning health facilities providing health services to the community , has a strategic role in accelerating the improvement of public health as well as to control the population growth. Placement provision these health facilities will consider the radius of coverage of health services related to basic needs that must be met for a means of serving patients in certain areas (Suharmiati et al., 2012).

Some health facilities are required such as :

1. Health Center that serves as the first level of health care facilities that provide services to the population in the treatment of disease , in addition to implementing health care programs and disease prevention in the working area.
2. The auxiliary community health centers, village health post *(Poskesdes)* , Integrated Service Post *(Posyandu)* that serves as the simple health care unit. These units provide limited health services and assist the implementation of the activities of health centers within the scope of the smaller area .

According to the Guidelines for Minimum Service Standards for Settlement through of the Minister of Settlement and Regional Infrastructure No. 534/KPTS/M/2001 for coverage unit regencies / cities spreading health facility / outreach minimal and poured in Indonesian National Standard SNI 03-1733-1989.

Sigi Regency is located at coordinates 0˚52 ' - 0˚03 ' south latitude and and 119˚38 ' - 120˚21 ' east longitude. Area of Sigi regency around 5196.02 km2, composed of 15 districts with 176 villages and 1 unit of transmigration settlement. The population of Sigi Regency in 2014 was 226 876 inhabitants. Highest number of inhabitants in the District

Sigibiromaru with a population of 45 218 people, while the population of the lowest in the district Lindu with a population of 4,948 inhabitants (BPS,2015). To get closer to the public health service is made health post (*Poskesdes)* , as basic health services for the community . *Poskesdes* services include promotive , preventive and curative carried out by health professionals, especially midwives with the involvement of volunteers or volunteer . Geographically Sigi regency has three districts are remote, regions with geographical conditions are difficult to reach in the mountains or swamps and the unavailability of public transport (Menkes.2007).

Table.1. Health Facility Needs

No.	Facility type	Total population	Radius attainment (m)	Locations
1	Village health posts	1000	500 m	Join the hall RW
2	Polyclinics	1000	1000 m	Amid a group of citizens
3	Maternity clinic	10000	1000 m	Can be reached by public transport
4	Auxiliary health centers	30000	1500 m	The center of the village administration
5	Community health center (Puskesmas)	30000	3000 m	District government center

Indonesian National Standard (SNI 03-1733-1989) and SNI 03-1733-2004

Geographical conditions Lindu district consists of 4 villages, transport can only use two-wheeled vehicles (motorcycles) and on foot to reach the village from the district town. The main transportation Lindu district community to travel between villages or districts out is by bike or on foot . In general transportation in the Nokilalaki district and Pipikoro district, same as the transport conditions in the Lindu district, the mobility of people is done with two-wheeled vehicles (motorcycles) and walk (districts Lindu, Pipikoro, Nokilalaki), these districts include remote area (Menkes.2007).

2. METHOD

The research method in this study is a method of non-experimental or descriptive survey method that aims to observe the variables of research that has been set. Subjects in the study is community health center facilities in Sigi regency, Central Sulawesi Province. The primary data of the coordinates of the location of the health center facility, while the secondary data, the distribution of health facilities, population data, administrative maps, maps of the road network and settlement maps. The variable measurement point coordinates health center position using GPS (Global Position System) which is then integrated into a topographical map (Pranasetia, 2009). The analytical method to do is buffering, this function will generate new spatial data or polygon-shaped zone with a certain range of spatial data into input. For example, spatial data point will generate new spatial data in the form of a circle around the dots center. For spatial data lines will generate new spatial data in the form of a polygon-polygon surrounding the stripes. Analysis will utilize software applications of GIS (Geographical Information System). Further analysis based on the availability of public health services and affordability of health care.

The availability of health services in the community can be seen from the process or act of real community environment (Sitorus . 2007) . Based on the data that the availability of health center *(Puskesmas)* in Sigi Regency as many as 19 pieces , 43 pieces of sub health center *(Puskesmas Pembantu)* and health post *(Poskesdes)* 81 pieces . Distribution of community health centers described in point form . The principle of affordability of health center in this paper is more emphasis on the accessibility community to achieve community health centers . Affordability of health care financing aspects overlooked because health care costs borne by the government .

3. RESULT AND DISCUSSION

Sigi Regency with the capital Bora directly adjacent to Palu (capital of Central Sulawesi province) , these conditions encourage the growth of new towns in the district of Sigi bordering the city of Palu . District directly adjacent and close to the city of Palu is Marawola district , Kinovaro district , Dolo district, West Dolo district and Sigi Biromaru district, which significantly regions is growing as urban. Primary data observation point coordinates health facility (Table 2 .) Integrated into the base map for the area of research and the results are presented in Fig.1 .

Location of community health care facilities *(Puskesmas)* preferably in a strategic location near major roads or collector roads so easy to reach by public accessibility . Poskesdes as a provider of basic health services for rural communities , scattered in every village location close to the settlement. Table 2 . describes the efforts of local government health service closer to the community , but the geographical factors become obstacles.

The distance between a residence with a health care negative effect on the number of health care . This is understandable since the further stay at a health care center will be more expensive (Laij , 2012) . Ease of health care facilities to be accessed , and the nearby settlement with the unit of health care facilities , will allow people to avail such services . The distance factor and a good road network will provide a positive influence for the community because people will more easily reach the location of health services .

Table.2. Distribution of Total Doctors and Community Health Center *(Puskesmas)*

No.	District	Total population	Doctor	Dentist	Hospital	*Puskesmas*	auxiliary *Puskesmas*
1	Pipikoro	8.251				2	3
2	Kulawi Selatan	8.940	2	1		1	1
3	Kulawi	14.954	2	1		2	4
4	Lindu	4.948		1		1	1
5	Nokilalaki	5.936		1		2	2
6	Palolo	28.888	5	1		2	6
7	Gumbasa	12.325	1	1		1	4
8	Dolo Selatan	15.243	1		1	1	3
9	Dolo Barat	13.267	1			1	3
10	Tanambulava	8.301	1	1		1	3
11	Dolo	21.725	3	1		1	2
12	Sigi Biromaru	45.218	10	3	1	1	7
13	Marawola	22.150	5	2		2	3
14	Marawoloa Barat	6.734	1	1		1	
15	Kinovaro	9.996	3			1	1
	Amount		35	12	2	19	43

BPS Sigi regency. 2015 Puskesmas is community health center

Furthermore, every point Puskesmas do buffering far as 3 km (SNI 1989 and SNI 2004) to display the radius of service as a basis of spatial analysis . Radius of 3 km is the ideal distance people can access health center *(Puskesmas).*

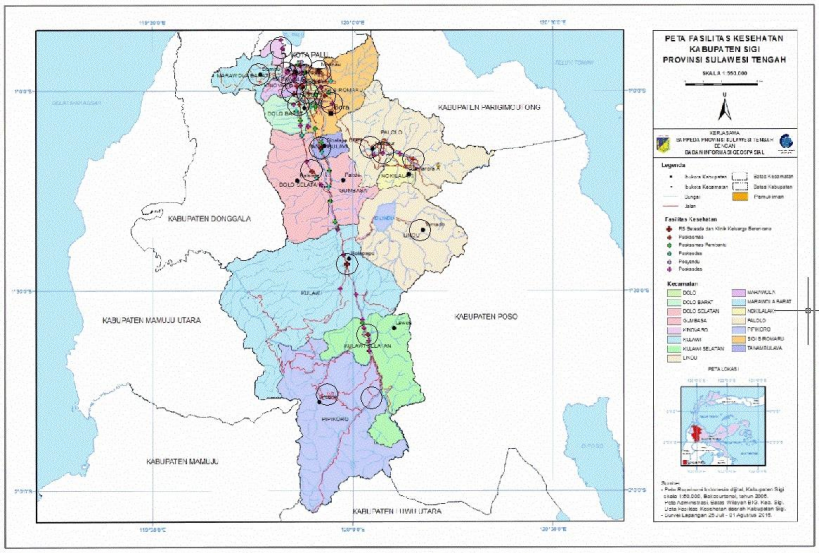

Figure.1. Buffer distance of *Puskesmas*

Studies carried out on the availability of health centers , the range and number of people based on SNI 2004 and the type of minimum health personnel to the health center based on the Minister of Health No. 75 in 2014. Activity analysis was restricted to the availability of doctors and the ratio of the need for doctors as well as the existence of health centers based on population . Calculations using the data that is in Tabel.1 . ; Table 2 . and Figure.1 .

Number of doctors in Sigi regency there is still less based on the ideal ratio of the need for doctors , while based on the ideal ratio of *Puskesmas* only Sigi Biromaru district unfulfilled . Sigi Biromaru as a capital district in addition to the health center are also available Regional Hospital (*RSUD*), so that the criteria have not been met is not appropriate . Analysis Table.3 . using the ideal ratio of doctors and health centers there are three districts that are not being met because one of the parameters is not available. There are Pipikoro district , Lindu district and Nokilalaki district .

Results of research on the continuity of health workers in rural Scotland find those working in rural areas feel more isolated than in small towns . Workplace conditions are very limited , resulting in dissatisfaction , so they want to leave the job (Richard et al. , 2005) . Geographical situation that is long distance or location where the task more difficult by poor transport infrastructure desire to move higher and is this condition that occurs in the Pipikoro distict , Lindu district and Nokilalaki district.

Table.3. The need for doctors and health centers based on population needs

No.	District	Doctor needs	Doctor	*Puskesmas* needs	*Puskesmas*	Primary care
1	Pipikoro	3	-	1	2	Not fulfilled
2	South Kulawi	4	2	1	1	Unfulfilled
3	Kulawi	6	2	1	2	Unfulfilled
4	Lindu	2	-	1	1	Not fulfilled
5	Nokilalaki	2	-	1	2	Not fulfilled
6	Palolo	12	5	1	2	Unfulfilled
7	Gumbasa	5	1	1	1	Unfulfilled
8	South Dolo	6	1	1	1	Unfulfilled
9	West Dolo	5	1	1	1	Unfulfilled
10	Tanambulava	3	1	1	1	Unfulfilled
11	Dolo	7	3	1	1	Unfulfilled
12	Sigi Biromaru	18	10	2	1	Unfulfilled
13	Marawola	9	5	1	2	Unfulfilled
14	West Marawoloa	3	1	1	1	Unfulfilled
15	Kinavaro	4	3	1	1	Unfulfilled
	Amount	89	35	16	19	

Analysis based on the ideal ratio of doctors 1 : 2,500 and the ideal ratio *Puskesmas* 1 : 30.000

There are five districts of *Puskesmas* do that if the position of the buffer radius of 3 km will each cover (overlapping) . This condition can be expressed as the area that has a health center with good accessibility (Figure.1 .) . District question area Marawola district , Kinavaro district , Dolo district, Dolo West district and Sigi Biromaru district , geographically the area is bordered by the city of Palu.

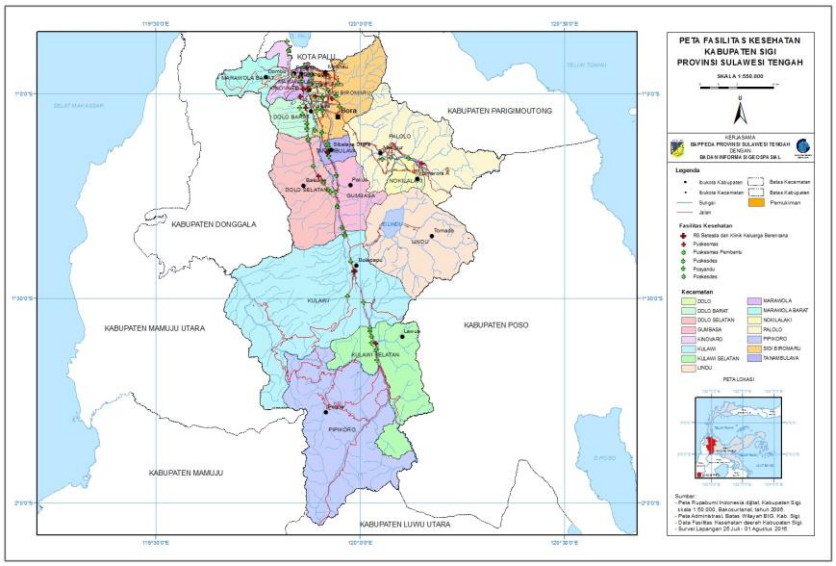

Figure.2 . Distribution of *Puskesmas*, auxiliary *Puskesmas*

To get closer to health services , the local government set up a auxiliary health center (*Puskesmas Pembantu)* 43 pieces and 81 pieces of health posts are spread evenly throughout the region (BPS , 2015) . Auxiliary health center and health post serves as a simple health care units that provide limited health services and help implement activities of health centers within the scope of the smaller area . Society is largely realized that health is very important and aware of the needs of a healthy life . The government hopes that the community no longer barriers less able to obtain medical care needed (Syah et al., 2014).

4. CONCLUSION

Sigi regency with mountainous geographical conditions have difficulties in implementing the health service . Spatially Figure.1 . and Figure.2 . provide information that health care in Sigi Regency can be grouped into 3 parts . The first part is health care that spatially illustrate the overlap in the buffer 3 km , which means that people's needs can be met with health facilities that position can serve each other , they are health centers in the Marawola district, Kinovaro district , Dolo district, West Dolo district and Sigi Biromaru district. The second part is based on the analysis of spatial and fulfillment ratio of the need for doctors to health services in Pipikoro district, Lindu district and Nokilalaki district, are not met . The third part is a Puskesmas spatially his position can not be reached easily by public and also ideal ratio unmet need for doctors, they are the Kulawi district , South Kulawi district, Palolo district, South Dolo district, Tanumbulava district, Gumbasa district, West Marawoloa district. Efforts to approach auxiliary health center and health post to the community is not substantially fulfilled the ideal ratio of doctors .

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