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Eating Behavior and the Utilization of Outpatient Services - The Case of Taiwan

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Abstract

This study analyzes the 2001 National Health Interview Survey (NHIS) and the National Health Insurance Research Dataset (NHIRD) in Taiwan to evaluate the impact of eating behavior on outpatient service utilization and expenditure using a two-part model. Our empirical analysis suggests that eating behavior is significantly associated with the utilization of outpatient services and with medical expenditure. If a person has grains, fruit or milk every day, the probability of using outpatient services and incurring medical expenditures is significantly lower. In addition, the probability of using outpatient services and related expenditure is higher for the people who have sweet food every day. Moreover, we also find that a higher eating quality reduces the probability of using outpatient services and the expenditure is also lower in the case of those people who develop a high eating quality once they decide to visit a doctor. If eating behavior is improved, the morbidities associated with chronic diseases may be reduced, which will further alleviate the burden of national medical expenditure. The implication for policy making is that healthy eating behavior should be promoted, especially among adolescents, since eating behavior is not easily changed once it has been formed.

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1. Introduction

In developed countries, the main problem related to malnutrition has become over-nutrition, which leads to obesity. According to statistics compiled by the World Health Organization (WHO), the prevalence of obesity has increased from 12% to 22% globally over the 1991 to 2004 period. Based on statistics compiled by the Department of Health in Taiwan, the prevalence of being overweight is 23% and that of being obese is 12%. Not only does obesity jeopardize national health, but it also imposes a burden on national health expenditure. Rashad (2006) identifies about 9% of health expenditure as being related to obesity-related diseases.

As in most developed countries, Taiwan also faces pressure from increasing health expenditure (Kleiman 1974; Newhouse 1977; Gerdtham et al. 1992; Hansen and King 1998; Getzen 2000). Kleiman (1974) and Newhouse (1977) first analyzed the determinants of medical expenditure using cross-sectional data and, since then, a great number of studies have attempted to find the factors that lead to increased health expenditure. These factors can be classified as demand-side, supply-side, and institutional factors. The demand-side factors include income, the ratio of elderly population, and the prevalence of health insurance. The supply-side factors include the progress in medical technology, the demand induced by doctors, and the increases in the numbers of doctors or beds. The institutional factors include the payment systems for insurance, hospital systems, and the ratio of public health care services (Kleiman 1974; Newhouse 1977; Gerdtham et al. 1992; Hitiris and Posnett 1992; Newhouse 1992; Murthy and Ukpolo 1994; McCoskey and Selden 1998).

Although there are a great number of studies that examine medical care utilization and medical expenditure, none of them investigates the effect of eating behavior on medical care utilization and medical expenditure. Huijbregts et al. (1997) document that eating quality is an important factor to personal health and it has attracted many studies that have investigated the relationship between nutrition and eating behavior and personal health (Nayga et al. 1999; Alaimo et al. 2001; Stuff et al. 2004; Bowman 2006; Gisle et al. 2009; Truong et al. 2010). Bad eating behavior leads to obesity, which is a risk factor for some chronic diseases such as heart disease, hypertension, diabetes, and strokes (McCullough et al. 2000; Hann et al. 2001; Kurth T and et al. 2002; Lin et al. 2002; Canoy et al. 2004; Truong et al. 2010). Moreover, the people with these chronic diseases constitute those members of the population with high medical care utilization which pushes health expenditure upwards. However, the relationship between eating behavior and medical care utilization or medical expenditure still remains unresolved.

This study analyzes the effect of eating behavior on the utilization of outpatient services and related expenditure using a two-part model. Our data are obtained from the 2001 National Health Interview Survey and the National Health Insurance Research Dataset in Taiwan. We hope our results may provide information that is useful for policy-making.

2. Methods

2.1 Database and Study Sample

The first source of our data is the National Health Interview Survey (NHIS) which was conducted in 2001 by the National Health Research Institutes (NHRI) and the Bureau of Health Promotion (BHP). The survey utilized multistage stratified systematic sample design and the data were collected by face-to-face interviews. The questionnaire contains information on personal characteristics (age, sex, location, education, and marriage), personal health status and behavior (history of diseases, eating behavior, lifestyle, height, and weight), personal medical service utilization, self-assessed health status, and work-economic status (occupation and income). There are 25,464 completed interviews in total and 20,855 interviewees are aged 12 and above.

The second source of our data is the National Health Insurance Research Database (NHIRD). An advantage of the NHIRD is its coverage since it contains all the records for medical service utilization under the national health system in Taiwan. However, the NHIRD does not contain personal socioeconomic variables that are available in the 2001 NHIS. In order to encourage relevant research, the National Health Research Institutes combines two datasets based on the consent obtained from 86.41% (22,003/25,464) of the interviewees in the 2001 NHIS who were willing to make their health care utilization records available for research.

In general, hospitalization is usually the result of severe diseases, accidents, or operations, which are less relevant to eating behavior. In addition, inpatients only account for 8% of the total population in Taiwan. To avoid sampling bias, we focus on the relationship between outpatients and eating behavior. Moreover, children under 12 do not have a stable pattern for eating because eating behavior changes with different development stages. Thus, we only analyze the effect of eating behavior on the utilization of outpatient services for those who are aged 12 and above.

In order to precisely show the impact of eating behavior on the utilization of outpatient services and related expenditure, we need information regarding personal outpatient service utilization and also need to control the socioeconomic, health information and geographic variables. Therefore, we link the two datasets (2001 NHIS and 2001 NHIRD) by each individual's identification number to perform the analysis. After discarding the observations for those under the age of 12 and those with incomplete information, there are 16,976 observations left in our dataset.

2.2 Analytical methodology

Our empirical analysis in based on a two-part model since the decision process to receive outpatient care can be separated into two steps. People first decide whether or not to receive

outpatient care and then only later decide on the number of services. In addition, we use the total expenditure instead of the number of outpatients as the measure of medical utilization since the former better reflects the level of medical service.

In the first part, we use a logit regression model to analyze the effect of eating behavior on the decision as to whether or not to utilize outpatient services (sample size, N=16,976). In the second part, we first exclude the observations which do not utilize outpatient services in 2001 and the number of observations is reduced to 15,471. We then use an ordinary-least-squares log linear model to investigate the effect of eating behavior on personal medical expenditure.

2.3 Variables of interest

The dependent variable in the first part concerns whether the respondent used inpatient care services and that in the second part is the amount of expenditure incurred on inpatient care services. Based on the categories in the U.S. Department of Agriculture's Center for Nutrition Policy and Promotion (Basiotis et al. 2002), we use the following variables to describe eating behavior: grains (bread, rice, and pasta), vegetables, fruit, milk (including cheese and yogurt), and meat (including fish, seafood, beans, and eggs). We also include two extra variables, namely, sweet food (candy, chocolate, and drinks containing sugar) and fast food (hamburger and fries), which are obtained from the 2001 NHIS dataset. Based on the research design of the U.S. Department of Agriculture's Center for Nutrition Policy and Promotion, a score of 10 is given if a person consumes at least the suggested quantity of the food. Scores of between 0 and 10 are given in proportion to the quantity consumed. However, since the 2001 NHIS dataset only contains the binary outcomes for food consumption, we use seven dummy variables representing the everyday consumption of these foods in this study.

Moreover, we construct a variable, namely, healthy-food-eating, that represents the variety in a person's diet based on the information provided by the U.S. Department of Agriculture's Center for Nutrition Policy and Promotion. One point is given for each of the following that a person consumes: grains, vegetables, fruit, milk, meat, fish, seafood, beans, and eggs. The variable, healthy-food-eating, is calculated as the sum of the points.

We also include socioeconomic variables, health information variables, and geographic variables as our control variables. The socioeconomic variables include age, sex, marriage, father's race, education, and monthly income. Father's race is coded 1 if he is Hokkien and 0 otherwise. The health information variables are self-assessed health status, (being) overweight, disease and healthy lifestyle. Overweight is coded 1 if a person's BMI>=25. Disease variables are five dummy variables regarding whether the respondent suffers from heart disease, hypertension, diabetes, hyperlipidemia, and strokes. We include five healthy lifestyle dummy variables – no smoking, no betel nut chewing, only light drinking, regular exercise, and having breakfast every day. Finally, the geographic variables include residential locations and

urbanization.

2.4 Statistical Analysis

This study utilizes a two-part model to examine the effect of eating behavior on outpatient utilization and medical expenditure. We use SAS 9.1 for data management and STATA 8.2 for regression analysis.

3. Results

Table 1 summarizes the descriptive statistics of the dependent and independent variables. A total of 91% of the respondents (15,471/16,976) utilized at least one outpatient service in 2001. The average expenditure on outpatient services is NTD 10,918. The percentages for those in the sample that consumed grains, vegetables, fruit, milk and meat each day were 47.2%, 82%, 56.5%, 31.2%, and 62.9%, respectively. About 14.4% of the respondents had sweet food each day and 2.7% of the respondents had fast food each day. The mean for healthy-food-eating was 4.953, which represented the average score for variety in a person's diet.

There were five age groups and the mean age was about 39. Those in the 21-35 and the 36-50 age groups accounted for about 30% of the sample. The proportion of males was about 50%; 56.8% of the respondents were married, and almost 73% of the interviewees had fathers who were Hokkien. There were four education groups and the senior high group, which was the largest education group, constituted about one-third of the total sample. Approximately 39% of the respondents had monthly incomes of NTD 0-4,999.

There were three categories for health status: good, normal, and bad. About 62.1% of the respondents were reported to be in good health and only 5.9% in bad health. Around 24.5% of the people were overweight. The percentage of respondents who suffered from heart disease, hypertension, diabetes, hyperlipidemia, and strokes were 6.6%, 11.2%, 4.2%, 9.9% and 1.1% respectively. About 69%, 82%, 74%, 53% and 76% of the interviewees reported that they had healthy lifestyles – no smoking, no betel nut chewing, only light drinking, regular exercise, and having breakfast every day, respectively.

As for the geographic variables, the residential locations were divided to four groups: northern, central, southern, and eastern. About 42.6% of the respondents were in northern Taiwan and only 8.4% in eastern Taiwan. There were three levels of urbanization: city (the most urbanization), county, and town (the least urbanization). 45% of our interviewees were categorized as being part of the town group.

Table 2 shows the estimation results of the logistic and OLS models for outpatient care services. From the logistic regression, we found that the everyday consumption of grains, fruit, milk and meat lowers the probability of using outpatient services. On the contrary, the everyday consumption of sweet and fast food increases the probability of doctor visits. The

results of the OLS regression show that the everyday consumption of grains, fruit, and milk reduces the expenditure on outpatient services. On the other hand, the everyday consumption of sweet food increases the expenditure on outpatient care.

The effect of variety in a person's diet on the utilization of outpatient services is shown in Table 3. A greater value attached to healthy-food-eating reflects the everyday consumption of a greater variety of food, which represents a higher eating quality. The logistic regression shows that a higher eating quality leads to a lower probability of doctor visits. In addition, those who include a wide variety of food in their diet incur less outpatient expenditure once they decide to visit a doctor.

From Tables 2 and 3, we find that personal socio-economic status matters in the utilization of outpatient services. Both the probability of visiting a doctor and the medical expenditures of the elderly are significantly higher than those for the people who are under the age of 65. Both females and those who are married have a higher probability of utilizing outpatient services and of incurring related expenditures. Compared to those people who have a college degree, people with less education are less likely to utilize the outpatient services. In addition, the medical expenditure is significantly lower for the people in the junior high and primary school and below groups. The probability of utilizing outpatient services is lower for those whose monthly income is below NTD 20,000. However, once they visit a doctor, the expenditures are significantly higher than for those whose monthly income is NTD 40,000 and above. Bad health status, being overweight, and five chronic diseases and five healthy lifestyles increase both the probability of using outpatient services and the associated medical expenditure. Compared to the probability of using outpatient services in the northern part of Taiwan, the probability is lower in the southern part, but is higher in the eastern part. As far as expenditure is concerned, the outpatient expenditure is the lowest in the northern part of Taiwan. Finally, the outpatient service expenditure is lower for those who live in the rural areas (towns).

4. Discussion

Previous research on the relationship between health status and diet focuses on the evidence that bad eating behavior results in obesity or chronic diseases (Randall et al. 1992; Huijbregts et al. 1995; Bazzano et al. 2003; Liu et al. 2003; Bowman and Vinyard 2004; Hung et al. 2004). In addition, most studies on the determinants of increasing medical expenditure ignore the relevance of personal eating behavior to the utilization of medical care and related expenditure, probably owing to the unavailability of data. This study utilizes a combined dataset from two databases – the 2001 NHIS and NHIRD. The combined dataset contains not only the personal inpatient records but also information regarding personal eating behavior, as well as socioeconomic and geographic variables. Thus, the study extends the literature in that we directly analyze the relationship between personal eating behavior and the utilization of

outpatient services and related expenditure.

After controlling for personal socio-demographic, health information, and geographic variables, we find that eating behavior is significantly associated with the utilization of outpatient services and with the related medical expenditure. Specifically, the probability of doctor visits is significantly lower if a person has grains, fruit, milk and meat every day. In the case of those people who make use of outpatient services, the medical expenditures are lower for those who have grains, fruits, or milk every day. Moreover, the probability of using outpatient services is higher for those people who have sweet food or fast food every day. Furthermore, the expenditure incurred by those who have sweet food every day is significantly higher.

The previous literature documents that personal eating quality affects a person's health status and the morbidity associated with chronic diseases (McCullough et al. 2000; Hann et al. 2001). Thus, we analyze not only the effect of seven individual food categories (Basiotis et al. 2002), but also the effect of variety in a person's diet. We find that higher eating quality lowers the probability of using outpatient services. In addition, the expenditure is lower for those people who maintain a high quality of eating once they decide to visit a doctor.

According to research conducted by the U.S. Department of Agriculture's Center for Nutrition Policy and Promotion, only 10% of the populations have good eating behavior. Bad eating behavior results in many chronic diseases that lead to increased medical expenditure. As in other developed countries, chronic diseases are the major causes of death. Cancer, cerebrovascular disease, heart disease, diabetes, and hypertension are the first, second, third, fifth, and tenth major causes of death in Taiwan and these diseases have been found to be relevant to personal eating behavior (Randall et al. 1992; Huijbregts et al. 1995; Bazzano et al. 2003; Liu et al. 2003; Bowman and Vinyard 2004; Hung et al. 2004).

Eating behavior has changed along with economic growth in Taiwan in recent decades. Western style food such as fast food has become popular and has resulted in more consumption of fat, calories, and cholesterol and less grains and fiber in people's everyday diet. Moreover, it has led to increases in both the mortalities from these chronic diseases among young people and the associated medical expenditure. If eating behavior is improved, the morbidities of these chronic diseases may be lowered, which will further alleviate the burden on the national health system. The implications for policy-making are that it is becoming increasingly important to promote healthy eating behavior, especially among adolescents, since patterns of eating behavior are not easily changed once they have been formed.

Aside from eating behavior, we find that socioeconomic, personal health, and geographic variables are associated with the utilization of medical services. As for the socioeconomic aspects, age (age 65 and above), (being) female, marriage, having a Hokkien father, and having a college degree increase both the probability of utilizing outpatient services and

incurring medical expenditure. As regards the geographical characteristics, the expenditures in the central, southern and eastern areas are significantly higher than those in the northern area. As for the health information variables, bad health status, being overweight, the existence of chronic diseases and healthy lifestyles increase both the probability of utilization and medical expenditure. A possible reason for the positive relationship between the probability of utilizing outpatient services and the healthy lifestyle variables is that the people with a healthy lifestyle are aware of the importance of personal health. These people tend to frequently make use of medical services since the out-of-pocket expenditure of outpatient care in Taiwan is low under the National Health Insurance program. One main reason is that general practitioners do not serve as gatekeepers in Taiwan. The out-of-pocket payment of a regular doctor visit ranges from NTD 50-360 (approximately from USD 1.5 to 11, with exchange rate USD 1 = NTD 33), depending on types of medical care institutions. The cost is relatively low when it is compared to the GDP per capita of Taiwan in 2001, USD 13,147. Thus, frequent doctor visits increases the total medical expenditure, which is shown in the second stage regression. A similar argument applies to those people who have a college degree.

We should, at this stage, point out several inherent limitations of this study. First, the health eating index (HEI) proposed in the U.S. Department of Agriculture's Center for Nutrition Policy and Promotion sets a scale from 0 to 10 for the consumption level for each kind of food. However, the 2001 NHIS provides no quantities but only binary information for each kind of food. Thus, we are unable to obtain the HEI exactly. Moreover, we do not have personal information regarding the quantities of daily intakes of supplements, fat, saturated fatty acids, cholesterol, and sodium. Moreover, the combined dataset only reveals the information for 2001 and so we are unable to analyze the relationship between eating behavior and the utilization of outpatient services in the long term.

Despite these limitations, our study indicates that good eating behavior reduces the utilization of outpatient services as well as the associated medical expenditure. It implies that improving eating behavior may help mitigate the fiscal burden arising from increased national health expenditure. Therefore, a policy that promotes the knowledge of good eating behavior is important both to improve personal health and reduce national health expenditure.

Table 1: Description of individual characteristics by control variables

Variables	Sample characteristics (n=16,976)			
	Mean (Column %)	S.D.	Min.	Max.
Health Care Utilization				
Outpatient Services	0.911	0.284	0	1
Outpatient Expenditures	10918.15	30332.33	0	823585
Food Group Components				
Grains	0.472	0.499	0	1
Vegetables	0.820	0.385	0	1
Fruit	0.565	0.496	0.	1
Milk	0.312	0.463	0	1
Meat	0.629	0.483	0	1
Sweet food	0.144	0.351	0	1
Fast food	0.027	0.163	0.	1
Healthy food eating	4.953	1.320	0	9
Socio-demographic Variables				
Age	39.017	17.413	12	98
Age 12-20	0.165	0.371	0	1
Age 21-35	0.297	0.457	0	1
Age 36-50	0.292	0.455	0	1
Age 51-65	0.151	0.358	0	1
Age 65 and above	0.095	0.294	0	1
Male	0.499	0.500	0	1
Married	0.568	0.495	0	1
Father’s Race	0.728	0.445	0	1
Education				
Primary school and below	0.252	0.434	0	1
Junior high	0.196	0.397	0	1
Senior high	0.322	0.467	0	1
College and above	0.230	0.421	0	1
Individual monthly income				
NT $ 0-4999	0.388	0.487	0	1
NT $ 5000-19999	0.197	0.398	0	1
NT $ 20000-39999	0.247	0.431	0	1
NT $ ≧40000	0.168	0.374	0	1

Table 1 (continued)

Variable	Sample characteristics (n=16,976)			
	Mean (Column %)	S.D.	Min.	Max.
Health information variables				
Health status				
Good	0.621	0.485	0	1
Normal	0.320	0.466	0	1
Bad	0.059	0.236	0	1
Overweight	0.245	0.430	0	1
Disease				
Heart disease	0.066	0.248	0	1
Hypertension	0.112	0.315	0	1
Diabetes	0.042	0.200	0	1
Hyperlipidemia	0.099	0.299	0	1
Stroke	0.011	0.104	0	1
Healthy Lifestyle				
No smoking	0.692	0.461	0	1
No betel nut chewing	0.824	0.381	0	1
Light drinking	0.735	0.441	0	1
Regular exercise	0.534	0.499	0	1
Eating breakfast every day	0.764	0.425	0	1
Geographic variables				
Residential locations				
Northern	0.426	0.495	0	1
Central	0.229	0.420	0	1
Southern	0.261	0.439	0	1
Eastern	0.084	0.277	0	1
Urban/rural strata				
City	0.263	0.440	0	1
County	0.287	0.452	0	1
Town	0.450	0.498	0	1

Table 2: Multivariate logistic regression analysis of the outpatient estimation

Variables	Logistic regression (n=16,976)		OLS regression (n=15,471)	
	Odds ratio	P value	Coefficient	P value
Food Group Components				
Grains	0.837	0.005**	-0.076	0.000***
Vegetables	0.893	0.141	-0.004	0.875
Fruit	0.818	0.002**	-0.060	0.003**
Milk	0.911	0.048*	-0.082	0.000***
Meat	0.852	0.007**	0.008	0.683
Sweet food	1.178	0.052^{+}	0.073	0.009**
Fast food	1.412	0.018*	0.007	0.907
Socio-demographic Variables				
Age				
Age 12-20	0.575	0.004**	-0.985	0.000***
Age 21-35	0.390	0.000***	-0.740	0.000***
Age 36-50	0.334	0.000***	-0.608	0.000***
Age 51-65	0.436	0.000***	-0.340	0.000***
Age 65 and above (reference group)	1.00	–	–	–
Male	0.681	0.000***	-0.133	0.000***
Married	1.577	0.000***	0.109	0.000***
Father’s Race	1.468	0.000***	0.012	0.555
Education				
Primary school and below	0.569	0.000***	-0.135	0.000***
Junior high	0.531	0.000***	-0.080	0.007**
Senior high	0.796	0.008**	0.003	0.903
College and above (reference group)	1.00	–	–	–
Individual monthly income				
NT $ 0-4999	0.740	0.003**	0.095	0.003**
NT $ 5000-19999	0.775	0.012*	0.094	0.004**
NT $ 20000-39999	1.037	0.697	0.042	0.150
NT $ ≧40000 (reference group)	1.00	–	–	–

Table 2 (continued)

Variable	Logistic regression (n=16,976)		OLS regression (n=15,471)	
	Odds ratio	P value	Coefficient	P value
Health information variables				
Health status				
Good	0.312	0.000***	-0.773	0.000***
Normal	0.490	0.000***	-0.486	0.000***
Bad (reference group)	1.00	–	–	–
Overweight	1.132	0.071^{+}	0.039	0.064^{+}
Disease				
Heart disease	1.867	0.002**	0.310	0.000***
Hypertension	1.762	0.000***	0.429	0.000***
Diabetes	2.980	0.000***	0.609	0.000***
Hyperlipidemia	2.271	0.000***	0.203	0.000***
Stroke	1.454	0.004**	0.305	0.000***
Healthy Lifestyle				
No smoking	1.537	0.000***	0.058	0.024*
No betel nut chewing	1.156	0.069^{+}	0.096	0.001**
Light drinking	1.132	0.073^{+}	0.154	0.000***
Regular exercise	1.340	0.000***	0.029	0.084^{+}
Having breakfast every day	1.315	0.000***	0.068	0.002**
Geographic variables				
Residential locations				
Northern (reference group)	1.00	–	–	–
Central	1.102	0.233	0.170	0.000***
Southern	0.864	0.042*	0.066	0.004**
Eastern	1.301	0.024*	0.240	0.000***
Urban/rural strata				
City (reference group)	1.00	–	–	–
County	1.082	0.319	-0.028	0.236
Town	1.129	0.112	-0.048	0.041*

*** p<0.001, ** p<0.01, * p<0.05, $^{+}$ p<0.1

Table 3: Outpatient estimation of the combined food groups

Variables	Logistic regression (n=16,976)		OLS regression (n=15,471)	
	Odds ratio	P value	Coefficient	P value
Food Group Components				
Healthy food eating	0.925	0.000***	-0.034	0.000***
Socio-demographic Variables				
Age				
Age 12-20	0.582	0.005**	-1.017	0.000***
Age 21-35	0.390	0.000***	-0.763	0.000***
Age 36-50	0.332	0.000***	-0.618	0.000***
Age 51-65	0.434	0.000***	-0.346	0.000***
Age 65 and above (reference group)	1.00	–	–	–
Male	0.650	0.000***	-0.161	0.000***
Married	1.577	0.000***	0.109	0.000***
Father's Race	1.487	0.000***	0.010	0.636
Education				
Primary school and below	0.547	0.000***	-0.151	0.000***
Junior high	0.518	0.000***	-0.089	0.003**
Senior high	0.786	0.005**	-0.002	0.923
College and above (reference group)	1.00	–	–	–
Individual monthly income				
NT $ 0-4999	0.732	0.002**	0.095	0.003**
NT $ 5000-19999	0.769	0.009**	0.095	0.003**
NT $ 20000-39999	1.031	0.745	0.042	0.144
NT $ ≧40000 (reference group)	1.00	–	–	–
Health information variables				
Health status				
Good	0.315	0.000***	-0.768	0.000***
Normal	0.491	0.000***	-0.485	0.000***
Bad (reference group)	1.00	–	–	–
Overweight	1.136	0.062^{+}	0.038	0.072^{+}

Table 3 (continued)

Variable	Logistic regression (n=16,976)		OLS regression (n=15,471)	
	Odds ratio	P value	Coefficient	P value
Disease				
Heart disease	1.874	0.002**	0.312	0.000***
Hypertension	1.751	0.000***	0.432	0.000***
Diabetes	2.974	0.000***	0.612	0.000***
Hyperlipidemia	2.267	0.000***	0.198	0.000***
Stroke	1.485	0.009**	0.312	0.000***
Healthy Lifestyle				
No smoking	1.535	0.000***	0.063	0.013*
No betel nut chewing	1.176	0.042*	0.106	0.000***
Light drinking	0.146	0.049*	0.159	0.000***
Regular exercise	1.364	0.000***	0.038	0.036*
Eating breakfast every day	1.334	0.000***	0.077	0.000***
Geographic variables				
Residential locations				
Northern (reference group)	1.00	–	–	–
Central	1.105	0.217	0.175	0.000***
Southern	0.878	0.068^{+}	0.063	0.006**
Eastern	1.299	0.024*	0.227	0.000***
Urban/rural strata				
City (reference group)	1.00	–	–	–
County	1.071	0.390	-0.030	0.200
Town	1.086	0.277	-0.056	0.017*

*** p<0.001, ** p<0.01, * p<0.05, $^{+}$ p<0.1

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