

ISSN 2597- 6052DOI: <https://doi.org/10.56338/mppki.v7i6.5317>**MPPKI****Media Publikasi Promosi Kesehatan Indonesia**
*The Indonesian Journal of Health Promotion***Research Articles****Open Access****Moran's Index Spatial Analysis On The New Case Detection Rate of Leprosy in West Java 2022**Meuthia Jasmine^{1*}, Arief Wibowo²^{1,2}Division of Biostatistics and Population, Faculty of Public Health, Airlangga University, Kampus C Mulyorejo, Jawa Timur – 60115*Corresponding Author : meuthia.jasmine-2020@fkm.unair.ac.id**Abstract**

Introduction: Leprosy is a chronic infectious disease, neglected tropical disease caused by *Mycobacterium leprae*. Leprosy is divided into two types based on the number of lesions on the skin. If there are less than 5 lesions, leprosy is classified as paucibacillary (PB) and if there are more than 5 lesions, leprosy is classified as multibacillary (MB). Indonesia is ranked third in the world after Brazil with 762 new cases of grade 2 disability leprosy by 2022. Therefore, spatial analysis of the new case detection rate of leprosy in West Java 2022 is needed.

Objective: To determine whether there are spatial dependency with the new case detection rate of leprosy in West Java 2022

Method: Quantitative research that utilises secondary data by conducting spatial analysis on the new case detection rate of leprosy in West Java 2022 using Moran's Index and LISA tests.

Result: There are 5 areas namely Bekasi, Karawang, Subang, Indramayu, and Cirebon that have not yet reached the national target in eliminating leprosy. The value of Moran's $I = 0.241$ and $p\text{-value } 0.0090 < \alpha (0.05)$ which means that there is a weak positive spatial dependence on the number of new leprosy cases in West Java Province 2022. There is 1 region that is in the high-high quadrant, namely Cirebon and there are 4 regions in the low-low quadrant, namely Cimahi City, Bandung City, Garut, and Tasikmalaya.

Conclusion: A small number of areas in West Java Province still have not reached the national target of eliminating leprosy, which is a CDR of <5 per 100.000 population, namely Bekasi, Karawang, Subang, Indramayu, and Cirebon. There are 5 areas that have spatial linkages in the new case detection rate of leprosy in West Java Province in 2022 based on the significance value. The region in the high-high quadrant is Cirebon and there are 4 regions in the low-low quadrant, namely Cimahi City, Bandung City, Garut District, and Tasikmalaya District.

Keywords: Leprosy; Moran's Index; Spatial Dependency

INTRODUCTION

Leprosy is a chronic infectious disease, neglected tropical disease which caused by *Mycobacterium leprae*. The *Mycobacterium leprae* bacteria that cause leprosy can affect various tissues of the human body such as peripheral nerves, mucosa, skin, respiratory tract, and eyes (1). Leprosy is divided into two types based on the number of lesions on the skin. If there are less than 5 lesions, leprosy is classified as *paucibacillary leprosy* (PB) and if there are more than 5 lesions, leprosy is classified as *multibacillary leprosy* (MB) (2). Leprosy is commonly found in developing countries, which generally have limitations in providing health services, a less clean environment, inadequate facilities for education, and high inequality in welfare and economy. In 2019, 79% of the world's new leprosy cases were found in India, Brazil and Indonesia (3). Indonesia is ranked third in the world after India and Brazil with 762 new cases of grade 2 disability leprosy in 2022 (4). Leprosy in Indonesia has increased every year since 2020. In 2020, the new leprosy case finding rate was 4.12 per 100,000 population and increased in 2022 to 4.42 per 100,000 population (5,6). The leprosy case finding rate in West Java Province has also increased where in 2020 the leprosy case finding rate was 1.37 per 100,000 population and increased in 2022 to 3.43 per 100,000 population, the prevalence of leprosy also increased by 0.09% in 2022 (1).

West Java Province is an area of 37,040.04 sq.km (7). As much as 1.96% of Indonesia's territory is covered by West Java Province. Large administrative areas can affect the occurrence of spatial dependence on public health problems. Detecting spatial dependency can be done using *Moran's Index* test, *Geary's C test*, and *Tango's Excess*. However, detecting spatial dependency using *Moran's Index* is more commonly used in research. *Moran's Index* testing has several advantages which are being able to provide information in a visual form so that readers who are unfamiliar with *Moran's Index* can read the results more easily, a more sensitive method in detecting spatial dependencies, and can provide information about *clustering*. Previous research conducted by Wahyuni and Makful (2024) using the *Moran's Index* test stated that there was a spatial relationship in the incidence of pneumonia in West Sumatra Province (8). In another previous study conducted by Kira *et al.* (2021) also stated that the *Moran's Index* test can detect spatial dependencies in the incidence of leptospirosis in Sawarak, Malaysia (9). As well as in research conducted by Budiarti *et al.* (2022) stated that there is a spatial dependence on the incidence of leprosy in East Java Province using the *Moran's Index* test (10).

This study uses spatial data to detect spatial dependence on the new case detection rate of leprosy in West Java Province, which is still limited in research. Thus, this study aims to determine whether there is spatial dependency in the new case detection rate of leprosy in West Java Province in 2022 and is expected to provide a better understanding of the geographical distribution on the new case detection rate of leprosy in West Java Province which can provide strategic efforts in achieving the target towards zero leprosy in Indonesia and globally.

METHOD

This research is a quantitative study utilising secondary data. The data used is the new case detection rate of leprosy in West Java Province 2022 published by the Central Bureau of Statistics of West Java Province in *Jawa Barat Dalam Angka Tahun 2023*. Unit of analysis used in the study is city and districts included in the administrative area of West Java Province. There are 27 city and districts in West Java Province consisting of 18 districts and 9 cities.

The research was conducted by conducting descriptive analysis and inferential analysis using GeoDa software. Research was conducted using the *Moran's Index* method or here in after referred to as *Moran's I* and LISA (*Local Indicators of Spatial Autocorrelation*) to determine the presence of spatial dependence on the new case detection rate of leprosy in West Java Province in 2022. A data can be assumed to have spatial dependence when the value of $I \neq 0$ which for the range of *Moran's I* values is -1 to 1, if the *Moran's I* value < 0 then the spatial correlation is negative while when the *Moran's I* value > 0 then the spatial correlation value is positive, the aggregation is higher the value of I is closer to 1 (11). This study uses queen contiguity as a spatial weight. Queen contiguity as a spatial weight is to increase the accuracy of the research (12). Queen contiguity uses the concept that every corner and side is a neighbour like chess, in contrast to other spatial weights such as Rook contiguity which uses the concept of neighbourhood area only on each side while Bishop contiguity uses the concept of neighbourhood only on each corner area (13).

RESULTS

Descriptive Analysis

The mapping in Figure 1. was done using the national target cutoff in 2022 of a case detection rate (CDR) of < 5 per 100,000 population.

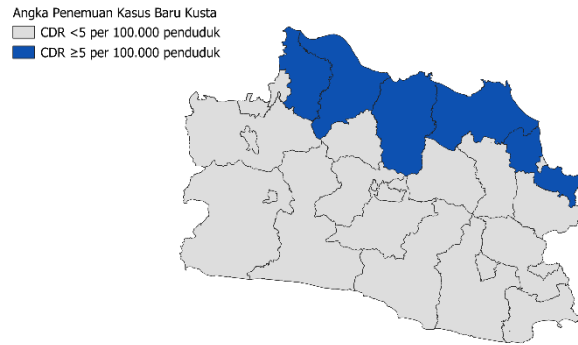


Figure 1. Distribution of New Case Detection Rate of Leprosy in West Java Province 2022

Figure 1 shows that there are two categories to describe the new leprosy case finding rate in West Java Province in 2022. Light colours on the map indicate areas that have met the national target with CDR <5 per 100,000 population and dark colours on the map indicate areas that have not met the national target with CDR ≥5 per 100,000 population. There are 5 areas that have not met the national target, namely Bekasi District, Karawang District, Subang District, Indramayu District, and Cirebon District. Indramayu District has the highest new leprosy case finding rate at 21.47 per 100,000 population. The other 22 districts have met the national target.

Moran’s Index Analysis

The use of spatial data in research cannot eliminate spatial dependencies assumptions. Detecting spatial dependency can be done by looking at the *Moran's I* value. *Moran's I* test using scatter plot is presented in Figure 2.

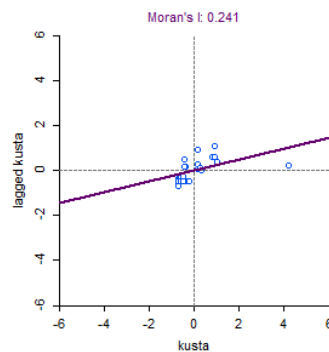


Figure 2. Global Moran's Index Scatter Plot of The New Case Detection Rate of Leprosy in West Java Province 2022

Based on the Moran's I test that has been carried out in Figure 2. it can be seen that the points have a grouped distribution or a cluster is formed. By looking at the value of statistical analysis, the *Moran's I* value is $0.241 > E[I] = -0.0385$ and the probability value is $0.0090 < \alpha (0.05)$ so that it can be said that there is a weak positive spatial dependence on the number of new case detection rate of leprosy in West Java Province in 2022.

LISA Significance Map Analysis

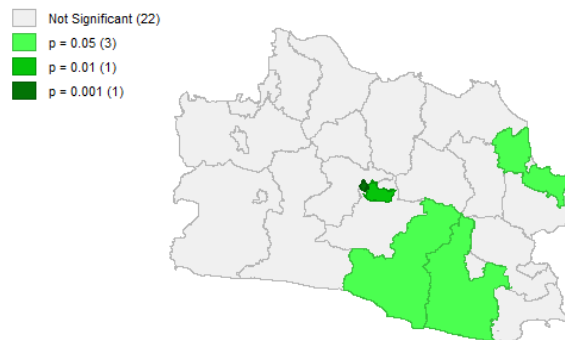


Figure 3. LISA Significance Map of New Detection Rate of Leprosy in West Java Province 2022

Figure 3. explains that there are 5 regions that have significant values. There are 3 regions that have a significance value <0.05, 1 region that has a significance value <0.01, and there is 1 region that has a significance value <0.001. Meanwhile, 22 other regions are not significant.

LISA Cluster Map Analysis

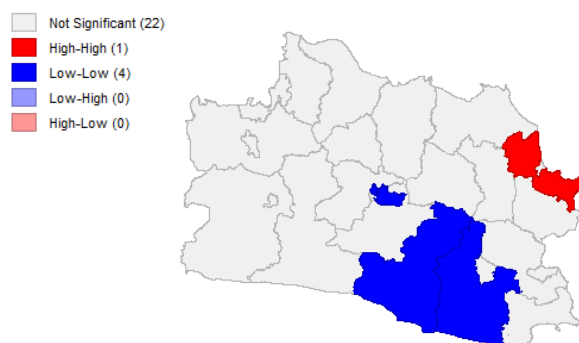


Figure 4. LISA Cluster Map of New Case Detection Rate of Leprosy in West Java 2022

LISA cluster map analysis in Figure 4. shows 1 region that is in the high-high quadrant which has a red colour on the map, namely Cirebon District. Areas that are in the high-high quadrant are areas that have high observation values and the surrounding areas have high observation values. Figure 4. can also show that there are 4 areas that are in the low-low quadrant where on the map is coloured blue. The areas in the low-low quadrant are Cimahi City, Bandung City, Garut District, and Tasikmalaya District. Areas in the low-low quadrant are areas that have low observation values and the surrounding areas have low observation values. While the other 22 regions are not significant.

DISCUSSION

In the study, it was found that there was a spatial dependence on the new case detection rate of leprosy in West Java Province using the Moran's Index test. The research is in line with a research that was conducted by Sabil and Sastri (2020) which states that there is a moderate positive spatial dependence on the prevalence of leprosy in South Sulawesi with a Moran's I value of 0.406 (14). The research is also in line with a research that was conducted by Bueno et al. (2023) obtained a Moran's I value of 0.523 and a p-value of 0.001 which states that there is a strong positive spatial dependence on susceptibility to leprosy in Minas Gerais from 2004 to 2011(15).

The results of LISA cluster map shows that there is one area, Cirebon District, that is included in the high-high quadrant and there are four areas that are included in the low-low quadrant, namely Cimahi City, Bandung City, Garut District, and Tasikmalaya District. Cirebon District has a high new case detection rate of leprosy and is also surrounded by areas that have a high new case detection rate of leprosy. Meanwhile, Cimahi City, Bandung City, Garut District, and Tasikmalaya District, which are included in the low-low quadrant have low new case detection rate of leprosy and are surrounded by areas that have low new case detection rate of leprosy. Given that leprosy can be spread through droplets, these five regions need to be more aware and cautious of an increase in the new case detection rate of leprosy. However, it is important to remember that leprosy transmission will only occur if a person has prolonged close contact with an untreated leper.

In a study conducted by Putri and Febriyanty (2021) stated that a person >43 years of age and personal hygiene were associated with the incidence of leprosy in the Kebon Jeruk Primary Health Center Working Area in 2019 (16). Research conducted by Pescarini et al. (2018) stated in their research that men, manual labourers, experiencing food shortages in the past, being in the same house as leprosy sufferers, and living in dense households (≥ 5 people per household) have a higher risk of developing leprosy in countries with a high morbidity burden (17).

CONCLUSION

This study concluded that only a small number of areas in West Java Province have not reached the national target of eliminating leprosy which is CDR of <5 per 100,000 population, namely Bekasi District, Karawang District, Subang District, Indramayu District, and Cirebon District. There are 5 areas that have spatial linkages on the new case detection rate of leprosy in West Java Province 2022 based on significance values. The region in the high-high quadrant is Cirebon District and there are 4 regions in the low-low quadrant, namely Cimahi City, Bandung City, Garut District, and Tasikmalaya District.

SUGGESTION

This study recommends that the provincial government as well as districts and municipalities in West Java Province pay attention to regional aspects in the preparation of programmes to prevent and reduce the new case detection rate of leprosy in West Java. The government can also pay more attention to areas in the high-high quadrant and also to areas in the low-low quadrant.

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