

Consumption Patterns in Malaysia Using Generalized Linear Model

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Abstract: Household expenditure is important as an indicator to financial stability of household in a country. According to economic theory, well-being is measured better by expenditure rather than by income. In general, there are various factors affecting household expenditure patterns including income, demographic and socioeconomic characteristics of each household. Therefore, this study investigates the relationship between the demographic and socioeconomic characteristics with household expenditure using Malaysian Household Expenditure Survey (HES) 2009/10 data which is based on 6480 sample of households and contains information on demographic and socioeconomic status of each household. Furthermore, we also examine household expenditure patterns according to expenditure classes which are classified into three groups; low, medium and high class expenditure. In addition, we explore the allocation of consumption expenditure of preretirement household (working household) and postretirement household (retirees) across several expenditure categories. Regression analysis with lognormal distribution and Generalized Linear Model (GLM) with Inverse Gaussian and Gamma distributions are performed to discern the effects of the demographic and socioeconomic characteristics on household expenditure patterns. The results show that GLM with Gamma distribution model is the best model followed by GLM with Inverse Gaussian distribution and multiple linear regression with lognormal distribution.

Key words: Consumption, expenditure, GLM, inverse gaussian, gamma

INTRODUCTION

Household expenditure patterns are important determinants of the structure of an economy as it can be an indicator to financial stability of a country. According to economic theory, well-being is measured better by expenditure rather than by income, indicating that consumption patterns also can gauge well-being of a community as a whole. Based on Keynesian theory, an individual income is an important determinant of personal consumption, implying that higher income levels produce higher level of expenditure. Household expenditure can be classified into several categories such as goods and services which consists of food, clothing, home appliances and furniture, transportation, communication and many more.

Numerous studies on household expenditure have been performed in other countries. As examples Kalwij and Salverda (2007) examined factors of the changes in household expenditure patterns over the last two decades in Netherlands using Dutch budget survey data, Guang used household expenditure using Engel model in

determining income elasticity among household in rural areas in China as expenditure is a good proxy of income and Sekhampu (2012) studied determinants influencing food expenditure using a multiple regression model among low income households in South Africa.

Several studies on retired household spending pattern can also be found. Some researchers were interested on how people manage their resources during retirement. As examples, Denton *et al.* (2006) focused on the differences between preretirement and postretirement patterns using data from Canada. They simulated household budget allocations at age 65 who are fully retired. They found that the decrease in consumption patterns among elderly were caused by the decline in income instead of changes in preferences related with age. Besides investigating income and demographic factors that affect retirees consumption patterns, Banerjee also studied on how the elderly manage their finances in retirement. Other studies investigated consumption patterns for other reason such as Kamakura and Du (2012) who studied on how household budget allocation change during recession across various of expenditure categories.

There were several studies on consumption patterns in Malaysia. Ong *et al.* (2008) focused on adults aged 55 years and above using hierarchical regression analysis while Sheng *et al.* (2008) investigated consumption patterns specific on food expenditure using Linear Approximate Almost Ideal Demand System (LA/AIDS). On the other hand, Yusof and Duasa (2010) studied the consumption of various types of goods by employed Malaysians according to age groups using weighted least squares model. Mok *et al.* (2011) found that households in different expenditure groups behave differently, they revealed that households in the lowest expenditure class spent most of their expenditure on food whereas households in the highest expenditure class allocate most of their expenditure on transportation. They performed their studies using Seemingly Unrelated Regression (SUR) model.

Household expenditure data is usually right skewed with variability increasing as the mean costs increases. In OLS, log transformation has to be implemented for nonlinear relationships data. GLM is an alternative solution to the standard model of OLS regression for cost prediction. GLM was introduced by Nelder and Wedderburn (1972). Numerous empirical studies on household expenditure have used GLM analysis. Battese and Bonyhady (1981) estimated household expenditure relationship using regression analyses with normal, lognormal and gamma distribution and they concluded that the assumption of gamma distribution fits the expenditure data better than other model. Griswold *et al.* (2004) studied health care costs using lognormal and GLM with Gamma distribution because health care expenditure is difficult to analyze using standard approach due to point masses and severe skewness. Moreover, Moran *et al.* (2007) found that GLM with Gamma and Inverse Gaussian distribution produced better model compared to lognormal model in predicting individual patient costs in Intensive Care Units (ICUs).

The main objective of this study is to investigate the demographic and socioeconomic factors that attribute to household consumption patterns using lognormal and GLM with Inverse Gaussian and Gamma distribution models. Besides comparing the regression models, we also compare household expenditure patterns between three classes of households which are classified into three groups namely low, medium and high class expenditure using the preferred model. In addition, we explore the allocation of consumption expenditure of preretirement household and postretirement household across several expenditure categories. This study contributes to the understanding of the demographic and socioeconomic determinants influencing household expenditure pattern

so that individuals manage to plan their resources in later life. Moreover, government also can plan effective strategies to maintain standard of living during preretirement and postretirement.

MATERIALS AND METHODS

Data and sample: Data from Household Expenditure Survey (HES) 2009/2010 conducted by department of statistics Malaysia and contained information on monthly expenditure, demographic and socioeconomic characteristics of each household are used in this study. The selected sample is a cross sectional data and consists of 6480 household heads.

In this study, the dependent variable is the household expenditure including food at home, alcohol and cigarettes, home appliances and furniture, clothing, education, entertainment and recreation, health, insurance, outside food (restaurant and café), transportation (own vehicle and public transport), personal care, rental, utility and other services (such as legal services, tax services, government agency). The independent variables consist of demographic and socioeconomic characteristics of each household which are region, strata, marital status, ethnic, educational attainment, occupational groups, employment status, age groups, household size and status of living quarters.

RESULTS AND DISCUSSION

Table 1 provides the summary statistics for the sample. The statistics show that more than half of households (69%) are located in urban areas, a large majority (78%) are married and more than half (64%) are Bumiputera. With respect to educational attainment, 14% of households are university or college graduates, 35% are high school graduates and the balances are below high school education (16%) and others (35%) who are attending informal education and religious education.

In terms of occupational groups, almost 13% of households are professionals and legislators, 18.6% and 13.3% are administrative supports and technicians respectively and the proportions (10%) of these four occupational groups; agriculture and fishery, craft and repair, elementary occupations and operators are quite balanced and almost half of households are private sectors employees; private professional and administrative (16.4%) and private technicians and below (33.4%) followed by self-employed (19%). With the exception of younger households (<35), the proportions of age group are quite equally divided. With regard to status of living quarters, more than half (67%) of households are homeowners and followed by renters (24.0%).

Table 1: Summary statistics for HES sample 2009

Variable	Proportion of households(%)
Region	
(Kelantan, Pahang, Terengganu)	15.0
(Johor, Melaka, Negeri Sembilan)	16.2
(Kedah, Perak, Perlis)	19.5
(P.Pinang, Selangor, Kuala Lumpur, Putrajaya)	27.1
(Sabah, Sarawak)	22.2
Strata	
Urban	69.2
Rural	30.8
Marital status	
Married	78.3
Single female	12.2
Single male	9.5
Ethnic	
Bumiputera	64.4
Non bumiputera	35.6
Educational level	
College/University	14.0
High school grad	35.1
Less than high school	16.1
Others (not attending formal education, religious education, not finishing school)	34.8
Occupational group	
Professionals and legislators	12.8
Administrative supports	18.6
Technicians	13.3
Agriculture and fishery	9.8
Craft and repair	9.5
Elementary occupations	10.4
Operators	10.7
Others (housewife, unemployed, disabled)	14.9
Employment type	
Employer	2.8
Government professional and administrative	7.0
Government technicians and below	6.3
Private Professional and Administrative	16.4
Private Technicians and below	33.4
Self-employed	19.0
Others (e.g., pensioners)	15.1
Subjective life expectancy	
live≤25	3.5
25≤live≤34	18.5
35≤live≤44	26.0
45≤live≤54	26.0
55≤live	25.9
Status living quarters	
Owned	67.2
Rented	24.0
Quarters	5.4
Others (e.g., squatters owned, squatters rented)	3.4

Lognormal regression and GLM with Inverse Gaussian and gamma distribution models were performed to investigate the effects of demographic and socioeconomic characteristics on household expenditure. Since the dependent variable is positively skewed or skewed to the right, data transformation using lognormal is selected. Table 2 shows the result of lognormal regression analysis. All characteristics are statistically and significantly associated with the household total expenditure at 10% level except for Region 5 (Sabah and Sarawak), occupation (craft and repair, operator and others including housewife, unemployed and disabled), employment type (others including pensioners).

Table 2: Lognormal regression model of expenditure

Variable	Estimate	S.E	p-value
Intercept	7.176	0.068	<2e-16***
Reference:			
Region 1			
Region 2	0.078	0.021	0.000257***
Region 3	-0.04	0.02	0.045897**
Region 4	0.187	0.02	<2e-16***
Region 5	-0.01	0.02	0.67
Reference:			
Rural			
Urban	0.182	0.015	< 2e-16***
Reference:			
Married			
Single female	-0.18	0.019	< 2e-16***
Single male	-0.08	0.022	0.000582***
Reference:			
Bumiputera			
Non-bumiputera	0.167	0.014	< 2e-16***
Reference:			
University grad			
High school grad	-0.25	0.021	< 2e-16***
Less than High School	-0.4	0.025	< 2e-16***
Other	-0.58	0.025	< 2e-16***
Reference:			
Admin. Supports			
Professionals and legislators	0.31	0.024	<2e-16***
Technicians	0.15	0.037	4.33e-05***
Agriculture and fishery	-0.18	0.032	3.23e-08***
Craft and repair	-0.05	0.034	0.112
Elementary occupations	-0.16	0.035	2.46e-06***
Operators	-0.04	0.035	0.219
Others	-0.18	0.119	0.122
Reference: Employer			
Govt. Prof. And Admin.	-0.22	0.044	1.24e-06***
Govt. Tech. and below	-0.15	0.049	0.002144***
Private Prof. and Admin.	-0.26	0.04	5.24e-11***
Private Tech. and below	-0.31	0.043	5.90e-13***
Self-employed	-0.26	0.039	8.04e-11***
Others	-0.19	0.122	0.125
Reference:			
Lives≤25			
25≤live≤34	0.065	0.035	0.063029+
35≤live≤44	0.094	0.035	0.007887***
45≤live≤54	0.192	0.036	9.84e-08***
55≤live	0.251	0.037	2.01e-11***
Reference:			
Others			
Owned	0.268	0.034	1.59e-15***
Rented	0.121	0.035	0.000513***
Quarters	0.109	0.041	0.008003**
Household Size	0.082	0.003	< 2e-16***

Significant: +p-value≤0.10 *p-value≤0.05, **p-value≤0.01, ***p-value≤0.001; AIC: 113684.6

The household expenditure is positively associated with Region 2 (Johor, Melaka, Negeri Sembilan) and Region 4 (P. Pinang, Selangor, Kuala Lumpur, Putrajaya), urban strata, married status, ethnic (Bumiputera and non Bumiputera), occupation (professionals and legislators and technicians), all age groups, all status of living quarters and household size indicating that these determinants have higher household expenditure. On the contrary, negative relationships are found between the size of household expenditure and Region 3 (Kedah, Perak, Perlis), single (male and female) status,

Table 3: GLM with inverse gaussian distribution model of expenditure

Variable	Estimate	S.E	p value
Intercept	7.187	0.091	<2e-16***
Reference:			
Region 1			
Region 2	0.098	0.026	0.000159***
Region 3	-0.050	0.024	0.050281+
Region 4	0.176	0.025	2.25e-12***
Region 5	-0.030	0.024	0.291
Reference:			
Rural			
Urban	0.184	0.017	< 2e-16***
Reference:			
Married			
Single female	-0.17	0.022	2.34e-14***
Single male	-0.07	0.025	0.002528**
Reference:			
Bumiputera			
Non-bumiputera	0.163	0.017	< 2e-16***
Reference:			
University grad			
High school grad	-0.24	0.033	5.66e-13***
Less than high school	-0.40	0.037	< 2e-16***
Other	-0.58	0.036	< 2e-16***
Reference:			
Admin supports			
Professionals and legislators	0.362	0.038	<2e-16***
Technicians	0.209	0.049	2.08e-05***
Agriculture and fishery	-0.140	0.04	0.000352***
Craft and repair	-0.030	0.044	0.462
Elementary Occupations	-0.120	0.044	0.007579**
Operators	-0.010	0.045	0.859
Others	-0.27	0.16	0.085839+
Reference:			
Employer			
Govt. Prof. and admin	-0.14	0.071	0.045377*
Govt. Tech. and below	-0.12	0.074	0.094121+
Private Prof. and Admin.	-0.25	0.066	0.000170***
Private Tech. and below	-0.32	0.066	1.55e-06***
Self-employed	-0.23	0.063	0.000241***
Others	-0.05	0.168	0.748
Reference:			
lives≤25			
25≤lives≤34	0.087	0.038	0.020782*
35≤lives≤44	0.109	0.038	0.004577**
45≤lives≤54	0.230	0.039	4.86e-09***
55≤live	0.253	0.041	6.73e-10***
Reference:			
Others			
Owned	0.253	0.035	6.47e-13***
Rented	0.116	0.036	0.001491**
Quarters	0.045	0.043	0.292
Household Size	0.097	0.004	<2e-16***

Significant: +p-value≤0.10, *p-value≤0.05, **p-value≤0.01, ***p-value≤0.001; AIC: 106466

all education levels except for university graduates, occupation (agriculture and fishery and elementary occupations), all groups of employment types except for employer and others including pensioners, implying that these determinants have lower household expenditure. Table 3 depicts the result of GLM using inverse gaussian analysis. The result of this model is slightly different than the previous model. All

independent variables are statistically and significantly related to the household expenditure at 10% level except for Region 5 (Sabah and Sarawak), occupation groups (operator, craft and repair), employment type (others including pensioners) and status of living quarters (quarters).

The household expenditure is positively associated with Region 2 (Johor, Melaka, Negeri Sembilan) and Region 4 (P.Pinang, Selangor, Kuala Lumpur, Putrajaya), urban strata, married status, ethnic (Bumiputera and non Bumiputera), occupation (professionals and legislators, administrative supports and technicians), all age groups, status of living quarters (homeowners and renters) and household size, implying that these characteristics have higher household expenditure.

On the contrary, negative relationships are found between the household expenditure and Region 3 (Kedah, Perak, Perlis), single (male and female) household, all education levels except for university graduates, occupation (agriculture and fishery, elementary occupation and others including housewife, unemployed, disabled), all groups of employment types except for employer and others including pensioners, implying that these characteristics have lower household expenditure.

Furthermore, GLM with Gamma distribution was performed to investigate the effects of demographic and socioeconomic characteristics on household expenditure. Table 4 provides the result of GLM with Gamma distribution.

All characteristics are statistically and significantly associated with the household total expenditure at 10% level except for Region 3 (Kedah, Perak, Perlis) and Region 5 (Sabah and Sarawak), occupation (craft and repair, operator and others including housewife, unemployed and disabled), employment type (others who are pensioners), age (25-34) and status living quarter (quarters). Overall, the result of GLM model with gamma distribution is quite similar to the multiple linear regression with lognormal distribution and GLM with inverse Gaussian distribution.

The household expenditure is positively associated with Region 2 (Johor, Melaka, Negeri Sembilan) and Region 4 (P.Pinang, Selangor, Kuala Lumpur, Putrajaya), urban strata, married status, ethnic (Bumiputera and non Bumiputera), occupation (professionals and legislators and technicians), all age groups except for households aged between 25 and 34, status of living quarters (homeowners and renters) and household size, indicating that these characteristics have higher household

Table 4: GLM with gamma distribution model of expenditure

Variable	Estimate	Std. Error	p-value
Intercept	7.233	0.086	<2e-16***
Reference:			
Region 1			
Region 2	0.086	0.027	0.001374**
Region 3	-0.04	0.026	0.166
Region 4	0.174	0.025	2.89e-12***
Region 5	-0.01	0.025	0.815
Reference:			
Rural			
Urban	0.167	0.018	<2e-16***
Reference:			
Married			
Single female	-0.14	0.024	6.17e-09***
Single male	-0.07	0.028	0.010109*
Reference:			
Bumiputera			
Non-bumiputera	0.175	0.017	< 2e-16***
Reference:			
University grad			
High school grad	-0.24	0.027	< 2e-16***
Less than high school	-0.39	0.032	< 2e-16***
Other	-0.57	0.031	< 2e-16***
Reference:			
Admin supports			
Professionals and legislators	0.37	0.056	<2e-16***
Technicians	0.188	0.046	4.57e-05***
Agriculture and fishery	-0.17	0.041	2.78e-05***
Craft and repair	-0.04	0.043	0.341
Elementary occupations	-0.15	0.044	0.000754***
Operators	-0.03	0.045	0.532
Others	-0.12	0.151	0.432
Reference:			
Employer			
Govt. Prof. and admin	-0.17	0.056	0.002016**
Govt. Tech. and below	-0.11	0.062	0.087848+
Private Prof. and Admin	-0.23	0.051	6.62e-06***
Private tech. and below	-0.29	0.054	1.23e-07***
Self-employed	-0.22	0.05	1.42e-05***
Others	-0.18	0.155	0.233
Reference:			
Live≤25			
25≤live≤34	0.059	0.044	0.184
35≤live≤44	0.1	0.045	0.024778*
45≤live≤54	0.21	0.045	3.73e-06***
55≤live	0.283	0.047	1.99e-09***
Reference:			
Others			
Owned	0.235	0.042	2.98e-08***
Rented	0.113	0.044	0.009850**
Quarters	0.079	0.052	0.128
Household size	0.085	0.004	< 2e-16***

Significant: +p-value≤0.10, *p-value≤0.05, **p-value≤0.01, ***p-value≤0.001; AIC: 106284

expenditure. On the contrary, negative relationships are found between household expenditure and single (male and female) status, all education levels except for university graduates, occupation (agriculture and fishery and elementary occupations), all groups of employment type except for employer, implying that these characteristics have lower household expenditure. Based on these three models, GLM with gamma distribution is

the preferred model because the AIC value is the smallest (106284) followed by GLM with Inverse Gaussian distribution (106466) and lognormal model distribution (113684).

Besides the AIC value, Fig. 1-3 exhibit diagnostic plots for lognormal model, GLM with Inverse Gaussian distribution and GLM with gamma distribution respectively. In terms of residuals values, the upper plots show that residual values of lognormal model and GLM with gamma distribution are symmetrically distributed and clustered towards the middle of the plot while the residual values of GLM with Inverse Gaussian distribution are not randomly scattered.

The Q-Q plot (lower left plot) indicates the errors of the model are normally distributed if the points lie relatively close to the dashed line. The points of these three models lie close to the lines, however some deviations are found at the ends of the plot.

Table 5 provides the results for household expenditure patterns according to expenditure classes using GLM with gamma distribution. With regard to households in the lowest expenditure class, the household expenditure is positively associated with Region 2 (Johor, Melaka, Negeri Sembilan) and Region 4 (P.Pinang, Selangor, Kuala Lumpur, Putrajaya), urban strata, married status, age group (45 = live = 54), homeowners and household size.

On the contrary, negative relationships are found between the expenditure and single (male and female) status, other education level (not attending formal education, religious education, not finishing school) and occupation (agriculture and fishery, craft and repair, elementary occupations and other occupations such as housewife, unemployed, disabled).

For households in the medium expenditure class, the household expenditure is positively associated with Region 4 (P.Pinang, Selangor, Kuala Lumpur, Putrajaya), urban strata, ethnic (Bumiputera and non Bumiputera), occupation (professionals and legislators and technicians), homeowners and household size.

On the contrary, negative relationships are found between the household expenditure and single female individual, all educational levels except for university graduates, occupation (agriculture and fishery and elementary occupations) and employment type (private professional and administrative, private technician and below and self-employed).

With regard to households in the highest expenditure class, the household expenditure is positively associated with ethnic (Bumiputera and non Bumiputera),

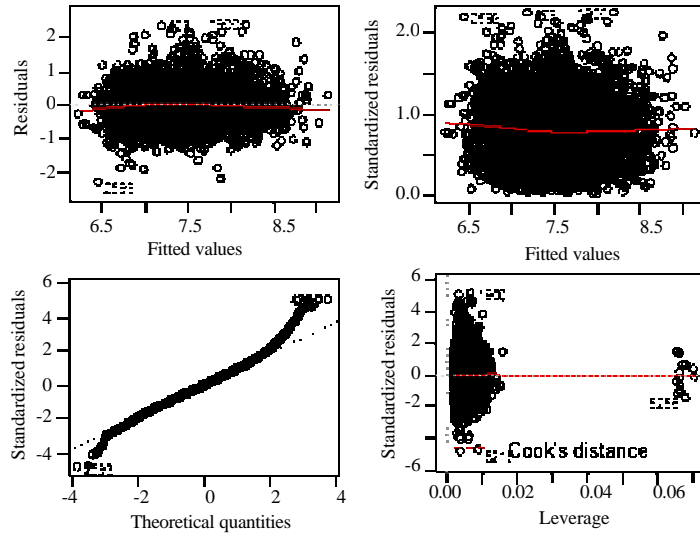


Fig. 1: Lognormal Model

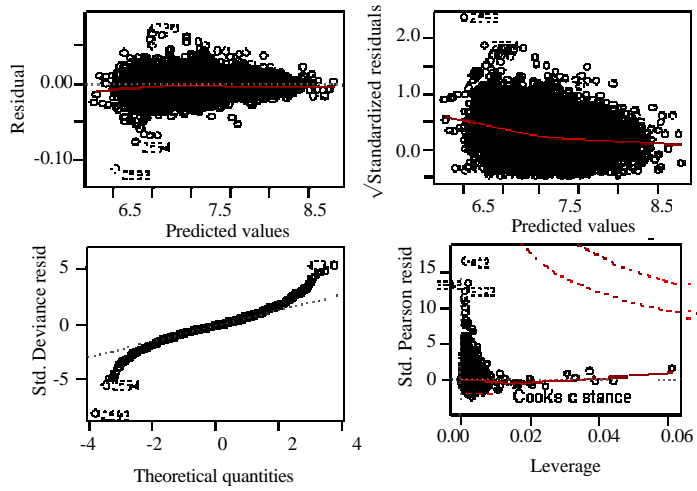


Fig. 2: GLM with inverse Gaussian Distribution Model

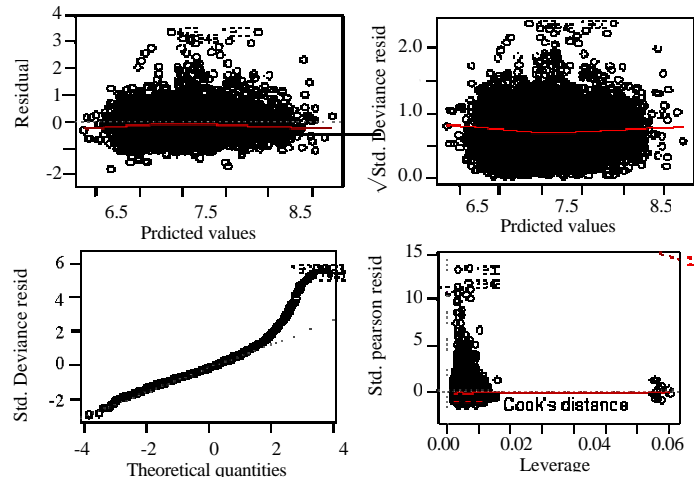


Fig. 3: GLM with Gamma Distribution Model

Table 5: Comparison of expenditure classes using gamma distribution
Expenditure class (estimate)

Variables	Low	Medium	High
Intercept	6.643320***	7.4892865***	8.122431***
Reference:			
Region 1			
Region 2	0.078048**	0.003	0.061
Region 3	-0.02	-0.01	0.049
Region 4	0.092990***	0.0434221***	0.04
Region 5	-0.03	0.012	-0.01
Reference:			
Rural			
Urban	0.084495***	0.0500600***	0.019
Reference:			
Married			
Single female	-0.153186***	-0.0283411*	-0.02
Single male	-0.081351***	-0.02	-0.05
Reference:			
Bumiputera			
Non-bumiputera	0.012	0.0487462***	0.060508*
Reference:			
University grad			
High school grad	-0.01	-0.0530241***	-0.110942**
Less than High School	-0.04	-0.0948433***	-0.100645+
Other	-0.113794*	-0.1238752***	-0.174037***
Reference:			
Admin. Supports			
Professionals and legislators	0.004	0.0750399 ***	0.245613***
Technicians	-0.01	0.0592815*	0.05
Agriculture and fishery	-0.112041 **	-0.0546872*	-0.02
Craft and repair	-0.077310+	-0.01	-0.03
Elementary occupations	-0.113115**	-0.0379967+	-0.02
Operators	-0.05	-0.02	-0.06
Others	-0.351637+	-0.01	0.159
Reference: employer			
Govt. Prof. and admin	0.035	-0.05	-0.06
Govt. Tech. and below	0.11	-0.05	0.109
Private Prof. and admin	-0.02	-0.1006668**	-0.04
Private Tech. and below	-0.01	-0.0942595 **	-0.01
Self-employed	-0	-0.0662544*	-0.03
Others	0.198	-0.06	-0.22
Reference:			
Live≤25			
25≤live≤34	0.047	9E-04	-0.08
35≤live≤44	0.046	0.016	0.006
45≤live≤54	0.067595*	0.034	0.048
55≤live	0.034	0.022	0.187
Reference:			
Others			
Owned	0.119290***	0.0442027+	0.001
Rented	0.035	0.001	0.045
Quarters	0.032	-0.01	-0.02
Household size	0.030812***	0.0156160***	0.026937***

Significant: +p-value≤0.10, *, **, ***p≤0.05, 0.01, 0.001

professionals and legislators occupation and household size. On the contrary, negative relationships are found between the household expenditure and all educational level except for university graduates.

Comparisons using t-test were made to determine the presence of differences in expenditure between working households and retired households. The sample was divided into two groups, households heads aged below than 55 are categorised as non-pensioners (n) whereas

Table 6: Comparison of expenditure categories between preretirement and postretirement

Expenditure item	Group	Mean	Result
Food at home	Non-pensioner	451.40	n<p
	Pensioner	471.50	
Alcohol and cigarettes	Non-pensioner	44.65	n>p
	Pensioner	38.79	
Home appliances and furniture	Non-pensioner	99.35	n>p
	Pensioner	91.89	
Clothing	Non-pensioner	75.26	n>p
	Pensioner	62.79	
Education	Non-pensioner	35.93	n>p
	Pensioner	16.55	
Entertainment and recreation	Non-pensioner	97.92	n = p
	Pensioner	97.93	
Health	Non-pensioner	25.85	n<p
	Pensioner	45.87	
Insurance	Non-pensioner	33.88	n<p
	Pensioner	34.61	
Outside food	Non-pensioner	255.20	n>p
	Pensioner	209.80	
Own vehicle	Non-pensioner	331.90	n>p
	Pensioner	266.40	
Personal care	Non-pensioner	84.32	n>p
	Pensioner	70.65	
Communication	Non-pensioner	7.40	n>p
	Pensioner	1.85	
Public transportation	Non-pensioner	22.84	n>p
	Pensioner	13.80	
Rental	Non-pensioner	381.20	n<p
	Pensioner	389.20	
Utility	Non-pensioner	238.50	n>p
	Pensioner	228.60	
Other services (legal, tax, government agency)	Non-pensioner	63.45	n<p
	Pensioner	67.78	

households heads aged 55 and above are grouped as pensioners (p). The results are provided in Table 6. As expected, the working households spend less on food at home and health while the retirees spend less on outside food, public transportation and clothing since working households spend more time outside like going to work. On the other hand, the retirees usually spend time at home and having homemade food.

Working households also spend more on personal care and communication as this group always pays more attention on appearance and uses communication gadgets such as mobile phones, tablets and others. With respect to entertainment and recreation both groups are equal as younger people probably spend more on entertainment while older people spend more on recreation.

A surprising element however can be seen for rental expenses, it was found that the retirees spend more on housing rent payment than working group while the elderly are expected having their own houses rather than renting houses.

However, they are presumably renting their own house to other people and choose for renting in smaller house, since their children live in separate accommodation with their own family.

CONCLUSION

This study has investigated the effects of demographic and socioeconomic factors that attribute to household consumption patterns using lognormal and GLM with Inverse Gaussian and Gamma distribution models. Overall, the demographic and socioeconomic factors from these three models are quite similar. As expected, GLM with gamma distribution is the best model compared to GLM with Inverse Gaussian and multiple linear regression with lognormal distribution.

From Table 2, the results show that the household expenditure increases with Region 2 (Johor, Melaka, Negeri Sembilan) and Region 4 (P.Pinang, Selangor, Kuala Lumpur, Putrajaya), urban strata, married status, ethnic (Bumiputera and non Bumiputera), occupation (professionals and legislators and technicians), all age groups except for households aged between 25 and 34, status of living quarters (homeowners and renters) and household size, indicating that these characteristics have higher household expenditure.

Not surprisingly these determinants have higher expenditure since cost of living in Region 2 and 4 and in urban areas are higher whereas married household spend more than single individual. Households working in professionals and legislators occupation also are expected to have higher expenditure since they earn higher income. However, households with age above 55 are not expected to have higher expenditure. Travelling and performing hajj among Muslims are probably the contributing factors to the higher household expenditure among the households from this age group. Meanwhile, younger households (age 25-24) have lower expenditure because of unstable employment and inconsistent salaries as they just enter the labour force.

Furthermore, this study has investigated the household expenditure patterns according to expenditure classes using GLM with gamma distribution as shown in Table 5. With respect to occupational group, households who are in working class comprising of agriculture and fishery, craft and repair, elementary occupations and others have significant impact on lower expenditure class while medium and higher expenditure classes are positively associated with households working in professional and legislators occupations. Hence, it can be concluded that lower income levels produce lower levels of expenditure and otherwise.

In addition, we explore the allocation of consumption expenditure of preretirement household and postretirement household across several expenditure categories as shown in Table 6. The working households spend less on food at home and health while the retirees spend less on outside food, public transportation and clothing.

It is hoped that the findings may assist the government in organizing economic strategies to sustain economic growth of the country. As for individuals, this information may provide them a better picture on consumption pattern, hence they can plan their expenditure wisely and can maintain their standard of living in future.

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