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# Geographic Accessibility towards Primary Health Care in Karawang District

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## Abstract

Health accessibility refers to the availability of health care services accessible to the community as required. However, the convenience of accessing such services vary throughout regions due to geography. Hence differences in geographic accessibility can be an obstacle to accessing health care. This study characterized the influence of geographic accessibility on primary health care (PHC) in Karawang District. A cross-sectional study was conducted in November 2019 in five sub-districts of Karawang District. Respondents were interviewed using questionnaires to collect geographic (mileage and travel time from respondents' house to nearest PHC) and transportation (mode of transportation and transportation cost) data. In total, the study involved 513 randomly selected households, of which 11% had far to travel to the PHC, 22% had a long traveling time, and 23% had expensive transportation costs, with motorcycles being the most common means of transport. Therefore, PHCs in several sub-districts in Karawang District are less accessible due to geographic barriers.

**Keywords:** geographic accessibility, Karawang District, primary health care

## Introduction

Health facilities provide health care services, including promotive, preventive, curative, or rehabilitative programs conducted by the central government, local government, and/or communities. Those that provide primary health care (PHC) are community health centers, doctor practices, dental practices, primary clinics, and primary class hospitals.<sup>1</sup> The PHC is the essential health service to maintain public health because they are affordable and more accessible than specialists or hospitals.<sup>2</sup>

Accessibility in the context of health is the availability of health services that can be accessed as and when required by individuals.<sup>3</sup> Health facilities, equipment, and services should be accessible to all communities, especially the vulnerable or marginalized groups such as minorities, indigenous people, women, children, the elderly, and individuals with disabilities, including in rural areas.<sup>4</sup> Access to health facilities can be classified into five dimensions: availability, accessibility, affordability, acceptability, and accommodation.<sup>5</sup> The last three dimensions are unrelated to space and reflect financial regulation and cultural factors in health care, whereas the first two dimensions are related to the area. Availability refers to the number of PHC services that the patient can select, and accessibility is the travel barrier (distance or time) be-

tween the location of the patient and the health service.<sup>5</sup>

Geographic accessibility is the ease of residents accessing health care services measured by the distance, duration of travel, and road infrastructure.<sup>6</sup> Geographic accessibility assumes that every member of the population has the potential to be a service user and the accessibility patterns depend on the location of the population and service facilities.<sup>7</sup> Geographical accessibility differences in health care arise because of the distance between the population and the source of health care. Specifically, health services are provided in limited quantities to a specific location, whereas they must serve a population that comes continuously and is not distributed evenly in an area. Thus, the common obstacles to access health care are long-distance, poor transportation access, and high healthcare costs.

Indonesia is an archipelago with 17,504 islands, a population of 246.9 million, and is one of the largest countries in the world with a total area of 5,193,250 km<sup>2</sup> (covering land and sea). This information places Indonesia as the 7<sup>th</sup> largest country globally after Russia, Canada, the United States, China, Brazil, and Australia. However, the vast region of Indonesia poses its problems regarding equality in health care access,<sup>8</sup> with the highly diverse geographical situation posing a severe challenge

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regarding access to health facilities.

Based on National Basic Health Research/*Riset Kesehatan Dasar* (Riskesdas) in 2018, the knowledge of access to health facilities was measured using the Principal Component Analysis (PCA) method in three dimensions: (1) types of transportation used to reach health facilities, (2) round trip travel time from home to health facilities, and (3) round trip fees incurred for transportation to health facilities. Knowledge of access to PHC provided an index score of 39.29%, with a correlation between 0.02 and 0.14.<sup>9</sup>

Located in West Java, the Faculty of Medicine of Universitas Padjadjaran has the vision to improve the public health sector. The West Java Province has 27 districts with a total of 1,069 PHCs. Karawang District has a population of 2.9 million people and 50 PHCs, giving a ratio of 1.72 PHCs per 100,000 population.<sup>10</sup> Hence, approximately 1–2 PHCs should serve 100,000 people, which is a relatively small number for a highly populated district and a growing number of sick individuals and sudden disease outbreaks. Therefore, Karawang District was chosen to conduct a detailed survey about the geographic accessibility of PHC in the area. Karawang District Health Department supported this study, the theme of which was highly relevant to the Universal Health Coverage vision in Indonesia, which included access to health facilities as one of the indicators.<sup>11</sup>

## Method

A cross-sectional study was conducted in November 2019 involving five sub-districts of Karawang District; Batujaya, Rengasdengklok, Tempuran, Lemahabang, and Cikampek. The respondents were interviewed using questionnaires. In addition, five villages were selected randomly from each sub-district, with a local cadre inviting the residents to be a respondent.

The questionnaire consisted of several items regarding the respondents' identity and four open questions asking about mileage, travel time, mode of transportation, and transportation cost to reach the nearest PHC from the respondents' house in one go. Of 275 enumerators across the 25 villages in five sub-districts in Karawang District conducted the interviews. This study was part of large public health study in Karawang District led by the Faculty of Medicine, Universitas Padjadjaran. These enumerators were the 2nd-grade medical students previously trained to equalize perception about the interview and questionnaire.

The interview process was conducted using a redcap application installed on the enumerator's mobile phone with available internet access. The application recorded all the data obtained by the enumerator, then transmitted to a server owned by the Faculty of Medicine, Universitas Padjadjaran, monitored online. The inclusion criteria

were invited healthy respondents who did not have any of the five diseases currently studied by the Faculty of Medicine, Universitas Padjadjaran, e.g., tuberculosis (TB), diabetes mellitus (DM), human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), leprosy, and psychiatric disorder. In comparison, the exclusion criteria were respondents who had those five diseases and those who attended health facilities not categorized as PHC. The collected data were downloaded from the redcap server, went through a cleaning process, and finally processed using Microsoft Excel software to evaluate geographic accessibility characteristics.

## Results

In total, this study involved 631 questionnaires, of which 94 (14.9%) were incomplete, 12 were duplicates (1.9%), and 12 respondents (1.9%) were not included in the PHC criteria. Thus, there were total data (n) from 513 questionnaires (81.3%) used in this study after the cleaning process (Table 1).

From Table 1, the respondents from the five sub-districts in Karawang District were mainly female (83.8%), adults (46.6%), and married (91%), probably because the interviews were conducted between 9 am to 1 pm, therefore mainly housewives were available to accept the invitation to participate. Furthermore, most respondents had graduated from elementary school (52%), which may be related to the time of data collection since working residents with a higher education level were not at home. However, this data also corresponded to the data from the Ministry of Education of the Republic of Indonesia, which indicated that elementary school graduates were the largest proportion in Karawang District.<sup>12</sup> Most respondents came from the Batujaya Sub-district (25.9%). They had a monthly income below the Minimum Wage/*Upah Minimum Karyawan* (UMK)/ (62.6%), which might be related to the Rate of Working Participation/*Tingkat Partisipasi Angkatan Kerja* (TPAK) (63.62%) and Rate of Unemployment/*Tingkat Pengangguran Terbuka* (TPT) (9.61%) in 2019.<sup>13</sup> The most visited type of health facility was PHC (49.9%).

Table 2 shows the characteristics of geographic accessibility to PHC in Karawang District. Some respondents wrote "do not know" or misperceived the questions related to the above variables when filling out the questionnaire. Hence, out of a total of 513 respondents, the response rate regarding the mileage was 82.6%, travel time was 94.3%, transportation costs were 73.1%, and the means of transportation was 97%.

The shortest distance (minimum) to a health facility was 5 m, and the furthest distance (maximum) was 50 km, giving a median value of 1 km. This was related to the diverse location of respondent's houses compared to

**Table 1. Characteristics of the Respondents in Five Sub-Districts of Karawang District**

Variable	Characteristic	Total (n = 515)	
		n	%
Gender	Male	85	16
	Female	430	84
Age (n = 482)	Teenager (12–25 years old)	56	12
	Adult (26–45 years old)	239	50
	Middle-aged (46–65 years old)	161	33
	Elderly (>65 years old)	26	5
Marital status (n = 512)	Single	13	2
	Married	465	91
	Divorced/widow/widower	34	7
Last education level (n = 481)	Not go to school	18	4
	Not finished elementary school	9	2
	Graduated from elementary school	251	52
	Graduated from junior high school	121	25
	Graduated from senior high school	76	16
	University	6	1
Sub-district* (n = 509)	Batujaya	133	26
	Rengasdengklok	82	16
	Tempuran	120	24
	Lemahabang	105	21
	Cikampek	69	13
Monthly income (IDR) (n = 456)	<Minimum wage (2,275,715.00)	321	71
	Minimum wage (2,275,715.01) – 2 times of minimum wage (4,551,430.00)	111	24
	>2 times of minimum wage (4,551,430.01)	24	5
	Others	13	3

**Notes:** \*The following villages were selected in each sub-district: Batujaya: Baturaden, Karyabakti, Kutaampel, Kertajaya, Segarjaya; Rengasdengklok: Dewi Sari, Dukuh Karya, Kertasari, South Rengasdengklok, North Rengasdengklok; Tempuran: Ciparagejaya, Jayanegara, Purwojaya, Sumberjaya, Tempuran; Lemahabang: Karyamukti, Kedawung, Lemahabang, Pasirtanjung, Pulomulya; Cikampek: Cikampek City, South Cikampek, East Cikampek, West Dawuan, East Dawuan.

the source of healthcare in each sub-district. Travel time was determined by the distance and mode of transportation used, with individual ability considered as a contributing factor. The fastest travel time (minimum) to a health facility was 15 seconds and the longest travel time (maximum) was 120 minutes. Transportation costs were associated with public and private transportation availability, followed by individuals' preference for transportation based on their financial capacity. The median travel time to the health facility was 10 minutes. The lowest transportation cost (minimum) was IDR 0, and the highest transportation fee was IDR 50,000 (maximum), giving a median value of IDR 10,000.

The most common means of transportation used by respondents to reach PHC were motorcycles and on foot. Some respondents also used public transportation such as city transportation and motorcycle taxis or their car or bicycle, and the least used means of transportation was rickshaws.

From Table 3, 11% of health facilities were more than

**Table 2. Characteristics of the Geographic Accessibility to Public Health Care in Five Sub-Districts of Karawang District**

Variable	n	%	Median	Min-Max
Mileage (km)	424		1	0.005-50
Travelling time (minute)	484		10	0.25-120
Transportation cost (IDR)	375		10,000	0-50,000
Transportation (n = 496)				
Walking	96	9.3		
Bike	3	0.6		
Motorcycle	276	55.6		
Car	5	1.0		
Public transportation	15	3.0		
Taxi bike	12	2.4		
Rickshaw	2	0.4		
Others	85	17.1		

5 km from the respondent's home, with most health care facilities (95%) being close in the sub-districts, Lemahabang and Cikampek. Twenty-two percent of respondents took more than 20 minutes to reach the health facilities, with Lemahabang having the most significant

Table 3. Geographic Accessibility to Primary Health Care in Five Sub-Districts of Karawang District

Variable	Category	Total		Batujaya		Rengasdengklok		Tempuran		Lemahabang		Cikampek	
		n	%	n	%	n	%	n	%	n	%	n	%
Mileage	Near (≤5km)	376	89	94	91	55	86	84	78	87	95	54	95
	Far (>5 km)	48	11	9	9	9	14	24	22	5	5	5	5
Traveling time	Fast (≤20 minutes)	380	78	97	77	60	75	81	73	91	89	47	78
	Slow (>20 minutes)	104	22	29	23	20	25	30	27	11	11	15	22
Transportation cost	Cheap (≤IDR 10.000)	288	77	58	62	55	82	66	84	68	82	43	86
	Expensive (>IDR 10.000)	87	23	35	38	12	18	15	16	15	18	7	14

proportion of respondents (89%) with a traveling time of ≤20 minutes (fast). Transportation costs for some respondents (23%) were also considered inexpensive (≤IDR 10,000), with Cikampek having the most significant proportion (86%) of affordable transportation costs. In comparison, Batujaya had the highest proportion (38%) of expensive transportation costs >IDR 10,000.

**Discussion**

Recently, World Health Organization (WHO) has promoted universal health coverage programs to provide everyone with access to health care when required without financial hardship.<sup>14</sup> Indonesian Government, through Government Regulation No. 47 of 2016 on Health Care Facilities, has set several policies related to access to health care facilities that focus on equal distribution. The distribution also takes into account the aspects of service needs, population, and accessibility to make it easier for the community to reach PHC and improve the service’s conduciveness.<sup>15</sup>

The most common respondents in this study were females. Gender further explains differences in health care access since females are independently associated with higher unmet health care needs compared to males.<sup>16</sup> In this study, the most common age category was adults aged 26–45 years. The older a person is, the lower the immune system, hence the more significant the disease burden, therefore the more likely to access healthcare resulting in higher effort for treatment.<sup>17</sup>

One of the socioeconomic demographic factors that are statistically related to the act of health search was marital status, and most respondents were married in this study. Advice from a husband or wife could be a strong driver for a person to seek treatment.<sup>18</sup> Most respondents graduated from elementary school with limited knowledge of health. Limited health literacy was associated with low socioeconomic status, comorbidities, and poor access to health care, suggesting that it might be an independent risk factor for health disparities.<sup>19</sup>

Most respondents came from the Batujaya Sub-district, possibly because of the availability of residents in that area to attend the interview. This study showed that

the monthly income of respondents was mainly below the UMK. Universally, most studies show that lower socioeconomic status is associated with more access barriers.<sup>20</sup> The most visited type of health facility by respondents was PHC, which is generally available in every sub-district to provide essential health services.

Geographical variation is one of the physical conditions that affect access to health care.<sup>21</sup> People will use health care facilities if they are within reach. According to Notoatmodjo, the community will not use health care facilities unless they can use them. Furthermore, one reason a person does not use health care is that the health facilities are very far away.<sup>22</sup> Wibowo stated that the further a health facility is, the more reluctant the people will visit.<sup>23</sup>

Mileage is closely associated with the travel time to reach health care facilities, with a faster travel time making it easier to reach health services. If the distance of health care is very close, people do not need transportation. People will think twice about traveling to the health facility only for health problems or diseases they believe are ‘not that severe.’<sup>24</sup> Based on the Regulation of the Minister of Health of the Republic of Indonesia number 75 of 2014, PHC should be established in each sub-district based on the consideration of service needs, the number of residents, and accessibility, with more than one community health center established in one sub-district.<sup>25</sup> Tempuran was the sub-district with the furthest mileage and longest time travel, possibly because it covers an area of 8,849 Ha consisting of 2,051 Ha of land and 6,438 rice fields.<sup>26</sup> Tempuran also has 14 villages with 65,245 people in 2016 but only equipped with two PHC, four additional PHC (*puskesmas pembantu*), and six general practitioner clinics.<sup>27</sup>

Transportation is one of the essential factors supporting access to health care. Ideally, health care facilities should be easily reached so that the community can get the health services they need.<sup>23</sup> The lack of transportation (or even none) to the health care facilities will affect the behavior of health care seeking in general; because the utilization of health facilities is influenced by geographical factors, scattered communities, remoteness,

difficulty, and expensive transportation costs.<sup>22</sup> If transportation costs are too high, it can affect people's quality of life because expenses must be allocated for transportation costs.<sup>24</sup> Although health care is already accessible in several countries, spending on transportation to health care facilities is an important consideration for families to take advantage of health care. In brief, high transportation costs are likely to discourage someone from coming to the health care facility. The consequences of expensive transportation will make people consider choosing other health care facilities that are easier to access with the cheaper vehicle. However, they have to spend more to get the service, for example, the nearest nurses or midwives.<sup>28</sup> Batujaya Sub-district had the highest proportion of high transportation costs, possibly because it is the largest sub-district with an area of 9,189 Ha and geographically diverse land types.<sup>29</sup> Considering the breadth of the area, Batujaya is only equipped with limited private vehicles and three types of public transportation; pedicabs, 3-wheeled vehicles, and rowboats making transportation costs high.<sup>30</sup>

These results were in line with Sparrow,<sup>31</sup> and Johar's study,<sup>32</sup> on utilizing health cards in Indonesia, which recommended that government price subsidies effectively improved access to public health services in health centers if equipped with other interventions. Health care should be easily accessible to everyone in society, and the distribution of health facilities is essential for the delivery of good health services. Health services concentrated in urban areas rather than rural areas do not provide a good service for all. If the health facility is easy to reach with available transportation, it will be widely utilized by the community.<sup>8</sup> This study confirmed that physically, both geographically, regional conditions and distances, contribute to people's access to health care facilities.

Geographical barriers are one of the most dominant factors affecting Indonesia's accessibility of health services due to it being an island nation. The government even specifically released a policy about geographical barriers. Through the Decree of the Director-General of Health Management Efforts Number HK.03.05/II/2485/2012, a policy was issued on Guidelines for Improving Access to Health Services in Disadvantaged Areas, Borders and Islands/*Daerah Tertinggal, Perbatasan dan Kepulauan Terluar* (DTPK) to ensure the accessibility of health services to vulnerable areas in terms of service availability.<sup>33</sup> The Ministry of Health also issued a policy of Nusantara Sehat to improve access and quality of essential health services in DTPK and Health Troubled Areas/*Daerah Bermasalah Kesehatan* (DBK), aiming to maintain the continuity of services, community empowerment, provide integrated health services, as well as improve the retention of health workers who work in DTPK.<sup>34</sup>

Understanding access to healthcare from the community perspective as a consumer can provide valuable input to the planning process. Policymakers can use data on health care access issues to identify and support priorities regarding funding for improvement.<sup>35</sup> Public involvement in the stewardship of the system is also critical to achieving a high-quality system based on evidence and equity values.<sup>36</sup>

This study was the first study that discussed geographic accessibility in Karawang District and was supported by Karawang District Health Office, which would use the study results as evaluation material for local governments to access health services to achieve equal access area. The limitation of this research was the minimum time to prepare the enumerators to perform the interview. Adequate preparation and briefing were the essential steps to avoid miscommunication and anticipate the diversity of education and knowledge levels when researching with interview methods, thereby obtaining optimal answers.

## Conclusion

This study shows that PHC in several sub-districts of Karawang District is still less accessible due to geographic barriers such as distance, long travel times, and expensive transportation costs. Both private and public transportation are available to support the mobilization of the community to PHC in Karawang District. However, the transportation costs incurred by some respondents are relatively expensive due to the distance from health facilities. The participation of the government and the community is urgently needed to address the barriers that complicate access to improve the geographic accessibility of PHC in Karawang District.

## Abbreviations

PHC: Primary Health Care; Riskeudas: *Riset Kesehatan Dasar* (National Basic Health Research); PCA: Principal Component Analysis; TB: Tuberculosis; DM: Diabetes Mellitus; HIV/AIDS: Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome; UMK: *Upah Minimum Karyawan* (Minimum Wage); TPAK: *Tingkat Partisipasi Angkatan Kerja* (Rate of Working Participation); TPT: *Tingkat Pengangguran Terbuka* (Rate of Unemployment); WHO: World Health Organization; DTPK: *Daerah Tertinggal, Perbatasan, dan Kepulauan Terluar* (Daerah Tertinggal, Perbatasan dan Kepulauan Terluar); DBK: *Daerah Bermasalah Kesehatan* (Health Troubled Areas).

## Ethics Approval and Consent to Participate

Ethical approval was obtained from the Faculty of Medicine Ethics Committee, Universitas Padjadjaran No: 1359/UN6.KEP/EC/2019. Subjects were explained the study's aims, risks, and procedures and signed informed consent as an agreement before the research was conducted

### Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

### Availability of Data and Materials

Data are not available due to the ethical restrictions of the research. Participants of this study disagreed for their data to be shared publicly.

### Authors' Contribution

NR: concept and design, data collection, literature research, data processing, and interpretation; MNA: concept and design, final approval of the article; BS: data collection, statistical expertise, final approval of the manuscript.

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