Commuting Time on the Cost of Daily Life Activities and Wellbeing in Pakistan

Alia Asmat[1,*], Ghulam Abbas Ghazi Gajani[2] and Ghinasha Choudary[1]

[1]Department of Psychology, University of Central Punjab, Lahore, Pakistan and [2]Department of Economics, Lasbela University of Agriculture, Water & Marine Sciences, Uthal, Pakistan

Email of corresponding author: dr.alia@ucp.edu.pk

Abstract: ***Introduction:*** Commuting can be described as non-work related activity outside of the paid work hours. Presently, an effort was made to evaluate Trade Offs between commuting time and daily life activities. ***Design:*** Secondary data analysis. ***Subjects and Methods:*** Sample of this research was taken from Federal Bureau of Statistics; Pakistan Time Use Survey 2007. Researchers have calculated all six activities from the given list (PTUS classification) of 144 activities performed by the commuters. Initially we have calculated commuting time from travel time of those participants who travel from home to the work place. Further, data was analyzed through Seemingly Unrelated Regression (SUR). ***Results:*** Commuting time and working hours are significantly and negatively affecting all six activities performed by the commuters on daily basis. Regarding gender difference across six activities found that female spent more time on caring child and elderly, personal care and physical activities however, they spent less time on sleeping, leisure and social-cultural activities as compare to men. Daily time spent on child and elderly care and sleeping time decrease as the age of the commuter increase. It was also documented that divorced individual spent more time on personal care but less on sleep. Additionally sleep and other activities are concerned people who are getting money from other members of the family and remittance sleep more. More over sleeping time also decreased as educational grades increase. Further, current analysis revealed that level of education and time spent on different activities, individual educational grade primary but below middle and inter but below degree spent more than people with no education. Individual with metric and under inter spent more time on personal care. As for as leisure time is concerned more educated spend more time on leisure activities as compare to uneducated. Only people with inter education spent time on physical care activities. Researchers supposed minimum commuting time is 60 minutes from the 1440 total allocated minutes per day. In present study while keeping the 60 minutes constant we have found urban and rural trade Offs; if 30 minutes increased in the commuting time it will decrease 2.3 minutes from sleep, 4.49 from child and elderly care, 3.5 from personal care, 5.03 from leisure and 2.03 minutes from sociocultural activities in urban commuters. Leisure time is more compromised than other activities. In rural 2.24 sleep, 4.79 child and elderly care, 3.61 from personal care, 5.81 from leisure, 5.21 physical care and 1.95 from sociocultural activities. ***Conclusion:*** This research would provide a baseline to the upcoming researches to established associations between travel time, mental and physical health issues as the cost of commuting in Pakistan.

Keywords: Commuting; Recreation; Model; Pakistan; Variable.

INTRODUCTION

Commuting is rarely anyone's favorite time of the day; but it can be more than just an inconvenience. Therefore, back and forth from work have serious impact on wellness. Every individual has to perform different, personal as well as collective activities based on preferences, requirement and responsibilities per day. Certain activities are thought to be nothing more than wasting time, inspite having such cognitions one has to perform due to some constraint.

Commuting journey represent a spatial and temporal frame according to which other travel activities and life style are based. So, it is expected that commuting might have more influence on daily activities. More over research also explore other aspects on which commuting has impact such as activities (Lyons & Urry, 2005) its relation to paid work (Levinson & Wu, 2005) and geographical region (Millward & Spinney, 2011). Michelson reported in (Michelson, 2005) that allocating time for family, work and leisure activities is determined by individual preferences, social roles and by biological needs and related commitments.

Researcher was interested to find out a key factor that is time and its division in certain activities performed by the individual on daily basis 1) total time spent on daily child and elderly care 2) daily sleep 3) daily personal care 4) daily leisure 5) daily physical and 6) daily social-cultural activities. Additionally, it was also finding out that if commuting time 30 minutes increase or decrease; how many minutes increase or decrease from the performed activity.

According to the resource drain model; changes in one activity negatively affect the other (Frone, 2003). This model assumed that recollection of time, energy like resources may be

intentional or un- intentional (Edwards & Rothbard, 2000). This model also explains effects of commuting time and time spent in other activities are related to quality of life and mental health. In present study tradeoffs between commuting and other activity also built to see the time allocation among activities and division of time.

Commuting research is well-versed by extensive collection of viewpoint (Novaco & Gonzalez, 2009). Longer commutes are positively associated with hypertension and weight gain while negatively linked with physical activity (Hoehner, Barlow, Allen & Schootman, 2012). Physical inactivity is a cause for developing osteoporosis, metabolic risk syndrome, Type 2 diabetes, and cardiovascular disease (Katzmarzyk, Church, Craig & Bouchard; Warburton, Nicol & Bredin, 2006;Farber & Peas, 2011; Besser, Marcus & Frumkin, 2008). Passive commuters for example Commuting by car is associated with poor sleep quality and higher obesity rates (Hansson, Mattisson, Bjork, Ostergern & Jacobsson, 2011). Due to these health concerns more research on methods for reducing these health issues is necessary related to tough life style of work and transportation, including time consumed by car (Owen, Sugiyama, Eakin, Gardiner, Tremblay & Sallis, 2011). while commuting connected with poor emotional wellness, results when contrasted with dynamic methods of transportation, car commuters encounter more negative moods and stress (Wener & Evans, 2011), which is in part inferable from the more prominent mental exertion required in driving and lower levels of predictability identified with activity and drive time. As the unusualness of commuter's time expanded, so did impression of anxiety (Gotthalmseder, Nowotny, Pruckner, & Theurl, 2009). This can be assumed that traffic congestion and others' driving practices make intense anxiety, and every day long distance ventures took a physiological toll after some time. Impedance, experienced as physical hindrances like traffic congestion and subjective impression of constrains, was a key donor to suburbanite stress. More noteworthy physical impedance was identified with lower disappointment resistance and negative mood, while subjective impedance was connected to wellbeing issues, poor state of mind at home, and diminished employment and residential fulfillment.

Recreation may assume a part in upgrading well- being and health while commuting to work. Recreation activities can possibly give health advantages to laborers encountering troubles in work place (Cartwright & Warner-Smith, 2003). Recreation investment appears connected with more noteworthy life satisfaction, happiness and mental prosperity, and physically active relaxation can direct the negative impacts of anxiety. Relaxation can give a method for adapting to upsetting work circumstances (Iwasaki, 2003) and with chronic stressors (Hutchinson & Kleiber, 2005). Subsequently, open doors for recreation might be an imperative thought for individuals with long and/or unpleasant commuters.

Resource drain model proposes that a lengthy commuter's time will adversely impact well-being because of the reallocation of time far from family and other activities. Hilbrecht, Smale, and Mock (2014) analyzed the relationship between commute time and well- being and tested degree to which physically active and social recreation time served as potential in any association found between commute time and well-being. Past the measure of time spent commuting, they additionally analyzed how perceived traffic congestion may intercede the relationship between commute time and well- being. Physical, social and leisure activities are performed to reenergize from a hectic routine similarly sleep is thought to be an important component to body restitution, e.g energy restoration and tissue reproduction. Quality of life of a person can be disrupted due to many different reasons; one of them is sleep, which is given less importance (National Sleep Foundation, 2007). The time for sleep varies from person to person (Shneerson, 2000). Carskadon and Dement (2005) revealed that length of sleep is 7 and 8.5 hour per day. People with sleep deprivation tend to have decline in higher mental functioning and mood (Philibert, 2005).

The Prime focus of the researcher is to bring the fact into notice by using data from Pakistan Time Use survey that how people here in developing country are affected by the transportation difficulties that consequently add up physical and psychological health concerns. We have found that rural commuters spent less time on commuting activities whereas urban population spent more. Since Hoehner et al (2012) found that longer commutes cause physical inactivity and negative health outcomes.

METHODOLOGY

DESIGN OF THE RESEARCH

The design of the study was secondary data analysis.

DATA AND SUBJECTS

This study uses secondary data set from Pakistan Time Use survey that was conducted in 2007 by the Federal Bureau of Statistics (FBS). Permission was also taken from the concerned department (FBS) to use this for research purpose.

SAMPLE

The primary focus of the study is to measure commuting (travel time) at the cost of mental and physical health. The sample is restricted to the age from 25 to 65 years old people; consider as working age group for this study. The first check taken on the data was elimination of number 17 and 140 from the list of respondents. Those not working (didn't engaged in work) or refused to report or did not report their income are 10942 and hence were dropped. The check on location of the respondent eliminated 168 respondents as they were not at home somewhere between 8:00 am and 10:30 pm and at their work place between 4:30 am and 7:00pm. Finally, 9576 respondents from rural and urban areas appeared to qualify the study criteria.

MEASURES

DEPENDENT VARIABLES

The total time spent on care of children and elderly people within dwelling, total time spent on sleep, personal care and self-maintenance, leisure activities, physical activities and social-cultural activities by the respondents during a typical day are the dependent variable of the study.

INDEPENDENT VARIABLES

The independent variable are daily commuting time the total time spent on working and several control variables such as residential location i.e., respondent is residing in rural or urban area, gender of the respondent, age, marital status, province, the day in which activities were record, education, occupation, personal income and the number of children under the age of 7 within the dwelling.

METHOD

Seemingly Unrelated Regression Model (SUR)

The study model used to analyze the given set of data is Seemingly Unrelated Regression. SUR model was proposed by Zellner (1962). Model explains the variation of not just in one dependent variable, the model itself consists of several linear regression equations with own dependent variable. Each equation can be estimated separately that is why the system is called Seemingly Unrelated Regression. The SUR model is a system of linear equations with error and error are correlated across equation for a given individual but these are uncorrelated across individuals. The SUR model is estimated through maximum likelihood (ML) method and initial model assumption includes: independent variables are weakly exogenous, there is no autocorrelation and time heteroscedasticity and are normally distributed. The general form of the SUR model is given by.

$$Y_{it} = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + +\beta_5 X_{4t} + \beta_5 X_{5t} + \beta_6 X_{6t} + \beta_7 X_{7t} + \beta_9 X_{9t} + \beta_{10} X_{10t} + \beta_{11} X_{11t} + \beta_{12} X_{12t} + \beta_{13} X_{13t} + \varepsilon_{it} \quad \ldots.1$$

Dependent variable in the model include:

Y1 = Daily total time spent on care of children and elderly

Y2 = Daily total time spent on Sleep

Y3 = Daily total time spent on Personal care activities

Y4 = Daily total time spent on Leisure activities

Y5 = Daily total time spent on Physical activities

Y6 = Daily total time spent on Social-cultural activities

Independent variable in the model include:

X2 = Daily commuting time (DCT)

X3 = Daily working time (DWT)

X4 = Respondent is rural or urban

X5 = respondent's age

X6 = Source of Personal Income

X7 = Personal Monthly Income

X8 = Respondent's Sex

X9 = Current Marital Status

X10 =day for which activities recorded

X11 = Respondent's Province

X12 = Respondent's Education

X13 = No. of children under 7

Table 1 shows 60.78 percent of the respondents resides in rural areas and female respondents are 14.49 percent. Majority of the respondents belongs to the age group 25-35 years and 88.08 percent of the respondents are currently married. 44.25% respondents are from Punjab province and majority of the study respondents have no formal education.

Table 2 presents the allocation of time spend on given daily performed activities under the commuting groups. Every respondent have to perform above activities at-least once in a whole day. What amount of time, a respondent consumes in any particular activity under commuting group is shown in Table 2. It is clear form table 2, the respondents who did not commute, allocate much of the time on these activities and as the commuting increase in further commuting groups the proportion of time allocation to these activities decreases.

Table 1: Respondent's Characteristics (n = 9576)

Rural urban	**Freq.**	**Percent**	**Education**	**Freq.**	**Percent**
Urban	3,756	39.22	No formal education	4,314	45.05
Rural	5,820	60.78	K.G. but below primary	565	5.9
Sex of respondent			Primary but below middle	1,211	12.65
			Middle but below metric	840	8.77
Male	8,188	85.51	Metric but below intermediate	1,153	12.04
Female	1,388	14.49	Inter. but below degree	585	6.11
Age			Degree and above	908	9.48
25-35	3,479	36.33	**Occupation**		
35-45	3,109	32.47	Wage/salary/piecework pay/commission	4,498	46.97
45-55	1,841	19.23	Earnings from own business/farm	4,400	45.95
55-65	1,147	11.98	Govt. grants/support	29	0.3
Marital Status			Investment	10	0.1
			Money from other household members	481	5.02
Never married	825	8.62	Remittance	52	0.54
Currently married	8,435	88.08	Compensation (from ex-spouse or father	5	0.05
Widow/widower	275	2.87	Other	101	1.05
Divorced	41	0.43	**Day for which activities recorded**		
Province			Monday	1,487	15.53
			Tuesday	1,591	16.61
Punjab	4,237	44.25	Wednesday	1,621	16.93
Sindh	2,647	27.64	Thursday	1,462	15.27
NWFP	1,408	14.7	Friday	1,309	13.67
Balochistan	1,284	13.41	Saturday	920	9.61
			Sunday	1,186	12.39

Table 2: Descriptive Statistics

	Commuting groups time basis					
Variable	0	0-90	90-180	180-270	More Than	Total
Care for children and elderly	48.068	17.874	12.304	12.345	6.57	16.99
Sleeping activity	506.86	508.89	490.95	453.64	420.00	494.35
Personal care and self-maintenance	367.826	208.425	186.493	175.429	161.62	206.25
Leisure activity	92.65	91.82	88.57	79.92	68.09	88.91
Physical activity	120.87	31.03	21.52	22.99	21.23	32.35
Social and cultural activity	88.06	93.10	104.62	111.51	119.49	99.50

The **Table 3** shows chi-square statistic of each of the six seemingly unrelated regression equations is highly statistically significant. The explained variations by first, second, third, fourth, fifth and sixth equation are 28.61%, 18.95%, 55.47%, 17.09%, 46.15% and 23.55 respectively. The Breusch-Pagan test of independence is used to test the correlation between errors across the equations. So, the test indicates the significant results that there is a correlation between errors across equations. But the correlation coefficients are not particularly strong that may not be a cause of serious problem with the model.

Table 3: Model Diagnostics

Equation	**Observation**	**Parms**	**RMSE**	**"R-sq"**	**chi2**
Care for children and elderly	5395	39	38.60592	0.2862	2162.93**
Sleeping activity	5395	39	82.67171	0.1895	1261.13**
Personal care and self-maintenance	5395	39	70.42397	0.5547	6720.3**
Leisure activity	5395	39	65.86323	0.1709	1111.79**
Physical activity	5395	39	51.71493	0.4615	4623.78**
Social and cultural activity	5395	39	71.46641	0.2355	1661.86**
Correlation matrix of residuals					
	Care for children and elderly	**Sleeping activity**	**Personal care and self-maintenance**	**Leisure activity**	**Physical activity**
Care for children and elderly	___	___	___	___	___
Sleeping activity	-0.1341	___	___	___	___
Personal care and self-maintenance	-0.0788	-0.3995	___	___	___
Leisure activity	-0.1026	-0.3137	-0.2064	___	___
Physical activity	0.4871	-0.2235	-0.016	-0.1384	___
Social and cultural activity	-0.1876	-0.2732	-0.2674	-0.2353	-0.2263

In **Table 4** the model results shows that there is a negative relationship of daily commuting time with daily time spent on care for children, daily time spent on sleep, daily time spent on personal care activities, daily time spent on leisure activities, daily time spent on physical activities and daily time spent on social and cultural activities. one unit increase in commuting time is associated with a reduction of 0.043, 0.289, 0.260, 0.173, 0.073 and 0.065 in daily time spent on care for children daily time spent on sleep, daily time spent on personal care activities, daily time spent on leisure activities, daily time spent on physical activities and daily time spent on social and cultural activities respectively. The rural individual as compared to urban individual spend 1.783, 3.074 13.093, 3.921, and 3.836 less minutes daily on care for children and elderly, personal care activities, leisure activities, physical activities and social and cultural activities respectively. The rural individual sleep 12.527 minutes more on daily basis as compared to the people residing in urban areas of Pakistan.

Table 4(a): SUR Model

	Coef.	Std.Err.	95% Conf.	Interval		Coef.	Std.Err.	95% Conf.	Interval
Daily total time spent on care of children and elderly					**Daily total time spent on Sleep**				
X2	-0.043**	0.008	-0.058	-0.028	X2	-0.389**	0.017	-0.422	-0.357
X3	-0.065**	0.004	-0.073	-0.057	X3	-0.208**	0.008	-0.224	-0.191
X4	-1.783	1.214	-4.162	0.596	X4	12.527**	2.599	7.433	17.621
X5	-0.388**	0.071	-0.527	-0.249	X5	-0.221	0.152	-0.519	0.077
X6					X6				
2	-2.341*	1.156	-4.606	-0.076	2	6.272*	2.475	1.421	11.123
3	-10.05	14.658	-38.785	18.675	3	-13.638	31.390	-75.161	47.885
4	19.360	15.848	-11.702	50.421	4	-4.981	33.937	-71.496	61.534
5	-2.455	3.035	-8.404	3.494	5	-35.933**	6.500	-48.673	-23.193
6	-6.855	6.871	-20.322	6.612	6	-43.198**	14.714	-72.037	-14.360
7	17.833	19.420	-20.229	55.895	7	6.182	41.586	-75.325	87.689
8	0.244	5.678	-10.883	11.372	8	1.505	12.158	-22.325	25.334
X7					X7				
2	-4.192	2.618	-9.323	0.939	2	10.806	5.606	-0.182	21.793
3	-0.210	2.517	-5.144	4.724	3	4.569	5.391	-5.997	15.135
4	1.414	2.569	-3.621	6.449	4	0.125	5.501	-10.657	10.907
5	2.060	2.707	-3.245	7.365	5	-8.620	5.796	-19.980	2.741
6	0.956	2.824	-4.579	6.491	6	-3.376	6.047	-15.229	8.476
7	1.232	3.033	-4.712	7.176	7	-1.315	6.494	-14.044	11.414
8	0.620	3.467	-6.176	7.415	8	7.559	7.424	-6.992	22.110
9	0.867	3.507	-6.006	7.739	9	3.631	7.509	-11.087	18.349
10	-2.078	3.012	-7.981	3.825	10	-3.291	6.449	-15.932	9.350
X8	47.611**	2.451	42.806	52.415	X8	-69.676**	5.249	-79.964	-59.388
X9					X9				
3	0.270	6.169	-11.822	12.361	3	14.765	13.211	-11.129	40.659
4	-16.08	15.837	-47.120	14.960	4	-80.037*	33.914	-146.506	-13.567
X10					X10				
2	-1.042	1.862	-4.693	2.608	2	8.196*	3.988	0.380	16.013
3	-1.264	1.845	-4.880	2.351	3	3.761	3.950	-3.981	11.503
4	1.165	1.899	-2.556	4.886	4	1.964	4.066	-6.005	9.933
5	-2.011	1.960	-5.853	1.831	5	2.744	4.198	-5.483	10.972
6	-2.267	2.158	-6.496	1.962	6	6.580	4.620	-2.476	15.636
7	-2.338	2.029	-6.315	1.638	7	6.857	4.345	-1.659	15.372
X11					X11				
2	-12.87**	1.344	-15.505	-10.237	2	8.807**	2.878	3.166	14.447
3	-20.13**	1.668	-23.404	-16.865	3	-4.957	3.572	-11.957	2.044
4	-18.69**	1.731	-22.085	-15.299	4	-12.521**	3.708	-19.787	-5.254
X12					X12				
2	4.053	2.291	-0.438	8.543	2	-7.469	4.906	-17.085	2.148
3	5.038**	1.702	1.702	8.375	3	-12.128**	3.645	-19.273	-4.983
4	-0.876	2.058	-4.909	3.157	4	-23.641**	4.406	-32.277	-15.005
5	2.234	1.813	-1.320	5.788	5	-21.166**	3.883	-28.777	-13.556
6	2.965	2.492	-1.919	7.849	6	-24.341**	5.336	-34.799	-13.883
7	8.618**	2.512	3.695	13.542	7	-36.310**	5.380	-46.853	-25.766
X13	2.406**	0.518	1.390	3.422	X13	-0.018	1.110	-2.193	2.157
_cons	70.597**	4.624	61.534	79.661	_cons	638.97**	9.903	619.563	658.38

Table 4(b): SUR Model

	Coef.	**Std.Err.**	**[95% Conf.**	**Interval]**		**Coef.**	**Std.Err.**	**[95% Conf.**	**Interval]**
Daily total time spent on Personal care activities					**Daily total time spent on Leisure activities**				
X2	-0.260**	0.014	-0.287	-0.232	X2	-0.164**	0.013	-0.19	-0.138
X3	-0.231**	0.007	-0.245	-0.217	X3	-0.160**	0.007	-0.173	-0.146
X4	-3.074	2.214	-7.413	1.266	X4	-13.093**	2.071	-17.151	-9.034
X5	0.211	0.129	-0.043	0.464	X5	0.394**	0.121	0.156	0.631
X6					X6				
2	-4.234*	2.108	-8.367	-0.102	2	-5.240**	1.972	-9.105	-1.376
3	-6.605	26.739	-59.014	45.803	3	6.888	25.008	-42.126	55.902
4	-24.221	28.909	-80.882	32.440	4	6.56	27.037	-46.432	59.551
5	23.699**	5.537	12.847	34.551	5	0.67	5.178	-9.48	10.819
6	14.392	12.534	-10.174	38.958	6	19.03	11.722	-3.945	42.006
7	33.525	35.425	-35.907	102.96	7	14.789	33.131	-50.146	79.724
8	5.445	10.357	-14.854	25.744	8	6.277	9.686	-12.708	25.261
X7					X7				
2	-5.014	4.775	-14.374	4.346	2	5.667	4.466	-3.086	14.421
3	-1.991	4.592	-10.992	7.010	3	6.205	4.295	-2.213	14.623
4	0.316	4.686	-8.869	9.500	4	8.129	4.383	-0.461	16.719
5	5.418	4.938	-4.259	15.096	5	14.945**	4.618	5.894	23.996
6	5.486	5.152	-4.610	15.583	6	15.276**	4.818	5.833	24.719
7	9.115	5.532	-1.728	19.959	7	9.292	5.174	-0.849	19.433
8	8.222	6.324	-4.173	20.617	8	5.304	5.915	-6.289	16.896
9	6.030	6.397	-6.507	18.568	9	10.172	5.982	-1.554	21.897
10	5.371	5.494	-5.397	16.139	10	14.073**	5.138	4.003	24.144
X8	124.65**	4.471	115.886	133.414	X8	-52.732**	4.182	-60.929	-44.536
X9					X9				
3	-9.353	11.254	-31.411	12.704	3	9.465	10.525	-11.164	30.094
4	108.62**	28.889	51.994	165.24	4	-0.038	27.018	-52.993	52.918
X10					X10				
2	-2.441	3.397	-9.100	4.217	2	-2.192	3.177	-8.42	4.035
3	2.128	3.365	-4.467	8.724	3	-2.104	3.147	-8.272	4.064
4	1.384	3.464	-5.404	8.173	4	-3.044	3.239	-9.393	3.305
5	-2.678	3.576	-9.687	4.330	5	-2.205	3.344	-8.759	4.35
6	-6.612	3.936	-14.326	1.102	6	5.426	3.681	-1.788	12.641
7	-2.061	3.701	-9.315	5.193	7	1.038	3.461	-5.746	7.822
X11					X11				
2	12.606**	2.451	7.801	17.410	2	-28.097**	2.293	-32.59	-23.603
3	25.111**	3.043	19.147	31.074	3	-22.584**	2.846	-28.162	-17.007
4	59.395**	3.158	53.205	65.585	4	-45.376**	2.954	-51.165	-39.586
X12					X12				
2	4.029	4.180	-4.163	12.221	2	-1.953	3.909	-9.614	5.708
3	2.026	3.105	-4.060	8.113	3	1.933	2.904	-3.76	7.625
4	8.714*	3.753	1.357	16.070	4	9.375**	3.51	2.495	16.256
5	6.548*	3.308	0.065	13.031	5	9.904**	3.093	3.841	15.967
6	4.827	4.545	-4.081	13.736	6	13.930**	4.251	5.598	22.261
7	5.569	4.583	-3.413	14.550	7	24.114**	4.286	15.713	32.514
X13	-0.530	0.945	-2.383	1.323	X13	-2.022*	0.884	-3.755	-0.289
_cons	286.97**	8.436	270.433	303.50	_cons	176.82**	7.889	161.359	192.284

Table 4(c): SUR Model

	Coef.	Std.Err.	[95% Conf.	Interval]		Coef.	Std. Err.	[95% Conf.	Interval]
Daily total time spent on Physical activities					**Daily total time spent on Social-cultural activities**				
X2	-0.073**	0.01	-0.094	-0.053	X2	-0.065**	0.014	-0.094	-0.037
X3	-0.134**	0.005	-0.144	-0.124	X3	-0.240**	0.007	-0.255	-0.226
X4	-3.921*	1.626	-7.108	-0.735	X4	3.836	2.247	-0.568	8.24
X5	-0.550**	0.095	-0.736	-0.364	X5	0.145	0.131	-0.112	0.402
X6					X6				
2	2.17	1.548	-0.864	5.204	2	1.871	2.14	-2.323	6.064
3	-16.014	19.636	-54.499	22.472	3	27.478	27.135	-25.706	80.662
4	2.775	21.229	-38.833	44.383	4	-27.582	29.337	-85.082	29.918
5	20.748**	4.066	12.779	28.718	5	-5.176	5.619	-16.189	5.837
6	36.798**	9.204	18.758	54.838	6	-14.769	12.72	-39.699	10.161
7	20.526	26.014	-30.46	71.512	7	-48.179	35.949	-118.64	22.28
8	8.915	7.605	-5.991	23.822	8	-25.945*	10.51	-46.544	-5.345
X7					X7				
2	-10.186**	3.507	-17.06	-3.313	2	-1.765	4.846	-11.263	7.733
3	-11.300**	3.372	-17.91	-4.691	3	0.934	4.66	-8.2	10.068
4	-6.874*	3.441	-13.619	-0.129	4	-0.562	4.755	-9.882	8.759
5	-6.806	3.626	-13.913	0.3	5	-3.501	5.011	-13.322	6.319
6	-10.987**	3.783	-18.401	-3.572	6	-3.296	5.228	-13.542	6.95
7	-8.027*	4.063	-15.99	-0.065	7	-5.532	5.614	-16.535	5.472
8	-7.678	4.644	-16.781	1.424	8	-10.292	6.418	-22.871	2.287
9	-13.416**	4.697	-22.623	-4.21	9	-5.57	6.491	-18.292	7.153
10	-13.022**	4.034	-20.929	-5.114	10	-1.312	5.575	-12.239	9.616
X8	82.506**	3.284	76.071	88.942	X8	-80.331**	4.538	-89.224	-71.437
X9					X9				
3	-4.077	8.264	-20.274	12.121	3	-5.146	11.421	-27.53	17.238
4	8.644	21.215	-32.936	50.224	4	-23.6	29.317	-81.06	33.861
X10					X10				
2	-2.408	2.495	-7.297	2.482	2	-3.335	3.448	-10.092	3.422
3	-2.068	2.471	-6.911	2.775	3	-1.028	3.415	-7.721	5.664
4	-0.116	2.543	-5.101	4.869	4	-0.919	3.515	-7.808	5.97
5	-1.675	2.626	-6.821	3.472	5	1.619	3.629	-5.493	8.731
6	-3.605	2.89	-9.27	2.06	6	-0.48	3.994	-8.309	7.348
7	-3.483	2.718	-8.81	1.844	7	-2.123	3.756	-9.484	5.238
X11					X11				
2	-12.158**	1.8	-15.686	-8.63	2	26.099**	2.488	21.223	30.974
3	-14.251**	2.234	-18.63	-9.872	3	12.135**	3.088	6.083	18.186
4	-10.119**	2.319	-14.665	-5.574	4	17.442**	3.205	11.16	23.723
X12					X12				
2	0.928	3.069	-5.088	6.944	2	5.186	4.241	-3.127	13.499
3	4.104	2.28	-0.366	8.573	3	2.974	3.151	-3.203	9.151
4	-1.997	2.756	-7.4	3.405	4	8.160*	3.809	0.695	15.626
5	-0.302	2.429	-5.063	4.459	5	-0.097*	3.357	-6.676	6.482
6	-3.436	3.338	-9.978	3.106	6	3.888	4.613	-5.152	12.929
7	0.821	3.365	-5.775	7.416	7	-1.761	4.65	-10.875	7.354
X13	2.638**	0.694	1.277	3.999	X13	0.352	0.959	-1.529	2.232
_cons	124.25**	6.195	112.109	136.392	_cons	192.65**	8.56	175.876	209.433

(* indicate that the coefficient is significant at 5% level of significance and ** indicate that the coefficient is significant at both level of significance 5% and 1%)

The **Table 5** shows that when daily commuting time is reduced from 60 to 30 minutes 22.193 out of 30 minutes are consumed on above listed activities in urban areas aggregately. While in rural areas 1.436 more minutes are spent on these activities. The urban individuals who commute 120 minutes have 4.599 minutes less to sleep daily as compared to the people with 60 minutes commuting time. While this proportion of time in rural areas is -4.488. The commuting time increases from 60 to 240 the sleeping time is reduced by 13.465 in rural areas while in urban areas this reduction is 13.797. The urban people spent more 4.493 minutes on care for children and elderly if they commute 30 minutes daily as compared to the individual who daily commute 60 minutes. And almost this amount of time decreases form the said activity if the individual's commuting time increase up to 90 minutes. While in rural areas 4.790 minutes would be increase as the commuting time reduced by 30 minutes (from 60 to 30 minutes) and 4.79 minutes will be lower when commute is increased by 30 minutes (from 60 to 90 minutes).

Table 5: Time Trade-offs between Commuting and other Activities

Urban							
Commuting Time	**Sleeping Activity**	**Care for Children and Elderly**	**Personal care and Self-maintenance**	**Leisure Activities**	**Physical Activities**	**Social-cultural Activities**	**Total Time spent**
30	2.300	4.493	3.564	5.034	4.768	2.034	22.193
60	___	___	___	___	___	___	___
90	-2.300	-4.493	-3.564	-5.034	-4.768	-2.034	22.193
120	-4.599	-8.985	-7.127	-10.069	-9.537	-4.068	-44.385
150	-6.899	-13.478	-10.691	-15.103	-14.305	-6.102	-66.577
180	-9.198	-17.971	-14.255	-20.138	-19.073	-8.135	-88.770
240	-13.797	-26.956	-21.382	-30.206	-28.610	-12.203	-133.155
Rural							
30	2.244	4.790	3.615	5.814	5.210	1.956	23.629
60	___	___	___	___	___	___	___
90	-2.244	-4.790	-3.614	-5.814	-5.210	-1.956	-23.629
120	-4.488	-9.580	-7.229	-11.629	-10.421	-3.912	-47.258
150	-6.732	-14.370	-10.843	-17.443	-15.631	-5.868	-70.888
180	-8.977	-19.159	-14.458	-23.258	-20.841	-7.824	-94.517
240	-13.465	-28.739	-21.687	-34.886	-31.262	-11.737	-141.775

DISCUSSION AND CONCLUSION

Researcher was guided through the researches on commuting that is significant contributors of physical and mental health issues (Hoehner, Barlow, Allen & Schootman, 2012; Wijndaele, Duvibneaud, Matton, Duquet, Deleacluse, Thomis & Philippaerts 2009). Commuting and its impact on health related issues are the important discussion of the era. First we would discuss the relationships between different socio-demographic variables and researched activities and their significance. Secondly we would explain the time tradeoffs between urban and rural population in the study that is extracted from Pakistan time use survey. We aimed to find out difference between rural and urban commute, tradeoffs between different activities and its link with existing literature.

In present study commuting time and working hours are significantly and negatively affecting all six activities performed by the commuters on daily basis (Table 4(a),4(b),4(c)). Literature provide immense evidences that commuters who spent more time on commuting to work place and work for long hours have more psychological and physical constrains as compare to those have less (Hansson, Mattisson, Bjork, Ostergern & Jacobsson, 2011) commuting scholars have discussed active commuters will have lesser issue and better quality of life in contrast to passive commuters (Lindstorm, 2008; Gatersleben & Uzzell, 2007).

Interesting finding regarding gender difference across six activities was found that female spent more time on caring child and elderly, personal care and physical activities however, they spent less time on sleeping, leisure and social-cultural activities as compare to men (Table-4 & 4a). Li and Pollmann-Schult (2016) concluded in their research that father commute to work result in different behavioral emotional issues in their children. It was also observed that more time to commute is significant in aggravating behavioral issues in children.

Generally perception of stress is different among males and females. Women perceive higher level of stress as compared to males. Consequently, women have more negative health outcomes than men in response of commuting. Means for diverse commuting contributes to build negative relation between health and commuting time across gender. This segregation is not because of working hour but because greater household responsibilities and child care as compare to men (Roberts, Hodson & Dolan, 2011). On the basis of current finding and taking from previous scholarly guidance that all three activities (i.e sleep, leisure and social-cultural activities) help on to reenergize, recollect energy and positive physical and mental outcomes. Wellbeing is not evaluated by the absence of disease and reduction of physical activity rather positive physical, mental and psychological state of the person. It includes global judgment of emotions, resilience, relationship quality and satisfaction with life (Helliwell & Putnam, 2004). Cultural participation is the second predictor of mental wellbeing and it is a stronger impact on health than other variables (income, place of residence, age, gender and occupation).

Moreover, researchers has also create link between social interaction and health the more you interact with social situations the more healthy you are (Brueckner & Largely, 2008). On the other hand opponent challenge that high density might be cause for the residents to with draw from communal contact and experience high level of stress (Umberson & Montez, 2010). research based on activity have displayed vital understanding into the social action slants yet these object measures may neglect to notice well known associations that don't represent to a different social activity. Moreover, it is obscure regardless of whether a decrease in the time spent taking an interest in formal social activities means a decrease in how fulfilled people are with their social surroundings. Since Umberson and Montez (2010) bring up, it is both the amount and nature of social contacts that matter to people (Bonsang & van Soest, 2012). Thus, as a contrasting option to time-use or movement based measurements, subjective estimations are gone for catching individual observations in regards to the sufficiency of their social co operations with relatives, companions, neighbors, or associates, for instance (Basner, Speath & Dinges, 2014), sleep researcher intensely centered around the sleep unfavorable effect of commuting time on sleep. Sleep time is equally identified with rest length a sign of American time use study (Basner, Fomberstein, Razavi, Banks, William, Rosa & Dinges, 2007) education has ended up one of the clearest pointer of life outcome and solid indicator of states of mind and prosperity. Education is regularly utilized by individuals to shape their social character, surrounding their comprehension of themselves and their associations with other individuals. Positive asserting social identity connected with health, wellbeing and social trust. However the stress on education in today's general public make it harder for individuals with low level of education to build up a positive social identity, this can adversely impact on well being and self respect. Current analysis revealed that level of education and time spent on different activities, individual educational grade primary but below middle and inter but below degree spent more than people with no education (Table 4(a),4(b),4(c)). Moreover, results from the present study revealed that as educational grade improves sleeping time decrease. Individual with metric and under inter spent more time on personal care. As for as leisure time is concerned more educated spend more time on leisure activities as compare to uneducated. Only people with inter education spent time on physical care activities (Table 4(a),4(b),4(c)).

Personal care activities may take the form of grooming, health related self care, travel related to personal care and other personal activities. Basner and colleague (2007) indicated that time devoted to personal care is associated with less sleep on both weekdays and weekend. Further they found that grooming time is associated with short sleep, short sleeper groom earlier in the morning than who obtained normal amount of sleep during week and weekend (Christian, 2012). However, long sleeper spend less time on grooming and started grooming activities late in the morning these finding are based on cross sectional data. Moreover, Hale 2014 noted that it

is unclear whether personal care actually influence sleep time or it is grooming behavior that make individual to wake up early to spend more time on grooming. Divorced individual spent more time on personal care but less on sleep (Table 4(a),4(b),4(c)). grooming time is also associated with shorter sleep () 39,38. Individuals earning from own business spent less time on daily child and elderly when comparing with others. One conclusion that can be made on considering these findings that doing own business is more time consuming activity and one may have to busy for hours to maintain all issues result in significant decline in dependents care. Moreover, people who are getting money from other members of the family and remittance sleep more (Table 4(a),4(b),4(c)). Aging effect the overall schedule and style life of the person; taking care of others means of investing energy, ways of spending time and emotional responsiveness as whole. Daily time spent on child and elderly care decrease as the age of the commuter increase as well as duration of sleep decreased with passage of age (Table 4(a),4(b),4(c)).

Commuting can be described as non work related activity outside of the paid work hour that can impact the biological symptoms. Scholars have suggested that commuting can be used as a means of detach from the work place allowing for beneficial health wellbeing outcomes ()40. Here in developing and thickly populated country, people are less privileged, has more difficult living circumstances as compare to the developed countries or nations. Researcher supposed minimum commuting time is 60 minutes from the 1440 total allocated minutes per day. Since Christian 2012 documented that one has to compromise of the time that a male spent with his spouse for at least 21.8 minutes, 18.6 minutes from children care and 7.2 minutes from the he spent with friends when one's commuting time is 60 minutes. In present study while keeping the 60 minutes constant we have found urban and rural trade Offs; if 30 minutes increased in the commuting time for urban population it will decrease 2.3 minutes from sleep, 4.49 from child and elderly care, 3.5 from personal care, 5.03 from leisure and 2.03 minutes from sociocultural activities (Table-5). Leisure time is more compromised than other activities. Further, the decline in activities time is less in rural population (Table-5). Since our finding supporting this difference that urban commute more than rural (Table-4). The other significance of the finding is if 30 minutes decrease from the total 60 minutes of commute, saved time would be divided among the activities as it was increased (Table-5).

In a nutshell our findings illustrate Pakistan Trade Offs between commuting time and daily routine activities. Individuals with longer commute and working hours have minimum time for rest of the responsibilities that are connected with overall wellness. In this concern it would provide baseline to the upcoming researches to established associations between commuting time and mental and physical health issues as the cost of commuting in Pakistan. On the basis of this data we also can generalize our finding by concluding our resulting creating link with presented literature that if commuting time increase it will swallow the massive amount of time that one has to spent other activities to make and take food etc.

Though we have connected our results of the study with writing of mental and physical well being; this is our concern but not documented these from the present research as there were no measure was used to evaluate mental and physical wellbeing. We were interested to highlight this cost of commuting for the policy makers and the research community for better health policies and to initiate relevant research projects to built effective and supportive environment for commuters on organizational basis as well government level to facilitate general population. However it would also be investigate by the future researchers that how parental commute to work is creating damage in their children. It's obvious if they spend more time on work related activities they could not proper time for care and look after children. Similar results were observed for father commute to and childhood outcomes (Li, & Pollmann-Schult, 2015).

REFERENCES

[1] Basner, M., Fomberstein, K. M., Razavi, F. M., Banks, S., William, J. H., Rosa, R. R., & Dinges, D. F.(2007). American time use survey: Sleep time and its relationship to waking activities. *Sleep, 30*(9),1085–1095. https://doi.org/10.1093/sleep/30.9.1085

[2] Basner, M., Spaeth, A. M., & Dinges, D. F. (2014). Sociodemographic characteristics and waking activities and their role in the timing and duration of sleep. *Sleep*, *37*(12), 1889-1906. https://doi.org/10.5665/sleep.4238

[3] Besser, L. M., Marcus, M., & Frumkin, H. (2008). Commute time and social capital in the U.S. *American Journal of Preventive Medicine, 34*(3), 207–211. https://doi.org/10.1016/j.amepre.2007.12.004

[4] Bonsang, E., & van Soest, A. (2012). Satisfaction with social contacts of older Europeans. *Social Indicators Research, 105*(2), 273-292. https://doi.org/10.1007/s11205-011-9886-6

[5] Brueckner, J. K., & Largey, A. G. (2008). Social interaction and urban sprawl. *Journal of Urban Economics, 64*(1), 18-34. https://doi.org/10.1016/j.jue.2007.08.002

[6] Cartwright, S., & Warner-Smith, P. (2003). 'Melt down': Young women's talk of time and its implications for health, well-being and identity in late modernity. *Annals of Leisure Research, 6*(4), 318–338. https://doi.org/10.1080/11745398.2003.10600930

[7] Carskadon, M.A., & Dement, W.C. (2011). Monitoring and staging human sleep. In M.H. Kryger, T. Roth, & W.C. Dement (Eds.), *Principles and Practice of Sleep Medicine,* 5th edition, (pp 16-26). St. Louis: Elsevier Saunders.

[8] Christian, T. J. (2012). Trade-offs between commuting time and health-related activities. *Journal of Urban Health, 89*(5), 746-757. https://doi.org/10.1007/s11524-012-9678-6

[9] Edwards, J. R., & Rothbard, N. P. (2000). Mechanisms linking work and family: Clarifying the relationship between work and family constructs. *Academy of Management Review, 25*(1), 178–199. https://doi.org/10.5465/amr.2000.2791609

[10] Farber, S., & Paez, A. (2011). Running to stay in place: The time-use implications of automobile oriented land-use and travel. *Journal of Transport Geography 19*(4), 782-793. https://doi.org/10.1016/j.jtrangeo.2010.09.008

[11] Frone, M. R. (2003). Work-family balance. In J. C. Quick & L. E. Tetrick (Eds.), *Handbook of occupational health psychology* (pp. 143–162). Washington, DC: American Psychological Association.

[12] Gatersleben, B., & Uzzell, D. (2007). Affective appraisals of the daily commute: Comparing perceptions of drivers, cyclists, walkers, and users of public transport. *Environment and Behavior, 39*(3), 416-431. https://doi.org/10.1177%2F0013916506294032

[13] Gottholmseder, G., Nowotny, K., Pruckner, G. J., & Theurl, E. (2009). Stress perception and commuting. *Health Economics, 18*(5), 559–576. https://doi.org/10.1002/hec.1389

[14] Hansson, E., Mattisson, K., Björk, J., Östergren, P.-O., & Jakobsson, K. (2011). Relationship between commuting and health outcomes in a cross-sectional population survey in southern Sweden. *BMC Public Health, 11*(1), 1-14. https://doi.org/10.1186/1471-2458-11-834

[15] Helliwell, J. F., & Putnam, R. D. (2004). The social context of well–being. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, *359*(1449), 1435-1446. https://doi.org/10.1098%2Frstb.2004.1522

[16] Hilbrecht, M., Smale, B., & Mock, S. E. (2014). Highway to health? Commute time and well-being among Canadian adults. *World Leisure Journal*, *56*(2), 151-163. https://doi.org/10.1080/16078055.2014.903723

[17] Hoehner, C. M., Barlow, C. E., Allen, P., & Schootman, M. (2012). Commuting distance, cardiorespiratory fitness, and metabolic risk. *American Journal of Preventive Medicine, 42*(6), 571–578. https://doi.org/10.1016/j.amepre.2012.02.020

[18] Hutchinson, S. L., & Kleiber, D. A. (2005). Gifts of the ordinary: Casual leisure's contributions to health and well-being. *World Leisure Journal, 47*(3), 2–16. https://doi.org/10.1080/04419057.2005.9674401

[19] Iwasaki, Y. (2003). The impact of leisure coping beliefs and strategies on adaptive outcomes. *Leisure Studies, 22*(2), 93–108. https://doi.org/10.1080/026143603200058777

[20] Katzmarzyk, P. T., Church, T. S., Craig, C. L., & Bouchard, C. (2009). Sitting time and mortalityfrom all causes, cardiovascular disease, and cancer. *Medicine & Science in Sports & Exercise, 41*(5), 998–1005. https://doi.org/10.1249/mss.0b013e3181930355

[21] Levinson, D. J., & Wu, Y. (2005). The rational locator reexamined: Are travel times still stable? *Transportation*, 32, 187–202. https://doi.org/10.1007/s11116-004-5507-4

[22] Lindstrom, M. (2008). Means of transportation to work and overweight and obesity: A population-based study in southern Sweden, *Preventive Medicine, 46*(1), 22-28. https://doi.org/10.1016/j.ypmed.2007.07.012

[23] Li, J., & Pollmann-Schult, M. (2016). Fathers' commute to work and children's social and emotional well-being in Germany. *Journal of Family and Economic Issues, 37*(3), 488-501. https://doi.org/10.1007/s10834-015-9467-y

[24] Lyons, G., & Urry, J. (2005). Travel time use in the information age. *Transportation Research Part A*, 39, 257–276. https://doi.org/10.1016/j.tra.2004.09.004

[25] Michelson, W. (2005). Time use: Expanding the power of the social sciences. Boulder, CO:Paradigm.

[26] Millward, H., & Spinney, J. (2011). Time use, travel behavior, and the rural-urban continuum:results from the Halifax STAR project. *Journal of Transport Geography, 19*(1), 51–58. https://doi.org/10.1016/j.jtrangeo.2009.12.005

[27] National Sleep Foundation. (2007)"Sleep in America" poll. 2007.

[28] Novaco, R. W., & Gonzalez, O. I. (2009). Commuting and well-being. In Y. Amichai-Hamburger (Ed.), *Technology and psychological well-being* (pp. 174–205). Cambridge: Cambridge University Press. https://doi.org/10.1017/cbo9780511635373.008

[29] Owen, N., Sugiyama, T., Eakin, E. E., Gardiner, P. A., Tremblay, M. S., & Sallis, J. F. (2011). Adults' sedentary behavior: Determinants and interventions. *American Journal of Preventive Medicine, 41*(2), 189–196. https://doi.org/10.1016/j.amepre.2011.05.013

[30] Philibert, I. (2005). Sleep loss and performance in residents and nonphysicians: A meta-analytic examination. *Sleep*, *28*(11), 1392-1402. https://doi.org/10.1093/sleep/28.11.1392

[31] Roberts, J., Hodgson, R & Dolan, P. (2011). It's driving her mad": Gender differences in the effects of commuting on psychological health," *Journal of Health Economics*, *30*(5), 1064-1076. https://doi.org/10.1016/j.jhealeco.2011.07.006

[32] Shneerson, J. M. (2000). Handbook of sleep medicine. Cambridge: Blackwell Science.

[33] Umberson, D., & Karas Montez, J. (2010). Social relationships and health: A flashpoint for health policy. *Journal of Health and Social Behavior*, *51*(1_suppl), S54-S66. https://doi.org/10.1177%2F0022146510383501

[34] Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal*, *174*(6), 801–809. https://doi.org/10.1503/cmaj.051351

[35] Wener, R. E., & Evans, G. W. (2011). Comparing stress of car and train commuters. *Transportation Research Part F: Traffic Psychology and Behaviour, 14*(2), 111–116. https://doi.org/10.1016/j.trf.2010.11.008

[36] Wijndaele, K., Duvigneaud, N., Matton, L., Duquet, W., Deleacluse, C., Thomis, M., Beunen, G., Lefevre, J., & Philippaerts, R. M. (2009). Sedentary behaviour, physical activity and a continuous metabolic syndrome risk score in adults. *European Journal of Clinical Nutrition, 63*(3), 421–429. https://doi.org/10.1038/sj.ejcn.1602944

[37] Zellner, A. (1962). An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. *Journal of the American statistical Association*, *57*(298), 348-368. https://doi.org/10.1080/01621459.1962.10480664

Received on 08-02-2022 Accepted on 03-03-2022 Published on 25-06-2022