Tackling the Impact of Travel Time on the Social Health Dimension for Bangkokian Commuter

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Abstract: The quality of life plays an important role as an urban indicator to assess the liveability of the city and urban environment. However, due to the development of urban area in several aspects has resulted to the changes of life style of people, it is undoubted that time consuming for leisure activity or family hour has been major replaced by travel time. This study aims to assess the impact of travel time on quality of life of people in term of the social health dimension which can be measured on the basis of travel behavior. The results indicated that the time consuming for different trip purposes on a variety of modes have different magnitude on the quality of life of people. Therefore, this study can reflect the magnitude of travel time impact as an alternative indicator for sustain social welfare improvement**.**

Key Words: *quality of life, travel time, public opinion*

1. INTRODUCTION

The quality of life plays an important role as an urban indicator to assess the liveability of the city and urban environment. However, due to the development of urban area in several aspects has resulted to the changes of life style of people, it is undoubted that time consuming for leisure activity or family hour has been major replaced by travel time. The evidence from the increasing in number of Bangkok population from 4.6 million people from 1980 to 6.8 million people in 2005 or approximately 30.9 in 25 years can be viewed as a signed for urban density problems such as housing needs, traffic congestion, etc. Furthermore, this growing rate will be continuing its pace and require for the supportive planning to sustain the quality of life of Bangkokian (Table 1). The projection of population indicated the demand of the population who commuted to work in Bangkok, consequently the key element to answer this problematic is the performance of public infrastructure system that provided to facilitate the commuters to perform their trips. However, it was found that through the ways in which land development and transportation investments, the number of automobiles have been far above the ground as illustrated by Figure 1. This linkage between the environments of auto oriented in the country was impact to the individual in term of social health dimension. Physical inactivity contributes to increased risk of many chronic diseases and conditions, including

obesity, hypertension, non–insulin-dependent diabetes, colon cancer, osteoarthritis, osteoporosis, and coronary heart disease (Ewing et al., 2003).

Table 1 Population Growth in Bangkok (Thailand) (ADB, 2005)

Province	2003	2007	2012	2017	2022
Bangkok (BMA)	6,502,000	6,796,000	7,382,000	8,066,000	8,368,000
Samut Prakan	1,025,000	1,098,000	1,180,000	1,347,000	1,436,000
Nonthaburi	906,000	1,011,000	1,132,000	1,346,000	1,488,000
Pathum Thani	702,000	824,000	969,000	1,211,000	1,401,000
Nakhon Pathom	800,000	845,000	895,000	1,007,000	1,059,000
Samut Sakhon	446,000	480,000	517,000	592,000	633,000
Total	**10,381,000**	**11,054,000**	**12,075,000**	**13,569,000**	**14,385,000**

BMA = Bangkok Metropolitan Area.
Source: Northern Railway Bang Sue to Rangsit Feasibility Study Project, Office of Transport and Traffic Policy and Planning.

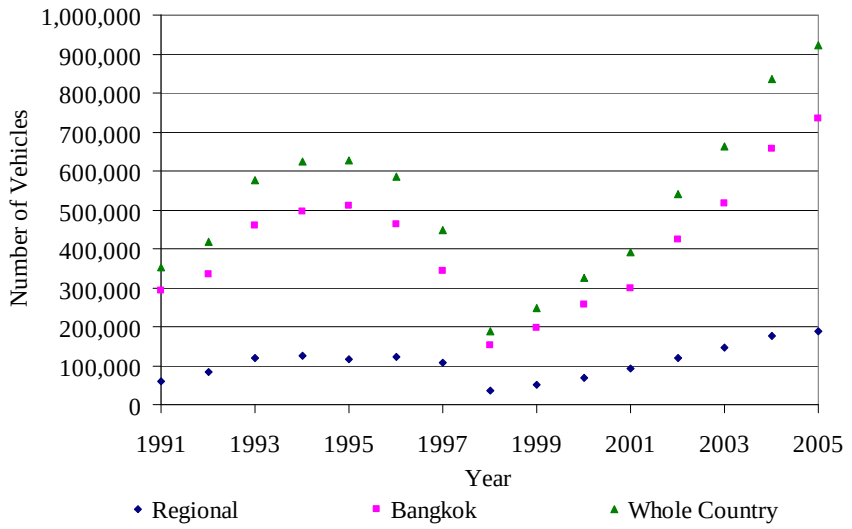


Figure 1 Number of Passenger Car in Thailand
Source: Office of Transport and Traffic Policy and Planning (2006)

Thus, it is obviously seen that one of the approach to assess transportation service should be performed base on human behavior in access of the service. Consequently, the methodology used to assess the impact of travel time on quality of life of people can be measured on the basis of their travel behavior. The results of the survey indicated that the time consuming for different trip purposes on a variety of modes have different magnitude on the quality of life of people. In addition, more than half of those who drive to work need to spend more than 1 hour on road as their travel time with negative attitude. Furthermore, most of public transport users need to tolerate with air pollution and time-consuming on road as captive riders. These events were found to have greater impact on their physical health, especially respiratory system. Therefore, this study can reflect the magnitude of travel time impact for concerned authorities to provide an alternative solution as a social welfare to improve the quality of life of people for sustainable development**.**

2. STUDY AREA

In the early 1990s, Bangkok was notorious for having some of the world's worst traffic congestion. Having identified this as a key problem, the Government of Thailand (the Government) quadrupled the investment in the transport sector in Bangkok in its Seventh Plan

(FY1992–FY1996) (ADB, 2005). As cities grow and expand, traffic speeds tend to remain stable with moderate to high congestion in the central area with the poor health condition of people as described in Table 2 and Table 3. The indication of the top ten diseases of people in Bangkok revealed that not only the poor physical health condition of people in Bangkok, but the mental health also demonstrate the same trend.

Table 2 Top Ten Diseases of People in Bangkok (2005)

Disease	Number of Patients
Respiratory Disease	895,056
Endocrine, nutritional and metabolic diseases	339,706
Cardiovascular Disease	251,582
Other Health Problem	131,346
Dermatologic Disease	75,468
Gastrointestinal Disease	67,700
Reproductive Disease	24,025
Ophthalmic Disease	22,333
Mental and behavioural disorders	13,709
Diseases of the nervous system	10,247

Source: Health department, Bangkok Metropolitan Administration

Table 3 Rate of Mental Health Disease per 100,000 populations, Bangkok

Disease	Number of Patients		
	2001	2002	2003
Psychoses	252	595	2,226
Neurosis	77	258	842
Addicted/Drug	46	162	495
depressive disorder	74	306	786
Other Mental Health Problem	136	366	1,136
Total	587	1,687	5,485

Source: Health department, Bangkok Metropolitan Administration

The evidences of physical health and mental health problem call for a consideration of the cause of this aggravating situation impact on social aspects. However, the public health literature widely accepts the hypothesis that significant health benefits can be achieved through moderate forms of physical activity (Frank and Engelke, 2005). As a result of this understanding, public health studies have begun to focus on the factors associated with the different pattern of lifestyles. However, many public health professionals believe that people could effect on daily activity which influence through changes in the environment in which people live, work, and other activities (Pucher and Dijkstra, 2003). This belief is based on the assumption that the ability to sustain an active lifestyle may partially hinge on the characteristics of the built environment in which we live, work, and play.

On the other hand, the current situation of congestion that spreads outward geographically and temporally to the off-peak periods, including weekends. The longer time utilizing for travel is one of the possibility of the potential health effect s associated with moped exhaust emissions. This is due to the reason that the primary pollutant considered is PM10. This is a very important urban air pollutant, and it has been associated with adverse health outcomes ranging from relatively minor respiratory symptoms to premature death. The choice of this pollutant as the overall indicator of harmful pollution levels is supported by dozens of scientific studies published over the past decade that demonstrate a strong association between PM10 concentration and poor health (ADB, 2005). This result was verified by the studies that have been undertaken in cities throughout the world at latitudes ranging from that of Los Angeles to that of Bangkok, including several cities in Europe, thus covering a wide variety of climatic conditions, lifestyles, baseline health levels and exposure conditions. Together these studies provide an important scientific basis for a causal association between

PM and health levels and furnish a series of quantitative data useful for risk assessment. On the other hand, when the consideration is taken to the green area for such a poor environmental condition in Bangkok, it was found that the ration green area per person is lowest compare to other megacities as depicted in Figure 2.

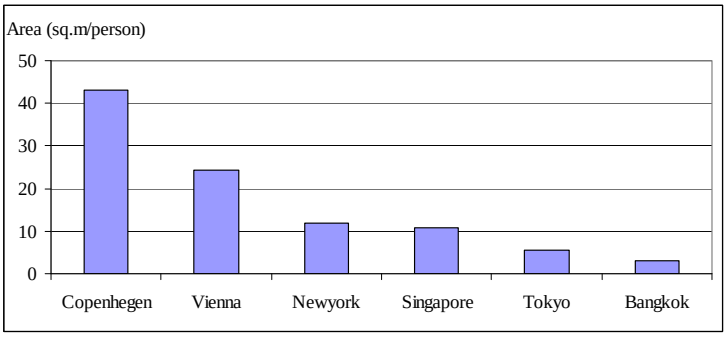
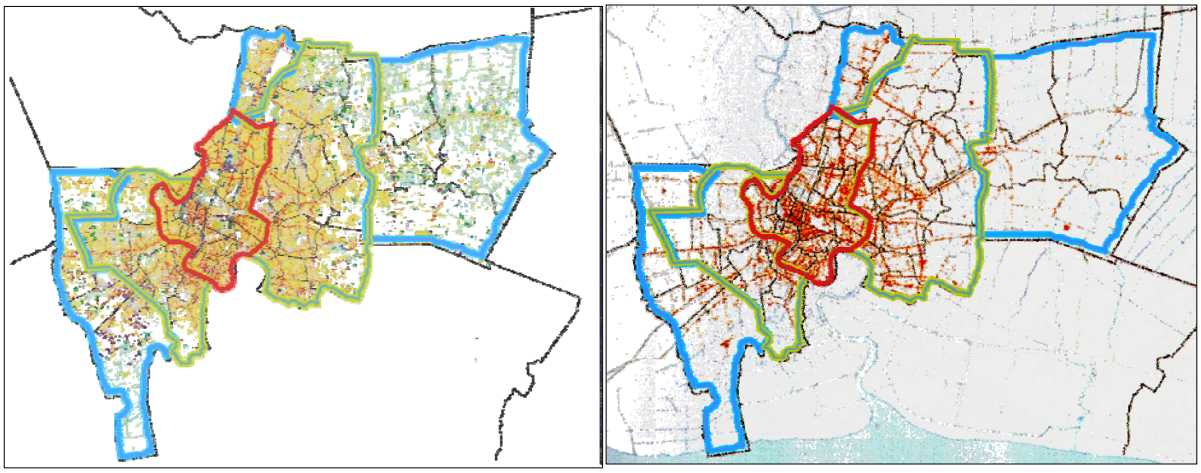


Figure 2 Green Space Ration in Megacities (Bangkok Metropolitan Administration)

Thus, the sprawling metropolitan areas of Bangkok Motorized travel might be one of the significant factor encouraged trip destinations are widely dispersed at the regional level. This is due to jobs are located far from housing, commuting by inadequate and inefficiency service of transit is less incentive, especially by bicycle or on foot will be nearly impossible (Li and Tsukaguchi, 2005). While recognition is widespread that regional development patterns such as the mixture of job sand housing are important, this particular measure has difficulties. Thus, this study selected Bangkok to be a representative of a pilot study area to examine the relationship of travel behavior impact on social health dimension. The assessment of travel behavior could bring fruitful information through conducting of field survey by separate study area into inner area of Bangkok, the outer area of Bangkok, and the surrounding area of Bangkok Metropolitan (Figure 3). Due to the limitation for the statistics of nonmotorization data in Bangkok, the travel surveys measuring usage of different means of transportation rely on basically the same definitions of transport modes but use varying methodologies for sampling and trip measurement to include the social health impact to draw its relationship.



Inner region Middle region Outer region

A. Distribution of Residential Area B. Distribution of Employment Area

Figure 3 Study Area

4. METHODOLOGY

As mention in the previous section, this study is a pilot research which aims at examining correlation between the problems in travel pattern of Bangkok commuter and their social

health status. In this study, social health dimension has been discriminated as 2 main categories—physical health, and mental health.

The first step in determining the impact of travel pattern on social health status was to discuss in focus groups the participatory ability of people with qualification in the perceptions of quality of life. Focus group methodology is a well-established technique used to canvass the range of thoughts about a topic and is also a useful aid in the design of questionnaires that contain terminology that is appropriate and understandable to a target population. Participants were recruited from the social-welfare and medical science researchers. Flexibility allowed for exploration of any concepts raised by participants.

The focused group discussion agreed to raise cost of medication for 10 top often found diseases for local Bangkok commuter to represent the physical health status—Respiratory Disease, Gastrointestinal Disease, Musculoskeletal Disease, Cardiovascular Disease, Nutritional Problem, Ophthalmic Disease, Infectious Disease, Dermatologic Disease, Reproductive Disease, and Other Health Problems. For mental health, existence of 8 symptoms which are Dizziness, Palma and/or Plantar Perspiration, Myalgia, Tachycardia, Topical Headache, Depression and/or Anxiety, Anorexia, and Insomnia; was raised as indicators in this study. To study the impact of travel pattern and travel time, 2 variables, i.e., percentage of time spent for travel per normal weekday, and time spent walking from the trip origin to access point in case of public transport riders; are explored in the questionnaire survey. The general demographic questions were also included to figure out the entire picture of this study. In addition, the percentages of time spent for rest and work (or study) were also included in the analysis to make the result more clear.

In the second step, questionnaire survey and in-depth interview had been conducted in order to reach the goal of this study. Sample size for participants group is based on the following equation (Johnson and Bhattacharyya, 2001), where: N of population size; and e is required precision:

$$\text{Sample Size} = N / (1+Ne^2) \qquad (1)$$

240 sets of questionnaire for local commuters have been completed with 12 rejections in total. The third step was to analyze the initial correlation among travel time factors and the other health status indicators. Several statistics provide information about the reliability and validity of the measures employed in this study. Most of data used in the analysis were aggregated into ordinal scale with greater or equal to 5 levels, thus the primary correlation analysis used the Spearman correlation (r) as the indices of agreement for continuous variables.

The fourth step in the study of travel time impact on social health was to reduce the entire health indicators into 3 common factors by conducting exploratory factor analysis (EFA) with the popular Principal Components method. These three factors were compared to analyze the result of Spearman’s coefficient of correlation again. Figure 4 briefly presents the process and step of this study. General data analyses were performed on computer (SPSS ver. 11.5 demo; SPSS Chicago, IL),

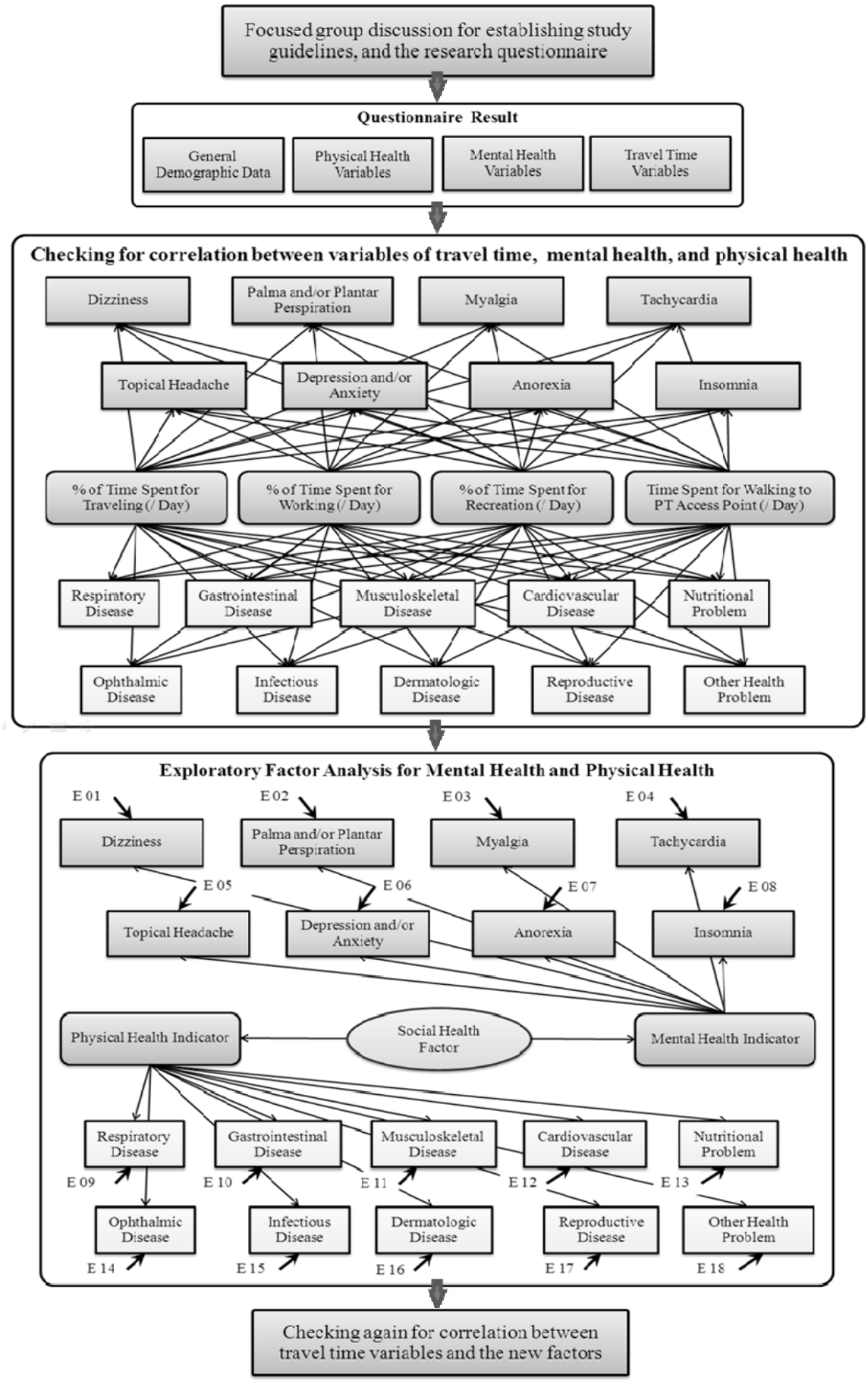


Figure 4 Chart presents brief process of methodology

5. RESULT AND ANALYSIS

Questionnaire survey was dispersedly conducted from different location and time to be sure that it could be a fare representative of the entire Bangkok commuter. Table 4 shows distribution of sample by demographic data in cross-tabulation format. Three classes of data location are the inner area of Bangkok, the outer area of Bangkok, and the surrounding area of Bangkok Metropolitan which is actually outside the Core Bangkok boundary.

Table 4 Variable classifications

		Data Location			Total
		Inner BKK	Outer BKK	Border BKK	
Gender	• male	35.0%	43.8%	32.5%	37.1%
	• female	65.0%	56.3%	67.5%	62.9%
		100.0%	100.0%	100.0%	100.0%
Age (years)	• < 20	33.8%	16.3%	13.8%	21.3%
	• 20 -29	46.3%	33.8%	25.0%	35.0%
	• 30 -39	5.0%	26.3%	26.3%	19.2%
	• 40 -49	5.0%	16.3%	23.8%	15.0%
	• 50 -59	10.0%	7.5%	11.3%	9.6%
	• > 60	33.8%	16.3%	13.8%	21.3%
		100.0%	100.0%	100.0%	100.0%
Career	• Government	18.8%	15.0%	33.8%	22.5%
	• Company	0.0%	7.5%	5.0%	4.2%
	• Business Owner	10.0%	37.5%	37.5%	28.3%
	• Freelance	1.3%	2.5%	0.0%	1.3%
	• Studying	63.8%	37.5%	23.8%	41.7%
	• Others	6.3%	0.0%	0.0%	2.1%
		100.0%	100.0%	100.0%	100.0%
Marital Status	• Single	88.8%	62.5%	66.3%	72.5%
	• Married	11.3%	35.0%	31.3%	25.8%
	• Divorced	0.0%	2.5%	2.5%	1.7%
		100.0%	100.0%	100.0%	100.0%
Income (baht/month)	• < 5,000	21.3%	10.0%	5.0%	12.1%
	• 5000-9000	35.0%	20.0%	10.0%	21.7%
	• 9001-13000	25.0%	42.5%	31.3%	32.9%
	• 13001-17000	8.8%	15.0%	25.0%	16.3%
	• 17001-21000	1.3%	3.8%	2.5%	2.5%
	• 21001-25000	3.8%	5.0%	6.3%	5.0%
	• > 25,000	5.0%	3.8%	20.0%	9.6%
		100.0%	100.0%	100.0%	100.0%
Trip Purpose	• Work trip	32.5%	43.8%	45.6%	40.6%
	• School trip	45.0%	16.3%	10.1%	23.8%
	• Recreation trip	10.0%	17.5%	17.7%	15.1%
	• Shopping trip	8.8%	8.8%	11.4%	9.6%
	• Personal trip	2.5%	13.8%	15.2%	10.5%
	• Others	1.3%	0.0%	0.0%	.4%
		100.0%	100.0%	100.0%	100.0%
Time of Day	• Peak	50.0%	50.0%	50.0%	50.0%
	• Off-peak	50.0%	50.0%	50.0%	50.0%
		100.0%	100.0%	100.0%	100.0%

Note:

- *The distributions represent total number of 240 respondents.*
- *There are 80 respondents each by Inner, Outer, and Border of Bangkok (240 in total)*

It was important to consider age, sex and grade as possible confounds in the relationship between the measured variables and the latent factor. This was examined before and after the developmental factor analysis.

From the total sample of 240 participants, mean scores on the 10 interested disease questionnaires for physical health were as follows: Respiratory Disease, Mean = 1.30,SD = .47; Gastrointestinal Disease, Mean = 1.10, SD = .76; Musculoskeletal Disease, Mean = 1.08, SD = .36; Cardiovascular Disease, Mean = 1.00, SD = .00; Nutritional Problem, Mean = 1.00, SD = .00; Ophthalmic Disease, Mean = 1.06, SD = .49; Infectious Disease, Mean = 1.00, SD = .00; Dermatologic Disease, Mean = 1.10, SD = .55; Reproductive Disease, Mean = 1.00, SD = .00; and Other Health Problems Mean = 1.04, SD = .29. The mean scores illustrate that most participants are healthy because scores were all within the minimal range. For Cardiovascular Disease; Nutritional Problem; Infectious Disease; and Reproductive Disease, variances are close to zero it is not effective to find their correlations.

For mental health analysis, mean scores on the 8 interested symptoms were as follows: Dizziness, Mean = 1.47, SD = .96; Palma and/or Plantar Perspiration, Mean = 1.30, SD = 1.30; Myalgia, Mean = 1.46, SD = 1.22; Tachycardia, Mean = .83, SD = 1.24; Topical Headache, Mean = 1.07, SD = 1.07; Depression and/or Anxiety, Mean = 1.49, SD = .91; Anorexia, Mean = .88, SD = 1.20; and Insomnia Mean = .87, SD = 1.27. The mean scores met criterion for sub-clinical levels of mental health status because scores were also within the minimal level and did not exceed clinical cutoffs.

Spearman correlation was selected as appropriateness with analyzed data with ordinal scale. All analyses were conducted at alpha level of .05and .01. Correlations that could not reach confidence interval of 95% and 99% were unconsidered in the analysis. Correlations were firstly conducted between scores on the Travel Time factors and all health indicators. Correlations below .35 are considered to be low strength, those between .35 and .65 are considered moderate strength and those above .65 are considered high strength.

The correlations found among the measured variables for the entire sample are presented in Table 5. The walking time to access point of public transport negatively correlated with most of the scores on mental health status. Likewise, percent of recreation time spent per day were negatively correlated with most of the scores on mental health status. In contrast, percent of travel time spent per day were positively correlated with those on the mention. In the next section, exploratory factor analysis was applied to the mental health variables to determine again the correlation with Travel Time factor.

For variables on physical health status, travel time factor rarely correlates with only three variables, these include Respiratory Disease, Musculoskeletal Disease, and Dermatologic Disease. For Respiratory and Musculoskeletal, the correlations lead to fact that the less time for taking rest, the higher chance to need a medicine. For Dermatologic, correlations point out that time which people spend for walking to PT station in one day brings lower probability to a have healthy skin. It can be assume that the severe potential of natural brightness for outdoor walking in Thailand may harm the pedestrians' skin.

Table 6 shows internal correlations for group of physical health variables and Table 7 for the mental health group. There are only 2 significant correlations shown in Table 6, these include Ophthalmic Disease vs Musculoskeletal Disease and Ophthalmic Disease vs Other Health Problem. By the in-depth interview, answer for these two variables were mostly from the general case of social syndrome or disease.

Table 5 Correlation between Travel Time vs Social Health Variables

		Travel Time Variable			
		Time spent for			
		Walking to PT Access Point (min)	Traveling (%/ Day)	Recreation (%/ Day)	Working (%/ Day)
Mental Health Variable					
Dizziness	Corr.	0.046	0.207**	-0.243**	0.103
	Sig.	0.481	0.001	0.000	0.111
Palma and/or Plantar Perspiration	Corr.	-0.119	0.202**	-0.228**	0.092
	Sig.	0.067	0.002	0.000	0.153
Myalgia	Corr.	-0.040	0.166**	-0.131**	0.006
	Sig.	0.534	0.010	0.043	0.932
Tachycardia	Corr.	-0.191**	0.201**	-0.238**	0.104
	Sig.	0.003	0.002	0.000	0.108
Topical Headache	Corr.	-0.130*	0.244**	-0.137*	-0.061
	Sig.	0.044	0.000	0.034	0.348
Depression and/or Anxiety	Corr.	-0.084	0.106	-0.118	0.129*
	Sig.	0.195	0.101	0.069	0.045
Anorexia	Corr.	-0.193**	0.153*	-0.157*	0.018
	Sig.	0.003	0.018	0.015	0.784
Insomnia	Corr.	-0.156*	0.115	-0.166**	0.065
	Sig.	0.015	0.076	0.010	0.318
Physical Health Variable					
Respiratory Disease	Corr.	0.017	0.050	-0.259**	0.319**
	Sig.	0.794	0.436	0.000	0.000
Gastrointestinal Disease	Corr.	0.064	-0.057	0.049	-0.002
	Sig.	0.326	0.380	0.450	0.979
Musculoskeletal Disease	Corr.	-0.058	0.168**	-0.193**	0.129**
	Sig.	0.374	0.009	0.003	0.046
Cardiovascular Disease	Corr.	.	.	.	.
	Sig.	.	.	.	.
Nutritional Problem	Corr.	.	.	.	.
	Sig.	.	.	.	.
Ophthalmic Disease	Corr.	-0.081	0.045	-0.043	0.034
	Sig.	0.209	0.491	0.503	0.602
Infectious Disease	Corr.	.	.	.	.
	Sig.	.	.	.	.
Dermatologic Disease	Corr.	0.134*	0.013	0.075	-0.091
	Sig.	0.038	0.839	0.248	0.160
Reproductive Disease	Corr.	.	.	.	.
	Sig.	.	.	.	.
Other Health Problem	Corr.	-0.109	-0.058	-0.051	0.121
	Sig.	0.091	0.373	0.431	0.061

Note:
* *Correlation is significant at 95% CFI (2-tailed)*
** *Correlation is significant at 99% CFI (2-tailed)*
For Cardiovascular Disease; Nutritional Problem; Infectious Disease; and Reproductive Disease, variances are close to zero it is not effective to find their correlations.

Table 6 Internal Correlation of Physical Health Variables

		Respiratory Disease	Gastrointestinal Disease	Musculoskeletal Disease	Ophthalmic Disease	Dermatologic Disease	Other Health Problem
Respiratory Disease	Corr.	1.000	.	.	.	.	.
	Sig.	.	.	.	.	.	.
Gastrointestinal Disease	Corr.	0.169**	1.000	.	.	.	.
	Sig.	0.009	.	.	.	.	.
Musculoskeletal Disease	Corr.	0.194**	0.262**	1.000	.	.	.
	Sig.	0.003	0.000	.	.	.	.
Ophthalmic Disease	Corr.	0.122	0.184**	0.335**	1.000	.	.
	Sig.	0.059	0.004	0.000	.	.	.
Dermatologic Disease	Corr.	-0.095	0.008	-0.041	0.279**	1.000	.
	Sig.	0.144	0.899	0.531	0.000	.	.
Other Health Problem	Corr.	0.147*	-0.045	-0.027	0.446**	0.245**	1.000
	Sig.	0.023	0.486	0.676	0.000	0.000	.

Note:
* *Correlation is significant at 95% CFI (2-tailed)*
** *Correlation is significant at 99% CFI (2-tailed)*

Table 7 Internal Correlation of Mental Health Variables

		Dizziness	Perspiration	Myalgia	Tachycardia	Topical Headache	Depression	Anorexia	Insomnia
Dizziness	Corr.	1.000	.	.	.	.	.	.	.
	Sig.	.	0.000	.	.	.	.	.	.
Palma and/or Plantar Perspiration	Corr.	0.392**	1.000	.	.	.	.	.	.
	Sig.	0.000	.	.	.	.	.	.	.
Myalgia	Corr.	0.476**	0.476**	1.000	.	.	.	.	.
	Sig.	0.000	0.000	.	.	.	.	.	.
Tachycardia	Corr.	0.224**	0.524**	0.374**	1.000	.	.	.	.
	Sig.	0.000	0.000	0.000	.	.	.	.	.
Topical Headache	Corr.	0.360**	0.472**	0.453**	0.455**	1.000	.	.	.
	Sig.	0.000	0.000	0.000	0.000	.	.	.	.
Depression and/or Anxiety	Corr.	0.421**	0.303**	0.445**	0.261**	0.262**	1.000	.	.
	Sig.	0.000	0.000	0.000	0.000	0.000	.	.	.
Anorexia	Corr.	0.248**	0.549**	0.438**	0.738**	0.555**	0.239**	1.000	.
	Sig.	0.000	0.000	0.000	0.000	0.000	0.000	.	.
Insomnia	Corr.	0.234**	0.452**	0.352**	0.778**	0.515**	0.148*	0.793**	1.000
	Sig.	0.000	0.000	0.000	0.000	0.000	0.022	0.000	.

Note:
* *Correlation is significant at 95% CFI (2-tailed)*
** *Correlation is significant at 99% CFI (2-tailed)*

In total, internal correlations for this group of variables are not highly presented. Using exploratory factor analysis, the examination of the relations between a set of measures can be explained by a common factor, without specifying a particular factor structure. This technique was chosen to examine whether the factor model would provide acceptable fit to the chosen

sample. If the proposed model of measured and latent variables could not fit the data sample, then there is no point in testing more constrained. Therefore, EFA would not be able to efficiently apply on this group of variables.

As shown in Table 8, internal vicariate correlation analysis illustrates that mental health variables are consistently correlated within this group. Thus this group was continually taken into the exploratory factor analysis. The output of exploratory factor analysis and their standardized regression weights with squared multiple correlations for the error terms are presented hereunder in Figure 6

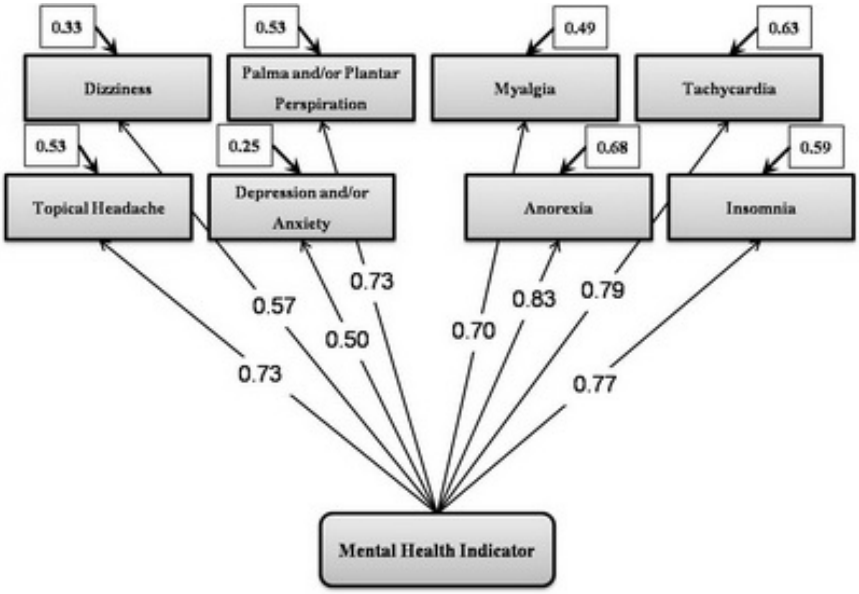


Figure 6 Diagram showing standardized regression weights and squared multiple correlations for the error terms.

In comparing, the new mental health factor slightly correlates with the variables from Travel Time group as shown in Table 8. It can be concluded that mental health status of the society can be enhanced by growing the time spent for walk to station and the people rest time. While the result confirms that longer time spent for travel and work harms social mental health and presses people into the risk of depression and anxiety. Since this small research was just a pilot study thus re-framework and deeper data collection would be needed to better utilize this issue as well as the confirmatory study.

Table 8 Correlations represent impact of Travel Time to mental health

		Mental Health Factor
Walking to PT Access Point (min)	Corr.	-0.138*
	Sig.	.033
Time spent for traveling (%/ Day)	Corr.	0.255**
	Sig.	0.000
Time spent for recreation (%/ Day)	Corr.	-0.254**
	Sig.	0.000
Time spent for working (%/ Day)	Corr.	0.073
	Sig.	0.258

5. CONCLUSIONS AND RECOMMENDATIONS

The result of study indicated the relationship between travel time and social health dimension, especially for mental health. Thus, in order to encourage more physical activity while transportation development several approaches could be recommended due to the influence of land development patterns on travel behavior:

- *High density*: this is due to the reason that low density can increase distances between origins and destinations. The higher density levels could result on the reduction of travel distances, theoretically increasing the incentive to walk and bike (Li and Tsukaguchi, 2005). This measurement is simple and cost effectively. For these reasons, density is the most significant factor for further research of land development to decentralize and encourage more nonmotorization.
- *Mix used developmen*t: The relative mix of land uses create diverse environment to attract more demand which affects the distances between trip origins and destinations. The supportive on the separation of uses into residential, commercial, and industrial zones increases travel distances, with discourage nonmotorized travel behavior.
- *Walkability*: The compact environment could be design to reduce the number of motorized travel to the destinations which are widely dispersed at the regional level. However, if jobs are located in the proximity area of housing, commuting by bicycle or on foot will be nearly impossible.
- *Site design:* It is undoubtedly that travel patterns could be motivated by street design, building orientation, and setback, along with other aesthetic considerations, especially for nonmotorized travel. The propensity to walk and bike could be designed on an adaptive of traffic calming technique

Since social health level will be cared by quality medical skill, sufficiency of hospital facilities and medicare policy, amid all of these complexities, very precise strategies could be articulated in the form of combination forms to launch interventions within the public health arena along with integration between land use and transportation planning. These *interventions* would be targeted at shaping emerging communities in a manner that enables, and even promotes, sustainable physical activity.

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