Spatial Distribution of Anemia Among Adolescents In Banda Aceh, Indonesia

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Abstract: Adolescents are an important assets to determine whether a country will be advance in the future. A good nutrient intake is needed to ensure their growth and development. Lack of nutrients will cause various health problems, one of them is anemia. Anemia is influenced by many factors, including spatial factors. The authors examine the relationship between anemia and variables that affect it. The relationship may be influenced by regional or spatial factors. Total data 602 of adolescents in nine sub-districts in Banda Aceh were analyzed using GeoDa software. The results of this study revealed that the number of cases of anemia in adolescents in Banda Aceh is no correlated with nutritional status, nutrient intake, breakfast habits, anemia knowledge, parental income, and the number of family covered, except in Kuta Alam and Lueng Bata Sub-districts. The numbers of cases of anemia in adolescents in Kuta Alam Sub-district are more correlated with nutritional status, nutrient intake, breakfast habits, anemia knowsledges, parent’s income, and numbers of family covered. The number of cases of anemia in adolescents in Lueng Bata Sub-district is more correlated with nutritional status, and the number of family covered. Thus, for nutrient intake, anemia knowledge and parental income, they are no correlated with the number of anemia cases.

Keywords: adolescent, anemia status, spatial, region

1. Introduction
Anemia is a condition where amount of oxygen-carrying red blood cells is insufficient to meet the physiological needs, which vary according to age, sex, smoking habits, and pregnancy status. Physiologically, anemia occurs when the levels of hemoglobin which carries oxygen to the body's tissues is reduced [1]. The normal hemoglobin level for women is higher than 12 gr/dl and more than 13 gr/dl for men. According to World Health Organization (WHO), global prevalence of anemia was 24.8%, which means that about 1.62 billion people in the world suffer from anemia. In India, nutritional status measured by anthropometry has a significant relationship to anemia[2]. Another survey in Indonesia showed that the prevalence of anemia in Indonesia is still high at 21.7% with 5-14 years old anemia sufferers was 26.4%, and 15-24 years old anemia sufferers was 18.4% [3]. Adolescents who do not like breakfast and eat less foods containing iron are among the factors that can increase the risk of anemia [4]. Although the number og anemia is high, but there has been no special attention to this case, information about anemia in adolescents has not been listed on Indonesian’s Health Profile.

Banda Aceh is the capital of Aceh province consists of nine subdistricts. In 2015, Banda Aceh’s population was 250.303 with adolescents’s proportion is 15.96% or 39.948 people [5]. Based on
adolescent nutrition survey in Banda Aceh 2017, 46.35% adolescents in Banda Aceh got anemia [6]. It is indicate that anemia is a problem needs to get attention from government.

In this paper, the authors examine the relationship between anemia and variables that affect it. The relationship may be influenced by regional or spatial factors.

2. Research Methodology
In spatial data analysis, it is possible that one region depends on another region. Meaning that observations in a region can be influenced by observations in other areas.

The sampling technique of this research is cluster random sampling, where primary school, junior high school and senior high school are used as clusters. List of all schools and the number of population for each cluster in each subdistrict obtained from Badan Pusat Statistik (BPS), then the cumulative frequency is calculated. For each cluster, 30 schools were selected using Probability Propotional to size (PPS) [6] The number of data in nine sub-district in Banda Aceh are 603 which 239 adolescents classified as anemia. Data were computerized using Epidata and analyzed with GeoDa software [7]. GeoDa software was created and developed by Dr. Luc Anselin which was originally only used at Spatial Analysis Laboratory (SAL), University of Illinois Urbana-Campaign in 2003 [8].

Figure 1 shows the distribution of adolescent anemia data in Banda Aceh. The number of cases of anemia in adolescents is most prevalent in Kuta Alam Sub-district, which is as many as 48 people. Sub-district with the second case of anemia is Baiturrahman Sub-district. While the fewest cases found in Lueng Bata Sub-district (12 people).

3. Result and Discussion
Anemia cases in adolescents is one of the nutritional problems in Banda Aceh which is not currently receive special attention. The pattern of anemia incidence is need to know so that the government can give priority in handling the case. By using Analysis of variance (ANOVA), we compared anemia status among the nine Sub-district in Banda Aceh. Here, the factor sub-district and the response variabel is anemia status.
Table 1 shows that P-value is less than 0.05, the test results statistically significant at 5% level. We conclude that the average of anemia status among nine sub-district in Banda Aceh are different.

| Table 1. ANOVA for Anemia status among nine sub-districts in Banda Aceh |
|------------------|-----------------|--------|-------|-------|
| Haemoglobin       | Sum of Squares  | df     | Mean Square | F     | Sig.   |
| Between Groups    | 31.965          | 8      | 3.996       | 2.746 | .006   |
| Within Groups     | 391.432         | 269    | 1.455       |       |        |
| Total             | 423.398         | 277    |             |       |        |

4. Thematic Map
The thematic map depicted using GeoDa Software, in this study, an illustration of the relationship of anemia with combination of two factors. Thematic maps are maps that show qualitative and quantitative information on an element that has to do with important topographic details [9]. Sub-district areas in each thematic map refer to Figure 2. The horizontal and vertical axis on the map shows the quantity of independent variables. While the number of occurrences of anemia is indicated by the color on the thematic map. If the colors on the map close to red, then the number of anemia events in certain districts will be more and more. If the color on the map is close to blue, then the number of occurrences of anemia is less.

Figure 2 shows the relationship between 1 nutritional status and nutrient intake on the number of cases of anemia in a region. The horizontal axis shows the number of adolescents with abnormal nutritional status. While the vertical axis shows the number of adolescents who consume foods that do not meet the minimum nutrient intake. Figure 2 (a) shows that the more teenagers who have abnormal nutritional status and the more teenagers who do not consume nutritious food, the fewer teenagers are anemia. Different pattern appear in the Kuta Alam and Lueng Bata Districts. In Kuta Alam, The conditions are number of adolescents with anemia, adolescents who have abnormal nutritional status, and the ones who do not eat nutritious foods are high. In Lueng Bata District, the number of adolescents with anemia is low, the number of adolescents with abnormal nutritional status are low and the number of adolescents who do not eat nutritious foods are high.

Figure 2 (b) shows the relationship between nutritional status and breakfast habits with anemia in adolescents. The horizontal axis shows the number of adolescents who have abnormal nutritional status, while the vertical axis shows the number of adolescents who breakfast less than 5 times a week. It appears that the more teenagers with abnormal nutritional status and the more teenagers who eat breakfast less than 5 times a week, then the fewer adolescents with anemia. But different things are seen in Kuta Alam and Lueng Bata Subdistricts. In Kuta Alam, number of adolescents with anemia are high, in line with adolescents who have abnormal nutritional status, and adolescents who take breakfast less than 5 times a week. In Lueng Bata, the number of adolescents with anemia is low, the number of adolescents with abnormal nutritional status is also low and those who eat breakfast less than 5 times a week are in the moderate category.

Figure 2 (c) shows the relationship of nutritional status variables and anemia knowledge variables with the number of cases of anemia. Nutritional status, which has the definition of the number of adolescents who have abnormal nutritional status, is indicated by the horizontal axis. While knowledge of anemia, which has the definition of the number of adolescents who have low knowledge about anemia, is shown by the vertical axis. Based on Figure 2 (c) it can be seen that the more teenagers who have abnormal nutritional status and the more teenagers who have low knowledge about anemia, the fewer cases of anemia. However, in Kuta Alam, number of adolescents with anemia are high, number of adolescents who have abnormal nutritional status and the number of adolescents with low knowledge of anemia is also high. In Lueng Bata, all categories are low. The number of adolescents who have
anemia, the number of adolescents who have abnormal nutritional status and those who have knowledge about anemia are low.

Figure 2(d) shows the relationship between nutritional status and parent's income on the number of cases of anemia. The horizontal axis shows the quantity of adolescents with abnormal nutritional status, whereas the vertical axis shows the quantity of adolescents with low-income parents. The more teenagers who have abnormal nutritional status they have low-income parents, the fewer cases of anemia. In contrast, Kuta Alam, the number of adolescents suffering from anemia is high with the number of adolescents who have abnormal nutritional status and the number of adolescents who have low income parents is also high. While in Lueng Bata, the number of adolescents who have anemia are low with the number of adolescents who have abnormal nutritional status are also low and the number of adolescents who have low-income parents are high.

Figure 2(e) shows the relationship between nutritional status and the numbers of family covered with the number of cases of anemia in adolescents. Horizontal axis shows the quantity of adolescents who have abnormal nutritional status. The vertical axis shows the quantity of adolescents who live with parents / carers, and covered more than 4 people. Based on Figure 2(e) it can be seen that the relationship pattern of nutritional status and the number of dependents on cases of anemia can not be determined. For example if the number of adolescents who have abnormal nutritional status is few and the number of adolescents who live with the parents that covered more than 4 people also few, the number of occurrences of anemia in some districts is high or low in others.
5. Conclusion
Based on the results, the conclusions of this study are as follows:

i. The number of cases of anemia in adolescents in Banda Aceh is no correlated with nutritional status, nutrient intake, breakfast habits, anemia knowledge, parental income, and the number of family covered, except in Kuta Alam and Lueng Bata. The number of cases of anemia in adolescents in Kecamatan Kuta Alam are more correlated with nutritional status, nutrient intake, breakfast habits, anemia knowledges, parent’s income, and numbers of family covered

ii. The number of cases of anemia in adolescents in Lueng Bata is more correlated with nutritional status, and the number of family covered. For nutrient intake, anemia knowledge and parental income, they are no correlated with the number anemia cases

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