Journal of Public Health for Tropical and Coastal Region (JPHTCR)
Journal homepage: https:/ejournal2.undip.ac.id/index.php/jphtr/index
ISSN: 2597- 4378

Affordability Assessment of Community Health Centre Services in Klaten Regency

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Abstract
Introduction: The existence and affordability of community health centers play a crucial role in supporting the achievement of health development goals. Klaten Regency as one of the regions in Central Java Province has various geographical characteristics and population densities, which resulted in inequality in access to health. This study aimed to assess the affordability of community health center distribution in the Klaten Regency by 2025.
Methods: This study was conducted descriptively. Secondary data were obtained from the Klaten Regency Health Profile 2023 for distribution by sub-district and Google Earth for geographic coordinates. Spatial analysis was conducted using Nearest Neighbor Analysis (NNA) to determine distribution patterns, and buffer analysis to assess service coverage.
Results: The NNA produced a T-ratio of 1.54, indicating a dispersed distribution of community health centers. Buffer analysis with a 3,000-meter service radius showed that many residential areas remain outside the reach of existing facilities.
Conclusion: The Klaten Regency Government should prioritize accessibility to health services through strategic mapping of health workers and facilities, providing incentives for staff in underserved areas, and optimizing health technology to improve service coverage.

Keywords: affordability, buffering analysis, community health center, nearest-neighbor analysis.

DOI: https://doi.org/10.14710/jphtcr.v8i2.27504

Article History: Received: 02th June 2025, revised: 14th August 2025 accepted: 15th August 2025

Introduction

Health is a fundamental right of every citizen guaranteed by the Constitution, as stated in Article 28H paragraph (1) and Article 34 paragraph (3) of the 1945 Constitution, which states that the state is obliged to provide adequate health care facilities to achieve the physical and spiritual well-being of the community.[1,2] According to Government Regulation No. 28 of 2024, health facilities are defined as places or equipment used to provide health services, including promotion, prevention, cure, rehabilitation, and/or palliation, that can be offered by the government or community.[3] Community health centers, auxiliary community health centers, and village community health centers are frontlines of health services. To provide these services, it is necessary to consider the aspects of service, population, territory, and accessibility.[4] Accessibility of health facilities is an indicator of the equality of services and improvement in the health of the community. The community has the

right to access health facilities in terms of distance, travel time, and affordability. [5,6]

The Community Health Center is the primary healthcare in Indonesia [7]. As first-level healthcare facilities, the existence and affordability of community health centers play a crucial role in supporting the achievement of public health development goals, especially in rural and urban areas .[8,9] However, the fact shows that the distribution of community health centers remains unequal, resulting in disparities in access to health services across various regions.[10] The equitable distribution of Community Health Centers in accordance with the needs and spatial characteristics of the region is an important factor in ensuring the accessibility of health services at all levels of society.[11] In addition to improving the accessibility of health services, an equitable distribution of community health centers can significantly reduce morbidity and mortality rates, support national health programs, and reduce the burden on referral health facilities. Several previous studies have explained that the development of community health centers is generally based on the population, service level, and current and future needs. Locating community health centers closer to settlements can reduce the risk of infant mortality, the elderly, death from chronic diseases, and emergency patients.[12] Several variables affect the accessibility of health facilities, one of which is the location of the main facility (health) and urban challenges. One of the urban challenge variables is traffic density. Traffic density is a problem that often occurs in urban areas. [13]

Klaten Regency as one of the regions in Central Java Province has varied geographical characteristics and population density. These conditions require accurate planning for the placement of health facilities, so that services can be accessed fairly and equitably. There are 34 community health centers in the Klaten Regency, consisting of 15 inpatient community health centers and 19 non-inpatient community health centers, spread across 26 sub-districts. Each sub-district in the Klaten Regency generally has at least one community health center. However, the numbers and capacities of these services vary. For example, community health centers in urban areas such as Central Klaten and North Klaten tend to have more complete facilities compared to community health centers in rural areas.[14,15] However, spatial studies on the distribution patterns and affordability of public health centers in this area are limited. This can lead to the lack of a more objective and comprehensive picture of the gaps or inequalities in the distribution of health services. Through its health agency, the Klaten Regency Government has implemented a public service innovation for the emergency sector called the Matur Dokter Application; however, the program has not worked as expected. This is partly due to the limited information available to the public regarding access to health facilities. [16]

One spatial analysis method that is relevant for assessing the distribution pattern of public health centers is Nearest Neighbor Analysis (NNA). This method enables researchers to determine whether the distribution pattern of an object in space is randomly scattered, evenly distributed or clustered.[17,18] The analysis works by measuring the distance between each point and its nearest neighbor and comparing this distance to the expected value based on a random distribution model.[19,20] In other words, this analysis describes a community health center point based on its distance from community health centers within a certain boundary. By employing NNA, this study aimed to identify the spatial distribution pattern of public health centers in the Klaten Regency, assess the level of affordability of the population to public health center facilities based on the spatial distance between facility points and residential areas, and identify potential spatial inequalities and disparities in the distribution of public health centers that can be the basis for future health facility planning considerations. In addition to using NNA, this study also used buffer analysis to determine a zone with a certain radius around a health facility to determine its service coverage.[21,22] In other words, buffer analysis addresses the problem of people who cannot reach a health facility

based on their closest distance from the health facility. The results of this study are expected to provide empirical insights for policymakers, especially the local government and Klaten District Health Office, in evaluating and planning the development of health facilities that are more equitable, fair, and based on spatial evidence.

Methods

This study employed descriptive research methods using a quantitative approach. These methods and approaches were used to identify the level of affordability of the distribution of community health centers in the Klaten Regency. The research units used in this study were all 34 community health centers in Klaten Regency, obtained from the Klaten Regency Health Profile 2023. The locations of the public health centers in this study are listed in Table 1.

The types of data used are spatial data, namely the coordinates of public health centers in Klaten Regency, which are obtained from Google Earth, the location of settlement distribution, and the administrative boundaries of Klaten Regency obtained from Ina-Geoportal. The research procedure is shown in the following figure:

Results

Klaten Regency is located between 110°30‘-110°45’ E and 7°30‘-7°45’ S, as shown in Figure 1. The area of the Klaten Regency reaches 655.56 km². Klaten Regency is one of the regencies in Central Java Province which is located between two major cities, namely the City of Yogyakarta to the west and the City of Surakarta (Solo) to the east. Administratively, in 2024, the Klaten Regency consists of 26 sub-districts, 391 villages, and 10 urban villages. It has an area of approximately 665.56 km² and directly bordering Sleman Regency (DIY) to the west, Boyolali Regency to the north and northeast, and Sukoharjo Regency to the southeast. Klaten's strategic geographical position makes it an important link between the two centers of economic and cultural activities in Java.[15]

In terms of demographics, Klaten in 2023 has a population of approximately 1.2 million people, with a relatively high population density in the central and southern regions, especially around the center of the Regency government in the Central Klaten Regency. This makes the Klaten Regency heterogeneous and reflects a mix of urban and rural areas. Most of Klaten's population lives in rural areas, with main activities in the agricultural sector, especially rice, secondary crops, and horticulture.

Based on the results of the calculations using Nearest Neighbor Analysis in Figure 2, it is observed that the distribution of public health centers in the Klaten Regency has a dispersed pattern. This is evidenced by the t ratio value of 1.54 with an expected mean distance of 2054.44 metres and a Z-Score value of 5.98. According to Rossbacher (1986), the t-ratio ranges from to 0-2.1. The t-ratio categories were as follows (23).

I : T-value of 0–0.7, indicating a cluster pattern.

II : T-value of 0.8 - 1.4, indicating a random or unevenly distributed pattern (Random Pattern).

III : T value of 1.5 - 2.15 indicates a uniform or evenly dispersed pattern (uniform/dispersed pattern).

To optimize the services of community health centers, a standard was developed based on SNI No. 03–1772–2004, which states that health facilities in the form of community health centers have a radius of 3,000 m. This standard serves as a benchmark to ensure the availability of adequate health services within an affordable distance of the population. The affordability of community health centers in the Klaten Regency can be determined using buffer analysis. Buffer analysis is a spatial analysis that can be used to determine the reachability zone or expansion of an object within a certain area. The result of the buffer analysis is the extent of the coverage zone of the public health center to the settlement. Based on Figure 3, there are still many settlements that are far from the radius of public health center services, including the sub-districts

of Kemalang, Manisrenggo, Bayat, Wedi, Karangnongko, and Juwiring. This should be a concern for relevant agencies to expand the distribution of public health centers and health workers in areas with many settlements.

Table 1. Distributions of Public Health Centers in Klaten Regency

No	Community Health Center	Sub-District	No	Community Health Center	Sub-District
1	Prambanan	Prambanan	18	Jambukulon	Ceper
2	Kebondalem Lor	Prambanan	19	Pedan	Pedan
3	Gantiwarno	Gantiwarno	20	Karangdowo	Karangdowo
4	Wedi	Wedi	21	Juwiring	Juwiring
5	Bayat	Bayat	22	Wonosari I	Wonosari
6	Cawas I	Cawas	23	Wonosari II	Wonosari
7	Cawas II	Cawas	24	Delanggu	Delanggu
8	Trucuk I	Trucuk	25	Polanharjo	Polanharjo
9	Trucuk II	Trucuk	26	Karanganom	Karanganom
10	Kalikotes	Kalikotes	27	Majegan	Tulung
11	Kebonarum	Kebonarum	28	Tulung	Tulung
12	Jogonalan I	Jogonalan	29	Jatinom	Jatinom
13	Jogonalan II	Jogonalan	30	Kayumas	Jatinom
14	Manisrenggo	Manisrenggo	31	Kemalang	Kemalang
15	Karangongko	Karangnongko	32	Klaten Selatan	Klaten Selatan
16	Ngawen	Ngawen	33	Klaten Tengah	Klaten Tengah
17	Ceper	Ceper	34	Klaten Utara	Klaten Utara

Source: Klaten Regency Health Profile 2023

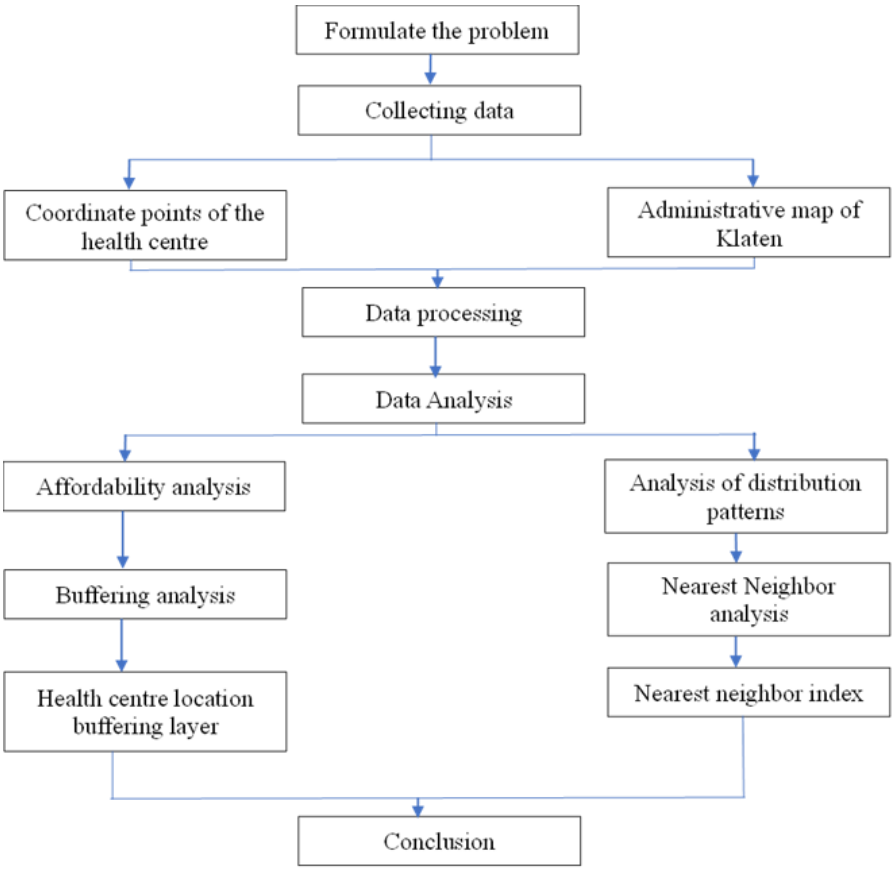


Figure 1. Flowchart of Analysis Stages

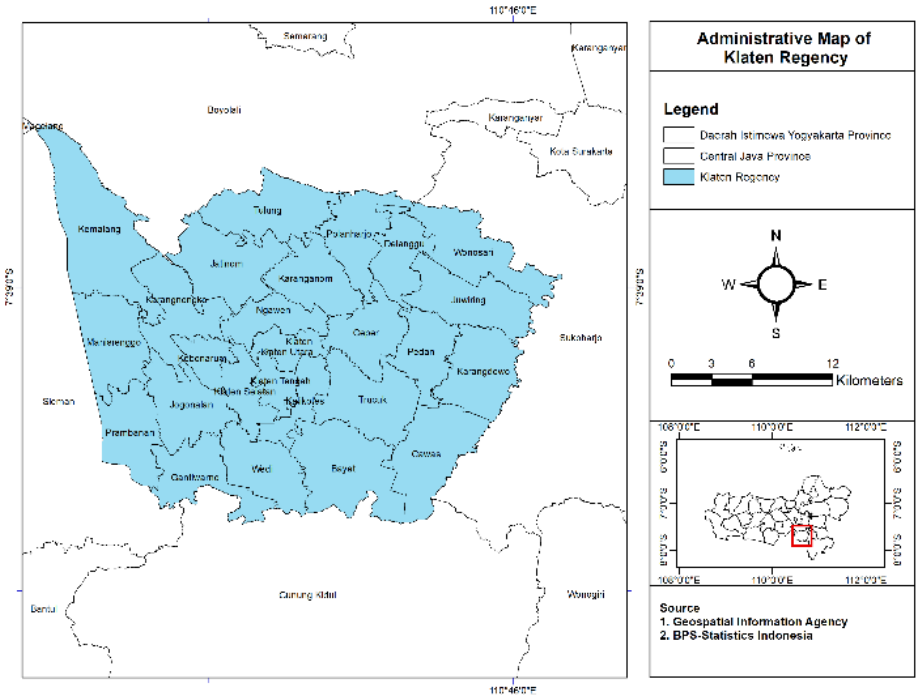


Figure 2. Administrative Map of Klaten Regency

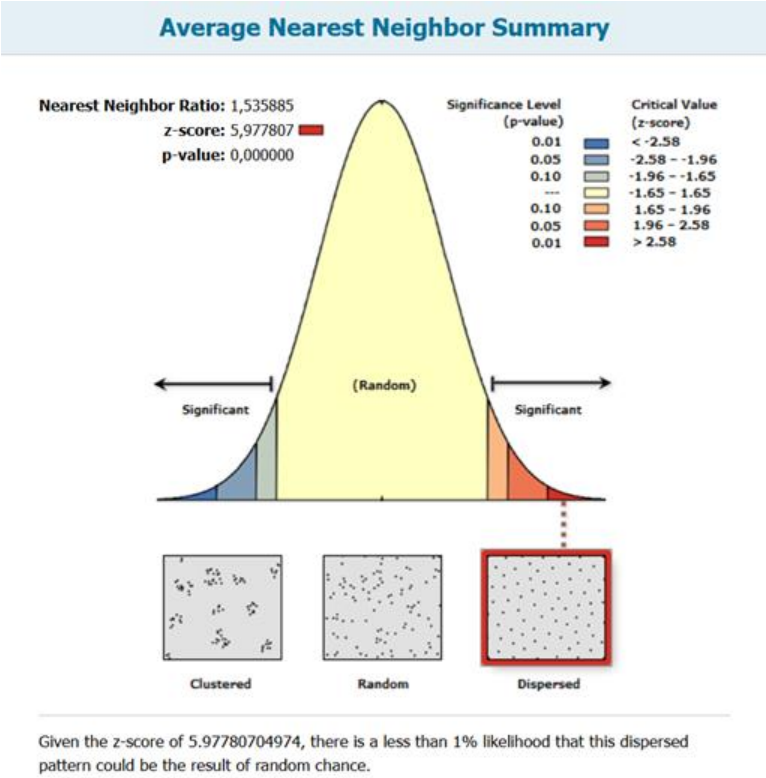


Figure 3. Results of Calculations Using Nearest Neighbor Analysis

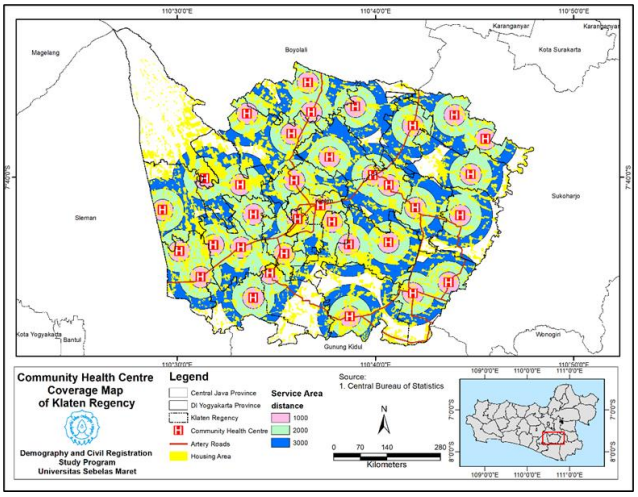


Figure 4. Map of Service Radius of Public Health Centers in Klaten Regency

Discussion

Improving health status begins with the seriousness of citizens and local governments regarding public health programs. One indicator of the successful development of the quality of human life is the achievement of an adequate level of public health. To support this goal, it is necessary to support the availability of adequate facilities and infrastructure, as well as affordable health costs for all levels of society, so that the community receives the benefits evenly and on target. [24,25]

The Klaten Regency Government has made efforts to improve and enhance health facilities and infrastructure by providing access to qualified, easy, and affordable health services closer to all groups of society, including mobile community health centers, assignment of doctors/midwives in all villages/sub-districts, ownership of health insurance for the community, improvement of family nutrition, improvement of maternal and child nutritional health, immunization, and provision of safe water facilities. The number of community health centers in Klaten Regency until December 2023 was 34, consisting of 15 inpatient community health centers and 19 non-inpatient community health centers. The number of Inpatient and Non-Inpatient community health centers in the Klaten Regency has not changed in the last five years (2019-2023) has not changed. [14]

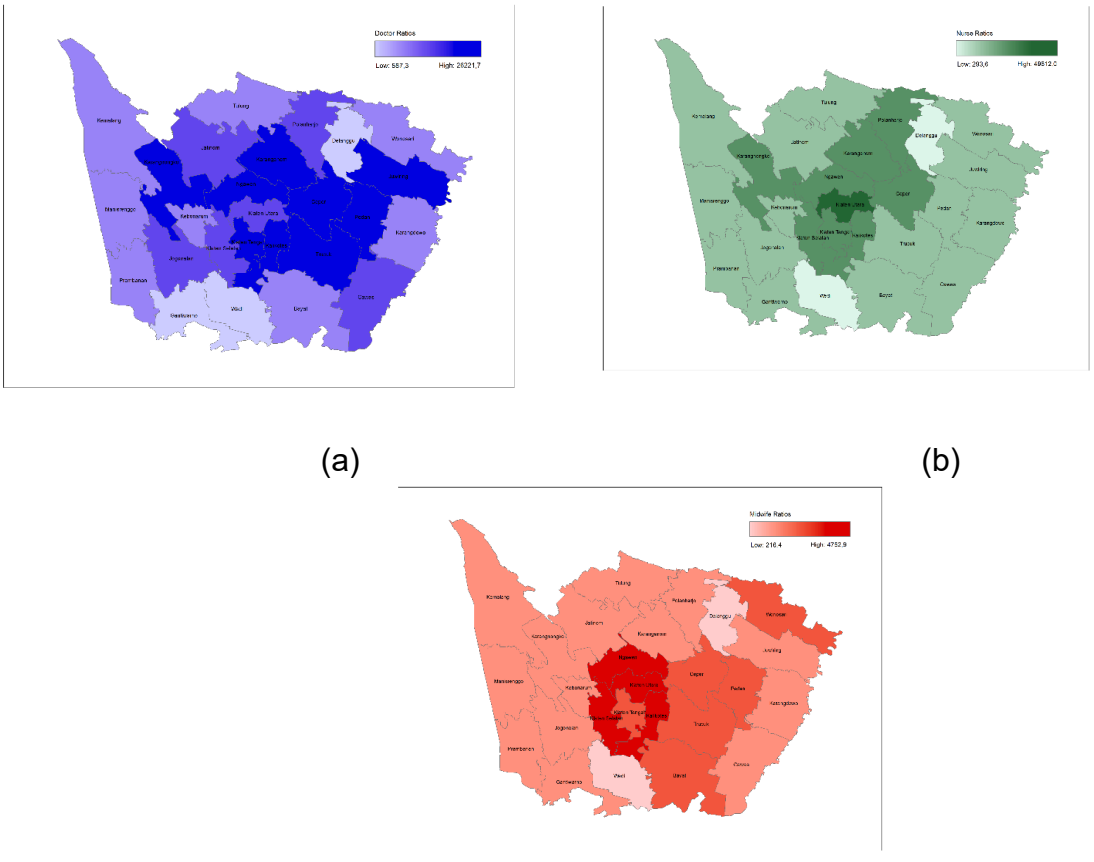
The fulfilment of primary healthcare needs can generally be seen from the ratio of community health centers to sub-districts. The ratio of community health centers to sub-districts in the Klaten Regency was 1.30. This illustrates that the ideal ratio of community health centers to sub-districts, which is a minimum of one community health center in one sub-district in the Klaten Regency, has been achieved. This indicates the seriousness of the Klaten Regency in providing equity in access to basic health services and reducing disparities in access between regions, which can result in gaps in health facilities. Community health centers also act as gatekeepers in the health system, enabling early disease detection. Hence, if there are insufficient community health centers, longer travel distances and waiting times can reduce the quality of health care. [26] In addition to the ratio of community health centers to sub-districts, another problem that arises in efforts to improve the services of community health center facilities is the ratio of health workers. According to the Regulation of the Minister of Law and Human Rights of the Republic of Indonesia No. 22 of 2021, on Criteria for Districts/Cities that Care for Human Rights, the ratios of doctors, nurses, and midwives to the population are 1:2200, 1:560, and 1:850, respectively. This means that one doctor in a sub-district serves 2200 residents in that subdistrict. Based on the figure, it was found that almost all sub-districts in the Klaten Regency do not have an ideal ratio of health workers to residents. An insufficient ratio of healthcare workers to residents has several impacts, including a decline in the quality of healthcare

services owing to the small number of healthcare workers affecting the quality of residents' examinations by healthcare workers because of the large number of residents queuing to be examined.

In addition, the large number of residents who must be examined continuously by health workers causes fatigue in health workers. Fatigue can reduce concentration and increase the risk of medical errors. In addition, the shortage of health workers in primary health facilities causes many minor cases to be referred directly to hospitals, thereby increasing examination costs, burdening referral facilities, and reducing the efficiency of the health system. [27] The only sub-district with an ideal ratio of health workers to population is Delanggu, whereas Wedi has only a midwife-to-population ratio.

Several steps that could be taken by Klaten Regency to improve the achievement of the ratio of health workers include mapping the numbers and distribution of health workers throughout Klaten Regency, providing additional incentives for health workers in low-accessibility areas, accelerating the fulfilment of the ratio of health workers by utilizing cooperation with universities and health polytechnics, and optimizing technology through telehealth and telemedicine programs to reach areas lacking medical personnel.

Not only the government but also the private sector and non-governmental organizations (NGOs) are needed to help provide resources and build a better health facility system. Policies must be data-driven so that concrete steps can be taken to address this issue more effectively. By improving the quality of health services, it is hoped that easy access to health services in an area can be fulfilled systematically and comprehensively, so that the health status of Indonesian people can be as high as possible.



(a) (b)

(c)

Figure 5. Ratio of Doctors to Residents (a), Ratio of Nurses to Residents (b), Ratio of Midwife to Residents (c)

Conclusion

Community health centers are health institutions coordinated by the health department, which plays an important role in providing medical services to the community at the local level. According to the results of this study, it was found that the distribution pattern of community health centers in Klaten Regency is spread with a T-ratio value of 1,54. According to SNI No. 03–1772–2004, which states that health facilities in the form of community health centers are within an outreach radius of 3,000 m, many housing areas in Klaten Regency are still far from the service radius of community health centers. This should be a serious concern for relevant agencies in increasing the affordability of the radius of community health center services, especially in areas far from access to community health centers. The use of the NNA method and buffer analysis in this study is still limited to the closest distance and assumes that all areas within a certain radius have the same access. In addition, the NNA method and buffer analysis do not consider the service capacity and time taken by the community to reach existing community health centers. Future research should integrate service capacity and travel time in the analysis of the affordability of public health centers and the use of real-time data to analyze the condition of existing road networks.

Ethics approval

Not Applicable

Availability of data and materials

Available

Acknowledgement

The authors acknowledge the Central Bureau of Statistics and the Health Profile of Klaten Regency for supporting this study

Funding

This study was funded by the authors and not funded by other parties

Author Contribution

FDC: Conceptualization, methodology, writing–original draft; NOA: writing-review, methodology; RD: data analysis, validation, supervision; LAK: validation and supervision; MSN: methodology and validation. All authors have read and approved the final manuscript

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