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Horizontal Inequality in Healthcare Utilisation in Rural Sabah, Malaysia

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ABSTRACT

Ensuring universal access to healthcare is essential for societal equity. However, significant inequalities exist within global healthcare systems, resulting in unequal access to services and divergent health outcomes. Socioeconomic inequity, poor living conditions, and inadequate healthcare infrastructure perpetuate poor health among poor communities. Despite greater healthcare needs, economically disadvantaged populations face substantial barriers to obtaining necessary services. This research evaluates the equitable aspect of healthcare utilisation in Sabah's rural areas to guide policy formulation. Nabawan, a rural area in Sabah with high poverty rates, was selected to assess income-related inequality and inequity in healthcare utilisation. Using the horizontal equity index and decomposition analysis, it was found that economic status significantly influences healthcare distribution, typically favouring the affluent. Central to this analysis is the concept of "equal treatment for equal need," ensuring individuals with similar healthcare needs receive similar care regardless of economic status. Results indicate that wealthier individuals are slightly more likely to utilise healthcare services, although the difference is minimal. To address disparities, enhancing targeted financial assistance programs like PeKa B40 could reduce out-of-pocket expenses for low-income households. Additionally, increasing healthcare funding for rural infrastructure and training local healthcare workers can ensure equitable access for all households.

INTRODUCTION

Ensuring universal access to healthcare is a cornerstone of societal fairness, echoing the principles outlined in the Universal Declaration of Human Rights by the United Nations (United Nations, 1948). Unfortunately, healthcare systems worldwide face significant inequalities, leading to divergent health outcomes and unequal access to services (Dickman et al., 2017; Guo et al., 2020; Mostafavi et al., 2020). The presence of socioeconomic inequity, substandard living circumstances, and insufficient healthcare infrastructure contribute to a continuous cycle of ill-health and increased rates of both mortality and morbidity among poor communities (Korda et al., 2007; Zhang et al., 2017). Ironically, economically poor populations have significant obstacles in obtaining necessary services, despite having larger healthcare need, whilst higher-income groups receive better treatment (Atun et al., 2016). This unequal access exacerbates poverty and ill-health, as impoverished households allocate a disproportionate share of their resources to healthcare expenses.

Furthermore, inequity or disparities persist not only between affluent and impoverished populations, but also within specific regions of countries (Atun et al., 2016; Ilinca et al., 2019). Rural, remote, and poor areas encounter unique challenges, exacerbating existing healthcare inequities. Addressing these disparities requires identifying and dismantling systemic barriers to equitable access. Horizontal equity, advocating impartial treatment based on "healthcare needs" rather than financial status, emerges as a crucial principle (Lu et al., 2007). It is imperative to focus on addressing underlying determinants such as economic status and health conditions.

While Malaysia has made significant strides towards universal healthcare coverage (Abu Bakar et al., 2019; Fadzil et al., 2020; Rannan-Eliya et al., 2016) adapting its system to mitigate financial barriers to essential services, the state of Sabah faces distinct challenges (Ali, 2010; Goroh et al., 2020; Oo Tha et al., 2020). With a disproportionately high poverty rate (Department of Statistics Malaysia, 2022c) and concerning health indicators, including elevated rates of infant and maternal mortality (Ministry of Health Malaysia, 2020) and an increased prevalence of communicable (Goroh et al., 2020; Naserrudin et al., 2023) and non-communicable diseases (Hanafiah et al., 2020), addressing healthcare disparities in the region is imperative.

Effective provision of healthcare, particularly in rural areas, is pivotal in mitigating health issues. All Malaysians have access to heavily subsidised public health facilities, but limited research has explored disparities in health service utilisation within economically underdeveloped regions. Therefore, there is a critical need for comprehensive studies to uncover barriers hindering equitable access to healthcare. This manuscript aims to assess the principle of "equal treatment for equal need" in the context of health service utilisation in economically underdeveloped rural regions of Sabah, identify primary barriers to achieving equitable healthcare utilisation, and provide supporting data for governmental policy formulation.

MATERIALS AND METHODS

This is a cross-sectional study that took place over a period of four months in Nabawan, a rural area in Sabah marked by high levels of poverty. This is a cross-sectional study conducted over four months in Nabawan, a rural area in Sabah characterised by high levels of poverty. Poverty is defined as the lack of sufficient financial resources to meet basic living standards. The poverty rate, indicating the percentage of the population living below the poverty line, has consistently ranged from 26% to 35.6% between 2016 and 2019 (Department of Statistics Malaysia, 2022a). Situated as one of Sabah's seven interior divisions, it boasts an

estimated population of approximately 32,309 as of 2020 (Department of Statistics Malaysia, 2022b). During data collection, face-to-face interviews were conducted with residents who had been in the locality for at least two weeks prior to the interview. All household members in the selected houses, including those without blood relations, were interviewed regardless of citizenship. Newborn babies less than two weeks old were also included as part of the household members. If an adult household member was deemed unfit for an interview due to frailty or mental incapacity, a proxy respondent was chosen to answer on their behalf. This proxy could be another household member or a non-household member familiar with the respondent's health-related matters. To maintain consistency within the study group, individuals residing in institutional settings such as school hostels were excluded.

The sample size was determined using a single percentage formula, with a precision of 5% and a confidence level of 95%. The population variance of 33.2% was accounted for, representing individuals seeking healthcare advice or treatment in Sabah within the last two weeks (Malaysia Ministry of Health, 2015b). Considering Nabawan's population of 32,309 individuals and a non-response rate of 20%, the desired sample size was calculated to be 414 respondents. Respondents were identified by dividing the research areas into Enumeration Blocks (EBs), recognized geographical entities by the National Statistics Department (Department of Statistics Malaysia, 2020a). A random sample of six EBs, totalling 96 random houses, was selected.

The study employed a questionnaire adapted from the Health Care Demand Module in the National Health and Morbidity Survey (NHMS) 2011 for its comprehensive content (Ministry of Health Malaysia, 2012). Prior to conducting interviews, all participants were required to provide consent in adherence to the guidelines set forth by the Medical Research Ethics Committee, Faculty of Medicine and Health Sciences, Universiti Malaysia Sabah (JKEtika 4/17(2)) and with a NMRR registration number 38145. Written informed consent was obtained from all research participants.

The interviews were conducted in Malay from February 23 to June 25, 2019. A locally hired translator was available to facilitate communication in other local languages if needed. Data entry was carried out using Epi Info version 7.2.2.6.

Dependent and Independent Variables

The dependent variable, healthcare service utilisation, was defined as having received any outpatient services within the previous two weeks or inpatient services within the past 12 months, irrespective of whether the visit was to a public or private health facility months (Ministry of Health Malaysia, 2012). Outpatient services include any medical consultations, treatments, or procedures that do not require an overnight stay, while inpatient services encompass any medical care that involves admission to a hospital at least one night (Aris et al., 2015). Meanwhile, independent variables were classified into two groups: need and non-need factors. Need factors encompassed gender, age, self-assessed health status, and daily functional limitations.

Gender and age are essential to horizontal equity analysis in healthcare because they directly influence healthcare needs and service use utilisation (Donnell et al., 2008). Gender affects needs due to biological differences, such as women's reproductive health and varying chronic condition prevalence. Age dictates healthcare at different life stages, from paediatric care for children to chronic disease management in middle age and intensive care for seniors (Kalseth & Halvorsen, 2020; Roth et al., 2022; Simons et al., 2023). Including these factors ensures healthcare access is evaluated based on true health needs rather than socioeconomic status.

Reported health status was assessed

using a Likert scale with response options ranging from "Very good" to "Very Bad," allowing respondents to classify their health as either positive (Very good, Good) or negative (Moderate, not good, Very Bad). Similarly, experienced activity limitations were measured by evaluating perceived restrictions in daily activities due to health conditions, also using a Likert scale. The response options included "Severe/unable to perform," "Moderate/mild," and "None," enabling respondents to categorize the severity of their limitations.

Non-need factors encompassed household income or socioeconomic status, education, and employment status. To determine socioeconomic status (SES), we followed World Bank guidelines by dividing household expenditure by household size, measured in adult equivalents according to the Organization for Economic Co-operation and Development (OECD) definition. The OECD definition is suitable because it accurately reflects household economic status by considering the differing resource needs of adults and children, ensuring comparability across studies (van Doorslaer et al., 2006). This method is widely recognised and utilised in socioeconomic analyses.

The calculation formula for adult equivalents (AE) in household h is represented as:

$$AE_h = (A_h + \alpha K_h)^{\theta}$$

(Organisation for Economic Co-operation and Development, 2008)

where,

AE_h is the adult equivalent in household h
A_h is the number of adults in household h
K_h is the number of children 0-14 years old
α (value is 0.5) is the "cost of children" and
θ (value is 0.75) reflects the degree of economies of scale.

After adjusting for adult equivalents, households were stratified into quintiles representing varying levels of economic status, ranging from the poorest to the most affluent. These quintiles were grouped into five categories, with quintile 1 representing the poorest 20% and quintile 5 representing the wealthiest 20% in Nabawan.

Statistical Analysis

The study investigated disparities in health services utilisation across various social demographics, employing both the Chi-square test and the Cochran–Armitage test. While the X^2 test was utilised to examine unordered categorical variables like employment status, the Cochran–Armitage test was applied to analyse ordinal variables such as age group, socioeconomic status, education level attainment, and self-assessed health status.

The concentration index (CI) was employed to gauge the extent of healthcare utilisation inequity linked to socioeconomic status. Further, it was decomposed to assess contributions from various components, encompassing both need and non-need factors. Additionally, the horizontal inequality (HI) index, factoring in health needs variations, was used to delineate healthcare utilisation inequity associated with socioeconomic status. The methodologies followed those outlined by Wagstaff et al. (1991). Wagstaff et al. (1991) examined various methodologies for measuring health inequalities, highlighting the significance of selecting appropriate metrics. They advocate for the slope index of inequality and the concentration index. These indices consider the entire population and accurately reflect socioeconomic disparities in health. The slope index measures the relationship between a health variable, such as the use of health services, and socioeconomic rank, while the concentration index evaluates how a health variable is distributed in relation to socioeconomic status, offering comprehensive insights into health inequalities.

Step 1: Health Services Utilisation Standardisation

The subsequent steps involved setting a benchmark for healthcare service utilisation. Initially, we calculated the distributions of actual service utilisation, expected service utilisation based on need, and standardised service utilisation based on need for each household income quintile. This allowed us to assess the distribution of service utilisation accurately, providing insight into the level of equity in healthcare distribution.

Predicted service usage, determined by "need variables," aimed to estimate the expected services required, distinguishing between situations of underuse and excess. Standardised service usage was employed to accurately evaluate the distribution of service utilisation, without factoring in variations in the distribution of health needs, in order to identify any inequities (Donnell et al., 2008). To compute the distribution of healthcare utilisation adjusted for need, considering its binary nature, we utilised a probit regression model in conjunction with an indirect standardization technique (Donnell et al., 2008; Zhang et al., 2022).

Step 2: Concentration Index and Decomposition

To assess socioeconomic disparities in service utilisation, we employed the concentration index (CI), a widely utilised metric in health economics research (Donnell et al., 2008). The CI ranges from -1 to +1, with zero denoting perfect equality and positive or negative values indicating disproportionate concentration of service utilisation among higher or lower socioeconomic strata, respectively (Xu et al., 2003). We calculated the CI using the formula:

$$C = \frac{2}{\mu} cov(h, r)$$

The *h* signifies the ranking of individuals regarding their utilisation of healthcare services, while *r* denotes the ranking of individuals based on their socioeconomic status, and μ represents the average level of healthcare utilisation across the population. Then, a decomposition analysis of the concentration index (CI) was undertaken to delineate the specific contributions of need variables and non-need factors to the socioeconomic inequity observed in service utilisation.

This analysis was facilitated through a probit regression model, expressed as (Wagstaff et al., 1991):

$$\gamma_i = \alpha + \sum_j \beta_j^m \chi_{ji} + \sum \gamma_k^n Z_{ki} + \varepsilon_i$$

In this equation, γ_i represents the likelihood of utilising health services, χ_{ji} stands for need factors, Z_{ki} stands for non-need factors, β^m_j and γ^n_k signify the effects of each variable, α serves as an intercept, and ε_i indicates the error term.

Subsequently, the decomposition of the CI is expressed as (Donnell et al., 2008):

$$C = \sum_j \frac{\beta_j^m \chi_j}{\mu} C_j + \sum_k \frac{\gamma_k^m Z_k}{\mu} C_k + \frac{GC_\varepsilon}{\mu}$$

In this equation, μ denotes the mean of *γ*, C_j and C_k represent the concentration index of χ_j and Z_k respectively, and GC_ε measure how much the error term *ε* contributes to the overall concentration index.

Step 3: Horizontal Inequity Index Calculation

Next, the horizontal inequity (HI) index was calculated and a positive HI indicates that individuals with high socioeconomic status are utilising more services than needed, while a negative HI implies that less affluent individuals accessing more services than needed (van Doorslaer et al., 2000).

$$HI = CM - CN$$

CM denotes the concentration index of actual

health service utilisation, and *CN* denotes the concentration index of the need-expected health service utilisation. *HI* lies in the range of (-2, 2), with a positive (negative) value indicating pro-rich (pro-poor) inequity (Lu et al., 2007).

All analyses were conducted using Stata version 18.0.

RESULTS

From the total of 438 respondents were interviewed, 21.2% (93) reported use of health care services. Based on Table 1, our analysis found notable associations between gender, age, and healthcare utilisation. Specifically, individuals aged 45–64, irrespective of gender, exhibited higher service utilisation compared to other age groups. Conversely, individuals aged 65 and older, regardless of gender, displayed lower service utilisation, ranging from 6.4% to 10.9%.

Self-assessed health emerged as a significant factor of healthcare utilisation. Individuals reporting very good health exhibited the highest service utilisation at 45.2%, followed by those reporting good health at 29.0%. Health limitations showed a significant association with healthcare utilisation. Individuals with severe or unable-to-perform health limitations had a service utilisation rate of 9.7%, those with moderate or mild limitations had a higher utilisation rate of 51.6%, while individuals reporting no health limitations had a utilisation rate of 38.7%.

Surprisingly, socioeconomic status did not demonstrate a significant association with healthcare utilisation. Utilisation across different socioeconomic quintiles ranged from 15.1% to 26.9%, with no discernible pattern based on socioeconomic status. Activity status showed as a significant association with healthcare utilisation. Employed individuals had an 8.6% utilisation, compared to 33.3% for self-employed individuals. In contrast, individuals not currently working exhibited the highest utilisation rate at 58.1%. This category also included children under the age of seven, who were automatically classified as not working. Only those aged seven to 17 were queried about their employment status, which encompassed any involvement in their parents' primary economic activities. Additionally, this group provided data on the number of household members dependent on others for financial support, either through employment or self-employment.

To explore the equitable aspect of healthcare utilisation, Table 2 illustrates the distributions of actual, need-expected, and need-standardised likelihoods of reporting healthcare utilisation, categorised by quintiles. These distributions are derived from predictive factors, including demographic variables, self-assessed health, and functional limitations of daily activities. Upon examining the actual distribution, there is a slight inclination towards favouring higher-income individuals and those in the poorest 20%. In contrast, the need-expected distribution shows a clear pro-rich bias. This means that the factors that determine healthcare needs-such as age, gender, and health conditions-are more common among wealthier people. Higher-income individuals often have better access to healthcare, allowing them to manage their health better, which affects their overall health conditions. Additionally, demographic factors like older age, which usually means higher healthcare needs, are more often found in wealthier groups because they tend to live longer and healthier lives. This connection between healthcare needs and higher income explains why wealthier individuals seem to need and use more healthcare, creating a pro-rich bias in the expected distribution of healthcare needs.

Consequently, the top two wealthiest segments of the population exhibit probabilities of reporting healthcare utilisation that are respectively 0.4% and 10.6% lower

Table 1: Social demographic characteristics, health status, and health services utilisation.

Variable	Number	Healthcare service utilisation		X2 or Z	p-value
		Number	Column %		
Need-factors Gender and age (years)					
Men				**17.19**	**0.004****
Less than 16	93	11	23.4		
16-34	50	11	23.4		
35-44	28	4	8.5		
45-64	40	15	31.9		
65-74	7	3	6.4		
Older than 74	5	3	6.4		
Women				**11.90**	**0.036***
Less than 16	78	13	28.3		
16-34	64	9	19.6		
35-44	18	3	6.5		
45-64	38	15	32.6		
65-74	15	5	10.9		
Older than 74	2	1	2.2		
Self-assessed health				**48.15**	**0.000*****
Very good	315	42	45.2		
Good	84	27	29.0		
Moderate/ Not good	33	20	21.5		
Very bad	6	4	4.3		
Health limitations				**51.97**	**0.000*****
Severe/unable to perform	14	9	9.7		
Moderate/mild	120	48	51.6		
None	304	36	38.7		
Activity Status				**7.12**	**0.028***
Employed	48	8	8.6		
Self-employed	101	31	33.3		
Not working#	289	54	58.1		
Education				**9.55**	**0.049***
Never attended schooling	36	14	15.1		
Completed primary	204	43	46.2		
Completed secondary	116	18	19.4		
Completed tertiary	22	3	3.2		
Children less than 7 y/o	60	15	16.1		

Notes:
1. # Children under the age of 7 were classified in this category. Those aged 7 to 17 were queried about their employment status, encompassing any involvement in their parent's primary economic activities.
2. Q = Quintile; y/o = years old
3. For non-ordinal categories like 'activity status,' the association was assessed using the chi-square test ($\chi 2$), whereas the remaining ordinal independent variables were examined using the Cochran–Armitage test (Z).
4. * $0.01 \leq p < 0.05$; ** $0.001 \leq p < 0.01$; *** $p < 0.001$

than expected given their need averages, compared to 15.8% lower in the poorest 20%. This highlights the disparity in healthcare utilisation based on socioeconomic status.

Following standardisation, the need-standardised distribution accentuates the pro-rich trend among the richest quintiles even further compared to the actual distribution. This disparity underscores the necessity for targeted interventions to address inequities in healthcare access and utilisation across socioeconomic strata. The p-value associated with the need-standardised utilisation of healthcare services evaluates the significance of the difference between the actual utilisation and the standardised utilisation, which adjusts for differences in healthcare needs across socioeconomic quintiles. A statistically significant difference p-value suggests potential inequity in healthcare utilisation even after accounting for differences in healthcare needs.

Table 2: Distribution of actual, need-expected, and need-standardised use of healthcare services.

Household Socioeconomic quintiles	Actual	Need-expected	Need-standardised
Poorest 20%	0.266	0.224	0.224
2nd poorest 20%	0.163	0.182	0.191
Middle	0.163	0.172	0.209
2nd richest 20%	0.230	0.229	0.206
Richest 20%	0.235	0.210	0.231
Standard error	0.053	0.052	0.024
t-ratio	0.268	0.544	0.304
p-value	0.053	0.052	0.024*

Notes:
1. The p-values for Actual, Need-Expected, and Need-Standardised columns represent the significance level for the respective variables.
2. * 0.01 ≤p < 0.05; ** 0.001 ≤p < 0.01; *** p < 0.001

Table 3 shows the decomposition analysis of the concentration index for healthcare utilisation in Nabawan, aimed at elucidating the underlying factors contributing to socioeconomic-related disparities in access to healthcare services. Among the need factors examined, age-sex groups exhibited a negative contribution of -0.007 (-42.7%), indicating a marginal alleviation of socioeconomic-related inequality associated with age and sex. Conversely, self-assessed health demonstrated a substantial negative contribution of -0.014 (-91.7%), underscoring its significant role in attenuating healthcare utilisation disparities across individuals with varying health perceptions.

Table 3: Decomposition of Concentration Index for health care utilisation.

	Absolute Contributions to concentration index	Percentage contributions
Need factors		
Age-sex groups	-0.007	-42.7
Self-assessed health	-0.014	-91.7
Functional limitations	0.009	57.7
Subtotal	-0.012	-76.7
Non-need factors		
Socioeconomic status	0.058	371.8
Activity status	-0.004	-24.0
Education	-0.014	-91.1
Subtotal	0.040	256.7
Residual	-0.014	-80.0
Total	0.014	
Horizontal Inequity Index	0.027	

Notes:
1. The p-values for Actual, Need-Expected, and Need-Standardised columns represent the significance level for the respective variables.
2. * 0.01 ≤p < 0.05; ** 0.001 ≤p < 0.01; *** p < 0.001

Interestingly, functional limitations displayed a positive contribution to the concentration index (0.009, 57.7%), suggesting a correlation between heightened limitations and increased healthcare utilisation, despite the overall negative impact of need factors on socioeconomic-related inequality.

Analysing non-need factors revealed varied influences on healthcare utilisation disparities. Socioeconomic status emerged as a notable contributor, demonstrating a positive impact (0.058, 371.8%) and emphasizing the pronounced effect of socioeconomic status on healthcare access. Conversely, both activity status and education exhibited negative

contributions, albeit to different extents (-0.004, -24.0% and -0.014, -91.1% respectively), suggesting a potential mitigating effect on healthcare utilisation disparities.

Furthermore, the positive horizontal inequity index (0.027) underscores residual inequality in healthcare utilisation, even after accounting for differences in healthcare needs. This finding highlights a persistent trend wherein individuals of higher socioeconomic status tend to exhibit greater healthcare utilisation compared to their counterparts of lower socioeconomic status.

DISCUSSION

Analysing income-related inequality and inequity in healthcare utilisation is essential for promoting social justice. It reveals disparities in access to essential services based on income levels (van Doorslaer et al., 2000). These disparities often lead to poorer health outcomes among marginalised populations and contribute to inefficiencies within healthcare systems. By identifying and addressing these disparities, policymakers and healthcare providers can develop targeted interventions to improve access to care for those with lower incomes, ultimately leading to better health outcomes, reduced economic costs, and a more equitable society founded on principles of fairness and ethical healthcare provision.

This paper presents a pioneering examination of income-related inequality and inequity in healthcare utilisation within a rural area of Sabah, Malaysia. Using the HI and decomposition analysis, it is evident that economic status significantly influences healthcare distribution in this region, typically favouring the affluent. For context, Van Doorslaer et al. (2000) analysed data from the early 1990s across ten OECD countries and found the HI for doctor visits ranged from 0.047 in the Netherlands to -0.010 in Germany, and for hospitalisations from -0.076 in Denmark to -0.047 in Switzerland. In comparison, Nabawan's HI for healthcare utilisation in 2019 was 0.027, similar to Sweden's 0.034 and more pro-poor than Denmark, Finland, the Netherlands, and the US from the 1990s. Additionally, Nabawan's HI is more favourable than Brazil's 0.037 (MacInko & Lima-Costa, 2012). Broader comparisons indicate that in rural Iran, the outpatient HI was 0.039 and the inpatient HI was -0.068 (Mostafavi et al., 2020), while in rural China, the outpatient HI was 0.029 and the inpatient HI was 0.16 (Guo et al., 2020). These disparities highlight the significant impact of economic inequalities on healthcare access across different healthcare systems and policies, underscoring the need for targeted interventions to improve equity in rural areas like Sabah.

The Universal Coverage Scheme (UCS) in Thailand was introduced in 2001 to make healthcare more accessible, particularly for the poor, by reducing financial barriers (Somkotra, 2011). The UCS includes a referral system ensuring access to necessary health services without prohibitive costs. After its implementation, the Health and Welfare Survey of 2005 reported that the HI for outpatient care was -0.067 and for inpatient care was -0.061, indicating a shift towards more equitable healthcare access (Somkotra, 2011). Before the UCS, healthcare utilisation favoured wealthier individuals due to high out-of-pocket costs. The UCS has reduced these financial barriers and aimed to standardise the quality of care across income groups by improving infrastructure, increasing the number of medical personnel in rural areas, and ensuring the availability of medications, thereby promoting horizontal equity in healthcare access.

Disparities in healthcare utilisation driven by non-need factors are predominant, with economic status, insurance coverage, and geographic location being primary contributors. In Nabawan, household socioeconomic status emerges as the most significant pro-rich contributor to inequality

in health service utilisation. The higher health service utilisation among affluent individuals can be attributed to their greater financial resources, better health literacy, geographic proximity to healthcare facilities, comprehensive employment benefits, cultural attitudes towards health, and potential response biases in data collection. Wealthier individuals generally have more disposable income, enabling them to afford healthcare services beyond the reach of lower-income groups, such as those not covered by public health systems, specialized care, and medications (Mackenbach, 2012). This financial capability significantly reduces barriers to healthcare access, resulting in higher utilisation rates among the affluent. Furthermore, higher education levels among wealthier people correlate with better health literacy, allowing them to understand the importance of healthcare, recognize symptoms early, seek preventative care, and navigate the healthcare system more effectively (Kickbusch, 2001; Nutbeam, 2000).

Affluent individuals often reside in urban or well-developed areas where healthcare facilities are more accessible and of higher quality, which minimises logistical challenges such as transportation issues or long travel times, barriers that are significant for those in rural or underdeveloped areas (Aday & Andersen, 1974; Feinstein et al., 2006). Additionally, many affluent people have jobs that provide comprehensive health insurance, significantly reducing out-of-pocket costs associated with healthcare services, and often covering preventative care, routine check-ups, and specialized treatments, thereby facilitating access to a wide range of healthcare services (Bodenheimer, 2005; Buchmueller et al., 2005).

Cultural differences also contribute, as wealthier individuals may place a higher value on regular check-ups and preventative care, which leads to higher healthcare utilisation among the affluent (Mechanic, 2002). The method of data collection via interviews could introduce response bias; wealthier individuals might be more likely to report their healthcare utilisation accurately, or there could be differences in how comfortable various socioeconomic groups feel about disclosing their health service usage (Sudman & Bradburn, 1974). This potential bias should be considered when interpreting the results. Collectively, these factors create a substantial disparity in healthcare access and utilisation between wealthier and lower-income groups, underscoring the need for targeted policies to address these inequities.

Income inequality remains significant in Sabah, and despite a noticeable decline in overall poverty rates over recent decades, rural areas continue to face higher poverty rates compared to urban areas (Ministry of Economy Malaysia, 2023), exacerbating healthcare access challenges. Sabah reports the highest poverty incidence in Malaysia at 19.5%, significantly surpassing the national rate of 5.6%, with rural areas bearing a disproportionate burden at 31.1% compared to 12.5% in urban areas (Department of Statistics Malaysia, 2020b). Additionally, Sabah has consistently high unemployment rates, ranging between approximately 5-8% over the past decade, about twice the national average. On top of that, the Institute for Public Health highlights Sabah as having one of the highest incidences of low health literacy among individuals aged 18 years and older (Institute for Public Health Malaysia, 2019). This combination of high poverty, high unemployment, and low health literacy, especially in rural areas, underscores the crucial link between socioeconomic factors and healthcare utilisation.

Geographic healthcare accessibility in Sabah presents a multifaceted challenge due to its diverse terrain, scattered population settlements, and infrastructure limitations. The state's expansive geography, encompassing remote rural areas and isolated islands, poses significant barriers to accessing healthcare services (Oo Tha Naing et al., 2020). Poor road

conditions and limited public transportation options further hinder healthcare access for remote communities (Ladin et al., 2020). The high prevalence of low-income households exacerbates these issues, as indirect costs like travel expenses can deter individuals from seeking necessary care. While urban centres like Kota Kinabalu may have relatively well-equipped healthcare facilities, rural and remote areas often face shortages of infrastructure, medical professionals, and essential supplies. Sabah's cultural and linguistic diversity adds complexity, as healthcare services may not always be culturally sensitive or accessible to indigenous populations (UN Permanent Forum on Indigenous Issues (UNPFII), 2015).

Accessing public hospitals can involve high fees, creating financial challenges, especially for low-income households. Specialist consultations range from RM 30 to RM 50, advanced diagnostic tests like MRI scans cost between RM 300 and RM 700, and surgical procedures vary widely, with minor surgeries around RM 100 and major ones potentially costing several thousand-ringgit (Governtment of Malaysia, 1951; Ministry of Health Malaysia, 2015). These costs, along with additional travel expenses, are particularly taxing for the low-income group. The combined financial burden of medical fees and travel can deter necessary care, explaining why Nabawan's HI tends to be more pro-rich, highlighting the need for targeted financial support and improved infrastructure to ensure more equitable healthcare access for all Malaysians.

The Malaysian government has taken proactive measures to improve healthcare accessibility, particularly in underserved regions like Sabah. Initiatives such as mobile clinics, flying doctor services (Koshy et al., 2013), 1Malaysia Clinics (Manual et al., 2014), the PeKa B40 Programme, and Skim Perubatan Madani (ProtectHealth, 2024) play a vital role. These efforts bring essential services to remote areas, making healthcare more affordable for vulnerable populations. By addressing both financial and logistical barriers, these programs aim to enhance healthcare equity and improve overall health outcomes in Sabah and other underserved regions.

Despite these initiatives, significant challenges persist in Sabah. Addressing these challenges effectively requires comprehensive strategies that encompass infrastructure development, capacity building for the healthcare workforce, health education programmes, and financial assistance initiatives. Only through such holistic approaches can equitably access to healthcare be improved for all residents of Sabah.

The "Residual" component in healthcare utilisation inequality analysis signifies the portion of the concentration index not accounted for by included variables, indicating unexplained disparities. Factors within the healthcare system itself, such as inefficient resource allocation and fragmented delivery systems, alongside cultural beliefs and social norms, contribute to disparities in healthcare access and utilisation (Zhang et al., 2022). Despite methodological limitations and variations in service coverage, this study illuminates disparities in healthcare utilisation within rural Sabah, emphasising the urgency of targeted policy interventions to rectify these inequities.

CONCLUSION

The expected utilisation of health services in Nabawan, based on standardised needs, is nearly equitable according to the horizontal equity index. This indicates that residents with similar levels of need for outpatient or inpatient care generally have equal access to healthcare services. Although wealthier individuals are slightly more likely to use these services, the difference is minimal.

Health service utilisation in Nabawan is generally better than in other rural areas

reviewed in the literature, indicating relatively good access to basic services. However, disparities may exist in the availability and quality of specialised care, such as cancer treatment, which often requires costly and time-consuming travel to urban centres. The variability in healthcare quality, with some clinics lacking resources for complex conditions, further exacerbates these issues. To address these disparities, comprehensive surveys and improved data collection methods are needed to accurately represent healthcare needs and service availability in Nabawan. This information will help policymakers and healthcare providers develop targeted interventions to enhance healthcare access and quality for all residents.

The horizontal equity index provides valuable insights for policymakers and healthcare stakeholders. It highlights areas where disparities in healthcare access exist and guides the development of targeted interventions to reduce these inequities, ensuring that everyone, regardless of socioeconomic status, has equitable access to healthcare services.

Effectively addressing these challenges requires a comprehensive approach. This includes developing infrastructure, training and deploying healthcare workers, initiating community outreach programmes, and fostering collaboration between government agencies, non-profit organisations, and local communities. By working together, we can ensure that all residents of Sabah have fair and equal access to the healthcare services they need.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethics approval was obtained from the Medical Research Ethics Committee, Faculty of Medicine and Health Sciences, Universiti Malaysia Sabah. The approval code is JKEtika 4/17(2). Written informed consent was obtained from all the participants.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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