

ANALYSIS OF EARLY RETIREMENT EXPENSES BALANCE FROM THE PERSPECTIVE OF AGE GROUPS

(Analisis Baki Perbelanjaan Awal Persaraan daripada Perspektif Kumpulan Umur)

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ABSTRACT

Many households have trouble managing their finances due to low income, growing living costs and poor saving habits. Effective early retirement planning influences long-term financial stability. Therefore, this study endeavors to examine the pattern of household income influence expenditure across five distinct age cohorts to assess retirement savings adequacy. Specifically investigating whether the income-expenditure differentials at different life stages allow for enough wealth accumulation to support sustainable retirement living standards. A total of 1870 household were chosen in this research focus on Selangor state, the most economically significant state in the country with the highest prevalence of bankruptcy. Selangor state with high population density, varied economic environment, and diversified demographic make it perfect microcosm of Malaysia larger socioeconomic fabric, which improves the findings' applicability to the country. This study used non-parametric methods to ensure robust statistical analysis due to the non-normal distribution of data, as identified by the Shapiro-Wilk test and confirmed by the ineffectiveness of transformations. Since income, expenses, and balance were not normal across age groups, even though the sample size was big, non-parametric tests had to be used to make sure the analysis was precise and trustworthy. The results show that household income has a significant impact on balance and spending. This study contributes insightful information to the field of retirement and personal finance studies in providing a foundation for future investigations.

Keywords: retirement planning; saving; income; expenses; non-parametric

ABSTRAK

Sistem pengurusan kewangan tidak terurus di kalangan isi rumah berleluasa dewasa ini ekoran daripada pendapatan yang tidak mencukupi, kos sara hidup yang meningkat dan tiada amalan menyimpan yang betul. Perancangan persaraan awal yang berstruktur memberikan kesan yang mendalam terhadap kestabilan kewangan jangka panjang. Kajian ini bertujuan mengenalpasti corak pendapatan isi rumah terhadap perbelanjaan di kalangan lima kohort umur yang berbeza bagi menilai kecukupan simpanan untuk persaraan. Kajian secara khusus melihat sama ada terdapat perbezaan ketara antara pendapatan dan perbelanjaan pada pelbagai peringkat umur yang membolehkan pengumpulan kekayaan mencukupi untuk menyokong standard kehidupan selepas bersara. Sebanyak 1870 isi rumah telah dipilih dalam penyelidikan ini dimana hanya fokus kepada negeri Selangor, negeri yang paling signifikan dari segi ekonomi di negara ini dengan jumlah kebangkrutan tertinggi. Negeri Selangor mempunyai kepadatan penduduk yang tinggi dengan kepelbagaian persekitaran ekonomi serta keadaan demografi yang pelbagai menjadikan ianya mikrokosm yang terbaik bagi sosioekonomi Malaysia yang lebih besar secara tidak langsung menjadi penanda aras kepada negara secara keseluruhan. Kajian ini menggunakan kaedah bukan parametrik untuk memastikan analisis statistik yang kukuh disebabkan oleh taburan data yang tidak normal setelah dikenalpasti dalam ujian Shapiro-Wilk dan disahkan di ketidakberkesanan transformasi. Memandangkan pendapatan, perbelanjaan, dan baki tidak normal merentasi kumpulan umur walaupun saiz sampel yang besar, ujian bukan parametrik lebih sesuai digunakan untuk memastikan analisis adalah lebih tepat dan boleh

dipercayai. Penemuan kajian menunjukkan kepentingan pendapatan isi rumah dalam mempengaruhi perbelanjaan dan baki perbelanjaan. Penyelidikan ini menyumbang pandangan terhadap kewangan individu dan kajian persaraan dengan menyediakan asas terhadap penyelidikan akan datang.

Kata kunci: perancangan persaraan; simpanan; pendapatan; perbelanjaan; bukan parametrik

1. Introduction

Early retirement savings has become increasingly evident align with the United Nations Sustainable Development Goal 8 (SDG 8): Decent Work and Economic Growth (Shevelkova *et al.* 2023). Many individuals face challenges in dealing with retirement readiness, due to insufficient saving (Hussain 2023; Ramli & Shariff 2023). There needs an effective financial strategy to be taken seriously. Financial management is a crucial component of home management that needs to be used in planning retirement. Financial planning, financial control and financial decision making are three roles in financial management (Aziz *et al.* 2013). Inadequate retirement planning may lead to lacking financial resource (Ghadwan *et al.* 2023). Expenditure is the foundation of financial management that needs to be in planning for retirement (Madudova & Corejova 2024). It involves researching existing resources to meet future needs, a process that becomes increasingly challenging when household needs to balance existing expenses with long-term financial assurances (Mansor *et al.* 2022). This study argues that early planning towards good spending is the key to ensuring a stable and comfortable life during retirement as lack of planning can lead to financial insecurity and reduce well-being in old age (Ghadwan *et al.* 2022)

Some individuals fail to effectively manage their income and control monthly expenditures (Sabri *et al.* 2024). This leads to overspending on non-essential items, neglecting budgets properly and failing to prioritize balance which hinders handling unexpected expenses (Achtziger 2022). The foundation of financial management is essential for households of all ages to balance their income, expenses and balance (Riha Parvin & Panakaje 2022). The correlation between household income, expenditure and balance habits across various age groups emphasizes how crucial it is to begin retirement planning early in one's personal life. Through this relationship, this study aims to provide in-depth income and spending patterns for over-term financial stability. Pension balance initially rise from 3.0% when a person starts work to 4.6% by age 46-48, then decrease as a person approached the retirement age (Muthitacharoen & Burong 2024)

The findings of this investigation have significant implications for policymakers and financial advisers which allow for more effective strategies to be developed to promote financial inclusion and early retirement provisions. The study advanced understanding of personal financial management improves understanding of how to modify pension plans and enhances economic well-being in general. Various previous study focused on household demographic factor (May *et al.* 2023; Qian *et al.* 2024; Selvadurai *et al.* 2018). Income, expenditure and balance are mutually connected (Ismail & Bakar 2012). However, studies on the importance of housing make preliminary planning on finance in terms of income, expenditure and balance by looking more deeply by age group are still not widely done.

The research methodology, results, and implications for household financial planning are covered in the next section on further research. These results of statistical analysis such as descriptive and correlation analysis are presented in this study. The next part provides clarification on the remaining portion of this section as follows: 2. Research Methodology, 3. Result and Discussion and 4. Conclusion.

2. Research Methodology

2.1. Statistical analysis procedure

This study performed three main analyses that are exploratory analysis, the distribution of data, and correlation analysis. The Shapiro-Wilk test was first used to look at the distribution of the data (Aziz *et al.* 2014). It showed that the data did not follow a normal distribution. Several methods of transformation were used, but normality could not reach. Hence, to compare groups, non-parametric test were used. This method makes sure the analysis is strong by dealing with non-normal structure of the data in the right way.

2.2. Data collection

Our study focuses on the development of a new mathematical programming model for future retirees to allocate their income, balance and expenditure in an optimal way. The first step is to determine whether retirees truly lack sufficient balance in post-retirement. An analysis will be conducted to assess the strength of the correlation and relationship between age groups and their income, balance and expenditure. Three hypotheses were investigated by the analysis: the distribution of income is the same across age group categories, the distribution of expenditure is the same across age group categories, the distribution of balance is the same across age group categories. Data from the Household Income and Expenditure survey conducted by Department of Statistics Malaysia (DOSM) which represented household nationwide was used in this study. The cross-sectional database version 2022 micro data extract include information on household's members' incomes in Malaysia. A preliminary study has employed histogram graph analysis to identify the state that contributes most significantly to the study as indicated by their elevated frequency of insolvency occurrences.

2.3. Exploratory analysis

According to (Larson 2006), exploratory analysis involves utilizing fundamental aspects of data such as frequency table charts, graphs, and basic statistics. Exploratory statistics were used in this study to describe the individuals features. The results were presented in terms of minimum value, maximum value, mean and standard deviation (SD) for continuous variables such as income, expenses, and balance for each age group.

2.4. The distribution of data

This section begins by examining the data distribution for each age group using the Shapiro-Wilk normality test, which is appropriate for datasets with fewer than 2000 observations (Shapiro & Wilk 1965). If the p -value is higher than the significance level ($\alpha = 0.05$), the data is normally distributed. Through parametric assumptions, association analysis can move forward if the p -value is greater than 0.05. If the p -value is less than 0.05, on the other hand, data transformation methods are used to make the data normal. Non-parametric methods are used to make sure that the analysis is valid when normality is not reachable even after change.

Based on the objectives, the following hypotheses are formulated to determine which individual income influences their spending. A nonparametric equivalent of the one-way Anova for making comparisons of more than two groups. There are some procedures that must be fulfilled to run Kruskal-Wallis one-way Anova by rank. The procedures are as follows (Ramachandran & Tsokos 2020):

- a) Combine the data of the various groups
- b) Arrange them in order from lowest to highest age group
- c) Assign rank to each of the observations

- d) Original ratio data has therefore been converted into ordinal or ranked data
- e) Ranks are sum in each group and the test statistics, H is computed
- f) Ranks assigned to observations in each of the k groups are added separately to give k rank sums.

Test statistic equation (Guo *et al.* 2013; Ostertagová *et al.* 2014):

$$\begin{aligned}
 H &= \frac{12}{N(N+1)} \sum \frac{R_j^2}{n_j} - 3(N+1) \\
 &= 12 \sum \frac{R_j^2}{n_j} - 3(N+1).
 \end{aligned}
 \tag{1}$$

In this equation

- $k \approx$ The number of groups,
- n_j = The number of observations in the j^{th} group,
- N = The number of observations in all the groups combined,
- R_j = The sum of the ranks in the j^{th} group.

2.5. Correlation analysis

2.5.1 Correlation for non-parametric analysis

Correlation analysis assesses monophonic relationships between paired data (Schober *et al.* 2018). This analysis examines the hypothesis that there is a significant relationship between income and expenses, and between income and balance within the same age group, using Spearman's correlation coefficient (ρ). The ranges of the coefficient is -1 to +1. Values close to +1 indicate a strong positive relationship, values near -1 indicate a strong negative relationship, and a coefficient of 0 indicates no monotonic association between the two variables (Ikpe *et al.* 2023; Zhang *et al.* 2024). The correlation equation used is as follows (Shi *et al.* 2022):

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}
 \tag{2}$$

where

- ρ = Spearman's rank correlation coefficient,
- $d_i = x_i - y_i$, difference between the two ranks of each observation,
- n = the number of elements,

where $\rho = 1$ indicates that the two arrays are arranged in the exact opposite order. $\rho = 0$ shows that the two arrays are sorted entirely independently. $|\rho| < 0.4$ indicates that there is moderate

relationship between the two arrays' rankings. Furthermore, $0.7 \leq |\rho| < 1$ indicates that there is a strong correlation between the two arrays' ranking.

3. Results and Discussion

3.1. Exploratory analysis

The total number of bankruptcies in Malaysia across the state is illustrate in Figure 1. Considering the data availability in 2022, a sample of raw micro-data was collected from 1870 household and divided into five age groups which are under 24 years, 25-34 years, 35-44 years, 45-54 years and 55 years and above.

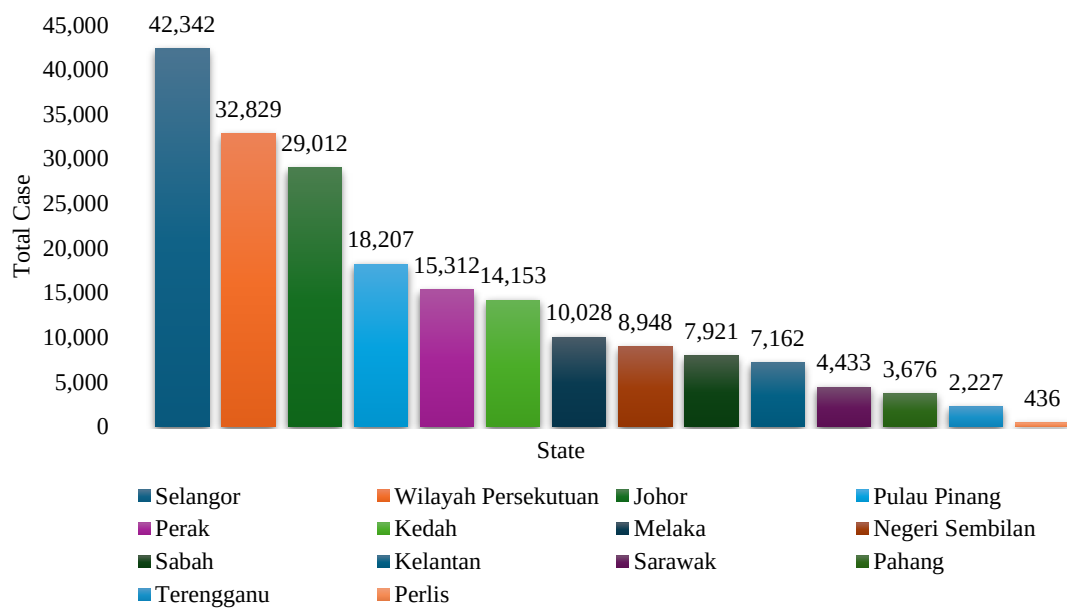


Figure 1: Total bankruptcy in Malaysia

This study employs a convenience sampling techniques which improve the finding robustness and generalizability to the larger Malaysia population. Based on the aggregate data of cases throughout 14 Malaysian, Selangor was selected as the focus of the study due to its highest incidence of bankruptcy cases, high population density, varied economic environment, and diversified demographic characteristic (Ibrahim *et al.* 2023; Ng 2021; Tey & Lai 2022). A multidimensional for analyzing financial behaviors and balance patterns is provided by the state's strong economy which includes both industrial and service sectors. Its sizable and diverse membership which includes people from a range of socioeconomic backgrounds, age groups, and ethnicities that enhance the data pool and makes it possible to derive complex insight into retirement planning. Furthermore, Selangor offers a pertinent setting for observing financial trends and spending patterns that are essential to retirement research because it is a center of industry and commerce. This selection complies with suitable sampling guidelines which maximize the number of attainable cases within the study's data constraint and quota structure. The large number of bankruptcy cases in Selangor offers a sizable dataset that may cover a variety of bankruptcy patterns and causes. This method provided a practical balance between breadth of coverage and depth of analysis, even though it might restrict generalizability

across the entire nation. The high number of cases in Selangor suggests that it operates as a state with a high level of bankruptcy activity, which may be important considered that apply to the larger Malaysia context.

Table 1: Demographic profile of the respondents

Variables	Categories	Frequency	Percentage
Gender	Male	1618	95.94%
	Female	252	4.06%
Age Group	24 and under	44	2.35%
	25-34	504	26.95%
	35-44	557	29.79%
	45-54	460	24.59%
	55 and above	305	16.31%
Marital Status	Never Married	372	19.89%
	Married	1379	73.74%
	Widow/ Widower	79	4.22%
	Divorce	33	1.76%
	Seperated	7	0.37%
Ethnic	Bumiputera	1123	29.02%
	Chinese	491	26.25%
	Indian	225	12.03%
	Others	31	1.66%
Strata	Urban	1794	95.94%
	Rural	76	4.06%

The respondents' demographic descriptive statistics were analyses as shown in Table 1. This demographic information provides important information on planning for retirement, particularly for those who are getting close to pension age. A sizeable percentage of responders are in the 45-54 and 55 above age ranges, it is critical to priorities financial planning. Married people may have more financial responsibilities, the uneven gender distribution raises the possibility that women are under-represented in retirement planning. Factors related to geography and ethnicity also influence how various groups are ready for retirement. It is evidence that financial preparation, including having enough pension funds, is essential for a safe retirement because respondents who are primarily from metropolitan areas may have to pay greater living expenses in retirement.

This study recognizes the gender disparity in the sample, with 95.94% male and 4.06% female respondents. This imbalance happens because the study used data from households and men are usually the main responders or household heads. This means that the data was mostly from men. This is how the household polls are set up, but it may still change the results since there are clear differences between men and women in terms of income and retirement saving. Future studies should aim balanced gender distribution to ensure broader representation. Also, the fact that 95.94% of the respondents were from urban areas means that the result limits applicable to people in cities areas who may have different financial habits and aging issues. Future research should include respondents from rural areas to improve the generalizability of the results.

Analysis of Early Retirement Expenses Balance from the Perspective of Age Groups

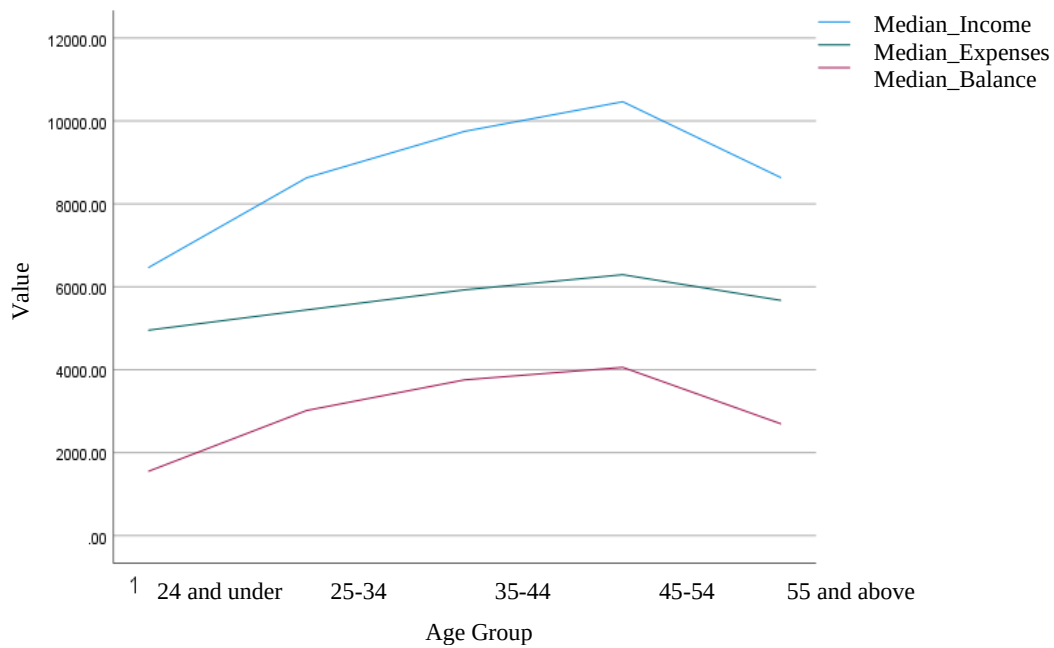


Figure 2: Household expenditure comparison 2022

Figure 2 shows the changes in income, expenditure and balance rates in Selangor state. The lowest income and spending rates are for those under 24 years of age, and this increases steadily until they reach age 45-54 years. The spending rate remains high and only slightly decreases at the age of over 55. There is a significant decrease in the number of balances at the age of 55 years and over.

The empirical finding demonstrates a clear change in the financial dynamics of households across a range of age groups. The demographic group over 55 years of age shows a statistically significant decline in income compared to the 45-54 years age range of peak earnings. According to (May *et al.* 2023), this results in a widening disparity between income and expenses. The growing number of households over 55 years highlights the financial difficulties associated with approaching the retirement phase.

Regarding sustainable retirement planning, these insights draw attention to several crucial factors. The fact that income declines after peak earning years emphasizes how important it is for people to have a strong financial foundation built during their strongest earning years to support themselves in retirement. In addition, the fact that spending steadily implies that retirement planning needs to take continuous steady living expenses into consideration to guarantee the household have enough money to sustain their quality of living after retirement. Ultimately when people start to rely more on their retirement funds or balance after retirement, the decline in balance in later years highlights the significance of prudent money management. For long-term financial stability and security, sustainable retirement planning should concentrate on controlling regular expenses, optimizing balance throughout the peak year and getting ready for a decline in income after retirement.

Table 2: Exploratory analysis of income, expenses, and balance

Variable (RM)	Age group				
	24 and under	25-34	35-44	45-54	55 and above
<u>Income</u>					
Mean	7506.94	9680.43	11441.71	13432.48	12162.17
Minimum	3003.75	2083.33	1966.67	1967.17	1900.00
Maximum	15300.00	39357.67	78965.41	106040.75	103561.59
Std. Deviation	3405.88	4924.48	7982.46	11557.92	13038.33
<u>Expenses</u>					
Mean	5663.30	6045.46	6818.73	7544.04	7125.46
Minimum	2027.30	2258.95	1877.65	918.66	906.31
Maximum	10461.24	43095.62	41013.88	49542.61	42541.94
Std. Deviation	2296.87	3185.15	3940.46	5342.29	5347.77
<u>Balance</u>					
Mean	1843.64	3634.97	4622.97	5888.44	5036.71
Minimum	-3843.40	-19067.87	-8465.19	-8953.56	-6875.84
Maximum	7297.98	17192.23	51176.23	68058.47	67141.40
Std. Deviation	2299.33	3536.77	5341.23	7805.81	8607.70

Table 2 shows mean, minimum, maximum, and standard division amount of household income, expenditure, and balance for age 24 and under, 25-34, 35-44, 45-54 and 55 and above. The budget was used to account for household income, expenditure and balance. According to the result, the lowest minimum values for income and expenses at age 55 and above which are RM1900, RM906.31 respectively, while the lowest values of saving at age 45 to 54 is RM8953.56. Conversely, the highest income and expenses at the age 45 to 54 are RM106,040.80, RM49,542.61 and RM68,058.47 respectively. There are negative balance rates that signify a serious financial problem. Large standard deviations in income RM13,038.33, expenditure RM5,347.77, and balance RM8,607.70 indicate financial disparities in this group. The result provides light on the variety of economic circumstances that people over 55 encounters, underscoring the significance of financial regulations and support networks to the needs of these various age groups.

The results emphasize how critical it is to prepare for steady living expenditures, maximize balance during years of high income and put into practice efficient withdrawal techniques to guarantee financial security in retirement. Furthermore, addressing seniors' varying income levels is critical to designing customized and long-lasting retirement plans. Households should prioritize balance during peak earning years, create a clear budget for regular costs and adopt a smart withdrawal plan to overcome the problems associated with sustainable retirement planning.

The boxplot (Figure 3) shows a general trend balance with age and reveals significant variation within each group, particularly those over 55. Even though the highest median balance on the age above 55, some have low or even negative balance indicate that potential financial challenges in retirement. This variability in the age group above 55 highlights the importance of early financial planning for retirement as well as the need for targeted policies to support those approaching retirement age with insufficient balance and ensuring that every household has the chance to attain a solid and safe financial future in their older years.

In the plot of distributions comparisons in Figure 4 show the distinct curves for each group displaying unique characteristics. The density curves for those over 55 are flatter and wider compared to young age groups, indicate a more diverse range of savings amounts. This group's curve has lower peak implies that balance amounts are more spread out with fewer people clustered around a single value. This pattern highlights the variability in financial preparedness among older individuals and indicates disparities in retirement readiness within this crucial age group.

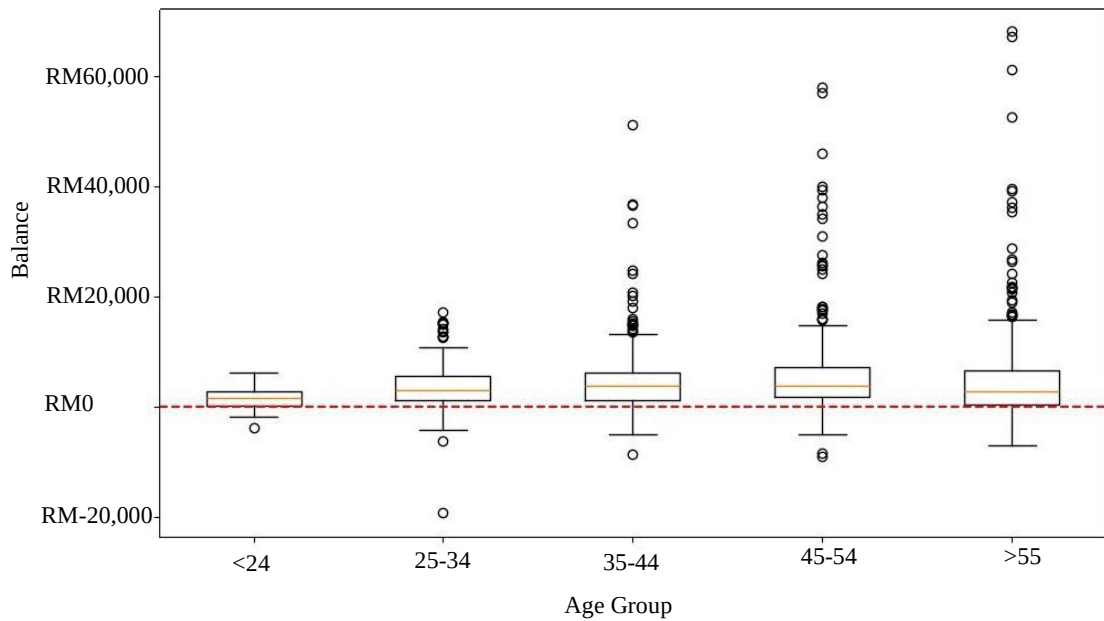


Figure 3: Box-plots of balance (RM) by five age group

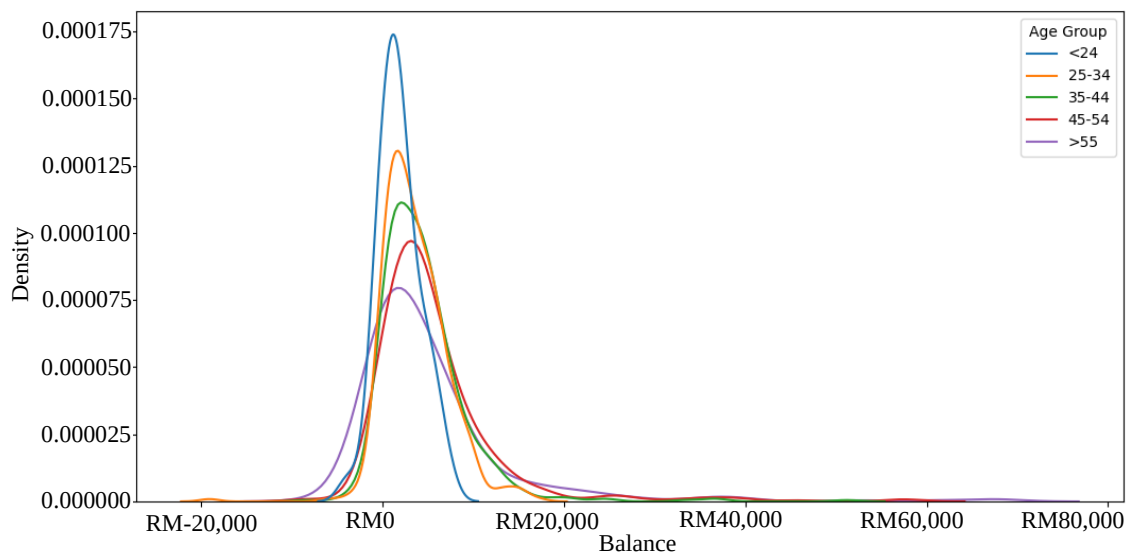


Figure 4: Overlay density plot of age group as compared to balance (RM) for household

Retirement strategy-focused educational initiative can provide senior citizens with the information they need to make wise financial decisions, and future can secure financial future by addressing this gap.

3.2. The behaviour of the data

This section assesses the distribution of income, expenses and balance of expenses among age groups to select the most relevant statistical methods for study. The Shapiro-Wilk test was used to check for normality initially followed by transformations. As the data remain non-normal, Kruskal-Wallis test was used to successfully look for difference between age group.

3.2.1 Normality test for each age group

Table 3: Shapiro Wilk test results

	24 and under	25-34	35-44	45-54	55 and above
Income	0.597*	0.001	0.001	0.001	0.001
Expenses	0.001	0.001	0.001	0.001	0.001
Balance	0.009	0.001	0.001	0.001	0.001

*Normality is significant if coefficient $> \alpha = 0.05$ level.

The Shapiro-Wilk test results in Table 3 show that income is normally distributed only in the “24 and under” age group (p -value = 0.597 $>$ 0.05) while it deviates significantly in all other age groups. Based on these results, it looks like most of the data does not fit the normality assumption. Therefore, to fix the non-normality data problem, the data needs to be transformed.

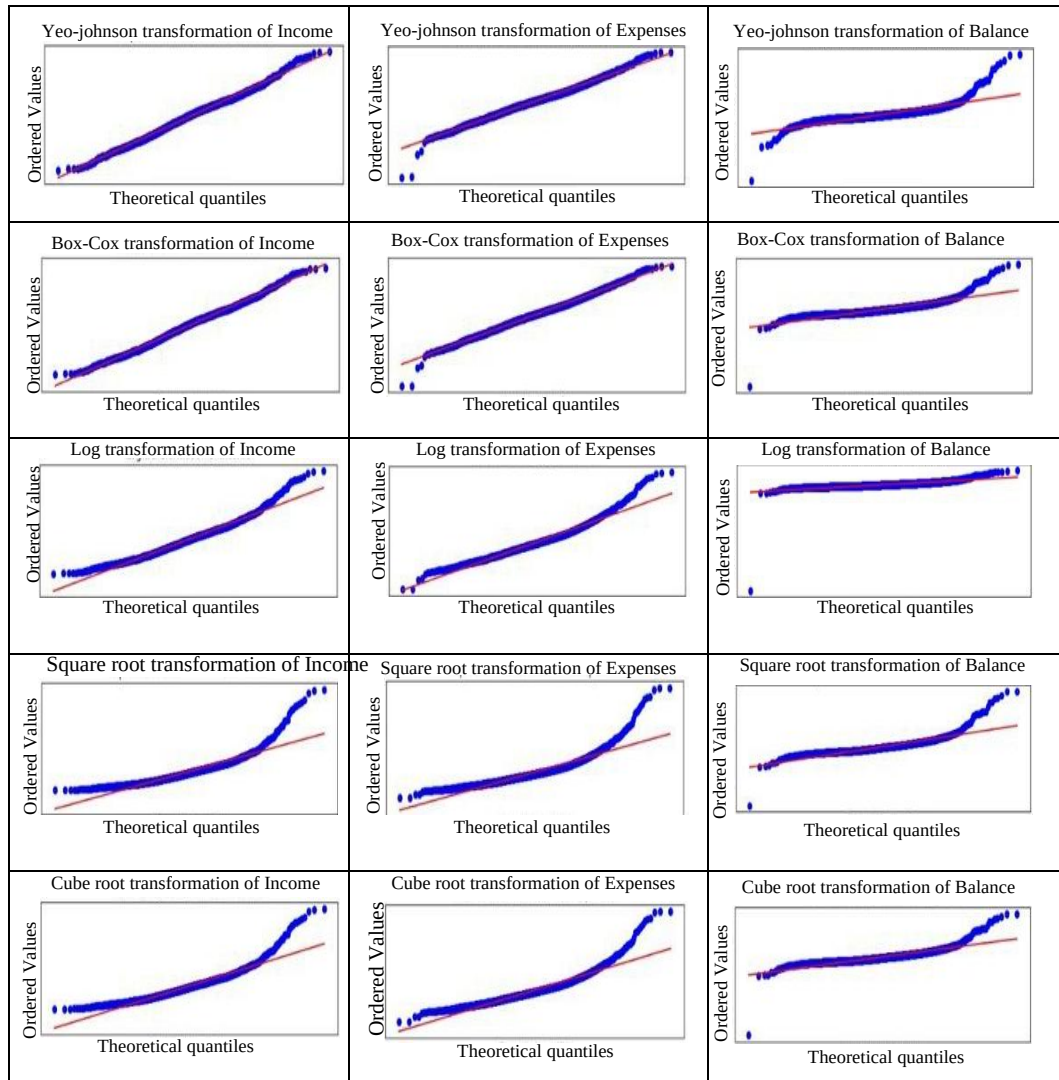


Figure 5: Q-Q plot after transformation

Figure 5 shows various transformations including yeo-johnson, box-cox, logarithmic, square root, and cube root are examined by the Q-Q diagrams to normalize the distributions on income, expenses and balance. The results show that none of the transformations fully matched the data with the theoretical quantiles of a normal distribution. This is due to the data showed big differences from the red line, especially at the ends. The income and balance numbers got linear better after cube root and square root changes. However, the changes didn't work very well for expenses where big deviations from normalcy stayed the same across all ways. These results show that the data doesn't have a normal distribution, even though transformations have been tried. This is probably because of outliers, or the variables are set up. Thus, for further research, non-parametric statistical methods such as Kruskal-Wallis test or Spearman's rank correlation perform the best use.

3.2.1 Kruskal-Wallis test analysis

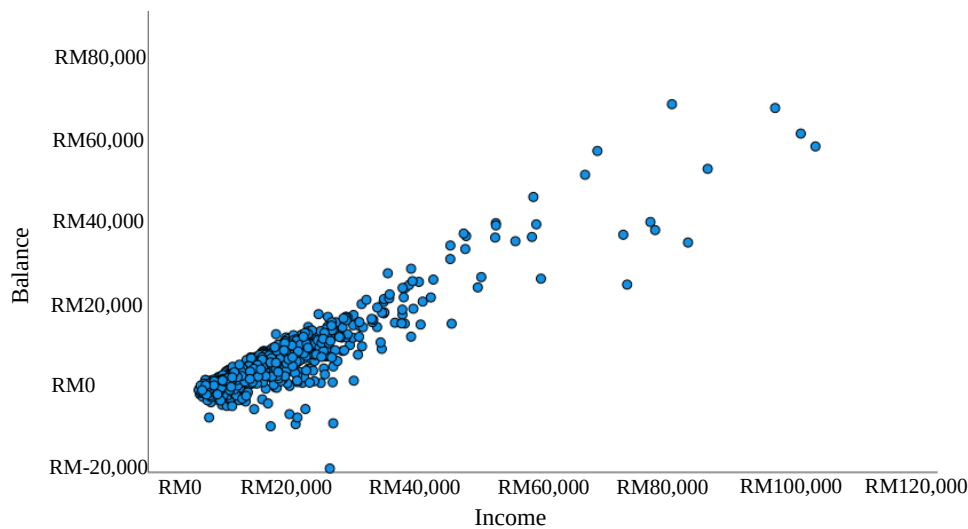


Figure 6: Scatter plot balance (RM) versus income (RM)

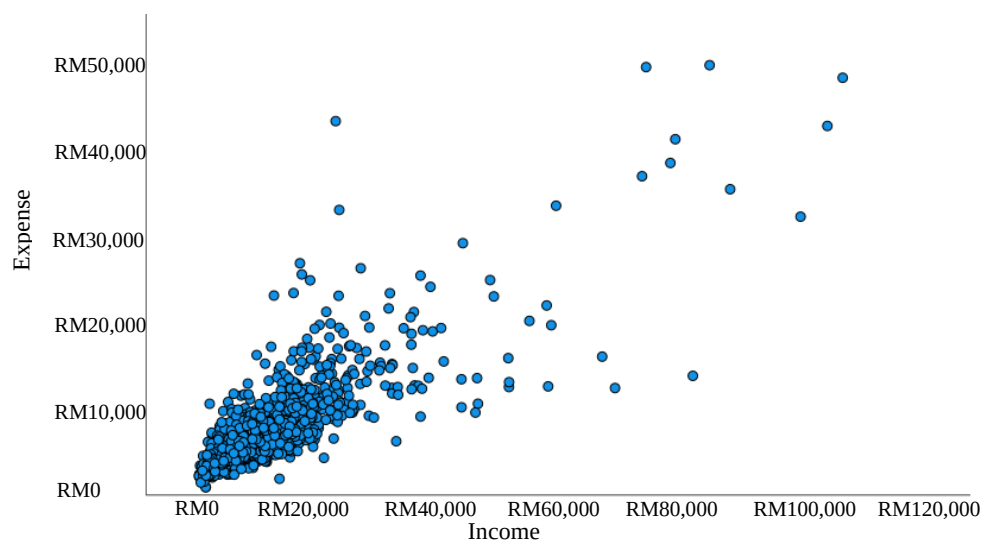


Figure 7: Scatter plot expenses (RM) versus income (RM)

A distinct pattern in financial behavior shown by the scatter plot illustrates the relationship between income, balance, and expenses. The balance plot in Figure 6 demonstrates a strong positive correlation with balance rising nearly linearly income rises. However, at higher income levels there is more dispersion indicating that higher earners are more variability. In contrast, the expenses scatter plot in Figure 7 shows a positive relationship with income but exhibits much more variability especially at higher income levels where spending behaviors diverge significantly. The distribution of expenses is more noticeable at higher income levels, which indicates that higher earners allocate their income across a wide range of expenditures. The more variable pattern of balance contrasted with the more erratic nature of spending underscoring the complexity of financial behaviors that early retirement planning must take into action. It is proposed that via addressing these various financial behaviors, households can improve their financial well-being after retirement and ensure higher financial resilience which will ultimately result in a more stable and secure retirement.

Table 4: Kruskal Wallis test results

Variable	Age	Median (IQR)	Chi-Square (H)	df	p-value
Income	24 and under	6466.79 (5273.25)	52.519	4	< 0.001
	25-34	8631.08 (6357.59)			
	35-44	9751 (7531.21)			
	45-54	10465.2 (8309.00)			
	55 and above	8636.33 (9599.10)			
Expenses	24 and under	4955.13 (3569.15)	32.349	4	< 0.001
	25-34	5444.45 (2660.02)			
	35-44	5928.5 (3255.29)			
	45-54	6293.51 (3840.38)			
	55 and above	5674.41 (4008.04)			
Balance	24 and under	1552.53 (3020.24)	45.430	4	< 0.001
	25-34	3018.23 (4570.58)			
	35-44	3757.61 (4825.36)			
	45-54	4058.82 (5577.31)			
	55 and above	2697.88 (6151.43)			

The Kruskal Wallis test in Table 4 revealed statistical variation ($p < 0.01$) in income, expenditure and balance patterns. These findings have important ramification for sufficiency of retirement funds. The analysis shows a concerning financial trajectory in the retirement transition, whereas expenses by only 9.8% (RM6,293.51 to RM5,674.41), income for those 55 years above declines by 17.5% (from RM10,465.20 to RM8,636.33) relative to the peak earning period (45-54 age group). This suggests disproportionate financial adjustment. The retirement age group in particular shows a significant 33.5% decline in capacity balance (from the peak retirement peak RM4,058.82 to RM2,696.88). These results show that there may be a mismatch between income decrease and expenses adjustment throughout the retirement period which could lead to financial vulnerability. These current balance patterns won't be enough to preserve long-term financial sustainability during retirement. Therefore, to improve retirement financial resilience, policy interventions that support pre-retirement financial optimization methods are required.

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Table 5: Spearman's correlation analysis

Variable	24 and under	25-34	35-44	45-54	55 and above
Income vs Expenses	0.7865**	0.7441**	0.7840**	0.8165**	0.8526**
Income vs Balance	0.6644**	0.8541**	0.8605**	0.8638**	0.8726**
Expenses vs Balance	0.1166	0.3516**	0.4232**	0.4673**	0.5359**

Note: ** means *p*-value less than significance level of 0.01

Table 6: Pairwise comparisons of income, expenditure and balance versus age group

	Variable	Test Statistic	Std. Error	Std. Test Statistic	Adj. <i>p</i> -value
Income	24 and under vs 55 and above	-222.58	87.08	-2.56	0.11*
	24 and under vs 25-34	-228.91	84.88	-2.70	0.70
	24 and under vs 35-44	-332.52	84.56	-3.93	0.00*
	24 and under vs 45-54	-417.85	85.21	-4.90	0.00*
	55 and above vs 25-34	6.34	39.17	0.16	1.00
	55 and above vs 35-44	109.27	38.46	2.86	0.04*
	55 and above vs 45-54	195.27	39.87	4.90	0.00*
	25-34 vs 35-44	-103.61	33.20	-3.12	0.02*
	25-34 vs 45-54	-188.93	34.82	-5.43	0.00*
	35-44 vs 45-54	-85.33	34.02	-2.51	0.12
Expenses	24 and under vs 55 and above	-57.13	84.88	-0.67	1.00
	24 and under vs 25-34	-118.83	87.08	-1.36	1.00
	24 and under vs 35-44	-169.02	84.56	-2.00	0.46
	24 and under vs 45-54	-239.26	85.21	-2.81	0.05
	55 and above vs 25-34	-61.70	39.17	-1.58	1.00
	55 and above vs 35-44	-111.89	33.20	-3.37	0.01*
	55 and above vs 45-54	-182.13	34.82	-5.23	0.00*
	25-34 vs 35-44	50.19	38.46	1.31	1.00
	25-34 vs 45-54	120.42	39.87	3.02	0.03*
	35-44 vs 45-54	-70.24	34.02	-2.07	0.39
Balance	24 and under vs 55 and above	-249.50	87.08	-2.87	0.42
	24 and under vs 25-34	-280.05	84.88	-3.30	0.01*
	24 and under vs 35-44	-351.56	84.56	-4.16	0.00*
	24 and under vs 45-54	-433.96	85.21	-5.09	0.00*
	55 and above vs 25-34	30.55	39.17	0.08	1.00*
	55 and above vs 35-44	102.06	38.46	2.65	0.08
	55 and above vs 45-54	184.46	39.87	4.63	0.00*
	25-34 vs 35-44	-71.51	33.20	-2.15	0.31
	25-34 vs 45-54	-153.91	34.82	-4.42	0.00*
	35-44 vs 45-54	-82.41	34.02	-2.42	1.54

Source Primary Data 2022 (Department of Statistics Malaysia 2023)

* Significant at 5% level

Significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 5 shows the Spearman's correlation analysis shows gradually stronger relationships between age groups, with the 55 and above age showing the strongest relationships between income and balance ($r = 0.8726$, $p < 0.01$), income and expenses ($r = 0.8526$, $p < 0.01$) and expenses and balance ($r = 0.5359$, $p < 0.01$). These findings highlight the critical importance of comprehensive financial planning in pre-retirement phase, as financial interdependence become more pronounced in retirement years.

Table 6 presented the Kruskal-Wallis pairwise comparison of income, expenditure and balance across age group reveals complex, non-linear relationship between age and economic indicator. There are statistical significance differences ($p < 0.05$) between age group 55 and above and middle group (35-44 and 45-54) in income and expenditure patterns. However, the age group 55 years and above exhibits no significant with younger cohorts (24 and under and 25-34) across all financial metrics examined. Unexpected similarity between the oldest and youngest adult groups contrasts sharply with their differences from middle-aged cohorts. The most distinctions consistently between 55 and above and 45-54 groups ($p < 0.001$ for all metrics), indicating a pivotal shift in financial dynamics during late middle age. These findings contribute to age-related financial patterns, emphasizing the life stage specific approaches in economic policy formulation and financial education initiatives.

Figure 8, Figure 9 and Figure 10 illustrates adopt from the step that have been carried out from (Zhang *et al.* 2024) show a significant differences (green lines) and non-significant differences (blue lines) between some adjacent age groups in pairwise comparison plot depict the average ranks of income, expenditure, and balance across five different age groups. The result indicate that the age group between 45-54 have peak financial activity with the highest average ranks in income (1053.52), expenditure (1030.78) and balance (1041.83) due to career advancement and accumulate experience. The younger with age 24 and below show lower average rank for income (635.67), expenditure (791.52) and balance (607.86) reflecting their lower income levels at the initial stages of wealth accumulation. For those who are in the range retirement stage, 55 years and above have the average ranks in income (858.25), expenditure (910.35) and balance (857.36) and slightly lower compared than age group between 45-54. Change in income sources and spending behaviours as transition into retirement phase suggest modest decline in financial activity after age 55 years old. However the expenditure rank for this age group remains relatively high while income may decrease due to accumulated wealth or ongoing financial commitments.

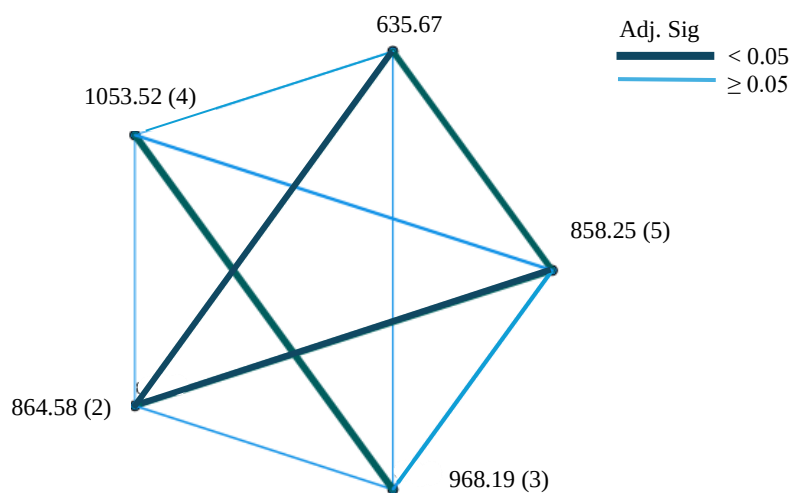
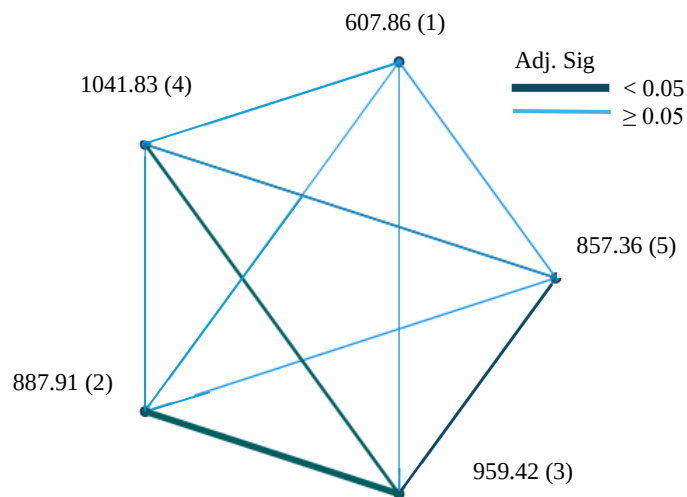
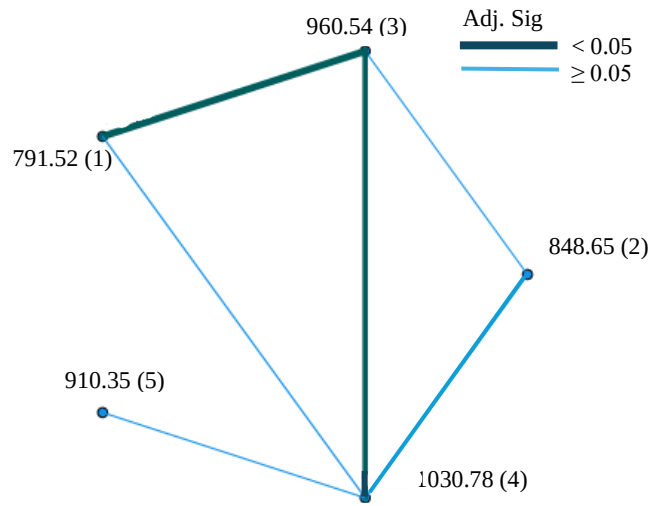


Figure 8: Pairwise comparisons of income across age group



3.4. Result of Generalized Linear Models (GLM)

Variance analysis (GLM) in Table 7, Table 8, and Table 9 serves to assess the meaning of the regression model.

Table 7: GLM type III test of model effects

Source	Wald Chi-Square	df	p-value
Intercept	0.066	1	0.797
Total Expenses	5.3224×10^{14}	1	0.000
Age Group	9.162	1	0.057
Total Income	2.402×10^{15}	1	0.000

Table 8: GLM parameter estimates

Variable	B	Std. Error	Wald Chi Square	df	p-value
Intercept	-0.001	0.003	2.682	1	0.101
Total Income	1.000	4.33×10^{-8}	5.32×10^{14}	1	0.000
Total Expenses	1.000	2.04×10^{-8}	2.40×10^{15}	1	0.000
24 and under vs 55 and above	0.001	0.0008	3.066	1	0.080
25-34 and under vs 55 and above	0.001	0.0003	6.437	1	0.011
35-44 and under vs 55 and above	0.000	0.0003	0.494	1	0.482
45-54 and under vs 55 and above	0.000	0.0003	1.730	1	0.188

Table 9: Model test

Goodness of Fit Statistic	Value	df	Value/df
Deviance	0.042	1863	0.000
Pearson Chi-Square	0.042	1863	0.000
Akaike's Information Criterion (AIC)	-14,703.97		
Bayesian Information Criterion (BIC)	-14,658.747		

A GLM with a normal distribution and an identity link function was used to predict total balance based on age group, total income, and total expenses in Table 7, Table 8 and Table 9. As shown by the goodness-of-fit values (Deviance = 0.042 and Pearson Chi-Square = 0.042, both with value/df = 0.000), the model fits the data well. The Akaike Information Criterion (AIC) was -14,703.017 and the Bayesian Information Criterion (BIC) was -14,658.747 also shows that the model suits well. The Omnibus test was significant ($\chi^2(6) = 52,751.267$, $p < 0.01$) showed that the model fit the data much better than the intercept-only model.

The individual predictors of total balance were total income ($B = 1.000$, $SE = 2.04 \times 10^{-8}$), Wald $X^2(1) = 2.40 \times 10^{15}$, $p < 0.001$) and total expenses ($B = -1.000$, $SE = 4.33 \times 10^{-8}$), Wald $X^2(1) = 5.32 \times 10^{14}$, $p < 0.001$). The total balance went up as well as the total income. On the other hand, bigger total expenses are linked to lower total balance. The categorical indicator age group had a chi-square value of 9.162 and a p -value of 0.057. It was found that age group (25-34 years) was significantly different from the reference group 55 and above ($B = 0.001$, $SE = 0.0003$), Wald $X^2(1) = 6.437$, $p = 0.011$). Age group 24 years and under, 35-44, and 45-54 did not show significant effects since $p > 0.05$.

The intercept wasn't important ($B = -0.001$, $p = 0.797$) which means that total balance isn't different from zero when the variables are at their starting points. The results show that a higher total balance is link to a higher total income and a lower total balance is linked to a higher total expenses. Age differences were modest, with only the 25-24 age group having a noticeable impact when compared to those 55 and older. This underscores the critical contribution of financial inflows (income) and outflow (expenses) to the determination of household financial balances.

Table 10: Kruskal Wallis H test for hypothesis testing

Hypothesis	Proposition	P-Value	Decision (5% sig)
1	The distribution of Income is the same across categories of Age Group	<0.01	Reject the null hypothesis
2	The distribution of Expenses is the same across categories of Age Group	<0.01	Reject the null hypothesis
3	The distribution of Balance is the same across categories of Age Group	<0.01	Reject the null hypothesis

The result of the Kruskal-Wallis H Test in Table 10 shows the results examining the distribution of income, expenses, and balance across five different age groups. The tests yielded p -values less than 0.01 for all three financial variables, which are below 5% significance level, shows a statistically significant. Consequently, the null hypothesis was rejected in all cases. These findings indicate that there are statistically significant differences in the distribution of income, expenses, and balance among various age groups. This suggests that age is a significant factor influencing these financial variables, to look over investigation into the specific nature of these differences across age categories.

4. Conclusion

Despite financial planning for retirement has been extensively studied, few have studied the relationship between stage age on balance and expenditure on household context as preparation for a comfortable retirement. Financial planning helps to ensure a balance between incoming income and outgoing expenses. It allows businesses or individuals to adapt to economic challenges and make proper plans for a comfortable retirement. Clear financial goals and implementation from an early age are very important in achieving all dreams so that nobody needs to struggle at old age. This study essentially focused on the importance of every household having proper financial planning over the stage age as it will affect expenses and balance after retirement. Since the balance amount is also influenced by income and expenses, the finding of this study can be used as a guideline to each household as a financial preparation for future pensioners. As more people start saving from a young age and lack of dependence on public resources will contribute to Sustainable Development Group Goals 8. Indirectly, it built up a stronger economic landscape and reduced poverty.

This expanded discussion offers a more thorough framework for addressing retirement preparedness across age groups by incorporating both practical suggestions and the possibility of mathematical modelling for additional study. The emphasis is on the development of early saving habits in younger individuals (20s-30s) by utilizing automated mechanisms such as personal saving accounts or employer sponsored plans to capitalize on the advantages of compound growth. Regular financial evaluations and investment strategy diversifications are advised for middle-aged people (40s to 50s) to handle any potential savings shortfalls and modify retirement objectives appropriately. Strategies for controlling retirement withdrawals, setting priorities for necessities, and reducing risk are stressed for older adults (60s and above) to maintain financial stability. Although these suggestions are based on previous research, dynamic linear programming techniques will be used to better assess the research outcomes. The most efficient tactics for various demographic groups and financial situations in Selangor can be found because of this method's systematic approach to optimize challenges throughout time. The goal of this study is to provide precise and significant solutions for improving retirement preparedness and financial resilience by combining actionable insight with dynamic linear programming.

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