

HIV CASES AND POPULATION DENSITY (WITH SPATIAL ANALYSIS APPROACH)

Krisologus Lase¹, Dertiana Sianturi², Wita Permata Sari Gulo³, Vierto Irennius Girsang⁴
^{1,2,3,4}Universitas Sari Mutiara Indonesia
Email: viertogirsang@gmail.com

ABSTRACT

The HIV epidemic has become a major health problem worldwide. Human Immunodeficiency Virus is an infectious disease whose number of sufferers continues to increase. Its spread extends from major cities to remote villages. The purpose of the study is to determine the relationship between the incidence of HIV cases and population density in North Sumatra province per city district with a spatial analysis approach. The study design used is an ecological study using aggregate analysis units. The data used is new HIV cases per district/city sourced from the BPS website of North Sumatra province in 2022. Population density data is taken from the BPS website of North Sumatra province in 2022, dividing the number of people per city district by the area of the area. The distribution of high-category HIV cases in North Sumatra is in 4 district/city, namely Simalungun, Asahan, Deli Serdang and Medan City, while the distribution of medium category HIV cases in district/city in 2022 is in 24 district/city and the HIV distribution category where there are no cases is 5 districts/cities. The distribution of population density in the dense category in North Sumatra province is found in 4 district/city while the distribution of population density in the rare category in North Sumatra province in 2022 is found in 25 district/city and 4 district/city with low population density. There is no relationship between population density and HIV cases in North Sumatra Province.

Keywords: *HIV, Density, Case, Spatial*

INTRODUCTION

The HIV/AIDS epidemic has become a major health problem worldwide. Human Immunodeficiency Virus (HIV) is an infectious disease whose number of sufferers continues to increase. Its spread extends from major cities to remote villages. Until now, the HIV pandemic continues to increase globally (Widiastuti & Arulita, 2022).

HIV is a virus that attacks the immune system by infecting white blood cells. AIDS is a set of symptoms that appear after HIV infection due to decreased immunity. When the immune system is weakened, sufferers are susceptible to various opportunistic infectious diseases that are often fatal.

HIV infection can be transmitted through oral, anal or vaginal sexual intercourse with an infected person, shared use of syringes, maternal transmission to the baby during

childbirth and possibly during breastfeeding, as well as organ transplants, transfusions or being infected with body fluids such as blood or blood products infected with HIV (YUSUF, 2016). Globally, Africa has the highest number of HIV cases, at 25.7 million people, followed by Southeast Asia with 3.8 million people, and America with 3.5 million people. Seeing the high number of people living with HIV/AIDS in Southeast Asia, Indonesia needs to increase its awareness of the spread and infection of HIV.

In Indonesia, HIV/AIDS cases are increasing every year. In 2019, HIV cases reached a peak with 50,282 people and an incidence rate of 8 people per 100,000 population. There are 12,214 cases of AIDS, the highest in the last eleven years, with an incidence rate of 5 people per 100,000 population.

In 2023, the achievement of HIV infection risk screening in Indonesia is only 76%, and in North Sumatra it is only 66% of the target of 85% based on the Minister of Health Regulation No. 13 of 2022 concerning the Ministry of Health's Strategic Plan for 2020-2024. Data on people with HIV suffering from opportunistic and comorbid infections, the percentage of marriage, employment status, and education of people with HIV were not included. Therefore, research is needed to reference HIV in Medan City. Epidemiological research based on people, places, and time in people with HIV is important to improve case discovery and targeted prevention and control programs (Zaini Miftach, 2018).

Medan City, as the third largest city in Indonesia, has the highest HIV cases in North Sumatra with 15,331 cases, followed by Deli Serdang with 2,607 cases in the October 2023 period. According to the Head of P3 of the North Sumatra Health Office, the high number of HIV cases in Medan City is caused by the large population and the high number of people who check themselves at health facilities. Haji Medan Hospital, as an HIV referral hospital and provider of free ARVs, is a representative of HIV in Medan City. At Haji Medan Hospital, HIV is included in the top 10 highest diseases in Outpatient Installations in 2023, ranking 8th. Meanwhile, in the Central Statistics Agency of North Sumatra in 2023, the number of new HIV cases is 2,008 cases, and there are 1200 cases in the city of Medan.

METHOD

This type of research is quantitative research using spatial analysis. The study design used is an ecological study design based on place or location. This study uses the aggregate unit of analysis, namely population, as the unit of analysis. So that research with this design uses secondary data obtained from related institutions. The unit of analysis used in this study is each district/city in North Sumatra province which totals 33 districts/cities seen for 1 year, namely in the year two thousand and twenty-two. This study uses total sampling where all patient data in the North Sumatra province will be spatially analyzed with the aim of finding and getting an overview of new HIV

cases in each district/city in North Sumatra province.

The data collection method is secondary data, namely population density data, and new HIV cases per district/city. The data collection method was taken from the BPS website of North Sumatra province in 2022. Data analysis techniques are carried out data examination, data entry, data cleaning and map making.

This spatial analysis is carried out using the overlay method, which is by combining two or more maps with a digital overlapping system to create a new map.

RESULT AND DISCUSSION

The number of new HIV cases in North Sumatra province in this study was taken based on data obtained from the BPS website of North Sumatra province in 2022. The distribution of the frequency of new HIV cases can be seen in the following table.

Table 1. HIV Distribution and Population Density by District/City in North Sumatra Province in 2022

No.	District/City	HIV Cases	Population Density
1.	Pakpak Bharat	1	0,45
2.	Tapanuli Selatan	26	0,51
3.	Samosir	6	0,67
4.	Padang Lawas Utara	7	0,68
5.	Padang Lawas	7	0,69
6.	Mandailing Natal	11	0,79
7.	Nias	22	0,81
8.	Tapanuli Utara	9	0,84
9.	Humbang Hasundutan	19	0,87
10.	Labuhan Batu Selatan	0	0,89
11.	Toba	56	0,91
12.	Labuhan Batu Utara	16	1,09
13.	Nias Utara	0	1,25
14.	Dairi	30	1,64
15.	Langkat	16	1,66
16.	Tapanuli Tengah	38	1,71
17.	Nias Barat	0	1,93
18.	Karo	20	1,95

19	Nias Selatan	0	2,05
20	Asahan	62	2,13
21	Simalungun	60	2,34
22	Labuhan Batu	0	2,36
23	Serdang Bedagai	28	3,52
23	Batu Bara	35	4,51
25	Gunung Sitoli	4	4,90
26	Deli Serdang	144	8,72
27	Tanjung Balai	38	16,67
28	Padang Sidempuan	3	20,15
29	Sibolga	49	21,88
30	Pematangsiantar	36	49,24
31	Binjai	21	50,69
32	Tebing Tinggi	44	57,35
33	Medan	1200	94,13

Based on the table above, it shows that the highest number of new HIV cases is in Medan City, which is 1,200 cases, and there are 5 districts/cities with no cases.

Population density data is obtained from the number of population per district/city divided by the area per district/city. Data on the number of population and area of districts/cities can be obtained from the website of the Central Statistics Agency (BPS) of North Sumatra Province.

Based on the table, it can be known that the most densely populated population density is in Medan City, which is 2,494,512 people, which is 94.13 people/km², while the lowest population density is in Pakpak Bharat, which is 54,609 people, which is 0.45 people/km².

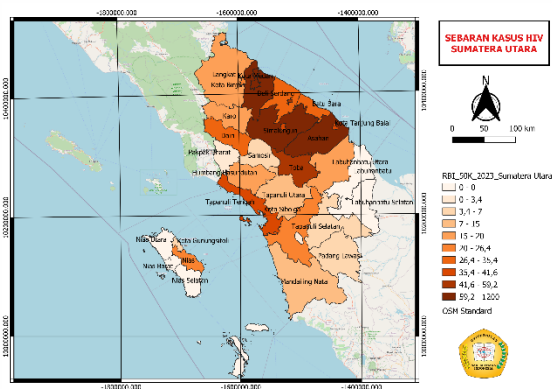


Figure 1. Distribution of new HIV cases by district/city in North Sumatra province in 2022

The figure shows that the districts/cities marked in dark orange are districts/cities that have a high prevalence of new HIV cases (≥ 59.2 -1200 cases) of the total number of detection targets. The districts/cities marked in white are districts/cities that do not have a prevalence of new HIV cases. The figure shows that there are 4 districts/cities in North Sumatra province with a high prevalence of new HIV cases. The figure also shows that there are 24 districts/cities in North Sumatra with a low prevalence of cases and 5 districts/cities with no new HIV cases.

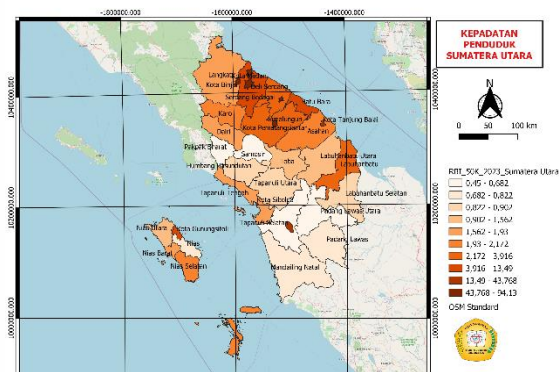


Figure 2. Distribution of population density by district/city in North Sumatra province in 2022

The figure shows that the dark orange district/city area is an area with a high population number, namely with a total population density of 43,768-94.13 in 4 districts/cities. The figure also shows that the white district/city area is an area with a low population, namely with a number of 0.45-0.682 in 5 district/city in North Sumatra province.

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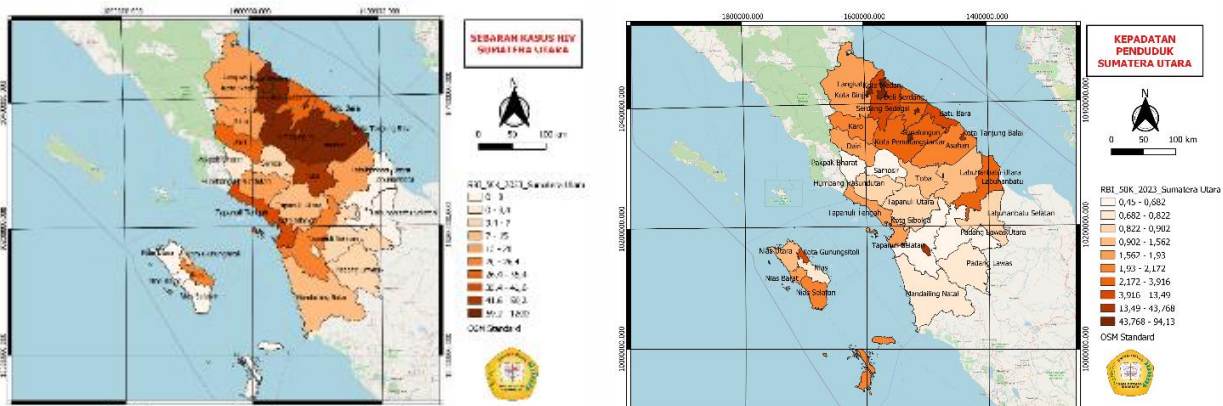


Figure 3. Comparison of the distribution of new HIV cases with population density by district/city in North Sumatra province in 2022

From the image of the map of the distribution of new HIV cases by district/city and the population density distribution map in 2022 above, it can be concluded that the district/city with the largest number of new HIV cases in North Sumatra province is dominated by the district/city with the highest population density, namely the city of Medan with a total of 1200 cases. The results of the spatial analysis showed that there was a relationship between population density and new HIV numbers.

The highest number of new HIV cases is found in areas with high population density. Population density factors affect the process of transmission or transfer of diseases from one person to another. Medan City is one of the areas with the most HIV cases every year the cases are always high. Medan City is an area with a high population density. This situation supports the increase in new HIV cases.

However, based on data on new HIV cases throughout 2022, it can also be known that there are several districts/cities with high populations but rarely have HIV cases, such as in the city of Gunung Titoli, which has a population density of 4.90 where the number of cases is only 4, so it

can prove that the high number of new HIV cases is not always in areas with dense population density. The results of this study show that high HIV cases occur and develop not only in areas with high population density, but also low population density. This condition can be interpreted that spatially, the distribution of the population has no effect on the distribution of HIV cases in North Sumatra.

In addition, according to researchers' assumptions, population density factors do not play an important role in the increase in HIV cases in North Sumatra Province in 2022. however, there are several other factors that may be the trigger factor for the high number of HIV cases. Some of the triggering factors for high HIV cases are promiscuous sex behavior without using contraceptives, the use of non-sterile syringes, blood transfusions and lack of knowledge about HIV transmission.

Behavioral factors also allow for an increase in HIV cases even in sparsely populated areas. The behavioral factors referred to by the researcher are related to the lack of knowledge about HIV transmission, this is evidenced by data in South Tapanuli Regency with a population

density of 0.51 and the number of cases as many as 26.

Based on the results of this study, it shows that population density based on the administrative area in each district/city in North Sumatra province cannot be used as an indicator of the high incidence of HIV in the area.

CONCLUSION

The conclusion in this study is that the distribution of high-category HIV cases in North Sumatra is in 4 districts/cities, namely Simalungun, Asahan, Deli Serdang and Medan City, while the distribution of HIV cases in the medium category in districts/cities in 2022 is in 24 districts/cities and the HIV distribution category where there are no cases is 5 districts/cities. The distribution of dense population density in North Sumatra province is found in 4 districts/cities while the distribution of population density in the sparse category in North Sumatra province in 2022 is found in 25 districts/cities and 4 districts/cities with low population density. There is no relationship between population density and HIV cases in North Sumatra Province. HIV case data is taken from the 2022 BPS website which is accessed from the 2023 BPS website and population density data is calculated by dividing the number of people per district/city divided by the area per district/city. The number of population and area use 2022 data accessed from the BPS website.

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