Socio-economic factors affecting household food expenditure in North Trinidad

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The paper was designed to examine food security and the factors that affect expenditure on different food groups for a sample of households of primary school children located in North Trinidad. Primarily the paper sought to examine the determinants of increased consumption of the fruits and vegetables. A random selection of schools was taken, classes selected and caregivers for children from the selected classes were interviewed. Data on household demographics and expenditures for four food groups were obtained in the survey. Results of the estimations of ordinary least squares (OLS) regression models showed that several factors including ethnicity, monthly household income, the age of household's head and an estimated food security index influenced the households' food expenditures.

Keywords: Caribbean, food security, socio-economic factors, food expenditures, Trinidad and Tobago

Trinidad and Tobago is facing a crisis of obesity and numerous lifestyle diseases. Low vegetable and fruit consumption are risk factors for obesity and increased consumption will decrease the risk for developing several chronic diseases (Ullman 2009). Webb and Lewis (2013) stated that during a child's development phase, negative dietary practices such as low intakes of fruits and vegetables can be transferred to adulthood and they have recommended increasing fruits and vegetables intake at a primary school level.

Understanding food expenditure patterns and the causes of food insecurity are of major importance in the selection of appropriate interventions to remedy low vegetable and fruit consumption. Some of the main causes of food insecurity include: economic shocks, low household incomes, political instability, unfavourable weather conditions and unequal distribution of foods within households. Factors affecting household expenditures in the Caribbean on the different food groups have not been well established, hence the primary aim of this paper is to explain these expenditure patterns. The focus in this paper is on explaining these expenditure patterns for rural low income households and therefore a sample of low income households located in north Trinidad was studied. Specifically the paper seeks to determine the socioeconomic variables that affect expenditure on food groups at the household level through the estimation of elasticities for these variables.

Overview

A study of the factors affecting food purchasing is of prime importance for low income households since food expenditure usually accounts for more than half of personal consumption expenditure in the budget of these households (Eustaquio 2014). Eustaquio (2014) also stated that past studies have shown that family size and composition, family income, educational expenses, highest educational attainment, age, occupation, the gender of household head and the number of employed family members all influence the food expenditure of households. Davis et al. (1983) explained household food expenditure patterns through socioe-conomic factors. Family size, household income, the educational level of the homemaker and food stamp programme participation were some determinants that were found to exert a strong positive impact on food expenditures.

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However, the nutritional knowledge of homemakers increased the efficiency of food purchasing activities.

Based on the theory of consumer behaviour, Cai (1998) investigated the relationship between vacation food expenditures and household socio-demographic characteristics and several determinants were identified which included earned and unearned income, age, the nature of their occupation, educational level, ethnicity, marital status, employment status, seasonality and the number of children. Darmon and Drewnowski (2008) established that the cost of diets in the United States is associated with the quality and nutritional content of foods and that this varies with socioeconomic status (SES), such that households in lower income groups spend more money on cheaper, poor-nutrient foods than households in higher income groups.

In order for household members to maintain a healthy, well-nourished lifestyle, the purchases and consumption of the different food groups should be in the correct proportion. Food consumption patterns have changed dramatically in some countries, mainly as a result of increased income. In this study, it is hypothesized that socioeconomic factors affect household food expenditure which affects the consumption of food groups by individuals. Once these socioeconomic factors are identified, suggestions can be made as to how these factors may be manipulated to influence the consumption of different foods, particularly increasing the intake of fruits and vegetables to improve the nutritional and health status of households. The hypothesized causal chain can be illustrated as follows:

Socioeconomic Factors → Household Food Expenditure → Consumption of Food Groups → Increased Consumption of Fruits and Vegetables → Improved Household Health

Thus this study proposes avenues for modifying consumer food purchasing in the direction of healthy diets. The following are the specific socioeconomic factors tested in this study: for the household - income, food insecurity status, and size, and for the household head – gender, marital status, educational status, ethnicity and age as illustrated in Figure 1.

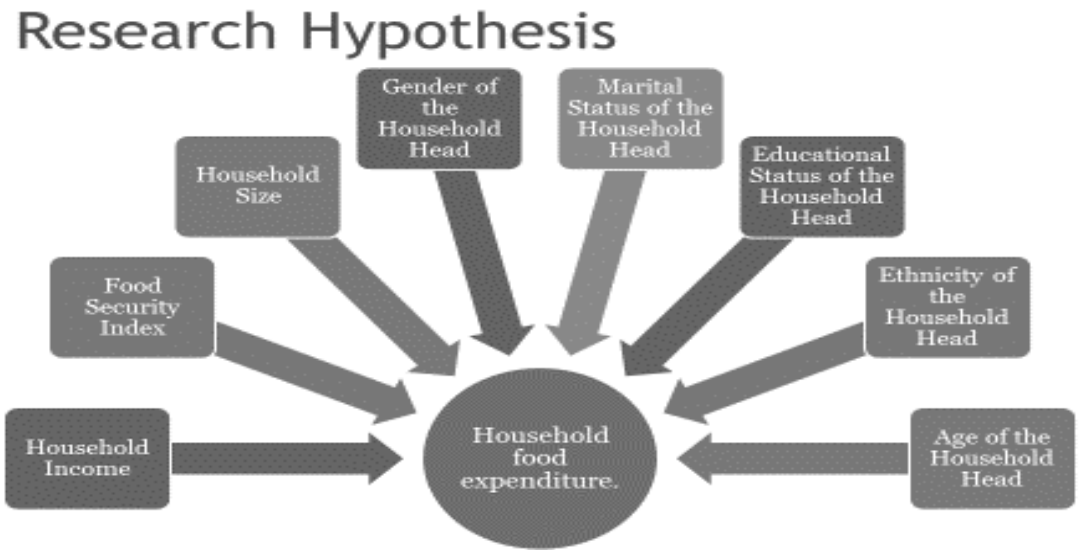

Figure 1: Study Hypothesis

Materials and methods

Survey description

An IDRC-funded joint project of McGill University and The University of the West Indies provided the data for this study. In this project, a Community Health and Nutrition Household Survey (CHS) gathered health, nutrition, and socio-economic information from households with primary-school-aged children (6-12 years old) in North Trinidad. The CHS was carried out in two geographical regions of North Trinidad: Sangre Grande and San Juan/ Laventille, from which primary schools were randomly selected. The four primary schools selected in the Sangre Grande region were: Guaico Government, Valencia Government, Valencia South Government, and Sangre Grande Government. In the San Juan/Laventille region the four primary schools selected were: St. Joseph Government, Aranguez Government, Febeau Government and El Socorro Central Government. The data were collected over a period of approximately 12 months through personal interviews, using a prepared questionnaire. Field staff collected the data from caregivers of the respective households from the selected schools.

The CHS sample was generated from the study by a child selection procedure. When the child was selected, the household members of that child were also selected to participate in the survey. From the eight selected schools, children enrolled in the four earliest primary grades: First and Second Year; Standard 1 and Standard 2 were also selected. This procedure of choosing the earliest primary grades decreased the risk of attrition over the period of the study and eased the requirements for subsequent tracking in the end-of-project surveys. Because there was no access to classroom rosters from these schools, the sample was generated from the recruitment efforts undertaken at each school. The recruiting efforts generated 517 eligible participants (i.e., consenting caregivers and children) from the eight schools. When two or more children from a single household were eligible to participate, the youngest child was selected for the study. Both the caregiver and the selected school child participated in the interview.

The specific information requested on the questionnaires included: the amount of money spent on food items for the previous thirty (30) days, monthly household income, respondent's age, educational status, marital status, ethnic group, gender of household head and food security data. The questionnaire was organized into 21 modules which also included other data not utilized in this study such as the selected child's dietary intake (24-hour recall), measurements of attitudes towards risk and uncertainty and contact information for future tracking and location of respondents for the end-of-project surveys.

Subsequent to the survey, the raw data from the questionnaires were analysed to determine food expenditure and monthly household income. The expenditure on each individual food item purchased by a household was determined and the item was placed in a relevant food group. Then the total expenditure of all items in each food group for that specific household was determined. Monthly household income was obtained by summing the monthly incomes from members of the particular household. The average duration for an interview was approximately 75 - 90 minutes. The questionnaires were then coded and the data validated.

Four (4) household expenditure regression equations were specified for each of the four food groups and an overall household total food expenditure regression equation was also estimated. Relevant tests were performed to determine the significance of the coefficients of the independent variables used in the regression equations.

The Household Food Security Index

A food security index was created from data from the Food Security section of the questionnaire. This section consisted of nine questions based on the USDA food security index scoring used in the "Six-Item Short Form of the Food Security Survey Module" (USDA). In the coding of these nine questions, the highest possible score for a household was 30. This score of 30 indicated maximum household food *insecurity* and the lowest score that can be obtained was zero (0), which indicated maximum household food security.

The Ordinary Least Squares Regression Model

Regression analysis was performed to determine the factors that influenced the level of expenditure of households of the participated respondents of the project. The investigation was conducted by utilizing ordinary least squares regression analysis based on the following general model (where 'ln' represents the natural logarithm):

$$\ln(Y_i) = \beta_0 + \beta_1 GEN + \beta_2 MSTAT + \beta_3 EDU + \beta_4 ETH + \beta_5 \ln HINC + \beta_6 \ln FSI + \beta_7 \ln HHS + \beta_8 \ln AGE$$

GEN = 1 Male (Head of Household)
= 0 Female

MSTAT= 1 Married (Head of Household)
= 0 Not Married

EDU = 1 Achieved Above Primary Education (Head of Household)
= 0 Achieved Primary Education or Below

ETH =1 African Descent (Head of Household)
= 0 Non-African Descent

HINC = Monthly Household Income

FSI = Food Security Index Household (0-30) (30 – Most Food Insecure)

HHS = Household Size

AGE = Age of Head of Household

Where: Y_i = the dependent variable, i = 1,…,5 as follows: 1 = Staples; 2 = Fruits, Vegetables, Legumes and Nuts; 3 = Food from Animals; 4 = Other Foods; 5 = Household Total Food Expenditure.

Results

Table 1 shows the means and standard deviations of the independent variables used in this paper. For the sample size, the gender of the household head had a mean of 0.67 which indicated that the majority of the household heads were male. Marital status had a mean 0.44 which showed that fewer household heads were married. With a calculated mean of 0.5, the educational level of the sample was equal between having 'below primary education' and 'above primary education'. Ethnicity had a mean of 0.46, which indicated that 46% of the households were of African descent. The mean monthly household income was US$708.80 with a mean household size of 5.3 persons, which suggests that the average income per person for the families was around $4.46 US per day, which indicates a low income status. The mean age of the household head was 42.5 years. The food security index mean was calculated to be 13.2, this indicated that a larger proportion of the household sample was food secure.

Table 1: Means and standard deviations of the socioeconomic factors (Independent Variables) which may have impacted on household's food expenditures

Socio-Economic Factors	Mean	Standard Deviation
Gender of Household's Head	0.67	0.47
Marital Status of Household's Head	0.44	0.50
Educational Level of Household's Head	0.50	0.50
Ethnicity of Household's Head	0.46	0.50
Monthly Household Income (US$)	708.8	861
Food Security Index	13.2	4.9
Household Size	5.3	1.8
Age of Head of Household	42.5	12.6

The results shown in Appendices 1 to 4 indicate that the highest expenditure in the sample among the food groups was for the "Meat" or "Food from Animals" food group, and the next highest food group was for "Staples" while the third highest expenditure was for "Other Foods", which consisted mainly of fats & oils, spices & condiments, beverages etc., while the lowest expenditure among the food groups was for Fruits, Vegetables, Legumes and Nuts. The household total food expenditure in Appendix 5 was $954.34 TT ($149.42 US) which means that the households were spending an average of 21% of their total monthly household income on food.

Breusch-Pagan Test for Heteroskedasticity

The situation where the conditional variance of the dependent variable population varies with an independent variable is known as heterokedasticity (unequal spread or variance). In the Breusch-Pagan test for heteroskedasticity if the computed chi-squared p-value is less than the chosen level of significance (5%), one can reject the null hypothesis of homoskedasticity, otherwise one does not reject it. Hence, in the regression outputs in the appendices, if the generated p-value of the chi-squared output is greater than 0.05, then we accept the null hypothesis that heteroskedasticity is not present.

From Appendix I for the food group Staples, the p-value for the Breusch-Pagan test for heteroskedasticity was found to be 0.863. This value is more that the chosen level of significance, therefore the null hypothesis is not rejected, hence, heteroskedacticity is not present. Similarly, for the food group "Food from Animals", in appendix II, the p-value was found to be 0.570, which indicated that heteroskedasticity is not present. In appendix III, for the food group "Fruits and Vegetables", the p-value was found to be 0.007, this indicated that heteroskadasticity was present. In appendix IV and V, for the food groups "Other Foods" and "Household Total Food", there were p-values of 0.065 and 0.085 respectively. These values are very close to the chosen level of significance of 5%. Heteroskedasticity is present in these two food groups with a moderate degree of statistical significance. Therefore for all the regressions heteroskedasticity-robust standard errors were utilized in the tests of significance for the regression coefficients.

Significant coefficients in the regressions

The significant coefficients from the five regressions analysing the socio-economic factors that affect household food expenditure categorized by food groups are given in Table 2. Full details of the regressions are given in the Appendices 1-5. From these results, it can be seen that a major factor affecting food expenditure on staples was Ethnicity, where

individuals of 'non-African' descent, purchased more or had a higher consumption of staples than households of African descent. This ethnicity variable had a coefficient of -0.155 and a p-value of 0.020 which was significant at the 5% level. From the results, there was a very high significance at 1%, for the coefficient for the level of food insecurity of the households, where the food security index had an elasticity coefficient of -0.33, which indicated that for every 10% increase in the food security index for households (households more food insecure), there was a decrease of 3.3% in the expenditure on staple foods.

With respect to the food group "Fruits, Vegetables, Legumes & Nuts", the results showed that the higher the household income, the higher the expenditure on this food group. Household income had an elasticity coefficient of 0.072, which was significant at the 5% level. This coefficient of income indicted that for these households there was an increase of 0.72% in expenditure on fruits and vegetables for every 10% increase in monthly household income. Similarly to the Staples group, the more food insecure the household, the lower the expenditure on fruits, vegetables, legumes and nuts, since the elasticity coefficient was -0.453 (significant at the 1% significance level).

Table 2: Significant coefficients for regressions explaining household food expenditure for different food groups

	Constant	**ETH**	**MSTAT**	**l_HINC**	**l_FSI**	**l_AGE**
Y_1 : Staples	6.145^{***}	-0.155^{**}			-0.33^{***}	
Y_2 : Fruits, Vegetables, Legumes & Nuts	5.456^{***}			0.072^{**}	-0.453^{***}	
Y_3 : Food From Animals	5.717^{***}		0.133^{*}	0.090^{**}	-0.337^{***}	
Y_4 : Other Foods	6.723^{***}	-0.169^{*}		0.112^{**}	-0.344^{**}	-0.423^{**}
Y_5 : Total Household Food Expenditure	7.170^{***}			0.073^{**}	-0.332^{***}	
***significant at 0.001 ** significant at 0.05 * significant at 0.10						

Food from Animals had similar results to the food group "Fruits, Vegetables, Legumes & Nuts" but with a greater elasticity for the household income variable. It was seen that for a 10% increase in household income among the households, there was an increase in the purchase of foods from animals by 0.9%. Also, for every 10% increase in the food security index among the households, there was a decrease of 3.37% of expenditure on food from animals. Therefore higher income households purchased more meat products and more food insecure households spend less money on foods from animals.

With respect to "Other Foods", like the two commodity groups, Fruits, vegetables, Legumes & Nuts and Food from Animals, the higher the household income, the higher the expenditure on these other foods. Household income and the food security index had elasticity coefficients of 0.112 and -0.344 respectively. These values indicated that for

every 10% increase in household income, there was a 1.12% increase on expenditures on other foods. Also, for this food group there was a decrease of 3.44% on expenditures for a 10% increase on the food security index. The "Non –African" households had greater level of expenditure on 'other foods' as compared to households of African descent. Age of the head of the household also was a significant variable in this expenditure regression, with an elasticity coefficient of -0.423. This value can be interpreted as follows: households with heads 10% older would show a decrease in expenditure on other foods by 4.23%. It was thus seen that the older the head of the household, the lower the consumption of this "Other Foods" food group.

As a whole, the total food expenditure results were similar to those for "Fruits, vegetables, legumes & nuts" and "Food from Animals" with the higher the monthly household income, the greater the household total food expenditure and the more food secure the household, the greater the household total food expenditure. For household income with the elasticity of 0.073, for the households, a 10% increase in household income would correspond to a 0.73% increase in household total food expenditure.

Conclusion

The need to improve the nutritional status of the population is of both individual and social importance. Hence, it was important to examine the determinants of food expenditures for low income households in this study. The objectives of the examination of household food expenditure patterns were to gain an understanding of the types of food purchases of these households and also, to raise the awareness of the avenues through which low income households can be induced to increase their consumption of fruits and vegetables. The focus of this study was to identify the socio-economic factors that affected household food expenditure on selected food groups: (1) staples, (2) food from animals, (3) fruits, vegetables, legumes and nuts and (4) other foods.

The hypothesis of this study: socio-economic factors do affect household food expenditures was supported by the results of this study. The results indicated, for this sample as a whole, that household income and the household's food security index both exerted a significant impact on the monthly total food expenditures. For the food group staples; ethnicity and the household's food security index explained the expenditures on this food group. Household income and the household's food security index impacted the two food groups: "food from animals" and "fruits vegetables and legumes and nuts". The largest number of variables: ethnicity, monthly household income, age of household's head and the household food security index, significantly explained expenditures on the food group – "other foods".

The results of this paper were comparable to the findings of studies from different parts of the world. Past studies have showed that ethnicity, monthly household income and household head's age were variables that had significant effects on household food expenditure. The study found that the "fruits and vegetables" food group had the lowest expenditure of the four food groups and in terms of increasing the consumption of this food group, the study found that this can result from an increase in the income of these households. This was also seen to be the case for increasing the expenditure on food from animals. These two food groups are thus "luxury type" food groups for these low income households.

The variable "food security index" had not been used as a socio-economic factor in past studies explaining low income food expenditures. This variable showed highly significant results for all food groups and also for total food expenditure. The inclusion of the variable, food security index was a unique contribution of this research. This variable also

demonstrated that there is a strong feed-back between household food security and food expenditures - those households that were most food insecure purchased less food, which turned out to be the prominent correlation of this study. Further research is suggested on this complex relationship between the level of food security for these and other similar low income groups and their expenditure on the different food groups. This research can include the apparent low status of household produced food (from back yard gardens etc.) even in non-urban areas and the contribution of state school meals programme to the alleviation of household food insecurity.

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APPENDIX I

Model 1: OLS, using observations 1-241
Dependent variable: l_Stapl
Heteroskedasticity-robust standard errors, variant HC1

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	6.14501	0.639552	9.6083	<0.00001	***
GEN	0.0209884	0.084263	0.2491	0.80352	
MSTAT	0.0617456	0.0826101	0.7474	0.45556	
EDU	-0.0174452	0.071055	-0.2455	0.80627	
ETH	-0.155198	0.0661676	-2.3455	0.01984	**
l_HINC	0.00394183	0.0306586	0.1286	0.89781	
l_FSI	-0.329366	0.106485	-3.0931	0.00222	***
l_HHS	0.125294	0.102823	1.2185	0.22425	
l_AGE	-0.00047602	0.132602	-0.0036	0.99714	

Mean dependent var	5.500279	S.D. dependent var	0.538137
Sum squared resid	62.80410	S.E. of regression	0.520295
R-squared	0.096369	Adjusted R-squared	0.065209
F(8, 232)	3.051265	P-value(F)	0.002772
Log-likelihood	-179.9186	Akaike criterion	377.8372
Schwarz criterion	409.2004	Hannan-Quinn	390.4729

Breusch-Pagan test for heteroskedasticity -
Null hypothesis: heteroskedasticity not present; Test statistic: LM = 3.93023
with p-value = P(Chi-square(8) > 3.93023) = 0.863363

APPENDIX II

Model 2: OLS, using observations 1-241
Dependent variable: l_meat
Heteroskedasticity-robust standard errors, variant HC1

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	5.71727	0.698222	8.1883	<0.00001	***
GEN	0.093673	0.0909917	1.0295	0.30433	
MSTAT	0.132709	0.0791518	1.6766	0.09496	*
EDU	0.0349277	0.0775972	0.4501	0.65305	
ETH	-0.068318	0.0722346	-0.9458	0.34525	
l_HINC	0.0902846	0.0402928	2.2407	0.02599	**
l_FSI	-0.337142	0.117353	-2.8729	0.00444	***
l_HHS	-0.127529	0.120238	-1.0606	0.28996	
l_AGE	0.127827	0.153206	0.8343	0.40494	

Mean dependent var	5.794255	S.D. dependent var	0.601491
Sum squared resid	74.40095	S.E. of regression	0.566298
R-squared	0.143142	Adjusted R-squared	0.113595
F(8, 232)	3.705918	P-value(F)	0.000428
Log-likelihood	-200.3371	Akaike criterion	418.6743
Schwarz criterion	450.0374	Hannan-Quinn	431.3099

Breusch-Pagan test for heteroskedasticity -
Null hypothesis: heteroskedasticity not present; Test statistic: LM = 6.69352
with p-value = P(Chi-square(8) > 6.69352) = 0.570031

APPENDIX III

Model 3: OLS, using observations 1-241
Dependent variable: l_Fruits
Heteroskedasticity-robust standard errors, variant HC1

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	5.45564	0.708485	7.7004	<0.00001	***
GEN	-0.023571	0.0974585	-0.2419	0.80910	
MSTAT	0.0869825	0.101492	0.8570	0.39231	
EDU	-0.0141397	0.0858059	-0.1648	0.86926	
ETH	-0.0545958	0.0821972	-0.6642	0.50722	
l_HINC	0.0715288	0.0357469	2.0010	0.04656	**
l_FSI	-0.453121	0.126041	-3.5950	0.00040	***
l_HHS	-0.102601	0.113946	-0.9004	0.36883	
l_AGE	0.112924	0.157945	0.7150	0.47536	

Mean dependent var	4.994647	S.D. dependent var	0.645359
Sum squared resid	88.29440	S.E. of regression	0.616911
R-squared	0.116679	Adjusted R-squared	0.086220
F(8, 232)	4.606917	P-value(F)	0.000031
Log-likelihood	-220.9677	Akaike criterion	459.9354
Schwarz criterion	491.2986	Hannan-Quinn	472.5710

Breusch-Pagan test for heteroskedasticity -
Null hypothesis: heteroskedasticity not present; Test statistic: LM = 21.061
with p-value = P(Chi-square(8) > 21.061) = 0.00698702

APPENDIX IV

Model 4: OLS, using observations 1-241
Dependent variable: l_Other
Heteroskedasticity-robust standard errors, variant HC1

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	6.72284	0.884532	7.6004	<0.00001	***
GEN	0.00350289	0.107053	0.0327	0.97393	
MSTAT	-0.130923	0.107299	-1.2202	0.22364	
EDU	0.00928862	0.0935649	0.0993	0.92101	
ETH	-0.169094	0.100159	-1.6883	0.09271	*
l_HINC	0.111747	0.0525162	2.1279	0.03440	**
l_FSI	-0.344171	0.130393	-2.6395	0.00887	***
l_HHS	0.174886	0.143361	1.2199	0.22374	
l_AGE	-0.422554	0.205294	-2.0583	0.04068	**

Mean dependent var	5.119153	S.D. dependent var	0.764299
Sum squared resid	128.5574	S.E. of regression	0.744397
R-squared	0.083020	Adjusted R-squared	0.051401
F(8, 232)	2.487612	P-value(F)	0.013155
Log-likelihood	-266.2394	Akaike criterion	550.4787
Schwarz criterion	581.8419	Hannan-Quinn	563.1144

Breusch-Pagan test for heteroskedasticity -
Null hypothesis: heteroskedasticity not present; Test statistic: LM = 14.7138
with p-value = P(Chi-square(8) > 14.7138) = 0.0649562

APPENDIX V

Model 5: OLS, using observations 1-241
Dependent variable: l_THFE
Heteroskedasticity-robust standard errors, variant HC1

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	7.17036	0.547007	13.1084	<0.00001	***
GEN	0.0341391	0.0730619	0.4673	0.64075	
MSTAT	0.069259	0.067285	1.0293	0.30439	
EDU	-0.00575923	0.0647084	-0.0890	0.92916	
ETH	-0.0973105	0.0609758	-1.5959	0.11188	
l_HINC	0.072779	0.0312184	2.3313	0.02060	**
l_FSI	-0.33184	0.0922129	-3.5986	0.00039	***
l_HHS	-0.00230747	0.0946482	-0.0244	0.98057	
l_AGE	0.0220524	0.122697	0.1797	0.85752	

Mean dependent var	6.861019	S.D. dependent var	0.497964
Sum squared resid	51.46361	S.E. of regression	0.470984
R-squared	0.135245	Adjusted R-squared	0.105426
F(8, 232)	4.317387	P-value(F)	0.000072
Log-likelihood	-155.9216	Akaike criterion	329.8432
Schwarz criterion	361.2063	Hannan-Quinn	342.4788

Breusch-Pagan test for heteroskedasticity -
Null hypothesis: heteroskedasticity not present; Test statistic: LM = 13.8618
with p-value = P(Chi-square(8) > 13.8618) = 0.0854397