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THE EFFECTS OF COMMUTING TO THE WORKPLACE ON THE QUALITY OF LIFE OF LOW-INCOME EMPLOYEES

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ABSTRACT

Background and Purpose: It is crucial to take into account the repercussions of mobility. The aim of this study was to investigate the impact of commuting to work on individuals from the low-income population in the island area of Penang State, Malaysia.

Methodology: The study utilized a combination of quantitative and qualitative procedures, employing a mixed methods approach. The quantitative aspect was distributing a questionnaire to 306 low-income urban workers. Concurrently, the qualitative component entailed conducting comprehensive interviews with a subgroup of 10 employees who consistently travel over 15 km to their place of work.

Findings: The study's findings suggest that a substantial majority of the participants, precisely 89.21%, demonstrate a considerable dependence on their own vehicles. Only a small fraction of persons, specifically 5.56%, opt to employ public transit for commuting to their workplace. The findings suggest that health challenges have a greater impact on the impacts of commuting, compared to decreases in work performance and the existence of a mental illness.

Contributions: Hence, policymakers must prioritize the inclusion of measures to decrease travel duration when developing sustainable transport regulations. This is crucial in promoting sustainable mobility among low-income urban workers and addressing health concerns associated with their daily journey to work.

Keywords: Effects of commuting, commuting to the workplace, quality of life.

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1.0 INTRODUCTION

The Sustainable Development Goals (SDGs) encompass a set of 17 goals that serve as a pressing global mandate for nations to formulate plans aimed at enhancing the overall standard of living. The United Nations (2016) highlights the interconnectedness of SDG 11 and SDG 3 as complementary approaches in the pursuit of developing sustainable and habitable urban areas, while also fostering sustainable communities. Pursuing sustainable transport and mobility is one of the SDG goals. Therefore, it is crucial for all nations to provide precedence to the advancement of sustainable transport in order to guarantee that the populace of the nation may reap the advantages of sustainable mobility, thereby enhancing their overall well-being and quality of life. Sustainable mobility is expected to facilitate economic growth within a nation, while the adoption of unsustainable mobility practises can result in a range of mobility issues, notably traffic congestion, which in turn escalates commuting costs and extends commuting time (Fattah et al., 2020). The significant cost associated with mobility has the potential to impact low-income populations, leading to financial limitations. In contrast to affluent commuters who possess the ability to choose from various transportation options and possess financial means to accommodate the expenses associated with longer-distance commuting.

Hence, the primary inquiry of this study pertains to the consequences experienced by low-income urban workers in Penang Island, Malaysia as a result of their everyday commuting activities to their workplaces. To ascertain the solution to the inquiry, it is important to discern the challenges commonly faced by low-income urban workers as a result of their commute to the workplace. Therefore, this article seeks to examine the context of commuting to work for low-income urban workers in Penang Island, Malaysia. The study aims to identify the impact in this regard and determine the factors that have the greatest impact on their well-being and quality of life.

Numerous contemporary research have also been conducted on the same topic in various countries on a national scale. In their study, Han et al. (2023) investigated the impact of extended commuting durations on individuals' quality of life in China. The findings of their research revealed that individuals who engage in longer commutes tend to experience diminished levels of satisfaction with both their professional and personal lives. Furthermore,

these individuals are more susceptible to health-related difficulties and a sedentary lifestyle. In a recent study conducted by Shi et al. (2022), it was found that the presence of significant traffic congestion resulting in prolonged commuting times has been associated with adverse health outcomes among low-income workers in Chengdu, China. Furthermore, the study conducted by Clark et al. (2020) revealed a significant association between extended commuting duration and diminished levels of job satisfaction, leisure satisfaction, and susceptibility to stress in the context of England. These adverse outcomes have been identified as potential contributors to compromised mental well-being. In a study conducted by Ali et al. (2021) in Dhaka, Bangladesh, a notable prevalence of health complaints arising from extended commuting and traffic congestion was observed.

Recent research has demonstrated that extended commuting significantly impacts individuals' overall well-being and quality of life. The current unsustainable circumstances necessitate the consideration of comprehensive measures by policymakers and planners to address the underlying issues associated with urban mobility. This study aims to address the existing limitations in the literature regarding the effects of commuting, specifically focusing on the challenges faced by low-income workers in a densely populated state with limited access to efficient and affordable public transportation options. Therefore, this study's findings will yield insights into the effects of low-income workers' mobility and identify the elements that require mitigation. Therefore, this will provide policymakers with vital information to enhance the strategic planning of mobility initiatives for low-income workers.

Furthermore, opting for a lengthy commute entails several repercussions, including weariness, stress, limited leisure time, diminished health, and other issues that pose a threat to their overall well-being and quality of life. The combination of excessive tiredness and stress resulting from lengthy commutes can have a detrimental impact on both physical and mental well-being (Gimenez-Nadal & Molina, 2019). Furthermore, individuals who endure lengthy commutes and consistently find themselves ensnared in traffic congestion are also susceptible to hypertension, a condition that, if left untreated, can result in heightened psychological strain and diminished overall life contentment (Chng et al., 2016). Regularly commuting long distances to the job, particularly during peak hour traffic, can have detrimental effects on commuters' mental well-being, subjecting them to stress and increasing their risk of road accidents (Nuttman, 2022). Furthermore, engaging in prolonged periods of sitting on a regular basis is considered a form of sedentary activity, which significantly contributes to the risk of developing health problems (Owen et al., 2010). This sedentary behaviour include activities

such as sitting at work or school and commuting by car, which are awake activities that involve minimal energy expenditure.

2.0 LITERATURE REVIEW

The impact of commuting on individuals' quality of life has gained considerable attention in urban studies, particularly with regard to low-income workers. Commuting, a necessary activity for many workers, involves challenges such as long travel times, financial burden, and the toll on physical and mental well-being.

2.1 Commuting and Quality of Life

Quality of life (QoL) is a multifaceted concept that encompasses an individuals' or community's overall well-being, satisfaction, and happiness. It is influenced by various factors, including health, education, employment, wealth, safety, and the environment. The World Health Organization (WHO) defines QoL as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns."

2.1.1 Impacts of Commuting

Commuting significantly influences the quality of life for low-income employees, particularly in urban settings like Penang Island, Malaysia. The daily journey to work can affect various aspects of well-being, including physical health, mental health, and overall life satisfaction. Extended commuting times are associated with increased stress and fatigue, which can negatively affect employees' health and productivity. Studies have shown that longer commutes contribute to stress, anxiety, fatigue, and other psychosomatic illnesses (Joshi & Kheng, 2019). For low-income workers, the effects of commuting are often more pronounced due to limited access to affordable housing near employment centers. This spatial mismatch forces them to reside in areas farther from their workplaces, leading to longer and more taxing commutes. The absence of a balance between employment availability and housing can significantly harm the quality of life and overall welfare of those in low-income categories (Rosli et al., 2024a). Commuting and Physical Health Several studies have examined how commuting affects physical health, highlighting the toll of long journeys on workers, particularly those in lower-income brackets. According to a study by De Vos et al. (2020), long commuting times have been linked to increased risks of cardiovascular diseases, obesity, and general fatigue. These effects are amplified for low-income workers who may not have the financial means to access

health care or adopt a healthier lifestyle (Besser & Dannenberg, 2022). In line with this, research by Bagley et al. (2023) emphasizes that long commutes exacerbate health disparities, particularly among marginalized populations. A study by Sener et al. (2021) similarly finds that long-distance commuters experience more frequent physical ailments, suggesting a critical need for policies that address these health concerns for vulnerable groups.

2.1.2 Factors Influencing Commuting

Several factors influence the commuting experiences of low-income employees, including housing affordability, transportation infrastructure and flexible work arrangements. The escalating cost of housing in urban areas compels low-income individuals to seek more affordable housing in suburban regions, often resulting in longer commutes. This compromise between housing affordability and job accessibility can adversely affect their quality of life (Rosli & Samat, 2025). The availability and quality of public transportation options are crucial. Inadequate or inefficient public transit systems can force low-income workers to depend on private vehicles, exacerbating traffic congestion and increasing commuting times. Enhancing transportation policies to provide affordable and efficient public transport is essential for improving the commuting experience of low-income employees (Rosli et al., 2023). Implementing flexible work arrangements can mitigate the negative effects of commuting. Allowing employees to work from home or adjust their work hours can reduce commuting stress and improve overall well-being. Such arrangements have been linked to better health outcomes and increased job satisfaction (Joshi & Kheng, 2019). The quality of life for low-income employees in Penang is significantly influenced by commuting patterns. Addressing issues related to job accessibility, housing affordability, transportation choices, and work flexibility is essential to enhance the well-being of these workers. Policymakers and employers should consider these factors to create supportive environments that improve the quality of life for low-income employees.

2.1.3 Commuting and Mental Health

The mental health implications of commuting are also significant. For low-income workers, long hours spent commuting to and from work can lead to increased stress, anxiety, and depression (Cao & Xu, 2022). These workers often endure overcrowded, unreliable public transport, which exacerbates these mental health challenges (Kim & Lee, 2021). A significant body of literature has suggested that the adverse mental health impacts are more pronounced

for those in lower socioeconomic strata, with factors such as job insecurity and lack of control over commute modes contributing to their vulnerability (Graham & Noland, 2022).

Work Performance and Commuting Research has also explored how commuting influences work performance. A key issue identified in several studies is the relationship between long commuting times and reduced productivity at work (Moudon et al., 2021). Low-income workers, who often cannot afford premium transport options, tend to face longer, more stressful commutes, leading to physical and cognitive exhaustion upon arrival at work (Frank et al., 2023). A study by Sato et al. (2022) suggests that the burden of commuting reduces the efficiency of low-income employees, resulting in lower overall work satisfaction and performance.

2.2 Transportation Modalities for Low-Income Workers

Sustainable mobility refers to transportation systems designed to meet the current mobility needs of individuals and societies without compromising the ability of future generations to meet their own needs. It aims to reduce the environmental impact of transportation by minimizing greenhouse gas emissions, energy consumption, and pollution, while promoting the use of alternative, low-emission vehicles such as electric cars and public transport. Furthermore, sustainable mobility encompasses social equity by ensuring that all individuals, including marginalized groups, have access to affordable and efficient transportation options. It also focuses on economic efficiency by reducing congestion and enhancing the overall productivity of transportation networks. To achieve these goals, sustainable mobility integrates a combination of strategies such as promoting active transport (walking and cycling), encouraging public transit usage, implementing cleaner technologies, and leveraging smart solutions for transportation management (World Bank, 2017; MDPI, 2020; Neste, n.d.).

Sustainable mobility refers to transportation systems that prioritize reducing environmental impacts while promoting social equity and economic sustainability. This concept includes strategies such as encouraging non-motorized transport (walking and cycling), enhancing public transportation, adopting electric and hybrid vehicles, and integrating Mobility as a Service (MaaS) platforms. Sustainable mobility aims to minimize carbon emissions, reduce air pollution, and decrease dependency on fossil fuels, contributing to cleaner urban environments (SWARCO, 2023). The relationship between sustainable mobility and quality of life is significant as it improves public health by promoting physical activity, reduces pollution-related health risks, fosters social equity by ensuring access to transportation for vulnerable populations, and enhances economic efficiency by reducing

transportation costs and traffic congestion (Yunex Traffic, 2024). In sum, sustainable mobility not only mitigates environmental challenges but also enhances overall well-being by improving health, equity, and economic opportunities (Aleatica, 2023).

2.3 Commuting Patterns in Penang Island

In Penang Island, low-income workers predominantly rely on privately owned vehicles, such as motorcycles, for commuting. This preference is driven by the need for cost-effective and time-efficient transportation options. A study revealed that individuals from low-income backgrounds exhibit a significant reliance on privately owned vehicles, with a preference for motorcycles due to their affordability and efficiency (Rosli et al., 2024b).

Dependence on Private Vehicles The findings of the study in Penang reveal a substantial reliance on private vehicles, with 89.21% of the respondents using their own cars for commuting. This finding is consistent with global trends where low-income workers may prefer private vehicles due to the unreliability and discomfort of public transport (Van Oort et al., 2023). Low-income individuals in many urban areas report that the perceived inconvenience and the lack of direct routes of public transit systems lead them to opt for private car use, even when it is economically burdensome (Sullivan & Nelson, 2022). Additionally, the costs associated with owning a private vehicle can impose a significant financial strain, further exacerbating the socio-economic disparities (Lo & Shiwaku, 2023).

Public Transport Challenges In contrast, only a small proportion of the participants in the study used public transportation, which highlights the limitations and challenges of public transit for low-income workers. Multiple studies have highlighted the inadequacy of public transportation options for low-income populations, such as overcrowded buses, limited routes, and long waiting times (Loo et al., 2022). As public transport often fails to meet the needs of these workers, they face compounded disadvantages when commuting, such as poor time management and increased stress levels (Cervero et al., 2021).

2.4 Job Demands-Resources (JD-R) Model

The relationship between the effects of commuting to the workplace on the quality of life of low-income employees and the Job Demands-Resources (JD-R) Model can be examined through the lens of how commuting acts as a job demand and influences employee well-being (refer Figure 1). The JD-R model, proposed by Bakker and Demerouti (2007), suggests that the demands of a job, such as time pressure, workload, and commuting, interact with available

resources such as social support and job autonomy, to influence employee outcomes like stress, job satisfaction, and overall quality of life.

2.4.1 Commuting as a Job Demand

Commuting, particularly for low-income employees, can be seen as a significant job demand within the JD-R model. Commuting typically requires a considerable amount of time, energy, and emotional effort, which can lead to strain and negatively impact employees' overall well-being (Van der Meer et al., 2018). The prolonged commuting time, coupled with the stress of traffic or poor infrastructure, can drain the resources that employees need to cope with other work-related demands, leaving them feeling fatigued, stressed, and less engaged at work (Mäkelä et al., 2020). For low-income workers, commuting can be particularly burdensome due to economic constraints, which may force them to live farther from their place of work, resulting in longer, more stressful commutes (Chandran et al., 2020). These prolonged commutes have been shown to lead to negative effects on physical and mental health (Groot et al., 2019) and a diminished quality of life, contributing to burnout and work-life imbalance (Mäkikangas et al., 2020).

2.4.2 Commuting and Job Resources

In contrast, the JD-R model also emphasizes the importance of job resources. For low-income employees, access to resources such as social support, flexible work hours, and organizational policies that reduce commuting stress can help mitigate the negative impact of long commutes. In this context, organizations that provide resources, such as telework options or flexible work hours, help employees balance the demands of commuting and their personal lives, thereby improving their overall quality of life (Nieuwenhuijsen et al., 2014). Moreover, low-income employees who face limited resources may experience lower levels of engagement and increased exhaustion because their resources such as energy and time, which are depleted by the demands of long commutes. As a result, the balance between job demands and resources is essential in understanding the impact of commuting on their well-being (Xanthopoulou et al., 2007).

2.4.3 Quality of Life and Well-being

The relationship between commuting and quality of life can be viewed through the JD-R model's perspective on work-life balance and employee well-being (refer Figure 1). According to the JD-R model, when job demands like commuting outweigh available resources,

employees are more likely to experience negative outcomes such as lower job satisfaction, higher stress, and poor physical and mental health (De Lange et al., 2003). In contrast, if job resources are optimized, employees may recover from job stress and improve their quality of life despite the presence of commuting demands. In summary, the JD-R model provides a framework for understanding how the demands of commuting can affect low-income employees' quality of life. By viewing commuting as a job demand, and acknowledging the role of available resources in mitigating its effects, organizations can better support employees and improve their well-being. The model also highlights the importance of balancing job demands and resources, especially for low-income workers who face unique challenges in managing both work and life responsibilities.

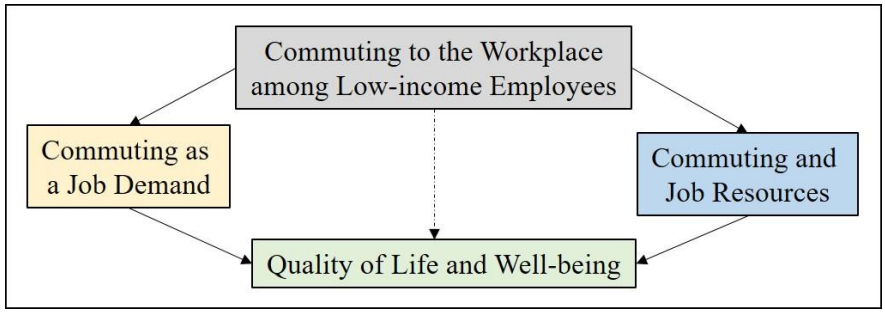

Figure 1: A theoretical framework of the relationship the effects of commuting to the workplace on the quality of life of low-income employees and the Job Demands-Resources (JD-R) model

3.0 METHODOLOGY

This study explores the effects of commuting on the quality of life of low-income employees in Penang Island, Malaysia (refer Figure 2), with the aim of understanding the relationship between long-distance commuting and the well-being of individuals from economically disadvantaged backgrounds. Penang Island, located in the state of Penang, Malaysia, serves as the geographical focus for this research. Penang is known for its rapid urbanization, with Georgetown in the southwestern district being the first area to undergo substantial development since its founding in 1786. Over time, urban expansion reached the northeastern district, including Bayan Baru, by the early 1970s (Geo Spatial Consultants Sdn. Bhd., 2000). The state of Penang achieved 90.8% urbanization by 2010, making it the second-most urbanized state in Malaysia (Zuan, 2014). As of 2018, Penang is the second-largest city in the country by population, underscoring its significance as a key economic hub (Mok, 2016).

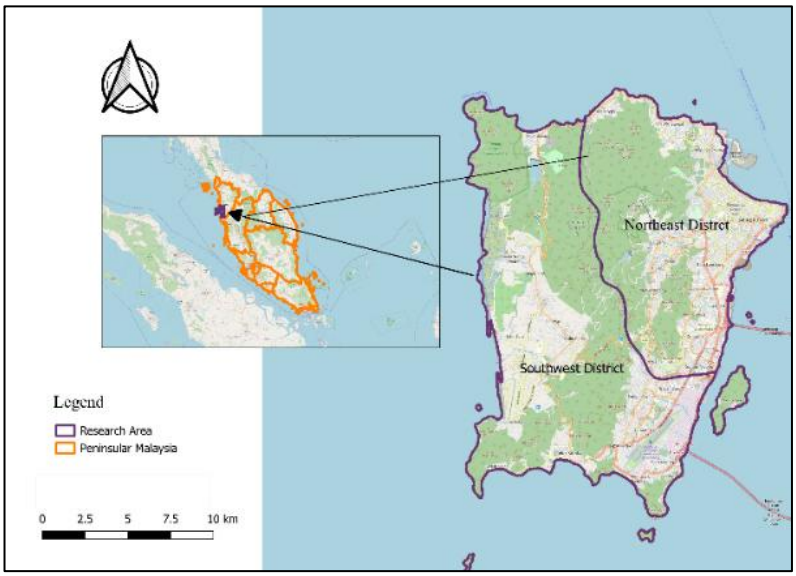

Figure 2: Map of Northeast and Southwest Districts, Penang, Malaysia

3.1 Data Collection Method

To gain a comprehensive understanding of the effects of commuting on low-income employees' quality of life, both quantitative and qualitative research methods were employed. The mixed-methods approach allowed for a nuanced exploration of the topic, combining the statistical breadth of quantitative data with the depth and richness of qualitative insights.

3.1.1 Quantitative Approach

A total of 306 respondents were selected using a stratified random sampling technique from a list of low-income households with household incomes below MYR 5249 (USD 1120.50), as outlined in the eKasih Penang State Welfare Assistance Program data for 2016. This dataset identified 1546 low-income households on Penang Island. Using the Morgan Table (refer Table 1), which calculates an optimal sample size for a given population size (Yamane, 1967), a sample size of 306 was determined to be representative of the larger population of 1546 households.

The questionnaire used in this study was designed based on a comprehensive literature review of studies on commuting, quality of life, and socio-economic status. The instrument included both closed- and open-ended questions to gather data on respondents' commuting patterns, perceived impacts on quality of life such as work-life balance, health, and time use; and socio-demographic characteristics. The reliability of the questionnaire was assessed through a pilot study involving 30 participants from similar socio-economic backgrounds,

yielding a Cronbach's alpha coefficient of 0.85, indicating high internal consistency. Furthermore, face validity was ensured by consulting with experts in transportation studies and social sciences.

3.1.2 Qualitative Approach

In-depth qualitative interviews were conducted with 10 participants who regularly commute more than 15 kilometers to their workplace. These participants were purposefully selected from the pool of 306 quantitative respondents based on their commuting distances, ensuring that those who experience longer, more taxing commutes were included. The rationale for selecting 10 interviewees was informed by recommendations from qualitative research methodology (Guest et al., 2006), which suggests that thematic saturation, a point at which no new information or themes emerge, can typically be reached with small sample sizes (usually 10-12 participants) when the aim is to explore a specific phenomenon in depth.

The interviews aimed to capture a wide range of commuting experiences, with a focus on the perceived effects of commuting on physical and mental well-being, time management, and overall quality of life. The interview guide was semi-structured, allowing flexibility for participants to express their personal experiences while ensuring that key themes, such as the impact of commuting on social relationships, work productivity, and health, were explored. Interviews were audio-recorded, transcribed verbatim, and analyzed using thematic analysis, as described by Braun and Clarke (2006), to identify key themes and patterns across the interviews.

Table 1: Morgan sampling table

Sample	Population
302	1400
306	1500
310	1600
313	1700

(Modified from: Krejcie & Morgan, 1970 in KENPRO, 2012)

3.1.3 Data Analysis

Quantitative data were analyzed using descriptive statistics to summarize the characteristics of the sample and inferential statistics, such as correlation analysis, to examine the relationship between commuting distance, quality of life indicators, and socio-economic variables. For the

qualitative data, thematic analysis was employed to identify recurring themes and to understand the subjective experiences of participants in relation to their commuting habits and its impact on their quality of life.

3.1.4 Limitations

This study acknowledges several limitations. First, the use of self-reported data in both the quantitative and qualitative phases may introduce bias, as participants may be influenced by social desirability or inaccurate recall of their commuting experiences. Second, the study is geographically limited to Penang Island, which may limit the generalizability of the findings to other regions with different urbanization and commuting patterns. Additionally, the study's focus on low-income employees may not fully capture the experiences of individuals from other socio-economic backgrounds, who may have different commuting behaviors and quality of life perceptions.

4.0 FINDINGS AND DISCUSSION

4.1 Demographic Characteristics

The demographic characteristics that were examined in this study are presented in Table 2. The dominance of male respondents in this study (67.97%) is consistent with broader gender trends seen in several Southeast Asian nations, where male participation in certain studies tends to be higher, especially in contexts related to work or socio-economic challenges (Pew Research Center, 2022). Male participation could be influenced by societal factors, including traditional gender roles in family structures and economic opportunities.

The age distribution observed (52.61% of respondents in the 18–28-year range) suggests a youthful demographic. A similar trend was found in studies on socio-economic issues and employment among young adults, where youth remain highly represented in low-income categories (Ng et al., 2021). The higher percentage of young adults can also be attributed to the growing focus on education and employment among younger populations in Malaysia (Kamarudin & Ismail, 2023). Furthermore, the gradual decline in the proportion of older adults (1.96% in the 59–68 age group) mirrors national demographic trends where younger populations are often more likely to engage in surveys focused on social or economic issues.

The preponderance of Malay respondents (83.66%) is reflective of the ethnic composition of Malaysia, where the Malay ethnic group is the largest. This proportion is also consistent with findings in other studies involving national surveys, where Malay participants

are frequently the most represented group (Yusof & Hani, 2020). The smaller presence of the Chinese and Indian populations aligns with their relative proportions in the country's demographics.

The findings regarding marital status (57.52% married, 37.25% unmarried) reflect broader social trends in Malaysia, where marriage is a significant social institution, especially within Malay communities (Jabatan Perangkaan Malaysia, 2023). The proportion of married individuals might also point to a tendency to form households early, typical among lower-income or rural populations, as seen in similar demographic studies (Rahman & Ahmad, 2022).

The overwhelming proportion of respondents from low-income households (91.83% with a monthly income below MYR 2500) is consistent with broader findings on poverty and income distribution in Malaysia. The study's emphasis on low-income individuals aligns with the national poverty rates, which have been found to be disproportionately high among rural Malay populations (Hasbullah et al., 2022). Recent reports highlight that many Malaysians, particularly those in rural areas, remain trapped in low-income brackets despite national economic growth (Mokhtar, 2023).

Table 2: Demographic characteristics

Characteristics	n	Percentage (%)
Gender		
Male	208	67.97
Female	98	32.03
Age		
18-28 years old	161	52.61
29-38 years old	85	27.78
39-48 years old	37	12.09
49-58 years old	17	5.56
59-68 years old	6	1.96
Ethnicity		
Malay	256	83.66
Chinese	15	4.9
Indian	35	11.44
Marital Status		
Not married yet	114	37.25
Married	176	57.52
Divorcee/widow/widower	16	5.23
Household Income		
Less than 2,500MYR	281	91.83
2,500MYR - 3,169MYR	21	6.87
3,170MYR-RM3969MYR	4	1.30

4.2 Commuting among Low-income Employees

In order to examine the commuting distance, specifically the routine followed by the respondents when travelling to their workplace, the researchers collected data on the distance between their homes and workplaces. This information is presented in Table 3. The findings of this study indicate that a majority of the participants travel a distance of up to 30 km to reach their workplace. Specifically, 44.77% of the respondents reported commuting within a range of 1 to 15 km, while 40.85% reported commuting within a range of 16 to 30 km. In the study, it was found that a proportion of 10.13% of the participants reported commuting a distance of 31 to 45 km to their workplace on a daily basis. Additionally, a smaller percentage of 4.25% indicated that their daily commute ranged from 46 to 60 km.

The study's findings on commuting distances align with national and regional transportation data. According to Numbeo, the average commuting distance in Malaysia is approximately 18.88 km, with an average travel time of 37.23 minutes (Traffic in Malaysia,

n.d.-b). In Penang, the average commute is about 20.17 km, taking approximately 34.78 minutes by car. These figures suggest that a significant portion of commuters in Malaysia and Penang travel distances similar to those reported in this study. The study's finding that 44.77% of respondents commute within 1 to 15 km and 40.85% within 16 to 30 km is consistent with the national average of 18.88 km. The 10.13% commuting 31 to 45 km and 4.25% commuting 46 to 60 km are higher than the national average, indicating that these respondents may be outliers or that the study sample includes areas with longer commutes. These comparisons suggest that the study's findings are consistent with broader commuting patterns observed in Malaysia and Penang.

Table 3: Distance from home to the workplace

Distance	n	Percentage
1-15km	137	44.77%
16-30km	125	40.85%
31-45km	31	10.13%
46-60km	13	4.25%

Subsequently, Table 4 presents the anticipated selection of transport modes for commuting to the workplace as reported by the participants. Evidently, a significant majority of 89.21% of the participants rely on private vehicles for transportation. A mere 5.56% and 5.23% of the participants, correspondingly, utilise public transportation and employer-provided transportation as their means of commuting to their place of employment. This findings is align with a recent research on commuting patterns in Malaysia, which examined commuting behaviors in Kuala Lumpur. That study revealing that many workers face challenges when traveling from suburban areas to urban centers. The research highlighted that public transportation was often insufficient, leading individuals to prefer driving privately owned cars (Zahari et al., 2023). This preference for private vehicles suggests that a significant portion of commuters travel longer distances to reach their workplaces.

Table 4: Transport mode choice for commuting to the workplace

Types of Transport Mode	n	Percentage
Public Transport	17	5.56%
Private Transport	273	89.21%
Employer's Transport	16	5.23%

The analysis of the relationship between transport mode choice and commuting time, with the aim of minimizing travel time, involved the examination of a cross-tabulation between these variables. The results of this analysis are presented in Table 5. Approximately 51.63% of the participants reported a one-way commuting time to their workplace of less than 30 minutes. In contrast, a significant proportion of the participants, specifically 41.50%, reported that their daily commute to their place of employment falls within the range of 31 to 60 minutes. A mere 5.56% of individuals engage in a daily commute lasting between 61 and 90 minutes, while a mere 1.31% endure a commute lasting between 91 and 120 minutes to reach their place of employment. The cross-tabulation data presented in this study examines the relationship between the choice of the fastest mode of transport and the duration of commuting. It is observed that a significant majority, specifically 47.71%, of the participants who use private transport for commuting complete their journeys in less than 30 minutes. This assertion can be substantiated by the research conducted by Vale (2013), which revealed that the distance of the commute plays a significant role in influencing individuals to opt for private transportation. This is because individuals tend to select faster modes of transportation in order to minimize their commuting duration.

Table 5: Cross-tabulation between transport mode and commuting time to the workplace

Transport Mode	Commuting Time [n (%)]			
	< 30 minutes	31-60 minutes	61-90 minutes	91-120 minutes
Public Transport	6 (1.96)	6 (1.96)	4 (1.31)	1 (0.33)
Private Transport	146 (47.71)	115 (37.58)	9 (2.94)	3 (0.98)
Employer's Transport	6 (1.96)	6 (1.96)	4 (1.31)	0 (0.00)
Total	158 (51.63)	127 (41.50)	17 (5.56)	4 (1.31)

4.3 The Effects of Commuting among Low-income Employees

This study aimed to examine the effects of commuting on individuals' well-being and work performance. Specifically, the analysis focused on three primary areas of concern: health, emotional well-being, and job performance. The present study employed the Friedman test to assess the relative impact of three major problems on the respondents. According to the

findings presented in Table 6, the Friedman test indicates that the obtained p-value is less than 0.05, specifically 0.035. This value signifies the validity of the conducted test, thereby establishing its suitability for generalization. In the context of commuting to the workplace, the findings of the Friedman test reveal that health problems are the most susceptible issues among the respondents, based on the highest mean rank value. According to Table 7, the average rank for health issues is 2.04, closely followed by the prevalence of mental disorders at 2.03. Additionally, work performance deterioration is ranked at 1.93. Hence, it can be inferred that a majority of the participants experience health issues as a result of their daily commute to their respective workplaces. This conclusion is consistent with the findings of Clark et al. (2020), who observed a correlation between increased commuting time and negative outcomes such as reduced job satisfaction, decreased leisure time, heightened stress levels, and compromised mental well-being among employees.

Table 6: Test statistics of Friedman test for commuting impacts among respondents

Test Statistics[a]	
N	306
Chi-Square	6.683
df	2
Asymp. Sig.	0.035

Table 7: Friedman test for commuting impacts among respondents

Descriptive Statistics					
Types of Problems	Mean	Mean Rank	Std. Deviation	Minimum	Maximum
Having health problems	44.49	2.04	43.301	1	88
Work performance declines	39.90	1.93	43.100	1	88
Having a mental disorder	40.29	2.03	43.034	1	88

Subsequently, a correlation analysis was conducted to ascertain the influence of various factors on the health issues reported by the participants. Specifically, the mobility parameters of distance between the respondents' residences and workplaces, as well as the duration of their daily commute to work, were individually examined. The correlation coefficients for both factors will be evaluated to determine the most influential factor in determining the health problems experienced by the respondents. Hence, Table 7 presents the association study

conducted using both mobility components. According to the data presented in Table 8, the Pearson correlation coefficient for the distance factor between an individual's home and workplace is 0.510, indicating a statistically significant relationship with a p-value of 0.005. In contrast, the Pearson correlation coefficient for the variable representing commuting time to work is 0.670, with a statistically significant p-value of 0.000. By comparing the correlation values of the two factors, it becomes evident that the component with the greatest influence on respondents' exposure to health concerns is the duration of their commute between their home and workplace. According to the findings of Halonen et al. (2020), there is a suggestion that an extended commute time beyond the typical weekly working hours may be associated with an elevated likelihood of experiencing physical inactivity and sleep disturbances. In addition, Hori et al. (2020) discovered a significant correlation between sleeplessness and extended periods of employment and commuting. According to the study conducted by Jin et al. (2022), it was determined that the extended duration of commuting does not significantly impact the perceived stress levels of young Korean workers. This lack of effect can be attributed to the workers' voluntary decision to opt for longer commuting distances in exchange for greater salaries. However, while doing an analysis of the impact of extended commuting on perceived stress levels, the researchers discovered that individuals who utilise public transportation experience a lower susceptibility to stress compared to those who rely on private vehicles for their daily commute. In a study conducted by Echeverría et al. (2023), a correlation was observed between extended commuting duration and the mode of transportation. Specifically, individuals who utilised bicycles for their commute exhibited improved health outcomes and lower body mass index, even when faced with longer commuting durations.

Table 8: Correlations between having health problems distance and commuting time from home to the workplace

	Pearson Correlation	Sig. (2-tailed)
Distance from home to the workplace	0.510**	0.005
Commuting time to the workplace	0.670**	0.000

In order to investigate the potential association between the respondents' health problems and their chosen method of transportation, a chi-square test was conducted and the results are presented in Table 9. The findings indicate that there is not a statistically significant association

between the selection of transport mode and the health issues reported by participants. This is supported by the Pearson Chi-square value of 0.731, which above the threshold of 0.05, and the minimum expected count of 0.05, which falls below the recommended minimum of 5. Hence, it can be inferred that there is no significant correlation between the respondents' choice of transport mode and the health issues they experience as a result of longer commuting times. Indeed, individuals have health-related issues as a consequence of the extended duration they must allocate for daily commuting to their place of employment. Figure 3 illustrates the distribution of the health impact on the quality of life experienced by low-income workers due to their regular commute to their place of employment. Based on the provided data, it is possible to identify the geographical region that exhibits a concentration of low-income workers who have health issues as a result of their daily commute to work.

Table 9: Chi-square between transport mode and having health problems

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.294[a]	15	0.731
Likelihood Ratio	13.729	15	0.546
Linear-by-Linear Association	2.278	1	0.131

a. 14 cells (58.3%) have expected count less than 5. The minimum expected count is 0.05.

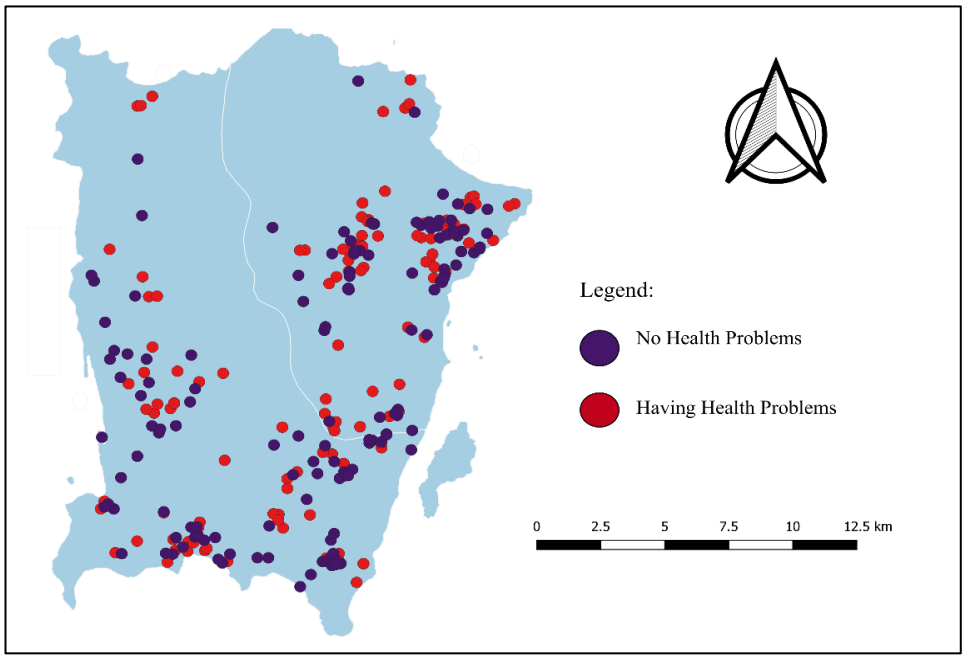

Figure 3: Distribution of low-income workers in Penang Island

The concept of well-being refers to an individual's emotional responses to their life circumstances, whereas quality of life concerns the objective conditions in which an individual finds themselves (Upton & Upton, 2015). As such, understanding well-being requires insight into the emotional reactions people experience in response to their environment. This study seeks to explore the impact of commuting to work on overall well-being, emphasizing the relationship between commuting experiences and commuters' perceptions of their emotional and physical states.

The effects of commuting on well-being can be influenced by various aspects of the commute, such as environmental conditions, travel time, and the mode of transportation used. For instance, respondents highlighted how the conditions encountered during commuting—such as dust, rain, and traffic congestion—can significantly affect their health and well-being. One respondent noted the discomfort caused by dust or rain while commuting by motorcycle:

R3: Male, Government servant, 35 years old, Motorcycle-dependent commuter:

> *"Well, the problem is mainly with the roads. They're often dusty, and when it rains, things get even worse. The dust gets into your eyes, your nose, everywhere. And when it rains, it's just uncomfortable, especially since I ride a motorcycle. I end up getting soaked and dirty. Sometimes, all that exposure leads to me feeling unwell. I even get a fever sometimes. On top of that, when you're stuck in traffic, it just makes everything worse. The air quality isn't great either, and that affects your breathing. After a long commute, I just feel exhausted. It affects my mood too, because I'm already tired from the commute, and then I have to go straight into work. And it's tough when you're sick, but you still have to push through because of the job. Well, if the roads were cleaner, or if there were more shelter on the routes, that would help. It would also be nice if there were less traffic so the commute was quicker. But for now, I just try to prepare for the worst."*

For other respondents, the long commuting time and the stress of traffic congestion were key factors influencing their physical and mental health. R4, a 30-year-old female government employee, discussed the physical strain of commuting and its subsequent impact on her emotional state:

> *"The commute is really draining for me. If I ride my motorcycle, the distance makes my hands go numb. I can barely hold on sometimes. But if I drive my car, the traffic jams are just... they're a nightmare. The stress from being stuck in traffic makes me feel so anxious. And then, when I get home, I'm so tired and frustrated that I lose my mood completely. It feels like I've spent all my energy just trying to get there and back. The backache is a big problem when I ride my motorcycle for too long. It gets to a point where it really hurts. And then the roads are under construction, so there's a lot of dust in the air. It makes it harder to breathe and adds to the exhaustion. When I'm stressed from the traffic, I can get angry easily. It affects my mood, and I just don't feel like myself when I finally get home. It's hard to shake off the frustration. And by the time I'm home, all I want to do is rest, but I feel like I've used up all my energy just on the commute. It's like it's taking a toll on my mental health. I really wish there were better solutions. Maybe smoother traffic flow or alternate routes could help. Less construction would be good, too. But overall, it would just be nice if the commute wasn't such a battle every day."*

Similarly, respondents who relied on cars for commuting also expressed concerns about the negative health impacts of long commutes. R5, a 35-year-old female government employee, discussed the physical toll that commuting took on her body, particularly in terms of fatigue and back pain:

> *"Well, there aren't any critical health problems, but I do feel the toll. I have to wake up really early to get to work, and driving every day makes me so fatigued. Sometimes, if I get stuck in traffic jams, my back starts to ache, which only adds to the exhaustion. By the time I get home, I'm completely drained, and I usually just fall asleep right away. It definitely impacts my energy. After a long commute, I just don't have the energy to do much else. And if I'm busy at the office, the fatigue only gets worse. The more stressed I am at work, the more exhausted I feel when I finally get home. It makes everything harder. The commute alone uses up so much energy, and then when I'm at the office, I don't get much time to rest. By the time I get home, I'm already so tired that I don't have the energy to do anything extra, like spend time with family or take care of things around the house. I've thought about it, but honestly, it's just a part of the routine. I try to make sure I get enough rest when I can, but the early mornings and long hours just seem to be unavoidable right now."*

R10, another female respondent, also noted the physical discomforts of daily commuting, particularly back pain from sitting in traffic:

> *"Well, usually, I get stuck in heavy traffic on my way home. The one thing I really notice is back pain. It comes on while I'm sitting there in the traffic, but it's only for a moment. After that, it goes away, so I don't really feel anything else. It's not constant, but sitting for long periods in traffic definitely makes it worse. It's uncomfortable, and I'm just stuck there with nothing to do but wait. Thankfully, it's temporary, so it doesn't stay with me after I'm out of the car. Other than the traffic itself. It's just the sitting for so long. If I could find a way to avoid the traffic, I think it would help a lot. The back pain is just one of those things that comes with sitting in traffic."*

These accounts highlight that while the health effects of commuting may not reach critical levels, they can significantly affect an individual's emotional and physical state. The long-term accumulation of these minor health issues could potentially escalate into more severe consequences. This is consistent with findings from Kistler (2022), who investigated the impact of commuting duration on work-related, familial, and health-related outcomes. The study found that longer commuting times were significantly associated with burnout symptoms, including physical fatigue, cognitive weariness, emotional exhaustion, and turnover intentions.

Additionally, Raza et al. (2021) examined the consequences of long commuting times and found that commuting contributes to physical inactivity, overweight, and sleep disturbances. These findings underscore the negative implications for health that commuting may have, particularly in terms of long-term effects. While the immediate health consequences of commuting may not be critical, the cumulative effects over time could become detrimental to well-being. The current study also highlights the prominence of certain health issues, such as physical fatigue and back pain, rather than more severe mental health or job performance declines. These findings are significant, yet they must be understood in a broader cultural, social, and economic context. The choice of transportation, such as the reliance on private vehicles over public transportation, may be influenced by factors such as infrastructure limitations, social norms, and economic status. For example, many urban workers in developing economies may prefer private vehicles due to the perceived unreliability or discomfort of public transportation systems (Verma et al., 2021). This is particularly true in areas where public transit options are insufficient or overcrowded, and where private car ownership is seen as a status symbol or a means of greater convenience (Chien & Ding, 2021). To mitigate the potential long-term health consequences of commuting, it is essential for urban workers to incorporate shorter commute times into their daily routines, where feasible. Encouraging flexible work arrangements or the development of more efficient public transport

networks could also help reduce the negative impact of long commutes on well-being (Weiss et al., 2022). In conclusion, while the immediate effects of commuting on well-being are not critical, there is a clear need for long-term strategies to address the cumulative health risks associated with prolonged commuting. Further research integrating both qualitative and quantitative data, as well as a deeper exploration of the cultural and socioeconomic factors influencing commuting patterns, would enhance the robustness of future studies on this topic.

5.0 CONCLUSION

In conclusion, the findings of this study highlight the significant health and emotional well-being challenges faced by low-income urban workers in Penang due to long daily commutes. The study emphasizes that health issues, including physical fatigue and back pain, are the most significant impacts, overshadowing concerns about work performance and mental health. These findings align with broader trends in Malaysia and other developing regions, where the reliance on private vehicles for commuting and the insufficient availability of public transport exacerbate the negative effects on workers. Given the substantial role commuting plays in shaping the health and quality of life for low-income workers, it is essential for policymakers to implement targeted and actionable strategies to address these issues.

First, urban planning and transportation policies should prioritize the development of more efficient and affordable public transportation systems, especially in areas with high reliance on private vehicles. Public transportation infrastructure improvements should focus on reliability, comfort, and coverage, to make it a viable option for more workers. Additionally, policymakers should consider incentivizing employers to provide transportation options or subsidies for low-income workers, which could reduce the financial burden of commuting. Examples of successful implementations of such policies can be found in cities like Bogota, Colombia, where government-subsidized transport for low-income workers has reduced car dependence and improved worker health outcomes (Daher, 2020). Moreover, urban planning initiatives should focus on reducing commuting distances for low-income populations by promoting mixed-use developments and affordable housing closer to employment hubs. This could be facilitated through zoning changes that encourage residential areas near key employment zones, minimizing the need for long commutes. While these policies may require significant initial investment, the long-term benefits, including improved worker health, productivity, and quality of life, would justify the costs. Finally, further research should be conducted to evaluate the feasibility of these recommendations, considering local economic conditions, infrastructure capabilities, and public acceptance. Case studies of similar successful

interventions in Southeast Asia could provide valuable insights for adapting these strategies to the context of Penang and other urban areas in Malaysia. Through these coordinated efforts, the negative impacts of commuting on low-income workers can be mitigated, leading to a healthier, and more productive workforce.

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