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Travel Frequency and Transport Mode Choice among Older Adults in the Klang Valley: Evidence from a Binary Logistic Regression Analysis

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Abstract: *This study examines the determinants of travel behaviour among older adults in the Klang Valley, focusing on weekly travel frequency and transport mode choice. Using survey data from 497 individuals aged 60 years and above, Binary Logistic Regression is applied to identify factors influencing frequent travel and the use of non-private transport modes. The findings show that older men and individuals with higher household incomes are significantly more likely to travel frequently (≥6 trips per week). Medical appointments emerge as the strongest driver of frequent travel (OR = 5.31), highlighting the importance of healthcare-related needs as compulsory mobility drivers in later life. In contrast, chronic illness (OR = 0.33) and walking difficulties (OR = 0.27) substantially reduce the likelihood of frequent travel, underscoring the constraining effects of health limitations on mobility. In terms of transport mode choice, car and motorcycle ownership significantly decrease the likelihood of using public, active, or multimodal transport, reinforcing continued reliance on private vehicles among older adults with access to them. Conversely, possession of the RapidKL concession card significantly increases the probability of using non-private modes (OR = 2.94), indicating the effectiveness of fare subsidies in promoting public and active transport use. Gender differences are also evident, with older women more likely to rely on non-private transport modes than older men. Overall, the findings demonstrate that travel behaviour among older adults is shaped by a complex interaction of individual characteristics, economic capacity, health conditions, and transport accessibility. This study provides empirical evidence to inform more inclusive and age-friendly urban mobility policies that support active ageing in rapidly urbanising Malaysian cities.*

Keywords: Older adults, Travel frequency, Transport mode choice, Urban mobility, Binary logistic regression

1. Introduction

Population ageing is an increasingly prominent global phenomenon and is expected to accelerate by 2030, as the proportion of older adults continues to rise across both developed and developing countries (United Nations, 2020). Malaysia is following a similar demographic trajectory and is projected to become an ageing nation within the next decade. This transition presents substantial challenges for urban planning and public service provision, particularly in

ensuring that cities remain inclusive, accessible, and supportive of the wellbeing of older adults.

Mobility constitutes a core pillar of the active ageing framework proposed by the World Health Organization (WHO, 2002), as the ability to move independently is closely associated with physical health, mental wellbeing, access to essential services, social participation, and autonomy in daily life (Devlin et al., 2017). For older adults, regular travel enables continued engagement in healthcare, social activities, and community participation, all of which are fundamental to maintaining quality of life in later years.

Nevertheless, mobility in older age is often constrained by physiological changes, declining motor function, and health-related limitations, while travel needs increasingly shift towards essential and non-discretionary purposes such as medical appointments and basic shopping (Zakaria et al., 2024). In metropolitan regions such as the Klang Valley, these challenges are further intensified by high dependence on private vehicles, traffic congestion, extended travel distances to public transport nodes, and urban infrastructure that is not yet fully adapted to age-friendly design principles. Although major investments have been made to expand the MRT, LRT, and bus networks, international evidence suggests that older adults continue to encounter barriers related to comfort, safety, information accessibility, and confidence when using public transport systems (Mitra et al., 2021).

Empirical evidence from Malaysia similarly indicates that older adults exhibit a strong reliance on private vehicles, followed by more limited use of public transport and active modes (Abdul Latiff & Mohd, 2023). This pattern raises important questions regarding the underlying factors shaping travel behaviour among older adults in urban settings. In particular, it remains unclear to what extent travel frequency and transport mode choice are influenced by individual characteristics such as gender and age, household resources including income and vehicle ownership, health conditions, and travel cost incentives. Existing studies in Malaysia have largely focused on general travel patterns or descriptive mobility trends, with relatively limited empirical analysis that jointly examines travel frequency and transport mode choice using robust behavioural models.

Accordingly, this study focuses specifically on three key dimensions consistently highlighted in the literature—individual characteristics, household resources, and health conditions—as primary determinants of mobility outcomes among older adults. These dimensions are empirically examined through two behavioural outcomes: weekly travel frequency and transport mode choice. By explicitly integrating these dimensions within a unified analytical framework, the study seeks to provide a more structured and policy-relevant understanding of older adults' travel behaviour in an urban context.

Against this backdrop, this study aims to examine the factors influencing the travel behaviour of older adults in the Klang Valley through two key dimensions: (i) weekly travel frequency and (ii) transport mode choice, specifically distinguishing between exclusive use of private vehicles and the use of public, active, or multimodal transport options. By applying Binary Logistic Regression, this study provides current empirical evidence on the determinants of mobility among older adults within Malaysia's urban transport ecosystem.

The findings of this study are expected to contribute to the literature on ageing and urban mobility by offering a more nuanced understanding of how health, economic capacity, and

transport accessibility interact to shape travel behaviour in later life. From a policy perspective, the results aim to support the development of more responsive, inclusive, and age-friendly urban mobility strategies that promote active ageing and social participation among older adults in rapidly urbanising Malaysian cities.

2. Literature Review

Understanding travel behaviour among older adults requires an integrated examination of how individual characteristics, household conditions, and health status interact to shape both travel frequency and transport mode choice. Previous studies consistently show that mobility in later life is not driven solely by personal preferences, but is strongly influenced by structural constraints, economic capacity, and physical capability. As populations age, these interactions become increasingly complex, particularly in urban environments where accessibility, affordability, and health-related limitations jointly shape daily mobility patterns.

Individual characteristics such as gender, age, education, and ethnicity are widely recognised as key determinants of older adults' travel behaviour. Gender differences are among the most consistent findings, with older men generally exhibiting higher travel frequencies and a stronger reliance on private vehicles compared to older women (Mitra et al., 2021; Rosenbloom, 2001). This pattern is often linked to greater lifetime driving experience, higher vehicle access, and socially embedded gender roles. In contrast, older women are more likely to depend on public transport, active modes, or family assistance due to differences in vehicle access, driving confidence, and caregiving responsibilities.

Age further plays a critical role in shaping mobility outcomes. Numerous studies report a decline in travel frequency with increasing age, particularly beyond the mid-60s, due to reduced physical stamina, retirement, and shrinking activity spaces (Zakaria et al., 2024; Devlin et al., 2017). Older adults tend to prioritise essential trips such as healthcare and daily necessities, while avoiding peak-hour travel, long distances, or unfamiliar environments. Education shows mixed effects, where higher educational attainment does not necessarily translate into higher mobility, as more educated older adults may exhibit stable routines, greater reliance on digital services, and stronger preferences for comfort and safety (Zhang et al., 2021). In multi-ethnic societies like Malaysia, ethnicity and cultural background further shape mobility through variations in family support structures, residential patterns, and attitudes towards public transport (Lejsková et al., 2023).

Beyond individual attributes, household characteristics represent an important structural dimension of older adults' mobility. Income level is consistently identified as a strong predictor, with higher-income older adults exhibiting greater travel frequency and wider access to private transport options (Musselwhite & Murray, 2024; Devlin et al., 2017). From a Rational Choice perspective, economic capacity expands feasible travel options and reduces sensitivity to travel-related costs. Conversely, lower-income older adults often face mobility constraints due to affordability issues and limited transport alternatives.

Vehicle ownership, particularly cars and motorcycles, strongly influences transport mode choice. Access to private vehicles significantly reduces the likelihood of using public or active modes, given the greater comfort, flexibility, and time control they offer (Abdullah et al., 2024; Luiu et al., 2018). However, among older adults, ownership does not always translate into frequent use, as vehicles may be shared within households or reserved for specific trips such

as medical visits. Household size and living arrangements further shape mobility, where co-residing older adults may rely on shared or accompanied travel, while those living alone may face greater constraints due to limited social support.

Health status is widely regarded as one of the most influential determinants of mobility in later life. Chronic illness and functional limitations, particularly walking difficulties, substantially reduce travel frequency and the use of public or active transport modes (Webber et al., 2010; WHO, 2002). Physical capability forms the foundation of elderly mobility, as declining motor function constrains access to transport systems and the ability to navigate urban environments. Walking difficulties pose particular challenges for public and active transport, which often require first- and last-mile walking and exposure to less accessible infrastructure (Zakaria et al., 2024).

At the same time, healthcare needs introduce a contrasting mobility dynamic. Regular medical appointments have been shown to increase travel frequency among older adults, despite physical limitations (Han et al., 2021). These trips represent compulsory mobility, driven by necessity rather than choice, and often involve multimodal travel, accompaniment, or reliance on public and community-based transport services.

Building on these strands of literature, the present study integrates individual, household, and health-related factors within a single analytical framework to examine their simultaneous influence on travel frequency and transport mode choice among older adults. While previous studies have largely examined these dimensions in isolation, empirical evidence that jointly analyses both mobility outcomes within a unified behavioural model remains limited, particularly in the Malaysian urban context. Accordingly, this study applies Binary Logistic Regression to analyse two key dimensions of mobility among older adults in the Klang Valley, contributing empirical insights to the development of age-friendly urban mobility and active ageing strategies.

3. Methodology

3.1 Research Design and Data Collection

This study adopts a quantitative research design using a structured survey to examine factors influencing the travel behaviour of older adults in the Klang Valley. A survey approach was selected as it is appropriate for analysing relationships between individual attributes, household characteristics, health conditions, and mobility outcomes within a large urban population. The questionnaire was developed based on established literature on elderly mobility in both Asian and international contexts to ensure conceptual validity. A pre-test was conducted to assess clarity of language, comprehension of questions, and contextual suitability for respondents aged 60 years and above.

Data collection was conducted using convenience sampling, a non-probability sampling technique commonly employed in social and health-related mobility research involving older populations. This approach allows respondents to be recruited based on accessibility and willingness to participate, particularly when sampling frames for older adults are limited (Ajithakumari, 2024). As a result, not all older adults in the Klang Valley had an equal probability of selection. However, this method was deemed appropriate given time and resource constraints, as well as the practical need to reach older adults directly in community-based settings (McCarthy & Cassidy, 2012).

Respondents were recruited from older adults attending community programmes organised by Urbanice Malaysia and selected local municipal councils at elderly activity centres and community hotspots across the Klang Valley. These settings provided a conducive environment for face-to-face data collection, ensuring respondent comfort and minimising disruption to daily routines.

Ethical approval for this study was obtained from Universiti Putra Malaysia (UPM) on 11 April 2022 under a collaborative research initiative involving Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKM), and Universiti Sains Malaysia (USM), funded by the Ministry of Higher Education (Kementerian Pengajian Tinggi, KPT) through the CoMTAS research grant. All respondents were informed about the purpose of the study, and participation was entirely voluntary. Informed consent was obtained from all respondents prior to data collection.

3.2 Sample Size and Questionnaire Structure

A total of 497 older adults were included in the final dataset after data screening and cleaning procedures, providing an adequate sample size for Binary Logistic Regression analysis. According to methodological guidelines, logistic regression models generally require a minimum of 10 to 20 observations per independent variable to ensure reliable parameter estimation and model stability (Hosmer et al., 2013). Given the number of explanatory variables specified in this study, the achieved sample size exceeds the minimum requirement and allows for robust empirical analysis.

The survey instrument was administered using a structured questionnaire designed to capture multidimensional aspects of travel behaviour among older adults. The questionnaire was developed based on an extensive review of existing studies on elderly mobility and transport behaviour, ensuring conceptual relevance and content validity. It was organised into four main sections. The first section collected information on respondents' individual characteristics, including gender, age, education level, and ethnicity. The second section focused on household characteristics, such as household income, household size, and ownership of private vehicles, specifically cars and motorcycles. The third section captured health-related factors, including the presence of chronic illnesses, walking difficulties, and the need for regular medical appointments. The final section examined travel behaviour, covering weekly travel frequency and transport mode usage.

To ensure the suitability of the questionnaire for the older population, a pre-test was conducted prior to the main survey. The pre-test aimed to evaluate clarity of wording, comprehension of questions, and the appropriateness of response categories for respondents aged 60 years and above. Feedback from the pre-test was used to refine the questionnaire, particularly in simplifying technical terms and ensuring that questions were easily understood. This process enhanced the reliability of responses and reduced the risk of measurement error in the final data collection.

3.3 Variable Operationalisation

The operationalisation of variables in this study was guided by the conceptual research framework illustrated in Figure 1, which synthesises key determinants of travel behaviour among older adults identified in the literature. The framework conceptualises travel behaviour through two outcome dimensions: weekly travel frequency and transport mode choice, both of which are influenced by individual, household, and health-related factors. This framework

provides the analytical basis for the specification of variables and the empirical models estimated in this study.

In accordance with the framework, two dependent variables were constructed in dichotomous form for Binary Logistic Regression analysis. Weekly travel frequency was categorised into infrequent travel, defined as 0 to 5 trips per week, and frequent travel, defined as six or more trips per week. This categorisation is also justified to ensure sufficient sample distribution across binary groups and to enhance model stability in logistic regression estimation. This categorisation reflects meaningful differences in mobility intensity among older adults and is consistent with thresholds commonly adopted in previous mobility studies. Transport mode choice was operationalised by distinguishing between respondents who relied exclusively on private transport, namely cars or motorcycles, and those who used public transport, active modes, or multimodal combinations. This classification captures the extent to which older adults engage with non-private transport options within the urban mobility system.

The independent variables were grouped into three main dimensions, consistent with both the literature review and the conceptual framework. Individual factors included gender, age, and education level, representing key demographic attributes that influence mobility preferences, access, and physical capability. Household factors comprised household income and ownership of private vehicles (cars and motorcycles), reflecting economic capacity and access to transport resources that shape travel decisions. Health factors included the presence of chronic illness, walking difficulty, and regular medical appointments, representing physical capability and health-related travel needs that directly influence mobility behaviour in later life.

A summary of respondents' characteristics and the distribution of all study variables is presented in Table 1. The selected variables were operationalised to ensure consistency between the conceptual framework, descriptive statistics, and the empirical models estimated in this study.

Overall, this operationalisation strategy ensures coherence between the conceptual framework, variable selection, and regression analysis. By aligning variable definitions strictly with the specified analytical models, the study enhances the interpretability and robustness of the findings on weekly travel frequency and transport mode choice among older adults in the Klang Valley.

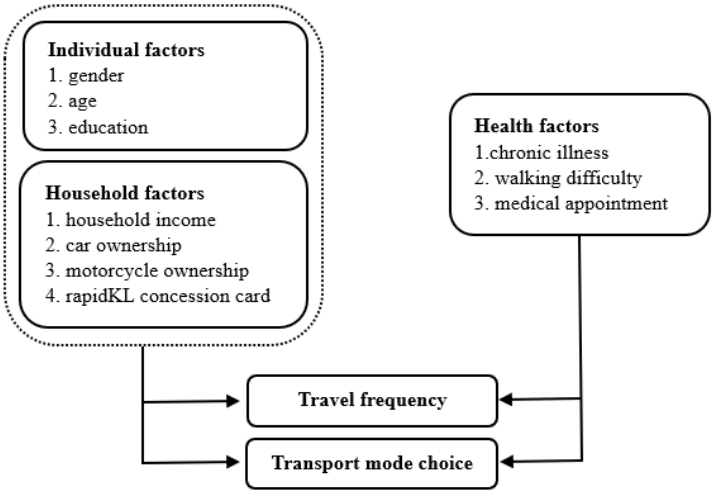

Figure 1: Conceptual model

Table 1: Summary of data on older adults respondents (N = 497)

Variable	Category	Frequency (n)	Percentage (%)
Travel Frequency (DV1)	Infrequent (0–5 per week)	298	60.0
	Frequent (≥6 per week)	199	40.0
Transport Mode (DV2)	Private only	148	29.78
	Public/Active/Combination	349	70.22
Gender	Male	213	42.86
	Female	284	57.14
Age	60–64 years	296	59.56
	65–74 years	169	34.01
	≥75 years	32	6.44
Education Level	No formal education	25	5.03
	School-level education	379	76.26
	Higher education	93	18.71
Household Income	No income	76	15.30
	<RM1000	105	21.13
	RM1001–RM4000	251	50.50
	>RM4000	65	13.07
Car Ownership	None	237	47.69
	At least one	260	52.31
Motorcycle Ownership	None	310	62.37
	At least one	187	37.63
RapidKL Concession Card	Yes	124	24.95
	No	373	75.05
Chronic Illness	Yes	475	95.57
	No	22	4.43
Walking Difficulty	Yes	163	32.80
	No	334	67.20
Medical Appointments	Yes	167	33.60
	No	330	66.40

4. Data Analysis

4.1 Descriptive Analysis

This section presents the descriptive patterns of travel behaviour among older adults in the Klang Valley. While the overall characteristics of respondents are summarised in Table 1 in the Methodology section, the descriptive analysis here focuses on key behavioural differences relevant to the study objectives, particularly variations in travel frequency and transport mode usage by gender.

4.1.1 Comparison of Travel Frequency by Gender

Table 2: Comparison of Weekly Travel Frequency by Gender

Binary Category	Female (n)	Female (%)	Male (n)	Male (%)	Trend
Infrequent (0–5)	192	64.4%	106	35.6%	More females fall under infrequent travellers
Frequent (≥6)	92	46.2%	107	53.8%	Males travel more frequently

This descriptive pattern provides an initial indication that gender may play a significant role in shaping weekly travel frequency, which is further examined in Model 1 using binary logistic regression. Table 2 presents the comparison of weekly travel frequency between males and females according to binary categories. For the infrequent travel category (0–5 trips per week), the number of females is substantially higher, with 192 respondents (64.4%) compared to 106 males (35.6%). This finding aligns with common patterns indicating that older women tend to stay at home more often or display more restricted mobility than older men, which may be attributed to social role expectations, mobility dependence, or lower confidence when navigating public spaces.

Conversely, in the frequent travel category (≥6 trips per week), males outnumber females, with 107 men (53.8%) compared to 92 women (46.2%). This trend suggests that older men are more likely to engage in regular outdoor activities, possibly due to factors such as driving ability, vehicle ownership, or involvement in social, community, or family-related activities that require more frequent movement.

Overall, the relationship between gender and travel frequency reveals a clear pattern: females dominate the infrequent traveller category, while males are more likely to fall within the frequent travel group. This observed gender disparity provides an important descriptive basis for the subsequent inferential analysis, where the role of gender is formally tested alongside other individual, household, and health-related factors in Model 1.

4.1.2 Patterns of Transport Mode Usage by Gender

Table 3: Transport Mode Usage by Gender

Mode (Binary)	Female (n)	Female (%)	Male (n)	Male (%)	Trend
Private only	61	41.2%	87	58.8%	Males more likely to use private transport
Public/Active/ Combination	223	63.9%	126	36.1%	Females more likely to use non-private modes

These gender-based differences in transport mode usage suggest structural and behavioural disparities in access to and reliance on private vehicles, which are formally tested in Model 2. Table 3 details the binary transport mode usage by gender. In the private-only category, males represent the larger proportion, with 87 respondents (58.8%) compared to 61 females (41.2%). This aligns with previous research indicating that older men tend to drive more frequently and maintain greater mobility autonomy even as they age.

In contrast, females dominate the category of public, active, or combination modes, with 223 respondents (63.9%), while males account for only 126 (36.1%). This indicates a relatively higher dependence among older women on non-private modes such as walking, public transport, or multimodal combinations. Factors that may explain this include limited access to private vehicles, domestic responsibilities, or a preference for more affordable and accessible modes.

The overall trend shows that older men are more inclined to use private vehicles, whereas older women are more likely to rely on public, active, or combined modes—reflecting structural, economic, and physical differences in mobility patterns between genders. These descriptive patterns establish a clear rationale for the binary logistic regression analysis in Model 2, which

formally evaluates the influence of gender alongside vehicle ownership, income, health status, and travel incentives on transport mode choice.

4.2 Inferential Analysis: Binary Logistic Regression Models

This study developed two binary logistic regression models to examine the factors influencing (i) the weekly travel frequency of older adults, and (ii) the choice of transport mode, specifically between exclusive use of private transport and the use of public/active/combination modes. The restructuring of the dependent variables into dichotomous form allows the analysis to focus more precisely on the differences in probability between the two categories of travel behaviour.

4.2.1 Model 1: Factors Influencing Weekly Travel Frequency

In the context of Binary Logistic Regression, the dependent variable (DV) is divided into two categories: DV = 1 and DV = 0. In Model 1, DV = 1 represents "frequent travel" (≥6 trips per week), while DV = 0 serves as the comparison or reference category, representing "infrequent travel" (0–5 trips per week). Although the interpretation of the model focuses on DV = 1, both DV categories are involved in the coefficient estimation process. Interpreting DV = 1 automatically provides the inverse meaning for DV = 0. For example, if males have a higher probability of being in the "frequent travel" category, then females are correspondingly more likely to fall under the "infrequent" category. Thus, binary analysis does not disregard DV = 0; rather, it functions as the essential reference point that allows precise estimation of how independent variables influence the likelihood of DV = 1 (Menard, 2021; Hosmer et al., 2013).

From the perspective of model fitness, the Hosmer–Lemeshow test produced a p-value of 0.412, which is not statistically significant, indicating that the model fits the observed data well, with no major discrepancies between predicted and actual values. In addition, the pseudo-R^2 values—Cox & Snell $R^2 = 0.38$ and Nagelkerke $R^2 = 0.51$—suggest that the model explains between 38% and 51% of the variance in travel frequency, reflecting a strong explanatory power for a behavioural travel model (Hosmer et al., 2013). The model also achieved a classification accuracy of 78.4%, indicating its strong predictive capability in distinguishing between older adults who travel frequently and those who do not. Overall, these model diagnostics confirm that Model 1 is well-constructed, stable, and statistically robust for estimating the influence of individual, household, and health-related factors on the weekly travel frequency of older adults.

Table 4: Binary Logistic Regression Analysis for Weekly Travel Frequency of Older Adults *(DV = Frequent travel; 1 = ≥6 trips per week)*

Variable	β	Std. Error	Odds Ratio (OR)	95% CI (Lower – Upper)	p-value
Gender (Male)	0.84	0.21	2.32	1.54 – 3.48	0.001 ***
Age (≥65 years)	-0.52	0.19	0.59	0.41 – 0.85	0.004 ***
Education (≥ Secondary)	-0.41	0.22	0.67	0.43 – 1.05	0.072 *
High income	1.15	0.28	3.17	1.83 – 5.49	0.000 ***
Car ownership	-0.62	0.24	0.53	0.33 – 0.85	0.009 ***
Motorcycle ownership	-0.38	0.20	0.68	0.46 – 1.01	0.058 *
RapidKL concession card	0.91	0.23	2.48	1.57 – 3.91	0.000 ***
Chronic illness	-1.10	0.45	0.33	0.14 – 0.76	0.010 **
Walking difficulty	-1.32	0.27	0.27	0.16 – 0.46	0.000 ***
Medical appointments	1.67	0.30	5.31	2.94 – 9.60	0.000 ***

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 4 summarises the results of Model 1, indicating that gender, income, travel incentives, and health factors are key determinants of weekly travel frequency among older adults in the Klang Valley. The regression results further indicate that most variables are statistically significant at conventional levels, confirming the robustness of the model in explaining travel frequency behaviour. Among individual-level factors, older men are significantly more likely to travel frequently compared to older women (OR = 2.32, $p < 0.01$). This pattern aligns with existing literature showing that older men tend to maintain higher mobility levels through driving and more frequent participation in outdoor social and economic activities (Mitra et al., 2021; Rosenbloom, 2001).

Conversely, increasing age shows a statistically significant negative association with frequent travel (OR = 0.59, $p < 0.01$), indicating that mobility declines as individuals grow older. Higher education also exhibits a negative relationship with travel frequency, although the effect is only marginally significant (OR = 0.67, $p < 0.10$). Individuals aged ≥65 years or those with higher educational attainment tend to travel less frequently, possibly due to reduced mobility needs after retirement, more stable lifestyle routines, and fewer regular outdoor activities. This finding is consistent with Devlin et al. (2017), who reported a decline in mobility as age increases and daily routines shift post-retirement.

Household factors also play an important role. Higher household income significantly increases the probability of frequent travel (OR = 3.17, $p < 0.01$), reflecting that economically capable older adults have more resources, opportunities, and reasons to travel. This supports the Rational Choice perspective, which posits that economic capacity expands mobility options (Musselwhite & Murray, 2024). However, both car ownership (OR = 0.53, $p < 0.01$) and motorcycle ownership (OR = 0.68, $p < 0.10$) are associated with a reduced likelihood of frequent travel. This somewhat counterintuitive finding may be explained by household dynamics, where vehicles are owned but not necessarily used by the older adult, or are utilised only for specific, non-daily purposes (Luiu et al., 2018).

Health-related dimensions emerge as the strongest predictors in this model. Chronic illness (OR = 0.33, $p < 0.05$) and walking difficulties (OR = 0.27, $p < 0.01$) significantly reduce the likelihood of frequent travel, indicating that physical limitations are major barriers to mobility among older adults. Walking difficulty, in particular, shows a very strong negative effect. This aligns with the elderly mobility framework outlined by Webber et al. (2010) and WHO (2002), both of which emphasise physical capability as a foundational element of active mobility. However, the variable representing medical appointments shows the opposite effect and is the strongest positive predictor in the model (OR = 5.31, $p < 0.01$). Older adults with regular medical visits are substantially more likely to travel frequently, indicating that healthcare-related needs function as compulsory mobility drivers that compel movement despite physical constraints (Fields et al., 2021).

In summary, Model 1 demonstrates that older men, individuals with higher household incomes, RapidKL concession cardholders, and those with regular medical appointments are the groups most likely to engage in frequent weekly travel. In contrast, older adults who are older, more highly educated, or experiencing chronic illness or walking difficulties fall into the low-mobility group. Overall, the findings confirm that physical capability, economic capacity, and access to mobility support mechanisms play statistically significant roles in shaping the travel behaviour of older adults (Zakaria et al., 2024; Devlin et al., 2017).

4.2.2 Model 2: Factors Influencing Transport Mode Choice

Model 2 employs Binary Logistic Regression to examine the determinants of transport mode choice among older adults in the Klang Valley. The dependent variable (DV) is categorised into two groups, where DV = 1 represents the use of public transport, active modes, or a combination of modes, while DV = 0 refers to exclusive reliance on private transport. The interpretation focuses on DV = 1, with DV = 0 serving as the reference category. As in binary logistic modelling, both outcome categories jointly contribute to coefficient estimation, and interpretation of DV = 1 inherently reflects the inverse likelihood of private-only transport use (Menard, 2021; Hosmer et al., 2013).

From the perspective of model adequacy, the Hosmer–Lemeshow goodness-of-fit test yields a non-significant p-value of 0.318, indicating a good fit between observed and predicted outcomes. The pseudo-R^2 values further demonstrate strong explanatory power, with Cox & Snell $R^2 = 0.36$ and Nagelkerke $R^2 = 0.49$, suggesting that approximately 36% to 49% of the variation in transport mode choice among older adults is explained by the model. In addition, the model achieves an overall classification accuracy of 80.2%, confirming its strong predictive capability in distinguishing between private-only transport users and those who utilise public, active, or multimodal transport options. Collectively, these diagnostic indicators confirm that Model 2 is statistically robust, stable, and appropriate for analysing transport mode choice behaviour among older adults.

Table 5: Binary Logistic Regression Analysis for Transport Mode Choice Among Older Adults *(DV = Use of public/active/combination modes; 1 = non-private)*

Variable	β	Std. Error	Odds Ratio (OR)	95% CI (Lower – Upper)	p-value
Gender (Male)	-0.71	0.22	0.49	0.32 – 0.74	0.001 ***
Age (≥65 years)	-0.58	0.20	0.56	0.38 – 0.83	0.003 ***
Education (≥ Secondary)	-0.44	0.23	0.64	0.41 – 1.01	0.056 *
High income	-0.92	0.27	0.40	0.23 – 0.69	0.001 ***
Car ownership	-1.26	0.25	0.28	0.17 – 0.46	0.000 ***
Motorcycle ownership	-0.63	0.21	0.53	0.35 – 0.80	0.003 ***
RapidKL concession card	1.08	0.24	2.94	1.83 – 4.72	0.000 ***
Chronic illness	-0.97	0.43	0.38	0.16 – 0.89	0.026 **
Walking difficulty	-1.41	0.29	0.24	0.14 – 0.41	0.000 ***
Medical appointments	1.35	0.31	3.86	2.11 – 7.07	0.000 ***

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 5 presents the regression results for Model 2, revealing that demographic characteristics, vehicle ownership, economic capacity, travel incentives, and health conditions significantly influence transport mode choice among older adults. The majority of variables are statistically significant at conventional levels, indicating that the model provides a robust explanation of mode choice behaviour. Gender emerges as a key demographic determinant, where older men are significantly less likely to use non-private modes compared to older women (OR = 0.49, $p < 0.01$). This pattern reflects persistent gender differences in driving practices, vehicle access, and perceptions of autonomy, with men tending to maintain private vehicle use in later life. Similar trends have been observed in previous studies on elderly mobility behaviour (Lejsková et al., 2023; Luiu et al., 2018).

Age also exhibits a statistically significant negative association with non-private mode use (OR = 0.56, $p < 0.01$), indicating that individuals aged 65 years and above are less inclined to rely

on public or active transport. This decline is likely attributable to increased physical limitations, higher risk perception, and a stronger preference for comfort and door-to-door travel at older ages. Education shows a modest negative effect, although only marginally significant (OR = 0.64, $p < 0.10$), suggesting that higher educational attainment does not necessarily translate into greater use of public or active modes among older adults, particularly when private transport remains available.

Structural and household-related factors emerge as the strongest predictors in this model. Car ownership has a substantial and highly significant negative effect on the use of non-private modes (OR = 0.28, $p < 0.01$), indicating a reduction of approximately 72% in the likelihood of using public or active transport. Similarly, motorcycle ownership significantly reduces the probability of non-private mode use (OR = 0.53, $p < 0.01$). These findings reinforce existing evidence that access to private vehicles remains a major barrier to modal shift due to the superior flexibility, comfort, and control over travel time associated with private transport (Abdullah et al., 2024; Luiu et al., 2018). Economic capacity further strengthens this pattern, as high-income older adults are significantly less likely to use public or active modes (OR = 0.40, $p < 0.01$), reflecting a continued preference for private vehicles even in later life. This aligns with the Rational Choice perspective, where individuals with greater financial resources prioritise convenience and perceived utility in transport decisions (Musselwhite & Murray, 2024).

In contrast, travel incentives demonstrate a strong and statistically significant positive influence. Possession of the RapidKL concession card nearly triples the likelihood of using public or active transport (OR = 2.94, $p < 0.01$), indicating that fare subsidies are an effective policy mechanism for encouraging modal shift among older adults. This finding highlights the sensitivity of older populations to travel costs and supports existing evidence that concession schemes can significantly enhance public transport uptake (Laverty et al., 2018).

Health-related variables provide a nuanced yet critical understanding of transport behaviour. Chronic illness significantly reduces the likelihood of using non-private modes (OR = 0.38, $p < 0.05$), while walking difficulty shows a very strong and highly significant negative effect (OR = 0.24, $p < 0.01$), indicating substantial barriers to public and active transport use when mobility limitations are present. These results emphasise the importance of physical capability as a fundamental determinant of mobility and are consistent with the mobility framework proposed by Webber et al. (2010) and WHO (2002). However, the presence of regular medical appointments exerts an opposite and highly significant effect (OR = 3.86, $p < 0.01$), suggesting that healthcare-related trips function as compulsory mobility drivers. Older adults with recurring medical needs are more likely to engage in public or multimodal transport, reflecting the necessity-driven nature of such trips (Fields et al., 2021).

Overall, Model 2 demonstrates that transport mode choice among older adults in the Klang Valley is shaped by a complex and statistically significant interaction of demographic attributes, vehicle availability, economic capacity, health status, and policy-driven travel incentives. While private vehicle ownership and higher income strongly reinforce reliance on private transport, concession schemes and healthcare-related needs significantly promote the adoption of public, active, or multimodal transport modes. These findings underscore the importance of integrating accessibility-oriented transport policies, health-sensitive planning, and targeted fare incentives to support inclusive and sustainable mobility for an ageing population.

5. Discussion

This discussion synthesises the key findings of the study across two dimensions of travel behaviour among older adults in the Klang Valley, namely weekly travel frequency and transport mode choice. By integrating the results from Model 1 and Model 2, the analysis highlights how individual characteristics, household resources, and health conditions interact to shape mobility decisions in later life. These findings are interpreted in light of travel behaviour theories and the Rational Choice perspective, which emphasise the role of physical capability, economic capacity, access, and necessity in influencing daily mobility outcomes (Musselwhite & Murray, 2024).

The results from Model 1 indicate that the majority of older adults in the Klang Valley fall within the low-mobility category, with fewer than half engaging in frequent weekly travel. This pattern suggests that mobility in later life is largely necessity-driven rather than discretionary, reinforcing the notion that older adults prioritise essential trips over optional activities. Such behaviour is consistent with the elderly mobility framework proposed by Webber et al. (2010) and empirical evidence reported by Devlin et al., (2017), which emphasise the central role of physical capability and functional health in shaping travel frequency.

Gender differences remain pronounced, with older men exhibiting a higher likelihood of frequent travel compared to older women. This finding aligns with international literature suggesting that men tend to retain driving autonomy and maintain engagement in public and social spaces for longer periods, while women experience greater mobility constraints due to lower vehicle access, reduced confidence, and reliance on family support (Mitra et al., 2021; Rosenbloom, 2001). These gendered mobility patterns reflect long-standing social roles and life-course travel behaviours that persist into older age.

Economic capacity also plays a significant role in shaping travel frequency. Older adults with higher household incomes are more likely to travel frequently, supporting the Rational Choice argument that financial resources expand feasible mobility options and reduce sensitivity to travel-related costs. However, the negative association between private vehicle ownership and frequent travel highlights an important nuance. Vehicle ownership among older adults does not necessarily translate into higher mobility, possibly due to shared household usage, selective driving behaviour, or a preference for limiting travel to essential purposes only. This finding underscores that access to resources alone is insufficient to guarantee higher mobility in later life (Abdullah et al., 2024).

Health-related factors emerge as the strongest determinants of travel frequency. Chronic illness and walking difficulties substantially reduce the likelihood of frequent travel, reaffirming physical capability as a fundamental constraint on mobility among older adults (WHO, 2002). In contrast, the presence of regular medical appointments significantly increases travel frequency, illustrating the concept of compulsory mobility. Healthcare needs compel older adults to travel despite physical limitations, highlighting a dual role of health as both a mobility constraint and a mobility driver. This dynamic is consistent with findings by Fields et al., (2021) and emphasises the importance of distinguishing between discretionary and necessity-driven travel in elderly mobility studies.

Turning to transport mode choice, Model 2 demonstrates that vehicle availability, economic capacity, fare incentives, and health conditions are key determinants influencing whether older

adults rely on private or non-private transport modes. While a substantial proportion of respondents continue to use private vehicles, the widespread use of public, active, or multimodal transport indicates that non-private modes remain relevant within dense urban environments such as the Klang Valley (Luiu et al., 2018).

Gender differences are again evident, with older women more likely to use public or active transport, while older men show a stronger preference for private vehicles. These patterns reflect cumulative life-course travel habits and differences in access, confidence, and perceived autonomy (Lejsková et al., 2023). Structural factors, particularly car and motorcycle ownership, significantly discourage the use of non-private modes, reinforcing the dominance of private transport when available. Higher income further strengthens this preference, suggesting that convenience and comfort remain key considerations in transport decisions among economically capable older adults.

At the same time, policy-related incentives demonstrate a meaningful impact. The RapidKL concession card significantly increases the likelihood of using public or active transport, highlighting the effectiveness of fare subsidies in promoting modal shift among older populations. This finding aligns with WHO and UN-Habitat recommendations advocating affordable and accessible transport as a cornerstone of active ageing and inclusive urban mobility (United Nations, 2020; WHO, 2002).

Health factors continue to play a critical role in shaping transport mode choice. Chronic illness and walking difficulties limit the feasibility of public and active transport use, particularly where first- and last-mile walking is required. Conversely, regular medical appointments increase the likelihood of multimodal travel, reflecting the need for flexible and accessible transport options to reach healthcare facilities. These findings reinforce the argument that health-related mobility needs must be central to transport planning for ageing populations.

Overall, the findings from both models demonstrate that while determinants of travel frequency and transport mode choice are related, they are not identical. Physical capability primarily constrains how often older adults travel, whereas vehicle availability, cost considerations, and policy incentives play a more pronounced role in shaping how they travel. This distinction highlights the importance of examining multiple dimensions of travel behaviour when assessing mobility outcomes among older adults.

From a policy perspective, the results underscore the need for age-friendly transport strategies that go beyond infrastructure provision. Improving public transport accessibility, enhancing pedestrian safety, strengthening fare concession schemes, and expanding community-based and demand-responsive transport services are essential for supporting both discretionary and compulsory travel among older adults. Ultimately, mobility in later life reflects not only individual capacity and choice, but also the responsiveness of the urban transport system in accommodating the diverse and evolving needs of an ageing population (Zakaria et al., 2024; United Nations, 2020).

6. Future Directions

Future research should further expand the understanding of travel behaviour among older adults by incorporating additional dimensions that were not fully explored in this study. First, future studies are encouraged to adopt longitudinal approaches to capture changes in travel

behaviour over time, particularly as individuals transition into more advanced stages of ageing where mobility constraints may intensify.

Second, there is a need to integrate built environment and spatial variables, such as accessibility to public transport, walkability, neighbourhood safety, and proximity to essential services, as these factors play a critical role in shaping mobility behaviour in urban settings. Including such variables would provide a more comprehensive understanding of the interaction between individual capability and environmental conditions.

Third, comparative studies across different urban areas in Malaysia or within the ASEAN region are recommended to examine contextual variations in mobility patterns and transport accessibility among older adults. This would help identify structural differences in transport systems and policy effectiveness across regions.

Finally, future research may benefit from adopting qualitative or mixed-method approaches to explore the lived experiences, perceptions, and behavioural motivations of older adults. Such approaches would complement quantitative findings and provide deeper insights into the barriers and facilitators of mobility in later life.

7. Limitations

This study has several limitations that should be acknowledged. First, the use of convenience sampling limits the generalisability of the findings, as respondents were selected based on accessibility and willingness to participate rather than through probability-based sampling methods. As such, the results may not fully represent the broader population of older adults in the Klang Valley.

Second, the cross-sectional design of the study restricts the ability to infer causal relationships between variables. While the analysis identifies significant associations between individual, household, and health factors and travel behaviour, it does not capture changes over time or establish causality.

Third, the dichotomisation of dependent variables, particularly weekly travel frequency, may lead to a loss of information by simplifying continuous behaviour into binary categories. Although this approach facilitates the use of Binary Logistic Regression and enhances interpretability, it may not fully capture the complexity and variability of travel behaviour among older adults.

Finally, the study primarily focuses on individual, household, and health-related factors, without explicitly incorporating environmental or transport system variables such as service quality, accessibility, or infrastructure conditions, which may also significantly influence mobility behaviour.

8. Conclusion

This study provides empirical insights into the travel behaviour of older adults in the Klang Valley by examining two key dimensions: weekly travel frequency and transport mode choice using Binary Logistic Regression. The findings demonstrate that mobility in later life is shaped by a complex interaction of physical capability, economic capacity, and transport accessibility.

Health-related factors emerge as the most influential determinants, where chronic illness and walking difficulties significantly constrain mobility, while medical appointments act as compulsory drivers of travel. At the same time, economic resources and cost-related incentives, particularly fare concession schemes, play an important role in facilitating mobility and encouraging the use of non-private transport modes.

Although private vehicle ownership remains a strong determinant of transport mode choice, the continued use of public, active, and multimodal transport indicates the relevance of non-private modes within urban environments. Gender differences further highlight structural disparities in mobility patterns among older adults.

Overall, the findings underscore the importance of developing inclusive, accessible, and age-friendly transport systems that address both physical limitations and economic barriers. Enhancing pedestrian infrastructure, improving public transport accessibility, and strengthening affordability measures are critical to supporting active ageing and social participation.

This study contributes to the literature by integrating multiple determinants of mobility within a single analytical framework and provides a robust empirical basis for policy development aimed at improving the quality of life among older adults in rapidly urbanising contexts.

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Conflict of Interest Statement
The authors declare that this research was conducted in the absence of any commercial, financial, or personal relationships that could be construed as a potential conflict of interest. The study was carried out solely for academic purposes, and no external influence affected the design, analysis, interpretation, or reporting of the findings.

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