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Travel Behavior of Urban Versus Rural Neighborhood : A Case Study in the USA

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Abstract
Travel behavior study has become more and more essential for Transportation Planning process. A good knowledge about the travel behavior incorporates with the neighborhood and the characteristics of the household or person will navigate in a good understanding of how to generate an appropriate model that can be used in Transportation Planning. This study was conducted to established model of travel behavior of trip generation, trip distribution, mode choice and trip assignment that affected by person and household characteristic and the neighborhood which in this case is represented by a variable that inform the place where respondent live. The result of the study has shown that the number of household members, vehicle ownership and family income are significant factors in trip generation and trip distribution and also in mode choice models. However, the person characteristics such as age and gender did not significantly approve to influence the utilization of the interstate in trip assignment model.
Keywords: *travel behavior, neighborhood, characteristic*

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I. Introduction

In 2009, national surveys were conducted all over USA for household travel. The data from this survey is called National Household Travel Survey. In this study, part of that data was taken to be utilized which is National Travel Survey Virginia Add-on. This study just focuses to build models for Norfolk, Virginia Beach and Newport News only, thus the data for the corresponding region has been extracted. This data consists of three datasets which are daily trips dataset, household dataset and person dataset. In the data processing for this study, some variables from one data set were taken to be combined with the other data set. The household data set with the combination of information taken from daily trips datasets has been applied to set up the model for trip generation, trip distribution and mode choice models, while the person dataset was utilized for traffic assignment model.

Previous Studies

Several studies about travel behavior that connected to the neighborhood have been carried out as in Khattak and Rodrigues [1], Bagley et al [2], Handy et al [3], and Greenwald and Boarnet [4]. Khattak and Rodrigues [1] in their paper entitled “Travel behavior in neo-traditional neighborhood development: A case study in USA” conducted a study to find out if the neighborhoods residents replace walking by driving trips or if they actually making more trips overall. The study also investigated the role of self-selection of residents in neo-traditional neighborhood development. The study revealed that the single-family household in that neighborhood conducted a similar number of trips, but significantly fewer trip by car and fewer external trip as well as fewer travel miles compare to the household in the conventional neighborhood. The result also confirms the hypothesis that households in the neo-traditional development substitute driving trips with walking trips.

Handy et al[3] in their paper entitled “correlation or casualty between the built environment and travel behavior? Evidence from Northern California”, try to investigate the relationship between neighborhood characteristics and travel behavior while incorporating the role of travel preferences and neighborhood preferences to reach the goal. The result of this study was that the differences in travel behavior between suburban and traditional neighborhoods are mainly explained by attitudes. Greenwald and Boarnet [4], have carried out a study to analyze the non-work walking travel using the datasets for Portland, Oregon area. The result of the study suggests that the land use effects on individual non work walking trip generation took place at the neighborhood level.

Kockelman [5] and also Bagley et al [2] examine the travel behavior in its relationship to the demographic factor. Kockelmaninvestigated the relative significance of the accessibility, land use mixing and land use balance to the household vehicle miles traveled (VMT). This study confirmed that those variables are highly significant after controlling demographic characteristics.WhileBagley et al carried out a study about the impact of residential neighborhood type on travel behavior, by putting into account attitudinal, lifestyle and demographic variables. The result of this study is that as attitudinal, lifestyle and socio demographic are incorporated the neighborhood type has little influence on travel behavior.

Structural equation modeling (SEM) has been utilized by Golob [6] and also Bagley et al [2] in their study about travel behavior. Golob in his study aimed to provide an introduction about this method to the people who have not used it before.

Learn from the previous studies, this study also tries to disclose the relationship between person and household character to the travel behavior by putting into account the neighborhood which in this case will be described by a variable as an indicator whether the respondent live in urban or rural area.

Research Design

Hypotheses

The hypotheses for this study are,

- There are individual and simultaneous relationships between the household characteristics, also the place they livedand the household trip generation by trip purpose, the household trips distribution by trip purpose and the household mode choice.
- There are individual and simultaneous relationships between the person's age and gender and the traffic assignment, in this case take the interstate or not.

Selecting variables

In correspond to the hypothesis the selected variables are present in the table 1 below.

Table 1 Variable used in the modeling

	Base file	**Dependent variable**	**Independent variable**
Trip Generation	Household	HBW trips HBO trips NHB trips	URBRUR HH Size HH Vehicle HH Income
Trip Distribution	Household	HBW travel distance HBO travel distance NHB travel distance	URBRUR HH Size HH Vehicle HH Income
Mode Choice	Household	Auto trips Walk + Bicycle trips	URBRUR HH Vehicle HH Income
Traffic Assignment	Person	Interstate use ('USEINTST'; yes/no)	URBRUR Age Gender

Descriptive Analysis

The Descriptive statistics (table 2) have pointed out that the average number of HBW trips is less than one. The reason for this is that the majority (63.8%) of the respondent in of the respondents in Norfolk – Virginia Beach – Newport News did not conduct Home Base Work trips on all working days, this can be confirmed in the distribution of HBW graph.

Table 2 Descriptive Statistic

	N	Mean	Std. Deviation	Minimum	Maximum
HBW trips	3160	0.827	1.311	0	9
NHB trips	3160	2.426	3.112	0	30
HBO trips	3160	4.592	4.128	0	32
HH Size	3160	2.389	1.232	1	10
HH Vehicle	3160	2.145	1.144	0	10
HH Income	3160	60099.684	29705.642	5000	100000

Most of them who conducted this trip made 2 trips everyday (17.5%), and there are 8.7% made this trips just once each day, while the others that conducted this kind of trip more than 2 trips a day just have less than 5% on each number of trip to the maximum of 9 trips a day (see figure 1).

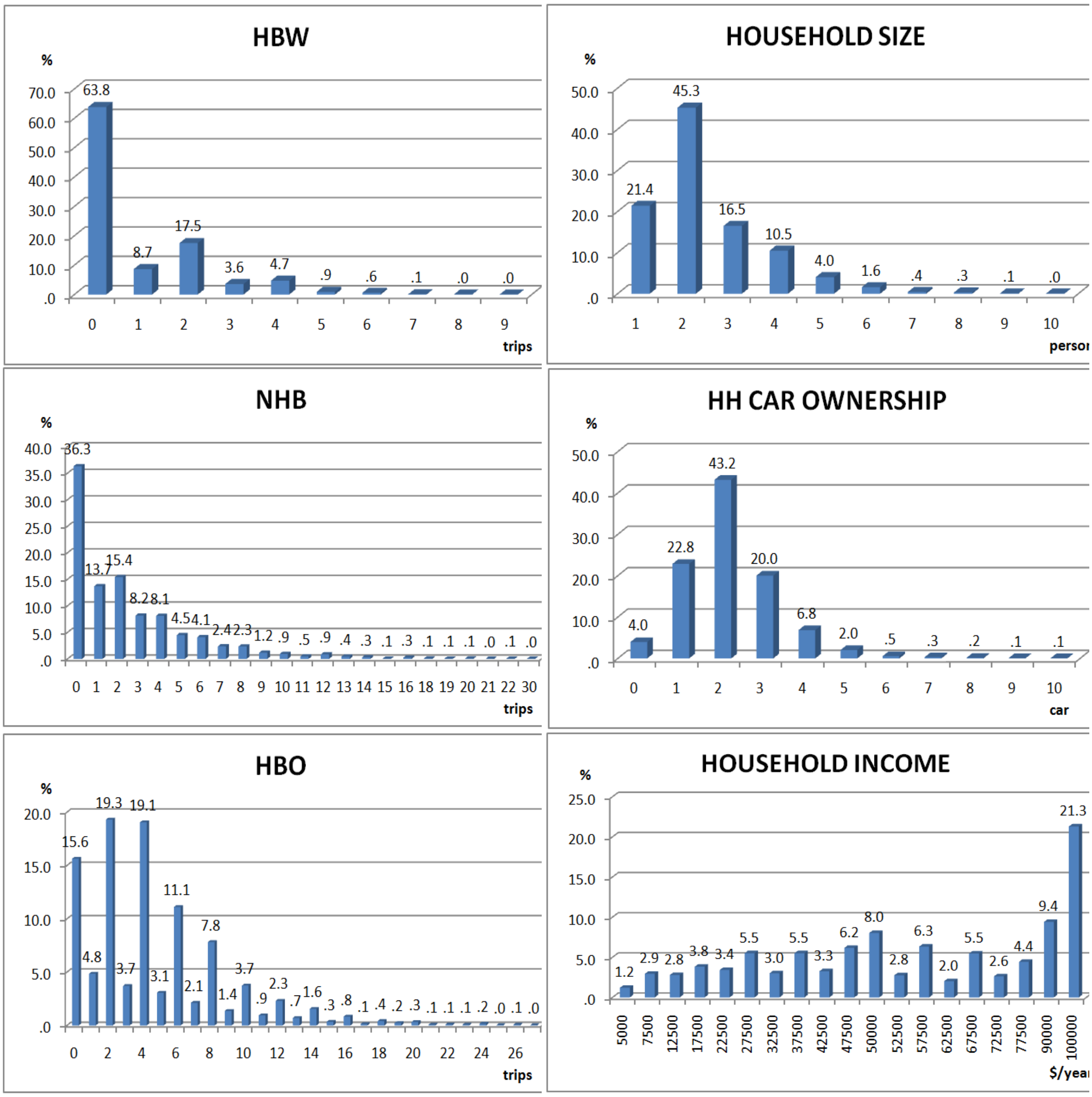

Figure 1Distribution of trips by purpose and household characteristic

The NHB graph also shows that the majority of the respondents (36.3%) did not made Non Home Base in every work days, however the mean for this kind of trip is 2.4 trips, this is connected to the fact that the distribution has long tail to the right, which is the maximum number of trips is 30. As in HBW trips, most respondents who made NHB trips do 2 trips daily (15.4%), followed by 1 trip daily (13.7%) and 3 and 4 trips that shared 8.2% and 8.1% respectively.

For HBO trips there are about 15.6% respondents did not carry out this kind of trip however this is not the majority. In fact, the Home Base Others graph has shown that most of the respondents conducted this kind of trip twice a day (19.3%) followed by 4, 6 and 8 which share 19.1%, 11.1% and 7.8% respectively, while the other number of trips are all less than 5%. The average number of this kind of trip is 4.59. One thing which is interesting from the distribution of HBO trips is that the share for almost every even number of the trip has much more share than those odd numbers, for example the percentage of the frequency for two trips is much higher than one trip, the four trips is much higher than the three trips and so on. It could be interpreted as a fact that people made round trips (go out and back home) in daily basis for this kind of trip.

From Household Size distribution it can be seen that the majority of the respondents (45.3%) have 2 family members. The second place is one family member (21.4%) followed by 3 and 4 family member that shared 16.5% and 10.5% respectively. While the other number up to maximum 10 family members shared less than 5%.

Most of the respondents owned at least one car, only 4% of the respondents did not own a car. The majority (43.2%) possessed two cars, the second place is one car (22.8%), while the third and the fourth place is 3 cars (20%) and 4 cars (6.8%). The other numbers of car ownership shared less than 3%.

The distribution of household income has demonstrated that most of the respondents (21.3%) earn \$100,000 or more annually, 9.4% earn \$ 90,000 per year and 8% earn \$ 50,000 per annum. The next place is people who earn \$57,500 (63%) followed by the people that earn \$47,500 each year. The people who earned \$67,500, \$37,500 and \$27,500 have the same share which is 5.5% each, while the other numbers of income shared less than 5%.

Correlation

Before conducting the regression analysis, it is important to acknowledge the correlation between variables, which are the correlation between dependent and independent variables and the correlation between each independent variable with other independent variables. Table 3 shows the correlation between dependent and independent variables.

Table 3 Pearson Correlations

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	.030	.065**	.708**	-.021	.025	.253**	.060**	-.009	.262**	.300**	.258**
2	.030	1	.332**	.019	.382**	.140**	.780**	.368**	-.007	.522**	.283**	.241**
3	.065**	.332**	1	.036*	.145**	.576**	.734**	.163**	.006	.311**	.237**	.243**
4	.708**	.019	.036*	1	-.001	.046**	.170**	.037*	.054**	.223**	.277**	.258**
5	-.021	.382**	.145**	-.001	1	.142**	.306**	.119**	.054**	.245**	.175**	.132**
6	.025	.140**	.576**	.046**	.142**	1	.375**	.085**	.039*	.213**	.172**	.183**
7	.253**	.780**	.734**	.170**	.306**	.375**	1	.084**	.004	.511**	.382**	.321**
8	.060**	.368**	.163**	.037*	.119**	.085**	.084**	1	-.029	.189**	.059**	.131**
9	-.009	-.007	.006	.054**	.054**	.039*	.004	-.029	1	.010	.106**	.012
10	.262**	.522**	.311**	.223**	.245**	.213**	.511**	.189**	.010	1	.434**	.317**
11	.300**	.283**	.237**	.277**	.175**	.172**	.382**	.059**	.106**	.434**	1	.438**
12	.258**	.241**	.243**	.258**	.132**	.183**	.321**	.131**	.012	.317**	.438**	1

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

1 = HBW trips
2 = HBO trips
3 = NHB trips
4 = HBW travel distance
5 = HBO travel distance
6 = NHB travel distance
7 = Auto trips
8 = Walk+Bicycle trips
9 = Urban or Rural
10 = HH Size
11 = HH Vehicle
12 = HH Income

To carry out the regression analysis, one would that there are strong correlations between dependent variables and each independent variable and on the other hand there are weak correlation between an independent variables to the other independent variables.

From the correlation table, it can be revealed that there is a weak correlation between HBW trips and HH Size (26.2%), although the correlation is statistically significant and the same with the correlation between HBW trips and HH Vehicle and between HBW trips and HH Income, which are 30% and 25.8% respectively, even though the correlations are also statistically significant.

There is a quite strong correlation between HBO trips and the HH Size (52.2%) and this correlation is statistically significant however there are only weak correlations between HBO trips and HH Vehicle (28,3%) and between HBO trips and HH Income (24.1%). Those correlations are statistically significant.

The correlation between NHB trips and HH Size, NHB trips and HH Vehicles and NHB and HH Income are all weak correlations (31.1%, 23.7% and 24.3% correspondingly). These correlations are all statistically significant.

The other correlations between dependent variable and independent variable that can be categorized as quite strong correlations and statistically significant are the correlation between HBW travel distance and Urban or Rural variable (54%), the correlation between HBO travel distance and Urban or Rural variable (54%), the correlation between Auto trips and HH Size (51.1%) and the correlation between Walk + Bicycle and HH

Vehicle. The correlation is statistically significant, quite strong, and positive which means that every addition to the variable will also result to the addition to the other variable that is correlated to it.

However, there are also correlation between independent variable and other independent variable that can be classify as quite strong correlations and statistically significant which are the correlation between HH Size and HH Vehicle (43.4%) and the correlation between HH Vehicle and HH Income (43.8%). Since those correlations are positive, it means that every addition to one of those variables will also result in the addition of the other variables.

Analysis in Trip Making Behavior

Multiple Regressions analysis,also known as ordinary least square (OLS) Regression analysis was utilized to expose the travel behavior of the respondent in this region. Table 4 showed the result of multiple regression analysis for several dependent variables which are HBW trips, HBO trips, and NHB trips. For the regression analysis the income will be counted in every $10,000.

Trip generation model

The trip generation model was shown by table 4 below,

	B	Std. Error	t	Sig.	F	Sig.	R Square	Adjusted R Square
Dependent Variable : HBW Trips								
(Constant)	-.321	.060	-5.379	.000	114.489	.000[a]	.127	.126
Urban or Rural 0 or 1	-.127	.067	-1.897	.058				
Count or HH members	.150	.020	7.517	.000				
Count of HH vehicles	.210	.023	9.233	.000				
Incomep10000	.059	.008	7.154	.000				
Dependent Variable : HBO (HBO + HBSHOP + HBSOCREC) Trips								
(Constant)	-.160	.171	-.936	.350	307.729	.000[a]	.281	.280
Urban or Rural 0 or 1	-.218	.191	-1.142	.254				
Count or HH members	1.609	.057	28.294	.000				
Count of HH vehicles	.167	.065	2.571	.010				
Incomep10000	.096	.024	4.054	.000				
Dependent Variable : NHB Trips								
(Constant)	-.281	.142	-1.979	.048	111.643	.000[a]	.124	.123
Urban or Rural 0 or 1	-.054	.159	-.342	.732				
Count or HH members	.595	.047	12.580	.000				
Count of HH vehicles	.207	.054	3.823	.000				
Incomep10000	.141	.020	7.177	.000				

Table 4 Multiple Regressions (OLS Regression) models for Trip Generation

R square for the OLS regression output of Dependent Variable HBW trips is 0.127 which means that 12.7% of the variance in average HBW trips can be predicted by the combination of the independent variables (urban/rural, HH members, HH vehicles and HH income). The P-value for the overall model is less than 5% (0.000), which means that the overall model is fit very well because it is statistically significant. From P-value for each variable it is exposed that urban/rural variable is not statistically significant, while the other variables are all statistically significant. This was expected since the urban/rural variable is a dichotomy variable (0 or 1), that most likely this variable did not distribute normally as it should to fulfill the requisite for OLS regression analysis. From the coefficient one would know thatevery addition of 1 HH members, there will be addition 0.15 on the number of HBW daily trip, every addition of 1 HH vehicle, there will be 0.21 more number of this kind of trip and every $10,000 addition per annum on Household Income, the corresponding daily trip will increase 0.059.

Parameter	B	Std. Error	Hypothesis Test		Exp(B)	Omnibus Test		Log Likelihood		R^2
			Wald Chi-Square	Sig.		Likelihood Ratio Chi-Square	Sig.	Intercept	Full	
Dependent Variable : HBW Trips										
(Intercept)	-1.853	.0857	467.177	.000	.157	804.847	.000	-4482.678	-4080.255	0.090
[URBRUR_0_1=.00]	.151	.0611	6.127	.013	1.163					
[URBRUR_0_1=1.00]	0[a]	.	.	.	1					
HHSIZE	.160	.0147	119.090	.000	1.174					
HHVEHCNT	.202	.0156	167.474	.000	1.224					
Incomep10000	.093	.0076	152.759	.000	1.098					
(Scale)	1[b]									
Dependent Variable : HBO (HBO + HBSHOP + HBSOCREC) Trips										
(Intercept)	.460	.0343	179.098	.000	1.584	2873.939	.000	-10232.827	-8795.858	0.140
[URBRUR_0_1=.00]	.048	.0256	3.565	.059	1.050					
[URBRUR_0_1=1.00]	0[a]	.	.	.	1					
HHSIZE	.261	.0057	2065.972	.000	1.298					
HHVEHCNT	.054	.0077	48.033	.000	1.055					
Incomep10000	.032	.0031	108.798	.000	1.033					
(Scale)	1[b]									
Dependent Variable : NHB Trips										
(Intercept)	-.305	.0478	40.810	.000	.737	1489.127	.000	-8577.531	-7832.968	0.087
[URBRUR_0_1=.00]	.025	.0347	.504	.478	1.025					
[URBRUR_0_1=1.00]	0[a]	.	.	.	1					
HHSIZE	.198	.0084	551.850	.000	1.218					
HHVEHCNT	.088	.0104	72.251	.000	1.092					
Incomep10000	.069	.0043	253.104	.000	1.072					
(Scale)	1[b]									

Table 5 Poisson Regression models for Trip Generation

The independent variables explain 28.1% of the variation of the dependent variable HBO trips. The model itself fit very well since the p-value for overall model is less than 5% (0.000) and again urban/rural variable became the only variable that is not statistically significant. The coefficient can be interpreted as have been carried in the previous paragraph.

The variation of the dependent variable NHB Trips was explained 12.4% by the all the independent variables simultaneously and it is statistically significant since the p-value for overall model is 0.000. Like the two previous OLS regression analyses, the urban or rural variable turns out to be the only variable that is not statistically significant. Similar interpretation of the coefficients can be applied in this part of regression analysis.

From the output of Poisson regression in table 5 Above, for trip generation model where the dependent variable is HBW trips, it was notified that the average of this trip is near to zero (0.157) as shown by the intercept. Once again, this may bebecause a big part of respondents (63.8%) who did not conduct this kind of trip. The output showed that this kind of trip was conducted 16.3% more in urban areas than in rural areas, and it is statistically significant. Also, all the independent variables have positive sign (exp (B)>1), where every addition of HH Size will add up the trip 17.4% more, every addition of HH Vehicle will add the trip 22.4% more and every addition of $10,000 per annum per HH Income will also add 9.8% of the trip.

Overall, the model has a good fit, since the P-value for overall model (as shown in omnibus test) is less than 0.05 which means it was statistically significant, although the Pseudo R^2 is just 9% which means that the combination of all independent variable can predict only 9% of the variation in dependent variable which in this case is HBW trips.

The HBO trips variable was mainly affected significantly by all the independent variables except the urban / rural variable. The overall model also has a good fit since the P-value for the overall model is less than 0.05. The Pseudo R^2 showed that those independent variables can only explain 14% of the variation in the HBO trips variable.

Analogy to the previous dependent variable, the NHB trips was also influenced by all the independent variable except the urban or rural variable. This model also has good fit as the P-value of the overall model was less than 0.05. The Pseudo R^2 for this model is 8.7%.

Trip Distribution model

The trip distribution models were presented in table 6. As shown in table6, in trip distribution modeling there are 3 models. The first one is the model where the dependent variables is HBW travel distance, the second one is the model where HBO travel distance is the dependent variable and the last one is the model where NHB travel distance is the dependent variable. From the output it is confirmed that almost all the independent variables are statistically significant affected the variance in dependent variables for all the models. The only variable which is the exception of the previous statement is the urban and rural variable, where in the third model, the P value for this variable is more than 0.05 (P value = 0.075). Overall, the independent variables for each trip distributions model simultaneously fit the corresponding model very well, where the overall P-value for all models is less than 0.05. From the R^2 it was made known that for the first model, the model explains 10.9% of the variation happened in the HBW travel distance, for the second model, the model explains 6.9% of the variation in the HBO travel distance and for the third model, it was shown that the model explained 6.2% of the variation in NHB travel distance.

	B	Std. Error	t	Sig.	F	Sig.	R Square	Adjusted R Square
Dependent Variable : HBW_VMT_MILE (HBW travel distance)								
(Constant)	-6.967	.916	-7.610	.000	96.695	.000[a]	.109	.108
Urban or Rural 0 or 1	2.065	1.026	2.014	.044				
Count or HH members	1.680	.305	5.501	.000				
Count of HH vehicles	2.798	.349	8.010	.000				
Incomep10000	1.034	.127	8.145	.000				
Dependent Variable : HBO_DIST_MIX (HBO travel distance)								
(Constant)	-4.941	2.823	-1.750	.080	58.433	.000[a]	.069	.068
Urban or Rural 0 or 1	8.223	3.162	2.601	.009				
Count or HH members	9.983	.941	10.605	.000				
Count of HH vehicles	3.395	1.077	3.153	.002				
Incomep10000	.766	.391	1.958	.050				
Dependent Variable : NHB_VMT_MILE (NHB travel distance)								
(Constant)	-6.387	1.751	-3.647	.000	53.629	.000[a]	.064	.062
Urban or Rural 0 or 1	3.491	1.962	1.780	.075				
Count or HH members	4.671	.584	7.998	.000				
Count of HH vehicles	1.750	.668	2.619	.009				
Incomep10000	1.375	.243	5.665	.000				

Table 6 Multiple Regressions (OLS Regression) models for Trip Distribution

Mode Choice model

The mode choice model is displayed in table 7. The tableshowed that the average of auto trip per day is about 3 trips (the intercept = 2.87). It is also displayed that the auto trips were more in urban than in rural for about 7.4% (statistically significant). Every addition in Household vehicle will add the auto trips for 19.8%, while every $10,000 addition for household income will also add the auto trips for 6.3% (both are statistically significant).

The walkbike trips model showed that the means of this trip frequency are close to 0 (0.297), this can be understood as the fact that there are not many people conducting this trip. The output revealed that the people who live in the urban area make the trip using foot or bike 25.8% more than the same kind of trip made by the people live in the rural area. From the P-value of each independent variable, one would know that every $10,000 addition of household income will raise the number of this kind of trips for 10.3% (statistically significant).

Parameter	B	Std. Error	Hypothesis Test		Exp(B)	Omnibus Test		Log Likelihood		R^2
			Wald Chi-Square	Sig.		Likelihood Ratio Chi-Square	Sig.	Intercept	Full	
Dependent Variable : Auto Trips										
(Intercept)	1.054	.0270	1519.774	.000	2.870	2471.994	.000	-12435.509	-11199.512	0.099
[URBRUR_0_1=.00]	.071	.0208	11.854	.001	1.074					
[URBRUR_0_1=1.00]	0^a	.	.	.	1					
HHVEHCNT	.181	.0055	1077.391	.000	1.198					
Incomep10000	.061	.0025	567.274	.000	1.063					
(Scale)	1^b									
Dependent Variable : WlkBike Trips										
(Intercept)	-1.214	.0894	184.613	.000	.297	199.496	.000	-4610.952	-4511.205	0.022
[URBRUR_0_1=.00]	.230	.0704	10.639	.001	1.258					
[URBRUR_0_1=1.00]	0^a	.	.	.	1					
HHVEHCNT	.014	.0203	.452	.502	1.014					
Incomep10000	.098	.0081	146.573	.000	1.103					
(Scale)	1^b									

Table 7 Poisson Regression models for Mode Choice

Trip Assignment model

The trip assignment logit model can be seen in table 8.

Observed		**Predicted Block 0**			**Predicted Block 1**				
		Interstate_Clear		Percentage Correct	Interstate_Clear		Percentage Correct		
		1	2		1	2			
Interstate_Clear	1	0	2996	.0	102	2894	3.4		
	2	0	3639	100.0	136	3503	96.3		
Overall Percentage				54.8			54.3		
Omnibus Tests of Model Coefficients				**Model Summary**			**Hosmer and Lemeshow Test**		
	Chi-square	df	Sig.	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Chi-square	df	Sig.
Model	24.623	2	.000	9111.029^a	.004	.005	23.095	8	.003
Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
R_AGE		-.005	.001	23.213	1	.000	.995	.992	.997
R_SEX(1)		.072	.050	2.090	1	.148	1.074	.975	1.184
Constant		.422	.065	42.632	1	.000	1.525		

Table 8 Logit Regression models for Trip Assignment

The assignment model in table 8 Explained that the block 1 model (full independent variable) has less percentage correct than the block 0 model (intercept only, without any explanatory variable). It means that the model gets worse after the independent variables were put into it. From omnibus test one will expect that the -2 log likelihood is significantly different with the previous block (block 0), it was confirmed since the P-value at omnibus test is lesser than 0.05. However, the Pseudo R^2 (in this case Nagelkerke R^2) is very small which is 0.5% which means that the independent variables only correlated 0.5% to the variation happened in the dependent variable (use interstate or no). Also, from the Homer and Lemeshow test, one will expect that the value should not be statistically significant since this test basically was aimed to see if the model do not fit the data, however in this case the value is 0.03 or less than 0.05 (statistically significant). It can be interpreted that the model does not fit the data very well. The last part of the table showed that every addition of respondent age will make the probability of taking the interstate become lesser by about 0.5%, the P – value for this variable confirmed that it is statistically significant.

II. Summary and conclusion

From the analysis it can be summarized that,

1. The multiple regression models for trip generation were over all fit the data, where all the P-values for overall models are less than 0.05. Also, from the P-values of each variable, urban and rural variable is the only one that is not statistically significant to the model. From this, it can be concluded that individually and simultaneously the household member, the household car ownership and the family income are all have relationship to the number of daily trips for home-based work, home base others and non-home-based trips made by the households.
2. All Poisson regression model analyzed in this study also show a good fit to the data where all the P-value for overall model (from omnibus test) are lesser than 0.05. Except urban and rural variables, all the other independent variables are statistically significant affected the dependent variable. The urban or rural variable only statistically significant at the model where home base works trips is the dependent variables. It can be concluded that the household member, the household car ownership and the family income are all have association with the number of daily trip of each trip purpose made by household in the location of the study.
3. The P-values of all independent variables in trip distribution models are all significant except the urban or rural variable in the model where non home base travel distance is the dependent variable. Overall, the 3 models for trip distribution fit the data very well since the P-value for the model are all less than 0.05. The conclusion that could be withdrawn from this is, it is confirmed that individually and simultaneously the household member, the household car ownership and the family income are all connected to all trip distance by trip purpose conducted by the household in the location of this study.
4. The Poisson regression model output for mode choice presented that all the models fit the data very well because the P-value for overall model (from omnibus test) are all less than 0.05. All the independent variables are statistically significant affect the dependent variable except the household vehicle variable in the walk bike trips model. In conclusion, the area where the respondents live (urban or rural), the number of vehicle and the family income associate with the auto trip while for the walk and bike trips, only the area where the respondents live and the family income that are related.
5. The trip assignment model output has proved that when the independent variables were put into the model, the model become worse, also the output have confirmed that the model did not fit the data. However, from the output it can be concluded that 54.8% of the respondents were taking the interstate when they conducted a trip.

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