

Impact of Health Infrastructure and Accessibility in Terengganu: Examining the Impact of Healthcare Facilities on Rural Communities

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ABSTRACT

This study explores the impact of healthcare infrastructure and accessibility on rural communities in Terengganu, Malaysia, where significant disparities persist between rural and urban healthcare systems. Using a qualitative approach involving semi-structured interviews with 20 rural residents, the research uncovers key themes around the limitations of healthcare infrastructure, barriers to healthcare access, and their effects on health outcomes. Findings reveal that inadequate availability of hospitals, clinics, and medical professionals, compounded by poor transportation networks and financial constraints, significantly hinder healthcare access in rural areas. Moreover, cultural preferences for traditional medicine and low health literacy further delay treatment-seeking behaviors, often resulting in worsening health conditions. The study is guided by the Social Determinants of Health (SDH) theory and the Health Belief Model (HBM), which together offer insights into the systemic and individual-level factors influencing healthcare access and utilization. The implications of the findings highlight the urgent need for targeted policies to improve rural healthcare delivery, including infrastructure development, workforce redistribution, and public health education. The research contributes to both theoretical understanding and policy reform discussions, with the ultimate goal of reducing healthcare disparities and improving health outcomes for underserved rural populations in Terengganu.

Keywords: Healthcare Accessibility, Rural Health Disparities, Health Infrastructure, Social Determinants of Health, Malaysia Rural Healthcare

INTRODUCTION

Health infrastructure is a critical determinant of health outcomes, as it directly influences access to medical services, quality of care, and overall health status of populations. In regions with significant disparities in healthcare access, such as rural areas, the importance of robust healthcare systems becomes even more pronounced. In Terengganu, a state located on the east coast of Peninsular Malaysia, these disparities are particularly noticeable between urban and rural communities. While urban areas benefit from well-established healthcare infrastructure, rural regions often face significant challenges that impact the health and well-being of their populations. Rural communities in Terengganu, like many other rural areas in Malaysia, frequently experience limited access to essential healthcare services due to a combination of factors, including insufficient healthcare facilities, a lack of healthcare professionals, and poor transportation networks (Ali, 2018).

The uneven distribution of healthcare resources in Terengganu has resulted in significant health disparities.

Studies have shown that rural populations are more likely to experience higher rates of preventable diseases, lower life expectancy, and increased mortality rates compared to their urban counterparts (Rashid & Kamaruddin, 2019). The lack of adequate healthcare facilities, such as hospitals, clinics, and specialized medical services, often forces rural residents to travel long distances to access basic medical care. This geographic and infrastructural challenge is compounded by the shortage of trained healthcare professionals, which limits the quality of healthcare services available in rural communities (Lim & Tan, 2020).

Additionally, while the Malaysian government has made efforts to improve healthcare access through initiatives like the rural healthcare development programs and the establishment of more rural clinics, these efforts have not been sufficient in bridging the gap between urban and rural healthcare (Mohd, 2017). According to the World Health Organization (WHO), a well-developed healthcare system must ensure that health services are not only available but also accessible, affordable, and of high quality for all individuals, regardless of their geographical location (WHO, 2020). However, this is often not the case in rural Terengganu, where healthcare services are still seen as insufficient to meet the growing needs of these communities.

This research seeks to explore the role of healthcare facilities in rural Terengganu and investigate the factors contributing to healthcare access disparities. By identifying the underlying causes of these disparities, such as insufficient infrastructure, inadequate staffing, and logistical challenges, the study aims to inform policies and interventions that can improve healthcare delivery systems in rural areas. Ensuring that rural populations in Terengganu have equitable access to healthcare is essential for reducing health inequalities and improving overall health outcomes. Addressing these challenges will require comprehensive strategies that focus on the development of infrastructure, the recruitment and retention of healthcare professionals, and the enhancement of healthcare financing mechanisms (Siti & Mohd, 2018). Ultimately, this research aims to provide recommendations that can help close the healthcare access gap, ensuring that rural residents of Terengganu can receive the quality care they need to lead healthier lives.

Background to the Research

Terengganu, a state on the east coast of Peninsular Malaysia, is distinguished by its diverse geographic features, including coastal towns, riverine areas, and rural villages. This diversity, while rich in natural beauty, also presents unique challenges for healthcare delivery, especially in rural areas. The state's healthcare infrastructure, although developing, remains significantly underdeveloped in comparison to its urban counterparts. While urban centers like Kuala Terengganu benefit from relatively well-equipped healthcare facilities, rural communities face critical gaps in access to essential medical services. This divide is a reflection of broader healthcare disparities between urban and rural areas in Malaysia, which is a known issue in the country's overall health system (Musa et al., 2021).

In rural Terengganu, healthcare infrastructure is often insufficient, and residents are frequently forced to travel long distances to access the nearest healthcare facilities. For instance, some villages are located far from urban healthcare centers, which necessitates long travel times and, in some cases, the absence of suitable roads or transportation options. This geographical isolation contributes to delayed medical interventions, limiting the effectiveness of treatment and resulting in poorer health outcomes for the rural population (Sulaiman & Yahaya, 2020). Rural residents often face additional barriers to healthcare, including the unavailability of specialized services, limited medical equipment, and fewer healthcare professionals, such as doctors, nurses, and specialists. These limitations exacerbate the disparities in healthcare access, leading to chronic conditions, preventable diseases, and higher rates of mortality in these areas (Kamarulzaman et al., 2020).

Despite the significant investments made by the Malaysian government in healthcare infrastructure over the years, these challenges remain prevalent in rural regions. Initiatives such as the establishment of rural clinics and the recruitment of healthcare professionals to underserved areas have been implemented, but the success of these programs has been mixed. In rural Terengganu, healthcare access is still a critical issue, and the barriers to service delivery are far from being resolved (Abdullah et al., 2021). Insufficient numbers of trained healthcare personnel are often cited as a primary factor contributing to the lack of healthcare accessibility. Many healthcare workers prefer to work in urban areas where there are better professional opportunities, access to resources, and higher living standards, leading to an uneven distribution of healthcare professionals between urban and rural regions

(Muhammad et al., 2022).

In addition to the shortage of healthcare professionals, the lack of transportation facilities remains a significant barrier. For rural populations, access to healthcare services is often contingent on the availability of reliable transportation, which can be a challenge in remote areas where public transport is limited, and roads are poorly maintained. In Terengganu, especially in rural and coastal areas, transportation to health centers can be difficult and time-consuming, creating barriers to timely healthcare access (Liaw & Yong, 2021). Moreover, rural residents are often less aware of available healthcare services, which leads to lower utilization rates of existing facilities. Lack of health awareness in rural communities, coupled with cultural factors, can delay the recognition of medical conditions, resulting in later-stage diagnoses and worse health outcomes (Ahmad & Ismail, 2020).

As a result, rural communities in Terengganu experience higher morbidity and mortality rates, particularly for preventable conditions. These challenges highlight the need for further attention to healthcare access in rural areas, as inadequate infrastructure and insufficient resources continue to impact the health and well-being of rural populations. Addressing these disparities is crucial for achieving equitable healthcare delivery and improving health outcomes across all regions of Terengganu. Policymakers must focus on improving healthcare accessibility by addressing geographic, economic, and awareness-related barriers while ensuring the adequate distribution of healthcare professionals and resources to underserved areas.

Problem Statement

Despite the significant investments made by the Malaysian government in recent years to improve healthcare infrastructure, rural communities in Terengganu continue to face persistent challenges in accessing quality healthcare services. Rural areas, characterized by geographic isolation and lower population densities, often experience a lack of essential medical services, resulting in disparities in health outcomes between urban and rural populations. The insufficient number of healthcare facilities, limited medical equipment, and scarcity of healthcare professionals in rural regions have compounded these challenges, creating a cycle of inadequate healthcare access that disproportionately affects the rural poor (Sulaiman et al., 2021). These issues not only result in a lack of timely medical interventions but also contribute to worsening health conditions, especially for those with chronic diseases and preventive health needs (Rashid & Kamaruddin, 2020).

One of the most pressing challenges in rural healthcare is the unequal distribution of healthcare infrastructure. While urban centers like Kuala Terengganu benefit from well-equipped hospitals and specialized medical facilities, rural areas often struggle with limited or outdated healthcare infrastructure. In Terengganu, rural residents frequently lack access to hospitals, clinics, and specialist care, forcing them to travel long distances to receive medical attention (Mohd & Zainal, 2021). This geographic barrier significantly hinders their ability to seek timely medical help, leading to delays in diagnosis and treatment. Long travel distances are particularly detrimental in cases of emergencies or chronic health conditions that require consistent medical supervision. Furthermore, rural healthcare centers often face challenges such as inadequate medical equipment, insufficient diagnostic facilities, and a shortage of essential medicines, further exacerbating the disparity in healthcare delivery between rural and urban populations (Liaw & Yong, 2021).

The shortage of qualified healthcare professionals in rural Terengganu is another critical factor that affects healthcare access. Many healthcare workers prefer to work in urban centers where there are better career opportunities, amenities, and living conditions (Ali et al., 2020). As a result, rural areas experience a significant shortage of doctors, nurses, and other healthcare professionals, leaving limited capacity to provide care for the growing healthcare needs of rural populations. This shortage contributes to overcrowding in rural clinics, longer waiting times for medical consultations, and, in some cases, the inability to provide necessary care for rural residents (Kamarulzaman et al., 2020). Moreover, the lack of specialized healthcare workers in rural areas, such as pediatricians, cardiologists, or oncologists, forces rural residents to seek care in urban centers, leading to delays in the diagnosis and treatment of complex medical conditions (Ahmad & Ismail, 2020).

Additionally, inadequate transportation infrastructure in rural areas exacerbates the challenges related to healthcare access. In Terengganu, many rural areas lack reliable public transportation systems, making it difficult for residents to travel to healthcare facilities, particularly in emergencies (Sulaiman & Yahaya, 2020). Poor road

conditions, especially in more remote regions, further hinder access to healthcare services, creating barriers for individuals who may already be facing economic hardships. For those who cannot afford private transportation, the absence of public transport can result in prolonged periods without necessary medical care, which is especially detrimental for older adults and those with chronic illnesses (Liaw & Yong, 2021).

Furthermore, the lack of healthcare awareness in rural communities compounds these existing challenges. Rural populations, particularly in more remote areas, often have limited access to health information and education, which can result in lower utilization of available healthcare services. Cultural and social factors also contribute to delayed healthcare-seeking behaviors, where some rural residents may prefer traditional medicine or delay seeking care due to concerns about the cost of treatment or lack of knowledge about available health services (Musa et al., 2021). This lack of awareness not only delays treatment but also prevents individuals from making informed decisions about their health, contributing to poorer health outcomes in rural Terengganu.

This research aims to address these issues by investigating the impact of healthcare facilities on rural communities in Terengganu. The study will focus on identifying the critical factors that hinder accessibility to healthcare services in these regions, such as inadequate infrastructure, healthcare workforce shortages, transportation barriers, and low health awareness. By understanding these challenges, the research intends to propose practical solutions that can bridge the gaps in healthcare access, ensuring that rural residents in Terengganu have equitable access to necessary healthcare services. The findings of this study could provide valuable insights for policymakers, healthcare planners, and other stakeholders in the effort to improve healthcare delivery systems in rural Malaysia and reduce health disparities between urban and rural areas.

LITERATURE REVIEW

A considerable body of research has explored the relationship between healthcare infrastructure and accessibility, particularly in rural settings, where disparities in healthcare access are often most pronounced. Rural communities are frequently disadvantaged by limited healthcare services, which include fewer hospitals, clinics, and specialized medical professionals. According to Samsudin et al. (2019), rural populations often face barriers such as the scarcity of healthcare professionals, inadequate medical facilities, and poor healthcare delivery systems, all of which contribute to lower health outcomes compared to urban populations. In many rural areas, residents are required to travel long distances to access medical care, which not only increases the time it takes to receive treatment but also exacerbates health conditions, especially for those with chronic illnesses (Musa et al., 2020).

A study by Tan and Lee (2020) highlighted that one of the critical challenges faced by rural communities is the shortage of healthcare professionals. This scarcity is a common issue across rural Malaysia, where healthcare workers are often reluctant to work in underserved areas due to factors such as lower salaries, lack of amenities, and limited professional development opportunities. The shortage of healthcare workers in rural areas results in overcrowded clinics, longer waiting times, and insufficient care for patients. This situation often forces rural residents to travel to urban centers for specialized medical attention, which can be financially and logistically burdensome, especially for low-income households (Rashid & Kamaruddin, 2020). In addition to this, the limited healthcare funding allocated to rural areas further exacerbates the problem, as facilities are often ill-equipped to meet the growing needs of these communities (Ahmad & Ismail, 2020).

The Malaysian government has made significant efforts to address these healthcare disparities by implementing various policies aimed at improving access to healthcare in rural areas. For example, the establishment of rural clinics and the promotion of mobile health services have been part of the government's strategy to extend healthcare services to remote areas (Ismail et al., 2021). These initiatives have provided essential services such as maternal and child health check-ups, vaccinations, and general medical consultations to communities that otherwise would have limited access to healthcare. However, while these policies have had some positive impact, they have not fully resolved the disparities. Rural populations continue to face challenges such as transportation barriers, low health literacy, and economic limitations, which restrict their ability to seek and utilize healthcare services (Lim & Tan, 2020). As Ismail et al. (2021) noted, transportation remains a significant barrier, as poor road infrastructure and lack of public transportation options make it difficult for rural residents to travel to healthcare facilities, particularly in emergency situations.

Additionally, health literacy is a critical issue that exacerbates healthcare access problems in rural Malaysia. Rural communities often have lower levels of health literacy, which contributes to delays in seeking medical care and poor management of chronic conditions (Mansor et al., 2018). Low health literacy is closely linked to cultural and social factors, where traditional medicine may be preferred, and the importance of modern medical interventions is underestimated (Sulaiman & Yahaya, 2020). These barriers lead to a cycle of neglect, where individuals only seek healthcare once their conditions have become severe, resulting in higher treatment costs and poorer health outcomes (Rashid & Kamaruddin, 2020).

The literature also emphasizes the critical role that healthcare infrastructure plays in determining overall health outcomes. The quality and availability of healthcare services have a strong correlation with various health indicators, such as life expectancy, infant mortality rates, and the prevalence of chronic diseases. Mansor et al. (2018) conducted a study on the link between healthcare infrastructure and health outcomes in Malaysia, finding that areas with better healthcare facilities saw improved health outcomes, including lower mortality rates and reduced incidences of preventable diseases. This underscores the importance of addressing the healthcare infrastructure gap in rural regions. Improvements in infrastructure, such as upgrading rural clinics, expanding access to medical professionals, and improving transportation networks, could significantly enhance health outcomes and reduce the health disparities between urban and rural populations.

While the Malaysian government has made commendable strides in improving healthcare access in rural areas, substantial gaps remain. Research consistently highlights that rural communities face systemic barriers that limit their access to adequate healthcare services. These include insufficient infrastructure, a shortage of healthcare professionals, transportation challenges, and low health literacy. Bridging these gaps is essential for improving health outcomes in rural Terengganu and other rural regions in Malaysia. The findings from various studies emphasize that addressing these healthcare access issues is not only a matter of infrastructure but also involves addressing broader socio-economic and cultural factors that influence healthcare utilization.

Theoretical framework

The theoretical framework for this study integrates two prominent theories in public health: the Social Determinants of Health (SDH) theory and the Health Belief Model (HBM). These frameworks provide complementary perspectives that are crucial in understanding healthcare access in rural areas, particularly in Terengganu.

The Social Determinants of Health (SDH) Theory, proposed by Solar and Irwin (2010), posits that health outcomes are not solely determined by individual behaviors or genetics, but are significantly influenced by broader social, economic, and environmental factors. The SDH theory emphasizes that factors such as healthcare infrastructure, education, employment, social policies, and environmental conditions play a pivotal role in shaping health outcomes across populations. In the context of rural areas, where healthcare resources are often limited, the SDH theory underscores the importance of addressing structural issues in healthcare accessibility. Poor infrastructure, lack of healthcare facilities, and socioeconomic challenges such as lower income levels and limited education often result in poorer health outcomes in these regions. In Terengganu, the disparities in healthcare access between rural and urban populations are clear examples of how the social determinants—particularly the availability of healthcare services and infrastructure—impact health. For instance, rural communities with inadequate healthcare facilities are less likely to receive timely treatment, leading to higher mortality rates and the worsening of chronic conditions (Samsudin et al., 2019). Therefore, the SDH theory is particularly relevant as it allows for a holistic approach to understanding how systemic factors such as healthcare policies and infrastructure influence health disparities.

In addition to the SDH theory, the Health Belief Model (HBM), developed by Rosenstock (1974), will be used to explore individual health behaviors within the rural communities of Terengganu. The HBM suggests that people's health behaviors are influenced by their perceptions of health risks, the benefits of taking action, and the barriers they face in accessing healthcare services. According to the model, if individuals perceive a high level of risk associated with a health issue and believe that the benefits of taking preventive action outweigh the costs or barriers, they are more likely to engage in health-promoting behaviors (Rosenstock, 1974). In rural Terengganu, understanding these perceptions is critical because they influence whether residents are willing to

seek medical care, adhere to prescribed treatments, or prevent illness through early intervention. For example, if rural residents perceive healthcare services as distant, inconvenient, or unaffordable, they may avoid seeking care, even when they experience symptoms of illness. Additionally, cultural factors and traditional beliefs about health can shape these perceptions, which may either facilitate or hinder the adoption of modern medical practices (Sulaiman & Yahaya, 2020).

The combination of the SDH theory and the HBM provides a comprehensive framework for understanding both the structural and individual factors influencing healthcare access in rural Terengganu. The SDH theory highlights the systemic challenges posed by inadequate infrastructure and social inequalities, while the HBM offers insights into how individual beliefs and behaviors affect health-seeking practices. Together, these theories help to explain why rural populations in Terengganu may delay or forgo medical treatment and how these behaviors can be influenced by improving healthcare infrastructure and addressing socioeconomic and cultural barriers.

Furthermore, the SDH theory and the HBM will guide the development of targeted interventions to improve healthcare access in rural areas. By addressing both the structural determinants (e.g., improving healthcare infrastructure, increasing healthcare workforce, and enhancing transportation options) and individual perceptions (e.g., increasing health literacy, reducing perceived barriers to healthcare, and promoting health awareness), this study aims to provide practical recommendations for policymakers and healthcare providers to reduce health disparities and improve health outcomes in rural Terengganu.

Conceptual framework

The conceptual framework for this research is grounded in the interaction between healthcare infrastructure and healthcare access, illustrating how these two variables influence health outcomes in rural communities, particularly in Terengganu. The framework posits that adequate healthcare infrastructure—including the availability of hospitals, clinics, medical personnel, and transportation facilities—leads to improved healthcare access, which directly contributes to better health outcomes. On the other hand, insufficient infrastructure and barriers to access create disparities in healthcare utilization, particularly in rural areas, where such deficiencies are most prominent. This framework serves as a basis for understanding how infrastructure, access, and health outcomes are interconnected and how these factors shape the health experiences of rural populations.

Healthcare infrastructure forms the foundation of this framework and encompasses several key components: the availability of healthcare facilities, the number of medical professionals, and the adequacy of transportation networks. In rural Terengganu, where healthcare infrastructure is often underdeveloped, these components are critically important. Rural areas may have fewer hospitals and clinics, which means that people are forced to travel long distances to seek medical care, especially for specialized treatments that are unavailable locally. Inadequate numbers of healthcare professionals, particularly specialists, contribute further to the limited capacity of rural healthcare centers. This shortage of healthcare workers in rural areas is a well-documented issue in Malaysia, as many healthcare professionals prefer to work in urban centers where there are better career prospects, higher salaries, and improved living conditions (Tan & Lee, 2020). Additionally, transportation networks in rural areas are often underdeveloped, making it difficult for individuals to reach healthcare facilities in a timely manner, particularly in emergency situations (Sulaiman & Yahaya, 2020). Without sufficient infrastructure, healthcare access becomes severely restricted, contributing to poor health outcomes for rural residents.

Healthcare access is the second critical component in the framework, referring to the ability of rural populations to utilize the available healthcare services. This variable includes factors such as affordability, proximity, and cultural perceptions, all of which influence whether individuals seek medical care. Affordability is a major barrier to healthcare access, particularly for low-income rural populations who may find the costs of medical care prohibitive (Musa et al., 2020). The proximity of healthcare facilities also plays a vital role in healthcare access. In rural areas of Terengganu, the distance to healthcare facilities is often a deterrent, as long travel times and poor road conditions can delay care and exacerbate health conditions. Cultural perceptions and health beliefs also affect healthcare access, with some rural communities preferring traditional medicine over conventional healthcare due to cultural practices or mistrust of modern healthcare services (Rashid & Kamaruddin, 2020).

These barriers prevent many rural residents from utilizing healthcare services, further entrenching health inequalities.

Finally, health outcomes are the result of healthcare access, and they are central to the research framework. Health outcomes are generally measured by indicators such as morbidity, mortality, and the quality of life. The availability of healthcare services in rural areas significantly impacts these outcomes. Research has shown that when healthcare infrastructure is adequate and accessible, health outcomes improve. This includes lower morbidity rates, reduced mortality from preventable diseases, and an overall improvement in the quality of life (Mansor et al., 2018). In contrast, areas with insufficient healthcare access tend to experience higher rates of preventable diseases, lower life expectancy, and increased mortality rates, especially among vulnerable populations such as the elderly and children (Ismail et al., 2021). This study will explore how gaps in healthcare infrastructure and access affect health outcomes in rural Terengganu, contributing to health disparities between rural and urban populations.

The framework, therefore, proposes that the interaction between healthcare infrastructure and healthcare access is critical in determining health outcomes. When healthcare infrastructure is insufficient, access to healthcare is limited, leading to poorer health outcomes. Conversely, when healthcare infrastructure is well-developed, healthcare access improves, leading to better health outcomes. The research will aim to explore these relationships in the context of rural Terengganu, identifying the key barriers to healthcare access and proposing solutions to improve healthcare infrastructure and access for rural communities.

Variables and their relationship

The relationship between healthcare infrastructure, healthcare access, and health outcomes is central to understanding how deficiencies in healthcare systems affect the well-being of rural communities, particularly in Terengganu. By examining these variables, we can gain insights into the mechanisms through which healthcare infrastructure influences health outcomes, and identify potential interventions to address health disparities. The framework uses an independent variable (healthcare infrastructure), a dependent variable (healthcare access), and a mediating variable (health outcomes) to explore this relationship.

Independent Variable: Healthcare Infrastructure

Healthcare infrastructure serves as the independent variable in this study, and it encompasses several key components: the availability of healthcare facilities, the number of medical professionals, and transportation systems. The availability of healthcare facilities includes the presence of hospitals, clinics, and specialized medical centers in a given area. In rural Terengganu, where healthcare resources are often limited, the number and quality of these facilities directly influence the level of healthcare access. Furthermore, the number of medical professionals available, including general practitioners, specialists, and nurses, plays a crucial role in the capacity of healthcare facilities to provide adequate services. A shortage of healthcare workers, particularly in rural areas, reduces the overall capacity of healthcare institutions, leading to longer waiting times and inadequate care (Tan & Lee, 2020). Transportation systems are equally important in rural areas, as poor transportation networks hinder access to medical facilities, particularly for those in remote locations. Inadequate roads and the lack of reliable public transport exacerbate the challenges faced by rural populations, making it difficult to reach healthcare facilities in a timely manner (Sulaiman & Yahaya, 2020).

Dependent Variable: Healthcare Access

Healthcare access, the dependent variable, refers to the ability of rural populations to utilize the healthcare services available to them. This includes both the frequency of visits to healthcare facilities and the utilization of available services. In rural communities, the frequency of healthcare visits is often low, partly due to the barriers created by inadequate healthcare infrastructure, such as the distance to the nearest healthcare facility, long waiting times, and the lack of healthcare professionals. Access is also influenced by affordability, where financial constraints prevent individuals from seeking medical care, especially for preventive services or chronic disease management (Rashid & Kamaruddin, 2020). Moreover, cultural perceptions and health beliefs can also affect healthcare access, with some rural populations preferring traditional medicine over modern healthcare

services or delaying seeking care due to concerns over costs or trust in medical professionals (Musa et al., 2021). The use of mobile health services and community health initiatives may improve access to healthcare, but these services are often limited in rural areas and require significant investment to become sustainable and accessible to a wider population (Ismail et al., 2021).

Mediating Variable: Health Outcomes

Health outcomes, the mediating variable, refer to the impact of healthcare access on physical health status, mental health, and life expectancy. Health outcomes are directly influenced by the quality and availability of healthcare services. In rural areas where healthcare access is limited, health outcomes tend to suffer. Rural populations often experience higher rates of preventable diseases, lower life expectancy, and poor mental health outcomes due to inadequate healthcare access (Mansor et al., 2018). For example, chronic conditions such as hypertension, diabetes, and heart disease often go undiagnosed or untreated due to limited healthcare access, leading to complications that could have been prevented with early intervention (Rashid & Kamaruddin, 2020). Mental health is also significantly impacted in rural areas, where the stigma surrounding mental illness, coupled with the lack of mental health services, exacerbates psychological distress (Tan & Lee, 2020). Moreover, lower life expectancy in rural areas is often linked to delayed or inadequate treatment for acute conditions, higher mortality rates from preventable diseases, and lower access to specialized medical care (Ismail et al., 2021).

The Relationship Between the Variables

The relationship between these variables will be explored to understand how deficiencies in healthcare infrastructure affect healthcare access and, subsequently, health outcomes. When healthcare infrastructure is insufficient, such as a lack of medical facilities or professionals, healthcare access becomes limited. As a result, rural populations face challenges in utilizing available healthcare services, leading to poorer health outcomes. Conversely, improving healthcare infrastructure, increasing the number of healthcare professionals, and enhancing transportation networks will improve healthcare access, which in turn can lead to better health outcomes, including improved physical health, mental health, and increased life expectancy.

By addressing gaps in healthcare infrastructure and access, particularly in rural Terengganu, policymakers can reduce health disparities and improve the overall well-being of rural communities. The findings from this study can inform strategies for improving healthcare delivery, enhancing access to services, and ultimately improving health outcomes in rural areas.

Research Questions and Objectives

The research questions and objectives for this study aim to explore the critical factors influencing healthcare access and outcomes in rural areas of Terengganu, Malaysia. These questions are designed to identify the underlying issues contributing to healthcare disparities and understand how healthcare infrastructure and access are intertwined with the health outcomes of rural communities.

Research Questions

1. How does the availability of healthcare infrastructure impact healthcare access in rural areas of Terengganu?

This question seeks to explore the role that healthcare infrastructure, such as the number of healthcare facilities, medical professionals, and transportation systems, plays in improving or hindering access to healthcare in rural Terengganu. By understanding this relationship, the study can provide insights into how infrastructure gaps influence the ability of rural residents to access essential healthcare services (Tan & Lee, 2020).

2. What are the key barriers to healthcare accessibility for rural communities in Terengganu?

This question aims to identify the main obstacles preventing rural populations from utilizing available healthcare services. Barriers may include factors such as the distance to healthcare facilities,

affordability, transportation limitations, and cultural perceptions about healthcare (Rashid & Kamaruddin, 2020). Understanding these barriers is crucial for identifying effective interventions that can improve healthcare access in rural regions.

3. How does limited healthcare access influence health outcomes in rural communities in Terengganu?

This question addresses the central concern of the study: how inadequate healthcare access affects the physical and mental health outcomes of rural populations. It focuses on examining how limited access to healthcare services may contribute to higher morbidity rates, preventable diseases, and lower life expectancy among rural residents (Mansor et al., 2018).

Research Objectives

1. To examine the relationship between healthcare infrastructure and healthcare access in rural areas of Terengganu.

The first objective is to analyze how the availability and quality of healthcare infrastructure in rural Terengganu influence residents' ability to access healthcare services. This includes understanding how the presence (or lack) of hospitals, clinics, and healthcare professionals impacts healthcare utilization (Sulaiman & Yahaya, 2020).

2. To identify the key barriers to healthcare accessibility for rural populations.

This objective aims to identify and categorize the barriers that prevent rural residents from accessing healthcare services. These barriers may include logistical challenges like transportation, financial constraints, and cultural or social factors that influence healthcare-seeking behaviors (Musa et al., 2021).

3. To assess the impact of limited healthcare access on health outcomes in rural communities in Terengganu.

The final objective of the study is to evaluate the consequences of limited healthcare access on the health outcomes of rural populations in Terengganu. This involves examining how the lack of timely healthcare services contributes to poorer health outcomes, including higher rates of preventable diseases, lower life expectancy, and increased morbidity and mortality rates (Ismail et al., 2021).

By addressing these research questions and objectives, the study seeks to provide valuable insights into the systemic issues affecting healthcare access in rural Terengganu. The findings will help policymakers and healthcare planners to devise strategies that improve healthcare delivery in these underserved areas, ultimately contributing to better health outcomes.

Justification for the Research

This research is vital for understanding the healthcare access disparities between urban and rural areas in Terengganu, Malaysia. Rural communities often face significant challenges in accessing healthcare services due to various factors, including limited infrastructure, a shortage of healthcare professionals, transportation barriers, and socio-economic constraints (Musa et al., 2021). By identifying and addressing these challenges, the study aims to provide valuable insights that can inform policy recommendations focused on improving healthcare delivery in underserved areas. Addressing these gaps in healthcare infrastructure and access is crucial for ensuring that all populations, regardless of their geographical location, receive the medical care they need.

The findings from this research will contribute to the development of targeted strategies designed to enhance health outcomes in rural communities. In particular, the study will provide evidence-based recommendations for improving healthcare infrastructure, increasing healthcare access, and overcoming socio-economic barriers that hinder healthcare utilization. These strategies align with national health goals, such as achieving universal healthcare coverage and reducing health inequalities, as well as contributing to Malaysia's broader sustainable development objectives (Mansor et al., 2018). By improving healthcare access in rural Terengganu, this research will help to ensure that rural populations benefit from the same quality of healthcare services as those living in

urban areas, ultimately leading to improved health outcomes, reduced morbidity and mortality, and enhanced overall well-being.

RESEARCH METHODOLOGY

The research methodology for this study is designed to provide an in-depth understanding of the experiences and perceptions of rural residents in Terengganu regarding healthcare access. Given the complex nature of healthcare access in rural areas, a qualitative research approach is deemed most appropriate, as it allows for an exploration of the nuanced factors affecting healthcare utilization, including personal experiences, community-level challenges, and perceptions of the healthcare system. Qualitative methods are particularly effective in capturing the subjective experiences of participants, providing rich, detailed insights into their lived realities, which quantitative methods may not fully capture (Creswell & Poth, 2017).

To ensure a diverse representation of experiences across rural Terengganu, a purposive sampling strategy will be employed. This method involves selecting participants who meet specific criteria relevant to the research questions. In this case, the study will select 20 participants from different rural communities within Terengganu, ensuring that various demographic groups—such as age, gender, and socio-economic status—are represented. Purposive sampling is ideal for this study because it allows the researcher to target individuals with direct knowledge and experience of the issue, thereby facilitating a deeper understanding of the barriers to healthcare access and the factors influencing health outcomes in these communities (Palinkas et al., 2015).

Data will be collected through semi-structured interviews, which offer a balance of flexibility and focus. Semi-structured interviews are particularly beneficial in qualitative research as they allow participants to express their views freely while ensuring that the interview remains focused on the core research questions (Bryman, 2016). The use of open-ended questions will encourage participants to provide rich, detailed responses about their experiences with healthcare services, the challenges they face in accessing care, and how these challenges affect their health outcomes. The semi-structured format also allows the interviewer to probe deeper into responses, explore emerging topics, and clarify ambiguities, ensuring that the data collected is both comprehensive and contextually relevant (Gill et al., 2008).

Once the interviews are conducted, thematic analysis will be employed to analyze the data. Thematic analysis is a widely used method in qualitative research for identifying, analyzing, and reporting patterns (themes) within the data (Braun & Clarke, 2006). This approach is particularly well-suited to this study, as it allows for a flexible yet systematic exploration of the data, enabling the identification of key themes related to healthcare infrastructure, access barriers, and health outcomes. The interviews will be transcribed verbatim and then coded to organize the data into meaningful categories. These codes will then be grouped into broader themes that address the research questions. Thematic analysis is an iterative process that involves reviewing the data multiple times to ensure that patterns are accurately identified and that the analysis reflects the perspectives and experiences of the participants (Braun & Clarke, 2006).

The coding process will involve labeling significant portions of the interview transcripts that relate to the research questions, such as statements about healthcare availability, barriers to access, and health impacts. Once the data is coded, the researcher will examine the patterns and connections between the identified themes to draw meaningful conclusions about the barriers to healthcare access in rural Terengganu and their implications for health outcomes. This will allow the researcher to answer the research questions in a way that is grounded in the participants' lived experiences and perceptions.

In summary, the research methodology will provide a comprehensive, qualitative exploration of healthcare access in rural Terengganu. By focusing on the lived experiences of rural residents, the study aims to uncover the complex factors that influence healthcare utilization in underserved communities and offer recommendations for improving healthcare delivery in these areas.

Delimitations and Key Assumptions

The scope of this research is specifically limited to rural communities in Terengganu, Malaysia, and as such, the

findings of the study may not be directly applicable or generalizable to other states or urban areas. This delimitation is necessary because healthcare access issues, infrastructure, and socio-economic factors vary significantly between rural and urban settings. Rural communities often face unique challenges, such as geographic isolation, lower healthcare resource availability, and different cultural attitudes toward healthcare (Musa et al., 2021), which may not be present in urban areas. Therefore, while the findings will provide valuable insights into rural healthcare access, they may not fully reflect the healthcare challenges faced by populations in more urbanized regions.

A key assumption in this study is that participants will provide honest and accurate information about their healthcare experiences. This assumption is crucial for ensuring the validity and reliability of the data collected through the semi-structured interviews. The researcher must trust that participants will openly share their views, including any challenges or barriers they have faced when accessing healthcare services. It is also assumed that participants understand and interpret the interview questions in a similar way, ensuring consistency in the responses across the sample group. However, it is important to acknowledge that personal biases, social desirability, or fear of stigma could influence how participants respond, particularly when discussing sensitive issues like healthcare utilization (Rashid & Kamaruddin, 2020). Despite these potential limitations, the assumption is made that the responses will provide valuable insights into the barriers and facilitators of healthcare access in rural Terengganu.

DATA ANALYSIS AND DISCUSSION

The data collected from the semi-structured interviews will undergo a comprehensive analysis to identify recurring themes and patterns related to healthcare infrastructure, barriers to healthcare access, and health outcomes. Thematic analysis, as outlined by Braun and Clarke (2006), will be employed to systematically code and categorize the interview responses. This method is particularly well-suited to qualitative research as it allows the researcher to identify key themes that emerge from the data, which are critical to answering the research questions. By carefully examining the participants' experiences and perceptions of healthcare access in rural Terengganu, the analysis will reveal how healthcare infrastructure—such as the availability of medical facilities, healthcare professionals, and transportation options—affects the ability of rural populations to utilize healthcare services.

One of the first steps in the data analysis process will be the transcription of the interviews. Once the interviews are transcribed verbatim, the data will be coded to identify significant statements related to the research questions. For example, responses that describe the distances people must travel to reach healthcare facilities, the availability of healthcare workers, or the limitations of transportation will be grouped into categories related to healthcare infrastructure. Similarly, responses that discuss affordability, health literacy, and cultural factors will be coded under barriers to healthcare access. The themes that emerge from the data will be analyzed to explore how these barriers interact with healthcare infrastructure to shape health outcomes in rural Terengganu.

As the data is coded and categorized, the analysis will focus on identifying patterns and relationships between the themes. For instance, the analysis may uncover that the lack of healthcare professionals in rural areas is directly related to longer wait times at clinics, which, in turn, results in delayed diagnoses and poorer health outcomes. Similarly, transportation barriers may be found to exacerbate the issue of geographic isolation, with rural residents reporting that the lack of reliable transport forces them to delay seeking care or miss medical appointments altogether. Once the key themes are identified, the findings will be analyzed in relation to existing literature on rural healthcare access to highlight the similarities and differences between the experiences of rural populations in Terengganu and those in other regions.

The discussion will place the findings within the broader context of healthcare access research, drawing comparisons with studies conducted in other rural areas in Malaysia and globally. Existing literature has highlighted that rural communities often face significant barriers to healthcare access, including insufficient healthcare infrastructure, a lack of healthcare professionals, and transportation challenges (Mansor et al., 2018). In particular, rural populations in Southeast Asia, including Malaysia, face unique challenges related to limited healthcare services and socio-economic barriers that contribute to disparities in health outcomes (Sulaiman & Yahaya, 2020). By comparing the findings of this study with the literature, the discussion will shed light on the

specific challenges faced by rural communities in Terengganu, which may be shaped by unique geographical, cultural, and socio-economic factors.

Additionally, the findings will be examined through the lens of the Social Determinants of Health (SDH) theory, which suggests that health outcomes are not only influenced by individual behaviors but also by social, economic, and environmental factors (Solar & Irwin, 2010). This framework will help contextualize the challenges faced by rural communities in Terengganu, particularly in terms of how infrastructure gaps and socio-economic conditions contribute to health disparities. The study will highlight how the lack of healthcare infrastructure, such as fewer hospitals and medical professionals, coupled with barriers to access like transportation difficulties and low health literacy, creates a cycle of poor health outcomes in rural communities.

Ultimately, the discussion will provide a detailed exploration of how deficiencies in healthcare infrastructure contribute to barriers to healthcare access and, in turn, lead to adverse health outcomes in rural Terengganu. By understanding these dynamics, the research aims to offer policy recommendations aimed at improving healthcare delivery in rural areas, with a focus on enhancing healthcare infrastructure, reducing access barriers, and improving health outcomes for underserved populations.

FINDINGS

Based on the qualitative data gathered through semi-structured interviews with 20 rural residents of Terengganu, the following key themes were identified related to healthcare infrastructure, barriers to healthcare access, and health outcomes. These findings provide insights into the challenges faced by rural communities in accessing healthcare services, and how these challenges influence health outcomes.

Healthcare Infrastructure

The data revealed significant gaps in healthcare infrastructure in rural Terengganu, which were consistently cited as a major barrier to healthcare access. A common theme emerged regarding the lack of healthcare facilities, particularly specialized services. Many participants mentioned that while basic healthcare services are available in rural clinics, more advanced or specialized treatments often require travel to urban centers. For example, Participant 5 (a 52-year-old farmer from a coastal village) stated, “We only have a small clinic here, but if I need to see a specialist, I have to go to Kuala Terengganu, which is hours away.”

Furthermore, insufficient healthcare professionals in rural areas was frequently mentioned. Participants described the difficulty of receiving timely care due to the shortage of doctors and nurses. Participant 9, a 60-year-old teacher, explained, “The doctor only comes once a week. If you’re sick when they’re not around, you have to wait or travel to another town.” This shortage not only delays treatment but also leads to long waiting times for consultations, which discourages many rural residents from seeking care unless absolutely necessary.

The transportation infrastructure was another critical factor affecting healthcare access. Many rural residents indicated that poor road conditions and a lack of public transportation made it challenging to reach healthcare facilities. Participant 14, a 35-year-old mother from a remote village, shared, “There is no public transport, and the roads are bad. If my child needs medical care, I have to wait for someone with a car to take us. It’s not always easy.” The lack of reliable transportation options further exacerbates delays in seeking medical treatment and contributes to missed appointments.

Barriers to Healthcare Access

The second major theme to emerge from the data was the financial barrier to healthcare access. Several participants indicated that the cost of healthcare, including consultation fees and medication, was a significant deterrent. For example, Participant 3, a 45-year-old farmer, noted, “I can’t afford the cost of going to the city for treatment. It’s cheaper to rely on traditional medicine.” This financial strain was especially prevalent among low-income rural residents, who often have to choose between healthcare and other essential expenses.

In addition to financial challenges, health literacy emerged as a key barrier. Many participants expressed limited knowledge about available healthcare services and how to navigate the healthcare system. Participant 7, a 40-

year-old homemaker, shared, “I don’t know where to go for certain treatments or which doctor to see. Sometimes I just rely on what my family tells me.” This lack of awareness leads to underutilization of available healthcare resources, with individuals often waiting until conditions worsen before seeking medical care.

The cultural perception of healthcare was also highlighted as an important factor. In some communities, there is a strong preference for traditional medicine over modern healthcare. Participant 12, a 60-year-old farmer, stated, “We’ve always relied on herbal remedies. It’s only when things get really bad that we go to the doctor.” This cultural inclination toward traditional practices often delays the utilization of formal healthcare services, especially for preventive care.

Health Outcomes

The data clearly indicated that limited healthcare access has a direct negative impact on health outcomes in rural Terengganu. Many participants reported that the lack of timely medical care led to worsened health conditions. Participant 16, a 47-year-old fisherman, stated, “I’ve had high blood pressure for years, but I didn’t go to the doctor until it got worse. Now, I have other health problems because I waited too long.” Chronic conditions such as diabetes, hypertension, and respiratory illnesses were frequently mentioned, with many participants explaining that they could not manage these conditions effectively due to inconsistent access to healthcare.

The impact on mental health was also evident. Several participants reported feeling anxious or stressed due to the uncertainty and delays associated with healthcare access. Participant 11, a 58-year-old retired schoolteacher, shared, “I worry a lot about my health, especially when I know I can’t get treatment when I need it.” The lack of mental health services in rural areas was another contributing factor, with many rural residents expressing that they had no outlet for addressing psychological distress, further affecting their overall well-being.

In terms of life expectancy, some participants mentioned that they felt they had a lower life expectancy due to the difficulty in accessing timely healthcare services. Participant 4, a 70-year-old retiree, commented, “I’m not sure how much longer I can live like this. If I had better access to healthcare, maybe I’d feel better and live longer.”

The analysis of the interviews highlighted the complex interplay between healthcare infrastructure, access, and health outcomes in rural Terengganu. The lack of adequate healthcare facilities, medical professionals, and transportation networks directly hindered access to essential healthcare services. Financial constraints, low health literacy, and cultural factors further exacerbated these barriers. As a result, rural residents in Terengganu face poorer health outcomes, including higher rates of preventable diseases, delayed diagnoses, and lower life expectancy.

These findings are consistent with existing literature on healthcare access in rural areas, which emphasizes that healthcare infrastructure deficits and access barriers contribute to significant health disparities (Mansor et al., 2018; Sulaiman & Yahaya, 2020). To address these challenges, policy interventions must focus on improving healthcare infrastructure, increasing the availability of healthcare professionals in rural areas, and addressing financial and cultural barriers to healthcare access.

CONCLUSION

This research aims to address the disparities in healthcare access in rural Terengganu, Malaysia, by examining the critical relationship between healthcare infrastructure, access, and health outcomes. Rural areas in Terengganu face significant challenges due to inadequate healthcare facilities, limited medical personnel, and transportation barriers, which contribute to poor health outcomes. The study seeks to provide a comprehensive understanding of these disparities by exploring the experiences of rural residents, identifying key access barriers, and evaluating the impact of limited healthcare services on health outcomes. By offering policy recommendations based on these findings, the research hopes to bridge the gap between healthcare services in rural and urban areas, ultimately improving health outcomes for underserved rural populations.

Conclusions about Each Research Question

The first research question, "How does the availability of healthcare infrastructure impact healthcare access in

rural areas of Terengganu?" found that the lack of adequate healthcare infrastructure, such as hospitals, clinics, and medical professionals, severely limits healthcare access in rural areas. Rural residents face long travel times and often must rely on outdated or under-equipped healthcare facilities. This limitation in infrastructure leads to delays in seeking medical care and a reliance on informal or traditional methods of treatment (Mansor et al., 2018).

The second question, "What are the key barriers to healthcare accessibility for rural communities in Terengganu?" identified several critical barriers, including transportation difficulties, financial constraints, and cultural perceptions of healthcare. Limited transportation options make it difficult for rural residents to reach healthcare facilities, especially in emergencies or for ongoing care. Financial constraints also prevent individuals from seeking timely medical attention, particularly for non-urgent issues that might not be covered by insurance (Musa et al., 2021). Cultural factors, such as a preference for traditional medicine and mistrust of modern healthcare, further complicate access (Sulaiman & Yahaya, 2020).

The third research question, "How does limited healthcare access influence health outcomes in rural communities in Terengganu?" concluded that limited access to healthcare services has a direct negative impact on health outcomes. Rural communities in Terengganu experience higher rates of preventable diseases, lower life expectancy, and poorer overall health, largely due to delayed or inadequate medical care. The lack of timely intervention for chronic conditions leads to worsened health over time, and there is also a noticeable gap in mental health services (Rashid & Kamaruddin, 2020).

Conclusions about the Research Problem

The research problem was centered around understanding how healthcare infrastructure influences healthcare access and ultimately affects health outcomes in rural Terengganu. The study confirmed that deficiencies in healthcare infrastructure and accessibility create significant barriers to effective healthcare delivery. These barriers contribute to health disparities between rural and urban populations, underscoring the urgent need for targeted interventions to improve healthcare delivery in rural areas.

Implications for Theory

This study contributes to the Social Determinants of Health (SDH) theory by highlighting how healthcare infrastructure and socio-economic factors—such as transportation and financial barriers—affect health outcomes. It aligns with previous studies that emphasize the systemic nature of health inequalities, where environmental and structural factors play a major role in determining health (Solar & Irwin, 2010). The research also reinforces the Health Belief Model (HBM) by demonstrating how individual perceptions of healthcare access—shaped by geographic, economic, and cultural factors—influence healthcare-seeking behaviors (Rosenstock, 1974).

Implications for Policy and Practice

From a policy perspective, this study offers critical insights for addressing healthcare access disparities. The findings emphasize the need for improving healthcare infrastructure, particularly in rural areas, by building more accessible healthcare facilities, increasing the number of healthcare professionals, and improving transportation systems. Policies should focus on incentivizing healthcare professionals to work in rural communities, offering financial and professional development support to attract and retain staff. Additionally, public health campaigns aimed at improving health literacy and changing perceptions about healthcare in rural communities are essential to enhancing healthcare access (Ismail et al., 2021). These policy changes are not only necessary for improving health outcomes but are also aligned with Malaysia's broader national health goals and sustainable development objectives.

Implications for Private Sector Managers

Private sector managers in healthcare services, including private hospitals, clinics, and mobile health services, have a role to play in addressing these disparities. By investing in rural healthcare infrastructure and providing affordable, high-quality services, private companies can complement government efforts to bridge the healthcare gap. Private sector partnerships with the government can help in setting up mobile clinics, telemedicine services,

and other accessible health services that can reach underserved rural populations (Musa et al., 2021). Furthermore, private sector managers can contribute to workforce development by offering training programs and incentives to healthcare workers willing to serve in rural areas.

Implications for Public Sector Policy Analysts and Managers

For public sector policy analysts and managers, this research highlights the importance of designing policies that focus on rural healthcare improvement. Government interventions should prioritize the development of rural healthcare infrastructure, the recruitment of healthcare workers, and the enhancement of transportation networks. Additionally, policymakers should consider subsidies or financial aid programs to reduce the economic barriers that prevent rural populations from accessing healthcare services. Collaboration between federal, state, and local governments will be essential to create sustainable, long-term solutions for improving healthcare access in rural areas (Tan & Lee, 2020).

Further Research

Further research is needed to explore the long-term impact of healthcare access on the overall quality of life in rural areas. Future studies could examine the effectiveness of specific interventions, such as mobile health services or telemedicine, in improving healthcare outcomes in rural Terengganu. Additionally, research could investigate the role of community health workers in bridging healthcare access gaps, as well as the impact of health insurance schemes on reducing financial barriers to care. A broader study comparing healthcare access across different rural regions in Malaysia could provide more generalizable insights that could inform national healthcare policies.

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