Food insecurity status and its determinants among low-income households in Klang Valley, Malaysia

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Abstract

The present work aimed to determine the food insecurity status among low-income households in the Klang Valley, and identify the underlying factors contributing to it. The persistence of food insecurity within households, particularly among low-income families in Klang Valley, Malaysia, necessitates a closer examination of its determinants. Data were collected from 449 respondents representing low-income households, and these respondents were categorised into four groups based on the developed food insecurity status: food secure, mildly food insecure, moderately food insecure, and severely food insecure. A logistic regression model was employed to ascertain the influence of demographic factors, such as age, gender, race, education level, household income, and household size on food insecurity status. The results revealed that 46.33% of low-income households in Klang Valley were classified as mildly food insecure, 47.22% moderately food insecure, and 4.0% severely food insecure. The logistics regression analysis indicated that socio-demographic factors (race, education level, household income, and household size) significantly impacted food insecurity status of the low-income households. The findings suggested that financial and food assistance should be targeted to households with incomes below RM2,500 and larger family size. Insights from the present work would provide a basis for formulating strategies and policies aimed at alleviating food insecurity among low-income families in Klang Valley.

Introduction

According to the Food and Agriculture Organization (FAO), more than 800 million people experience hunger, and over the past three years, this number has slowly risen. The term "food insecurity" was coined in the mid-1970s in response to international food shortages due to global economic crisis, limited employment prospects, unstable income levels, and a lack of reliable household head in low-income families (FAO, 2010). According to Sulaiman *et al*. (2011), food security is a condition characterised by the difficulty in accessing adequate and nutritious food, leading to the inability to live a healthy life and unsatisfactory dietary practices (Alam *et al*., 2016). One of the risk factors for food insecurity is poverty, which is often associated with individuals who consume less and lower quality food (Mohamadpour *et al*., 2012). It primarily affects low-income households across both developed and developing countries, particularly Asia (Maarof, 2018; DOSM, 2021). Numerous studies have demonstrated a strong correlation between poverty and food insecurity across diverse socioeconomic settings (Wight *et al*., 2014; Siddiqui *et al*., 2020).

In a 2021 assessment of global food security, Malaysia's national food security status was rated as food secure, ranking 39th among 113 countries in the Global Security Index. However, according to the published literature, food insecurity remains a pressing concern at the household level driven primarily by affordability issue. Based on the income level, the population is classified into three tiers: Bottom 40 (B40), Middle 40 (M40), and Top 20 (T20) group. The B40 household refers to the lowest income group, comprising households with an average monthly income below RM4,850 (DOSM, 2021). Compared to other income groups, low-income households face more significant challenges in accessing adequate food resources (Maarof, 2018).

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The Consumer Price Index (CPI) for foods and beverages has outpaced the overall CPI (DOSM, 2021). In 2020, the CPI for foods and non-alcoholic beverages reached 134.8%, compared to the overall CPI of 120.1%, indicating a higher rate of food inflation relative to the general inflation. Furthermore, the data showed that low-income households allocated a greater proportion of their earnings to food purchases than their middle- and higher-income counterparts. For example, the low-income households in Klang Valley spent about 14.2% of their spending on food compared to 11.7 and 9.9% for medium income and higher income households, respectively.

The urban food insecurity is a complex issue involving several interrelated factors of social, economic, and environmental aspects of the local food system. The COVID-19 pandemic has intensified existing challenges in the global food systems, leading to the disruptions in urban supply chain (Yazew et al., 2023). In 2020, food insecurity affected up to 30% of the world's population, representing a 4% increase from the year before, with considerable regional variations. Access to sufficient and nutritious food has thus become an increasingly pressing global concern, particularly in the aftermath of the pandemic. Malaysia has not been spared from these impacts. The first wave of COVID-19 infections occurred on January 24, 2020, with rapid spread across the world. The surge in cases of COVID-19 transmission prompted the Federal Government to implement stringent containment measures, the Movement Control Order (MCO 1.0). Although necessary for public health, these measures resulted in severe economic disruptions, with adverse impact on livelihoods and food security (Tan et al., 2022). The immediate consequence of the MCO was widespread income loss due to the near-complete shutdown of economic activity. A study in the United Kingdom showed that individuals who lost more than 25% of their income during the country's lockdown were particularly at risk for food insecurity. In addition, limited mobility during lockdowns have hindered access to food, further compounding the challenges faced by affected populations.

Food insecurity in Malaysia has been a growing concern, with recent data revealing trouble trends. According to the Malaysian Household Income Survey 2019, 10.6% of households were already experiencing food insecurity, even during the pre-pandemic era. The impact of the health crisis has

likely exacerbated the figure, with vulnerable populations like low-income families and migrant workers being among the most affected.

Published literatures have shown that food insecurity is prevalent among the low-income households. For example, the Malaysian Adults Nutrition Survey 2014 reported that about 24.8% of Malaysian households were food insecure. Similarly, a study by Siwar et al. (2014) identified that 28% of low-income households in Kuala Lumpur were food insecure, with 27% children in these households classified as experiencing hunger. Norhasmah et al. (2012) reported even higher rates in Selangor, where 81.2% of households were affected, including 32.8% individuals, 20.3% households, and 28.1% experienced child hunger. The United Nations Children's Fund (UNICEF) reported alarming malnutrition levels among children in low-cost apartments in Kuala Lumpur, with 32% aged four exhibiting thinness, 23% experienced stunted growth, and 22% were underweight (UNICEF, 2020).

Given the rising cost of living and its disproportionate impact on economically disadvantaged groups, it is crucial to evaluate the degree and nature of food insecurity prevalent among low-income households in the Klang Valley. Therefore, the present work sought to establish the food insecurity status of low-income households in Klang Valley, and to investigate the underlying factors contributing to this issue. Assessing food insecurity status is crucial for developing mitigation strategies to address food insecurity, in line with Sustainable Development Goal (SDG) 2, which aims to eliminate poverty.

Literature review

According to the Food and Agriculture Organization (FAO), food insecurity is characterised as "a situation that exists when people lack secure access to sufficient amount of safe and nutritious food for normal growth, development, and the maintenance of an active and healthy life". At the household level, food insecurity is primarily linked to accessibility issues (Berry et al., 2015). In similar vein, food insecurity is a state where individuals cannot consistently obtain sufficient food to lead an active and healthy lifestyle (Negash and Alemu, 2013). The cost of food, which is often correlated with provincial variations in food production and supply, can significantly impact a household's vulnerability to food insecurity (Mazenda et al.,

2022). Food insecurity and hunger are the results of a complex collection of circumstances that are frequently made worse by economic hardship, conflict, and the pursuit toward better developmental outcomes in the face of economic and social ramifications.

To quantify and understand the extent of food insecurity, several methodological approaches have been employed at the household and national levels. Household level food insecurity has been measured through indicators such as individual consumption patterns, dietary diversity, household calorie intake, and coping strategies employed by households (Leroy *et al.*, 2015). Tools such as Household Diet Diversity Score, Coping Strategy Index, Food Consumption Score Self-Household Hunger Scale, Assessed Food Security Scale, as well as Household Food Insecurity and Access Scale (FSIP) have been utilised to compute the overall Food Security Index (Farhadian *et al.*, 2015). At the national scale, the Multidimensional Food Insecurity Index (FIMI) is frequently used, with scores ranging from 0 (best case scenario) to 100 (worst case scenario) (Napoli *et al.*, 2011).

The Household Food Insecurity Access Scale (HFIAS), developed by Coates *et al.* (2013), is a widely adopted instrument and the standard approach for quantifying household food insecurity. The HFIAS divides the households into four distinct levels based on their food security status: food secure, mildly, moderately, and severely food insecure. The scale not only calculates the prevalence of each category in the sample, but also evaluates the food access issues faced by households over a 30-day recall period. This provides insights into the fluctuations in eating habits and the intensity of food insecurity resulting from limited or inadequate access to food. There are nine questions in the HFIAS, and each one has four possible answers: never, rarely, sometimes, and often, coded as 0, 1, 2, and 3, respectively, based on the frequency with which households encounter the situation. Several studies have utilised HFIAS as an approach to assess the food insecurity status. For example, Maarof (2018) employed the HFIAS to gauge food insecurity levels in households with kids between the ages of five and six. Similarly, a study by Farhadian *et al.* (2015) utilised the same method to assess food insecurity level among low-income rural households in Sabah, Malaysia. In another study, Mota *et al.* (2019) discovered that 71.6% of households in southern

Ethiopia were food insecure, as determined by the HFIAS.

The literature further identified a range of indicators used to assess food insecurity status, such as anxiety and uncertainty about food access, insufficient quality, insufficient quantity of food intake, and the physical consequences due to the lack of food intake. According to previous studies, the dimensions used varied depending on the study areas. For instance, Alam *et al.* (2016) used all four dimensions indicated earlier to investigate the prevalence of food insecurity among low-income households on the east coast region of Peninsular Malaysia. They discovered that 69.8% of the households experienced anxiety and uncertainty, 47.2% reported food shortages, and 17% suffered from insufficient food intake further compounded by the adverse effects of medical treatments on their physical health.

Another study conducted in Southern Somalia by Ahmed (2017) also utilised the same dimensions to assess food insecurity among households in Juba Valley. The situation was described as even more severe, with 80% of households reporting food anxiety and uncertainty, 84% having insufficiently nutritious food, and 85% suffering physical consequences due to inadequate food consumption. In addition, a study conducted in Sodo Town discovered that about 37.3% were anxious and uncertain, 37.6% reported inadequate food quality, and 33.3% experienced inadequate food intake that compromised their physical well-being and medical treatment (Tadesse Tantu *et al.*, 2017).

Studies have shown that socio-demographic factors can affect the level of food insecurity (Zalilah *et al.*, 2008). Shone *et al.* (2017) stated that smaller household demonstrated a lower likelihood of experiencing food insecurity compared to larger households, with the risk becoming more severe when the households comprise of children and elderly dependents. This observation aligns with the findings of Drammeh *et al.* (2019), who established that larger households are more vulnerable to food insecurity primarily due to the reduced availability of food resources, and the need to ration portions. Kim *et al.* (2011) supported this view by highlighting the increased risk of food insecurity among households with dependents.

Educational status has also emerged as a critical determinant of food security. Motlagh *et al.* (2015) observed that households where parents

possess educational qualification below diploma level are more prone to experiencing food insecurity. Titus and Adetokunbo (2007) corroborated this by emphasising the importance of education in securing food stability. Similarly, Huang *et al.* (2018) indicated that individuals or households with lower incomes and educational levels tend to consume food of lower nutritional value, which contribute to food insecurity. The relationship among family size, educational attainment, and income level suggests a compounded effect on food security, particularly in households with a large number of dependents, such as young children and school-aged children, which often correlates with increased poverty risk. Nevertheless, Drammeh *et al.* (2019) argued that despite the adverse impact of food insecurity, the situation can be mitigated if other household members have secure jobs, thereby offsetting the negative impact.

The disparities between urban and rural areas illustrate the complex nature of food insecurity, with urban areas often experiencing higher levels of severity. Murdad *et al.* (2022) attributed this increased vulnerability in cities to real wage rates and the prevalence of unemployment. Secure employment opportunities are crucial in stabilising household income, as increases in real wages typically tied to greater employment stability, which, in turn, enhances a household's food security status. Another contributing factor of households' food insecurity is total income. Sekhampu (2017) found that lower-income groups, due to limited savings, are often left without a financial buffer, leaving them more susceptible to food insecurity.

Materials and methods

The present work adopted the conceptual framework proposed by Coates *et al.* (2013) to examine food insecurity among low-income households in Klang Valley. Figure 1 depicts the adapted conceptual framework that delineates four key dimensions of inadequate access to food: anxiety and uncertainty about food access, insufficient quality characterised by a lack of variety, unpreferred options, limited social acceptability, insufficient quantity of food intake, and physical consequences due to lack of food intake. The term "anxiety," as employed in this framework, refers to a wide range of related phenomena, including a group of mental diseases and certain behavioural patterns. Alternatively, it is viewed as a future-focused emotional disposition that is prevalent among all people, though the degree to which it is felt varies (Cisler *et al.*, 2010). The inherent uncertainty of the future makes it challenging to adequately plan for the future, as it requires one to weigh the potential benefits and drawbacks of different preparatory strategies that may prove insufficient, and those that are more effective but may be completely unnecessary. The uncertainty surrounding future event can cause concern, anxiety, or even the incapacity to function (Tsamakis *et al.*, 2020).

The second dimension of food insecurity, insufficient quality, takes into account social acceptability factors like variety and preference. It reflects a lower consumption of nutrient-dense foods, especially fruits and vegetables, among food-insecure populations (Mohamadpour *et al.*, 2012). Insufficient
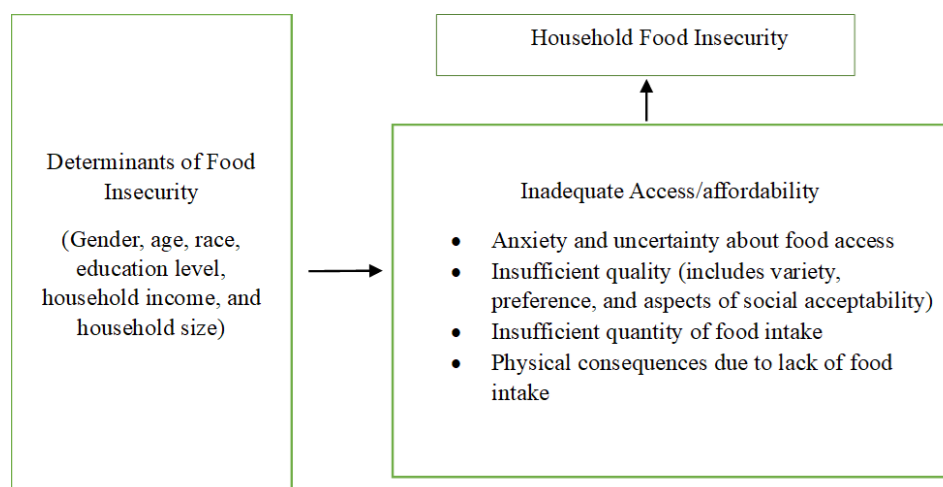

Figure 1. Conceptual framework of food insecurity status among low-income households in Klang Valley. Source: Modified from Coates *et al.* (2013).

food intakes, as defined by Duong *et al*. (2018), occurs when households consume less than what was advised to ensure food availability. Such scarcity exists and often stems from unsuitable dietary choices attributed to low income or difficulties in obtaining food (French *et al*., 2019). The physical consequences due to lack of food intake can cause malnutrition, a condition marked by the body's deficiency in essential vitamins, minerals, and nutrients needed for maintaining healthy tissues and organ functions. Malnutrition may arise when people are overfed or under consume the nutrients they require, leading to deficiencies that compromise bodily function (Soeters *et al*., 2017). These four dimensions were used to assess the food insecurity status of low-income household in Klang Valley.

In addition, socio-demographic factors, as established by the theoretical framework and empirical research, have been identified as one of the determinants of food insecurity. Five factors that primarily influence food insecurity status are age, race, education level, total income, and household size. Figure 1 also illustrates the independent variables used to assess these contributing factors. In essence, the framework hypothesised that age, race, education level, total income, and household's size would determine food insecurity status.

Data were collected from low-income households in Klang Valley using a structured questionnaire. A stratified random sampling method was applied that divided the population into distinct strata, and then randomly selecting participants from each stratum. The list of the low-income households was obtained from the E-Kasih database, a governmental database system that provides information on disadvantaged households to facilitate the development, execution, and monitoring of poverty alleviation programs. The E-Kasih database provided the information on households residing in Projek Perumahan Rakyat (PPR, also known as People Housing Program) areas. Using the stratified random sampling, the respondents were divided into strata or small groups based on their respective residential locations in the PPR. The selection was done from each stratum to form the total sample that reflect the geographical distribution of low-income households in the Klang Valley.

Following Krejcie and Morgan's (1970), the minimum sample size required to represent the low-income households in Klang Valley was 385

respondents. This calculation was based on a 95% confidence level, which indicates a high degree of certainty that the sample accurately reflects the population. A margin of error of 0.05 was set, minimising the potential for statistical errors arising from sampling uncertainty. While the minimum sample size was 385, the study successfully recruited 449 respondents, exceeding the minimum threshold to enhance the precision of the results and generalisability. A larger sample size reduces the margin of error, increasing the likelihood that the findings accurately represent the true characteristics of the low-income population in Klang Valley. Furthermore, increasing the number of participants could enhance the representativeness of the population studied, thereby preventing the study's conclusions from being skewed towards a specific demographic. It is important to note that for small populations, a correction for a finite population may be necessary to refine the sample size calculation. However, given the relatively large population of low-income households in Klang Valley, this correction was not deemed essential for the present work. The sampling frame was drawn from the Implementation Coordination Unit (ICU) under the Prime Minister's Department of Malaysia.

To develop the food insecurity index, questions from Household Food Insecurity Access Scale (HFIAS) were used as a basis to develop the questionnaire. An additional eight questions from the HFIAS were incorporated into the existing framework. These additional questions were carefully tailored based on the inputs obtained from the stakeholders during focus group discussion (FGD) to reflect the food insecurity situation in Klang Valley. As a result, the final food insecurity instrument comprised 17 items covering four dimensions: anxiety and uncertainty about food access, insufficient quality, insufficient quantity, and physical consequences due to inadequate food intake (Coates *et al*., 2013). This adaptation ensured that the instrument aligned more closely with the local context. The respondents were required to indicate the frequency with which they experienced food insecurity situations across the four dimensions, with each item addressing specific aspects of these challenges. A scoring system was employed, with values of 0 (never), 1 (rarely), 2 (sometimes), and 3 (often) assigned to each response.

Given that the objective of the present work was to ascertain the Food Insecurity Index (FII) for low-income households in Klang Valley, the index was calculated using Eq. 1:

$$FII = \frac{TS}{Max\ Score} \times 100 \qquad (Eq.\ 1)$$

where, FII = Food Insecurity Index; TS = total score, and Max Score = maximum score.

In order to develop the Food Insecurity Index (FII), the total score (TS) was calculated as the sum of scores obtained from all respondents. The score reflected the responses to 17 frequency-of-occurrence items across multiple dimensions as shown in Eq. 2, being derived from the actual frequence scores for each respondent:

$$TS = \sum_{i=1}^{17} F_{ij}\ N \qquad (Eq.\ 2)$$

where, TS = total score obtained from all respondents, $\sum_{i=1}^{17} F_{ij}$ = sum of the frequencies for each item i (with $i = 1, ..., 17)$ in every dimension for respondent j, and N = total number of respondents (449).

To establish the maximum score possible, Eq. 3 was applied. It was determined by multiplying the maximum frequency for each item by the total number of respondents (449):

$$Max\ Score = \sum_{i=1}^{17} HF_{ij} * N \qquad (Eq.\ 3)$$

where, Max Score = maximum potential score that can be obtained for all respondents across all dimensions, $\sum_{i=1}^{17} HF_{ij}$ = sum of the highest frequency (HF) for each item i, and N = total number of respondents (449).

The Individual Food Insecurity Index (IFII) was then calculated to determine the food insecurity status for each respondent. Eq. 4 was used to calculate the IFII as a percentage of the total score relative to the maximum score, which was then used for the classification of food insecurity levels (mild, moderate, severe):

$$IFII = \frac{TS_j}{Max\ Score_j} \times 100 \qquad (Eq.\ 4)$$

where, IFII = Individual Food Insecurity Index, TS_j = total score obtained from each individual j respondent, and $Max\ Score_j$ = maximum score that can be obtained for all dimensions considered for each j respondent.

To determine the total score for respondents, Eq. 5 provides a refined expression similar to that in Eq. 2:

$$TS = \sum_{i=1}^{17} F_{ij} \qquad (Eq.\ 5)$$

Similarly, the maximum score for respondents was determined using Eq. 6:

$$Max\ Score = \sum_{i=1}^{17} HF_{ij} \qquad (Eq.\ 6)$$

where, Max Score and $\sum_{i=1}^{17} HF_{ij}$ maintain their previous definitions (see Eq. 3).

The maximum score in the present work corresponded to the household response of "often = 3" for all 17 frequency-of-occurrence questions, yielding a maximum score of 51 (17 × 3). This raw score was subsequently normalised and converted into an index ranging from 0 to 100. The households were further categorised into four food insecurity levels: (1) food secure, (2) mildly food insecure, (3) moderately food insecure, and (4) severely food insecure, based on their index values. The household is considered food secure if the food insecurity index falls between 0 and 17.65. An index from 17.66 - 37.25 denotes mildly food insecure, 37.26 - 70.59 reflect moderate food insecurity, and scores above 70.60 indicate severe insecurity. These thresholds are consistent with the classification system developed by Coates *et al*. (2013). Studies conducted in South Africa and Nigeria by Chakona and Shackleton (2018) and Adesoye and Adepoju (2020), respectively, also employed similar categories. It is important to note that moderate food insecurity reflects a household's limited ability to buy foods with better nutritional value, while severely food insecure indicates a critical lack of resources, often leading to food shortages and compromised meal consumption, particularly for children and adults (Coates *et al*., 2007; Nunnery and Dharod, 2017).

To determine factors influencing food insecurity among low-income households in Klang Valley, the socio-demographic factors were incorporated into the model, including age, race, level of education, total income, and household size, using Eq. 7:

$$g(x) = logit\ P = log\left[\frac{P}{1-P}\right] =$$

$$\beta_0 + \beta_1 \chi_1 + \beta_2 \chi_2 + \beta_3 \chi_3 + \beta_4 \chi_4 + \beta_5 \chi_5 \qquad (Eq.\ 7)$$

where, x = logit for food insecurity *log*it P, β_θ = constant term, and β_θ, β_1, β_2, β_3, β_4, β_5 = estimated coefficients for the socio-demographic factors: χ_1 = age, χ_2 = race, χ_3 = education level, χ_4 = total income, and χ_5 = household size.

According to Gujarati *et al.* (2015), a combination of dichotomous and continuous variables is needed for the binary logistic regression model, as well as binary dependent variables. According to Ngema *et al.* (2018), household food insecurity is influenced by age. The race of the household was considered in the model as one of the independent variables, with Malay group chosen as the reference group. Education was treated as a categorical regressor classified into primary school, secondary school, and higher institution, with primary school as the reference group. It was hypothesised that higher levels of education would have positive effect on household food insecurity.

Income, another crucial determinant, was hypothesised to correlate negatively with food insecurity. As household total income increased, the probability of experiencing food insecurity was expected to decrease. Household size captured during the study period represented the number of individuals residing in the same household. According to Akinboade and Adeyefa (2018), larger households are vulnerable to food insecurity, with the likelihood of being food insecure increases in proportion to its size.

Results and discussions

Demographic profiles

A total of 449 urban low-income households in Klang Valley have participated in the present work. Table 1 presents the socio-demographic profile of the respondents. The gender distribution revealed that the sample consisted of more female (61.7%) than male (38.3%), and the majority of the respondents were aged between 41 and 50 years old (40.2%), followed by those aged 31 - 40 years (19.2%), 51 - 60 years (17.6%), 61 - 70 years (11.6%), 21 - 30 years (9.0%), and a small percentage of respondents aged over 71 years (2.4%). In term of races, the majority of respondents identified as Malay, accounting for

Table 1. Socio-demographic profile of respondents (*n* = 449).

Demographic variable	Category	Frequency (*n*)	Percentage (%)
Gender	Male	172	38.3
	Female	277	61.7
Age	21 - 30	40	9.0
	31 - 40	84	19.2
	41 - 50	181	40.2
	51 - 60	79	17.6
	61 - 70	52	11.6
	Above 71	11	2.4
Race	Malay	281	62.6
	Chinese	84	18.7
	Indian	84	18.7
Education level	Primary School	95	21.1
	Secondary School	296	65.9
	Higher Institution	58	13
Household income	Less than RM2,500	185	41.2
	RM2,501 - RM3,169	140	31.2
	RM3,170 - RM3,969	113	25.2
	RM3,970 - RM4,549	11	2.4
Household size	1 - 3	123	27.4
	4 - 6	322	71.7
	7 - 9	4	0.90

62.6% of the total sample, while both Chinese and Indian participants accounted for 18.4% each. The educational background of the respondents comprised a majority having secondary school education (65.9%), followed by primary school (21.1%), and higher institution (13.0%). In terms of income, the respondents can be categorised into four income brackets. The majority of the respondents earned less than RM2,500 per month (41.2%), followed by 31.2% earned between RM2,501 and RM3,169, while 25.2% earned between RM3,170 and RM3,969. A smaller minority (2.4%) fell into the highest income bracket of RM3,970 to RM4,549. The household size was predominantly in the range of 4 to 6 members (71.7%), followed by household with 1 to 3 members (27.4%), and a small minority with 7 to 9 members (0.90%).

Food insecurity status

　　　　Table 2 shows the food insecurity situation of low-income households, measured across four dimensions using 17 items designed to gauge key elements of food insecurity. Under Dimension 1 (Anxiety and Uncertainty about Food Access), the findings indicated a substantial number of the households facing persistent anxiety and uncertainty about food access. Only 20% ($n = 89$) reported never experienced worried about enough food, while 17% ($n = 77$) indicated that they had never been concerned about running out of food. This aligned with the work of Motlagh *et al.* (2015), who reported that only 26.2% ($n = 104$) of households never been anxious about not having enough food, while a striking 73.8% ($n = 293$) had encountered such concerns. Dimension 2 (Insufficient Quality) was assessed using seven items, and the findings showed that the majority of households experienced issues related to food quality at least 1 to 2 times per month. Furthermore, 44% of the households reported purchasing cheaper food, and 40% opted for low-quality food at least 3 to 10 times per month (sometimes). These findings implied that food insecurity persisted, even if the household

Table 2. Household's food insecurity situation by dimension.

Food insecurity dimension/frequency	Never (%)	Rarely (1-2 times per month) (%)	Sometimes (3-10 times per month) (%)	Often (More than 10 times per month) (%)
Dimension 1: Anxiety and uncertainty about food access				
1. Worry about enough food	89 (20)	188 (42)	123 (27)	49 (11)
2. Worry running out of food	77 (17)	168 (37)	158 (36)	46 (10)
Dimension 2: Insufficient quality (includes variety and preference of type of food)				
3. Unable to eat preferred food	76 (17)	181 (40)	126 (28)	66 (15)
4. Eat limited variety of food	105 (23)	153 (34)	129(29)	62 (14)
5. Unable eat nutritious food	139 (31)	163 (36)	104 (23)	43 (10)
6. Eat just a few kinds of foods	95 (21)	180 (40)	102 (23)	72 (16)
7. Eat foods that really do not want to eat	135 (30)	115 (26)	144 (32)	55 (12)
8. Buy cheaper food	30 (6)	75 (17)	197 (44)	147 (33)
9. Buy low quality of foods	65 (14)	76 (17)	176 (40)	132 (29)
Dimension 3: Insufficient quantity of food intake aspects of social acceptability				
10. Eat a smaller meal	68 (15)	164 (37)	145 (32)	72 (16)
11. No any kind of food to eat in the household	125 (28)	156 (35)	132 (29)	36 (8)
12. Eat fewer meals in a day	95 (21)	183 (41)	130 (29)	41 (9)
13. Go to sleep in hungry	90 (20)	202 (45)	119(27)	38 (8)
14. Unable to consume main meals	103 (23)	161 (36)	103 (23)	82 (18)
15. Go the whole day and night without eating	85 (19)	183 (41)	147 (33)	34 (7)
Dimension 4: Physical consequences due to lack of food intake				
16. Weight loss	282 (63)	167 (37)	-	-
17. Health problem	280 (62)	169 (38)	-	-

experienced it rarely (1 to 2 times per month), indicating constant struggles with food quality among low-income households.

There were six items used to measure Dimension 3 (Insufficient Quantity of Food Intake), and the findings showed that most households rarely (1 to 2 times per month) experienced insufficient quality of food intake. However, some households experienced this issue more frequently, indicating that food insecurity was a recurring challenge. As for Dimension 4 (Physical Consequences), more than half of the households (63%) had never lost weight and 62% stated that they had not encountered health problems stemming from financial constraints related to food. Overall, the findings revealed a moderate degree of food insecurity in low-income households in Klang Valley. While the situation might not have been dire, it was evident that the challenges associated with insufficient food access continued to affect a significant portion of the population.

In Malaysia, food insecurity still exists among the low-income households in Klang Valley, though it has not escalated to the extent of hunger and malnutrition. The households' food insecurity situation was closely linked to an insufficient quantity of food intake, which may be driven by income instability and the rising cost of living.

The Food Insecurity Index categorises food insecurity into four distinct levels: (1) food secure, (2) mildly food insecure, (3) moderately food insecure, (4) severely food insecure (Coetes *et al.*, 2013; Ibok *et al.*, 2019). The results showed that low-income households in Klang Valley scored 42.3 on this index, indicating a widespread occurrence of food insecurity within this demographic. The score also suggested that these households were experiencing moderate food insecurity situation characterised by frequent anxiety related to food scarcity, occurring more than 10 times per month. In addition, they face challenges related to both quantity and quality of food intake between 3 to 10 times per month, primarily due to financial limitations that restrict their ability to procure sufficient food. According to Napoli *et al.* (2011), a score above 40% on the Food Insecurity Index signifies a state of food insecurity that warrants intervention. This was corroborated by Cooper (2013), who reported that 64.3% of rural households in Malaysia experienced food insecurity. Similarly, Farhadian *et al.* (2015) found that 64.7% of households in Sabah were categorised as food

insecure, while Alam *et al.* (2016) noted that 47.2% of households with low-income on the east coast of Malaysia faced food insecurity. The findings of the present work aligned with earlier findings, emphasising that food insecurity in low-income households in Klang Valley is a pressing issue, with moderate severity.

Table 3 presents the Food Insecurity Index of individual low-income households. The classifications of food insecurity status were determined based on how frequently respondents encountered food insecurity situations across various dimensions, as presented in Table 2. Based on Table 3, 46.33% of households were experiencing mild food insecurity. While this category exhibited a diverse range of frequencies across different dimensions, a commonality was the relatively frequent occurrence of anxiety and uncertainty regarding food access, with a frequency of 3 to 10 times a month (sometimes). Conversely, experiences of insufficient food quality, quantity, and related physical consequences were less frequent, occurring only 1 to 2 times per month. Further analysis showed that 47.22% of households were categorised as moderately food insecure, experiencing more severe disruptions. In this category, anxiety and uncertainty about food access were reported to occur more than 10 times per month. Additionally, the occurrences of insufficient quality, insufficient quantity of food intake, and physical consequences due to a lack of food intake were more prevalent, with households reporting these issues 3 to 10 times a month.

Table 3. Food insecurity status among low-income households in Klang Valley, Malaysia.

	Category	Percentage (%)
Food secure	0 - 17.65	11 (2.45%)
Mildly food insecure	17.66 - 37.25	208 (46.33%)
Moderately food insecure	37.26 - 70.59	212 (47.22%)
Severely food insecure	70.6 - 100	18 (4.0%)

A smaller but more concerning proportion, 4% of households experienced severe food insecurity. These households faced the highest frequency of food insecurity across all measured dimensions. That is, the households often experienced anxiety and uncertainty about food access, insufficient quality, insufficient quantity of food intake, and physical consequences due to lack of food intake, with these

events occurring more than 10 times per month. The severity of their food insecurity was marked by the need to limit their food intake for over ten days each month. In extreme cases, households reportedly went days without food, and slept through the night to stave off hunger due to a lack of resources.

Meanwhile, only 2.45% of the households were food secure, indicating that a very small proportion of respondents had sufficient access to food to feed all household members. In a comparative study conducted in Malaysia, the proportion of individuals experiencing food insecurity varied between 9.5 and 32.8%. The findings demonstrated that low-income families in Klang Valley, in particular, continued to face food insecurity. This aligned with Alam *et al.* (2016), who indicated that both rural and urban residents in the East Coast Economic Region faced similar challenges, emphasising that food insecurity transcended geographic boundaries in the country. Further supporting these findings, Cooper (2013) reported that 64.3% of households in Sarawak, Malaysia, experienced food insecurity, with 10.0% classified as mildly food insecure, 25.7% as moderately food insecure, and 28.6% as severely food insecure. Sulaiman *et al.* (2021) also found a significant portion of low-income Malaysian households, with 47.2% grappling with food insecurity.

Among the Mah Meri (indigenous women) community in Peninsular Malaysia, more than 50% of households were similarly affected by food insecurity, with 29.3% experiencing household food insecurity and 23.4% experiencing household individual food insecurity (Pei *et al.*, 2018). A study conducted among poor rural communities in Sabah, Malaysia, revealed that 8.8% of households experienced severe food insecurity, while 28.4 and 27.5% faced mild and moderate food insecurity, respectively (Farhadian *et al.,* 2015). These findings highlighted that moderately and severely food insecure households struggled to access an adequate quantity and variety of nutritious food. As a result, greater attention must be directed toward these groups, as they are more vulnerable to the adverse consequences of food insecurity.

When compared to other developing countries, Malaysia exhibits a relatively more favourable food security situation. For example, the present work found that 47.22% of households were moderately food insecure, a figure lower than the 59% observed in Bangladesh (Shuvo *et al.*, 2024). In Afghanistan,

food insecurity is even more pervasive, with 95% of rural households suffering from moderate or severe levels (Najam *et al.*, 2023). In contrast, the food insecurity in Malaysia is less severe, as it does not escalate into widespread hunger compared to a study in South Africa that found 31.8% of respondents experienced hunger (Tambe *et al.*, 2023), which is a more acute manifestation of food insecurity than what has been observed in Malaysia.

The implications of food insecurity, especially for households under moderate and severe food insecure, are profound. Low-income households, especially those earning below RM2,500, face increased risk, including diminished access to nutritious food, leading to poor health outcomes, and is associated with slower development and lower educational performance among children. A study conducted in the United Kingdom involving 278 families demonstrated that children aged 12 raised in food-insecure environments had lower cognitive abilities, and increased behavioural and emotional difficulties relative to their food-secure peers.

Logistic regression analysis

As presented in Table 4, the logistic regression analysis revealed that all four factors: race, education level, total income, and household size were significantly associated with the outcomes at the 10, 5, and 1% levels of significance. The sign of the estimated coefficient provided insight into the directions of the relationships between these variables and food insecurity. The likelihood of a case being classified into a specific category was determined using exponential (B) values in the equation (Pallant, 2005). The analysis revealed that race played a crucial role in determining food insecurity. Specifically, Indian households exhibited a positive estimated coefficient for race (β = 1.811), indicating that these households were 1.811 times more likely to be food insecure compared to Malay households. This highlighted the significant impact of racial differences on food insecurity among low-income communities. This finding was supported by Morris *et al.* (2016) among university student in Illinois, United Sates, in which race could influence the food insecurity status (Tan *et al.*, 2022). The study also echoed observations made during the COVID-19 pandemic, which revealed that Indian households faced higher odds of food insecurity compared to Malay and Chinese households (Tan *et al.,* 2022).

Table 4. Factors affecting food insecurity status among urban low-income in Klang Valley

Variable	Estimated coefficient (B)	SE	Wald	Sig.	Exponential (B)
Age	-0.013	0.009	2.111	0.146	0.988
Race Chinese	0.234	0.270	0.754	0.385	1.264
Race India	0.594	0.279	4.522	0.033* *	1.811
Education level (Secondary school)	0.023	0.264	0.007	0.932	1.023
Education level (Highest institution)	-1.059	0.393	7.240	0.007***	0.347
Total income	-0.001	0.000	34.060	0.000***	0.999
Household size	0.157	0.088	3.146	0.076*	1.170
Constant	1.698	0.688	6.086	0.014	5.465
-2 Log-Likelihood				557.267	
Cox and Snell R square				0.135	
Nagelkerke R Square				0.180	
Hosmer and Lemeshow Test				0.620	

(***) significant at 1% level of significance; (**) significant at 5% level of significance; and (*) significant at 10% level of significance.

Education level emerged as another significant factor influencing food insecurity outcomes. The negative estimated coefficient for education (β = -1.059) suggested that households with higher education levels were 0.347 times less likely to experience food insecurity. This underlined the assertion that higher education enhances job prospects, increases the probability of securing well-paying job, increases income, and consequently decreases the likelihood of food insecurity (Babatunde *et al.*, 2010; Adeyemo and Olaijide, 2013; Ahmed *et al.*, 2015; Smith *et al.*, 2017; Olagunju *et al.*, 2019; Mthethwa and Wale, 2020; Ogunniyi *et al.*, 2021).

Total income is another important factor that has influence on food security status among low-income households in Klang Valley. A negative relationship was observed with an estimated coefficient of β = -0.001, indicating that households with higher incomes were 0.99 times less likely to face food insecurity than those with lower incomes. The present finding aligned with the findings of a Bangkok-based study in which they found that lower-income households with more children were disproportionately likely to experience food insecurity (Jankhotkaew *et al.*, 2022). The comparison with the COVID-19 pandemic further underlines the role of total household income as one of the significant determinants of food insecurity and

psychological well-being. The global health crisis has introduced a number of unexpected socioeconomic challenges, including financial stability brought on by global economic downturns, job losses, and wage cuts.

In the present context, individuals with lower financial literacy are vulnerable to food insecurity, particularly during periods of MCO. A study conducted during the pandemic found that households with monthly income below RM4,000 were at an increased risk of food insecure during MCO 1.0 (Tan *et al.*, 2022). The present findings corroborated this, showing that households earning less than RM2,500 were even more susceptible to food insecurity. For household size, the estimated coefficient of β = 0.157 indicated its significant influence on food insecurity, with larger households being 1.170 times more likely to face food insecurity compared to households with fewer members. This finding was in line with Shariff and Khor (2008), in which they found that larger household tend to be more food insecure. Studies from Nagaland, India, and North Wollo, Ethiopia also yielded similar findings, where larger household sizes diminished the capability of low-income households to maintain food security, especially in urban settings (Sahu *et al.*, 2017; Mota *et al.*, 2019). The presence of more children in food-insecure households can exacerbate this issue, as larger households not only face

nutritional challenges but also carry greater financial burdens, especially when the household members rely on a limited number of income-generating individuals (Idrisa *et al*., 2008).

Limitations

The present work faced several limitations that warrant consideration. The availability of relevant studies specifically addressing urban low-income populations in Klang Valley from the Malaysian perspective are limited, where existing studies predominantly emphasise food security and insecurity in rural areas (Alam *et al*., 2016). This limited comparative insights for urban settings. Furthermore, sample size employed represented only a fraction of the larger population, as the focus was confined to low-income urban households in Klang Valley. As a result, caution must be exercised when attempting to generalise these findings across the entire country. Future studies would benefit from a more extensive and geographically varied pool of participants involving those from other states to ensure the broader applicability. Additionally, the present work only examined four key dimensions: anxiety and uncertainty about food access, insufficient food quality, insufficient quantity of food intake, and physical consequences due to lack of food intake. However, dimensions such as nutritional status and diet quality were not explored, and the inclusion of these factors in future studies would offer deeper insight into household food insecurity in Malaysia.

Conclusion

The present work revealed that the overall Food Insecurity Index in Klang Valley was 42.3, indicating a moderate level of food insecurity among low-income households. This moderate food insecurity would have significant adverse implications, particularly on public health, where it contributes to detrimental outcomes such as stunting in children and micronutrient deficiency in adults. Without timely intervention from relevant authorities and stakeholders, moderate food insecurity risks escalating into severe food insecurity. Addressing food insecurity is crucial to achieving Sustainable Development Goal 2 (SDG-2), which strives for the eradication of hunger.

The present work measured four dimensions of food access, *i.e.*, anxiety and uncertainty about food

access, insufficient quality, insufficient quantity of food intake, and physical consequences as a result of lack of food intake, to derive the Individual Food Insecurity Index. The data revealed an overwhelming majority of households (97.55%) experiencing food insecurity (of which 46.33% were mildly food insecure, 47.22% were moderately food insecure, and 4.0% were severely food insecure), while only 2.45% were considered food secure. The four dimensions effectively captured the frequency and severity of the situation faced by the low-income households in Klang Valley. Furthermore, the present work identified race, education level, household total income, and household size as key factors influencing food insecurity in this urban setting. In response to these findings, it is recommended that interventions from stakeholders, including government agencies, be specifically directed toward households with incomes below RM2,500 and large family sizes. Both food and financial assistance should be prioritised for these vulnerable groups. Special consideration should also be given to those facing moderate to severe levels of food insecurity, ensuring that government assistance reaches those most in need.

The result also suggested that improving the educational level among the low-income households could significantly reduce the likelihood of food insecurity. As a short-term measure, targeted financial assistance for education is recommended to alleviate the immediate challenges of food insecurity in these communities. The government has a major role to play by offering necessary support, such as free tuition, scholarships, and financial aid, particularly for larger households with more than four members. Such intervention not only address food insecurity, but also contribute to improved nutrition outcomes, and simultaneously advancing the goal of SDG-2.

Food insecurity and poverty are deeply interrelated, and it is essential to address both challenges at once rather than in parallel silos. Policymakers are urged to prioritise these vulnerable groups when formulating strategies to mitigate food insecurity. To further inform these strategies, future research should consider expanding the sample size to include broader demographic across multiple states to achieve better generalisability. It is also encouraged to involve a wider range of variables that contribute to food insecurity for more comprehensive comparisons between different respondent groups. A comparative analysis between urban and rural food

insecurity could also provide valuable insights, and help identify region-specific challenges. These areas also might be considered for future research. Such research will ultimately guide the development of targeted safety net programs tailored to the unique needs of low-income households, ensuring a more effective and sustainable response to food insecurity.

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