THE DETERMINANTS OF CONSUMER HEALTH INFORMATION ON CHRONIC NON-COMMUNICABLE DISEASE: AN EXPLORATORY STUDY IN PENANG, MALAYSIA

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ABSTRACT:

The objective of the present study is to investigate the impact of socio-demographic factors on the acquisition of health information on Non-Communicable Diseases (NCDs) among Malaysian adults. A robust analysis was conducted on cross-sectional survey data obtained from 398 respondents in Penang (Malaysia) between August to October 2010. An ordered probit model was applied to examine the factors affecting the scale of health information. The results suggest that old individuals, rural dwellers, having chronic disease and history of serious family illnesses are 0.19%, 2.39%, 2.2% and 2.71% less likely to acquire poor health information on NCDs than others, whereas Malays, Chinese, males and those of low educated are 8.76%, 6.22%, 2.94% and 21.62% more likely to acquire poor health information on NCDs than others. Based on these findings, several intervention measures toward increasing the health knowledge among the population are recommended, which include the use of language-based mass media to advertise the information on diseases, designing health awareness campaigns in urban areas and introducing more basic health related subjects and courses into primary and secondary schools.

Keywords: *NCD, health information, Health Literacy, Malaysia*

Introduction

The increasing burden of Non-Communicable Disease (NCDs) has become a serious issue worldwide (1). Disease Control Division reported that approximately 60% of mortality and 43% of disease burden were related to NCDs (2).[1] It was predicted that by the year 2020, NCDs would be responsible for at least 75% of all deaths in the world (2). In Malaysia, the majority of mortality and morbidity were caused by NCDs (2), accounting for more than two-third of total disease burdens (3). Each year, there are at least 70% of Malaysians diagnosed with NCDs, most notably, heart diseases, diabetes and cancers (4). Ministry of Health Malaysia reported that NCDs are the leading factors causing mortality in the government hospital (3).

The risk of acquiring diseases can be reduced if individuals are aware of the symptoms and treatments for the diseases. However, most individuals lack of knowledge on health (5). Hence, individuals tend to seek health care at the late stage of disease, and consequently are less likely to be cured (6). As emphasized by Newhouse and Friedlander, most of the NCDs can be prevented through changes in lifestyle (7), but was not practiced, probably due to the lack of knowledge and/or awareness. To reduce the prevalence of NCDs, essential health information has to be communicated to the society in an effective manner.

[1] Disease Control Division refers to the NCD survey conducted by the Ministry of Health Malaysia to establish the NCD surveillance system which would provide information to determine the extent of NCD risk factors Malaysia (2).

A thorough review of the existing literatures indicates that there are only a few in-depth studies examining the factors affecting the acquisition of health information. This is mainly due to the difficulties in measuring health information. The empirical study on acquisition of health information was first conducted by Pauly and Satterthwaite, but the method used in the study was just a proxy for measuring health information, and thus could not accurately identify the determining factors (8). Another two studies used a direct assessment to measure the scale of health information acquisition (6, 9).[2] These studies observed that socio-demographic factors such as age, gender, education and income could significantly influence the acquisition of health information among population.

In spite of the rising prevalence of NCDs in Malaysia, there is lack of study that investigates factors influencing the acquisition of health information on NCDs (i.e. the symptoms of hypertension and diabetes) among Malaysian adults.[3] The contributions of the present study are two folds. First, the present study takes into account several lifestyle and health factors, in addition to socio-demographic factors, in an effort to examine their impact on acquisition of health information. Two, a better understanding of the factors affecting the acquisition of health information can assist the public policy makers in formulating better intervention measures towards improving the health awareness among population.

Methods

Data

Data used in the present study was a primary cross-sectional survey data of Penang (Malaysia) (10). Given the time, budget and geographical constraints, a non-probabilistic convenience sampling approach was adopted to conduct the survey. Nevertheless, samples were stratified in proportion to the ethnic structure of Penang population (41.6% Malays, 40.9% Chinese, 17.5% Indian/ others). The data was collected at various locations in Penang such as university, shopping malls, offices and cafes, where include individuals with various age, income ranges and education levels. The survey period was conducted between August to October, 2010.

Pretested bi-lingual (*Bahasa Malaysia* and English) questionnaires were distributed to the respondents who were 21 years old and above, and had resided in Penang for at least 12 months. During the survey, the respondents were asked to answer the questionnaires by themselves along with the assistance by the interviewers. Several questions in relation to the general health knowledge on NCDs were addressed to the respondents. Meanwhile, the respondents were asked to self-report on their socio-demographic, lifestyle and health profiles such as age, income, education, ethnicity, gender, marital status and history of serious family illnesses.

The sample size was calculated using OpenEpi software (12). The sample size calculation was based on three criteria: 1) the assumption of 50% (+/- 5%) of population had a high level of health information on NCDs; 2) the level of precision (95% of confidence level); and 3) 1609900 populations of Penang (13). A total of 415 respondents were surveyed (8% above the estimated minimum sample size) and the non-response rate was 4.1%. Data of the remaining respondents (398 respondents) were analyzed using the Stata statistical software (14).

Statistical analysis

The dependent variable of the present study is the scale of health information, that is, the amount of health knowledge that individuals acquire, and is measured as categorical and ordinal outcomes with a clear ordering (low, lower-middle, upper-middle, high). As such, the ordered probit model is appropriate to use for explaining the variations of such variable (15). In general, the ordered probit model can be expressed as below:

$$HealthInformation^* = X'\beta + e$$

$$\text{Health information} = 1(\text{low}) \quad \text{if } [-\infty < HealthInformation^* < \mu_1]$$

$$\text{Health information} = 2(\text{lower-middle}) \quad \text{if } [\mu_1 < HealthInformation^* < \mu_2]$$

$$\text{Health information} = 3(\text{upper-middle}) \quad \text{if } [\mu_2 < HealthInformation^* < \mu_3]$$

$$\text{Health information} = 4(\text{high}) \quad \text{if } [\mu_3 < HealthInformation^* < \infty] \qquad (1)$$

where, *HealthInformation** is a latent variable for health information, X' is a transposed vector of the independent variables, β is a matrix of the regression coefficients and e is the stochastic error term. μ_1, μ_2 and μ_3 are the corresponding thresholds.

Dependent variables

The approach applied in the present study to measure health information was similar to those of Kenkel and Hsieh and Lin (6, 9). The respondents were given 20 questions concerning the indicators and effects of diabetes and hypertension, and were asked to answer 'yes', if they

[2] Kenkel and Hsieh and Lin used several survey questions about the definitions and symptoms of NCDs to examine the respondents' health knowledge (6, 9).

[3] Since the prevalence of hypertension and diabetes in Malaysia rises tremendously, these two particular NCDs are chosen (11).

knew the answer, otherwise 'no'.[4] Those respondents who answered 'yes' for 16 questions and above were considered as having 'high stock of health information (high)', 11-15 questions were referred as having 'upper-middle stock of health information (upper-middle)', 6-10 questions were denoted as having 'lower-middle stock of health information (lower-middle)', and less than 6 questions were indicated as having 'low stock of health information (low)' (Table 1).

Table 1: Description of variables in the statistical model

Variable name	Descriptions
I. Dependent variables	
STOCK	Amount of stock of health information (High = 4, Upper-middle = 3, Lower-middle = 2, Low = 1)
II. Independent variables	
AGE	Age (in years)
MALAY	Being Malay (yes = 1, otherwise = 0)
CHINESE	Being Chinese (yes = 1, otherwise = 0)
INDOH*	Being Indian/other (yes = 1, otherwise = 0)
MALE	Being male (yes = 1, otherwise = 0)
MARRIED	Being married (yes = 1, otherwise = 0)
INSURANCE	Having medical insurance (yes = 1, otherwise = 0)
RURAL	Living in rural area (yes = 1, otherwise = 0)
CHRONIC	Presence of chronic disease (yes = 1, otherwise = 0)
FAMILL	Presence of history of serious family illnesses (yes = 1, otherwise = 0)
PRIMARY	Having primary school qualification or less as highest level of education (yes = 1, otherwise = 0)
SOMEHIGH	Having some high school qualification as highest level of education (yes = 1, otherwise = 0)
HIGHSCHOOL	Having completed high school qualification as highest level of education (yes = 1, otherwise = 0)
COLLEGE	Having some college qualification as highest level of education (yes = 1, otherwise = 0)
BACHELOR*	Having at least bachelor degree as highest level of education (yes = 1, otherwise = 0)
LOWINC*	Monthly individual income is RM 0 – RM 999 (yes = 1, otherwise = 0)
LOWMIDINC	Monthly individual income is RM 1000 – RM 2999 (yes = 1, otherwise = 0)
UPMIDINC	Monthly individual income is RM 3000 – RM 5999 (yes = 1, otherwise = 0)
HIGHINC	Monthly individual income is ≥ RM 6000 (yes = 1, otherwise = 0)
SMOKER	Being a smoker (yes = 1, otherwise = 0)
DRINKER	Being a alcohol drinker (yes = 1, otherwise = 0)
POORHLT	Self-rated poor health (yes = 1, otherwise = 0)

*Note: *Refers to base/reference category.*

[4] Appendix I demonstrates the survey questions that were used to measure the respondents' health information.

Independent variables

Owing to the paucity of empirical studies examining acquisition of health information in Malaysia, the independent variables of the present study were selected based on Kenkel and Hsieh and Lin (6, 9). In particular, the following variables were hypothesized to have significant impacts on the acquisition of health information: (1) age; (2) ethnicities; (3) gender; (4) marital status; (5) medical insurance; (6) house locality; (7) chronic disease; (8) history of serious family illnesses; (9) education; (10) income; (11) smoking; (12) drinking; and (13) self-rated health (Table 1).

In the present study, the respondents' age (AGE) was included as a continuous variable for analysis. The respondents' ethnicities were categorized into three categories: MALAY (Malays), CHINESE (Chinese) and INDOTH (Indians and those of other ethnic groups).[5] Three health variables were included for analysis: presence of chronic disease (CHRONIC), presence of history of serious family illnesses (FAMILL) and self-rated health (POORHLT).[6] The respondents' education level was categorised into five groups: primary school or less (PRIMARY), some high school (SOMEHIGH), completed high school (HIGHSCHOOL), college (COLLEGE) and bachelor degree or higher (BACHELOR). Four categories were included: RM 0 – RM 999 (LOWINC), RM 1000 – RM 2999 (LOWMIDINC), RM 3000 – RM 5999 (UPMIDNIC) and ≥ RM 6000 (HIGHINC). Two lifestyle variables were included: smoking (SMOKER) and drinking (DRINKER).

Results

Characteristics of the survey respondents

Descriptive analysis for health information is illustrated in Table 2. Of the total respondents, 52% have high stock of health information, 30% have upper-middle stock of health information, 12% have lower-middle stock of health information, and only 6% have low stock of health information. The total sample consists of approximately 38% Malays, 41% Chinese, 21% Indians/others and 44% males. These ethnic and gender compositions closely mirror the population structure of Penang (41.6% Malays, 40.9% Chinese, 17.5% Indian/others, 49.3% males) (14).

Marginal effects of independent variables

Results for ordered probit analysis of acquisition of health information are presented in Table 3. The statistical test is considered significant if the p-values are below 10%, 5% and 1% at 2-sided level. The results show that an additional year of age (AGE) reduces the probability of having low stock of health information by 0.19%, lower-middle stock

[5] Indians and those of other ethnic groups were combined to represent the ethnic minority in Malaysia.

[6] The details about self-rated health were described elsewhere (16).

Table 2: Descriptive analysis for stock of health information

Variables	Mean [standard deviation] or percentage				
	High [n_1=207(52%)]	Upper-middle [n_2=118(30%)]	Lower-middle [n_3=48(12%)]	Low [n_4=25(6%)]	Total [n=398(100%)]
AGE	38.54 [14.20]	34.40 [12.63]	32.63 [12.00]	37.92 [13.33]	36.56 [13.60]
MALAY	30	41	56	56	38
CHINESE	40	47	31	40	41
INDOH	30	13	13	4	21
MALE	42	42	48	68	44
MARRIED	53	43	46	60	50
INSURANCE	66	66	65	56	65
RURAL	23	20	19	12	21
CHRONIC	22	12	19	8	18
FAMILL	57	47	40	36	51
PRIMARY	4	4	6	12	5
SOME HIGH	11	5	2	24	9
HIGH SCHOOL	19	24	31	16	22
COLLEGE	18	19	13	20	18
BACHELOR	49	48	48	28	47
LOWINC	31	37	27	28	32
LOWMIDINC	42	46	52	52	45
UPMIDINC	22	14	19	16	19
HIGHINC	5	3	2	4	4
SMOKER	11	16	23	24	15
DRINKER	29	42	23	24	32
POORHLT	6	3	6	4	5

Note: For age variable (continuous outcomes), the values refer to mean [standard deviation], whereas, for the other variables (categorical outcomes), the values refer to percentage.

of health information by 0.30% and upper-middle stock of health information by 0.32%, but increases the probability of having high stock of health information by about 0.81%.

Malays (MALAY) and Chinese (CHINESE) are found to be 30.45% and 23.67% less likely to have high stock of health information, respectively, than Indians and other ethnic groups (INDOTH). Likewise, the results also indicate that Malays have a 8.76%, 11.65% and 10.05% higher probability of having low, lower-middle and upper-middle stock of health information, respectively, compared to Indian/others. Besides, Chinese are also observed to have a 6.22%, 8.94% and 8.52% higher propensity of having low, lower-middle and upper-middle stock of health information, respectively, than Indian/others.

Our data suggests that males (MALE) have a 2.94%, 4.56% and 4.75% higher probability of acquiring low, lower-middle and upper-middle stock of health information, respectively, than females. Similarly, males were also found to be 12.26% less likely than females to acquire high stock of health information. It is found that rural dwellers (RURAL) have a 11.82% higher probability of having high stock of health information than urbanites. Also, these individuals are 2.39%, 4.16% and 5.27% less likely to have low, lower-middle and upper-middle stock of health information, respectively, compared to urban dwellers.

Individuals who have history of serious family illnesses (FAMILL) are 11.60% more likely to have high stock of health information compared to those without such health background. Similarly, they also have a lower probability of having low (2.71%), lower-middle (4.28%) and upper-middle (4.61%) stock of health information. Individuals who have chronic disease (CHRONIC) have a 2.20% lower probability of having low stock of health information compared to those without chronic disease. The findings of the present study exhibit that individuals with only primary school or less education (PRIMARY) are 38.49% less likely to have high stock of health information than those who have at least bachelor degree (BACHELOR), this is followed by a higher likelihood of having low (21.62%) and lower middle stock of health information (15.72%).

Discussion

Application of simple linear regression models such as ordinary least square (OLS) and linear probability model (LPM) will face a serious problem if the dependent

Table 3: Results for ordered probit analysis of acquisition of health information

Variables	Low	Lower-middle	Upper-middle	High
AGE	-0.0019**	-0.0030***	-0.0032**	0.0081***
	(0.0007)	(0.0011)	(0.0013)	(0.0029)
MALAY	0.0876***	0.1165***	0.1005***	-0.3045***
	(0.0275)	(0.0299)	(0.0229)	(0.0679)
CHINESE	0.0622***	0.0894***	0.0852***	-0.2367***
	(0.0228)	(0.0285)	(0.0250)	(0.0690)
MALE	0.0294**	0.0456**	0.0475**	-0.1226**
	(0.0145)	(0.0216)	(0.0216)	(0.0552)
MARRIED	0.0168	0.0267	0.0289	-0.0724
	(0.0138)	(0.0217)	(0.0235)	(0.0582)
INSURANCE	-0.0127	-0.0199	-0.0207	0.0533
	(0.0143)	(0.0218)	(0.0217)	(0.0574)
RURAL	-0.0239**	-0.0416**	-0.0527*	0.1182**
	(0.0112)	(0.0205)	(0.0295)	(0.0592)
CHRONIC	-0.0220*	-0.0385	-0.0491	0.1096
	(0.0131)	(0.0246)	(0.0360)	(0.0722)
FAMILL	-0.0271**	-0.0428**	-0.0461**	0.1160**
	(0.0123)	(0.0187)	(0.0203)	(0.0489)
PRIMARY	0.2162*	0.1572***	0.0115	-0.3849***
	(0.1126)	(0.0376)	(0.0536)	(0.0914)
SOMEHIGH	0.0253	0.0359	0.0317	-0.0929
	(0.0330)	(0.0420)	(0.0290)	(0.1031)
HIGHSCHOOL	0.0284	0.0413	0.0380	-0.1077
	(0.0227)	(0.0297)	(0.0232)	(0.0741)
COLLEGE	0.0032	0.0051	0.0054	-0.0137
	(0.0165)	(0.0257)	(0.0267)	(0.0689)
LOWMIDINC	0.0130	0.0207	0.0221	-0.0558
	(0.0141)	(0.0221)	(0.0232)	(0.0589)
UPMIDINC	-0.0116	-0.0194	-0.0228	0.0539
	(0.0163)	(0.0283)	(0.0359)	(0.0802)
HIGHINC	-0.0085	-0.0143	-0.0169	0.0398
	(0.0278)	(0.0492)	(0.0631)	(0.1400)
SMOKER	0.0216	0.0316	0.0294	-0.0825
	(0.0222)	(0.0295)	(0.0234)	(0.0741)
DRINKER	0.0065	0.0102	0.0108	-0.0275
	(0.0153)	(0.0237)	(0.0245)	(0.0634)
POORHLT	-0.0063	-0.0105	-0.0121	0.0290
	(0.0296)	(0.0510)	(0.0625)	(0.1430)

*Note: Asymptotic standard errors in parentheses. Asterisks *** indicate significance at the 1% level, ** at the 5% level, and * at the 10% level. Log likelihood = -415.4560, LR χ^2 (19) = 68.10, P > χ^2 = 0.0000, Pseudo R^2 = 0.0757*

variable is measured as categorical and ordinal outcomes. Therefore, in order to improve the degree of reliability, an ordered probit model is used (17). The results of the present study suggest that age, ethnicity, gender, house locality, chronic disease, history of serious family illnesses and education are significantly associated with acquisition of health information. Specifically, individuals who are older, rural dwellers, having chronic disease and history of family illness are less likely to acquire poor health information than others, whereas Malays, Chinese, males and those of low educated are more likely to acquire poor health information compared to others. These findings can provide the public policy makers with the important information on formulating an effective intervention

measure towards increasing health knowledge among the population, which, in turn, reducing the prevalence of NCDs.

Age is positively associated with the probability of acquiring good health knowledge. This finding is in contrast to that of Hsieh and Lin, which concluded otherwise (9). This may be explained by the fact that older individuals tend to encounter more serious deterioration in health (18), and they spend more for using health care services (19). As the consequence, they tend to be more concerned about the symptoms and negative consequences of diseases than their younger counterparts. In view of this finding, an effective public health policy should focus on improving health knowledge among youngsters. It is recommended that detailed information about diseases should be frequently publicised in the social media that have strong influences on youngsters such as Facebook, Twitter and Instagram.

It is interesting to note that Indians and other ethnic groups are more likely to acquire a high stock of health information compared to Malay and Chinese, making these ethnicities to have the greatest awareness of health among all the ethnic groups in Malaysia. However, owing to the limited availability of data, there is a lack of clear definition on the percentage of different ethnicity in the population and the acquisition of subjects from different ethnic groups by chance. Therefore, future in-depth studies which examine the ethnic differences in acquisition of health information are needed. In terms of policy implication, the public policy makers should urgently introduce more nationwide health awareness programmes. We suggest that the government should use various Malay and Chinese language-based mass media such as newspapers, television programmes and radio channels to widely advertise the information about health and diseases.

Women are found to have a higher likelihood of acquiring good health information compared to men. This finding is consistent with the argument of Kenkel that women carry greater responsibilities to look after their family health, whereas men are more inclined to spend their time on paid works, and consequently have a lower priority for family health (6). Hence, in general, women tend to have better health knowledge in relative to men. Conversely however, this finding contradicts that of a study conducted in Burkina Faso (20). The study claimed that females and those individuals living in a female headed household are more likely to report illnesses than males and those individuals living in a male headed household, respectively.

Rural dwellers are found to have a higher likelihood of having good health knowledge than urbanites, which somewhat contradicts the finding of Hsieh and Lin (9). Perhaps, this is because urban dwellers have better access to health care facilities, and may tend to rely heavily on health care professional for treating diseases, whilst people reside in rural areas tend to rely on their health knowledge for preventing diseases. Such explanations, however, need to be confirmed by the future studies using more comprehensive health survey data. An effective intervention measure should be aimed primarily at providing more health information for urban dwellers. This can include designing more health awareness campaigns and seminars in urban areas.

Rather astonishingly, results of the present study suggest that individuals with chronic disease and history of serious family illnesses are more likely to have good health knowledge than their counterparts who without such health background. The notion is that individuals with chronic disease and history of serious family illnesses are likely to be more conscious of their health. Hence, they are highly motivated in acquiring new health information. This is in agreement with the findings of Cheah that individuals who have history of serious family illnesses and self-rated poor health tend to be more health-conscious, and thus are more likely to use health care to prevent diseases (10). Considering this outcome, the present study suggests selection and training of peer educators from individuals with NCDs and who have family members with NCDs. This will be a promising possibility to disseminate health information effectively in the community.

Education is found to be significantly associated with acquisition of health knowledge, as higher educated individuals are more likely to acquire good health knowledge compared to lower educated individuals (6, 9). Well-educated individuals tend to have a better interpreting skill, and thereby can easily obtain more health information than those of less educated. With regard to policy implication, information about diseases should be made more available at school, whereby students can access it since schooling years. For instance, the government can consider introducing more basic health related subjects and courses into primary and secondary schools.

Somewhat surprisingly, the evidence of the present study suggests that income is not significantly correlated with acquisition of health information. This outcome is contrary to the finding of Kenkel and Hsieh and Lin that suggests that income is positively associated with the amount of health information acquired (6, 9). The absence of the causal relationship between income and acquisition of health information may be possible due to limited information provided by the data, as the information about the exact amount of individual and household income of the respondents has not been canvassed.

Given the budget, time and geographical constraints, several inherent limitations are noted. First, the sample size used in the present study could not represent the Malaysia population as a whole. Second, questions used in the present study to measure health information are somewhat limited. Hence, in addition to adding the sample size, questions measuring individuals' health awareness such as use of vitamins, and consumption of green leafy vegetables and fruits are suggested to be taken into account by the future studies.

Conclusion

Findings of the present study suggest that socio-demographic factors are significantly associated with acquisition of health information. Specifically, the elderly, rural dwellers and individuals with chronic disease and history of family illness have a higher likelihood of having good health knowledge than others, whereas, Malays, Chinese, males and those of lower educated are more likely to have poor health knowledge than others. Marital status, income, medical insurance, self-rated health, as well as drinking and smoking do not possess any significant impacts on acquisition of health information.

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